Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan 2003 Revision

Great Basin Unified
Air Pollution Control District

November 13, 2003

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Great Basin Unified Air Pollution Control District

November 13, 2003

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S.1 PURPOSE OF THE REVISED SIP

This Revised Owens Valley PM_{10} Demonstration of Attainment State Implementation Plan (RSIP) has been prepared by the Great Basin Unified Air Pollution Control District (District) to meet federal requirements in the Clean Air Act Amendments of 1990 (CAAA) and the Owens Valley PM_{10} Demonstration of Attainment State Implementation Plan (SIP) approved by the US Environmental Protection Agency (USEPA) in 1998. The RSIP includes an analysis of the particulate matter air pollution problem in the Owens Valley and provides a revised control strategy to bring the area into attainment with the National Ambient Air Quality Standards (NAAQS) for particulate matter by December 31, 2006.

S.2 FEDERAL CLEAN AIR ACT, THE SIP AND THE REVISED SIP

On July 1, 1987, the USEPA revised the NAAQS, replacing total suspended particulates (TSP) as the indicator for particulate matter with a new indicator called PM_{10} (particulate matter less than or equal to 10 microns in diameter). The intent of the new, health-based standard for particulate matter was to prevent concentrations of suspended particles in the air that are injurious to human health. PM_{10} can penetrate deep into the respiratory tract, and lead to a variety of respiratory problems and illnesses. On August 7, 1987, the USEPA designated the southern Owens Valley in Eastern California (Figure S.1) as one of the areas in the nation that violated the new PM_{10} NAAQS. Figure S.2 shows the boundaries of the nonattainment area, which is known as the Owens Valley Planning Area.

Subsequent air quality monitoring by the District has shown that the bed of Owens Lake – most of which is owned by the State of California and managed by the California State Lands Commission (SLC) – is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. In January 1993, the southern Owens Valley was reclassified as a “serious nonattainment” area for PM_{10}.

The USEPA required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrated how PM_{10} emissions would be decreased to prevent exceedances of the NAAQS. The District is the agency delegated by the state to fulfill this requirement. On November 16, 1998, the District adopted the SIP, which was approved by USEPA on August 17, 1999. That SIP provided for a five-year extension of the deadline for attainment, and for a Revised SIP (RSIP) in 2003 that would determine the final control strategy to attain the NAAQS by December 31, 2006.

This document was prepared to satisfy the requirement for an RSIP that demonstrates attainment of the PM_{10} NAAQS. This RSIP includes a PM_{10} control strategy to reduce wind blown PM_{10} emissions from the exposed playa at Owens Lake. The control strategy requires using gravel coverings, managed vegetation, or shallow flooding to accomplish PM_{10} emission reductions at Owens Lake. It is anticipated that the control strategy can be implemented such that the Owens Valley Planning Area will be brought into attainment by December 31, 2006 as required by the CAAA. If the District Board adopts the RSIP, it will be sent to the California Air Resources Board for review and approval. If approval is granted by the state, it will then be officially submitted to the USEPA in compliance with federal requirements.

S.3 HEALTH IMPACTS OF PM_{10} FROM OWENS LAKE

Particulate pollution is generally associated with dust, smoke and haze and is measured as PM_{10}, which is an acronym for particulate matter less than 10 microns in diameter. These particles are extremely small, approximately one-tenth the diameter of a human hair. Because of their small size they can easily penetrate deeply into the lungs. Breathing PM_{10} can cause a variety of health problems. It can increase the number and severity of asthma and bronchitis attacks. It can cause breathing difficulties in people with heart or lung disease, and it can increase the risk for, or complicate existing respiratory infections. The National Ambient Air Quality Standard is intended to protect people who are especially sensitive to elevated levels of PM_{10}, which includes; children, the elderly and people with existing heart and lung problems. The PM_{10} NAAQS for a 24-hour average is set at 150 $\mu g/m^3$. At much higher concentrations of PM_{10}, the dust can adversely affect even healthy individuals. The USEPA has set an episode level of 600 $\mu g/m^3$ as the level that can pose a significant risk of harm to the health of the general public, including otherwise healthy individuals (40 CFR 51.151).

The NAAQS for PM_{10} is frequently violated in the planning area because of wind blown dust from Owens Lake. Wind speeds greater than about 17 mph (7.6 m/s) have the potential to cause wind erosion from the barren lake bed. Ambient PM_{10} readings in the Owens Valley Planning Area are the highest measured in the country. One 24-hour average PM_{10} concentration at Dirty Socks Well on May 2, 2001 measured greater than 12,000 $\mu g/m^3$—more than 80 times higher than the PM_{10} NAAQS. From 1987 through 2001 the 24-hour PM_{10} NAAQS was violated about 14 times per year in Keeler, six times per year in Olancha and three times per year in Lone Pine. The annual PM_{10} average at Dirty Socks is estimated at 157 $\mu g/m^3$, more than 3 times higher than the federal standard of 50 $\mu g/m^3$.

Studies of dust transport from Owens Lake show that the standard can be exceeded more than 50 miles away and expose many more people to violations of the PM_{10} standard than just the residents near Owens Lake. The dust from Owens Lake at concentrations that can be above the federal PM_{10} standard annually affects about 40,000 permanent residents between Ridgecrest and Bishop. In addition, many visitors spend time in the dust-impacted area to enjoy the many recreational opportunities the Eastern Sierra and high desert have to offer.

The City of Los Angeles, acting through its Department of Water and Power (LADWP) is responsible for installing and operating the dust control measures on Owens Lake. Water diversions by the LADWP since early in the 20th century have cut Owens Lake off from its natural sources of water and caused the saline lake bed to be exposed. Frequent winds in the Owens Valley loft the lake bed soils and cause the PM_{10} violations. The 1998 SIP required the LADWP to begin operation of dust control measures by the end of 2001. Since

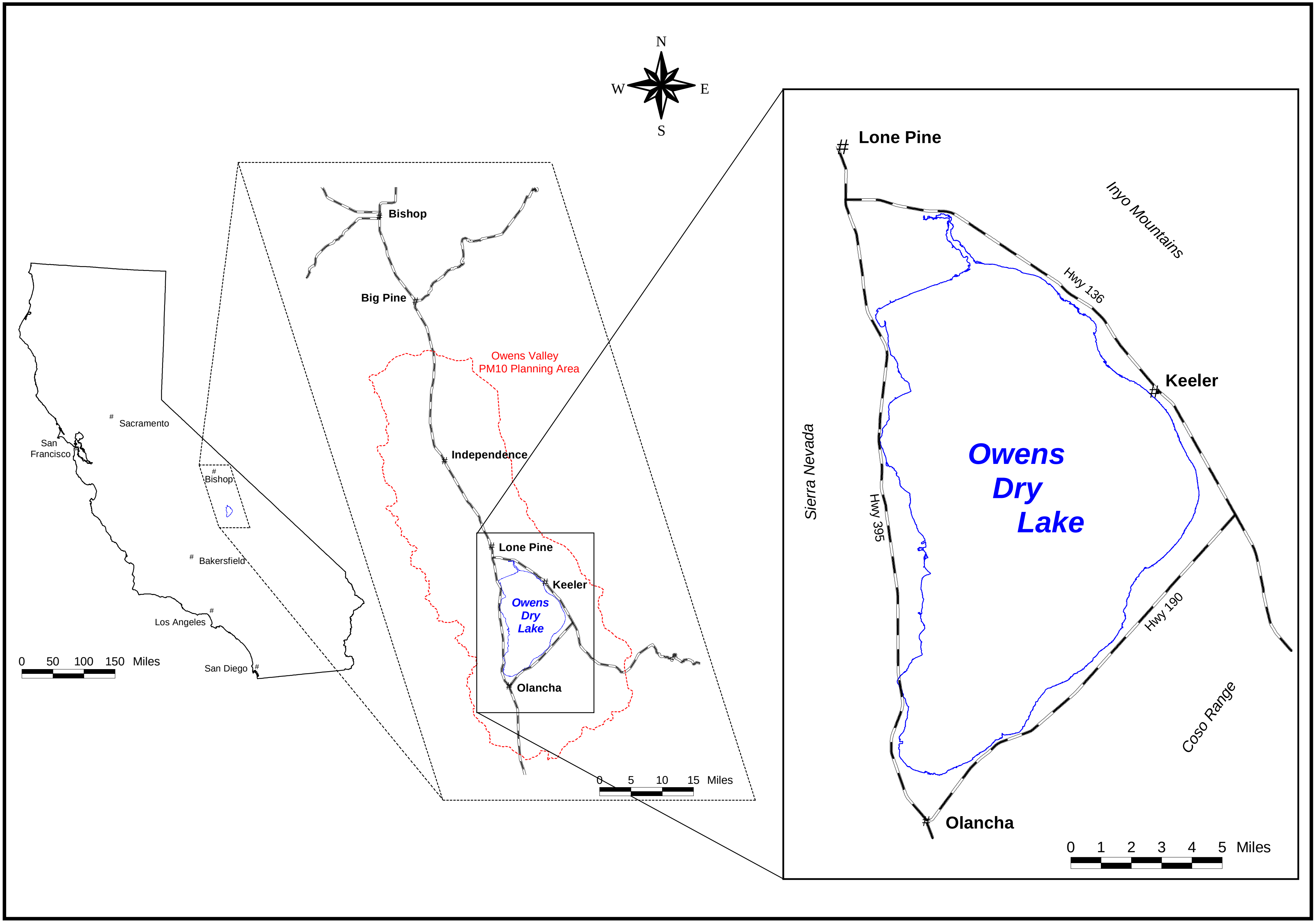

Figure S.1 - Vicinity map.

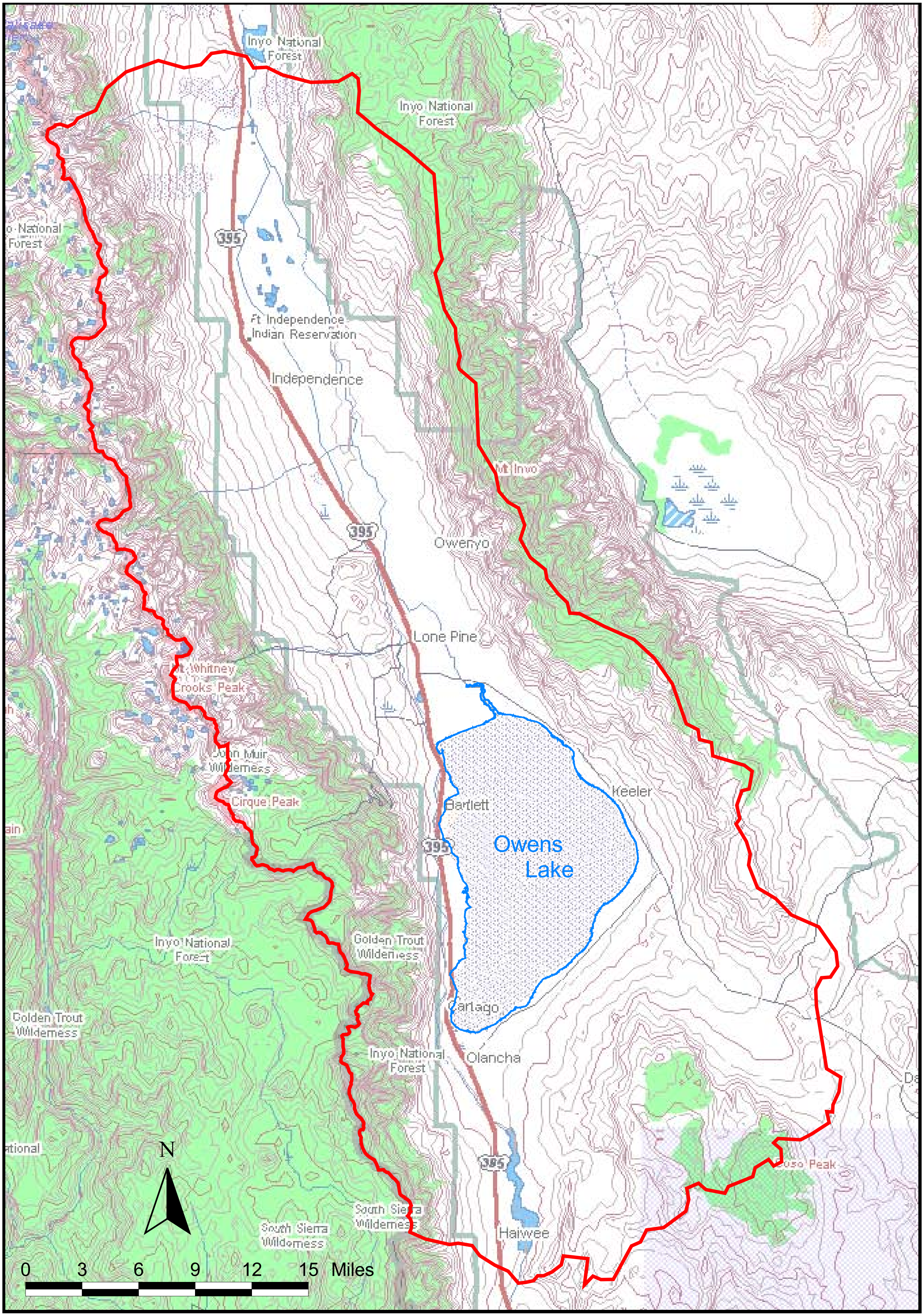

Figure S.2 - Boundaries of the federal PM-10 non-attainment area.

2001 the LADWP has installed and is operating dust controls on 13.5 square miles of emissive lake bed, in compliance with the requirements of the 1998 SIP.

S.4 SOURCES OF PM_{10} EMISSIONS

Air pollution emissions in the nonattainment area are dominated by PM_{10} emissions from wind erosion from the exposed Owens Lake playa. Other wind erosion sources in the nonattainment area are: off-lake sources of lake bed dust, small mining facilities and some areas near Lone Pine and Independence that have been disturbed by human activity. There are few industrial sources in the Owens Valley and the only other source of criteria pollutant emissions are wood stoves, fireplaces, unpaved and paved road dust, and vehicle tailpipe emissions. The USDA Forest Service will also be emitting PM_{10} from prescribed burning activities in and around the nonattainment area. The prescribed burning activity, however, is not expected to be done on windy days when the Owens Lake dust storms occur. Predicted windy days are avoided when doing prescribed burns for fire safety reasons.

Wind eroded material from Owens Lake comprises more than 96 percent of the 24-hour and annual emission inventories. Wind erosion emissions can be separated into lake bed and non-lake source areas. The on-lake source areas are the wind erosion areas on the historic playa of Owens Lake. Figure S.3 shows the identified source areas that have been used for the attainment demonstration RSIP. These source areas were determined by modeling the emissions and ground-truthing the actual areas on the lake bed. Non-lake sources of wind blown dust are caused by dust that was initially entrained from the exposed playa and then deposited in dune field areas off the lake bed. These dust deposition areas, which are located adjacent to the lake bed near Keeler and Olancha, become secondary sources of dust that can be re-entrained under windy conditions.

The locations of lake bed source areas were determined by a network of 135 sand motion monitors, visual observations, Global Positioning System (GPS) mapping and modeling that related sand motion to measured PM_{10} concentrations on the shoreline.

S.5 PM_{10} CONTROL MEASURES

Control measures are defined as those methods of PM_{10} abatement that could be placed onto portions of the Owens Lake playa and when in place are effective in reducing the PM_{10} emissions from the surface of the playa. Since 1980 the District and other researchers have studied the lake environment and the mechanisms that cause Owens Lake's severe dust storms. Since 1989 the District has pursued a comprehensive research and testing program to develop PM_{10} control measures that are effective in the unique Owens Lake playa environment. The District, in cooperation with the LADWP, has developed three PM_{10} control measures that it has found to be feasible and effective: shallow flooding, managed vegetation and gravel.

S.5.1 Shallow Flooding

The surfaces of naturally wet areas on the lake bed (i.e., those areas typically associated with seeps and springs) are resistant to wind erosion that causes dust. Shallow flooding mimics the physical and chemical processes that occur at and around natural springs and wetlands. The shallow flooding dust control measure provides dust control over large areas with minimal infrastructure and requires minimal ongoing operation, maintenance and lake bed access. This control measure consists of releasing water along the upper edge of the PM_{10} emissive area elevation contour lines and allowing it to spread and flow down-gradient toward the center of the lake. To attain the required PM_{10} control efficiency, at least 75 percent of each square mile of the control area must be wetted (i.e., standing water or surface saturated soil) between October 1 and June 30 each year. This coverage is determined by aerial photography, satellite imagery or any other method approved by the Air Pollution Control Officer. To maximize project water use efficiency, flows to the control area are regulated at the outlets so that only sufficient water is released to keep the soil wet. Although the quantity of excess water is minimized through system operation, any water that does reach the lower end of the control area is collected and recirculated through the system. At the lower end of the flood area, or at intermediate locations along lower elevation contours, excess water is collected along collection berms and pumped back up to the outlets to be reused.

Due to the generally flat, uniform nature of the lake bed, the outlet water spreads over wide areas to create a random pattern of shallow pools. These pools are generally less than a few inches deep. Pooled areas produce no PM_{10}. In fact, standing water acts as a sand trap to capture loose sand and prevent wind erosion and dust generation. Damp and saturated soils also resist wind erosion. Locally high areas or "islands" of non-wetted soil tend to self-level; the soil blows off the higher islands and is captured in the pools. Thus, over time the high areas become lower and the low areas become higher. This leveling process can be expected to occur over a period of a few years.

Shallow Flooding has been shown to be effective for controlling wind blown dust in sand dominated soils on the lake bed. Between 1993 and 1996 a 600-acre test was conducted on the sand sheet between Swansea and Keeler. Effectiveness was evaluated in four ways; a) from aerial photographs assuming that flooded areas provided 100 percent control, b) from portable wind tunnel measurements of test and control areas, c) from fetch transect analysis of sand motion measurements; and d) from areal analysis of sand motion measurements. The average control effectiveness was 99 percent after the surface water covered 75 percent of the test area. By July 2003 the shallow flooding control measure was implemented on about 13.9 square miles of emissive lake bed. Measurements show that it has been effective in controlling emissions from that area.

The expansive shallow flooded areas already constructed on the Owens Lake bed provide ephemeral resting and foraging habitat for wildlife use. Insect and shorebird utilization of wet areas created by the LADWP's implementation of shallow flooding on the lake bed is common. Shallow flooding creates large areas of wildlife habitat in areas where very little previously existed.

Water flows between October 1 and June 30 will be maintained to provide the required 75 percent of the area in standing water or saturated soil. Based on the District's large-scale tests of shallow flooding, operating the shallow flooding control measure in this manner is predicted to use approximately four acre-feet per year (ac-ft/yr) of water per acre controlled.

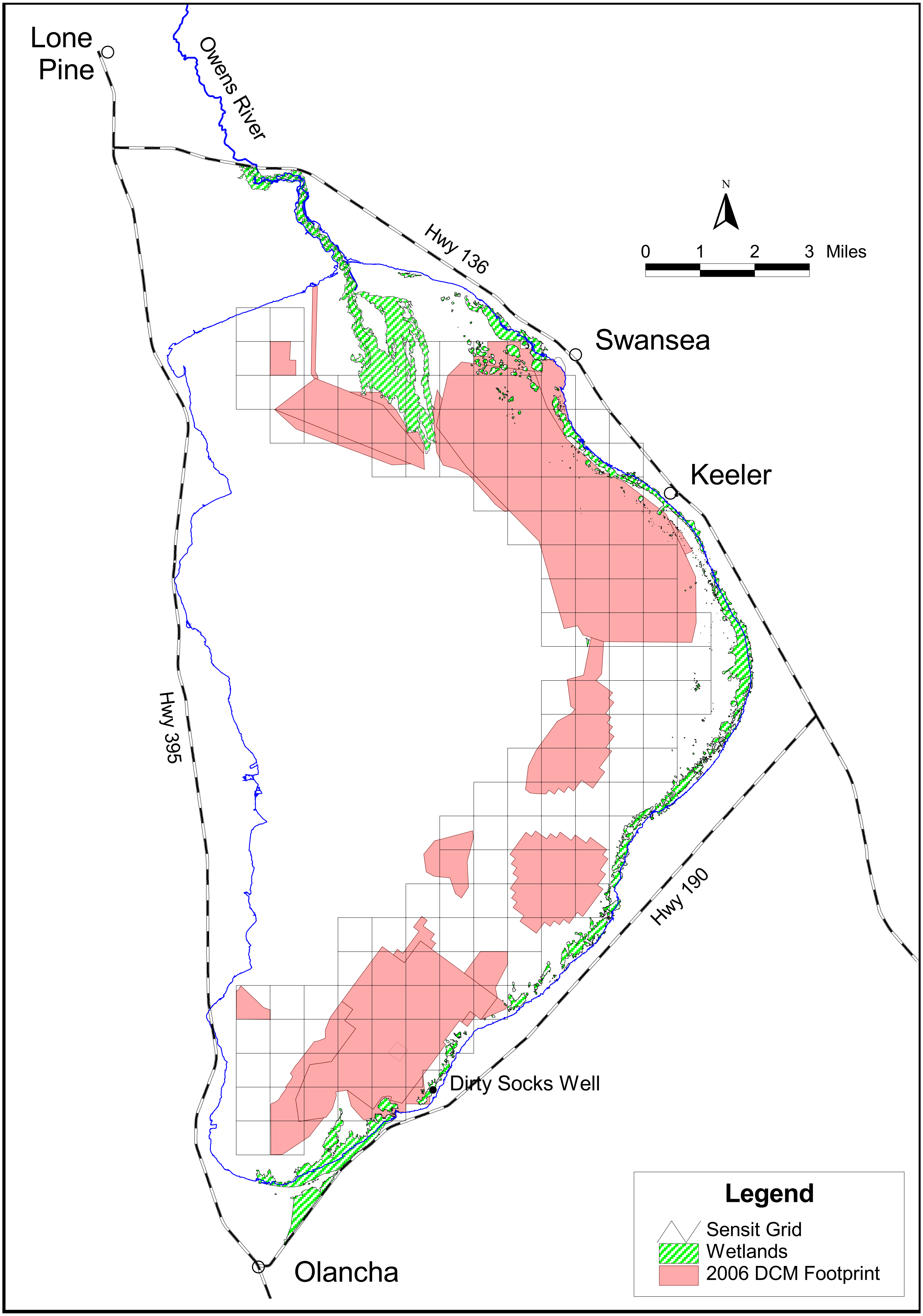

Figure S.3 - 2006 dust control measure footprint map.

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S.5.2 Managed Vegetation

Vegetated surfaces are resistant to soil movement and thus provide protection from PM_{10} emissions. Vegetation that has established at least 50 percent total surface cover provides a barrier that prohibits wind speeds from reaching the threshold velocity for emissions at the playa surface. Vegetation has naturally become established where water appears on the playa surface with quantity and quality sufficient to leach the salty playa surface and sustain plant growth. Saltgrass meadows around the playa margins and the scattered spring mounds found on the playa are examples of such areas. The managed vegetation strategy is modeled on these naturally protected saltgrass vegetated areas. Dust control using managed vegetation will occur within a mosaic of irrigated fields provided with subsurface drainage to create soil conditions suitable for plant growth using a minimum of applied water.

The managed vegetation control measure consists of creating a farm-like environment from currently barren playa. The saline soils must first be reclaimed with the application of relatively fresh water, and then planted with salt-tolerant plants that are native to the Owens Basin. Thereafter, soil fertility and moisture inputs must be managed to encourage rapid plant development to, and maintenance of, 50 percent cover. Demonstrated methods for accomplishing 50 percent cover within two years of the start of reclamation at Owens Lake are based either on level basin reclamation or on drip irrigation. Both of these techniques are methods of soil reclamation and plant husbandry that are used elsewhere in this country and world-wide for vegetation of salt-affected soils.

To attain the required PM_{10} control efficiency of 99 percent, a plant cover of 50 percent live or dead cover will be required on the managed vegetation control areas. Data from test plots on the lake indicate that such cover can be achieved after two growing seasons. Total cover will include both live and dead plant materials, as both function to prevent PM_{10} emissions. Field studies on Owens Lake test plots confirm that the target saltgrass cover of 50 percent can be sustained with about 2½ ac-ft/yr of irrigation water for each acre planted with saltgrass. Percent cover can be measured by the point-frame method, aerial photos, satellite imagery or spectroscopy.

Initially, saltgrass (*Distichlis spicata)* is the only plant species considered by this RSIP for introduction into managed vegetation fields. Saltgrass is tolerant of relatively high soil salinity, spreads rapidly via rhizomes (underground stems) and provides good protective cover year-round even when dead or dormant. It is adapted to produce its most vigorous growth during seasonally cooler months, and then use minimal amounts of applied water during the xeric summer. Saltgrass grows vigorously in conditions of soil salinity that exclude invasive pest exotics. Eventually, salt-tolerant, locally native shrubs such as salt bushes (*Atriplex* spp.), greasewood (*Sarcobatus vermiculatus*), and seepweed (*Sueada moquinii*) may be introduced to established saltgrass fields to increase diversity and possibly reduce total water demand.

Based on field studies done at Owens Lake and elsewhere, the District concludes that more than 99 percent reduction of soil erosion and PM_{10} will be achieved at Owens Lake with a salt grass cover of 50 percent. For modeling and emissions inventory purposes the controlled PM_{10} emissions from the vegetation managed area are estimated at one percent of the uncontrolled emission rate.

Water use will be highest during the initial stages of development of this measure, in order to leach the root zone soil to a salinity level tolerable to saltgrass. Since the later stages of leaching can be accomplished after planting, the total water input that will be required for the first year of implementation will be at most seven ac-ft/ac. Managed vegetation will consume up to 2½ acre-feet of fresh or mixed water per irrigated acre once the target cover of 50 percent is reached. Non-irrigated acres used for roads, berms and water storage will also use some saline water for maintenance of protective (non-emissive) salt-crusted surfaces and weed control.

S.5.3 Gravel Cover

A four-inch layer of coarse gravel laid on the surface of the Owens Lake playa will prevent PM_{10} emissions by: (a) preventing the formation of efflorescent evaporite salt crusts, because the large spaces between the gravel particles interfere with the capillary forces that transport the saline water to the surface where it evaporates and deposits salts; and (b) raising the threshold wind velocity required to lift the large gravel particles (i.e., larger than ½-inch diameter) so that transport of the particles is not possible by wind speeds typical of the Owens Lake area. Gravel blankets can work effectively on essentially any type of soil surface. Gravel test plots on Owens Lake were in place for approximately 17 years and continued to completely protect the emissive surfaces beneath. Gravel placed onto the lake bed surface will be durable enough to resist wind and water deterioration and leaching and will be approximately the same color as the existing lake bed.

Under certain limited conditions of sandy soils combined with high ground water levels, it may be possible for some of the gravel blanket to settle into lake bed soils and thereby lose effectiveness in controlling PM_{10} emissions. To prevent the settling of protective gravel material into lake bed soils, a permeable geotextile fabric may be placed between the soil and the gravel where necessary. This will prevent gravel settling. Gravel areas will also be protected from flood deposits with flood control berms, drainage channels and desiltation/retention basins. These measures will ensure that the gravel blanket will remain an effective PM_{10} control measure for many years.

To attain the required PM_{10} control efficiency, 100 percent of all areas designated for gravel must be covered with a layer of gravel at least four inches thick. All gravel material placed shall be screened to a size greater than ½-inch in diameter. The gravel material shall be at least as durable as the rock from the three sources analyzed in the Final Environmental Impact Report (FEIR) prepared for the 1998 SIP. The material shall have no larger concentration of metals than found in the materials analyzed in the FEIR. The color of the material used shall be such that it does not significantly change the color of the lake bed.

A gravel cover forms a non-erodible surface when the size of the gravel is large enough that the wind cannot move the surface. If the gravel surface does not move, it protects finer particles from being emitted from the surface. The potential PM_{10} emissions from a gravel surface can be estimated using the USEPA emission calculation method for industrial wind erosion for wind speeds above the threshold for the surface. PM_{10} will not be emitted if the wind speed is below the threshold speed.

The proposed gravel cover will have a threshold wind speed of 90 miles per hour measured at 10 meters. This wind speed is rarely exceeded in the Owens Lake area. A more typical gust for Owens Lake may be around 50 miles per hour. The PM_{10} emissions are expected to be zero for the gravel cover since the threshold wind speed to entrain gravel, and thus PM_{10}, is above the highest expected wind speeds expected for the area. This will result in 100 percent reduction of PM_{10} from areas that are covered by a gravel blanket.

S.6 PROPOSED CONTROL STRATEGY

The selected PM_{10} control strategy sets forth an overall plan to control dust from Owens Lake by implementing the three control measures discussed above, shallow flooding, managed vegetation and gravel. Through the use of air quality modeling, the District has determined that this control strategy has a high likelihood of bringing the Owens Valley PM_{10} Planning Area (OVPA) into attainment with the PM_{10} NAAQS by December 31, 2006, or sooner.

The proposed control strategy will take place between January 1, 2004 and December 31, 2006. Control measures have already been implemented on 16½ square miles of lake bed. The proposed control strategy will require control measures on an additional 13.3 square miles in order to provide for attainment of the PM_{10} NAAQS by December 31, 2006.

S.6.1 Dust Control Measure Requirements

The control strategy will use one or more of the three dust control measures discussed above (shallow flooding, managed vegetation and gravel) to control PM_{10} emissions from the Owens Lake bed. The 29.8 square mile control area is shown in Figure S.3. Construction of the control measures and compliance with the performance standards must be complete by 5 p.m. on December 31, 2006.

The proposed control strategy allows the LADWP to use any combination of the three allowable Best Available Control Measures (BACM), shallow flooding, managed vegetation or gravel. The procedures to refine or add BACM are described in the Board Order in Chapter 8.

S.6.2 Contingency Measures – Supplemental Control Requirements

The dust-producing areas on Owens Lake change from year to year depending on temperature and rainfall. The requirement for control of 29.8 square miles of the Owens Lake bed was determined by data gathered from January 2000 through June 2002. All three of those years had below normal rainfall in the Owens Valley and runoff from the Sierra Nevada. It is possible that areas on the lake bed that were not emissive during that period could become emissive in the future.

This RSIP contains a procedure for supplemental control requirements to be automatically implemented, if lake bed conditions change. This satisfies the requirement of the Clean Air Act for contingency measures that become effective without the need for agency approval if the proposed control strategy does not attain the NAAQS by the specified date (December 31, 2006).

S.6.3 Requirements in the Event of an Appeal

In the event of a legal challenge by the LADWP to this RSIP that causes these requirements to be stayed or disapproved, the requirements of the 1998 SIP remain in effect. That SIP requires the LADWP to continue to annually complete implementation and begin operation of control measures on an additional two (2) square miles of the Owens Lake bed by December 31 of each calendar year after 2003. The implementation of these additional control measures will continue unless the District determines on or before December 31 of the previous year, that the OVPA will attain the PM_{10} NAAQS by the statutory deadline without implementation of further controls. This requirement is automatic—it is part of the EPA-approved 1998 SIP and Order and requires no further action by the District or any other agency.

Upon State of California approval of the RSIP pursuant to Cal. Health & Safety Code §41650, the LADWP shall make up any control measure shortfall caused by the RSIP challenge, if any, or shall be provided credit for control measure installation beyond the state approved RSIP, if any. Any required control measure shortfall will be made up by the LADWP within one year of the approval of this 2003 RSIP by the state.

S.7 MODELED ATTAINMENT DEMONSTRATION

An air quality modeling analysis was performed to show that the proposed control strategy would reduce the PM_{10} emissions to a level that will bring the Owens Valley Planning Area into compliance with the PM_{10} NAAQS. After the proposed control strategy is implemented, ambient PM_{10} levels are expected to be below both the 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$ and annual PM_{10} NAAQS of 50 $\mu g/m^3$. The highest impact area is expected to occur in the area near the northeast shoreline.

S.8 CONCLUSION

The proposed control strategy using a combination of shallow flooding, managed vegetation, and gravel covering can reasonably be expected to be implemented in three years to meet the federal attainment deadline of December 31, 2006. Investigations performed on the lake bed show that the three control measures developed by the District and the LADWP will prove to be feasible and that they will significantly reduce PM_{10} emissions. Air quality modeling has shown that this strategy can reduce PM_{10} impacts at sites around the historic lake shore to below the federal 24-hr and annual PM_{10} standards.

CHAPTER 1

Introduction

1

Introduction

This 2003 Revised State Implementation Plan (RSIP) has been prepared by the Great Basin Unified Air Pollution Control District (District) to meet federal requirements in the Clean Air Act Amendments of 1990 (CAAA) and the Owens Valley PM_{10} Demonstration of Attainment State Implementation Plan (SIP) approved by the US Environmental Protection Agency (USEPA) in 1999. This RSIP includes an analysis of the particulate matter air pollution problem in Eastern California's Owens Valley and provides a revised control strategy to bring the area into attainment with the National Ambient Air Quality Standards (NAAQS) for particulate matter by December 31, 2006.

1.1 FEDERAL CLEAN AIR ACT, THE SIP AND THE REVISED SIP

On July 1, 1987, the USEPA revised the NAAQS, replacing total suspended particulates (TSP) with PM_{10}, a new indicator for particulate matter. PM_{10} is the term given to airborne particulate matter less than or equal to 10 microns in diameter. The intent of the new, health-based standard for particulate matter is to prevent concentrations of suspended particles in the air that are injurious to human health. PM_{10} can penetrate deep into the respiratory tract, and lead to a variety of respiratory problems and illnesses.

On August 7, 1987, the USEPA designated the southern Owens Valley (known as the Owens Valley Planning Area) as one of the areas in the nation that violated the new PM_{10} NAAQS. Subsequent air quality monitoring by the District has shown that the bed of Owens Lake – most of which is owned by the State of California and managed by the California State Lands Commission (SLC) – is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. The Owens Lake bed is considered an anthropogenic (human caused) source of PM_{10} because the City of Los Angeles' Aqueduct diverts water sources that historically supplied the lake. In January 1993, the southern Owens Valley was reclassified as "serious non-attainment" for PM_{10}.

The USEPA required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrated how PM_{10} emissions would be decreased to prevent exceedances of the NAAQS. The District is the agency delegated by the State to fulfill this requirement. In accordance with Section 189(b) of the CAAA, an Attainment SIP that demonstrates conformance with the federal air quality standards through the implementation of a program of control measures was required to be submitted to the USEPA by February 8, 1997. In November of 1998, the District adopted the SIP, which was approved by USEPA on August

17, 1999. The 1998 SIP provided for a five-year extension of the deadline for attainment, and for a SIP Revision in 2003 that would determine the final control strategy to attain the NAAQS by December 31, 2006. By statute, attainment of the NAAQS for PM_{10} must have been accomplished by December 31, 2001 unless the USEPA granted a one-time maximum five-year extension. The 1998 SIP approval included the five-year extension.

1.2 DEMONSTRATION OF ATTAINMENT SIP

This document was prepared to satisfy the requirements for a SIP that demonstrates attainment with the PM_{10} NAAQS by December 31, 2006. This RSIP includes a PM_{10} control strategy to reduce wind-blown PM_{10} emissions from the exposed playa at Owens Lake such that the PM_{10} NAAQS will be attained in the Owens Valley. The control strategy requires using shallow flooding, managed vegetation, and gravel coverings to accomplish PM_{10} emission reductions at Owens Lake. It is anticipated that this control strategy can be implemented in three years and bring the area into attainment by December 31, 2006 as required by the CAAA. If adopted by the District, this RSIP will be sent to the California Air Resources Board for review and approval. If approval is granted by the State, it will then be officially submitted to the USEPA in compliance with federal requirements.

1.3 ELEMENTS OF THE REVISED SIP

The RSIP includes an analysis of the air quality impacts caused by the wind-blown PM_{10} from Owens Lake, estimates of the quantity of PM_{10} emitted, a discussion of control measures, an analysis of the emission reductions achieved through 2003 and an air quality modeling analysis that demonstrates that it is possible to attain the PM_{10} standard with the proposed additional control measures. The following is a brief description of the contents of the RSIP:

- Chapter 2 describes the Owens Valley Planning Area and provides a history of Owens Lake and the air pollution problem.

- Chapter 3 includes a summary of PM_{10} air pollution measurements taken in the Owens Lake area, a description of sensitive airsheds in the area, and an assessment of how air quality in the Planning Area compares to the federal standards.

- Chapter 4 contains the annual and peak 24-hour PM_{10} emission summary from wind erosion and other sources in the Owens Lake area.

- Chapter 5 describes the three control measures that the District, in cooperation with the City of Los Angeles (City), has developed and that have been found to be feasible and effective on Owens Lake: shallow flooding, managed vegetation, and gravel covering.

- Chapter 6 describes the air quality modeling method that the District used to show that the proposed control strategy would bring the Owens Valley into attainment with the PM_{10} NAAQS.

- Chapter 7 sets forth the control strategy and describes how the control measures will be placed on the lake bed to accomplish the overall level of control that is needed upon completion.

- Chapter 8 contains the Board Order that will be issued to the City of Los Angeles to implement the RSIP control strategy.

- References are listed at the end of each chapter, and are summarized in a composite list in Chapter 9.

- Terms, acronyms and measurement units are defined in a glossary in Chapter 10.

- The declaration of the Board Clerk and associated resolutions are contained in Chapter 11.

- Appendices to the RSIP include daily PM_{10} data summaries, air quality dispersion modeling results, and additional RSIP support documents including public comments on the draft document and the District's responses for the final (see List of Appendices in the Table of Contents).

- An Environmental Impact Report (EIR) has also been prepared for the project. In conjunction with previous environmental analyses performed by both the District and the City of Los Angeles, the EIR for the RSIP analyzes the proposed project's impacts on the environment and requires mitigation measures to reduce or eliminate those impacts.

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CHAPTER 2

Owens Valley Planning Area

FIGURES

2

Owens Valley Planning Area

2.1 PROJECT LOCATION AND LAND OWNERSHIP

2.1.1 Location

Owens Lake is located in Inyo County in eastern-central California. It is situated at the south end of the long, narrow Owens Valley with the Sierra Nevada to the west, the Inyo Mountains to the east, and the Coso Range to the south (Figure 2.1). The predominantly dry, alkaline Owens Lake bed is approximately eight miles south of the community of Lone Pine on U.S. Highway 395, 60 miles north of the city of Ridgecrest, and 35 miles west of Death Valley. The communities of Olancha and Keeler are located on the southwestern and eastern shores of the lake bed, respectively. The bed of Owens Lake is defined as the area below 3600 feet above mean sea level (all elevations will be given in feet above mean sea level).The lake bed extends about seventeen miles north and south and ten miles east and west and covers an area of approximately 110 square miles (70,000 acres).

Owens Lake and its surrounding dry playa are depicted on the following seven USGS 7.5 minute series topographic quadrangle maps: Lone Pine, Dolomite, Bartlett, Owens Lake, Keeler, Olancha and Vermillion Canyon. These maps are available for review in the District's Bishop office. Site specific topographic mapping has been compiled and is summarized in Figure 2.2.

The proposed project for the Revised State Implementation Plan (RSIP) will be implemented on approximately 29.8 square miles (19,072 acres) of the former lake bed, predominantly in the eastern portion (Figure 2.3). The dark solid areas in Figure 2.3 represent those areas where controls have already been constructed by the City of Los Angeles (City) acting through its Department of Water and Power (LADWP) under the requirements of the 1998 SIP. The light solid areas in Figure 2.3 show those additional areas that require dust control measures (DCM) in order to meet the NAAQS by 2006, and the unshaded grid represents potential PM_{10} source areas that may have to be controlled under the contingency measures provision (Section 7.4).

Figure 2.3 shows the existing riparian and wetland resources delineated at Owens Lake (GBUAPCD, 2003d). These areas were mapped using ground surveys and satellite photos. Riparian vegetation extends onto the largely barren dry lake bed in the area of the Owens River delta. In addition, a narrow band of vegetation consisting of spring mounds and alkaline meadows is present along the edge of the historic shoreline, above the barren lake bed areas that are the primary sources of PM_{10} emissions.

2.1.2 Land Ownership

Approximately 68,000 acres, or 95 percent, of the Owens Lake bed is owned by the State of California and managed by the State Lands Commission (SLC). Most of this lake bed state-owned land is leased for a variety of purposes. U.S. Borax leases about 16,120 acres of lake bed for the purposes of extracting trona ore (an evaporite sodium carbonate mineral). In addition, there are a few agricultural (grazing) leases near historic shoreline areas. Most of the remaining state-owned lake bed areas are leased from the state by the District and the City of Los Angeles for the purpose of developing and implementing PM_{10} control measures. Most of the remaining 5 percent of the lake bed, or approximately 2,800 acres, is owned by the City of Los Angeles and is managed by the Los Angeles Department of Water and Power. The City's lands are in the Owens River delta and on the lake bed west of Keeler. A few small areas below and considerable areas above the historic shoreline are federal lands managed by the U.S. Bureau of Land Management (BLM). A few small isolated private land parcels are also located on the lake bed. All control measures and supporting infrastructure are expected to be owned by the City of Los Angeles, on property owned by the City or on leases or easements from other underlying owners.

2.2 PROJECT HISTORY

2.2.1 Environmental Setting and Effects of Diversions on Owens Lake

2.2.1.1 Geologic History

Owens Lake is part of a chain of lakes formed between 10,000 and 16,000 years ago. The lakes spanned from Mono Lake (previously a much larger lake known as Lake Russell) in the north to Lake Manley, the southeasternmost lake of the chain, in what is now known as Death Valley. During much of this time, water from the Owens Valley basin flowed out of Owens Lake, through Rose Valley and into China Lake. The high stand of Owens Lake that produced the shorelines at an elevation of 3,880 is estimated to have occurred 15,000-16,000 years ago. Since that time, the surface extent of the water of Owens Lake has been diminishing. Two deep cores on the lake bed failed to identify any previous episodes of complete desiccation (Saint-Amand, *et al.*, 1986, Smith and Bischoff, 1993). Uplift processes in the Coso Range, combined with a post-glacial drying trend, eliminated overland outflow from the basin about 3,000 years ago. As a result, the lake basin became closed, losing water only through surface evaporation and transpiration. This internal drainage, combined with the arid environment, created the highly saline condition of remaining surface waters and soils at the bottom of the Owens Lake basin. Even during historic periods in the 1800's when it was used as a navigable waterway, Owens Lake was an alkali lake.

2.2.1.2 Historic Lake Levels

Although historic lake levels were as high as 3,597 feet in 1878 (Lee, 1915), surface water diversions in the Owens Valley over the last 130 years have reduced the lake to less than one-third of its original size and about 5 percent of its original volume (Mihevc and Cochran, 1997). From the 1860's to the early 1900's, withdrawals from the Owens River

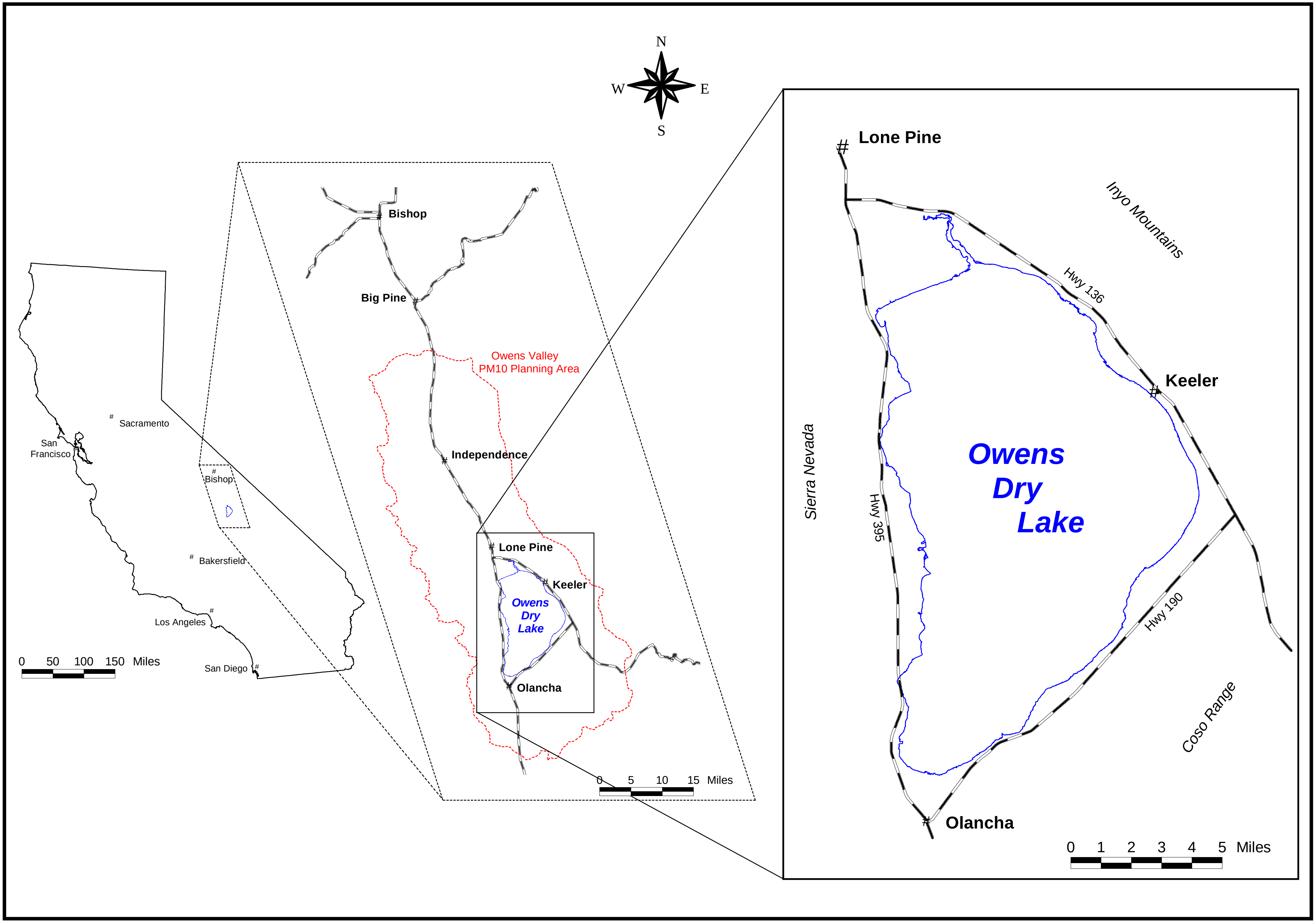

Figure 2.1 - Vicinity map.

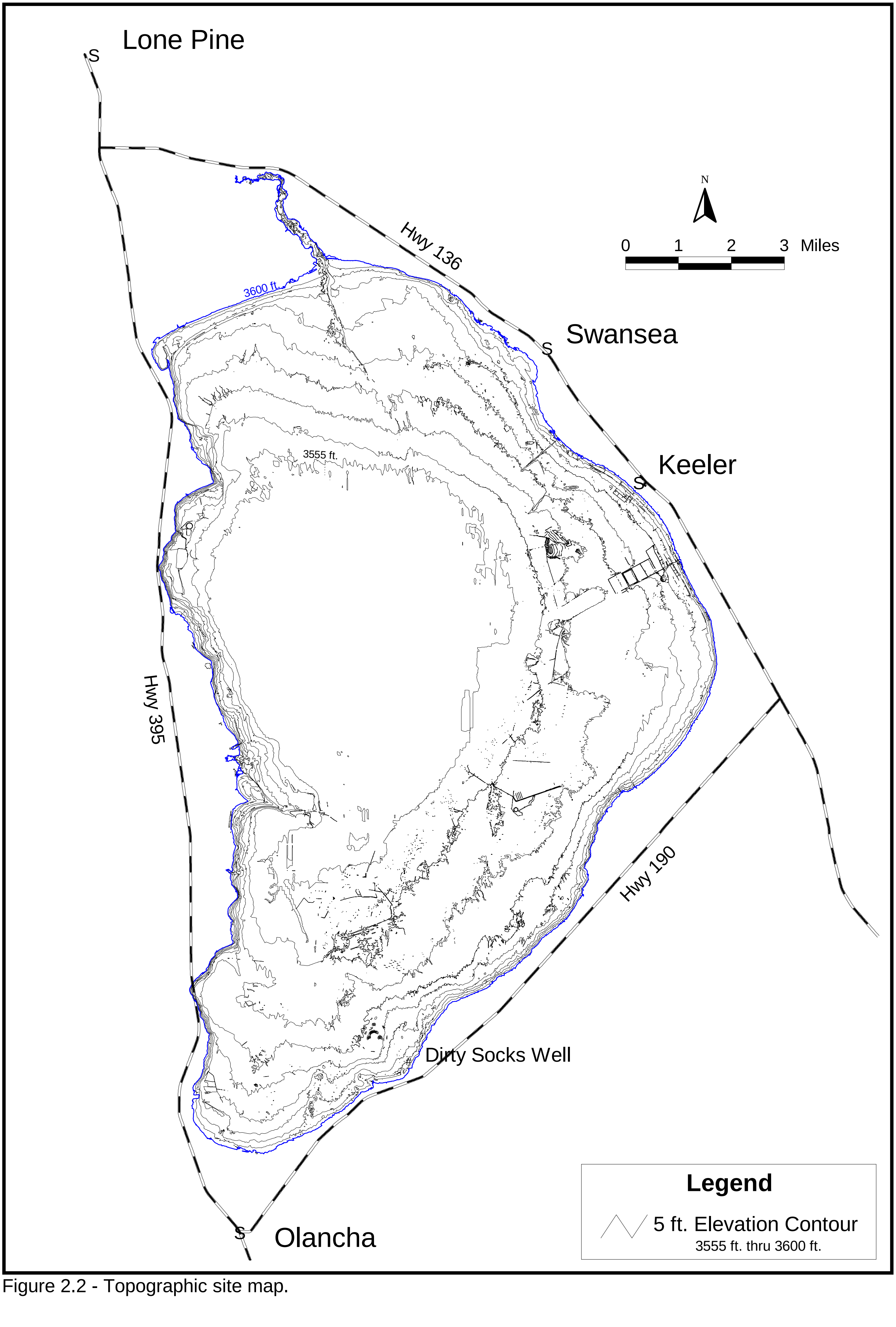

Figure 2.2 - Topographic site map.

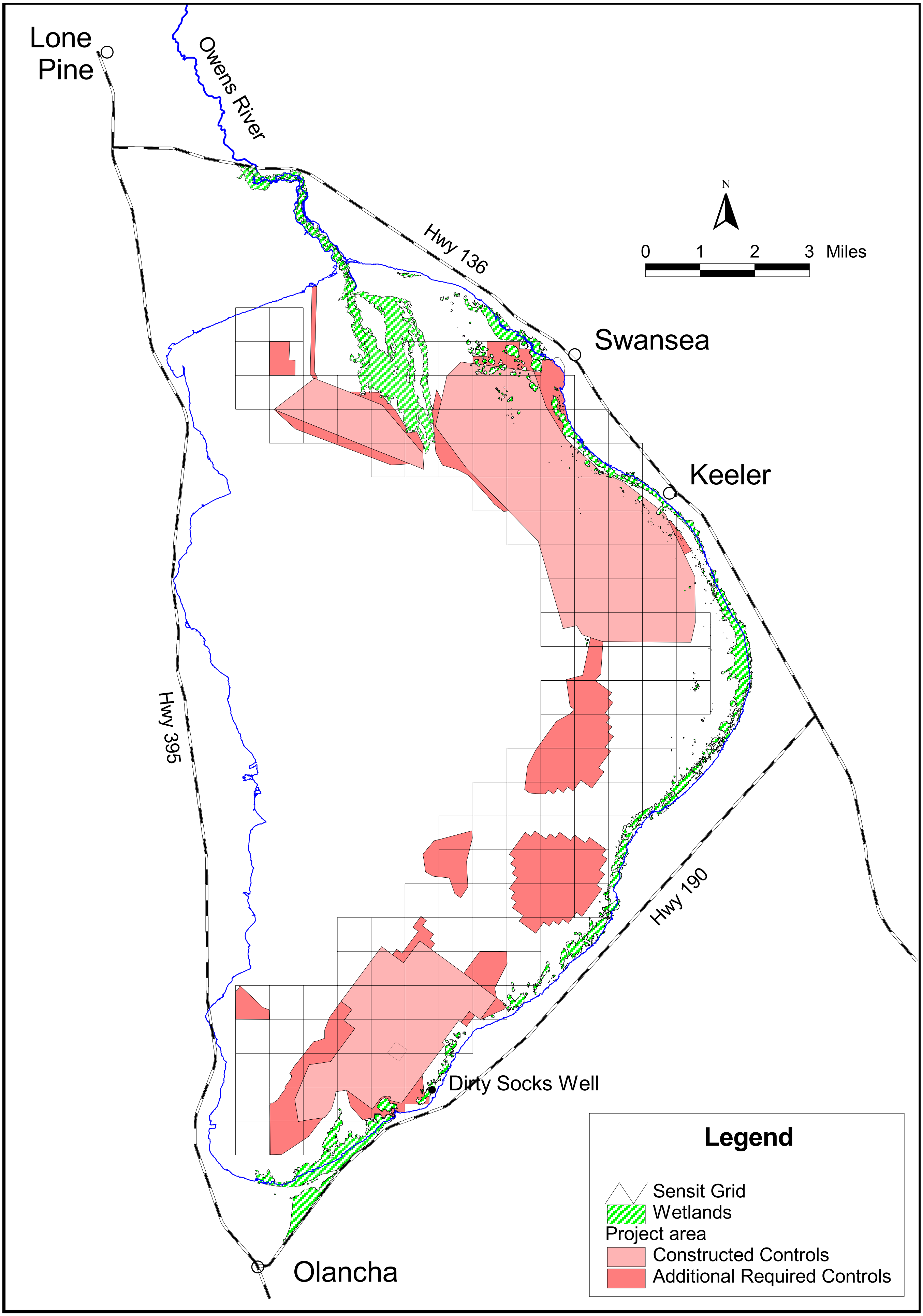

Figure 2.3 - 2006 dust control measure footprint map.

for agricultural purposes substantially reduced surface water inflow to the lake. Extensive irrigation projects compounded by drought caused the lake level to drop as low as 3,565 feet in 1906. However, as the drought ended, by 1912 the level had risen to 3,579 feet (Lee, 1915). In 1913, the LADWP completed a fresh water aqueduct system and began diverting waters of the Owens River south to the City of Los Angeles. Demand for exported water increased as Los Angeles grew, and diversions for irrigation continued in the Owens Valley (mainly on City-owned property). These factors resulted in Owens Lake becoming virtually dry by 1930; its level having dropped to its current ordinary high water elevation of about 3,554 feet (Saint-Amand, *et al.*, 1986 and LADWP, 1966).

A former or stranded shoreline was left behind at an approximate elevation of 3,600 feet. The former shoreline bounds the lake bed playa in aerial photographs and on most maps. The area enclosed by the stranded historic shoreline is approximately 110 square miles (70,400 acres). Today, the remnant Owens Lake consists of a hypersaline permanent brine pool about 25.5 square miles (16,320 acres) in size in the lowest portion of the basin, surrounded by dry playa soils and crusts. The ordinary high water mark of this remnant brine pool has been defined by the U.S. Army Corps of Engineers to be that portion of the lake basin below 3,553.55 feet. Evaporite deposits and brines cover much of the playa area; the concentration of dissolved solids (salts) can be as high as 77 percent by weight (GBUAPCD, 2001b).

2.2.1.3 Flora and Fauna

The Owens Valley has been described as having a very rich variety of plants with over 2,000 species represented in the region, though they are limited in distribution at Owens Lake to the relic shoreline and nearby alluvial fans (DeDecker, 1984). Riparian, alkaline meadow and alkali seep plant communities, which circumscribe Owens Lake, provide important habitat for resident and migratory wildlife species. Many of the diverse wildlife resources that are characteristic of the Sierra Nevada, Inyo, and Coso mountain ranges surrounding Owens Lake will occasionally be found on the Valley floor, particularly during winter. Heindel and Heindel (1995) report as many as 320 bird species for the Owens Valley floor including permanent residents, summer residents, winter residents, and migrants. Ephemerally flooded areas in the vicinity of Owens Lake provide excellent resting and foraging habitat for migrants and winter residents and winter prime opportunities for bird watching. Several sensitive wildlife species are found at Owens Lake.

2.2.1.4 Cultural History

The Owens Valley has attracted the interest of archeologists since at least the 1930’s. The Riddells (Riddell, H. 1951; and Riddell and Riddell 1956) conducted the major work in the region in the 1940s and 1950s, recording several sites on the perimeter of Owens Lake including important sites at Cottonwood Creek and Rose Spring. Two California State Historic Landmarks and two California Points of Historic Interest are located in the vicinity of Owens Lake. Ethnographic data indicate that the east shore of Owens Lake was used by Native American groups. Historic resources related to mining and transportation have been identified along the stranded shoreline.

2.2.2 Legal History

2.2.2.1 Natural Soda Products Co. vs. City of Los Angeles

By the late 1920's, the majority of the lake bed was dry and remained so until 1937. As the lake dried and the lake bed was uncovered, valuable mineral deposits of trona ore were exposed and became available for extraction. In 1937, 1938, and 1939, the LADWP released large quantities of water onto the lake bed, causing extensive damage to the mineral deposits and chemical processing plants. In 1937, the Natural Soda Products Company, a lessee of mineral rights from the State of California, sued the City of Los Angeles for damages to its chemical plant and business caused by the flooding of Owens Lake. The court decided the case in 1943 and a judgment for damages was awarded. Natural Soda Products Co. vs. City of Los Angeles 1943, 23 Cal.2d 193 [143 P.2d 12] established that "the city, by its long continued diversion of the waters of the Owens River, incurred an obligation to continue that diversion…at least so long as it continued to maintain its aqueduct." In 1939, the State, as owner of the lake bed, brought an action in People vs. the City of Los Angeles 1939, 34 Cal.2d 695 [214 P.2d 1] to define whether the City's obligation could be enforced by injunction, and if so, to determine the extent of the injunction. The trial court, citing the principles set forth in the Natural Soda Products case, later granted an injunction and prohibited the City from: (a) diverting any waters from the Mono Basin watershed into or onto Owens Lake, and (b) diverting any waters of the Owens River and its tributaries into or onto Owens Lake "which are not in excess of an amount equal to the reasonable capacity of [LADWP's] aqueduct system and all of its component facilities reasonably operated." The City of Los Angeles appealed the trial court's injunction.

In 1950, the appeal of People vs. the City of Los Angeles was finally resolved. The appellate court modified and affirmed the lower court's decision regarding the injunction. The two significant modifications were as follows. First, since waters of the Mono Basin watershed and Owens Valley waters become mixed, the first part of the injunction was technically unenforceable. It was, therefore, amended to prohibit increasing the natural flow of the Owens River, by diverting into it waters of the Mono Basin, if such a diversion would necessitate the release of water into or onto Owens Lake. Second, the LADWP was found to be under no obligation to spread surplus water onto land owned in the Owens Valley in excess of amounts that could reasonably be used on such land or stored underground for future beneficial use. Importantly, it also reaffirmed that portion of the injunction regarding "diverting any waters out of [LADWP's] aqueduct system onto Owens Lake, or in any way releasing any waters to be deposited into or onto Owens Lake at any time, unless the flow of water of the Owens Valley watershed is in excess of an amount equal to the reasonable capacity of [LADWP's] aqueduct system and all of its component facilities reasonably operated."

Although the RSIP control measures are not expected to interfere with mining interests, the shallow flooding and managed vegetation control measures involve releasing water onto Owens Lake, which is an action that could have conflicted with the injunction. In September of 2000, the Riverside County Superior Court modified that injunction to allow for the implementation of particulate control measures on Owens Lake (People v. City of Los Angeles, *et al.*, (2000) Riverside County Superior Court, Case 34042).

2.2.2.2 Senate Bill 270

In 1982, the LADWP applied for a permit from the District to construct and operate a geothermal electric generating plant in the Coso Known Geothermal Resource Area. The permit was denied based on the assertion that LADWP was in violation of air pollution rules and regulations elsewhere in the region. Specifically, District Rule 200 considered the water-gathering operations of LADWP to be a “facility” responsible for the particulate emissions from Owens Lake and concluded that an air quality permit was required.

After failure of efforts to petition the action, a negotiated settlement emerged in Senate Bill 270 (SB 270) sponsored by Senator Dills in 1983. SB 270 (Cal. Health and Safety Code §42316) exempted the City of Los Angeles’ water-gathering operations from state air quality permit regulations. It provided that the City must fund control measure development and must implement reasonable measures ordered by the District to attain compliance with the state and federal ambient air quality standards at Owens Lake. By law, the District mandated control measures may not affect the City’s right to produce, divert store or convey water. Chapter 8 of this document includes additional information on Cal. Health and Safety Code §42316 as it applies to the Board order to implement control measures.

2.2.3 Regulatory History

2.2.3.1 PM_{10} Nonattainment Designation

In 1987, the US Environmental Protection Agency (USEPA) revised the National Ambient Air Quality Standards, replacing total suspended particulates (TSP) as the indicator for particulate matter with a new indicator called PM_{10}. PM_{10} is defined as particulate matter that has an average aerodynamic diameter less than or equal to 10 microns. The standards for PM_{10} were set at 150 micrograms per cubic meter ($\mu g/m^3$) for a 24-hour average and 50 $\mu g/m^3$ for an annual average. At the same time, USEPA set forth regulations for implementing the revised NAAQS, and announced the policy for development of SIPs and supporting control strategies. Also in 1987, USEPA identified the southern Owens Valley (known as the Owens Valley Planning Area) as one of the areas in the nation that violated the PM_{10} NAAQS. Subsequent air quality monitoring by the District showed that the dried bed of Owens Lake is the major source of PM_{10} emissions contributing to air quality violations in the Owens Valley Planning Area. Extremely high PM_{10} concentrations (over 12,000 $\mu g/m^3$ or more than 80 times the standard) have been verified downwind of Owens Lake. Inter-basin transport of PM_{10} into the southern Owens Valley is inconsequential.

Consequently, the USEPA required the State of California to prepare a SIP for the Owens Valley Planning Area that demonstrates how PM_{10} emissions will be decreased to comply with the NAAQS. The District is the agency delegated by the state to fulfill this requirement. An initial SIP was prepared by the District in 1988 (GBUAPCD, 1988), approved by the California Air Resources Board (CARB), and forwarded to the USEPA. No action was taken by USEPA to approve or disapprove the 1988 SIP.

2.2.3.2 1990 Clean Air Act Amendments

In November 1990, the federal Clean Air Act Amendments (CAAA) were signed into law, setting into motion new statutory requirements for attaining the PM_{10} NAAQS. All areas in the United States that were previously classified as federal non-attainment areas for PM_{10}, including the southern Owens Valley, were designated as “moderate” PM_{10} non-attainment areas. In November 1991, the District prepared an addendum to the 1988 SIP that updated the air quality information and the work performed since 1988 (GBUAPCD, 1991).

Section 188(b) of the CAAA specified that any area that could not attain the PM_{10} NAAQS by December 1994 would subsequently be reclassified as a “serious” PM_{10} non-attainment area. In January 1993, USEPA completed its initial reclassification process, and included the southern Owens Valley among five areas reclassified as “serious” nationwide, effective February 8, 1993. Section 189(b) of the CAAA further specified that a SIP revision was due within eighteen months of the reclassification (August 8, 1994). The revision was to assure that implementation of “best available control measures” (BACM), including “best available control technology” (BACT), would be effective within four years of the reclassification date. A Best Available Control Measures SIP was prepared in June 1994 and approved by CARB (GBUAPCD, 1994).

The CAAA required that by February 8, 1997, a PM_{10} Attainment SIP must be submitted to the USEPA that (a) included preferred and contingency PM_{10} control strategies, (b) provided air quality modeling that demonstrated attainment of the federal air quality standards from the implementation of these controls, and (c) provided quantitative milestones for “reasonable further progress” reporting to the USEPA. The CAAA further require that the PM_{10} NAAQS be attained by December 31, 2001. On November 16, 1998, the District adopted a SIP, which was approved by USEPA on August 17, 1999. That SIP provided for a five-year extension of the deadline for attainment, and for a Revised SIP in 2003 that would determine the final control strategy to attain the NAAQS by December 31, 2006 (GBUAPCD, 1998). This document is the 2003 Revised SIP mandated by the 1998 SIP and is intended to demonstrate attainment with the PM_{10} NAAQS set in 1987. Pursuant to CAAA Section 110(n), provisions of this plan will remain in effect as part of the applicable implementation plan if the NAAQS are revised in the future, except to the extent that a revision is approved or promulgated by the USEPA pursuant to the CAAA.

2.2.3.3 Natural Events Policy

In May 1996 the USEPA issued a new policy with regard to areas that would be in compliance with the PM_{10} NAAQS but for impacts caused by natural events (USEPA, 1996a). The new policy allows the USEPA Administrator to exclude PM_{10} monitoring data affected by natural events, such as wildfires, volcanic and seismic activities, and unusually high wind events, in designating or re-designating an area as attainment or non-attainment, including the moderate and serious designations for PM_{10} non-attainment.

The policy allows Natural Event Action Plans (NEAP) to be developed in lieu of SIP revisions. A NEAP would include a public health advisory program to alert the public when PM_{10} levels are affected by natural events and a schedule to implement Best Available Control Measures (BACM) if anthropogenic sources of wind-blown dust are the cause of the violation. For a high wind event from an anthropogenic source to qualify as a “natural event,” it must meet two separate and independent tests:

1) that BACM for wind erosion was in place and properly maintained at the time of the event and
2) that unusually high winds were the cause of the exceedance.

The definition and determination of what constitutes an unusually high wind are completely independent of what has been determined to be BACM (Hardebeck, 1998, Howekamp, 1998).

Since this RSIP contains provisions to adjust BACM (Chapter 8, Board Order Paragraph 5, "Adjustments to BACM and Transition of Implemented Control Measures"), there will be no stable BACM for Owens Lake during the adjustment process. Therefore, USEPA's Natural Events Policy will not apply until the final BACM are established and approved by the USEPA. If a PM_{10} violation occurs as a result of other natural events, such as a forest fire or volcanic eruption, a NEAP will be developed and implemented to deal with air pollution impacts from future related natural events.

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CHAPTER 3

Air Quality Setting

FIGURES

TABLES

3

Air Quality Setting

3.1 CLIMATE AND METEOROLOGY

The Owens Valley Planning Area (OVPA) is located in the southern end of the Owens Valley in Inyo County, California. Owens Lake is bounded by the Inyo Mountains to the east and the Sierra Nevada to the west, which rise over 10,000 feet (3,000 m) above the lake bed surface. Because it is in the rain shadow of the Sierra Nevada, annual rainfall is very low in the project area. Owens Lake averages around 4 inches (10 cm) of rainfall per year with the greatest amount falling from November through April. Temperatures range from around 18ºF (-8ºC) to 70ºF (21ºC) during the winter, and 45ºF (6.6ºC) to 112ºF (44ºC) during the summer. Winds in the area can exceed hourly average speeds of 40 mph (18 m/s) as measured at a 33-foot (10-m) height. These winds are generally associated with the passage of low-pressure systems during the winter and spring months. The leading edges of these low-pressure systems are usually cold fronts that initially produce winds from the south as the colder air mass approaches, under-running and displacing the warmer air in its path. As the leading edge of the front passes, the wind direction shifts, often resulting in converging winds from the south along the east side of the valley and from the north along the west side. Cold winds from the north typically follow the passage of the low-pressure system as high pressure begins to build back over the area.

3.2 AIR QUALITY AND AREA DESIGNATIONS

Air quality is regulated through federal, state and local requirements and standards in the project area. Under the Federal Clean Air Act, the U.S. Environmental Protection Agency (USEPA) has set ambient air quality standards to protect public health and welfare. Federal air quality standards have been set for the following criteria pollutants; particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), ozone, carbon monoxide, oxides of nitrogen, sulfur dioxide, and lead. In addition, California has set air quality standards for these pollutants, which are usually more stringent, and has added to this list standards for vinyl chloride, hydrogen sulfide, sulfates and visibility reducing particles. Table 3.1 shows the current state and federal ambient air quality standards.

Table 3.1 – California and National Ambient Air Quality Standards.

Pollutant	Averaging Time	Calif. Standards[a]	National Standards[b]	
		Concentration	Primary[c]	Secondary[d]
Ozone	1 hour	0.09 ppm (180 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)	Same as primary.
	8 hours	~	0.08 ppm (157 $\mu g/m^3$)	Same as primary.
Carbon monoxide	8 hours	9.0 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)	Same as primary.
	1 hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	Same as primary.
Nitrogen dioxide	Annual average	~	0.053 ppm (100 $\mu g/m^3$)	Same as primary.
	1 hour	0.25 ppm (470 $\mu g/m^3$)	~	Same as primary.
Sulfur dioxide	Annual average	~	0.03 ppm (80 $\mu g/m^3$)	~
	24 hours	0.04 ppm (105 $\mu g/m^3$)	0.14 ppm (365 $\mu g/m^3$)	~
	3 hours	~	~	0.5 ppm (1300 $\mu g/m^3$)
	1 hour	0.25 ppm (655 $\mu g/m^3$)	~	~
Respirable particulate matter (PM_{10})	24 hours	50 $\mu g/m^3$	150 $\mu g/m^3$	Same as primary.
	Annual average	20 $\mu g/m^3$	50 $\mu g/m^3$	Same as primary.
Fine particulate matter ($PM_{.2.5}$)	24 hours	~	65 $\mu g/m^3$	Same as primary.
	Annual average	12 $\mu g/m^3$	15 $\mu g/m^3$	Same as primary.
Sulfates	24 hours	25 $\mu g/m^3$	~	~
Lead	30-day average	1.5 $\mu g/m^3$	~	~
	Calendar quarter		1.5 $\mu g/m^3$	Same as primary.
Hydrogen sulfide	1 hour	0.03 ppm (42 $\mu g/m^3$)	~	~
Vinyl chloride (chloroethene)	24 hours	0.010 ppm (26 $\mu g/m^3$)	~	~
Visibility reducing particles	8 Hours	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70% (e)	~	~

(a) California standards for ozone, carbon monoxide, sulfur dioxide (1 and 24 hours), nitrogen dioxide, particulate matter (PM_{10} and $PM_{2.5}$) and visibility reducing particles, are values that are not to be exceeded. The sulfates, lead, hydrogen sulfide, and vinyl chloride standards are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in § 70200 of Title 17 of the California Code of Regulations.

(b) National standards, other than ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone and 24-hour PM_{10} standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one. The 24-hour $PM_{2.5}$ standard is met when the 98-percentile daily concentrations averaged over three years is equal to or less than the standard. The annual PM_{10} and $PM_{2.5}$ standards are met when the annual average concentration averaged over three years is equal to or less than the standard.

(c) National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the pubic health.

(d) National Secondary Standards: The level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

(e) Prevailing visibility is defined as the greatest visibility that is attained or surpassed around at least hall of the horizon circle, but not necessarily in continuous sectors.

Source: Calif. Air Resources Board (revised 3/26/03)

The OVPA has been designated by the state and the USEPA as non-attainment for the state and federal 24-hour average PM_{10} standards. The boundaries of the federal PM_{10} nonattainment area are shown in Figure 3.1. The area is designated as “attainment” or “unclassified” for all other ambient air quality standards. Wind-blown dust from the dry bed of Owens Lake is the dominant cause of National Ambient Air Quality Standard (NAAQS) violations for PM_{10} in the non-attainment area.

The USEPA designated the Owens Valley as a “serious” non-attainment area due to the frequent violations of the NAAQS for PM_{10} and the inability of the area to attain the standard by December 31, 1995. For serious PM_{10} non-attainment areas, the federal Clean Air Act Amendments of 1990 (CAAA) required the submittal of a State Implementation Plan (SIP) by February 8, 1997 that would bring the area into attainment with the NAAQS by December 31, 2001, if practicable. In November 1998, the District adopted the SIP, which was approved by the USEPA on August 19, 1999 (Federal Register, 1999). That SIP provided for a five-year extension of the deadline for attainment, and for a SIP Revision in 2003 that would determine the final control strategy to attain the NAAQS by December 31, 2006. This Revised SIP (RSIP), which includes the plan for the dust control project, is intended to satisfy those CAAA requirements. The extension of the attainment deadline by USEPA requires the implementation of Most Stringent Measures (MSM) to control PM_{10}.

3.3 PM_{10} AIR QUALITY

3.3.1 Health Impacts of PM_{10}

Particulate pollution is generally associated with dust, smoke and haze and is measured as PM_{10}, which indicates particulate matter less than 10 microns in average aerodynamic diameter. These particles are extremely small, one-seventh the diameter of a human hair. Because of their small size, they can easily penetrate into the lungs. Breathing PM_{10} can cause a variety of health problems. It can increase the number and severity of asthma and bronchitis attacks. It can cause breathing difficulties in people with heart or lung disease, and it can increase the risk for, or complicate, existing respiratory infections. Children, the elderly and people with existing heart and lung problems are especially sensitive to elevated levels of PM_{10}. Even healthy people can be adversely affected by dust at extremely high concentrations. The USEPA has set an episode level of 600 $\mu g/m^3$ (averaged over 24 hours) as the level that can pose a significant risk of harm to the health of the general public (40 CFR 51.151).

3.3.2 Owens Lake Health Advisory Program

The NAAQS for PM_{10} is frequently violated in the planning area because of wind-blown dust from Owens Lake. Wind speeds greater than about 17 mph (7.6 m/s) have the potential to cause wind erosion from the barren lake bed. Ambient PM_{10} readings are the highest measured in the country (USEPA, 2003). Twenty-four-hour average PM_{10} concentrations measured at the Dirty Socks monitor site have exceeded 12,000 $\mu g/m^3$—more than 80 times higher than the 24-hour NAAQS of 150 $\mu g/m^3$.

In 1995, the District instituted a program to advise the public when unhealthful levels of particulate pollution occur in the Owens Valley area. Under this program, the District issues Air Pollution Health Advisories when dust storms from Owens Lake cause PM_{10} concentrations that exceed selected trigger levels. Health Advisory notices are faxed to schools and doctor's offices in the area and to local news media.

- A Stage 1 Air Pollution Health Advisory is issued when hourly PM_{10} levels exceed 400 µg/m^3. The Stage 1 Health Advisory recommends children, the elderly, and people with heart or lung problems refrain from strenuous outdoor activities in the dust-impacted area.
- A Stage 2 Air Pollution Health Advisory is issued when hourly PM_{10} levels exceed 800 µg/m^3, and recommends that everyone refrain from strenuous outdoor activities in dust-impacted areas.

From fall of 1995 through fall of 2002, ninety-five advisories were issued as part of the Owens Lake Air Pollution Health Advisory program. During this seven-year period, hourly PM_{10} levels exceeded 400 µg/m^3 at Keeler, Olancha or Lone Pine on 331 different dates. However, because the majority of these events occurred either on weekends or during non-business hours, no health advisories were called during these off-hours. In the future, it may be possible to operate an automated system that will allow alerts to be called at any time of the week. This program is not intended to replace the need to control the dust problem at Owens Lake, but is intended to help reduce adverse health effects until dust control measures are in place. The health advisory program will remain in effect until dust control measures are fully implemented at Owens Lake and PM_{10} levels no longer violate the NAAQS.

3.3.3 Monitoring Sites and Data Collection

3.3.3.1 PM_{10} Monitoring Network

Ambient PM_{10} measurements to determine compliance with the federal PM_{10} standard have been taken at Keeler, Olancha and Lone Pine for over 15 years. Meteorological data are also collected at each of these permanent monitoring sites to provide wind speed, wind direction, and temperature information. An upper air profiler was operated from March to May 2000 and January to September 2001 at Dirty Socks and from October 2001 to June 2003 at the Mill Site to measure upper level wind speeds and temperature profiles. Precipitation data are also collected at the Keeler site and humidity and barometric pressure are recorded at the Olancha site. Three additional PM_{10} sites were set up on the South shore of Owens Lake as part of the Owens Lake Dust Identification Program. These are Dirty Socks (Summer 1999) and Shell Cut and Flat Rock (both set up in January 2001). Figure 3.2 shows the location of these sites. Other sites that were or still are monitored for PM_{10} from Owens Lake include the Navy 1 site at the Coso Known Geothermal Resource Area and the Coso Junction site. These sites are about 10 miles south of the RSIP planning area. The Coso Junction PM_{10} monitor is currently operating on a one-in-three day sampling schedule and the Navy 1 monitor was discontinued in 1998.

The Lone Pine Paiute-Shoshone Tribe installed a PM_{10} monitor on the Lone Pine reservation in 2002. The Lone Pine Tribe operates a Tapered Element Oscillating Microbalance (TEOM) PM_{10} monitor in accordance with federal monitoring guidelines (40 CFR, Part 58). The monitor site is located southeast of the District's Lone Pine monitor

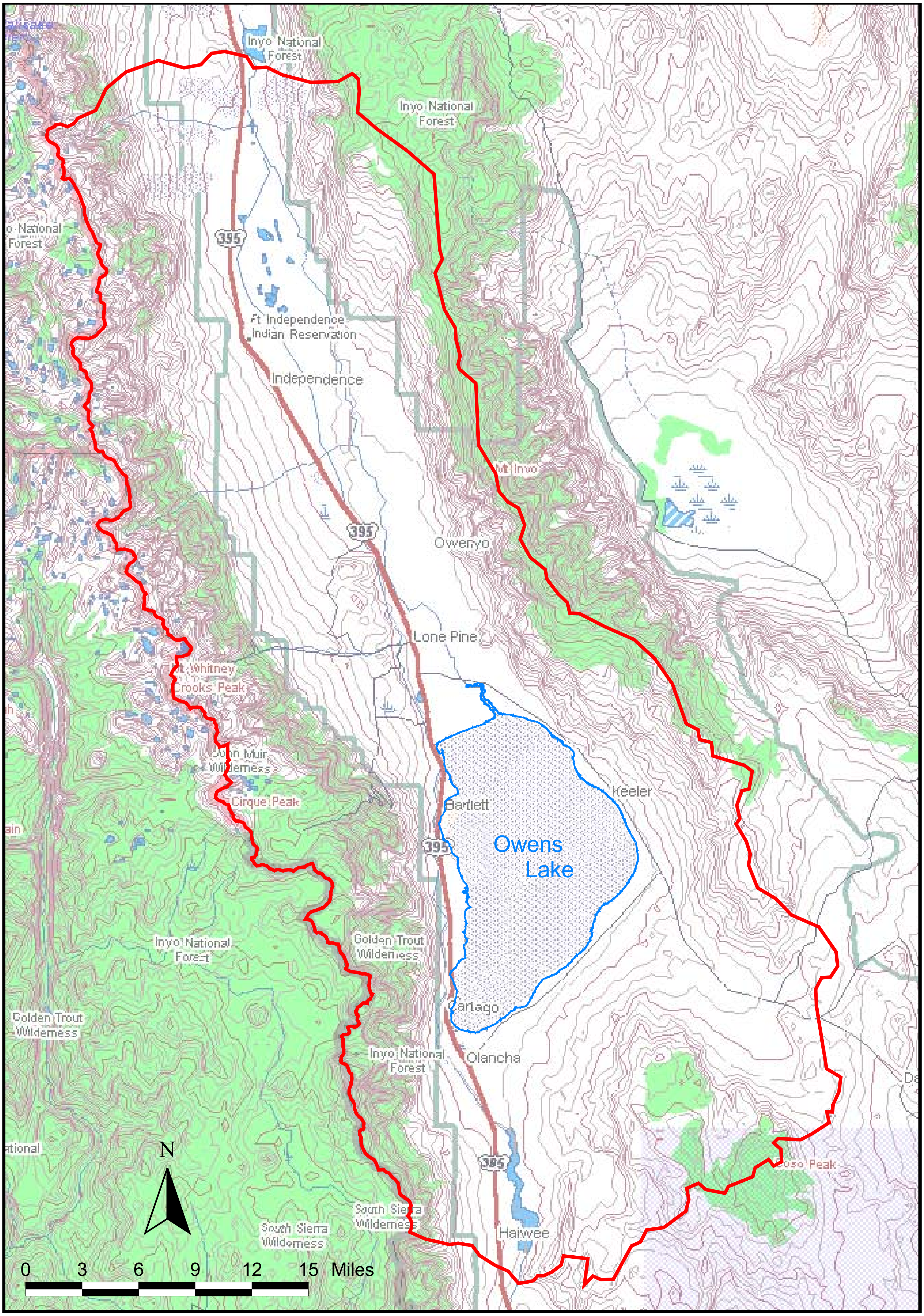

Figure 3.1 - Boundaries of the federal PM-10 non-attainment area.

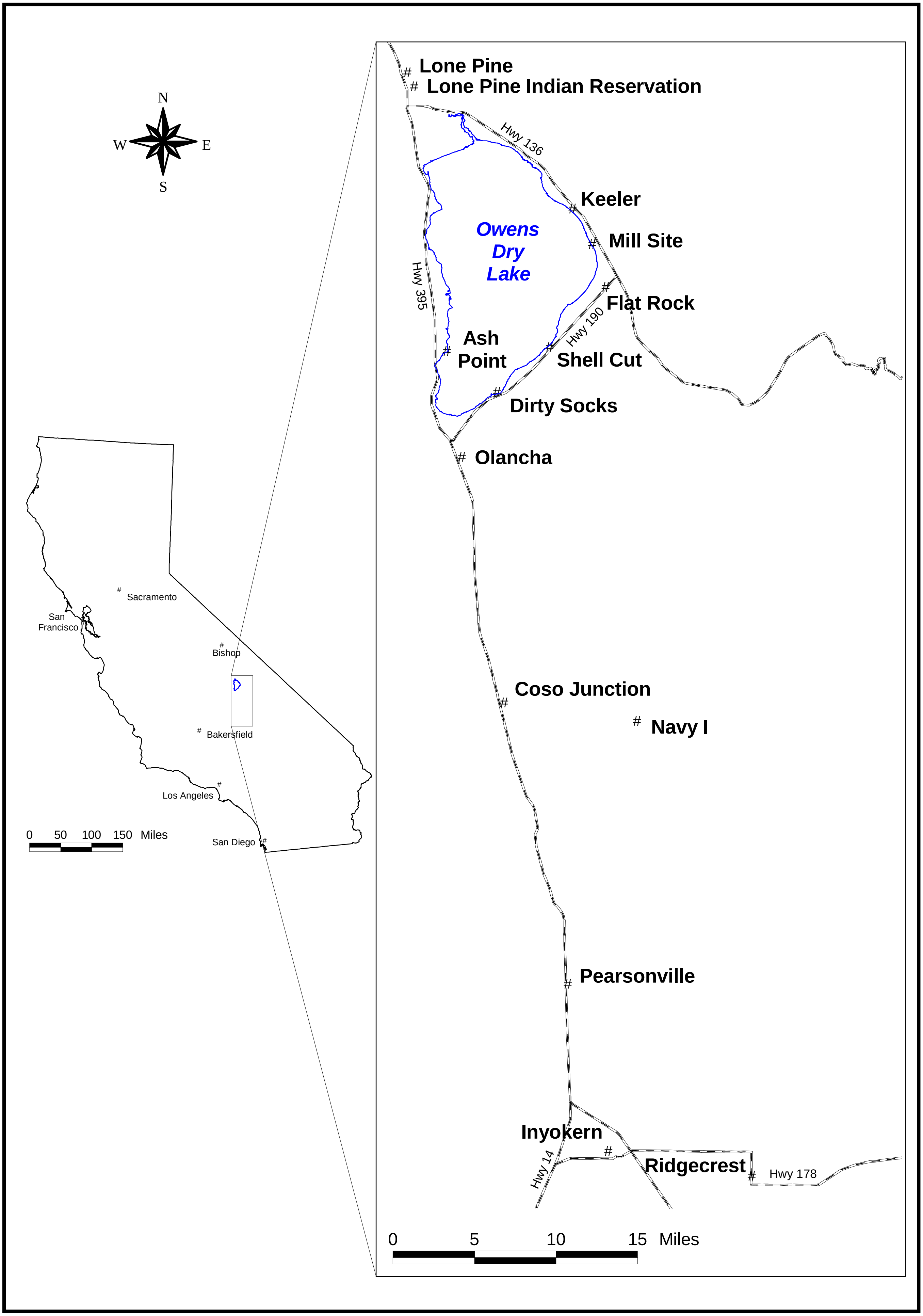

Figure 3.2 - Location of PM10 monitor sites near Owens Lake.

site. PM_{10} data from this site are not included in this RSIP. During the brief period that it has been running, data from the Lone Pine Tribe's TEOM have closely paralleled the values recorded by the District's Lone Pine TEOM.

Currently, all the PM_{10} monitor sites in the planning area are equipped with TEOM continuous PM_{10} samplers (*EPA Manual Reference Method:* EQPM-1090-079) that provide hourly and daily PM_{10} concentrations. TEOMs are USEPA equivalent method particulate monitors. Some of the monitoring sites began collecting PM_{10} data with High-Volume (Hi-Vol) samplers (Wedding [RFPS-1087-062] or Graseby [RFPS-1287-063]). The years that the sites were transitioned from Hi-Vols to TEOMs are indicated in Table 3.2. The sites are also currently equipped with Partisol PM_{10} samplers (RFPS-1298-126 and RFPS-1298-127), which are filter-based USEPA-approved reference method samplers that measure PM_{10} concentrations on a daily schedule. The Partisol samplers confirm the 24-hour averages of the TEOM samplers (Parker, 2003). Table 3.2 summarizes the particulate matter monitoring history at each site in the Planning Area.

The District performed a detailed study of different types of PM_{10} monitors and found significant differences in the concentrations measured by collocated monitors of different types. The District's analysis showed that the TEOM and the Partisol samplers provide the most consistent measurements at Owens Lake, and that they are the most suitable monitors for measuring PM_{10} caused by wind-blown dust. (Ono, *et al*., 2000)

Table 3.2 - Summary of the particulate matter monitoring history for each site.

Site	Year	Peak 24-Hour Value	Number of Exceeds[1]	Adjusted # of Exceeds[2]	Annual Average	3-Year Average	Number Sample Days	Primary Sampler Type
Keeler	1987	672	4	24	46.70		60	Hi Vol
Keeler	1988	394	2	12	31.96		58	Hi Vol
Keeler	1989	1861	4		**Invalid**[3]		55	Hi Vol
Keeler	1990	858	2		**Invalid**		20	Hi Vol
Keeler	1991	181	1		**Invalid**		47	Hi Vol
Keeler	1992	526	3	18	37.34		59	Hi Vol
Keeler	1993	781	1	6	30.66		58	Hi Vol
Keeler	1994	1381	20		**Invalid**		297	TEOM
Keeler	1995	3929	23		**Invalid**		311	TEOM
Keeler	1996	862	15	15	38.01		309	TEOM
Keeler	1997	835	12	12	30.95		341	TEOM
Keeler	1998	1464	17	17	35.11		353	TEOM
Keeler	1999	2569	19	19	50.41	38.82	364	TEOM
Keeler	2000	1101	18	18	42.56	42.69	365	TEOM
Keeler	2001	1400	9	9	39.19	44.05	353	TEOM
Keeler	2002	1077	13	13	36.76	39.50	365	TEOM
Lone Pine	1987	178	1	6	23.27		58	Hi Vol
Lone Pine	1988	172	1	6	21.89		60	Hi Vol
Lone Pine	1989	126	0	0	23.13	22.76	61	Hi Vol
Lone Pine	1990	68	0	0	17.56	20.73	61	Hi Vol
Lone Pine	1991	82	0	0	17.90	19.40	59	Hi Vol
Lone Pine	1992	63	0	0	17.15	17.40	57	Hi Vol
Lone Pine	1993	44	0		**Invalid**		56	Hi Vol
Lone Pine	1994	499	3	3	22.28		350	TEOM

Table 3.2 Continued.

Site	Year	Peak 24-Hour Value	Number of Exceeds[1]	Adjusted # of Exceeds[2]	Annual Average[3]	3-Year Average	Number Sample Days	Primary Sampler Type
Lone Pine	1995	392	5	5	23.19		362	TEOM
Lone Pine	1996	166	1		**Invalid**		330	TEOM
Lone Pine	1997	123	0	0	16.87		359	TEOM
Lone Pine	1998	472	5	5	23.42		343	TEOM
Lone Pine	1999	325	3	3	22.23	20.84	348	TEOM
Lone Pine	2000	180	2	2	19.35	21.67	358	TEOM
Lone Pine	2001	260	2		**Invalid**		325	TEOM
Lone Pine	2002	315	7	7	26.59		365	TEOM
Olancha	1987	31	0		**Invalid**		31	Hi Vol
Olancha	1988	55	0	0	19.19		57	Hi Vol
Olancha	1989	109	0		**Invalid**		52	Hi Vol
Olancha	1990	200	2	12	23.19		61	Hi Vol
Olancha	1991	181	1	6	18.04		59	Hi Vol
Olancha	1992	366	1	6	19.66	20.30	60	Hi Vol
Olancha	1993	153	0		**Invalid**		36	Hi Vol
Olancha	1994	55	0		**Invalid**		46	Hi Vol
Olancha	1995	55	0		**Invalid**		40	Hi Vol
Olancha	1996	2383	8	8	33.22		354	TEOM
Olancha	1997	2229	12	12	36.95		347	TEOM
Olancha	1998	367	5	5	19.26	29.81	357	TEOM
Olancha	1999	353	5	5	23.16	26.45	354	TEOM
Olancha	2000	417	5	5	20.55	20.99	364	TEOM
Olancha	2001	1545	3	3	25.38	23.03	351	TEOM
Olancha	2002	905	7	7	32.42	26.13	364	TEOM
Dirty Socks	1999	2182	10		**Invalid**		185	TEOM
Dirty Socks	2000	10549	33	33	141.21		365	TEOM
Dirty Socks	2001	12038	39		197.75[4]		329	TEOM
Dirty Socks	2002	6702	41	41	131.54	156.82	364	TEOM
Flat Rock	2001	1779	8	8	28.00		354	TEOM
Flat Rock	2002	758	6	6	25.82		358	TEOM
Shell Cut	2001	2660	14	14	35.08		351	TEOM
Shell Cut	2002	2840	19	19	68.69		360	TEOM

Notes:
(1) Number of samples 150 µg/m^3 or more.
(2) If not daily sampling, number of exceeds is divided by sampling frequency (e.g., divide by 1/6 for 1-in-six-day sampling).
(3) Annual average is invalid if less than 75% of scheduled samples are collected in each of four quarters.
(4) One quarter (3rd) at 73% data capture. District views data as valid.

3.3.3.2 Dust Transport Study

Historically, the permanent stations were operated on a one-in-six day schedule to sample PM_{10}, and did not sample on five of six off-schedule days. This was changed for a period from March 1993 to June 1995 to collect data to assess the PM_{10} impacts downwind from Owens Lake toward the City of Ridgecrest. A special-purpose monitoring network was set up, as shown in Figure 3.2, adding the communities of Pearsonville, Inyokern and Ridgecrest. During the special-purpose monitoring period, samplers were operated remotely to start sampling at approximately the same time on the day Owens Lake dust events were forecast to impact the southern sites. The results of this study showed that Owens Lake dust plumes caused exceedances of the PM_{10} NAAQS as far as Ridgecrest, 60 miles south of the lake. Appendix A includes the monitoring data from this episode-monitoring program.

About 40,000 permanent residents from Ridgecrest to Bishop are affected by the dust from Owens Lake. In addition, many visitors spend time in the dust-impacted area, to enjoy the many recreational opportunities the Eastern Sierra and high desert have to offer. Lone Pine annually hosts the Lone Pine film festival, which draws thousands of visitors from outside the area. The National Park Service is concerned about the health hazard posed to an estimated 250,000 to 350,000 visitors that are expected to annually visit the Manzanar National Historic Site, 15 miles north of Owens Lake. The Park Service is concerned because a high percentage of the visitors to Manzanar will be older visitors who are more prone to airborne respiratory threats, and that they will spend 3 to 4 hours outdoors in a potentially harmful environment (Hopkins, 1997).

3.3.4 PM_{10} Data Summary

3.3.4.1 Number of 24-hour Exceedances

From 1994 to 2002, almost daily PM_{10} sampling recorded 156 PM_{10} exceedances at Keeler. This averages about 20 exceedances per year. The Dirty Socks monitor recorded 114 PM_{10} exceedance days over a three year period from January 2000 to December 2002. Dirty Socks averaged over 35 exceedances per year and had the highest concentrations of the 6 sites monitored. Figure 3.3 shows the number of exceedances from 1994 through 2002 at each site. The figure shows the results from measurements taken only by TEOM PM_{10} monitors. All six monitor sites were in violation of the 24-hour average PM_{10} NAAQS, which allows no more than one exceedance per year over a three year period.

3.3.4.2 Annual Average PM_{10} Concentrations

Since the installation of a PM_{10} monitor at Dirty Socks in 1999, this monitor site has consistently measured the highest concentrations. The three-year annual average for Dirty Socks is estimated at 157 $\mu g/m^3$ for the years 2000-2002. The three-year annual average value includes a sampling quarter with 73 percent data capture (3^{rd} qtr. 2001), which is just short of the 75 percent data capture target. Because this data capture shortfall occurred in the lowest concentration quarter (summer), the District believes the 2001 annual average is representative of the average for that year. Figure 3.4 shows the annual PM_{10} concentration trend for all six sites from 1994 through 2002. The annual average for compliance with the NAAQS is calculated as a rolling three-year average. For air quality compliance purposes the Dirty Socks value of 157 µg/m3 for the period from 2000-2002 shows that the planning area is nonattainment for the annual PM_{10} NAAQS.

3.3.4.3 Peak PM_{10} Concentrations

Twenty-four hour average PM_{10} measurements from the Owens Lake sites are consistently listed as the highest concentrations in the United States on the USEPA's AIRData website (USEPA, 2003). PM_{10} concentrations at the Dirty Socks monitor site have been measured over 12,000 µg/m^3, which is more than 80 times higher than the 24-hour NAAQS of 150 µg/m^3. Figure 3.5 shows the daily PM_{10} concentrations for the six PM_{10} monitor sites at Owens Lake for a three-year period. PM_{10} concentrations are shown on a logarithmic scale due to the extreme concentration range. The seasonal nature of the dust events can also be seen in this figure. Most dust events occur during winter and spring. There are few violations recorded during the summer and fall months.

For days when the 24-hour PM_{10} standard is violated, peak hourly wind speeds at the Owens Lake monitoring sites have been measured up to 50 mph. However, violations have also been recorded when the hourly wind speed peaked at a more modest 20 mph. The daily average wind speed when the 24-hour PM_{10} standard is violated ranges from 5 to 33 mph, since many violations occur with winds that last only a few hours.

3.4 CANCER RISK DUE TO OWENS LAKE DUST STORMS

Owens Lake dust contains cadmium, arsenic and other toxic metals that are at levels above the natural concentrations in soils in the Owens Valley. These metals pose a significant risk for additional cancer cases in the areas of greatest dust impact. Table 3.3 shows that the cancer risk at Keeler, associated with cadmium and arsenic in the Owens Lake dust, is estimated at 22 in a million. This is based on an annual concentration average of 43 µg/m^3 from the dust storms for a 70-year period. The value of 43 µg/m^3 is taken from the seven-year average of PM_{10} concentrations measured using a TEOM at Keeler (1994-2000). This average represents the annual average prior to the implementation of controls.

Under the District's adopted air toxics policy, a toxic risk greater than one in a million additional cancer cases is considered to be significant. This policy requires implementation of controls on sources that pose a risk greater than one in a million in order to reduce the risk, and it prohibits the issuance of a permit to sources that exceed a risk of 10 in a million (GBUAPCD, 1987).

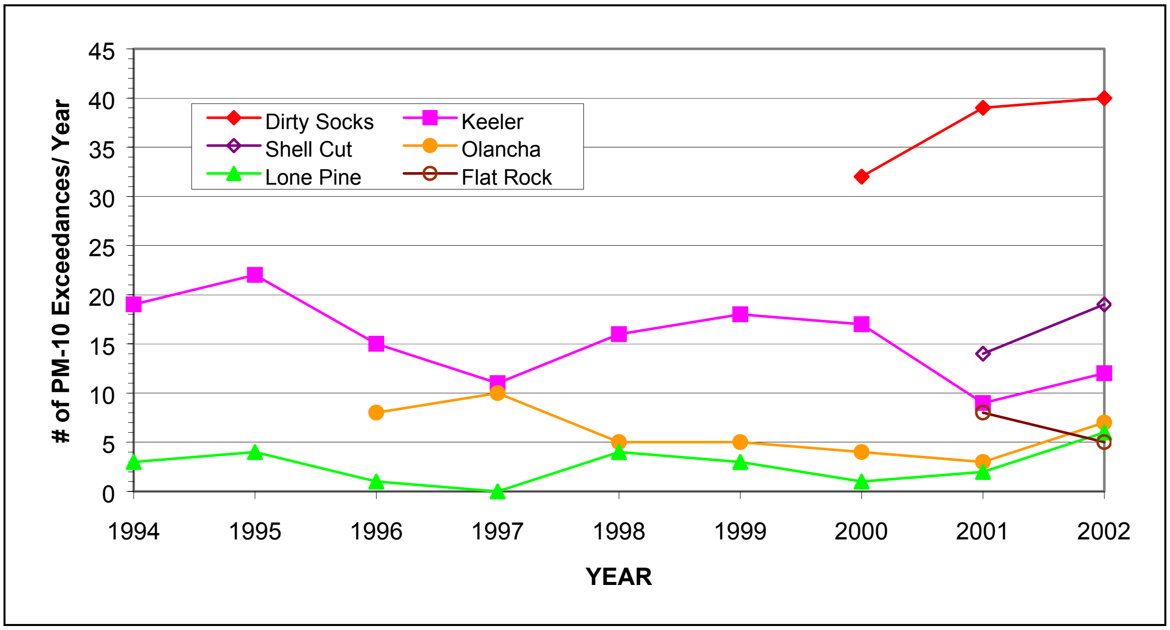

Figure 3.3: All six PM_{10} monitor sites violated the NAAQS by averaging more than one exceedance per year of the 24-hour-average NAAQS (150 µg/m3).

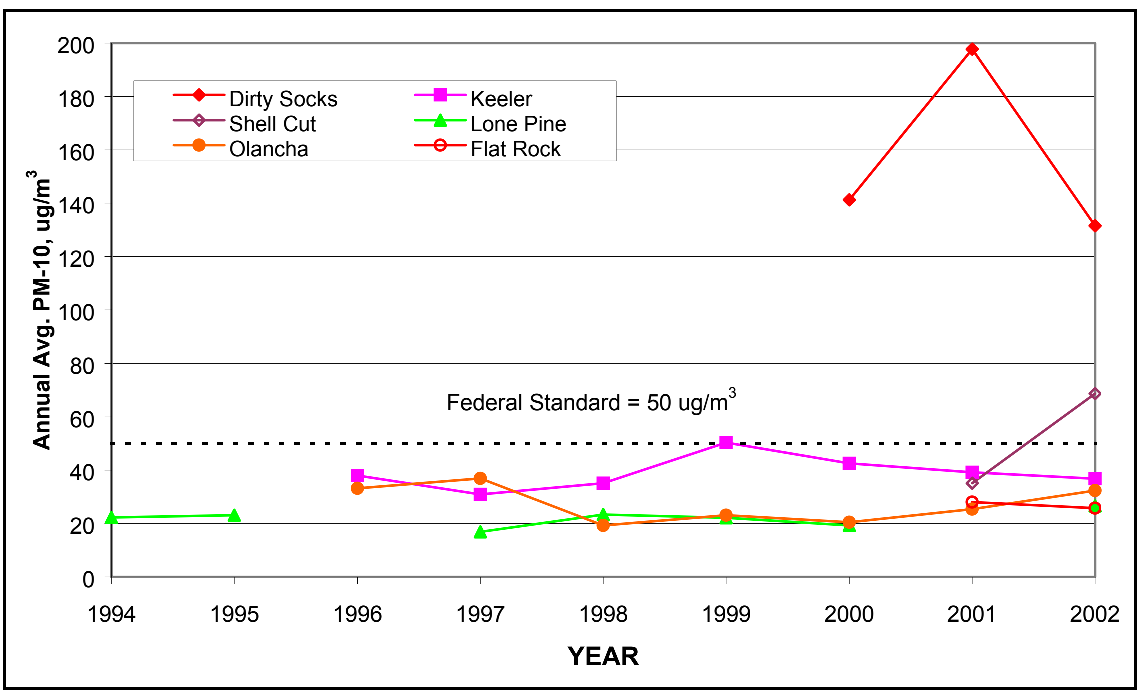

Figure 3.4: The 3-year annual average PM_{10} concentration measured at Dirty Socks was 157 µg/m3, which violated the PM_{10} annual NAAQS of 50 µg/m3.

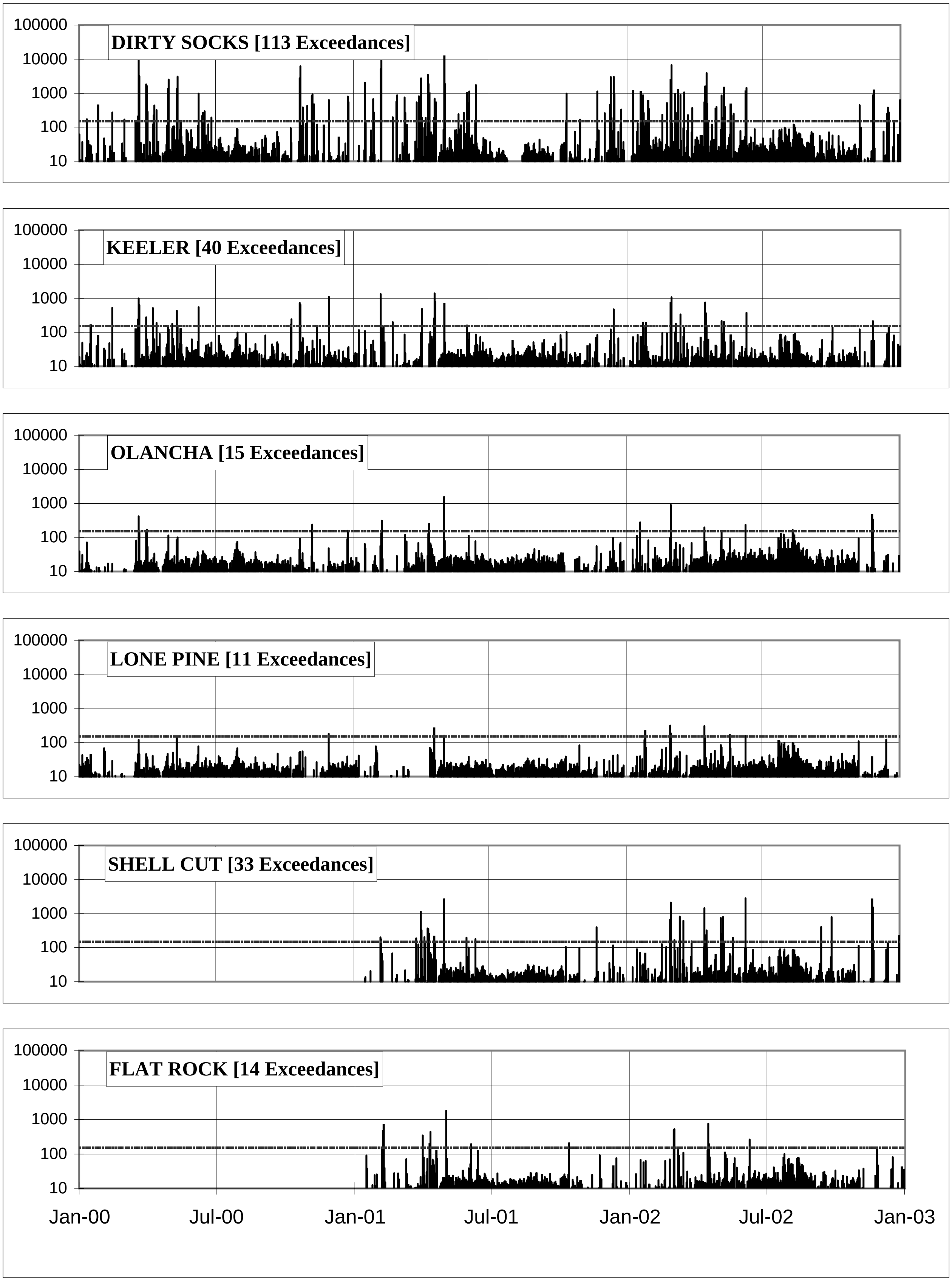

Figure 3.5 - Daily 24-hour TEOM average (μg/m^3) at Owens Lake Monitoring Sites, Jan 2000 - Dec 2002.

Table 3.3 – Inhalation cancer risk at Keeler due to Owens Lake dust storms.

Toxic Metal	Cancer Potency $(\mu g/m^3)^{-1}$	Toxic Metal Concentration (parts per million)	Inhalation Cancer Risk
Cadmium	4.2×10^{-3}	29	5 per million
Arsenic	3.3×10^{-3}	118	17 per million

Lifetime Cancer Risk = 22 per million

- *Cancer potency from the Air Toxics Hot Spots Program (OEHHA, 2002).*
- *Dust samples are taken from Keeler PM_{10} filters, with concentrations measured by x-ray fluorescence (Chester LabNet, 1996).*
- *70-year cancer risk at PM_{10} = 43 $\mu g/m^3$ (Keeler annual average from 1994-2000).*

3.5 VISIBILITY AND SENSITIVE AIRSHEDS

Visibility in the Owens Valley generally ranges from 37 to 93 miles, with the best visibility occurring during winter. Visibility is most limited from May through September and during days when Owens Lake dust storms occur. Owens Lake dust storms can reduce visibility to near zero at Owens Lake and obscure visibility 150 miles away from the lake bed. The main cause of visibility degradation in the Owens Valley is fine particles in the atmosphere. In addition to dust from Owens Lake, visibility degradation results from transport of air pollutants from the San Joaquin Valley and South Coast air basins, and from forest fires. Most of the visibility degradation can be attributed to inter-basin transport of air pollutants. On days when Owens Lake dust storms do not occur, emissions of fine particulate matter from gasoline and diesel fueled vehicles and equipment within the Owens Valley are local man-made contributors to visibility degradation. These local sources have an insignificant impact on the area’s visibility. Nitrogen dioxide, a light-absorbing gas formed during fuel combustion, contributes less than five percent to the overall visibility degradation. Other man-made sources of visibility degrading emissions represent less than five percent of the overall reduction in visibility (Trijonis, *et al.*, 1988).

There are 11 sensitive airsheds in the region, including wilderness areas, national parks, national forests, a national historic site, and the R-2508 military airspace. Figure 3.6 shows the locations of these sensitive airsheds. Four of these airsheds are designated as Class I PSD (Prevention of Significant Deterioration) areas, which are afforded more stringent protection from visibility degradation and for impacts from air pollutants: John Muir and Domeland Wilderness Areas, Kings Canyon and Sequoia National Parks. These sensitive areas and their classifications are shown in Table 3.4.

The R-2508 military air space, which includes the China Lake Naval Air Weapons Station, is a sensitive site for visibility impacts from Owens Lake dust events. Good visibility is needed for some military operations, such as an air-to-air test (an air-launched target whose target is also in the air), which relies on high-speed cameras to record time and position information. Owens Lake events can reduce the visibility to less than one to two miles at China Lake. The Department of the Navy has stated that cancellation of a test costs the Range and/or its customer approximately $10,000 to $50,000. Owens Lake dust events can lead to cancellations of several tests per day and can last for one to two days, or occasionally longer (Stevenson, 1996).

Table 3.4 – Sensitive airsheds and their PSD classifications.

	Sensitive Airshed	PSD Airshed Classification
*	Wilderness Areas in National Forests:	
	Domeland	Class I
	Golden Trout	Class II
	John Muir	Class I
	South Sierra	Class II
*	National Parks:	
	Death Valley	Class II
	Kings Canyon	Class I
	Sequoia	Class I
*	National Historic Site:	
	Manzanar	Class II
*	National Forests:	
	Inyo	Class I&II
	Sequoia	Class I&II
*	Military Base:	
	China Lake NAWS	Class II

Source: MHA Environmental Consulting, Inc., 1994.

3.6 REFERENCES

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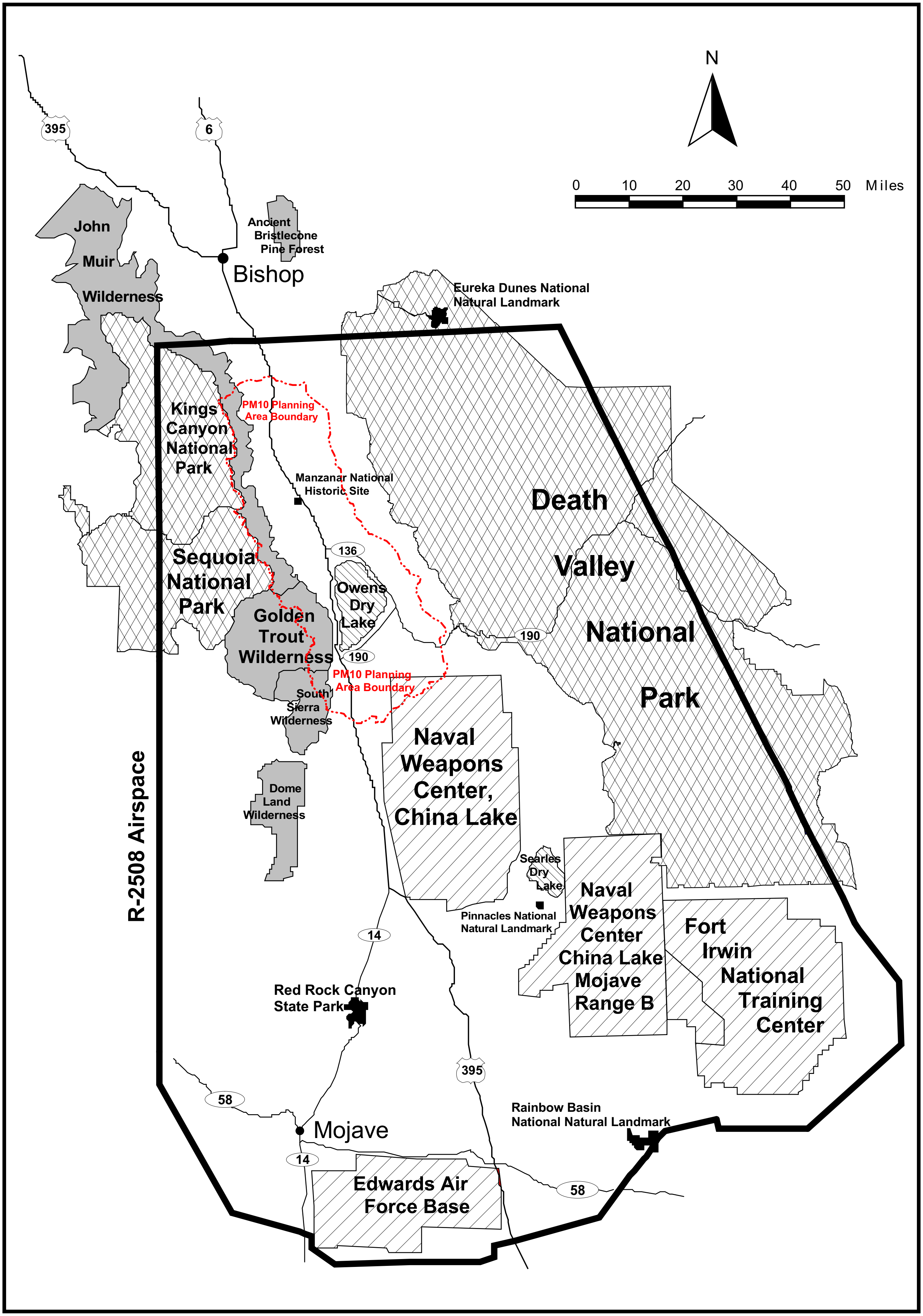

Figure 3.6 - Locations of sensitive airsheds near the Owens Valley Planning Area.

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CHAPTER 4

PM_{10} Emission Inventory

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PM_{10} Emission Inventory

4.1 INTRODUCTION

Criteria pollutant emissions in the Owens Valley PM_{10} nonattainment area are dominated by PM_{10} emissions from wind erosion on the exposed Owens Lake playa. Other wind erosion sources in the Owens Valley Planning Area include off-lake sources of lake bed dust, small mining facilities and open areas near Lone Pine and Independence that have been disturbed by human activity. There is a lack of large industrial sources in the Owens Valley and the only other sources of criteria pollutant emissions are wood stoves, fireplaces, unpaved and paved road dust and vehicle tailpipe emissions. Prescribed burning for wildland management on federal and private lands also generates PM_{10} in and around the nonattainment area. However, prescribed burning is not normally conducted on windy days when Owens Lake dust storms occur. Predicted high wind days are avoided when doing prescribed burns for fire safety reasons.

The emissions inventory includes PM_{10} sources within the expected control area for the plan. This covers the southern half of the designated nonattainment area, which includes the community of Lone Pine on the control area’s northern boundary. The future emissions inventory is not expected to grow significantly. Changes to future population and traffic-related emissions are expected to be insignificant in comparison to the wind-blown PM_{10} from Owens Lake. The future inventory will be kept constant for planning purposes.

The annual and 24-hour PM_{10} emissions for the Owens Valley PM_{10} Planning Area are summarized in Table 4.1 for the Year-2000 inventory base-year and discussed in this chapter for each source category. The focus of the emission inventory effort was to estimate PM_{10} emissions due to wind erosion from the Owens Lake bed. PM_{10} emissions for other wind erosion areas within the planning area were not included in the inventory due to the difficult nature of accurately estimating emissions from these sporadic source areas. However, along with other area sources the impact due to non-lakebed wind erosion is included as a contributor to the background concentration (20 $\mu g/m^3$) in the air quality model, so it was not necessary to quantify the emissions from these sources, since they were not individually modeled.

Table 4.1 Annual and 24-Hour PM_{10} Emissions in the Owens Valley PM_{10} Planning Area for the Year-2000 Emissions Inventory

	PM_{10} Peak 24-Hour (Tons/Day)	PM_{10} Annual (Tons/Year)
Area and Mobile Sources		
Owens Lake Bed Wind Erosion	6,956	76,191
Owens Lake Secondary Wind Erosion	364	4,207
Vehicle Tailpipe	0.01	3
Unpaved Road Dust	0.29	104
Paved Road Dust	0.21	77
Residential Wood Burning	0.24	36
Prescribed Burning	42	2,532
Agricultural Operations	0.00	1
Industrial Facilities		
Big Pine Distributors	0.06	21
Pacific Lightweight Prod.	0.09	32
Federal White Aggregate	0.08	28
Total PM_{10} Emissions	7,363	83,232

4.2 NON-OWENS LAKE PM_{10} EMISSIONS

4.2.1 Entrained Paved Road Dust and Tail Pipe Emissions for Mobile Sources

Entrained paved road dust PM_{10} emissions are based on revised estimates from the California Air Resources Board for the 2000 emissions inventory, which estimates annual PM_{10} emissions of 299 tons of PM_{10} per year (0.818 tons per day) in Inyo County. PM_{10} emissions from vehicle exhaust were estimated at 0.03 tons per day (T/d) in Inyo County for 2000 (CARB, 2003).

Assuming for estimation purposes that vehicle traffic in the control area is primarily on Highway US 395, a simple proportion of the mileage in the control area to the length of US 395 in Inyo County yields a good estimate of the PM_{10} 24-hour and annual emissions from mobile sources.

Entrained Road Dust:
(30 miles/115 miles) x 0.818 T/d = 0.21 tons of PM_{10} per day
0.21 T/d x 365 days = 77 tons of PM_{10} per year

Vehicle Exhaust:
(30 miles/115 miles) x 0.03 T/d = 0.007 Tons of PM_{10} per day
0.007 T/d x 365 days =2.6 tons of PM_{10} per year

The average daily VMT has been relatively stable in Inyo County between 1990 and 2000, so there is no forecasted growth or decline for these emission estimates for future years. (CARB, 2002)

4.2.2 Entrained Unpaved Road Dust

An estimate of entrained PM_{10} emissions from traffic on unpaved roads in the control area is based on emission factors found in the USEPA's *Compilation of Air Pollutant Emission Factors, AP-42* (USEPA, 1998).

$$E = \frac{2.6(s/12)^{0.8}(W/3)^{0.4}}{(M/0.2)^{0.3}}[(365 - p)/365]$$

Where:
- E = PM_{10} emissions in pound per vehicle mile traveled
- s = silt content of road surface material (5 percent)
- W = mean vehicle weight (3 tons)
- p = number of days per year with precipitation greater than 0.01 inches (assume zero for daily and worst-case annual emissions)
- M = surface material moisture content (assume 0.3% from lake bed sand)

The Owens Valley values for each variable in the emission estimate are shown in parenthesis. The 5 percent silt content value is based on samples taken in the Owens Lake area from the Cerro Gordo Road and Keeler, which showed the silt content ranged from 1 to 6 percent (Murphy, 1997). Assuming 50 vehicles per day, with an average trip length of 10 miles, yields 0.29 tons of PM_{10} per day, or 104 tons of PM_{10} per year.

Since the average daily VMT and population has been relatively stable in Inyo County between 1990 and 2000, there is no forecasted growth or decline for these emission estimates for future years. (CARB, 2002)

4.2.3 Residential Wood Combustion

The AP-42 emission factor for wood stoves is 15 grams of PM_{10} per kilogram of wood burned. An estimate of residential wood combustion emissions for the planning area can be made by using the wood usage estimate of 2 cords of pine per year (density = 800 kg/cord) for Bishop, which is 60 miles north of the control area. The heating season is about 150 days per year. The population estimate for the control area is 2,745. A high-end estimate for the number of wood stoves is one for every two people (1,372.5 stoves). This yields an estimate of 0.24 tons of PM_{10} per day and 36.3 tons of PM_{10} per year for residential wood combustion in the control area.

Since the population has been relatively stable in Inyo County between 1990 and 2000, there is no forecasted growth or decline for these emission estimates for future years (CARB, 2002).

4.2.4 Prescribed Burning Emissions and Regulations

Prescribed burning activities will take place on federal lands for forest management and private lands for rangeland improvement and wildland management purposes. The U.S. Forest Service provided air pollution emission estimates for historic pre-settlement smoke emissions in the Owens Valley PM_{10} nonattainment area (McKee, 1996). The Forest Service plans to increase prescribed burning activities in the national forest to a level that is comparable to historic natural forest fire cycles in the Eastern Sierra. Based on the Forest Service's fuel models and the historic fire return rate to forest land in the Owens Valley PM_{10} nonattainment area, an annual average estimate of 2,532 tons per year of PM_{10} is determined. As the burn season for prescribed burning is expected to last about 60 days per year, daily average emissions will be about 42.2 tons per day.

The inclusion of these emission estimates for prescribed burning is for SIP conformity purposes to ensure that prescribed burning activities in the nonattainment area have been considered in the Owens Valley PM_{10} SIP attainment demonstration. General conformity requirements contained in District Regulation XIII, require that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards.

Prescribed burning activities are not expected to take place on windy days when the Owens Lake dust storms occur. Predicted high wind days are avoided when performing prescription burns for fire safety reasons. In addition, prescribed burning is regulated through District Rules 410 and 411 for wildland and forest management burning. These rules require that a burn plan be submitted to the Air Pollution Control Officer prior to conducting the burn, and that burning will not cause or contribute to violations of the air quality standards. If prescribed burning is done in a manner that complies with District rules, burning activities are not expected to interfere with attainment of the PM_{10} NAAQS in the Owens Valley.

4.2.5 Industrial Facilities

Emissions from industrial facilities are based on permitted emissions under each facility's daily permit limit for throughput or operating hours. Annual emissions are extrapolated from peak daily emissions over a 351-day work year. Total PM_{10} emissions from industrial facilities are 0.23 tons of PM_{10} per day and 81 tons per year. Table 4.1 lists the individual industrial facilities that are located in the control area. There are no other significant industrial sources of PM_{10} foreseen for the planning area.

4.2.6 Agricultural Operations

There are very few agricultural operations near Owens Lake. In the area south of Lone Pine and north of Haiwee reservoir, there are about 200 acres of pastureland and 20 acres of alfalfa. Emissions for agricultural operations are less than 1 ton of PM_{10} per year using estimates provided by the California Air Resources Board. (CARB, 1997 and Keisler, 1997). There is no significant change foreseen for agricultural operations in the planning area.

4.3 LOCATING AND ESTIMATING WIND-BLOWN DUST PM_{10} EMISSSIONS

4.3.1 Dust ID Program Overview

Because wind erosion is the dominant source of PM_{10} in the planning area, a significant effort was made to improve the methods used to estimate emissions and to locate the sources of the emissions on the lake bed. Traditional methods of estimating emissions such as the use of wind tunnel generated emission estimates and methods described in AP-42 were investigated prior to developing the Dust ID method that is discussed in this section. The 1998 Owens Valley SIP used emission algorithms based on wind tunnel tests performed at Owens Lake. PM_{10} emissions were estimated for different seasons as a function of wind speed. (Ono, 1997) With the wind tunnel method, the size of the dust producing area was fixed at 35 square miles, and it was assumed that dust would be produced whenever winds were greater than 17 miles per hour. Although these assumptions were adequate for modeling the largest dust events, smaller events were overestimated due to smaller erosion areas, and variable threshold wind speeds. The US EPA suggests another approach to estimate PM_{10} due to wind erosion using methods contained in AP-42 (USEPA, 1998). The AP-42 approach also has the same shortfalls as the wind tunnel method since it assumes a fixed threshold wind speed for a fixed area size. Ono, *et al.* (2003b) compared the daily emission estimates using AP-42 to those generated using the Dust ID method and found that the AP-42 method often predicted significant emissions when no erosion activity was detected at Owens Lake, and significantly underestimated emissions for the largest dust events. A new method was needed that could account for the changing threshold wind speeds and could also locate the source of the emissions. Ideally, such a method would provide hourly PM_{10} emissions from each area of the lake bed and could be used in an air quality model to determine which areas of the lake bed were causing or contributing to violations of the PM_{10} NAAQS.

After the adoption of the 1998 SIP, the District initiated a new program to estimate emissions using time-resolved wind erosion measurements. The program, known as the Owens Lake Dust Source Identification (Dust ID) Program, was started in January 2000 (GBUAPCD, 2000). As shown conceptually in Figure 4.1, wind erosion involves particles that creep along the surface, and sand-sized particles or agglomerates that bounce or saltate across the surface. These creeping and saltating particles loosen other particles and abrade the surface, causing finer particles, including PM_{10} to go into suspension. Near the surface, creeping and saltating sand-sized particles are blown horizontally and finer dust particles are ejected and mix vertically in the turbulent air stream to form visible dust plumes. Previous research at Owens Lake and in other areas showed that the vertical flux of PM_{10} dust emissions is generally proportional to the horizontal flux of sand or saltation particles. Using this assumption, PM_{10} emissions were estimated from sand flux measurements that were taken with instruments placed in the saltation zone, which may range from the ground to about 1 meter above the surface. As discussed later in this section, the proportion of PM_{10} associated with the sand flux was later inferred by comparing monitored PM_{10} concentrations with the predicted concentrations from an air quality model.

Hourly sand fluxes are determined using electronic sensors and passive sand catchers for 30 months at sites spaced one km apart on a 135 sq. km area of the lake bed as shown on the map in Figure 4.2. The sand flux was assumed to be representative of the one square kilometer area. The proportion of PM_{10} to sand flux was found to increase during winter and spring, and was found to vary spatially on the lake bed with different soil textures. The proportionality factor, known as the K-factor (K_f), was used to estimate PM_{10} emissions at Owens Lake using Equation 4.1.

Equation 4.1

$$PM_{10} = K_f \times q$$

where,

q = Sand flux measured at 15 cm above the surface [$g/cm^2/hr$]

K_f = K-factor, empirical ratio of the vertical PM_{10} emission flux to the horizontal sand flux at 15 cm.

Sand flux was measured using Cox Sand Catchers (CSCs), which are passive sand collectors, and Sensits, which are electronic erosion measurement devices. The Sensits were used to time-resolve the CSC mass to provide hourly sand flux. Sand flux was measured at 15 cm above the surface to represent a measurement of the total horizontal sand flux at the site. An analysis of the total horizontal sand flux measured from the surface to one meter showed that the sand flux at 15 cm was proportional to the total sand flux with very little deviation. (Ono, *et al*., 2003a, and Gillette, *et al*., 2003)

The Dust ID network provided a one square km spatial resolution over 135 sq. km , and one hour temporal resolution on the emissions from each square kilometer grid cell in the network. In comparison, most air quality planning areas lack spatial information, and use 24-hour temporal resolution for their PM_{10} emission inventories. The fine-scale spatial and temporal resolution for the Owens Lake inventory was very useful for modeling wind-blown dust using the CALPUFF air quality model. The methods and results of the Dust ID Program are discussed in the Chapters 6 and 7. Additional details can be found in Chapter 8 (Exhibit 2, Attachment 4), Appendix B, Ono, *et al*., 2003a and Richmond *et al*., 2003.

4.3.2 Sand Flux Measurements

Co-located Sensits and CSCs were used to determine hourly sand flux rates at 135 locations as shown in Figure 4.2. Sensits are electronic sensors that measure the kinetic energy and the particle counts of sand-sized particles as they bounce across the surface. Due to differences in the electronic response of individual Sensits, each was co-located with a CSC to compare each Sensit output against the CSC-collected mass. An example of the linear relationship between the CSC mass and the output from a co-located Sensit is shown in Figure 4.3. By using collocated instruments, the CSC mass could be time-resolved to provide an hourly sand flux rate.

Figure 4.4 shows a Sensit suspended above the ground and a CSC in the ground to the left. Sensits are battery-powered with solar charging systems. A datalogger records 5-minute average data during active erosion periods.

CSCs are passive instruments that capture sand-sized particles that are blown across the surface during a dust event. These instruments were designed and built by the District as

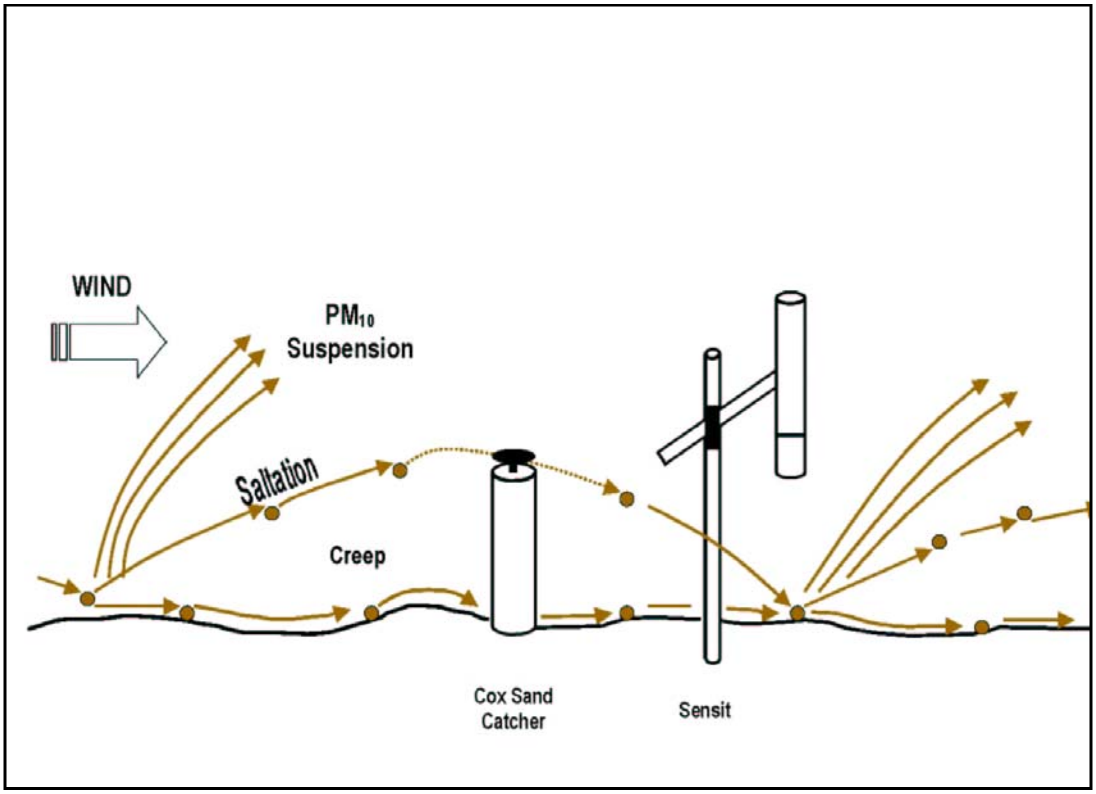

Figure 4.1 – Conceptual depiction of the wind erosion process with a Cox Sand Catcher and Sensit positioned in the saltation zone to measure sand flux.

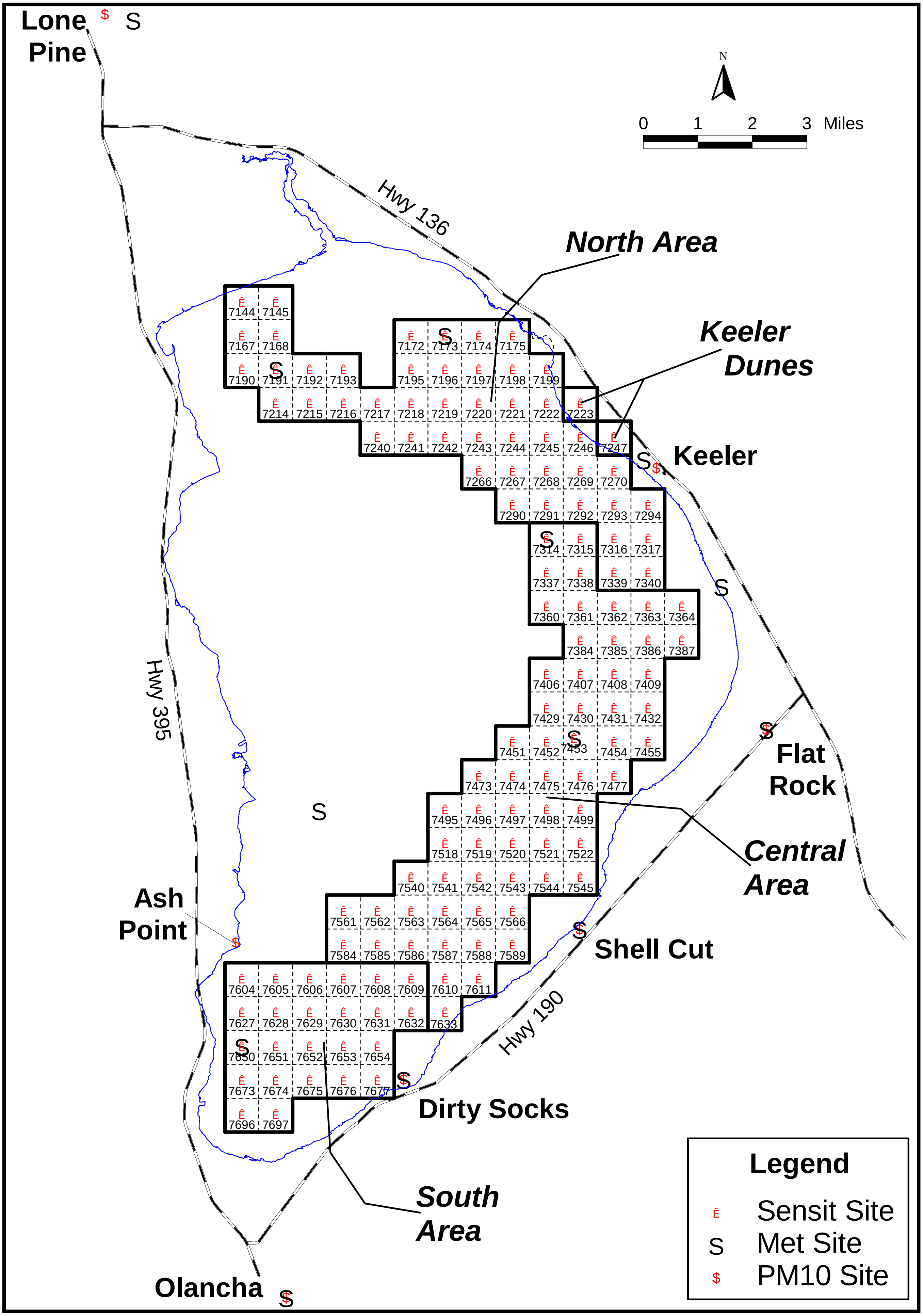

Figure 4.2 - Owens Lake Dust ID Monitoring Network

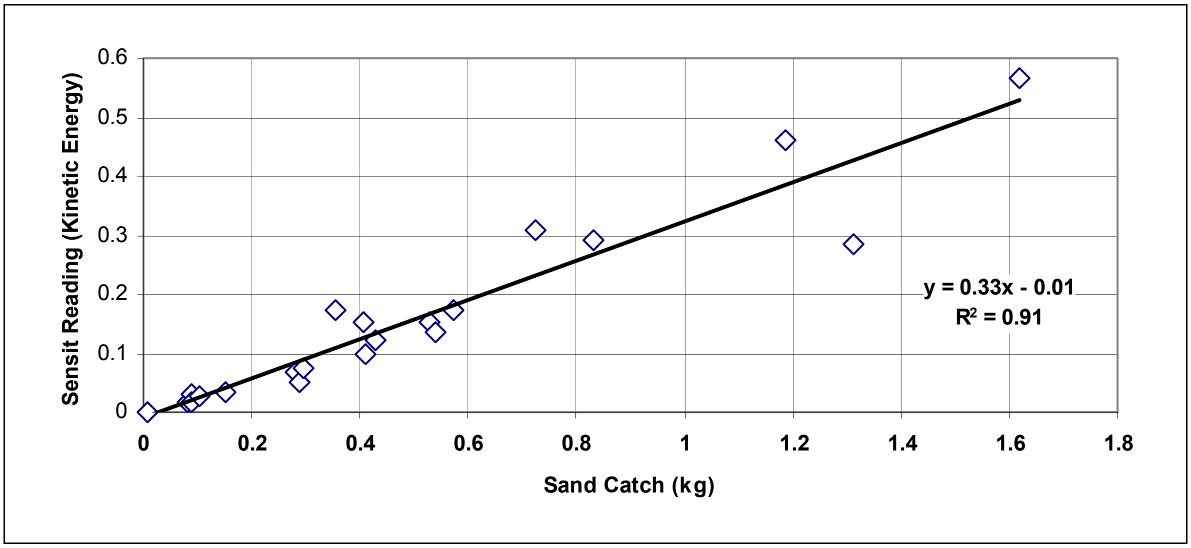

Figure 4.3 – An example of the linearity between CSC mass and a Sensit reading (Sensit No. 7291 using total kinetic energy)

Figure 4.4 – Sensit suspended above the ground and a Cox Sand Catcher in the ground to the left.

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reliable instruments that could withstand the harsh conditions at Owens Lake. CSCs have no moving parts and can collect sand for a month or more at Owens Lake usually without overloading the collectors. Field personnel must visit each CSC site to physically weigh the sand catch masses. A diagram of the CSC is shown in Figure 4.5. Not shown in the diagram are an internal sampling tube and a height adjustment sleeve that can be seen in the photo in Figure 4.6. The internal sampling tube is removed from the PVC casing to measure the sand catch sample. The lengths of the sampling tubes and casings are adjusted during construction to accommodate the amount of sand flux in each area and to avoid overloading the CSCs. The CSC length ranges from about 2 to 4 feet. Because the PVC casing is buried in the ground, an adjustment sleeve is used to keep the inlet height at 15 cm to compensate for surface erosion and deposition.

Figure 4.7 shows an example of sand flux measured in a dust event for each grid cell in the Dust ID network. The high sand flux areas correspond with the locations of dust source areas that were mapped by off-lake observers during parts of the dust storm.

4.3.3 Temporal and Spatial K-factors

To estimate PM_{10} emissions using Equation 4.1, the proportion of PM_{10} to sand flux, or K-factors, must be determined for different areas and periods. A three step process was used to develop these spatial and temporal K-factors. The first step was to calculate K-factors for each hour of a dust event, the second step was to screen the hourly K-factors for weak plume impacts, and the final step was to group the hourly K-factors into spatial and temporal groups for the emissions inventory.

Hourly K-factors were inferred from the CALPUFF model by using hourly sand flux as a surrogate for PM_{10} emissions. Predicted PM_{10} concentrations were then compared to monitored concentrations at PM_{10} monitor sites to determine the K-factor that would correctly predict the monitored concentration for each hour. A K-factor of 5×10^{-5} was initially used to run the CALPUFF model and to generate concentration values that were close to the monitored concentrations. Hourly K-factor values were then adjusted in a post-processing step to determine the K-factor value that would make the modeled concentration match the monitored concentration at the PM_{10} monitor site. The initial K-factor was then adjusted using Equation 4.2.

<u>*Equation 4.2*</u>

$$K_f = K_i \left(\frac{C_{obs.} - C_{bac.}}{C_{mod.}} \right)$$

Where:

K_i = Initial K-factor (5×10^{-5})
$C_{obs.}$ = Observed hourly PM_{10} concentration. ($\mu g/m^3$)
$C_{bac.}$ = Background PM_{10} concentration (assumed 20 $\mu g/m^3$)
$C_{mod.}$ = Model-predicted hourly PM_{10} concentration. ($\mu g/m^3$)

Hourly K-factors were screened to remove hours that did not have strong source-receptor relationships between the active source area (target area) and the downwind PM_{10} monitor. For example, the screening criteria excluded hours when a PM_{10} monitor site was located on the edge of a dust plume. Because the edge of a dust plume has a very high concentration gradient a few degrees error in the plume direction could greatly affect the calculated K-factor.

The hourly K-factor was excluded if it failed any of the following criteria:

1) Wind speed is greater than 5 m/s at 10-m height.
2) Hourly modeled and monitored PM_{10} concentrations were both greater than 150 µg/m^3 at the same monitor-receptor site.
3) Hourly wind direction is from the lake bed to the monitor site.
4) The mean sand flux for all sites with non-zero sand flux is greater than 0.5 g/cm^2/hr.
5) At least one sand flux grid center located within the target area and within a 30-degree upwind cone has sand flux greater than 2 g/cm^2/hr.
6) All sources are within a distance of 15 km of the receptor.
7) More than 65 percent of the PM_{10} contribution at a monitor site came from the target source area (North area, South area, Central area or Keeler dunes).
8) Eliminate hours when sand flux data are missing from one or more cells that are located within a 30-degree upwind cone and within 10-km of the shoreline monitor. For Olancha and Lone Pine, which are both located 5 to 10 km from the lake bed, the distance limitation is changed to 10 km upwind of the shoreline.

About 1,000 hours of screened data were used to generate temporal and spatial K-factors. Figure 4.8 shows the hourly K-factors for the South area of the lake bed. The results show scatter in the hourly values, but as predicted by the PM_{10} to sand flux theory, there appears to be a fairly constant average K-factor for each storm during certain periods of the year. While the K-factors may change by a factor of two or three, their consistency is in contrast to the large shifts in the hourly sand flux rates, which often change by three orders of magnitude and drive the emissions using Equation 4.1. Hourly K-factors and storm averages for the South area, as well as other areas usually increase during the winter and early spring. This period corresponds to the formation of an efflorescent salt on the surface that forms a very powdery and loose surface. Efflorescent salts form annually at Owens Lake with increased precipitation and cold temperatures.

In addition to the South area, three other areas of the lake bed were identified for the spatial K-factor sets: the Keeler dunes, the Central area and the North area. The boundaries of the four areas, which are shown on the map in Figure 4.2, were delineated by a survey of the surface soil textures. All four areas showed temporal K-factor trends, as well as some differences that may be attributed to different soil textures. Figures 4.9 through 4.11 show the hourly and storm average K-factors for the Keeler dunes, Central area and North area from January 2000 through June 2002. Temporal cut-points for each area were subjectively selected based on shifts in the 75-percentile storm-average values, which also appeared to correspond to seasonal shifts in the observed surface conditions, such as efflorescent salt formation or surface crusting.

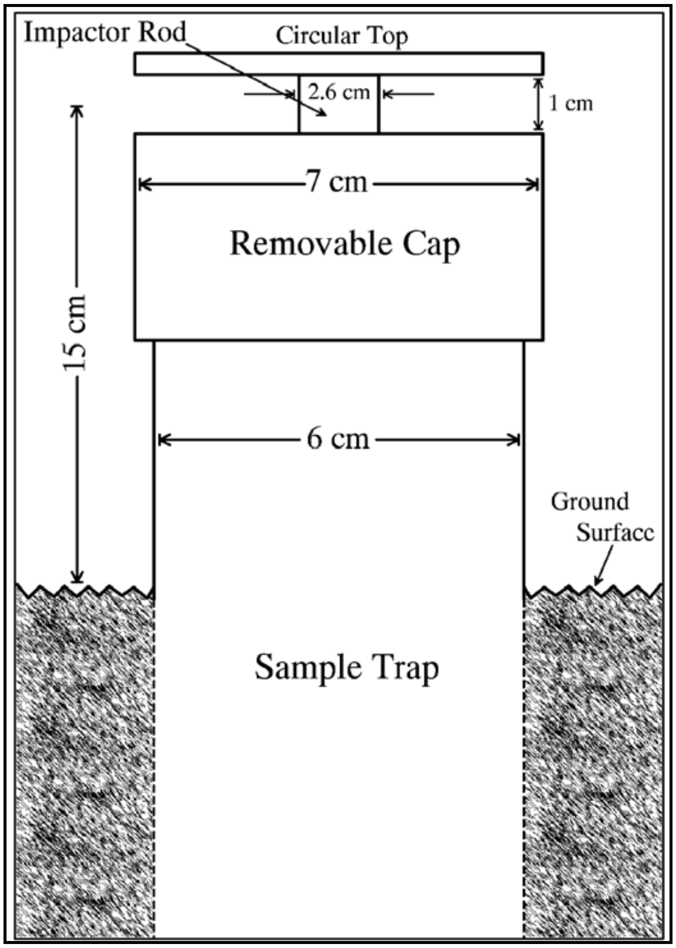

Figure 4.5 – Diagram of the Cox Sand Catcher
(Not to Scale)


Figure 4.6 – Photo of a Cox Sand Catcher
with the inner sampling tube removed.

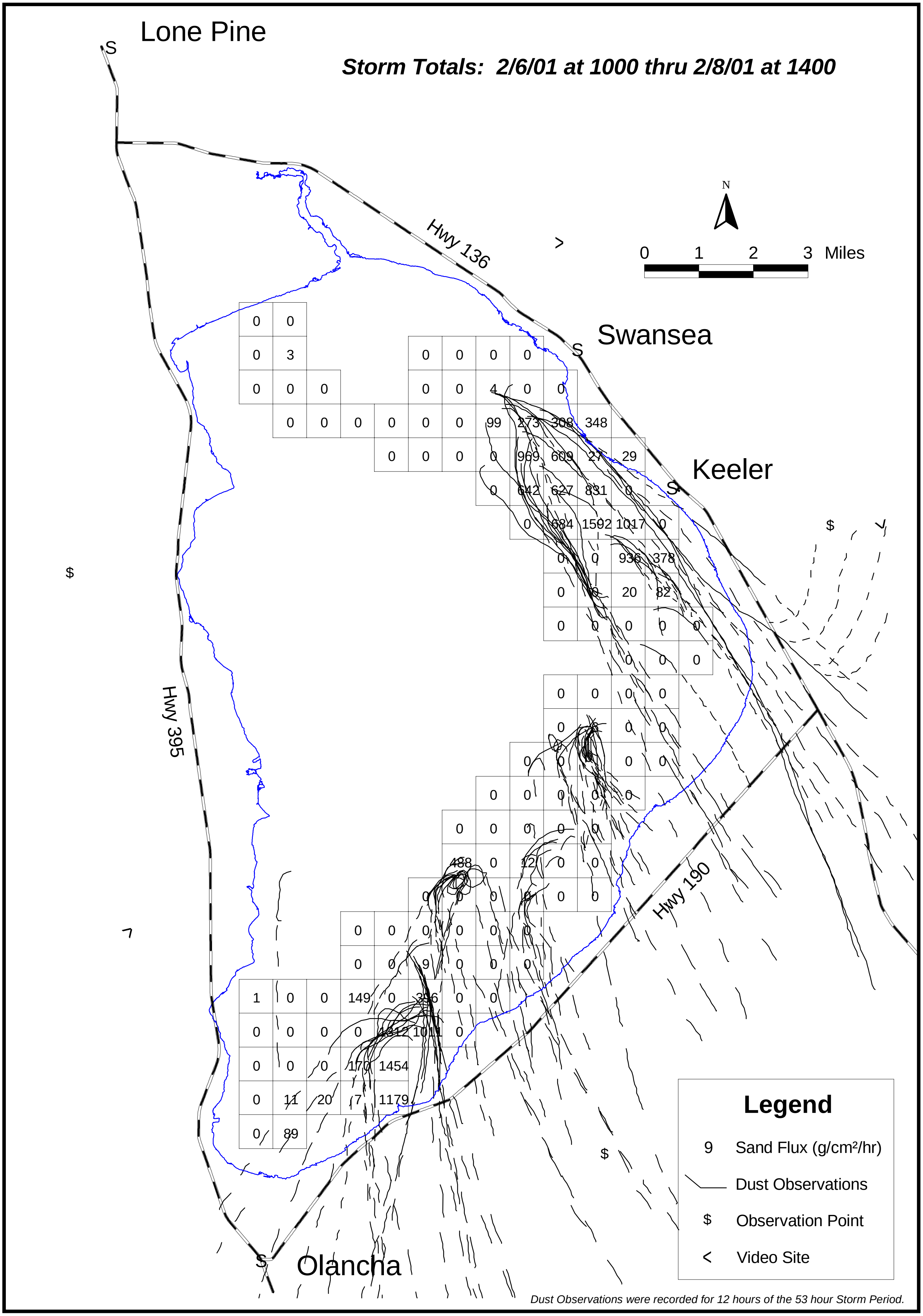

Figure 4.7 - Example of network sand flux measurements and visual observations during a dust event.

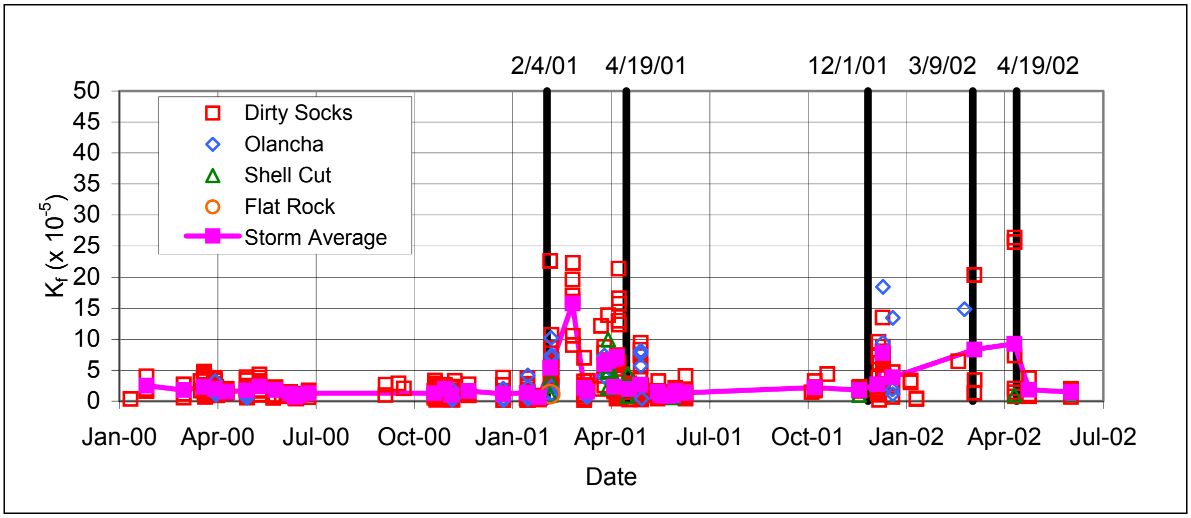

Figure 4.8 – Hourly and storm-average K-factors for the South Area

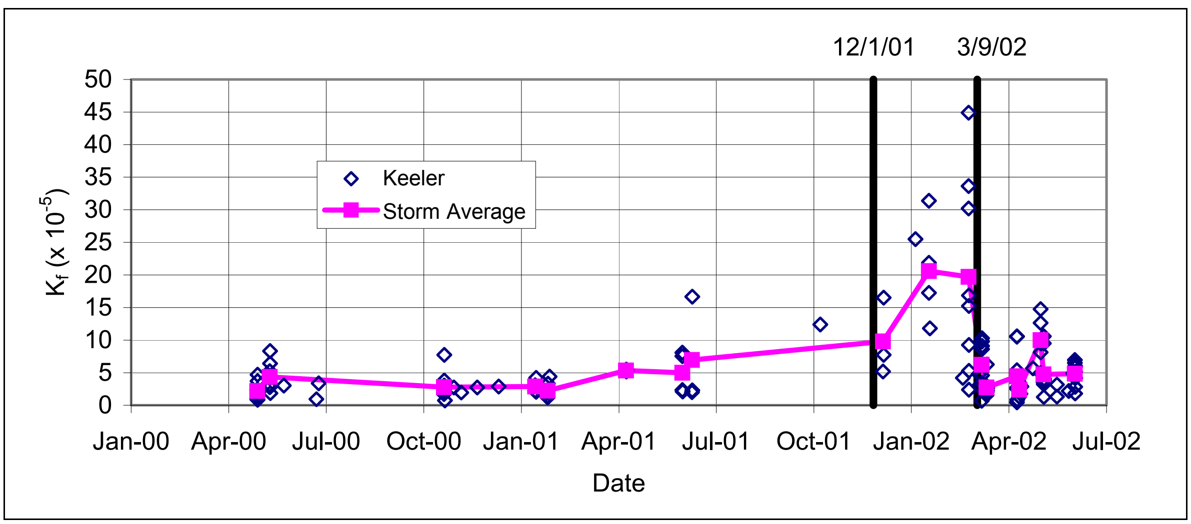

Figure 4.9 – Hourly and storm-average K-factors for the Keeler Dunes

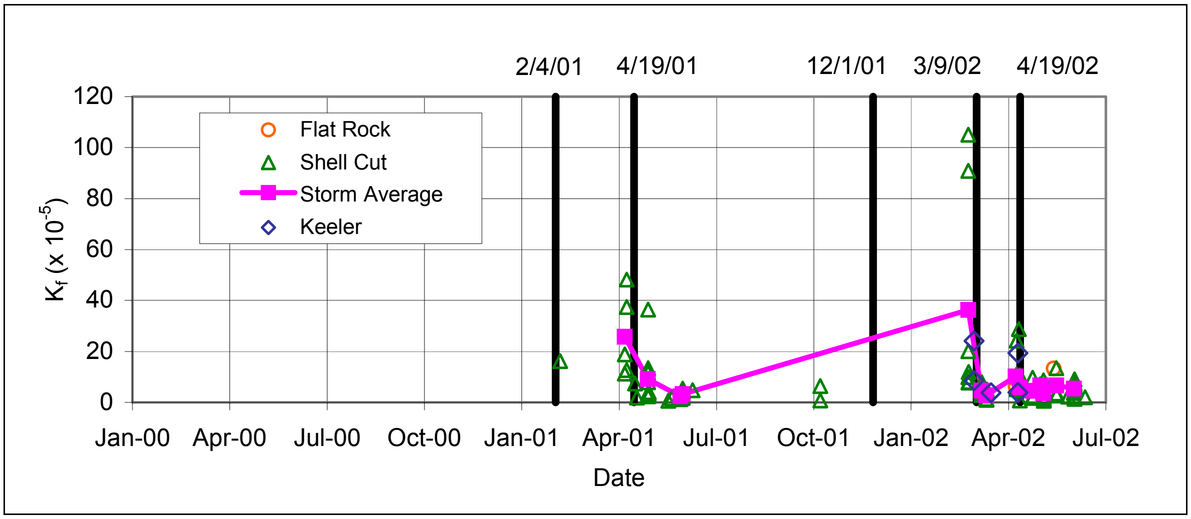

Figure 4.10 – Hourly and storm-average K-factors for the Central Area.

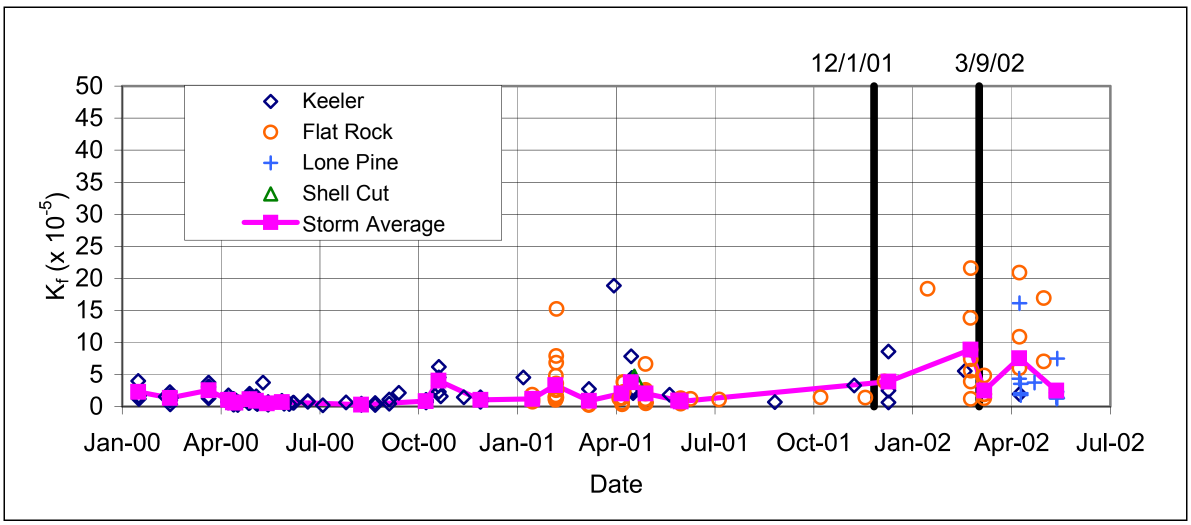

Figure 4.11 – Hourly and storm-average K-factors for the North Area.

Table 4.2 shows a summary of the temporal and spatial 75-percentile K-factors that were generated from the screened K-factors. It was determined through a model performance analysis of the 50-percentile, 75-percentile and 95-percentile storm-average, that the 75-percentile storm-average values provided the best model performance for the high PM_{10} days and the attainment demonstration (see Appendix B for the model performance results). Only one or two storm-average K-factor values were available for some periods in the South and Central areas, which made the 95-percentile and the 75-percentile identical and made selecting the K-factor cut-points impractical based on results from one area. However, K-factor shifts in the South and Central area showed similar temporal patterns, and the K-factor gaps occurred during different periods. So this temporal similarity was applied to select the cut-points for two spring periods in the Central area, and the last two periods in the South area.

Table 4.2 – 75-percentile storm-average K-factors were determined to provide spatial and temporal values to estimate hourly emissions and model ambient PM_{10} impacts.

Period	K-factors (10^{-5})			
	Keeler Dunes	North Area	Central Area	South Area
1/1/00-2/3/01	5.10	2.05	6.62	1.88
2/4/01-4/18/01	5.10	2.05	25.72	6.69
4/19/01-11/30/01	5.10	2.05	6.27	1.91
12/1/01-3/8/02	20.14	7.65	35.72	5.82
3/9/02-4/18/02	5.54	5.01	6.93	9.03
4/19/02-6/30/02	5.54	5.01	6.63	1.77

4.3.4 Daily and Annual PM_{10} Emissions for Lake Bed Areas

Using the Dust ID method, hourly, daily, and annual PM_{10} emissions can be calculated using Equation 4.1. Figure 4.12 shows the daily PM_{10} emissions within the Dust ID network based on the hourly sand flux for each cell and the temporal and spatial K-factors from Table 4.2. The PM_{10} emissions shown in Figure 4.12 include both the lake bed and Keeler dunes. For the lake bed source areas, the highest daily emission total during the program was estimated at 6,956 tons of PM_{10} on May 2, 2001. The annual PM_{10} emissions from the lake bed were estimated at 76,191 tons from July 2000 through June 2001. This 12-month period was used to estimate the annual emissions because the full sand flux network was in place during this period and it was not influenced by the dust controls that were implemented at the end of 2001. Currently, PM_{10} emissions are on the decline as the result of dust mitigation efforts that started in 2001. Emissions are expected to continue their decrease as more dust areas are controlled through 2006.

4.3.5 Daily and Annual PM_{10} Emissions for Off-Lake Dune Areas

In addition to the PM_{10} source areas on the Owens Lake playa, PM_{10} emissions are also generated from off-lake source areas adjacent to the lake bed. The two main sources consist of the Keeler dunes and the Olancha dunes (Figure 4.13). The Keeler dunes are included in the Dust ID network and emissions can be calculated for them in the same manner as for emissions from lake bed areas. Olancha dunes emissions are estimated using research on alluvial fan areas east of the Keeler dunes (Nickling *et al*., 2001). Emissions from these two dune fields are calculated below and are included in the emission inventory.

There are additional sources present along the east and southeastern portion of the lakeshore. These sources consist of natural alluvial fan sand deposits on the lower slopes of the Inyo and Coso Mountains mixed with secondary source material blown up from the exposed Owens Lake playa. The boundaries of these areas are diffuse and poorly defined and the PM_{10} emission rates associated with these areas are unknown. Emissions from these diffuse areas are assumed to be much less than both the lake bed and the two dune fields and are not included in the emission inventory.

Most of these off-lake sources of wind-blown dust were formed by material that was initially entrained from the exposed playa and then deposited in areas off the lake bed (Holder, 1997). The Olancha dunes were present prior to the early 20th century desiccation of Owens Lake, but subsequent lake bed dust storms have deposited additional sand and dust in the dune field. These dust deposition areas are secondary sources of dust that can be entrained under windy conditions. After the lake bed sources areas are controlled, PM_{10} emissions from the off-lake dunes are expected to decline (Niemeyer, 1996). See Section 7.3.3 for additional information on dunes.

Peak daily and annual PM_{10} emissions from the Olancha dunes were estimated from the Keeler dune emissions, which were measured as part of the Dust ID network. An estimate of PM_{10} emissions was made using Equation 4.3.

<u>*Equation 4.3*</u>

$$PM\text{-}10 = \left(\frac{F_{KD}}{A_{KD}}\right) \times A_D \times R_D$$

where,

F_{KD} = PM_{10} emissions from the Keeler dunes (252 tons/day or 2,909 tons/year)
A_{KD} = Area size of the Keeler dunes = 1.84 sq. km
A_D = Area size of Olancha dunes = 3.04 sq. km
R_D = Ratio of Olancha dunes to Keeler dune K-factors (0.27)

The Olancha dune emission estimate is based on comparing the Olancha dune area to the Keeler dune emissions that were included in the Dust ID network. Since there were no sand-flux monitors on the Olancha dunes, the Olancha dunes are assumed to have similar activity levels (sand flux per unit area per time) as the Keeler dunes, and to have a K-factor similar to the alluvial fan sand deposits east of the Keeler dunes. The Olancha dunes K-factor is expected to be similar to the alluvial fan area, because they are both farther from the lake bed than the Keeler dunes. Because of the greater distance from the lake bed, more PM_{10} may be winnowed out of the dune material as it is transported farther from the lake bed. Wind tunnel tests showed that dunes located on the alluvial fan east of the Keeler dunes had an average K-factor of 1.0×10^{-5}, while the average Keeler dune K-factor was

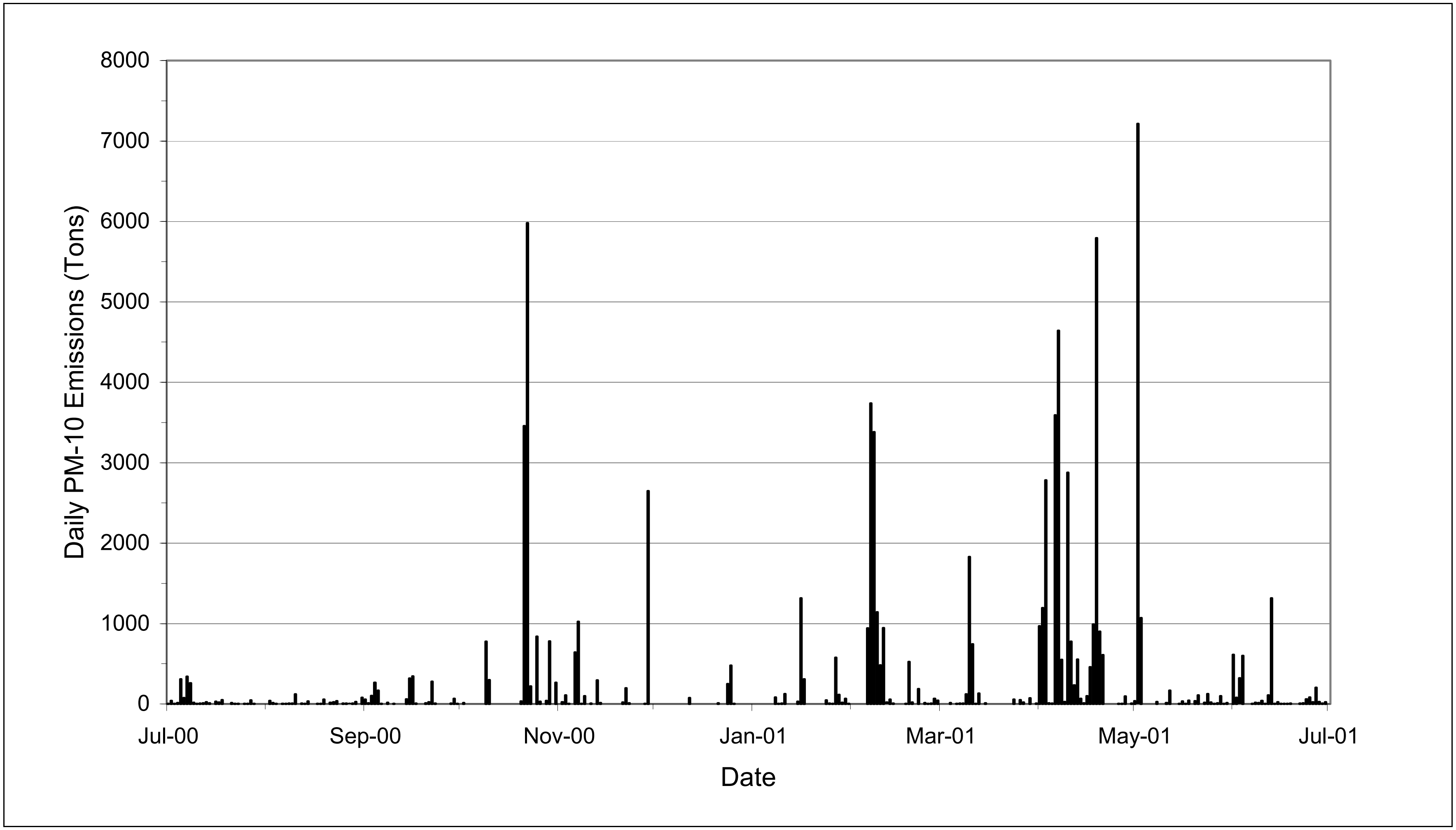

Figure 4.12 – Daily PM_{10} emissions within the Dust ID network (July 2000 – June 2001).

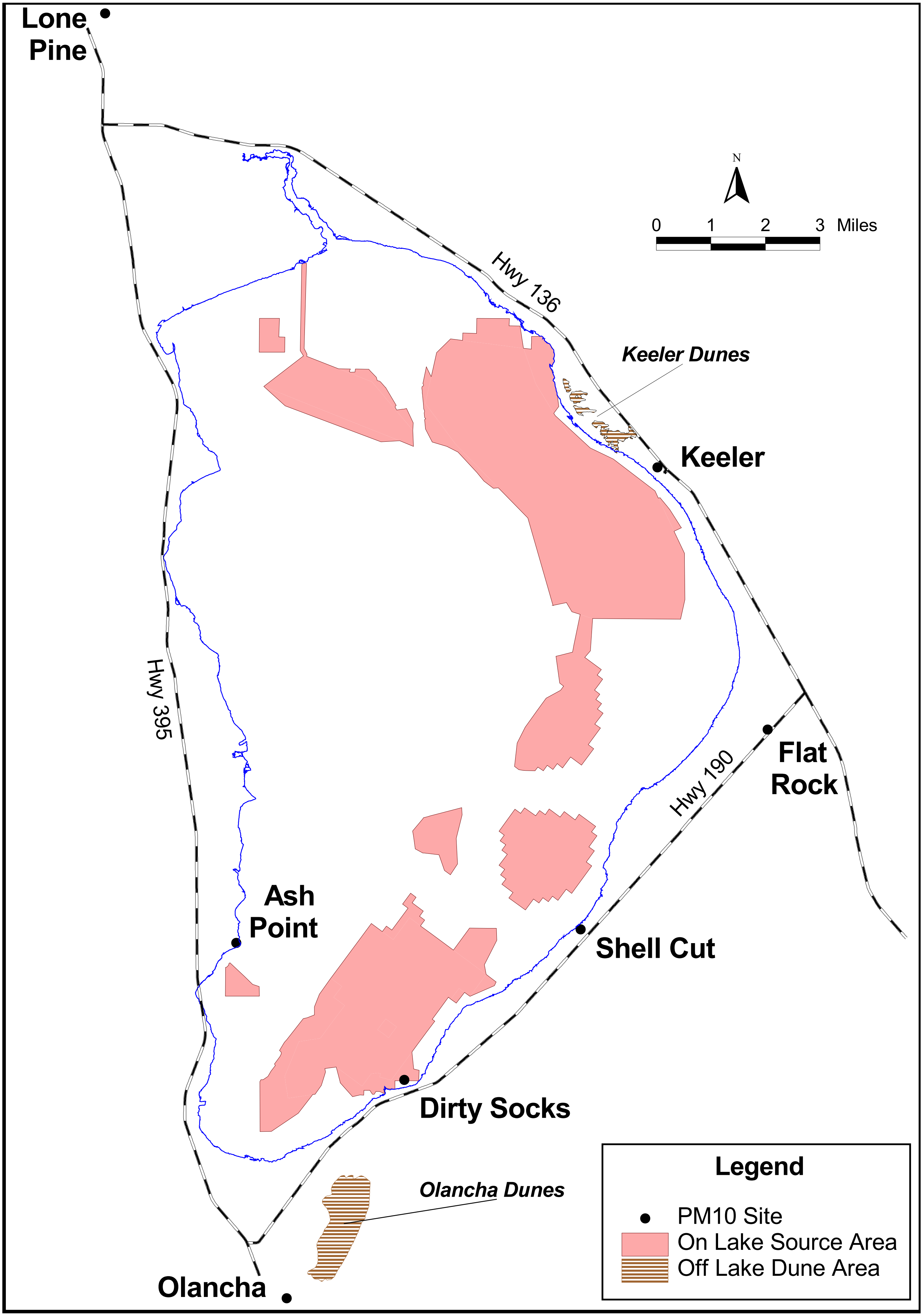

Figure 4.13 - Map of off-lake dune areas.

3.7 x 10^{-5} for the same period (Nickling, *et al*., 2001). This yields a K-factor ratio between the two areas of 0.27. Dune area sizes are based on estimates made for the 1998 SIP (GBUAPCD, 1998a).

Table 4.3 shows a summary of the wind-blown dust PM_{10} emissions from the lake bed and the adjacent off-lake dunes. The lake bed emissions are separated for the North, Central and South areas as shown in Figure 4.2. Peak daily emissions are estimated for a dust event on May 2, 2001 at 364 tons for the off-lake dune areas. The annual emissions for the two dune areas are estimated at 4,207 tons from July 2000 through June 2001.

4.4 PM_{10} EMISSIONS FROM DUST CONTROL AREAS

In future years, PM_{10} emissions from Dust Control Areas (DCA) will be generated from construction-related activities and the residual PM_{10} emissions for the DCM that is about one percent of the uncontrolled emissions. Construction-related emissions may be generated by fugitive dust from unpaved roads, installing drainage systems, pipes, or berms, and preparing the soil to plant saltgrass. Estimating projected emissions into the future will be important tracking for Reasonable Further Progress as discussed in Section 7-5.

PM_{10} emissions from construction activities are estimated at 2.4 tons per day, and 171.6 tons per year (GBUAPCD, 2003c). These emissions are not included in the emissions inventory, since construction is a transient activity that will be completed in less than a year on each DCA, and because including them may double count the uncontrolled wind-blown dust emissions that would be generated from the same area.

PM_{10} emissions from the DCAs can be estimated using the Dust ID method discussed in Section 4-3 or by reducing uncontrolled emissions by 99 percent for areas that are in compliance with the shallow flood or managed vegetation BACM requirements. Emission reductions to track and project Reasonable Further Progress will be estimated by assuming that the shallow flood and managed vegetation DCMs will achieve 99 percent control efficiency from the uncontrolled emissions. Annual emission reduction projections for future years are discussed in Section 7-5 and shown in Figure 7.2.

Table 4.3 - Summary of the peak uncontrolled daily and annual PM_{10} emissions due to wind-blown dust from Owens lake.

Erosion Area	Area Size (sq. km)	Peak Daily* PM_{10} (tons/day)	Annual PM_{10} (tons/yr)
North Area	47	3,436	25,615
Central Area	62	2,390	22,648
South Area	24	1,130	27,928
Lake Bed Total	**133**	**6,956**	**76,191**
Keeler Dunes	1.84	252	2,909
Olancha Dunes	3.04	112	1,298
Dune Total	**4.9**	**364**	**4,207**
Lake Bed & Dunes	**137**	**7,320**	**80,398**

* The Peak Daily Emission for the Lake Bed occurred May 2, 2001.

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CHAPTER 5

Dust Control Measures

FIGURES

TABLES

5

Dust Control Measures

5.1 INTRODUCTION

Dust control measures are defined as those methods of PM_{10} abatement that could be placed on portions of the Owens Lake playa and when in place are effective in reducing the PM_{10} emissions from the surface of the playa. Since 1980 the District and other researchers have been involved with the study of the lake environment and the mechanisms that cause Owens Lake's severe dust storms. Since 1989 the District has pursued a comprehensive research and testing program to develop PM_{10} control measures that are effective in the unique Owens Lake playa environment. Dust control measures that were tested on the lake, but have not been shown to be effective dust control measures for the SIP, include the use of sprinklers, chemical dust suppressants, surface compaction, sand fences and brush fences. These measures were discussed in the Owens Valley PM_{10} Planning Area Demonstration of Attainment SIP Projects Alternatives Analysis document (GBUAPCD, 1996), in the Final Environmental Impact Report (FEIR) (GBUAPCD, 1997) and the FEIR Addendum Number 1 (GBUAPCD, 1998b) for the 1998 SIP. Additional descriptions of the control measures as they have been implemented by the City of Los Angeles are found in the City's two Mitigated Negative Declarations for Phases 1 and 2 of the project (LADWP, 2000 and LADWP 2001). Descriptions of the work remaining to be completed before the end of 2006 can be found in the EIR prepared for this RSIP (GBUAPCD, 2003c). For the attainment demonstration included in Chapters 6 and 7 of this RSIP, the District is specifying that the PM_{10} control measures used will be shallow flooding, managed vegetation and gravel.

This chapter includes a brief description of each dust control measure, a discussion of the PM_{10} emissions after the control measure is implemented and the conditions that need to be met to achieve the necessary level of control. These descriptions contain both mandatory and conceptual elements and are provided to illustrate how the control strategy mandated by this RSIP may be feasibly implemented. The mandatory elements of the control strategy are set forth in the Board Order in Section 8.2. Control strategy elements not mandated by this RSIP are left to the discretion of the City of Los Angeles. Chapter 7 of this document will show where these controls will be used on the playa to achieve the National Ambient Air Quality Standard for PM_{10}.

5.2 SHALLOW FLOODING

5.2.1 Description of Shallow Flooding for PM_{10} Control

The surfaces of naturally wet areas on the lake bed (i.e., those areas typically associated with seeps and springs) are resistant to wind erosion that causes dust emissions. In these naturally wet areas, water is discharged where the groundwater table intersects the flat lake bed surface (Figure 5.1). The areal extent of wetting is dependent upon the amount of water discharged to the surface, evaporation rate and lake bed topography. The size of the wetted area is less dependent on soil type because, once the water table is raised to the playa surface, surface evaporation is soil-type independent. The shallow flooding dust control measure mimics the physical and chemical processes that occur at and around natural springs and wetlands and can provide dust control over large areas with minimal infrastructure.

This control measure consists of releasing water along the upper edge of PM_{10} emissive area elevation contour lines and allowing it to spread and flow down-gradient toward the center of the lake (Figure 5.2). To attain the required PM_{10} control efficiency, at least 75 percent of each square mile of the control area must be wetted (i.e., standing water or surface saturated soil) between October 1 and June 30 of each year. This coverage can be determined by aerial photography, satellite imagery or any other method approved by the Air Pollution Control Officer (Hardebeck, *et al.*, 1996 and Schade, 2001). Figure 5.3 is a portion of one of the aerial photos used to evaluate the first phase of shallow flooding.

The following portions of the areas designated for control with shallow flooding are exempted from the requirement of 75 percent saturated surface:

1) raised berms, roadways and their shoulders necessary to access, operate and maintain the control measure which are otherwise controlled and maintained to render them substantially non-emissive.
2) raised pads containing vaults, pumping equipment or control equipment necessary for the operation of shallow flooding infrastructure which are otherwise controlled and maintained to render them substantially non-emissive.

"Substantially non-emissive" shall be defined to mean that the surface is protected with gravel or durable pavement sufficient to meet the requirements of District Rules 400 and 401 (visible emissions and fugitive dust).

To maximize project water use efficiency, flows to the control area will be regulated at the outlets so that only sufficient water is released to keep the soil wet. Although the quantity of excess water will be minimized through system operation, any water that does reach the lower end of the control area will be collected and recirculated through the system. At the lower end of the flood area, or at intermediate locations along lower elevation contours, excess water will be collected along collection berms and pumped back up to the outlets to be reused or otherwise discharged (Figure 5.4). The District estimates that approximately four acre-feet of water is required annually to control PM_{10} emissions from an acre of lake bed (Hardebeck, *et al*., 1996 and Agrarian, 2001).

Figure 5.1 – Flow from natural springs onto Owens Lake bed.

Figure 5.2 – Shallow flood dust control measure.

Figure 5.3 – Aerial photo of shallow flood dust control measure.

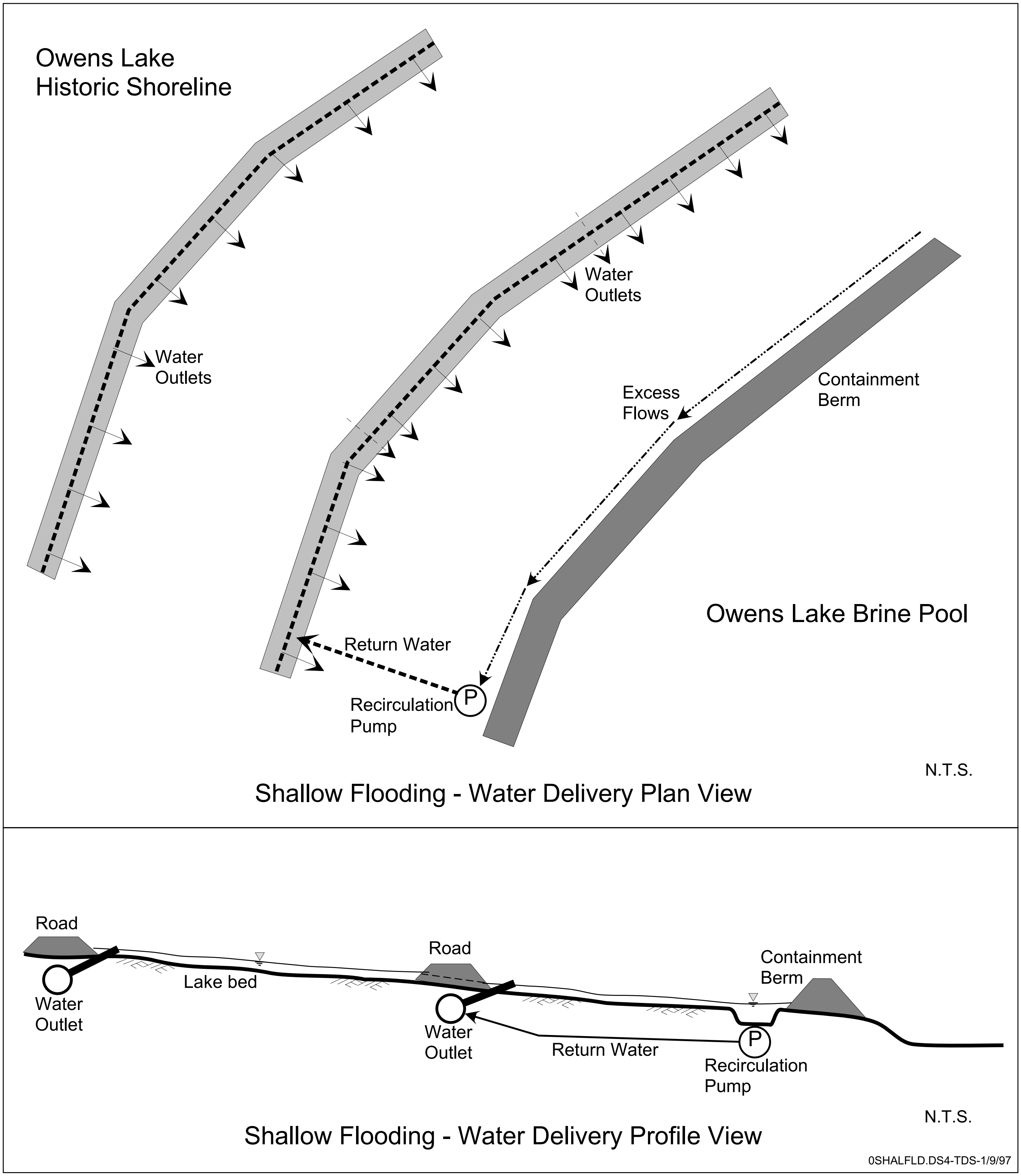

Figure 5.4 – Shallow flooding water delivery schematic

Due to the generally flat, uniform nature of the lake bed, the outlet water would spread over wide areas to create a random pattern of shallow pools. These pools would be generally less than a few inches deep. Pooled areas will produce no PM_{10} and will act as sand traps to prevent crust abrasion and dust generation. Damp and saturated soils also resist wind erosion. Locally high areas or “islands” of non-wetted soil tend to self-level; the soil blows off the higher islands and is captured in the pools. Thus, over time the high areas would become lower and the low areas would become higher. This leveling process can be expected to occur over a period of a few years. In some cases, it may be necessary to mechanically level high areas. This would occur primarily where natural land forms or previous earthwork performed on the lake bed prevents natural uniform spreading of shallow flood waters. In order to maximize the leveling effect of natural processes, dust control measure contractors should minimize disturbances to naturally flat lake bed areas designated for shallow flooding.

Shallow flooding will require a water transmission, distribution and outlet infrastructure, excess water collection and redistribution infrastructure and the construction of electrical power lines, access roads and water control berms as discussed in the EIRs for the SIP and RSIP.

5.2.2 PM_{10} Control Effectiveness for Shallow Flooding

Shallow flooding has been shown to be effective for controlling wind-blown dust and PM_{10} on sand-dominated soils on the lake bed. Between 1993 and 1996 a 600-acre test was conducted on the sand sheet between Swansea and Keeler. Effectiveness was evaluated in four ways; a) from aerial photographs assuming that flooded areas provided 100 percent control, b) from portable wind tunnel measurements of test and control areas, c) from fetch transect (1-dimensional) analysis of sand motion measurements; and d) from areal (2-dimensional) analysis of sand motion measurements. The average control effectiveness was 99 percent after surface water covered 75 percent of the test area (Hardebeck, *et al.*, 1996).

In 2000 the LADWP began construction on a 13.5 square-mile shallow flood project on the north end of the lake bed. Beginning in December 2001, a 12 square-mile portion of this project between Keeler and the Owens River delta was operational. By the end of 2002 the LADWP completed construction on additional dust control measures on the south end of the lake bed and has been operating about 13.7 square miles of shallow flooding. Visual observations since the implementation of existing shallow flood facilities have shown no dust plumes originating in the controlled areas.

PM_{10} emissions from a controlled 12-square mile area near Keeler (known as Zone 2), were calculated based upon observed sand flux before and after controls were implemented. Control efficiency across the area averaged 99 percent. Prior to shallow flooding, average PM_{10} emissions were 15,350 tons during the first 6 months of both 2000 and 2001. After shallow flooding, PM_{10} emissions were reduced to 200 tons from the same Zone 2 area during the first six months of 2002.

5.2.3 Shallow Flooding Habitat

When shallow flood water is distributed across the playa, opportunistic plant species are expected to establish themselves where low water salinities create favorable conditions.

Limited stands of cattails (*Typha* spp.), sedges (*Carex* spp.), saltgrass (*Distichlis spicata*) and other species associated with saturated alkaline meadows of the region colonized the immediate vicinity of the water outlets on the District's 1993 to 1996 flood irrigation project. However, during the operation of the first phases of LADWP's shallow flood project, recirculated runoff waters generally kept water salinities high, which prevented any significant spontaneous establishment of vegetation. Based on testing performed by the District at the North Flood Irrigation Project test area and the LADWP's operation of the first phases of shallow flooding, naturally established vegetation can be expected to immediately occur on between zero and 0.5 percent of the area that is controlled with shallow flooding.

The expansive shallow flooded areas provide ephemeral resting and foraging habitat for wildlife use. Figure 5.5 is a photo of the LADWP's North Sand Sheet Shallow Flood Project. Shorebirds can be seen using the wetted area. Shorebird utilization of wet areas on the lake bed was common during the District's control measure testing as well as during LADWP's operation of the first phase of large-scale shallow flooding (Ruhlen and Page, 2001, 2002). Based on these previous experiences, it is anticipated that shallow flooding will create areas of wildlife habitat in areas where very little previously existed.

In addition to desirable plant species, such as those listed above, that may invade and help control PM_{10} emissions, there is the possibility that undesirable non-native salt cedar (*Tamarix* spp.) may invade wet playa areas. A mandatory element of this project will be a program to remove any salt cedar that invades PM_{10} control areas. Salt cedar on the lake bed will be controlled independently or through annexation into Inyo County's control program. Annexation into the County's program would require a cooperative agreement with Inyo County.

Every effort will be made to limit the potential for introduction of exotic plant species into areas that will be controlled through the use of shallow flooding. Fortunately, the existing saline soil conditions inherent to the lake bed are inhospitable to most plants including exotic pest plants such as tamarisk, puncture weed and Russian thistle and noxious grasses such as *Cenchrus*. Exotic pest plants will be removed from the dust control areas. Removal will be accomplished through an appropriate combination of biological, mechanical and chemical control methods.

Field investigations were performed by mosquito entomologists from the University of California, Davis at District shallow flooding test sites and at natural pond, spring and seep areas around Owens Lake to determine the potential for water-based control measures to create mosquito-breeding habitat (Eldridge, 1995). These investigations concluded that mosquito habitat had limited potential to occur on the lake bed, but could occur when water depths range from 2 to 20 inches and when water had essentially no movement.

A mandatory element of this project will be a program to abate mosquito and other pest vector breeding and swarming. Abatement activities may include site design elements to minimize vector breeding habitat, application of pesticides and/or biological controls. These measures are successfully used throughout the Owens Valley. As an alternative to a separate mosquito abatement program, the City of Los Angeles may petition the County of

Figure 5.5 - American Avocets on the LADWP's first phase of shallow flooding.

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Inyo to annex all water-based control measure areas into the Inyo County Mosquito Abatement Program. If annexation occurs, appropriate assessments may be levied to ensure that abatement activities can take place. In recognition of the location of the source emission control areas in an area that is a stopover location for shorebirds and waterfowl, the mosquito abatement program shall be designed to minimize the potential impacts on the breeding success of western snowy plovers and other birds that use the playa.

5.2.4 Shallow Flooding Operation and Maintenance

Water flows between October 1 and June 30 will be maintained to provide the required 75 percent of the area in substantially evenly distributed standing water or surface-saturated soil. Based on the District's large-scale tests of shallow flooding, operating the shallow flooding control measure in this manner is predicted to use approximately four acre-feet per year (ac-ft/yr) of water per acre controlled. Careful management of shallow flood areas and/or improvements in infrastructure design may allow for less water to be used. Drains installed near naturally occurring wetlands would be operated so as not to cause significant groundwater drawdown or loss of surface water extent in the adjacent areas.

Maintenance activities associated with shallow flooding would consist of minor grading and berming on the control areas to ensure uniform water coverage and prevent water channeling and maintenance of pipeline, valves, pumping equipment and other infrastructure. Based on District projects and operation of the first phases of shallow flooding by the LADWP, the District estimates that staffing requirements for operation and maintenance of the shallow flooding areas will be approximately one full-time equivalent employee (FTEE) per 600 acres of flooded area.

5.3 MANAGED VEGETATION

5.3.1 Description of Managed Vegetation for PM_{10} Control

Vegetated surfaces are resistant to soil movement and thus provide protection from PM_{10} emissions. Vegetation that has established at least 50 percent total surface cover provides a barrier that prohibits wind speeds from reaching the threshold velocity for emissions at the playa surface. Vegetation has naturally become established where water appears on the playa surface with quantity and quality sufficient to leach the salty playa surface and sustain plant growth. Saltgrass meadows around the playa margins and the scattered spring mounds found on the playa are examples of such areas. The managed vegetation strategy is modeled on these naturally protected saltgrass vegetated areas. Dust control using managed vegetation will be designed as a mosaic of irrigated fields provided with subsurface drainage to create soil conditions suitable for plant growth using a minimum of applied water. Aerial and ground-level views of District test plots constructed using this strategy are shown in Figures 5.6 and 5.7.

The managed vegetation control measure consists of a creating a farm-like environment from currently barren playa. The saline-sodic soil must first be reclaimed with the application of relatively fresh water, and then planted with salt-tolerant plants that are native to the Owens Basin. Thereafter, soil fertility and moisture inputs must be managed to encourage rapid plant development to, and maintenance of, 50 percent cover. Demonstrated methods for accomplishing 50 percent cover within two years of the start of reclamation at

Owens Lake are based either on level basin reclamation (GBUAPCD, 1998c, 2001a, 2002a) or on drip irrigation (GBUAPCD, 2002b, 2003a). Level basin infrastructure calls for small (approximately 4 to 20 acre) confined fields constructed on contour and irrigated with shallow pulses of water. Because this method relies on earthen infrastructure for water distribution, it is best suited to clay soils that can be used for the construction of ditches, berms, channels and reservoirs that allow for level border irrigation strategies that leach and drain readily through the fractured structure of the soil. Drip irrigation requires far less initial soil disturbance. Plowing that homogenizes the soil structure would increase the lateral spreading of water away from drip emitters, thus improving the reclamation and plant use efficiency of applied irrigation. Otherwise, hoses with appropriately spaced and secured emitters can be simply laid onto or buried beneath the playa surface, so drip irrigation is less sensitive to soil type than is level basin irrigation. Level basin and drip are methods of soil reclamation and plant husbandry that are used elsewhere in this country and world-wide for vegetation of salt-affected soils.

The amount of water required to leach playa soils to within a level suitable for salt-tolerant species depends on whether the soil type is predominantly clay or sand, and to a lesser degree on the amount of surface treatment. Level basin treatment in heavy clay soil requires between 2½ and 6 feet of water to initially reclaim a two-foot deep soil profile to a level suitable for planting with saltgrass (Ayars, 1997). Drip emitters on predominantly clay soil must be allowed to deliver a similar input for reclamation prior to planting with saltgrass, regardless of whether tillage is heavy or none (GBUAPCD, 2002b). When practiced on sand-dominated soils, the amount of drip irrigation required for leaching (in no-till fields) prior to planting with saltgrass is between 0.5 and 2 feet (GBUAPCD, 2003a). These amounts of water can be delivered to new fields in 2 to 6 irrigation events, which can take place during a period of about 1 week to 4 months. Therefore, if leaching began during the winter months, saltgrass could be planted during the spring of the same year.

Leaching and irrigation water applied to the managed vegetation serves to maintain a gradient of salts away from the rooting area of the underlying soil. Managed vegetation is sustainable at Owens Lake only if salt from the naturally occurring shallow water table is prevented from rising into the rooting zone by capillary action. The drain system in the managed vegetation area functions to prevent the rise of the water table into the rooting zone, and irrigation is scheduled to maintain the necessary downward gradient within the rooting zone. Proper irrigation and drainage progressively leach the soil of superabundant salts. These salts can be removed from the area using subsurface drains (Figure 5.8). Drain water produced during the initial years of the project and in areas of naturally shallow saline groundwater will contain sufficient salts to render it useless as irrigation water unless it is mixed (diluted) with fresh water. As root zone soils improve in quality, the drain water in some areas may become fresh enough for recirculation as irrigation water. Drains installed near naturally occurring wetlands would be operated so as not to cause significant groundwater drawdown or loss of surface water extent in the adjacent areas.

Recycling of at least a portion of the recovered leaching fraction should be practiced on the clay-dominated soils found in the area designated for managed vegetation. Irrigation with low-salinity or fresh water can potentially cause a collapse of the soil structure, preventing water infiltration and salt leaching. If necessary, the drainage system would be constructed

Figure 5.6 – Aerial photo of District managed vegetation test site (DIVIT site).

Figure 5.7 – District managed vegetation test plot (Tree Rows plot).

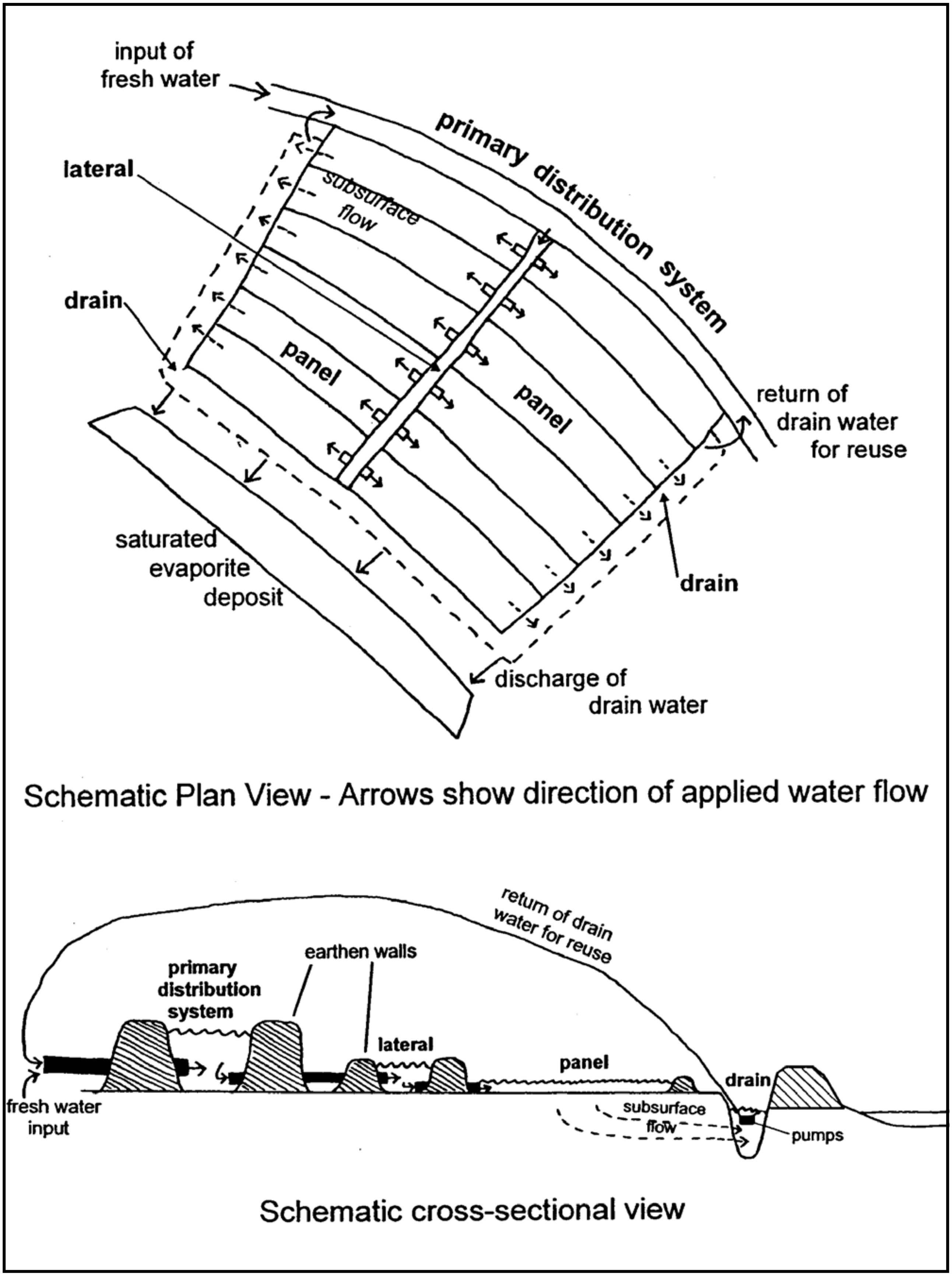

Figure 5.8 – Managed vegetation—subsurface drain schematic.

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to allow for the mixing of fresh water and saline drain water to achieve an ideal irrigation salinity (Ayars, 1997). The portion of drain water that is not reused for irrigation may be discharged to shallow flood areas. Otherwise, the clay soils found on many areas of the lake bed are appropriate for the construction of earthen infrastructure. In addition, the native profiles, texture and fractured structure of the clay soil makes it well suited for water distribution and drainage. The lower profiles in clay soils often include a network of existing fractures, facilitating effective drain water collection and natural drainage where the groundwater does not intrude into the rooting zone. The fine clay particles have a very high pore volume (approximately 50 percent) and therefore retain ample water for a long period of time that can be used by plants between irrigation events (Stradling, 1997 and Ayars, 1997).

Data from test plots on the lake indicate that 50 percent cover can be achieved during the second growing season (GBUAPCD, 2003a, 2003b). Total cover includes living plants, and any dead but still anchored plant materials, as both function to prevent PM_{10} emissions. Once the target cover of 50 percent is attained, meadow-like saltgrass stands can be sustained at or above this level of cover with 2½ acre-feet per year of irrigation water for each level basin or drip irrigated acre planted in sand or clay soils (GBUAPCD, 2002a, 2002c).

The following portions of the areas designated for control with managed vegetation are exempted from the requirement of 50 percent vegetative coverage:

1) portions consistently inundated with water, such as reservoirs, ponds and canals,

2) roadways and equipment pads necessary to access, operate and maintain the control measure which are otherwise controlled and maintained to render them substantially non-emissive, and

3) portions used as floodwater diversion channels or desiltation/retention basins.

“Substantially non-emissive” shall be defined to mean that the surface is protected with gravel, durable pavement or other APCO-approved surface protections sufficient to meet the requirements of District Rules 400 and 401 (visible emissions and fugitive dust).

Percent cover can be measured by the point frame method or via ground-truthed remote sensing technologies such as aerial photography or satellite imagery (Scheidlinger, 1997, Groeneveld, 2002).

Initially, saltgrass (*Distichlis spicata)* will be the only plant species considered by this RSIP for introduction into managed vegetation fields. Saltgrass is tolerant of relatively high soil salinity, spreads rapidly via rhizomes and provides good protective cover year-round even when dead or dormant. It is adapted to produce its most vigorous growth during the spring and autumn, and then use minimal amounts of applied water during the hot summer. Saltgrass grows vigorously in conditions of soil salinity that exclude invasive pest exotics. Eventually, salt-tolerant, locally native shrubs such as salt bushes (*Atriplex* spp.), greasewood (*Sarcobatus vermiculatus*), and seepweed (*Sueada moquinii*) may be introduced to established saltgrass fields to increase diversity and possibly reduce total water demand.

5.3.2 PM_{10} Control Effectiveness for Managed Vegetation

Field and wind tunnel research using Owens playa sands and actual saltgrass vegetation has been conducted by Lancaster and White (Lancaster, 1996, White, *et al.*, 1996). These studies indicate that even sparse populations of saltgrass function very effectively in reducing sand migration and PM_{10} within the stand. Lancaster concluded that for the coarse sands of the north sand sheet on Owens Lake, 95 percent reduction in sand movement can be achieved with a saltgrass cover of between 16 to 23 percent, depending on wind speed and direction. White showed that a vegetation cover of 12 to 23 percent will significantly reduce the amount of entrained sand and PM_{10}.

Wind tunnel studies were conducted in February 1997 on untreated, leached, vegetated, and "simulated" vegetated sites on the Owens Lake clay soils (Nickling, *et al.* 1997). Although the vegetation increased the aerodynamic roughness of the surface, there was no statistically significant difference between PM_{10} emissions from the vegetated and from the control (leached but unvegetated) sites. Both of these sites, however, showed PM_{10} reductions of two orders of magnitude compared to the natural playa surfaces. This indicates that treatment of the clay surfaces at Owens Lake by watering and leaching surface salts can by itself significantly reduce wind erosion without vegetation. However, saltgrass vegetation cover will provide additional surface protection after evaporation decreases the initial protection provided by surface wetting (Nickling, *et al.* 1997).

In a companion project, Owens Lake clay soils with saltgrass were subjected to various wind speeds in a wind tunnel at the University of California Davis. Preliminary results (White, 1997) indicate that 54 percent vegetation cover reduces the emission rate of PM_{10} at wind speed of 45 mph by 99.2 percent as compared to emissions from the natural playa at Owens Lake.

Control efficiencies were calculated for Owens Lake clay soils in both the field and the laboratory wind tunnels. The field studies showed 99.5 percent control efficiency with 11 to 23 percent saltgrass cover and the laboratory study demonstrated 99.2 percent control efficiency at 54 percent cover as compared to uncontrolled emissions at Owens Lake.

The plan for managed vegetation is to achieve cover values of at least 50 percent, a value that would include dead or dormant stems that would provide erosion protection without presenting a transpirative surface. This level of cover will be retained with appropriate plant husbandry and irrigation during the growing season. It will function during winter months without irrigation. A high control effectiveness for low levels of plant cover in agricultural-type soils is supported by field research performed by Buckley and Grantz, *et al.* in places other than Owens Lake, which indicate that a plant cover of even 30 percent can achieve better than 99 percent reduction of soil erosion (Buckley, 1987; and Grantz, *et al.*, 1995).

Based on the Buckley and Grantz field studies, the field studies at Lake Texcoco, near Mexico City, other work relating to PM_{10} emissions and vegetation and studies done at Owens Lake, the District believes that more than 99 percent reduction of soil erosion and PM_{10} will be achieved at Owens Lake with a salt grass cover of 50 percent. Table 5.1 summarizes research results regarding vegetation cover and control effectiveness. For modeling and emissions inventory purposes in this RSIP, the controlled PM_{10} emissions from the managed vegetation area are estimated at one percent of the uncontrolled emissions.

Table 5.1. Summary of studies relating the surface cover of vegetation to percent control of PM_{10} emissions.

Reference	Surface Cover Characteristics	Wind Speed	% Control
Buckley, 1987	30% ground cover.	NA	99%
Fryrear, 1994	50% canopy cover.	48 mph	96.3%
Grantz, *et al.*, 1995	31% cover on sandy soil.	NA	99.8%
Lancaster, 1996	16-23% salt grass cover at Owens Lake on sandy soil.	39 mph	95%
Musick & Gillette, 1990	25% vegetation lateral cover, 19.4 mph threshold on bare surface.[1]	NA	100%
Nickling, *et al.,* 1997	11-30% saltgrass cover at Owens Lake on clay soil.	$\geq$ 45 mph	99.5%[3]
van de Ven, *et al.*, 1989	4-5 inch high stubble, 30 stems/ sq. ft 19.28 mph threshold on bare surface.	NA	100%
White, *et al.*, 1996	12% cover on loose Owens Lake sand in a wind tunnel.	44 mph	97.1%[2]
White, 1997	54% saltgrass cover in wind tunnel at UC Davis in clay soil	45 mph	99.4%[3]

Notes:

[1] Wind speeds are normalized to an equivalent 10 meter wind speed at Owens Lake. This conversion uses the surface boundary layer equation assuming 0.01 cm surface roughness and the free stream speed for a given height if 10 meter wind speeds are not available.

[2] Measured PM_{10} emission reduction in the wind tunnel.

[3] Use uncontrolled $PM_{10} = 2.6 \times 10^{-3}$ g/m^2/s (from 1998 SIP (GBUAPCD, 1998a))

5.3.3 Managed Vegetation Habitat

Even if saltgrass is the only plant species that is deliberately introduced to the managed vegetation area, other plant species are expected to establish themselves opportunistically. Plant species observed on saltgrass test plots include inkweed (*Nitrophila occidentalis*), alkali sacaton (*Sporobolus airoides*), arrowscale (*Atriplex phyllostegia*), cattail (*Typha latifolia*) parry saltbush *(Atriplex parryi*), seablight (*Sesuvium verrucosum*) and stinkweed (*Cleomella sp*.). The species typical of transmontane alkaline meadows elsewhere in the Owens Basin, including sedges (*Scirpus* spp.), greasewood (*Sarcobatus vermiculatus*), and yerba mansa (*Anemopsis californica*) would also be expected to appear where soil leaching is most complete, adding diversity and wildlife habitat value to the fields. On saltgrass test plots established by the District on the playa, evidence of use by birds, rabbits, mice, kangaroo rats, gophers, foxes, coyotes, and a diverse group of invertebrates has been found. Care must be taken to avoid creating disturbed, highly freshened habitats that facilitate pest vector (eg., mosquito) or noxious weed (eg., salt cedar) infestations. The mosquito and salt cedar control programs discussed in Section 5-2.3 would also take place on the managed vegetation control measure.

5.3.4 Managed Vegetation Operation and Maintenance

Water use will be highest during the initial stages of development of this measure, in order to leach the root zone soil to a salinity level tolerable to saltgrass. Since the later stages of leaching can be accomplished after planting, the total water input that will be required for the first year of implementation will be at most seven ac-ft/ac. Managed vegetation will consume up to 2.5 acre feet of fresh or mixed water per irrigated acre once the target cover of 50 percent is reached. Non-irrigated acres used for roads, berms and water storage will also use some saline water for maintenance of protective (non-emissive) salt-crusted surfaces and weed control. The distribution of the water over the entire vegetated area will be irregular, because at any given time some fields will be irrigated for maximum growth while others will receive minimal amounts of water allowing for minimal stand maintenance.

Operation and maintenance activities for managed vegetation would consist of implementing irrigation and fertilization schedules for the fields, as are appropriate for any sustainable perennial cropping system. Necessary maintenance will include repair and periodic replacement of water transmission structures, water delivery structures, field berms and field ditches. Based on District projects, staffing requirements for operation and maintenance of the managed vegetation area are estimated by the District at approximately one full-time equivalent employee (FTEE) per 500 acres of vegetated area.

5.4 GRAVEL COVER

5.4.1 Description of Gravel Cover for PM_{10} Control

A four-inch layer of coarse gravel laid on the surface of the Owens Lake playa will prevent PM_{10} emissions by: (a) preventing the formation of efflorescent evaporite salt crusts, because the large spaces between the gravel particles interfere with the capillary forces that transport saline water to the surface where it evaporates and deposits salts; and (b) raising the threshold wind velocity required to lift the large gravel particles so that transport of the particles is not possible by wind speeds typical in the Owens Lake area. Gravel blankets can work effectively on essentially any type of soil surface. The District constructed small-scale gravel test plots on the Owens Lake bed that were in place for approximately 17 years and continued to completely protect the emissive surfaces beneath. Gravel placed onto the lake bed surface will be durable enough to resist wind and water deterioration, physical/ mechanical/chemical weathering and leaching and, to minimize visual impacts, will be approximately the same color as the existing lake bed.

Under certain limited conditions of sandy soils combined with high groundwater levels, it may be possible for some of the gravel blanket to settle into lake bed soils and thereby lose effectiveness in controlling PM_{10} emissions. To prevent the loss of any protective gravel material into lake bed soils, a permeable geotextile fabric may be placed between the soil and the gravel, where necessary. This will prevent the settling of gravel into lake bed soils.

To prevent pore space infilling and possible capillary rise of emissive salts to the surface, gravel areas must be protected from water- and wind-borne soil and dust. The gravel blanket should be the last control measure to be installed or graveled areas should be surrounded by non-emissive areas. This will minimize wind-borne depositions into the gravel blanket. Gravel areas should also be protected from flood deposits with flood control berms, drainage channels and desiltation/retention basins. The large pore spaces between the coarse gravel particles must be maintained to ensure that the gravel blanket will remain an effective PM_{10} control measure for many years.

To attain the required PM_{10} control efficiency, 100 percent of all areas designated for gravel must be covered with a layer of gravel four inches thick. All gravel material placed shall be screened to a size greater than ½-inch in diameter. The gravel material shall be at least as durable as the rock from the three sources analyzed in the EIR and EIR Addendum Number 1 associated with the 1998 SIP. The material shall have no larger concentration of metals than found in the materials analyzed in the 1998 EIR. To minimize visual impacts, the color of the gravel material used shall be such that it does not significantly change the color of the lake bed.

5.4.2 PM_{10} Control Effectiveness for Gravel Cover

A gravel cover forms a non-erodible surface when the size of the gravel is large enough that the wind cannot move the surface. If the gravel surface does not move, it protects finer particles from being emitted from the surface. Gravel and rock coverings have been used successfully to prevent wind erosion from mine tailings in Arizona (Chow and Ono, 1992). The potential PM_{10} emissions from a gravel surface can be estimated using the USEPA emission calculation method for industrial wind erosion for wind speeds above the threshold for the surface (USEPA, 1985). PM_{10} will not be emitted if the wind speed is below the threshold speed.

Based on a minimum particle size of ¼ inch, the proposed gravel cover will have a threshold wind speed of 90 miles per hour measured at 10 meters (USEPA, 1992, Ono and Keisler, 1996). This wind speed is rarely exceeded in the Owens Lake area. A more typical gust for Owens Lake is around 50 miles per hour.

The proposed four-inch thick gravel cover is intended to prevent capillary movement of salt and silt particles to the surface. Fine sands and silts that fill in void spaces in the gravel will allow the capillary rise of salts and reduce the effectiveness of a gravel blanket to control PM_{10} at Owens Lake. In addition, finer particles will lower the average particle size and lower the threshold wind speed for the surface. Gravel blanket tests were performed at two sites on Owens Lake starting in June 1986. These tests showed that four-inch thick gravel blankets composed of ½ to 1½-inch and larger rocks prevented capillary rise of salts to the surface. Observations of ungraveled test plots in the same area, one with no surface covering and another with local unscreened, unsorted alluvial soil, showed that salts would otherwise rise to the surface (Cox, 1996).

The PM_{10} emissions are expected to be zero for the gravel cover since the threshold wind speed to entrain gravel, and thus PM_{10}, is above the highest wind speeds expected for the area. This will result in 100 percent reduction of PM_{10} from areas that are covered by a gravel blanket.

5.4.3 Gravel Cover Operation and Maintenance

Because fine particles can not be allowed to cover or significantly infill the gravel, the gravel blankets should be the last measure implemented after all adjacent erodible areas are controlled. Once the gravel cover has been applied to the playa, limited maintenance would be required to preserve the gravel blanket. The gravel will be visually monitored to ensure that the gravel blanket was not filled with sand or dust, or had not been inundated or washed out from flooding. If any of these conditions were observed over areas larger than one acre, additional gravel will be transported to the playa and applied to the playa surface. The District estimates that operation and maintenance staffing requirements are one FTEE per five square miles of gravel and an average ongoing maintenance amount of gravel of 7,000 cubic yards per square mile per year (this allows for complete gravel replacement once every 50 years).

5.5 STORMWATER MANAGEMENT

The bed of Owens Lake is subject to flooding, alluvial deposits and fluctuating brine pool levels caused by stormwater runoff flows. In order to protect the PM_{10} control measures installed on the lake bed, the City shall design, install, operate and maintain flood and siltation control facilities. Flood and siltation control facilities shall be designed to provide levels of protection appropriate for the PM_{10} control measures being protected. For example, lake bed areas controlled with managed vegetation or gravel would require a higher level of flood protection than areas controlled with shallow flooding. Flood and siltation control facilities shall be integrated into the design and operation of the PM_{10} control measures. All flood and siltation control facilities shall be continually operated and maintained to provide their designed level of protection. All flood and siltation control facilities and PM_{10} control measures damaged by stormwater runoff or flooding shall be promptly repaired and restored to their designed level of protection and effectiveness. All flood and siltation control facilities shall be designed so as not to cause the existing trona mineral deposit lease area (State Lands Commission leases PRC 5464.1, PRC 3511 and PRC 2969.1) to be subjected to any greater threat of alluvial material contamination than would have occurred under natural conditions prior to the installation of PM_{10} control measures.

5.6 REGULATORY EFFECTIVENESS

Rule effectiveness is a measure of the compliance by the regulated sources with the control measures required under the plan. Since virtually all the PM_{10} emissions in the Planning Area originate from the dry playa of Owens Lake, and since a single operator, the City of Los Angeles, is required to undertake the control measures required under this plan to control those emissions, the District projects a rule effectiveness of 100 percent for the plan's control measures.

The District will enforce the plan's requirements through continual oversight and inspection of the City's efforts to construct, operate and maintain operation of the control measures, and through periodic inspection and monitoring. The plan contains a 2006 milestone for construction and operation of the control measures, and test methods for determining the compliance of the City's control strategy implementation with the performance standards required under this plan.

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CHAPTER 6

Air Quality Modeling

FIGURES

6

Air Quality Modeling

6.1 INTRODUCTION

Computer-based air quality modeling techniques were used to predict PM_{10} concentrations resulting from wind-blown dust emissions off the Owens Lake playa. The predicted PM_{10} concentrations were derived using measured PM_{10} concentrations at monitoring sites and measured wind speed and directions. Air quality modeling techniques were applied to assess control scenarios to reduce PM_{10} concentrations and bring the airshed into attainment. A performance evaluation was also conducted to assess the uncertainty and reliability of these modeling methods based on a comparison of model predictions with ambient PM_{10} measurements.

Dispersion model simulations were performed with the CALPUFF modeling system using data collected through the Dust ID Program (Scire, *et al*., 2000, Ono, *et al*., 2003a). These simulations were used diagnostically to aid in identifying source areas and to infer PM_{10} emission fluxes from these area sources. Dispersion modeling also plays an important role in the testing and development of control strategies and forms the basis of the attainment demonstration.

This section provides a synopsis of the modeling analysis conducted by MFG, Inc. for this RSIP. The technical details of the study are described in *Owens Valley Air Quality Modeling Study* (MFG, 2003), which is included in this RSIP as Appendix B. The study followed the methods outlined in the *Owens Valley PM_{10} Attainment Demonstration Draft Modeling Protocol* (MFG, 2001).

The objectives of the air quality modeling were as follows:

- conduct the dispersion modeling in accordance with the regulatory guidance for PM_{10} SIPs using USEPA recommended modeling tools and procedures.

- perform an evaluation of the proposed dispersion modeling techniques using two years of ambient data and focus the evaluation on the higher observed 24-hour PM_{10} concentrations. The performance evaluation was used to assess model uncertainty and aid in the selection of several aspects of the modeling procedures.

- assess and refine control strategies until the modeling approach demonstrates attainment of the PM_{10} National Ambient Air Quality Standards (NAAQS).

The 24-hour NAAQS for PM_{10} is 150 µg/m^3, not to be exceeded more than once per year at locations accessible to the public. The current modeling analysis is based on 30 months of data collected through the Dust ID Program. Within this 30-month period, no more than two concentrations higher than the NAAQS are allowed at each receptor location. The NAAQS is attained when the expected third highest 24-hour concentration at each shoreline receptor located on the 3,600 foot contour of Owens Lake is less than 150 µg/m^3.

6.2 OVERVIEW OF THE DUST ID PROGRAM

The District conducted a field program at Owens Lake from January 2000 through June 2002 to identify PM_{10} emission source areas, provide the basis for the estimation of PM_{10} emission fluxes, and to support development of this RSIP. The field program was designed based on the premise that PM_{10} emissions are related to the flux of saltating sand-sized particles (Ono, *et al*., 2003a and Gillette, *et al*., 2003). Figure 4.2 shows a map of Owens Lake with the location of the Dust ID instrumentation. Features of the Dust ID Program are as follows:

- Co-located Sensits™ and Cox Sand Catchers (CSCs) were used to determine hourly sand flux rates at 135 locations spaced one kilometer apart. The instruments were placed with their sensor or inlet positioned 15 cm above the surface. Sensits™ measure the kinetic energy and the particle counts of sand-sized particles as they saltate across the surface. CSCs are passive instruments used to collect sand-sized particles blown across the surface during a dust event. For a given period, the total mass of saltating sand was based on the CSC catch and the Sensits™ were used to time resolve the horizontal sand flux. Ono, *et al*., 2003a provide further details concerning the operation and calibration of the paired Sensits™ and CSCs.
- Hourly PM_{10} concentration data were collected at six sites around Owens Lake using Tapered Element Oscillating Microbalance (TEOM) PM_{10} monitors. The TEOMs were co-located with filter-based PM_{10} monitors collecting 24-hour samples.
- Surface meteorological data were collected hourly at 13 locations. Winds were observed at 10 meters (m) above the surface at all locations and selected sites collected atmospheric pressure, precipitation, temperature, and relative humidity. Although not used in the current study, two of the sites record wind and temperature data at multiple heights for the estimation of surface energy fluxes. The Dust ID Program also benefited from the surface wind observations collected by other researchers during the 30-month study.
- A 915 MHz Radar Wind Profiler and a Radio Acoustic Sounding System (RASS) were used to collect upper level wind and temperature measurements. The Wind Profiler was initially located at Dirty Socks then moved to the Mill Site during the 4th quarter of 2001.
- To help verify the location of dust source areas, time-lapse video cameras were

installed at three sites to continuously record dust events during daylight hours and three observers mapped dust source areas and plumes during the storms on regular workdays. In addition, the erosion boundaries of some source areas were mapped by field personnel using Global Positioning Systems (GPS) after selected storms.

A large Geographic Information System (GIS) database was constructed using observations collected during the Dust ID Program. Using the GIS database, the District prepared maps displaying hourly sand movement, winds, visually observed plume and source area boundaries, and PM_{10} concentrations for dust events at Owens Lake during the study period. Ono, *et al*., 2003a and the Dust ID Program Protocol provide further detail (GBUAPCD, 2000).

6.3 DISPERSION MODELING TECHNIQUES

The CALPUFF modeling system was selected for assessing source contributions to measured PM_{10} concentrations and for the development of control strategies for the RSIP. CALPUFF is the USEPA recommended modeling approach for long-range transport studies. Recently the modeling system is also being applied to near-field dispersion problems where the three-dimensional qualities of the wind field are important and for stagnation episodes when pollutants remain within the modeling domain over periods of several hours or more. Observations during the Dust ID Program indicate dust events on Owens Lake are sometimes influenced by complex wind patterns, with North Sand Sheet plumes traveling in different directions from South Sand Sheet plumes. Preparation of the meteorological data, application of CALPUFF, and the estimation of PM_{10} emission fluxes are discussed in the remainder of this section.

6.3.1 Preparation of the Meteorological Data

Three-dimensional wind fields for CALPUFF were constructed from surface and upper air observations using the CALMET meteorological preprocessor program. CALMET combines surface observations, upper air observations, terrain elevations, and land use data into the format required by CALPUFF. The wind fields are adjusted objectively using combinations of both surface and upper air observations according to options specified by the user. In addition to specifying the three-dimensional wind field, CALMET also estimates the boundary layer parameters used to characterize diffusion and deposition by the CALPUFF dispersion model. CALMET was applied following the general procedures discussed below.

The model domain shown in Figure 6.1 is a 34 km-by-48 km area centered on Owens Lake. The extent of the model domain was selected to include the “data rich” study area, terrain features that act to channel winds, and receptor areas of interest. The meteorological grid used a one-kilometer horizontal mesh size with ten vertical levels ranging geometrically from the surface to four kilometers aloft. The one-kilometer mesh size and orientation of the meteorological grid matched the spacing used for the Sensit™ network.

The majority of the necessary surface meteorological data came from the District's network of ten-meter towers shown in Figure 4.2. In addition to the District's network, surface data from other field programs on the lake were used when available. CALMET requires cloud cover and ceiling height observations. Cloud cover is a variable used to estimate the surface energy fluxes and, along with ceiling height, is used to calculate the Pasquill stability class. Hourly cloud cover and ceiling height observations were collected from the surrounding surface airways observations at China Lake and Bishop Airport. During dust event conditions, the sensitivity of the CALPUFF modeling system to these variables is reduced, as the stability class becomes neutral under moderate to high winds. Algorithms within the modeling system that depend on the surface energy fluxes are dominated by the momentum flux and tend to be insensitive to cloud cover under high winds. For these reasons, the absence of local cloud cover and ceiling height measurements are not expected to significantly affect the results of the modeling study.

Upper air data for construction of the wind fields and estimation of mixing heights with CALMET included local hourly observations from the Dirty Socks/Mill Site Wind Profiler and regional twice-daily upper air soundings from Desert Rock Airport (Mercury, Nevada) and China Lake Naval Air Station. The Wind Profiler with RASS samples wind and temperature from 100 m up to 5000 m with a vertical resolution as low as 60 m depending on the clutter environment, atmospheric scattering conditions, and pulse length. Experience at Owens Lake indicates wind data recovery is sometimes poor above 1000 m due to the dry environment and the RASS data are limited to the lower levels during windy conditions.

When operating, hourly wind and temperature data from the Wind Profiler and RASS were used for as many vertical levels as possible. In order to extend the profiles aloft near the profiler, 500-mb data were stripped from the China Lake (Desert Rock when missing) sounding. Since the soundings are generally taken at 12-hour intervals, it was necessary to interpolate between the observation times to match the hourly Wind Profiler data. During extended periods when the Wind Profiler was not operating, soundings from China Lake and Desert Rock were used to construct the data set. The China Lake and Desert Rock soundings were primarily used for upper level temperature lapse rates. Except near the Wind Profiler location winds aloft were based on extrapolation of the surface wind measurements.

The methods used to extrapolate surface winds aloft influenced predicted upper level winds in portions of the domain away from the Wind Profiler and during periods when the Wind Profiler data were unavailable. Data from the Wind Profiler at Dirty Socks and at the Mill Site during dust events indicate little or no wind speed shear in the vertical and no consistent turning of the wind direction with height. The default algorithms employed by CALMET based on Similarity Theory often adjust the winds in the wrong direction and predict too much increase in wind speed with height even for very small surface roughness lengths. As an alternative, wind speeds aloft were adjusted using the empirical results suggested by the Wind Profiler. No wind direction turning with height was assumed except near the Wind Profiler site where the actual data were used when available.

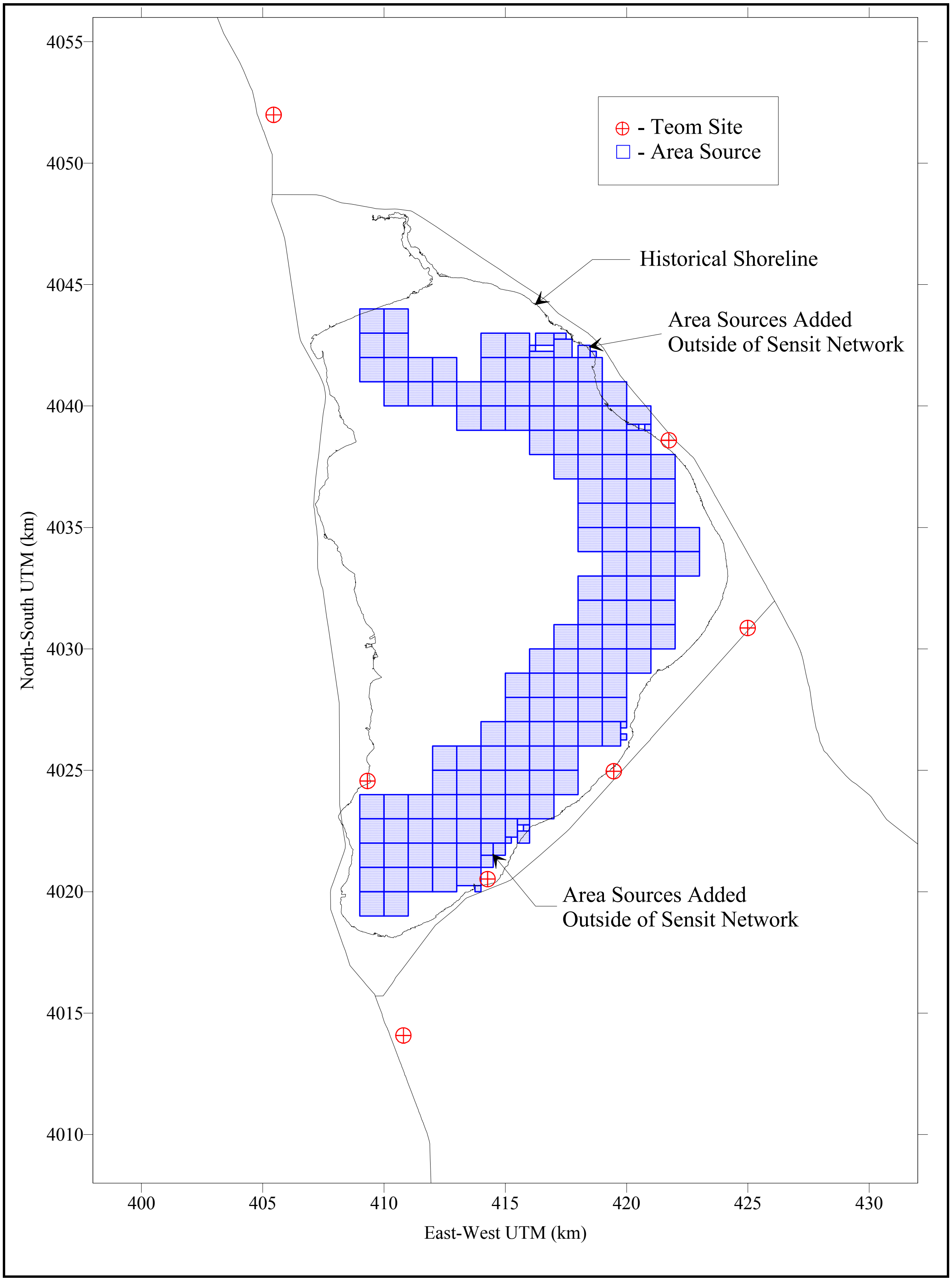

Figure 6.1. – Model domain and area source configuration.

6.3.2 PM_{10} Emissions and Source Characterization

This section provides an overview of the methods discussed in Section 4.3, which were used to calculate hourly wind-blown PM_{10} emissions for dispersion model simulations at Owens Lake. PM_{10} emission fluxes from source areas at Owens Lake were calculated using hourly sand flux activity data and the following simple relationship:

Equation 6.1

$$PM_{10} = K_f \times q$$

where:

PM_{10} = the vertical PM_{10} emission flux ($g/cm^2/hr$)
K_f = an empirical constant (referred to as the K-factor)
q = the horizontal sand flux measured at 15 cm above the surface ($g/cm^2/hr$)

Field data at Owens Lake suggest the horizontal sand flux at a single measurement height is proportional to the total horizontal sand flux and is a good indicator of wind erosion processes generating PM_{10} emissions. The total horizontal sand flux is a strong function of both the surface shear stress and the properties of the soil at the time of the event. Rather than trying to predict the horizontal sand flux using wind speed and properties of the soil, sand movement on the lake was parameterized using the network of paired Sensit™ and CSC measurements.

Experimental and theoretical evidence suggest K_f is a property associated with the binding energies of the soil and is relatively independent of the surface stress induced by wind speed. At the highest wind speeds, K_f appeared to increase in some areas and seasons, but not enough to warrant modeling K_f as a function of wind speed. On Owens Lake this empirical constant appears to vary by season and by source areas grouped together by surface soil textures. During the Dust ID Program K_f was inferred using the modeling practices described by Ono, *et al*., 2003a. Simulations were performed using a first guess for K_f and the measured hourly sand flux data. Following a screening analysis, predictions were then compared to observed PM_{10} concentrations and a revised estimate for K_f was obtained. The screening criteria were selected to ensure a strong relationship existed between the source area and the downwind PM_{10} monitoring site. The source-to-receptor relationship was established using wind direction data, sand flux data for the source area, the maps generated from visual observations, and source contribution matrices based on the modeling. The screened estimates for K_f were then grouped together by event and source area.

Table 4.2 displays an interpretation of the K_f data inferred from modeling. These estimates were obtained from storm ensemble averages grouped by period of the year and source area. Four source areas, as shown in Figure 4.2, were selected based on common surface soil properties. These source areas are identified as; the Keeler dunes, North Area, Central Area and the South Area. The periods were subjectively based on inspection of the variability exhibited in time series plots and considerations of the precipitation-temperature history thought to affect surface crusting, surface erodibility, and the formation of efflorescent salts on the surface. Seventy-five-percentile storm averages are shown in Table 4.2. These estimates are somewhat higher than the median or average storm averages and were selected based on consideration of model performance for the larger dust events. Further discussion on model performance is provided later in this chapter.

The CALPUFF simulations at Owens Lake are sensitive to source configuration. Emissions were varied hourly according to Equation 6.1 and supplied to CALPUFF for each Sensit™ location as area sources. CALPUFF contains an area source algorithm that provides numerically precise calculations within and near the area source location. The area source configuration is shown in Figure 6.1. In most instances, the Sensit™ measurement was assumed to be representative of the horizontal sand flux for the one square kilometer surrounding the measurement location. In some instances, these one square kilometer areas contain wetlands where little or no significant PM_{10} emissions are expected. For these areas, the sources were divided into smaller pieces and the wetlands removed. In addition, for two regions shown in Figure 6.1 the source areas were extended to neighboring cells without Sensit™ measurements. These areas were included in the simulations based on visual inspection and GPS mapping of the erosive areas following dust events.

PM_{10} emissions from non-Owens Lake PM_{10} sources are not included in the model as individual sources. Due to the difficult nature of accurately estimating emissions from these much smaller, sporadic sources, non-Owens Lake PM_{10} emissions are included as contributors to the background concentration. This also includes contributions from upwind sources that may be outside the modeling domain.

6.3.3 CALPUFF Options and Application

The application of CALPUFF involves the selection of options controlling dispersion. Although the simulations are primarily driven by the meteorological data, emission fluxes, and source characterization, the dispersion options also affect predicted PM_{10} concentrations. In this study, the following options were selected for the simulations:

- Dispersion according to the conventional Pasquill-Gifford dispersion curves. Sensitivity tests were also performed by applying CALPUFF with dispersion routines based on Similarity Theory and estimated surface energy fluxes. These tests did not indicate improved performance over the Pasquill-Gifford based simulations.
- Near-field puffs modeled as Gaussian puffs, not elongated “slugs.” CALPUFF contains a computation intensive “slug” algorithm for improved representation of plumes when wind directions vary rapidly in time. This option was tested, but did not significantly influence the CALPUFF predictions.
- Consideration of dry deposition and depletion of mass from the plume. The particle size data used were based on measurements taken within dust plumes on Owens Lake as discussed below.

Dry deposition and subsequent depletion of mass from the dust plumes depend on the particle size distribution. Several field studies have collected particle size distributions within dust plumes at Owens Lake. Based on results from Niemeyer, the CALPUFF simulations assumed a lognormal distribution with a geometric mean diameter of 3.5 µm and a geometric standard deviation of 2.2 (Niemeyer, *et al.*, 1999). These variables are based on the average of 13 dust plume size distributions reported by Niemeyer between June 1995 and March 1996 at different locations within the airshed.

6.3.4 Background PM_{10} Concentrations

The dispersion model simulations include only wind-blown emissions from the source areas with sand flux activity shown in Figure 6.1. During high wind events other local and regional sources of fugitive dust also contribute to the PM_{10} concentrations observed at the monitoring locations. A constant background concentration of 20 µg/m^3 was added to all predictions to account for background sources. The constant background was calculated from the average of the lowest observed PM_{10} concentrations for each dust event when 24-hour PM_{10} concentrations at any of the sites were above 150 µg/m^3. To avoid including impacts from lake bed dust source areas in the background estimate, the procedures used a simple wind direction filter to exclude hours when the lake bed may have directly influenced observed PM_{10} concentrations. Such hours were removed and daily average background concentrations were recalculated based on the remaining data (Ono, 2002).

6.4 MODEL PERFORMANCE EVALUATION

The District conducted a model performance evaluation comparing CALPUFF predictions to hourly and 24-hour observations at the PM_{10} monitoring sites in Figure 4.2. Statistical measures and diagnostic graphics were used to examine the modeling procedures' ability to explain the frequency distribution, spatial variability, and temporal variability of observed concentrations. The performance evaluation used data from the first 24 months of the 30-month Dust ID Program. During the last six months of the study, several key sand flux monitoring sites were removed to allow construction of dust control measures.

Figures 6.2 to 6.5 compare model predictions to observed hourly PM_{10} concentrations at four monitoring sites during a large dust event on May 2-3, 2001. This event produced some of the highest PM_{10} concentrations observed during the Dust ID Program with hourly concentrations exceeding 10,000 µg/m^3 at several monitoring sites. In general, the model simulations driven by the hourly sand flux measurements explain the temporal patterns observed at the monitoring sites. Note hourly concentrations vary by over three orders of magnitude at the monitoring sites affected during this event. For this episode, the highest hourly concentrations are under predicted at Dirty Socks and Keeler, the peak predictions match observations at Shell Cut and Flat Rock, and some of the concentrations between 500 to 5,000 µg/m^3 are over predicted at Dirty Socks.

Figure 6.6 shows a contour plot of hourly PM_{10} predictions for hour 0800-0900 on May 2, 2001. Observed PM_{10} concentrations are also posted on this figure. The concentration patterns depict sharp gradients in the crosswind direction for this hour characterized by northwesterly winds near Keeler to north-northeasterly flow near Dirty Socks. PM_{10} concentrations at Keeler for such storms are often difficult to predict because Keeler is typically on the edge of the plume and small differences in plume trajectory can significantly affect predicted concentrations. Although Lone Pine shows a high hourly PM_{10} concentration due to dust north of the monitoring site, it is a small value compared to PM_{10} concentrations from Owens Lake bed dust.

Figure 6.7 displays a scatter diagram of predicted versus observed 24-hour PM_{10} concentrations for all days from January 2000 through December 2001. In this example, CALPUFF simulations were based on the 75-percentile storm average K_f constants shown Table 4.2. The predictions are well correlated with the observations; based on over 3,500 samples the linear and geometric correlation coefficients are 0.86 and 0.75, respectively. The slopes of linear and power law fits to the data shown in Figure 6.7 are 0.80 and 0.89, respectively, reflecting a tendency towards over prediction as PM_{10} concentrations decrease. The scatter in the model simulations also increases as concentrations decline because many of these days are not wind events, the background is more variable than the constant 20 $\mu g/m^3$ used for the simulations, or the sand flux network spacing does not capture some of the smaller events. Some of the outliers in Figure 6.7 are caused by inaccurate plume trajectories and the correlation coefficients are lower at the more distant monitoring sites. In several instances relatively high PM_{10} observations can be attributed to emissions from off-lake sources not included in the CALPUFF simulations.

Figure 6.8 presents a quantile-quantile (Q-Q) plot for the same 24-hour PM_{10} data set. Q-Q plots test the ability of the modeling procedures to represent the frequency distribution of the observations. Q-Q plots are simple ranked pairings of predicted and observed concentrations, such that any quantile of the predicted concentration is plotted against the same ranking of the observed concentration.

Model performance was evaluated using 50-percentile, 75-percentile and 95-percentile storm-average K_f to determine which set provided the best model performance for the highest PM_{10} dust events. The 50-percentile K-factors tended to under predict the high PM_{10} events and the 95-percentile tended to over predict at most of the sites. Simulations based on the 75-percentile storm average K_f tend to over predict 24-hour concentrations in the range of 50 to 500 $\mu g/m^3$ at several of the monitoring sites, but are less biased towards the higher end of the frequency distribution. The bias toward over prediction of the more modest dust events is most pronounced at Keeler and Flat Rock. The frequency distribution at Dirty Socks is well represented throughout the range of observed 24-hour PM_{10} concentrations. The model performance results comparing the 50, 75 and 95-percentile K-factor sets are discussed in the Owens Valley PM_{10} Modeling Report (MFG, 2003). Based on the model performance for the high PM_{10} days, the 75-percentile K-factor set shown in Table 4.2 was selected for the attainment demonstration modeling.

6.5 CONTROL STRATEGY ANALYSIS

As discussed in Chapter 5, three Dust Control Measures (DCMs) were found to be effective and are considered as Best Available Control Measures for PM_{10} at Owens Lake; shallow flooding, managed vegetation and gravel. Shallow flooding and managed vegetation are credited with 99 percent PM_{10} emission reductions in areas where these measures are fully implemented. Gravel is assumed to have 100 percent control

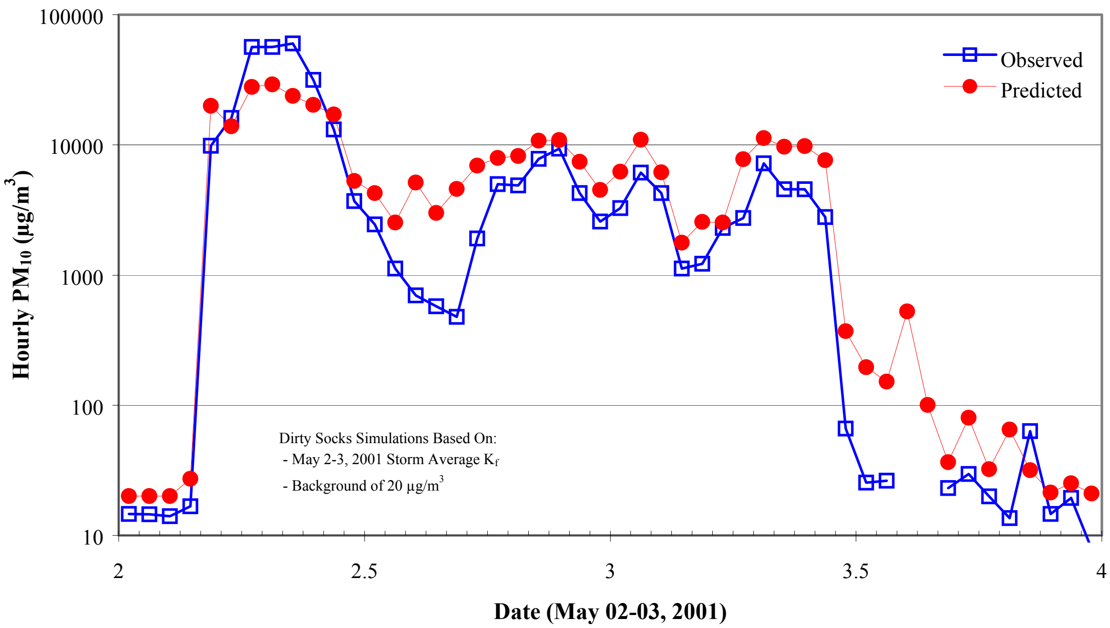

Figure 6.2 – Predicted vs. observed hourly PM_{10} concentrations at Dirty Socks monitoring site, May 2-3, 2001.

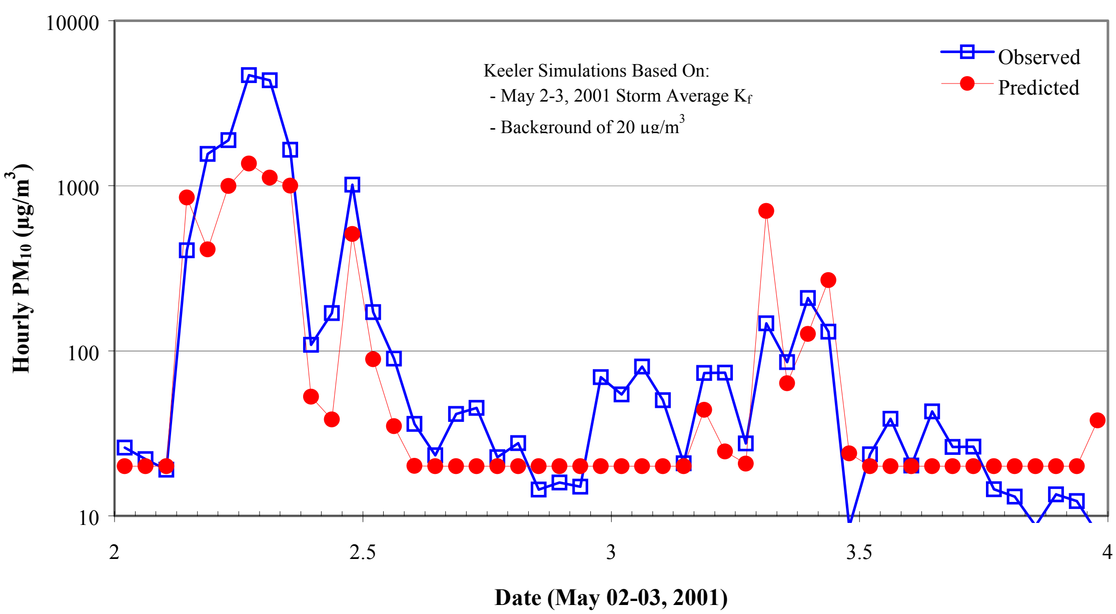

Figure 6.3 – Predicted vs. observed hourly PM_{10} concentrations at Keeler monitoring site, May 2-3, 2001.

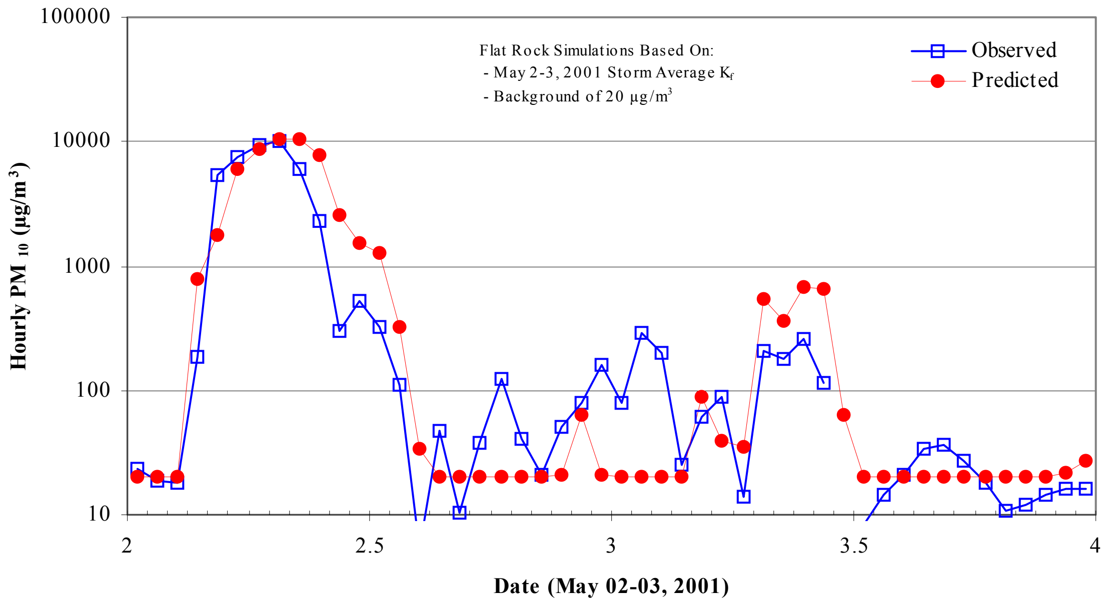

Figure 6.4 Predicted vs. observed hourly PM_{10} concentrations at Flat Rock monitoring site, May 2-3, 2001.

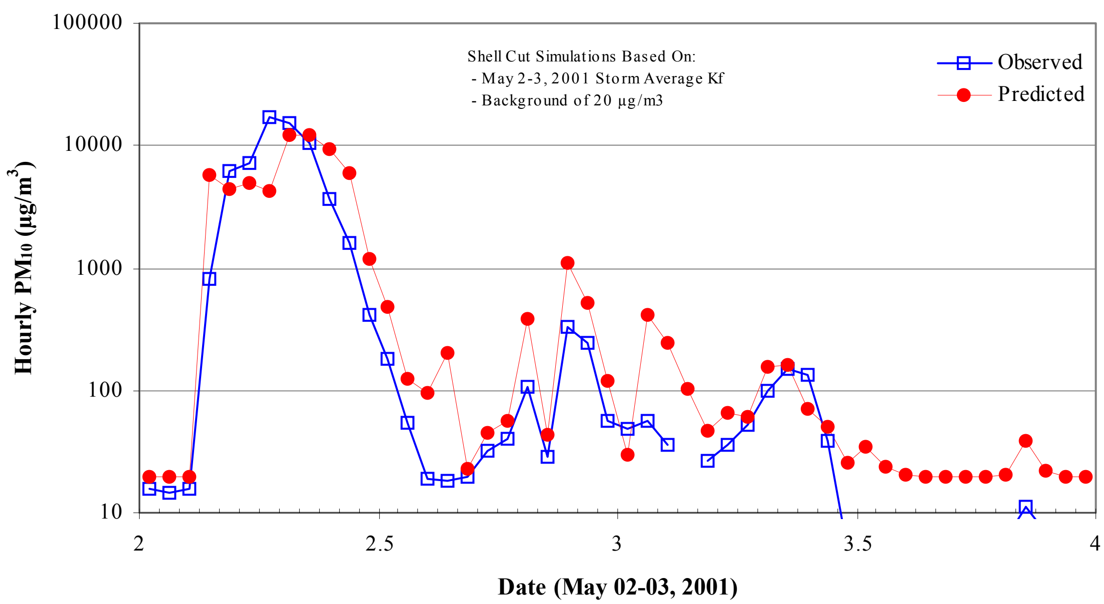

Figure 6.5 Predicted vs. observed hourly PM_{10} concentrations at Shell Cut monitoring site, May 2-3, 2001.

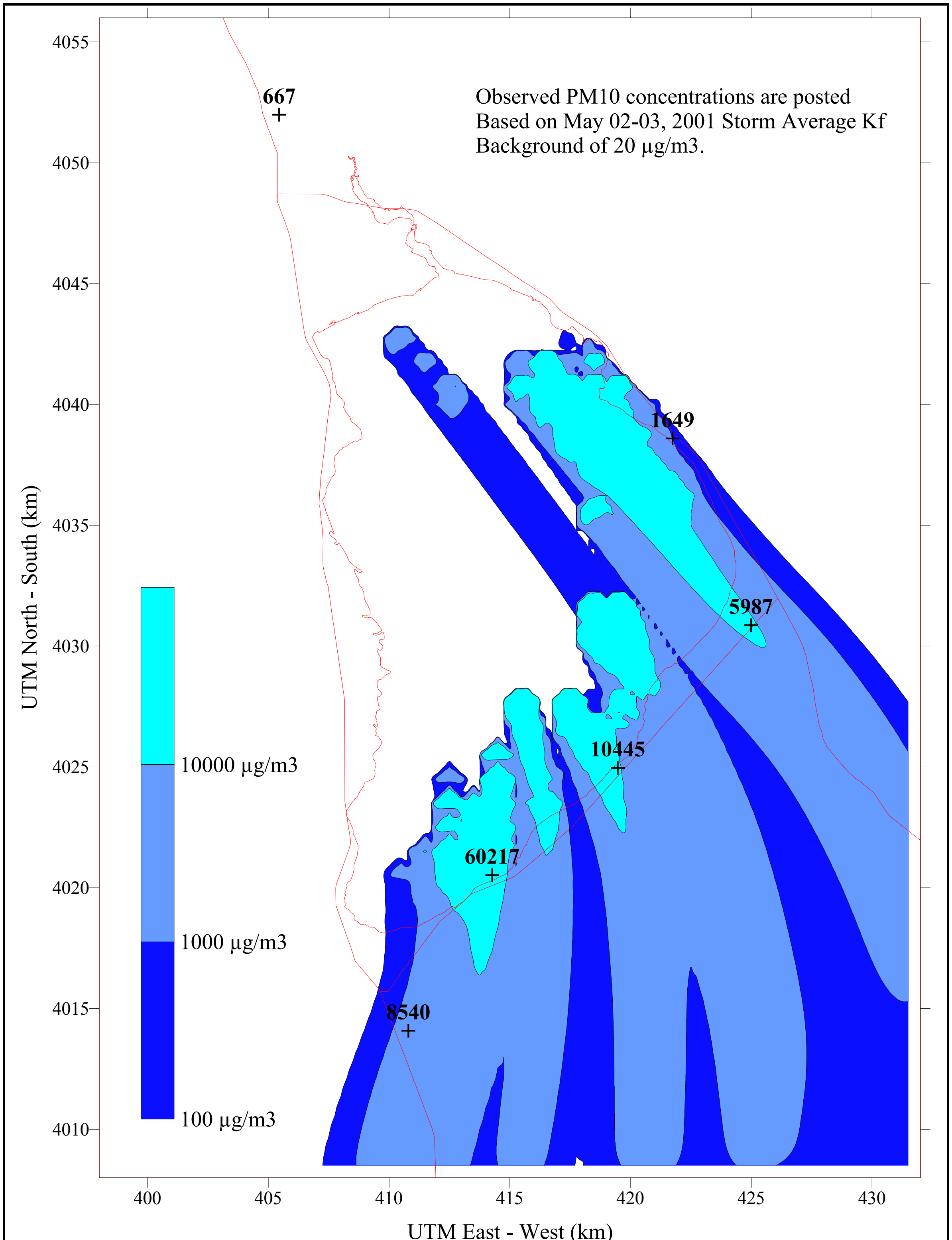

Figure 6.6 – CALPUFF predicted PM_{10} Concentrations (µg/m^3), May 2, 2001, Hour 0800-0900.

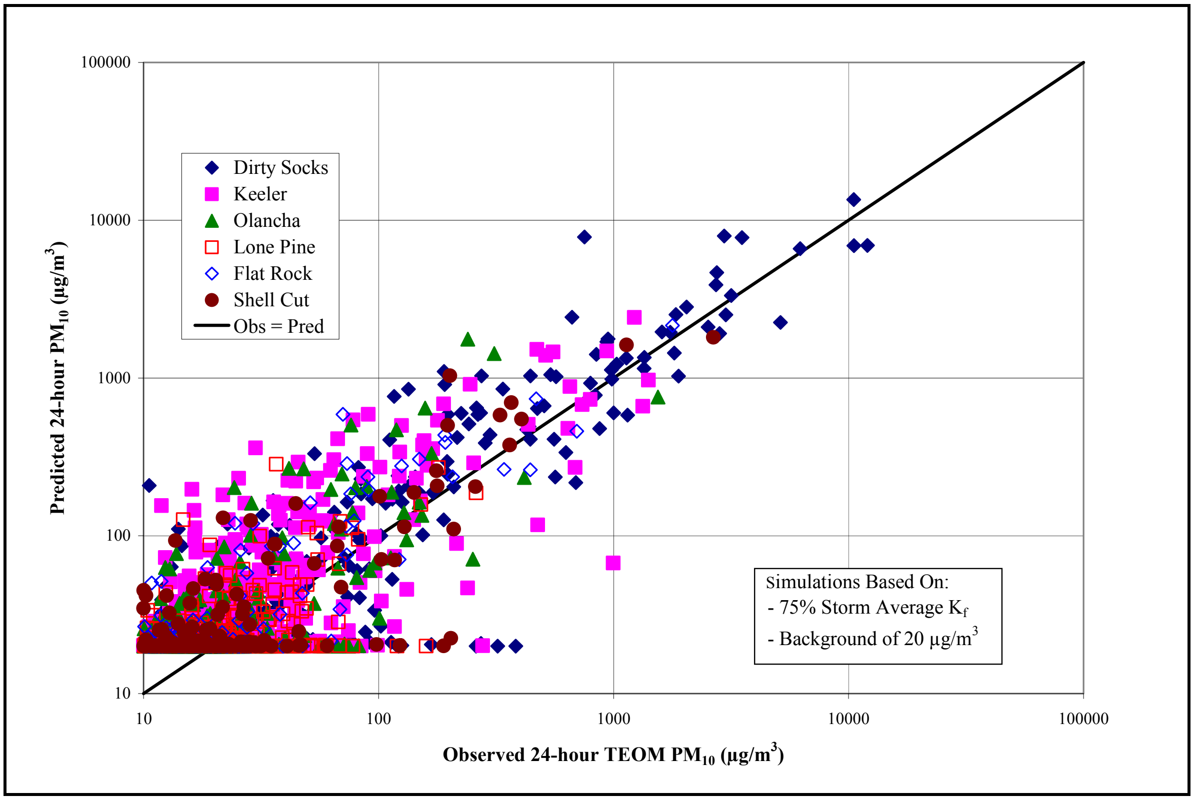

Figure 6.7 – Scatter plot of observed vs. Predicted 24-hour PM_{10} concentrations, January 2000 – December 2001.

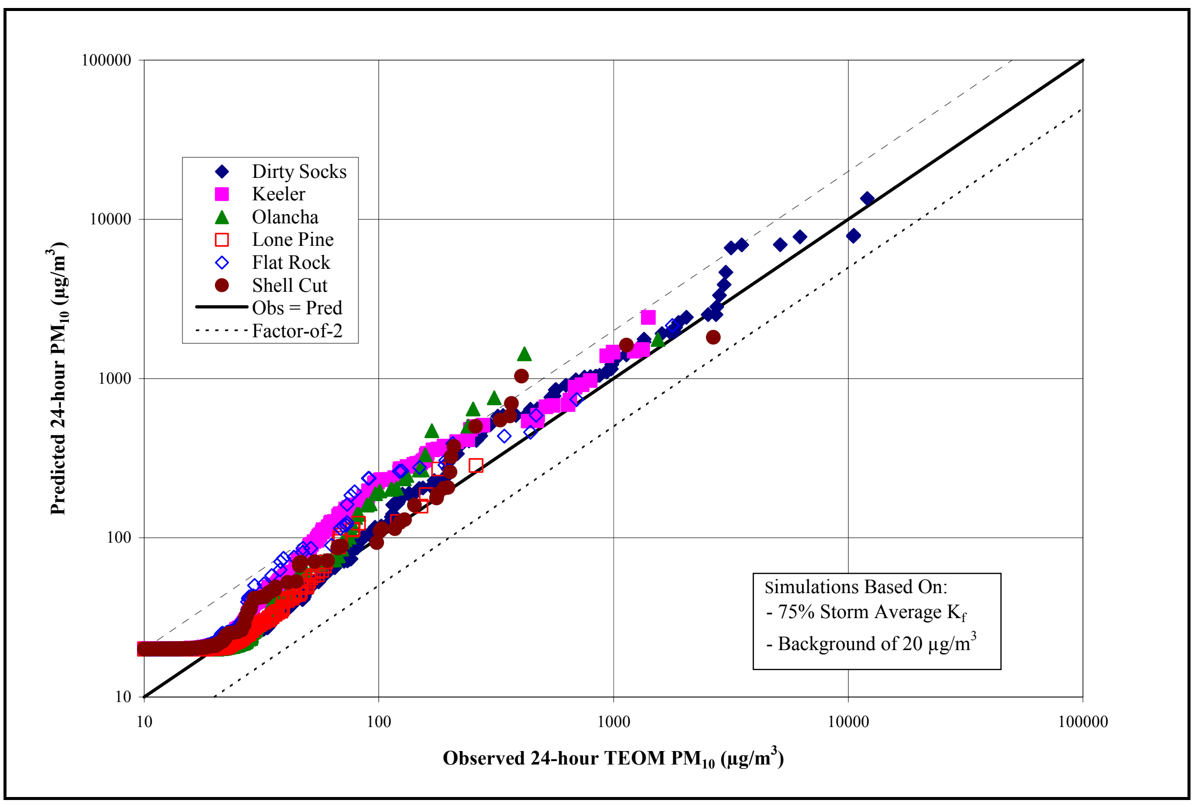

Figure 6.8 – Q-Q plot of Observed vs. Predicted 24-hour PM_{10} concentrations January 2000-December 2001.

efficiency, but there are currently no plans to use gravel for a large-scale dust control measure. The City of Los Angeles started large-scale implementation of shallow flooding in 2001, followed by managed vegetation in 2002. These measures are scheduled for implementation on at least 43 square kilometers by the end of 2003.

The CALPUFF modeling techniques were applied to assess the control strategy proposed for this RSIP. This control strategy analysis evaluated the currently implemented DCMs, plus controls on any additional areas that may be required to attain the NAAQS. PM_{10} emissions were simulated using the hourly sand flux data collected during January 2000 through June 2002 based on the area source configuration shown in Figure 6.1. The characterization of uncontrolled emissions followed the general techniques used to assess model performance except estimated emissions from the Keeler dunes were removed and the simulation period was six months longer. The District believes emissions from the Keeler dunes and several other off-lake sources are caused by deposition from the lake bed sources. Once the lake bed emissions are controlled, source material will be winnowed from these areas and PM_{10} emissions are expected to be similar to other relatively non-emissive regions surrounding Owens Lake. See Section 7.3.3 for additional discussion of sand dune emissions.

Attainment of the NAAQS was assessed using concentration predictions at the historic shoreline in addition to receptors at the monitoring stations. Previous model runs with gridded receptors showed that modeled PM_{10} concentrations decrease at points farther from the shoreline and that the maximum impacts, apart from those on the lake bed, can be expected near the historic shoreline (see Figure 6.6). Since attainment must be demonstrated at points off the lake bed, the shoreline receptors represent the sites of the highest expected impacts. Attainment is achieved when the third highest 24-hour PM_{10} concentration in two years at each receptor is less than 150 $\mu g/m^3$ and when annual concentrations are less than 50 $\mu g/m^3$. A ring of more than 460 receptors was placed at the historic shoreline (approximately at the 3600 ft elevation) of Owens Lake. The receptor spacing along the historic shoreline ranged from 100 to 200 m. Note in Figures 6.10 and 6.11 that in several areas, receptors are adjacent to the PM_{10} source areas.

Control strategy evaluations can involve many repetitive dispersion model simulations where different options for control are tested. These simulations can be computer resource intensive, and with 135 source areas, 460 receptors and hundreds of dust-event days, there were many possible combinations of different source areas to control. In order to streamline the process, CALPUFF was first applied to simulate the uncontrolled case. Daily source contribution matrices were then developed for each source-receptor combination resulting in a database with over nine million daily contributions. The database was sorted by PM_{10} concentration at each receptor and the source contributions from the top ten PM_{10} predictions at each receptor imported into a spreadsheet. Within the spreadsheet, District air quality planners could reduce the contribution from each source area by 99 percent to simulate the application of a DCM. This allowed the testing of different control options without re-running the dispersion model.

Once a strategy was developed using the spreadsheet, CALPUFF was applied to the controlled area sources to check whether a new day, not in the original top ten, produced

PM_{10} concentrations above the NAAQS. It was found that the dust source areas that caused the ten highest values at each receptor were the same areas that caused all the modeled exceedances during the 30-month period. For the simulations at Owens Lake, source contributions based on the top ten days at each receptor were sufficient to test attainment of the NAAQS.

Figure 6.9 shows a control strategy developed from CALPUFF simulations using the 75-percentile storm-average K-factors in Table 4.2. DCM areas currently constructed are shown and additional areas needing control are separated into three categories: extreme, lone, and pack violators. An area identified as a “lone” violator is predicted to exceed the 24-hour PM_{10} NAAQS at the shoreline in the absence of any other lake bed source. Such areas are identified first since these sources will always need to be controlled to attain the NAAQS. “Pack” violators are area sources that in combination with other lake bed emissions significantly contribute to high-predicted concentrations above the NAAQS. These candidates for control were selected using a strategy that minimized the total number of such area sources and considered their proximity to existing DCM areas. The “extreme” violators are a special case. Emissions from these sources are predicted to violate the NAAQS even after implementation of shallow flooding or managed vegetation using 99 percent control efficiencies. The historical shoreline passes through or borders these source areas.

The predicted third highest 24-hour PM_{10} concentrations at receptors located along the shoreline are shown in Figure 6.10 based on a simulation of the control strategy in Figure 6.9. The simulations predict the control strategy would attain the 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$. The highest 24-hour average PM_{10} concentration for the 30-month modeling period is 149.9 $\mu g/m^3$ at a receptor north of Keeler.

Figure 6.11 shows the predicted annual PM_{10} concentration at the shoreline receptors. All the receptors are in compliance with the annual PM_{10} NAAQS of 50 $\mu g/m^3$. The highest annual average PM_{10} concentration for the 30-month modeling period is 27 $\mu g/m^3$ at a receptor near Dirty Socks.

The boundaries for source areas suggested by the dispersion model simulations were refined using the dust source mapping and GPS surveying database and additional on-lake inspections. The refined dust control area footprint is discussed in Chapter 7.

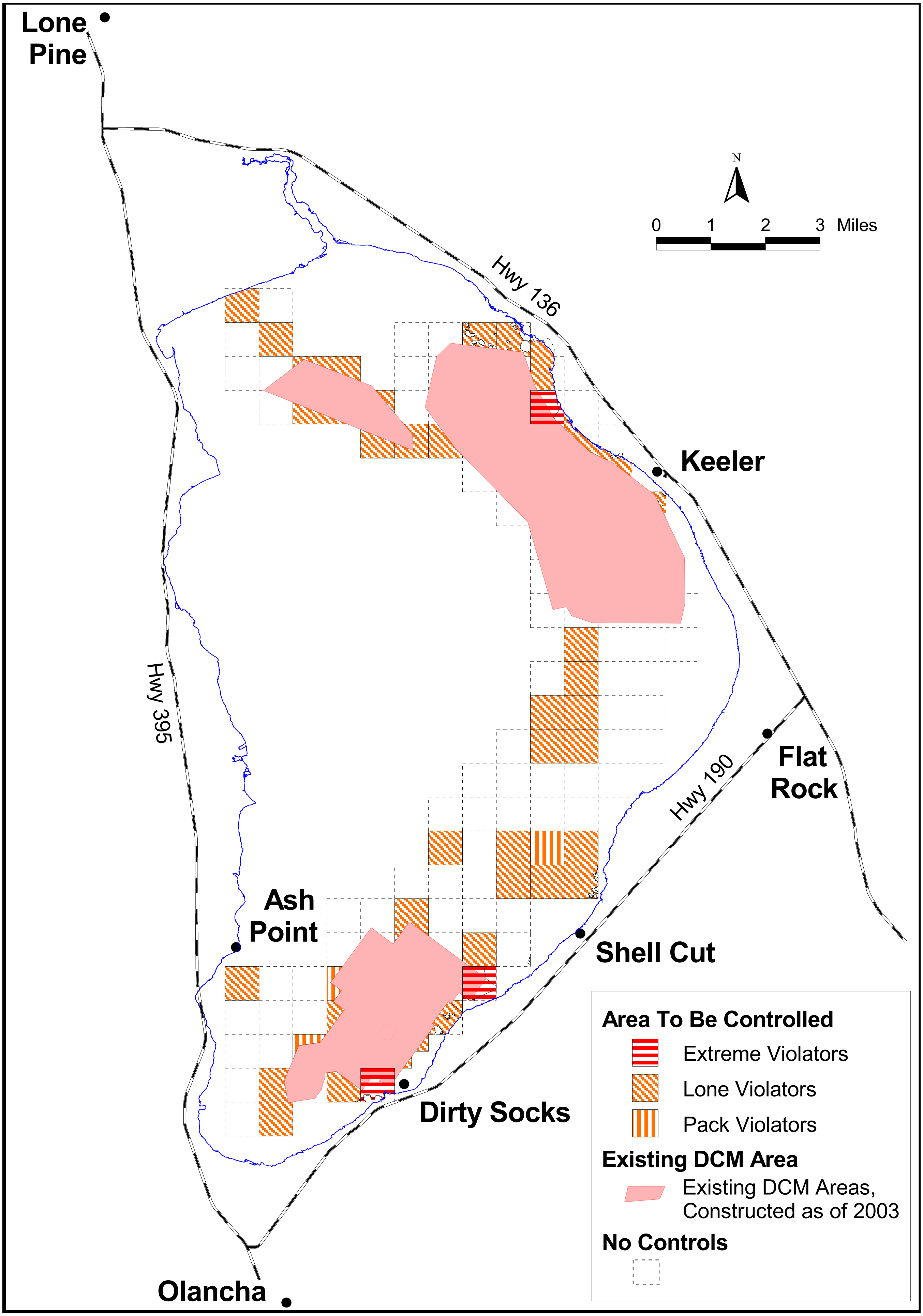

Figure 6.9 - Modeled control area based on 75% Storm Average K-factor.

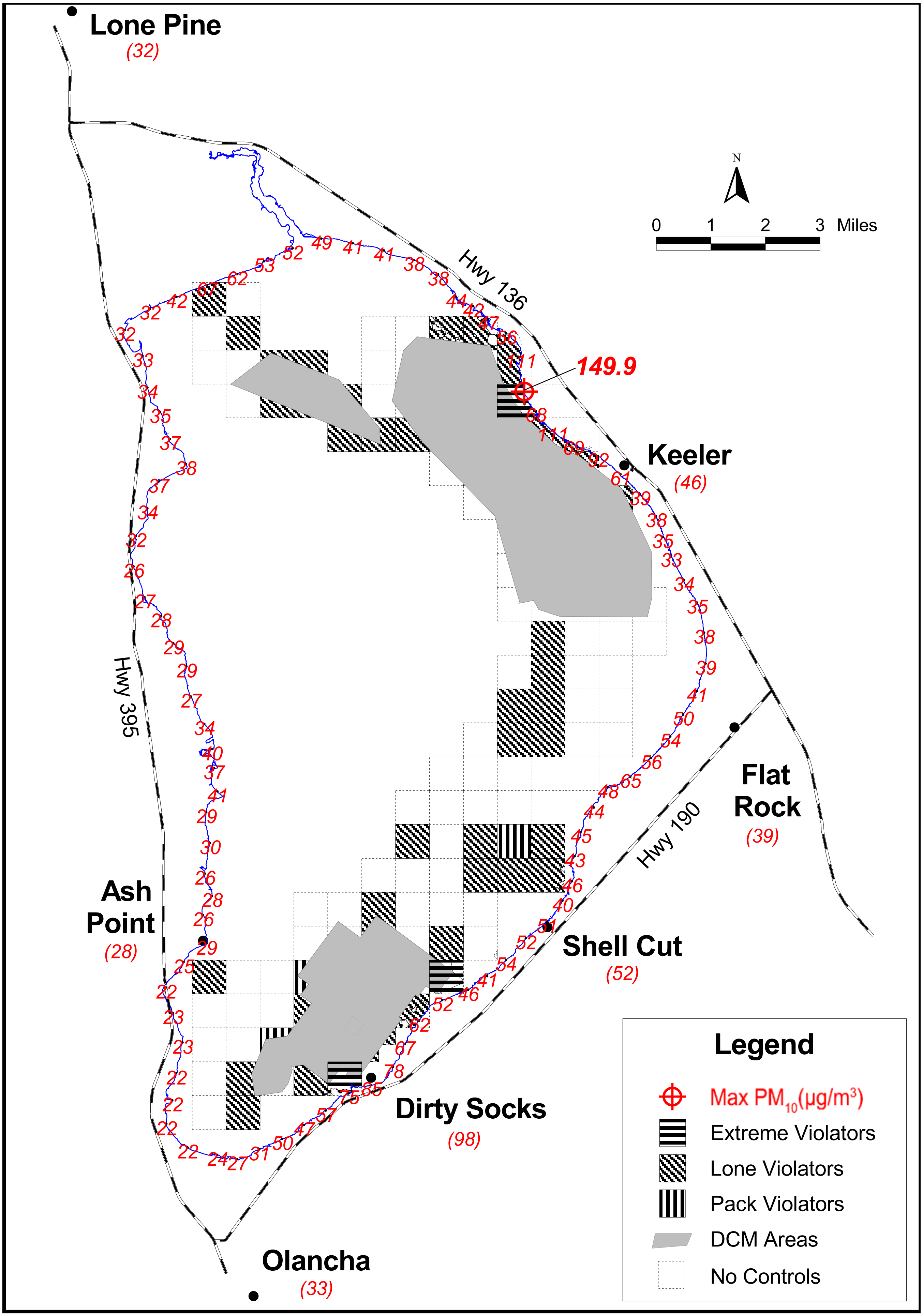

Figure 6.10 - Predicted third highest 24-hour PM_{10} concentrations (μg/m^3) at shoreline receptors after controls.

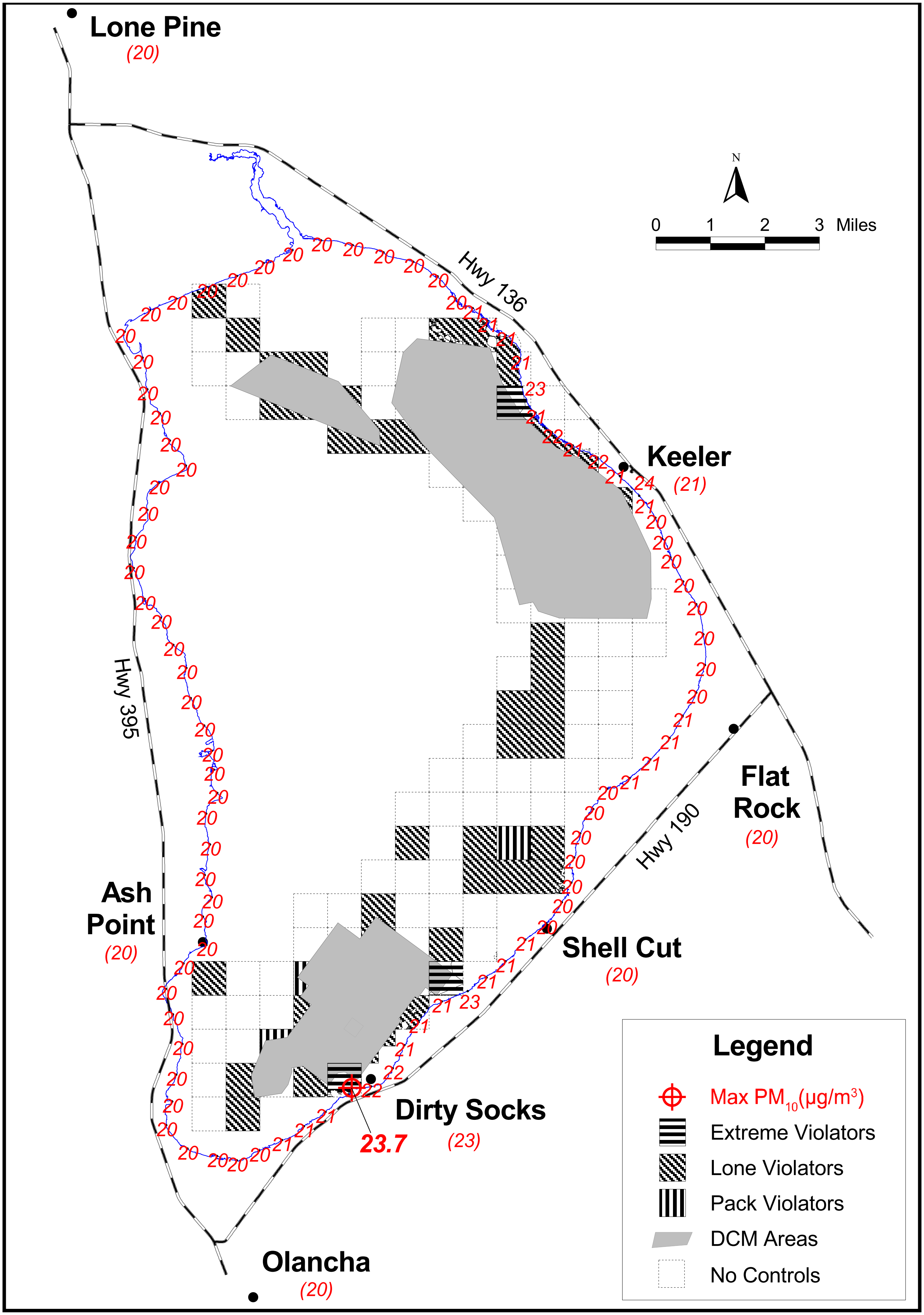

Figure 6.11 - Annual average PM_{10}(μg/m^3) concentrations at shoreline receptors after controls.

6.6 REFERENCES

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CHAPTER 7

Control Strategy and Attainment Demonstration

FIGURES

TABLES

7

Control Strategy and Attainment Demonstration

7.1 INTRODUCTION

This control strategy sets forth an overall plan to control dust from Owens Lake by combining the three Best Available Control Measure (BACM) methods discussed in Chapter 5: shallow flooding, managed vegetation and gravel. These three BACM control methods are the “most stringent measures” (MSM) that have been applied in a USEPA-approved SIP and are feasible for implementation at Owens Lake. The application of MSM is required by the USEPA for nonattainment areas to be granted a five-year attainment deadline extension in accordance with the requirements of the federal Clean Air Act. With this extension, PM_{10} NAAQS attainment is required by December 31, 2006. For the purpose of regulatory requirements, these three BACM are also considered MSM for the Owens Valley Planning Area, and will be referred to as BACM in this chapter.

The following control strategy builds on the 16.5 square miles of BACM dust controls that will be implemented by the LADWP by December 31, 2003 on the lake bed under the requirements of the 1998 SIP. Through the use of air quality modeling (Chapter 6), the District has determined that this control strategy has a high likelihood of bringing the planning area into attainment by December 31, 2006.

7.2 PROPOSED CONTROL STRATEGY

Under the control strategy, the LADWP is required to control any lake bed areas that are determined to cause or contribute to an exceedance of the NAAQS at the historic shoreline. Fugitive dust control measures will be implemented in three increments to bring the area into attainment by the statutory deadline and to ensure maintenance of the NAAQS after 2006.

- Increment 1 dust control areas (DCAs) include those areas that were controlled to comply with the 1998 SIP requirements and are anticipated to be in full compliance by December 31, 2003.

- Increment 2 DCAs include those areas that were determined to cause or contribute to a NAAQS exceedance based on dust events prior to July 1, 2002. Increment 2 areas must be controlled by December 31, 2006.

- Increment 3 DCAs are those areas that are determined to cause or contribute to a NAAQS exceedance based on dust events after July 1, 2002. Increment 3 DCAs will be controlled within 2½ or 4 years of the determination by the Air Pollution Control

Officer (APCO) that an area causes or contributes to a NAAQS exceedance, depending on the BACM control method. If BACM by shallow flooding is implemented, the DCA will be in compliance within 2½ years, otherwise the DCA will be in compliance within 4 years.

The following discussion provides an overview for phasing in control measures in Increment 1, 2 and 3 DCAs. It also discusses potential control measure changes that may include refining the performance standards of existing BACM, making the transition from one BACM method to another or researching new BACM control methods for application at Owens Lake. The regulatory requirements that will be adopted to support this control strategy are included in Chapter 8.

7.2.1 Increment 1 - Dust Control Areas Selected for the 1998 SIP

Under the 1998 SIP, the LADWP is required to control 16.5 square miles of potential dust source areas on the lake bed through the implementation of BACM as discussed in Chapter 5. The LADWP will be in full compliance with this requirement by December 31, 2003. Figure 7.1 shows the footprint of the existing constructed DCAs, which cover about 19.5 square miles. BACM was implemented in these areas in 3 phases starting in January 2001. Phase 1 included 13.8 square miles of shallow flood in the North Area. Phases 2 and 3 were a combination of shallow flood and managed vegetation in the South and Central Areas on 5.7 square miles. Parts of the managed vegetation area may not be in compliance by the end of 2003 if the saltgrass does not grow fast enough to meet the 50 percent cover requirement. For the model attainment demonstration, it is assumed that the entire 19.5 square miles of constructed DCA will be in full compliance with the BACM requirements by December 31, 2006.

7.2.2 Increment 2 - Dust Control Areas Selected for the 2003 RSIP

Increment 2 requires the implementation of BACM in areas that were determined to cause or contribute to a NAAQS exceedance based on dust events that occurred between January 2000 and July 1, 2002. Increment 2 DCAs were selected using information collected through the Dust ID Program during that period. The Dust ID method of modeling emissions from dust source areas to identify DCAs is discussed in Chapters 4 and 6, and Appendix B (See also Ono, *et al*., 2003a, 2003b; Richmond, *et al*., 2003; Gillette, *et al*., 2003; GBUAPCD, 2000).

Figure 6.9 shows the footprint of the Increment 2 DCAs that were identified through the modeling analysis based on information from the sand flux network. Because the sand flux network indicates the amount of erosion at points separated by one kilometer, better resolution of source area boundaries was obtained from ground-based mapping using a Global Positioning System (GPS). Whenever possible, the edges of the Increment 2 source area boundaries were based on surface inspections of erosion areas and mapping using a GPS. Figure 7.1 shows the refined boundaries of the areas requiring controls in addition to the 19.5 square miles of existing constructed DCAs. The additional areas requiring dust control total approximately 10.3 square miles.

Together, the footprint of Increment 1 and 2 DCAs includes 29.8 sq. miles (19,072 acres). The control strategy will require the application of BACM and full compliance in these DCAs by December 31, 2006.

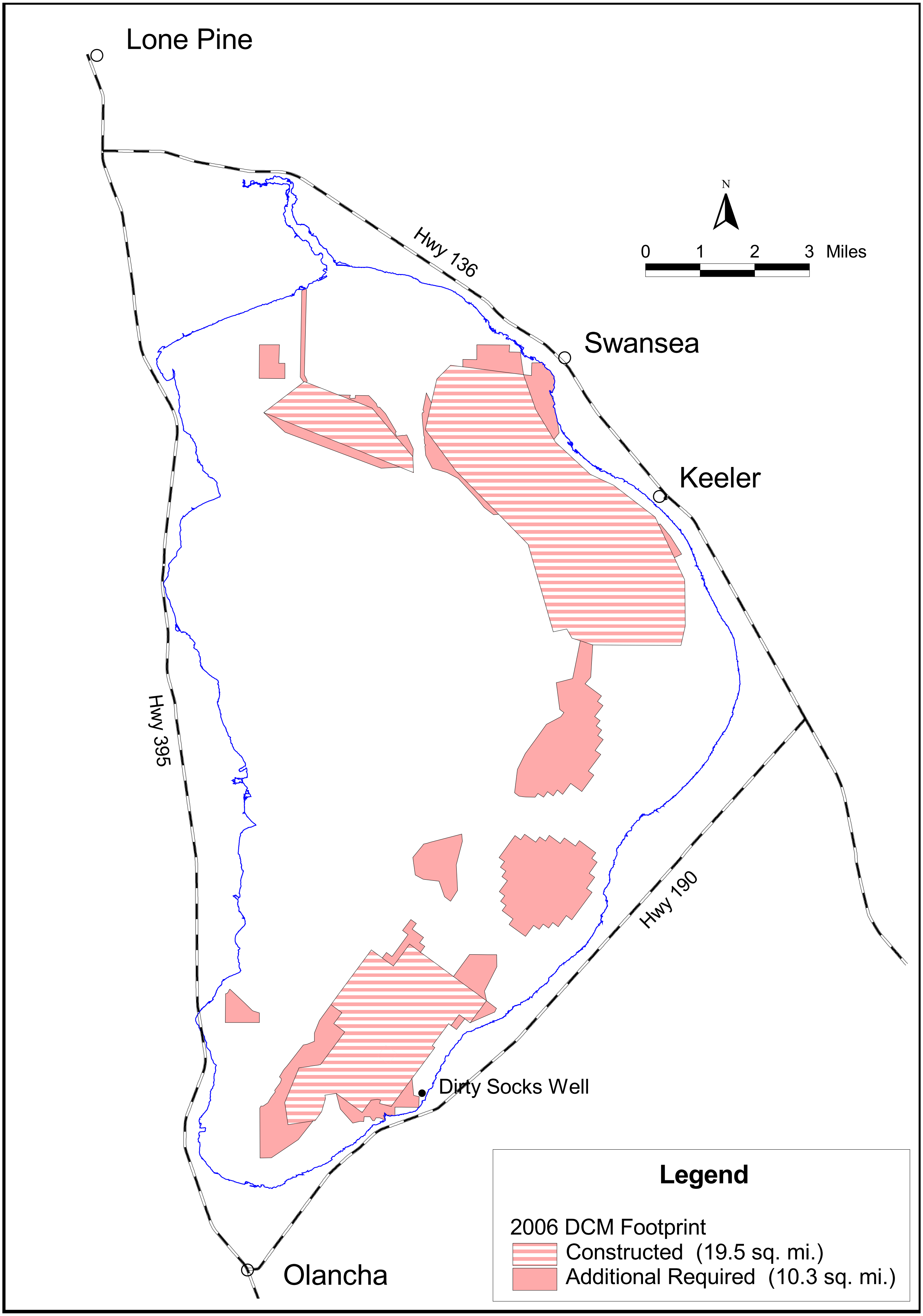

Figure 7.1 - 2006 dust control measure footprint map.

7.2.3 Increment 3 – Dust Control Areas Identified for Supplemental Control Requirements

Increment 3 requires the implementation of BACM in areas that are determined to cause or contribute to a NAAQS exceedance based on dust events that occur after July 1, 2002. Increment 3 DCAs will be identified from information collected through the Dust ID Program and evaluated following the procedures in the Supplemental Control Requirements found in Chapter 8. These events may be caused by:

- New source areas on the lake bed that were not identified prior to July 1, 2002, or
- Areas that are located within DCAs that are in compliance with BACM, but residual emissions are still found to cause or contribute to an exceedance of the NAAQS.

If there are new dust source areas, they will be identified from information collected through the Dust ID Program. If the new source areas are determined by the APCO to cause or contribute to any monitored or modeled PM_{10} NAAQS exceedance at the historic shoreline, those areas will be identified for BACM implementation.

Some significant dust source areas may be located within DCAs that are in compliance with the BACM requirements, but due to extreme emissive conditions, may still cause or contribute to a monitored or modeled exceedance of the NAAQS at the historic shoreline. In this case, the BACM controls may be adjusted to provide more uniform and/or denser application of the dust controls in the DCA. For example, shallow flooding may be applied to a small-scale hotspot area that is located within a DCA that may be in compliance with BACM over a larger scale area. Increased application of water or saltgrass, or the application of gravel, may be necessary to control emissions from these extreme areas.

The air quality model identified three potential extreme violator cells that could continue to cause violations after the application of BACM reduced emissions by 99 percent. These areas are included in the Increment 1 and 2 DCAs with the additional requirement to achieve 99.5 to 99.75 percent control efficiency. An adjustment to BACM may be needed in these areas if they are identified as Increment 3 DCAs after the application of the initial BACM controls.

7.2.4 Changes to BACM

BACM may be replaced with other BACM to help reduce implementation and operating costs. In addition, control measure research may identify new BACM control methods that are as effective as the three BACM methods discussed in Chapter 5. If approved by the APCO, a BACM control method, such as shallow flooding, could be changed in a DCA to managed vegetation. Any transitions of BACM methods in DCAs, however, must be done in a manner that will not cause or contribute to a modeled or monitored PM_{10} NAAQS exceedance at the historic shoreline.

Testing of any new or modified BACM on the DCAs must be approved by the APCO. New methods may include different control method approaches or may be adjustments to the saltgrass, shallow flood or gravel BACM methods. Any control measure research will be performed under a project test protocol approved by the APCO. Any new BACM must show that they will not cause PM_{10} NAAQS violations at the historic shoreline. The regulatory requirements to adjust, change or research new BACM are discussed in detail in Chapter 8.

7.3 MODELED ATTAINMENT DEMONSTRATION

7.3.1 Modeling Increment 1 and 2 DCAs

As discussed in Chapter 6, an air quality modeling analysis was performed to show that controlling the Increment 1 and 2 areas (Figure 6.9) would reduce PM_{10} emissions from lake bed source areas to a level that will likely bring the areas around Owens Lake into compliance with the PM_{10} NAAQS. Air quality modeling utilized the CALPUFF modeling system. CALPUFF is the USEPA recommended modeling approach for long-range transport studies and for near-field modeling of complex wind fields. Only lake bed source areas were included in the attainment demonstration modeling. Off-lake dune areas were excluded and are discussed later in this section.

The application of BACM in the model reduced uncontrolled source area emissions by 99 percent for shallow flooding and managed vegetation. Figure 6.10 shows the third-high modeled PM_{10} concentrations for the 30-month modeling period after the implementation of BACM on the 29.8 sq. mile Increment 1 and 2 DCAs. After implementing BACM, ambient PM_{10} levels are expected to be below the 24-hour PM_{10} NAAQS of 150 $\mu g/m^3$ at all receptors, and Figure 6.11 shows that the annual PM_{10} NAAQS of 50 $\mu g/m^3$ will be attained at all receptors. The highest impact from lake bed sources is expected to occur in areas near extreme violator cells (Figure 6.9).

7.3.2 Increment 2 Extreme Violators

The initial modeling analysis revealed three grid cells (7222, 7611 and 7677 shown in Figure 4.2) that due to extremely high emission rates and their closeness to shoreline receptors still caused violations after reducing emissions by 99 percent (Figures 6.10). All three extreme violator cells are partially within the existing DCMs, and touch or extend beyond the shoreline contour. The attainment demonstration modeling was initially done by assigning the PM_{10} emission rate calculated from the sand catch to the entire cell, including that area above the shoreline, and assigning 99 percent control to the portion of the cell within the DCM. This 99 percent control level was used to allow flexibility in implementing any of the three BACM measures; gravel, managed vegetation or shallow flooding. To demonstrate attainment with the NAAQS at 150 $\mu g/m^3$, the District determined that a control efficiency of 99.5 percent is needed for cells 7222 and 7611, and 99.75 percent control is needed for cell 7677.

Gravel and 100 percent coverage with shallow flooding can achieve 100 percent control and could be applied to meet the control level requirement in the extreme areas. Currently, it is not possible to predict the additional vegetation cover or shallow flooding cover, above the 50 percent and 75 percent BACM requirements, respectively, that would be needed to achieve better than 99 percent control. If enhanced vegetation cover or enhanced shallow flooding is selected as the control option, the sites will be monitored using sand flux and/or PM_{10} monitors to determine if the control measure has achieved the necessary control effectiveness. Therefore, all extreme cells will require gravel cover or “enhanced BACM,” which is defined as:

1) 100 percent coverage with shallow flooding, or
2) Enhanced managed vegetation with greater than 50 percent cover with sand flux and/or PM_{10} monitoring to determine if the daily minimum PM_{10} control efficiency of 99.5 percent or 99.75 percent control effectiveness has been achieved, or

3) Enhanced shallow flood with greater than 75 percent water cover with sand flux and/or PM_{10} monitoring to determine if the daily minimum PM_{10} control efficiency of 99.5 percent or 99.75 percent control effectiveness has been achieved, or
4) Modified BACM that has been tested on that extreme cell in accordance with Board Order #031113-01, Exhibit 3 and is demonstrated to achieve a daily minimum control efficiency or 99.5 percent or 99.75 percent control effectiveness in the extreme area where modified BACM is applied.

7.3.3 Keeler and Olancha Dune Areas

The Keeler dunes are located northwest of the town of Keeler above the 3600-foot elevation that defines the historic Owens Lake shoreline (Figure 4.13). The total area covered by deep sand is about 0.64 square kilometers (157 acres). The Keeler dunes were primarily formed from sand moving off the lake bed after it became dry. Figure 7.2 shows a sand dune about one-half mile north of Keeler in the Keeler dune field that has formed across the abandoned State highway. Sensits and sand catchers have been installed in the Keeler dunes so that their PM_{10} emissions could be modeled, and not attributed to lake bed sources. Currently, there is circumstantial evidence that the shallow flooding DCM in Zone 2 may have arrested the growth of the Keeler dunes. The District has observed that old landmarks, desert pavement surfaces and dead upland shrubs that were buried under the dunes have become recently exposed; this may be due to the lack of new sand from the lake bed that replenished the dunes before dust controls were implemented.

The other major dune area, the Olancha dunes, is shown in Figure 4.13 and were not monitored or included in the model. The attainment demonstration modeling assumes that once the lake bed is controlled, the dunes will stop growing and the fine particles will be winnowed out. No additional controls are proposed for the off-lake dunes at this time.

7.4 IMPLEMENTATION MILESTONES AND EMISSION REDUCTIONS

Table 7.1 summarizes the Increment 1 and 2 DCMs for the RSIP control strategy. Increment 1 DCAs were implemented in 3 phases, with the final phase expected to be in compliance by December 31, 2003. Increment 2 DCAs are anticipated to be in compliance by December 31, 2006. Emission reductions associated with each Phase or Increment can be estimated from the annual emissions for the period from July 2000 through June 2001. During this period the Dust ID sand flux network was complete and the Phase 1 DCM was not in place. Annual uncontrolled lake bed emissions are estimated at 76,191 tons per year. This represents an uncontrolled emissions baseline that can be used to track emission reductions from the Increment 1 and 2 DCAs. Since Increment 3 DCAs were not significantly active during this period and the areas have not been identified, they are not included in this emissions reduction tracking.

Table 7.1 Control strategy milestones and estimated PM_{10} emission reductions.			
Milestone	PM_{10} Emissions (Tons/Year)	PM_{10} Reductions (Tons/Year)	Date
Pre-Project Emissions	76,191*	—	
Increment 1			
Phase 1 - 10 sq. mi.	52,716	23,475	12/31/2001 (complete)
Phase 2 - 3.5 sq. mi.	51,958	24,233	12/31/2002 (complete)
Phase 3 - 3 sq. mi.	40,416	35,775	12/31/2003
Increment 2			
13.3 sq. mi.	762	75,429	12/31/2006
Increment 3			
Additional areas as needed for SCR			Within 2½ or 4 years of determination by APCO
* Total lake bed emissions from Table 4.1.			

7.5 REASONABLE FURTHER PROGRESS

Under CAAA Section 189(c), the demonstration of attainment SIP is required to include quantitative milestones that are to be achieved every three years until the area is redesignated attainment. These milestones must demonstrate reasonable further progress toward attainment of the NAAQS by the attainment date. Table 7.1 includes the milestones that will be tracked to achieve the emission reduction trend as shown in Figure 7.3 to demonstrate reasonable further progress toward attaining the NAAQS. As required by Section 189(c)(2) of the CAAA, the District shall submit to the USEPA, no later than 90 days after the date of each milestone, a demonstration that each milestone has been met.

7.6 CONTINGENCY MEASURES – SUPPLEMENTAL CONTROLS

The federal Clean Air Act Amendments of 1990 require a description of contingency measures (CAAA Section 172(c)(9)). The contingency measures are control measures that will be implemented in case the RSIP control strategy fails to bring the planning area into attainment or the Reasonable Further Progress Milestones cannot be met. The District commits to make a determination at least once a year, starting in 2004, as to whether there have been any monitored or modeled exceedances of the PM_{10} NAAQS from areas on the Owens Lake bed that have not been included in the RSIP control strategy in the Increment 1 and 2 DCAs. The procedure for this determination is described in the Board Order (Section 8.2) Any new areas that are determined to cause or contribute to a NAAQS exceedance based on dust events that occur after July 1, 2002, will be included in Increment 3 Supplemental Control Requirements (SCR) as discussed in Section 7.2.3.

If the APCO determines that there are new areas that cause or contribute to a NAAQS exceedance, controls will automatically be required. This contingency measure is automatic; it is incorporated into this RSIP and Order and requires no further action by the District or any other agency. The determination by the APCO as to whether additional areas have caused or

Figure 7.2 – Sand dune that formed across the old State highway to Death Valley.

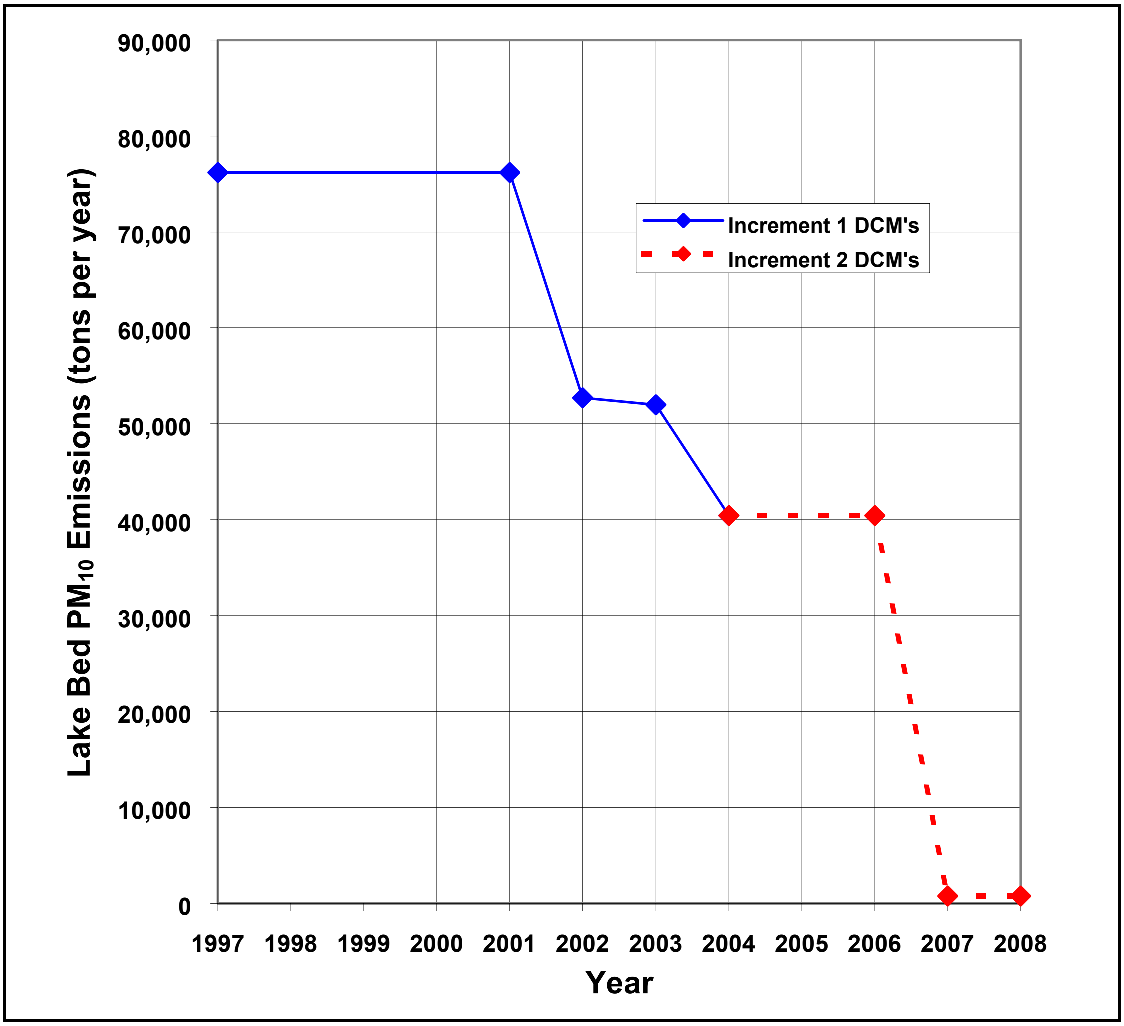

Figure 7.3 – Projected Reasonable Further Progress trend for the annual lake bed emissions resulting from implementation of the SIP control strategy.

contributed to a PM_{10} exceedance is not an order under Cal. Health & Safety Code §42316, and therefore cannot be appealed to the California Air Resources Board (CARB).

If the requirements of this RSIP, which are an order under Cal. Health & Safety Code §42316, are appealed to the CARB, and the implementation of this order is stayed, as provided by Cal. Health & Safety Code §42316, Board Order # 981116-01 from the 1998 SIP will remain in effect. Board Order #981116-01 requires the City to continue to implement control measures on an additional two (2) square miles of the Owens Lake bed every year until the District determines that the NAAQS have been attained. If the CARB subsequently approves this RSIP, the City must comply with all requirements of this RSIP within one year of the CARB's approval. If the CARB rejects this RSIP, the City must continue to implement all control measures required under Board Order #981116-01 until the NAAQS are attained or the 1998 SIP is revised and ultimately approved by the CARB.

7.7 IMPLEMENTATION MONITORING AND ENFORCEMENT

Adoption of the control strategy set forth in this RSIP will require the District to maintain programs to monitor and enforce the proper and timely execution of mandatory implementation and air quality attainment provisions of this RSIP. With regard to air quality, the District will continue to monitor PM_{10} levels in the OVPA in order to determine:

- whether reasonable further progress is being made, as predicted by the estimated annual emission trend (Figure 7.3),
- whether the control strategy achieves progress toward attainment of the 24-hour PM_{10} NAAQS by December 31, 2006 and
- whether the PM_{10} NAAQS has been attained in the OVPA.

With regard to control measure deployment, the District will monitor and enforce the City of Los Angeles' implementation of the control strategy, to ensure that the control measures are properly and timely installed, and that their installation and operation conform to the design and performance requirements of this RSIP. Failure to meet any of the mandatory project implementation milestones set forth in Section 7.5 is subject to enforcement as authorized by Cal. Health & Safety Code §42316. All necessary environmental analysis, leases, easements and permit approvals required to implement the control measures are the sole responsibility of the LADWP. For enforcement purposes, each Phase or Increment is a separate milestone.

With regard to the impact of the control measures on the environment, the District adopted Mitigation Monitoring and Reporting Programs at the time it certified the Final Environmental Impact Reports for the 1997 SIP (GBUAPCD, 1997) and the 2003 RSIP (GBUAPCD, 2003c). As required by the Mitigation and Monitoring Programs, the District will enforce the mitigation measures, as well as elements of the project description, that are intended to avoid or lessen adverse environmental impacts of implementing the control strategy. Some of those mitigation measures and project elements require long-term monitoring of certain environmental effects of implementing the control strategy, and taking appropriate responsive action when the monitoring discloses an adverse environmental effect.

7.8 COST AND EMPLOYMENT

The cost of implementing PM_{10} control measures on the Owens Lake bed depends on the total acreage and types of DCMs used by the City of Los Angeles to meet the NAAQS. Based on actual costs for DCMs in place and the LADWP's estimates for work to be constructed, LADWP staff estimates that the total cost of planning, design, permitting and construction for the 29.8 square miles of DCM that must be in place by the end of 2006 will be about $415 million (Harasick, 2003, pers. comm.).

Operation and maintenance costs were estimated in the 1998 SIP to be approximately $27 million per year. These costs include the annual cost of water for the project. The O & M estimates make the conservative assumption that the City replaces the water supplied from the Los Angeles Aqueduct with purchases from the Metropolitan Water District at a cost of $450 per acre-foot. (Actual replacement costs may vary.)

By annualizing the estimated construction cost over 25 years ($415 million total cost, interest = 5%, n = 25 years—annualized construction cost = $29 million) and using the above annual operation and maintenance cost estimate ($27 million), the 25-year total annualized cost for Owens Lake dust controls is $56 million per year. In Chapter 4 the estimated annual primary and secondary emissions from the Owens Lake bed were calculated to be about 80,400 tons (Table 4.3). This gives a cost per ton of PM_{10} controlled of $697. The South Coast 1987 Air Quality Management Plan set the PM_{10} BACM cost-feasibility limit at $5,300 per ton. Actual control costs required by the South Coast Plan range from $170 per ton for agricultural sources to $630 per ton for unpaved roads.

The District estimates that the Proposed Project will create as many as 200 jobs during construction and approximately 50 long-term jobs for operation and maintenance of the control measures.

7.9 REDUCING IMPLEMENTATION COSTS

During the course of implementing the control strategy, experience and ongoing studies will provide knowledge that will help reduce the cost of implementing the control measures. Experience will be gained while constructing and operating the control measures on the playa that will help to reduce costs associated with the control measures. The proposed allowance for adjustments to BACM, discussed in Section 7.2.4 and in Chapter 8, provides both the time and the control measure flexibility to ensure that dust control measure efficiencies will improve as they are implemented.

7.10 EXISTING RULES AND REGULATIONS TO CONTROL PM_{10}

The focus of the discussion in the RSIP control strategy is on controls for Owens Lake, which is regulated under Cal. Health & Safety Code §42316. This is discussed in more detail in Chapter 8. Other sources that contribute PM_{10}, such as industrial sources, forest management burning (see section 4.2.4 regarding prescribed burning), and fugitive dust are covered under existing District Rules. These rules are listed in Table 7.2 for sources other than Owens Lake. Methods to control fugitive dust and to comply with these rules are included in permits to operate for industrial sources.

Table 7.2 Existing rules and regulations to control sources of PM_{10}.

District Rule	Description
209-A	Requires new sources with PM_{10} emissions greater than 250 pounds per day of total suspended particulates, or facility modifications of greater than 15 tons per year of PM_{10} to apply Best Available Control Technology to control PM emissions.
400	Limits visible emissions from any source, except those exempted under Rule 405, to less than Ringelmann 1 or 20% opacity.
401	Requires that reasonable precautions be taken to prevent visible particulate emissions from crossing the property boundary.
402	Prohibits sources of air pollution from causing a nuisance to the public or endangering public health and safety.
408	Limits agricultural burning operations to designated burn days and requires a burn permit.
409	Limits range improvement burning to designated burn days and requires that a burn plan be approved by the APCO.
410	Limits forest management burning to designated burn days and requires that a burn plan be approved by the APCO.
411	Limits wildland management burning to designated burn days and requires that a burn plan be approved by the APCO.
Reg. XII	Requires that federal actions and federally funded transportation-related projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards.
Reg. XIII	Requires that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards.

7.10.1 Fugitive Dust Regulations

It should be noted that contractors involved in the implementation of the RSIP control strategy are subject to these District rules and regulations regarding fugitive dust control. District Rules 400 and 401 limit visible emissions and require that reasonable precautions be taken to control fugitive dust from activities such as road building, grading, gravel mining and hauling. Mitigation measures to control fugitive dust associated with the implementation of DCMs on the lake bed are discussed in the Final Environmental Impact Report for the 2003 RSIP (GBUAPCDc, 2003). Any gravel mining and hauling activities will be required to apply for an Authority to Construct and obtain a Permit to Operate from the District. The permit will include Conditions of Approval.

7.10.2 Transportation Conformity

Transportation conformity requirements, contained in District Regulation XII, require that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards. The emissions inventory shows very low PM_{10} emissions from mobile sources and transportation-related activities in the OVPA. However, fugitive dust from construction-related activities in areas along Highway 395 has caused significant dust events in the planning area. Several events in May 2001 appear to have caused or significantly contributed to PM_{10} NAAQS violations and District-called health advisories for Lone Pine. During one such event, wind-blown dust from an area north of Lone Pine generated large dust clouds that obscured driver visibility and impacted the community of Lone Pine. Figure 7.4 shows photos of dust from the areas north of Lone Pine along Highway 395 on May 2, 2001. According to Caltrans officials, highway construction in this area was completed in 1999, but restoration of vegetation in the areas was unsuccessful (Hallenbeck, 2001, pers. comm.).

For transportation conformity purposes, PM_{10} emissions from construction-related activities will be quantified as required by District Rule 1231(e) for any new highway construction projects in the OVPA, and will be subject to District Rules 400 and 401 for controlling fugitive dust.

7.10.3 General Conformity

General conformity requirements contained in District Regulation XIII require that federal actions and federally funded projects conform to SIP rules and that they do not interfere with efforts to attain federal air quality standards. Prescribed burning activities will take place on federal lands for forest management and private lands for rangeland improvement and wildland management purposes. The burn season for prescribed burning is expected to last about 60 days per year and daily average emissions will be about 42.2 tons per day (Section 4.2.4). The inclusion of these emission estimates for prescribed burning is for SIP conformity purposes to ensure that prescribed burning activities in the nonattainment area have been considered in the Owens Valley PM_{10} SIP attainment demonstration.

Prescribed burning activities are not expected to take place on windy days when Owens Lake dust storms occur. Predicted high wind days are avoided when performing prescription burns for fire safety reasons. In addition, prescribed burning is regulated through District Rules 410 and 411 for wildland and forest management burning. These rules require that a burn plan be submitted to the Air Pollution Control Officer prior to conducting the burn, and that burning will not cause or contribute to violations of the air quality standards. For General Conformity purposes, all prescribed burns in the OVPA will be limited to 42.2 tons of PM_{10} per day. If prescribed burning is done in a manner that complies with District rules, burning activities are not expected to interfere with attainment of the PM_{10} NAAQS in the Owens Valley.

7.11 AUTHORITY AND RESOURCES

Under Cal. Health & Safety Code §42316, the District is authorized to require the City of Los Angeles to undertake reasonable control measures to mitigate the air quality impacts of its activities in the production, diversion, storage or conveyance of water. The control measures may only be required on the basis of substantial evidence that the water production, diversion, storage or conveyance of water by the City causes or contributes to violations of state or federal ambient air quality standards. In addition, the control measures shall not affect the right of the City to produce, divert, store or convey water.

The District has found that the control measures required under this plan are reasonable and that, on the basis of substantial evidence, the City's water production, diversion, storage or conveyance causes or contributes to violations of state or federal ambient air quality standards in the Owens Valley Planning Area. Also, the District has concluded that the required control measures do not affect the right of the City to produce, divert, store or convey water. On this basis, the District has authority, directly under state law, to issue orders directing the City of Los Angeles to implement the control strategy described in this plan. Those orders are enforceable by the District under state law. Cal. Health & Safety Code §42402 provides that the District may impose civil penalties of up to $10,000 per day against a person who violates

Figure 7.4 – Photos of wind-blown dust from highway construction-related activity north of Lone Pine on May 2, 2001.

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any order issued pursuant to Cal. Health & Safety Code §42316. In addition, under Cal. Health & Safety Code §41513, the District is empowered to bring a judicial action in the name of the People of the State of California to enjoin any violation of its orders.

The District has the financial resources to enforce compliance with the plan. Cal. Health & Safety Code §42316 authorizes the District annually to assess and collect reasonable fees from the City of Los Angeles. The amount of the fees is set by the District, based on an estimate of the actual costs to the District of its activities associated with the development of air pollution control measures and related air quality analysis, pertaining to the air quality impacts of the City's production, diversion, storage or conveyance of water. Enforcement of the requirements of this plan is a cost that the District may properly include in the estimate it develops as a basis to impose its annual fees under Cal. Health & Safety Code §42316. Such enforcement costs include salaries and expenses of appropriate personnel and attorneys' fees incurred in enforcing provisions of the plan and defending the District in challenges to the plan and its adoption. As with the control measures, the District's orders to pay fees are enforceable under state law. The District may impose civil penalties of up to $10,000 per day and seek injunctive relief if any of its fee assessments are not timely and fully paid. Moreover, although state law permits the City to appeal an order imposing fees to the California Air Resources Board, the Court of Appeal of the State of California has ruled that the appeal does not stay the City's obligation to pay the fees on time (City of Los Angeles, *et al.* v. Superior Court of Kern County (1998) Cal. Court of Appeal, 5^{th} App. Dist., Case F029795).

7.12 REFERENCES

GBUAPCD, 1997. Great Basin Unified Air Pollution Control District, Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan Final Environmental Impact Report, GBUAPCD, Bishop, California, July 2, 1997.

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CHAPTER 8

Enabling Legislation to Implement Control Strategy

FIGURES

BOARD ORDER TABLES AND EXHIBITS

8

Enabling Legislation to Implement Control Strategy

8.1 CONTROL STRATEGY IMPLEMENTATION

Under California Health & Safety Code §42316 (see following page and Section 2.2.2.2), the Great Basin Unified Air Pollution Control District (District) is adopting an order to the City of Los Angeles (City) to implement the Revised Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (RSIP) control measures on the schedule included in Chapter 7. The schedule will require that implementation of the additional control measures take place over a three-year period with completion by December 31, 2006. The Board order to implement the control strategy is incorporated into this RSIP and adopted concurrently with the approval of this RSIP.

The order requires the City to implement shallow flooding, managed vegetation, or gravel within the areas shown in and described by Exhibit 1, below. Implementation under the Board's order also ensures compliance with the California Environmental Quality Act. This includes specified environmental mitigation measures, environmental monitoring and reporting requirements. Additional environmental documents to the RSIP Final Environmental Impact Report (EIR) may be needed for complete implementation of the proposed control strategy.

The Attainment Demonstration in Chapter 7 shows that controlling 29.8 square miles of the Owens Lake bed will attain the National Ambient Air Quality Standards everywhere along the historic shore line (3600 foot elevation).

Text of California Health & Safety Code §42316

H&S 42316 Great Basin APCD Authority Mitigation Requirements

(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 Procedures 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.

(Added by Stats. 1983, Ch. 608, Sec. 1. Effective September 1, 1983.)

Text of CH&SC §42316 that allows the District to assess fees for studies and order mitigation measures to implement the SIP control strategy.

8.2 THE BOARD ORDER

The following order of the Great Basin Unified Air Pollution Control District is incorporated into this State Implementation Plan and constitutes an integral part thereof.

BOARD ORDER # 031113-01
Implementation of PM_{10} Control Measures on the Owens Lake Bed

With regard to the control of PM_{10} emissions from the bed of Owens Lake, the Governing Board of the Great Basin Unified Air Pollution Control District (District) orders the City of Los Angeles (City) as follows:

PREAMBLE

WHEREAS, the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (1998 SIP), dated November 16, 1998, requires a series of actions to reduce particulate emissions from the Owens Lake bed so that the Owens Valley Planning Area (OVPA) will attain and maintain the National Ambient Air Quality Standards (NAAQS) for particulate matter (PM_{10}) by the statutory deadlines, including a revision to the 1998 SIP in 2003;

WHEREAS, the District is required by law to maintain its discretion to protect the environment, public health and safety, and this Order is intended to fulfill those duties without improperly constraining that lawful exercise of discretion;

WHEREAS, in consideration of the District's continuing duties under federal and state law, including but not limited to the Clean Air Act, to control particulate emissions from the Owens Lake bed without interruption, the District intends, if this Order is stayed or disapproved, that Board Order #981116-01 shall immediately be in effect so that at all times, there will be continuous control of these emissions;

WHEREAS, the District thereby intends that if this Order is stayed due to a legal challenge, including but not limited to a challenge to this Order under Health and Safety Code Section 42316, to the State Implementation Plan, or to the Environmental Impact Report for this Revised SIP, or if this Order is disapproved by the California Air Resources Board, the District will revert to enforce the terms of Board Order #981116-01 which shall immediately be in effect and shall remain in full force for the duration of any stay or, in the case of disapproval, until another Order is issued by this Board; and

WHEREAS, to prevent the deterioration of air quality due to dismantling or "backsliding" on control measures that have already been implemented before any such stay or disapproval, the District intends that the City shall continue to continuously operate and maintain all control measures already implemented at the time of any such stay or disapproval without interruption, unless and until a further Order of the District allows for such interruption, if the City has not appealed the control measures under Section 42316 within 30 days of the effective date of this Order, and if those control measures were not invalidated as a result of that appeal;

IT IS HEREBY ORDERED as follows:

ORDER

1. **Requirement for controls** – From the date of adoption of this order until December 31, 2003, the City shall continue to operate and maintain PM_{10} control measures, as described in Paragraph 2 hereof, on 13.5 square miles of the Owens Lake bed within the approximately 29.8 square mile envelope shown in Exhibit 1. The City shall complete implementation of PM_{10} control measures, as described in Paragraph 2 hereof, on 16.5 square miles of the Owens Lake bed within the approximately 29.8 square-mile envelope shown in Exhibit 1 by December 31, 2003, and complete implementation of PM_{10} control measures as described in Paragraph 2 hereof on the entire approximately 29.8 square miles of the Owens Lake bed shown in Exhibit 1 by December 31, 2006. Upon implementation, the City shall continuously operate and maintain the control measures without interruption to comply with the performance standards set forth in the Control Measures descriptions contained in this Order.

2. **Control measures** - The City shall implement Best Available Control Measures (BACM) for PM_{10} as set forth in this Order, described herein in the section entitled "Control Measures." To complete implementation of a specified control measure by a date as required by this Order means that the control measure shall be constructed, installed, operated and maintained so as to comply with the performance standards for the specified control measure not later than 5:00 p.m. on the required date.

3. **Contingencies – Supplemental Control Measures** - At least once in 2004, and in each subsequent calendar year, the District's Air Pollution Control Officer (APCO) will make a written determination as to whether any areas, in addition to those described in Exhibit 1, meet the criteria set out in Paragraph 4 of this Order and thereby automatically require air pollution control measures in order to attain or maintain compliance with the NAAQS for PM_{10}. In making that determination, the APCO shall employ the methods described in Paragraph 4 of this Order.

   A. If the APCO determines under this Paragraph that additional areas require air pollution control measures, the APCO shall issue a written directive to the City informing them that the automatic provisions of Paragraph 4 of the Order require the City to implement, operate and maintain air pollution control measures on additional areas of the Owens Lake bed. The directive will include information on how the control measures as applied to the additional areas were analyzed under the California Environmental Quality Act (CEQA) and suggest any further action necessary for the City to comply with CEQA for such control measures.

   B. Unless the procedure for issuance of the written directive by the APCO, as provided in Paragraph 4 of this Order, is appealed by the City under Health & Safety Code Section 42316 within 30 days of the issuance of this Order, and unless the procedure is invalidated as a result of that appeal, any such directive is not, and shall not be construed to be, a further requirement for mitigation measures that may be appealed to the California State Air Resources Board under that Section. The District acknowledges that the issuance of such a directive is final agency action subject to challenge by the City in state court for review under the abuse of discretion standard.

C. Paragraph 4 fixes the period of time within which the implementation of the additional control measures must be completed. Upon implementation, the City shall continuously operate and maintain, without interruption, the control measures to comply with performance standards set forth for such measures in the control measure descriptions contained in this Order.

4. **Criteria for Determining Additional Controls** - The criteria and methods for making the determinations described in Paragraph 3 shall be those described in detail in Exhibit 2. Where Exhibit 2 and/or its attached protocols provide for actions to be authorized by joint agreement of the parties, neither party shall be obligated to agree.

5. **Adjustments to BACM and Transitions of Implemented Control Measures** - This Order further provides for the City to transition from one control measure to another provided that, at all times, the performance standards of one or the other control measure are continuously met during the transition to assure that the transition shall not prevent the OVPA from attaining or maintaining the NAAQS for PM_{10}. This Order also provides for adjustments to BACM. The absence of a stable BACM description due to the terms of this Paragraph precludes the application of the U.S. Environmental Protection Agency's Natural Events Policy for any purpose under this Order. The APCO shall have full discretion to consider any such application for a change in BACM, and to accept, reject or condition its approval of such application. Non-compliance with any such condition shall be enforceable as noncompliance with a District Order. Without limiting the District's discretion as provided herein, the procedures for transitions of implemented control measures or adjustments to BACM shall be those described in Exhibit 3.

6. **Alternative Methods for Supplemental Controls -** Notwithstanding any other provision of this Order, the District shall maintain its ability under Health and Safety Code Section 42316 to order the City to implement additional controls, and/or to control additional areas of the lake bed, to prevent the OVPA from failing to attain or maintain the NAAQS for PM_{10} if circumstances arise that are not specifically addressed in Paragraphs 3 or 5 of this Order.

7. **Relationship to Board Order 981116-01** - The District hereby stays the force and effect of Board Order 981116-01 for all times that this Order is in full force and effect. In the event this Order, or any provision of this Order, is stayed due to a legal challenge, including but not limited to a challenge to this Order under Health & Safety Code Section 42316 or any other law, to the State Implementation Plan, or to the Environmental Impact Report for this Revised SIP, or in the event the Order is disapproved by the California Air Resources Board, the following shall apply:

A. If the stay or disapproval causes Paragraph 1 of this Order to cease its operative force and effect, Board Order #981116-01 shall immediately be in effect and shall remain in full force for the duration of any stay or, in the case of disapproval, until another Order is issued by this Board. In addition, the City shall continue to operate and maintain without interruption all control measures already implemented in any area if those control measures were not appealed under Health & Safety Code Section 42316 within 30 days of the date of this Order, and if those measures were not invalidated as a result of that appeal.

B. If the stay or disapproval causes Paragraph 3 and/or 4 of this Order to cease its operative force and effect, but does not affect Paragraph 1 of this Order, the City shall continue to operate and maintain all control measures already implemented without interruption. Board Order #981116-01 Paragraphs 7 and 9 (as supplanted by the Control Measures provided for in this Order) shall immediately be in effect and shall remain in full force for the duration of any stay, along with any other terms of this Order that are not stayed or disapproved.

C. If the stay or disapproval does not affect Paragraphs 1, 3, or 4 of this Order, those Paragraphs and any other terms of this Order that are not stayed or disapproved shall be in effect, and shall remain in full force for the duration of any stay. The City shall continue to operate and maintain, without interruption, all control measures already implemented.

D. If a stay of this Order is imposed, then lifted so that this Order is in effect, the City shall, within one year after the lifting of the stay, meet all requirements and deadlines set by this Order as if no stay had been imposed. The City shall not remove or decrease any control measures during this one-year period without the express written permission of the APCO, and the provisions of Board Order 981116-01 shall again be stayed. If the stay of this Order is only partially lifted such that any portion of this Order remains stayed, Board Order 981116-01 shall remain in effect as provided under Paragraphs 7.A., 7.B. and 7.C herein.

Control Measures

Shallow Flooding

The “shallow flooding” dust control measure will apply water to the surface of those areas of the lake bed where shallow flooding is used as a dust control measure. Water shall be applied in amounts and by means sufficient to achieve the following performance standard commencing on October 1 of each year, and ending on June 30 of the next year: at least 75 percent of each square mile of the designated areas shall continuously consist of standing water or surface-saturated soil, substantially evenly distributed. If a contiguous shallow flood dust control area is less than one square mile, 75 percent of the entire contiguous area shall consist of standing water or surface-saturated soil. Aerial photography, satellite imagery or other methods approved by the APCO shall be used to confirm coverage.

The following portions of the areas designated for control with shallow flooding are exempted from the requirement of 75 percent saturated surface:

1) raised berms, roadways and their shoulders necessary to access, operate and maintain the control measure which are otherwise controlled and maintained to

render them substantially non-emissive and

2) raised pads containing vaults, pumping equipment or control equipment necessary for the operation of shallow flooding infrastructure which are otherwise controlled and maintained to render them substantially non-emissive.

“Substantially non-emissive” shall be defined to mean that the surface is protected with gravel, durable pavement or other APCO-approved surface protections sufficient to meet the requirements of District Rules 400 and 401 (visible emissions and fugitive dust).

Excess surface waters and shallow groundwaters above the annual average water table before site construction that reach the lower boundary of the dust control areas will be collected and recirculated for reapplication to dust control areas or otherwise discharged. The dust control measure areas will have lateral boundary edge berms and/or drains as necessary to contain excess waters in the control areas and to isolate the dust control measure areas from each other and from areas not controlled. If drains are used, they shall be designed and constructed so that they may be regulated such that groundwater levels, surface water extent and wetlands in adjacent uncontrolled areas are not impacted.

The City shall remove any exotic pest plants, including salt cedar (*Tamarix ramosissima*), that invade any of the areas designated for control by shallow flooding. As necessary to protect human health, the City shall prevent, avoid and/or abate mosquito and other pest vector breeding and swarming in and around the control areas by effective means that minimize adverse effects upon adjacent wildlife.

Managed Vegetation

In areas where “managed vegetation” is used as a dust control measure, the following performance standard shall be achieved commencing on October 1 of each year, and ending on June 30 of the next year: substantially evenly distributed live or dead vegetation coverage of at least 50 percent on each acre designated for managed vegetation. Vegetation coverage shall be measured by the point-frame method, by ground-truthed remote sensing or by other methods approved by the APCO. The vegetation shall consist only of locally-adapted native species approved by the APCO or species approved by both the APCO and the California State Lands Commission. To date, the only locally-adapted native species approved by the APCO is saltgrass (*Distichlis spicata).*

The following portions of the areas designated for control with managed vegetation are exempted from the requirement of 50 percent vegetative coverage:

1) portions consistently inundated with water, such as reservoirs, ponds and canals,

2) roadways and equipment pads necessary to access, operate and maintain the control measure which are otherwise controlled and maintained to render them substantially non-emissive, and

3) portions used as floodwater diversion channels or desiltation/retention basins.

“Substantially non-emissive” shall be defined to mean that the surface is protected with gravel, durable pavement or other APCO-approved surface protections sufficient to meet the requirements of District Rules 400 and 401 (visible emissions and fugitive dust).

Excess surface waters and shallow groundwaters above the root zone depths that reach the lower boundary of the dust control areas will be collected and recirculated for reapplication to dust control areas or otherwise discharged. The dust control measure areas will have lateral boundary edge berms and/or drains as necessary to contain excess waters in the control areas and to isolate the dust control measure areas from each other and from areas not controlled. Drains shall be designed and constructed so that they may be regulated such that groundwater levels, surface water extent and wetlands in adjacent uncontrolled areas are not impacted.

To protect the managed vegetation control measure from flooding, the City shall incorporate stormwater control facilities (e.g, weirs, channels, drains and spillways) into and around managed vegetation areas adequate to maintain the dust mitigation function of managed vegetation, and outlet flood waters into the Owens Lake brine pool, shallow flood areas, or reservoirs. The drains and channels shall be designed to incorporate features such as desiltation/retention basins that are adequate to capture the alluvial material carried by flood waters and to avoid greater than normal deposition of this material into the Owens Lake brine pool.

The City shall remove any exotic pest plants, including salt cedar (*Tamarix* spp.), that invade any of the areas designated for control by managed vegetation. As necessary to protect human health, the City shall prevent, avoid and/or abate mosquito and other pest vector breeding and swarming in and around the control areas by effective means that minimize adverse effects upon adjacent wildlife.

Gravel Cover

In areas where gravel is used as a control measure, the City shall meet the following performance standard: one hundred percent of the control area shall be covered with a layer of gravel at least four inches thick. All gravel material placed must be screened to a size greater than one-half inch (½ inch) in diameter. Where it is necessary to support the gravel blanket, it shall be placed over a permanent permeable geotextile fabric. The gravel shall have resistance to leaching and erosion. It shall be no more toxic than the gravel from the Keeler fan site analyzed by the District in the Final Environmental Report prepared for the 1997 SIP. To minimize visual impacts, all gravel used shall be comparable in coloration to the existing lake bed soils.

To protect the gravel control measure from flooding, the City shall incorporate drains and channels into and around the control measure areas adequate to maintain the dust mitigation function of the gravel, and outlet flood waters into the Owens Lake brine pool, shallow flood areas, or reservoirs. The drains and channels shall be designed to incorporate features such as desiltation or retention basins that are adequate to capture the alluvial material carried by the flood waters and to avoid greater than normal deposition of this material into the Owens Lake brine pool.

The gravel placement design and implementation shall adequately protect the graveled areas from the deposition of wind- and water-borne soil or infiltration of sediments from below. All graveled areas will be visually monitored to ensure that the gravel blanket is not filled with sand, dust or salt and that it has not been inundated or washed out from flooding. If any of these conditions are observed over areas larger than one acre, additional gravel will be transported to the playa and applied to the playa surface such that the original blanket performance standard is maintained. The City will apply best available control measures (BACM) and New Source Performance Standard (NSPS) emission limits to its gravel mining and transportation activities occurring within the District's geographic boundaries as required by the District in the City's District-issued Authority to Construct and Permit to Operate.

Increment 2 Extreme Violators

On areas 25 and 26 in Exhibit 1, the City shall implement one of the Control Measures listed below, and described in this Section, above, to achieve 99.5 percent PM_{10} control effectiveness. On area 27 in Exhibit 1, the City shall implement one of the Control Measures listed below and described in this Section, above, to achieve 99.75 percent control effectiveness.

1) Gravel, or
2) 100 percent coverage with shallow flooding, or
3) Enhanced managed vegetation with greater than 50 percent cover with sand flux and/or PM_{10} monitoring to determine if the daily minimum control efficiency of 99.5 percent or 99.75 percent control effectiveness has been achieved, or
4) Enhanced shallow flood with greater than 75 percent water cover with sand flux and/or PM_{10} monitoring to determine if the daily minimum control efficiency of 99.5 percent or 99.75 percent control effectiveness has been achieved, or
5) Modified BACM that has been tested on that extreme cell in accordance with this Board Order #031113-01, Exhibit 3 and is demonstrated to achieve a daily minimum control efficiency or 99.5 percent or 99.75% control effectiveness in the extreme area where modified BACM is applied.

Stormwater Management

The bed of Owens Lake is subject to flooding, alluvial deposits and fluctuating brine pool levels caused by stormwater runoff flows. In order to protect the PM_{10} control measures installed on the lake bed, the City shall design, install, operate and maintain flood and siltation control facilities. Flood and siltation control facilities shall be designed to provide levels of protection appropriate for the PM_{10} control measures being protected. Flood and siltation control facilities shall be integrated into the design and operation of the PM_{10} control measures. All flood and siltation control facilities shall be continually operated and maintained to provide their designed level of protection. All flood and siltation control facilities and PM_{10} control measures damaged by stormwater runoff or flooding shall be promptly repaired and restored to their designed level of protection and effectiveness. Flood and siltation control facilities shall be designed and constructed so that groundwater levels, surface water extent, and wetlands in adjacent uncontrolled areas are not impacted by induced drainage. All flood and siltation control facilities shall be designed so as not to cause the existing trona mineral deposit lease area (State Lands Commission leases PRC 5464.1, PRC 3511 and PRC 2969.1) to be subjected to any greater threat of alluvial material contamination than would have occurred under natural conditions prior to the installation of PM_{10} control measures.

Schedule

The Control Measures shall be implemented on the areas set forth in Paragraph 1 by the dates set forth in that Paragraph. Supplemental Control Requirements will be met on the schedule shown in Exhibit 2.

Additional Requirements

Furthermore, the Board orders the City of Los Angeles to satisfy the following requirements related to the implementation of the shallow flooding, managed vegetation, and gravel control measures:

1. The City's construction, operation and maintenance activities will comply with all Mitigation Measures set forth in Final Environmental Impact Reports, EIR Addendum and Mitigated Negative Declarations associated with the areas on which dust controls are placed and all subsequent environmental documents adopted by the District for implementation of the requirements of this SIP.

2. The City shall comply with any and all applicable requirements of the Mitigation Monitoring and Reporting Programs adopted by the District concurrently with its certification of the Final Environmental Impact Reports and Final Environmental Impact Report Addendum for this project and all subsequent environmental documents adopted by the District for implementation of the requirements of this SIP.

3. The City shall apply best available control measures (BACM) to control air emissions from its construction/implementation activities occurring in the District's geographic boundaries.

Exhibits

Exhibit 1 – Map and Coordinates of PM_{10} Control Area

Exhibit 2 – Owens Valley Planning Area Supplemental Control Requirements

Exhibit 3 – Modifying Owens Valley Planning Area BACM

Exhibit 1 – Map and Coordinates of PM_{10} Control Area

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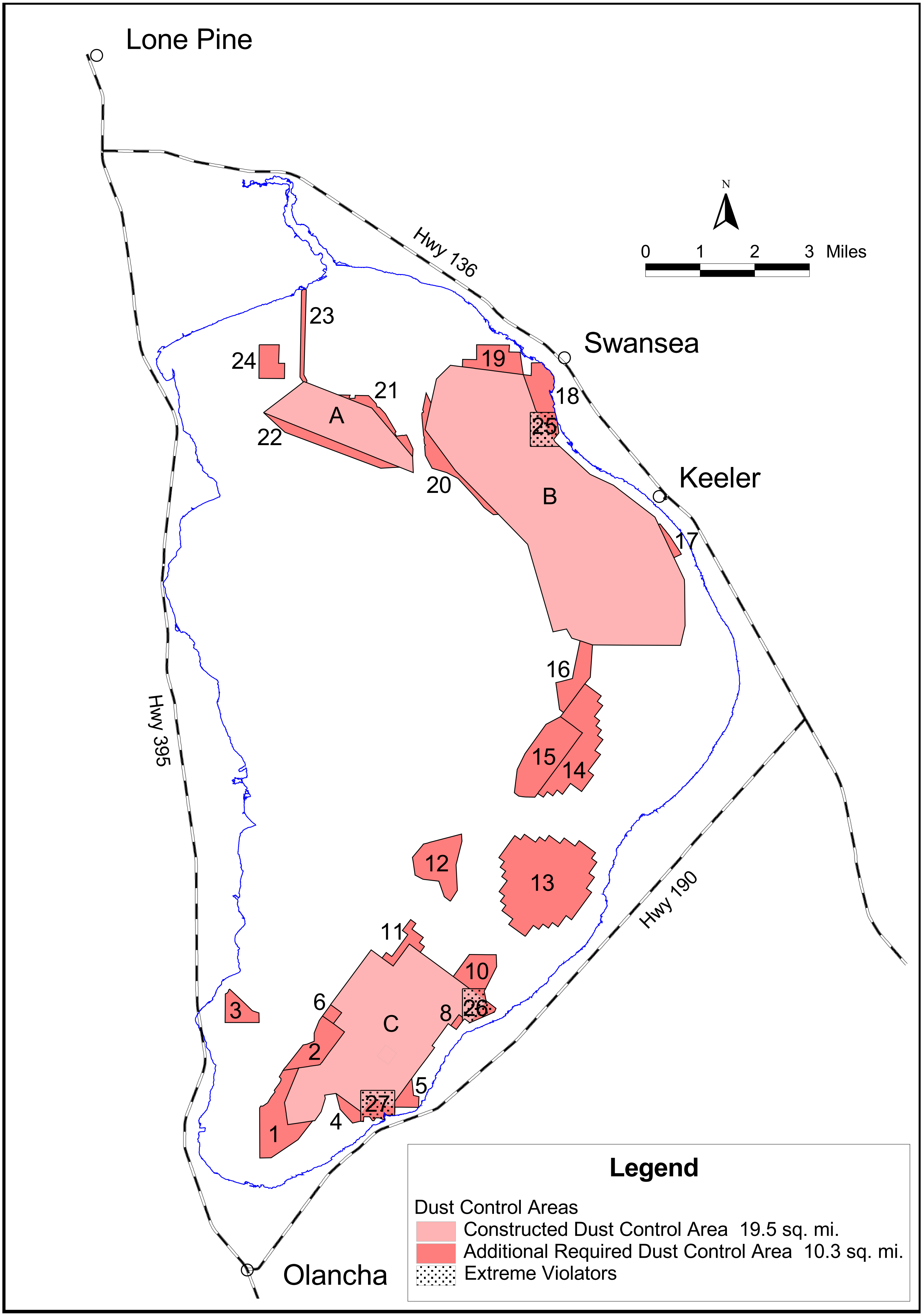

Exhibit 1 - Map of dust control areas.

Exhibit 1 - Coordinate Description of Owens Lake 2003 Dust Control Areas						
	Area A			**Area C**		
	X-Coordinate	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**	
	410,132.63	4,040,993.50		411,579.38	4,020,095.52	
	411,328.81	4,041,911.00		411,644.09	4,020,105.24	
	413,324.16	4,041,129.00		411,835.78	4,020,364.68	
	414,528.03	4,039,697.76		411,952.81	4,020,758.01	
	414,550.66	4,039,224.50		411,937.56	4,020,860.13	
	410,132.63	4,040,993.50		412,270.97	4,020,910.20	
				413,000.00	4,020,371.55	
	Area B			413,000.00	4,021,000.00	
	X-Coordinate	**Y-Coordinate**		414,000.00	4,021,000.00	
	419,466.72	4,034,262.38		414,000.00	4,020,668.55	
	419,223.19	4,034,342.77		415,178.06	4,022,263.07	
	419,065.03	4,034,610.44		415,103.19	4,022,318.42	
	418,665.63	4,034,527.44		415,581.25	4,022,965.46	
	418,667.03	4,034,531.66		415,653.88	4,022,911.75	
	418,666.34	4,034,532.51		415,894.22	4,023,234.32	
	417,924.34	4,037,110.42		416,000.00	4,023,156.08	
	415,793.06	4,039,285.02		416,000.00	4,024,000.00	
	414,894.03	4,040,494.46		416,211.50	4,024,000.00	
	415,233.97	4,041,986.70		414,432.09	4,025,314.72	
	415,642.38	4,042,393.20		413,954.00	4,024,667.76	
	417,792.31	4,042,118.50		413,307.25	4,025,145.65	
	418,156.13	4,041,076.09		412,111.97	4,023,528.16	
	418,202.41	4,041,000.00		412,435.56	4,023,289.19	
	418,000.00	4,041,000.00		412,196.47	4,022,965.67	
	418,000.00	4,040,000.00		412,519.91	4,022,726.63	
	418,870.16	4,040,000.00		411,802.84	4,021,756.10	
	419,761.13	4,039,174.84		411,171.19	4,021,661.17	
	420,449.03	4,038,850.23		410,750.13	4,020,640.98	
	421,672.66	4,037,910.55		410,848.53	4,019,985.74	
	422,544.63	4,036,064.36		411,579.38	4,020,095.52	
	422,560.44	4,034,701.13				
	422,429.47	4,034,126.35		**Area C (Sliver)**		
	419,834.66	4,034,140.72		**X-Coordinate**	**Y-Coordinate**	
	419,531.31	4,034,241.30		416,217.56	4,022,993.08	
	419,466.72	4,034,262.38		416,208.38	4,023,000.00	
				416,222.69	4,023,000.00	
				416,217.56	4,022,993.08	
Note: All coordinates are in Meters, UTM Zone11, NAD83(North American Datum 1983)						

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Exhibit 1 - Coordinate Description of Owens Lake 2006 Dust Control Areas							
Area 1			**Area 3**			**Area 8**	
X-Coordinate	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**
411,579.38	4,020,095.52		409,007.94	4,023,848.44		415,653.88	4,022,911.75
410,848.53	4,019,985.74		408,999.63	4,023,000.19		415,814.81	4,022,792.84
410,750.13	4,020,640.98		410,005.25	4,022,997.94		416,000.00	4,023,035.79
411,169.16	4,021,656.25		410,001.34	4,023,280.37		416,000.00	4,023,156.08
410,715.06	4,021,588.07		409,806.69	4,023,351.01		415,894.22	4,023,234.32
410,596.25	4,021,399.51		409,555.13	4,023,595.23		415,653.88	4,022,911.75
410,649.44	4,021,345.23		409,135.94	4,023,986.44			
410,650.59	4,021,294.34		409,106.25	4,023,960.47		**Area 9 (Sliver)**	
410,612.44	4,021,216.86		409,096.88	4,023,915.25		**X-Coordinate**	**Y-Coordinate**
410,451.69	4,020,999.42		409,043.25	4,023,853.55		416,217.56	4,022,993.08
410,475.59	4,020,954.53		409,007.94	4,023,848.44		416,222.69	4,023,000.00
410,344.88	4,020,785.74					416,233.13	4,023,000.00
410,253.97	4,020,631.27		**Area 4**			416,217.56	4,022,993.08
410,113.09	4,020,537.48		**X-Coordinate**	**Y-Coordinate**			
410,050.13	4,020,532.67		413,000.00	4,020,083.81		**Area 10**	
410,015.56	4,020,477.81		412,973.88	4,020,085.68		**X-Coordinate**	**Y-Coordinate**
410,025.16	4,019,002.05		412,756.72	4,020,031.39		416,678.53	4,024,000.00
410,360.72	4,019,008.50		412,389.28	4,020,442.03		416,211.50	4,024,000.00
411,149.75	4,019,542.15		412,270.97	4,020,910.20		415,726.16	4,024,358.61
411,579.38	4,020,095.52		413,000.00	4,020,371.55		416,204.25	4,025,005.67
			413,000.00	4,020,083.81		416,996.88	4,025,000.18
Area 2						417,006.56	4,024,645.44
X-Coordinate	**Y-Coordinate**		**Area 5**			416,678.53	4,024,000.00
410,715.06	4,021,588.07		**X-Coordinate**	**Y-Coordinate**			
410,748.03	4,021,640.42		414,000.00	4,020,341.65		**Area 11**	
410,812.25	4,021,710.18		414,000.00	4,020,668.55		**X-Coordinate**	**Y-Coordinate**
411,300.00	4,022,339.12		414,505.78	4,021,353.01		414,755.66	4,025,075.65
411,418.00	4,022,362.83		414,557.38	4,020,853.02		414,432.09	4,025,314.72
411,626.09	4,022,444.94		414,717.53	4,020,809.50		413,954.00	4,024,667.76
411,626.69	4,022,688.17		414,704.84	4,020,499.81		413,630.56	4,024,906.76
411,772.72	4,023,057.18		414,000.09	4,020,502.47		413,751.25	4,025,067.89
411,870.34	4,023,192.73		414,000.00	4,020,341.65		413,911.84	4,024,948.96
412,196.47	4,022,965.67					414,389.91	4,025,596.00
412,519.91	4,022,726.63		**Area 6**			414,228.72	4,025,715.32
411,802.84	4,021,756.10		**X-Coordinate**	**Y-Coordinate**		414,468.50	4,026,041.04
411,171.19	4,021,661.17		412,196.47	4,022,965.67		414,628.88	4,025,919.52
411,169.16	4,021,656.25		411,870.34	4,023,192.73		414,511.22	4,025,756.58
410,715.06	4,021,588.07		412,111.97	4,023,528.16		414,842.16	4,025,511.94
			412,435.56	4,023,289.19		414,730.41	4,025,355.50
			412,196.47	4,022,965.67		414,880.19	4,025,244.15
						414,755.66	4,025,075.65
Note: All coordinates are in Meters, UTM Zone11, NAD83 (North American Datum 1983)							

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Exhibit 1 - Coordinate Description of Owens Lake 2006 Dust Control Areas							
Area 12			**Area 13 (Continued)**			**Area 15**	
X-Coordinate	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**
415,641.06	4,026,578.40		419,922.81	4,028,008.01		418,889.09	4,032,023.96
415,463.69	4,026,710.94		419,804.13	4,027,847.22		418,465.09	4,031,795.84
415,303.78	4,027,171.29		419,962.91	4,027,729.82		417,843.91	4,030,935.96
414,868.34	4,027,220.98		419,727.69	4,027,403.37		417,610.78	4,030,467.77
414,829.75	4,027,225.67		419,888.44	4,027,284.55		417,527.47	4,029,781.15
414,603.41	4,027,348.40		419,649.63	4,026,961.11		417,554.63	4,029,761.19
414,525.44	4,027,872.69		419,810.50	4,026,842.21		417,657.81	4,029,680.64
414,819.75	4,028,226.00		419,213.84	4,026,032.84		417,777.97	4,029,662.60
414,845.56	4,028,265.16		419,054.56	4,026,155.62		417,857.97	4,029,654.42
415,969.69	4,028,562.67		418,812.91	4,025,828.54		418,135.53	4,029,650.33
415,987.34	4,028,348.72		418,651.28	4,025,948.17		419,536.09	4,031,545.90
415,812.00	4,027,654.86		418,530.28	4,025,787.40		418,889.09	4,032,023.96
415,850.16	4,026,902.89		418,369.84	4,025,906.02			
415,641.06	4,026,578.40		418,252.09	4,025,746.62		**Area 16**	
			418,088.56	4,025,863.82		**X-Coordinate**	**Y-Coordinate**
Area 13			417,849.59	4,025,540.30		418,980.19	4,032,147.18
X-Coordinate	**Y-Coordinate**					418,860.31	4,032,237.83
417,849.59	4,025,540.30		**Area 14**			418,754.03	4,033,026.46
417,364.06	4,025,898.33		**X-Coordinate**	**Y-Coordinate**		419,239.53	4,033,150.52
417,483.84	4,026,060.54		418,889.09	4,032,023.96		419,466.72	4,034,262.38
417,160.25	4,026,299.66		419,606.16	4,032,994.50		419,531.31	4,034,241.30
417,277.22	4,026,457.97		420,092.59	4,032,635.14		419,831.78	4,034,141.68
417,118.09	4,026,580.94		419,972.03	4,032,474.17		419,770.84	4,033,190.79
417,237.88	4,026,742.62		420,133.38	4,032,354.12		419,606.16	4,032,994.50
417,075.94	4,026,862.26		419,892.84	4,032,028.77		418,980.19	4,032,147.18
417,314.91	4,027,185.74		420,047.78	4,031,910.15			
417,154.00	4,027,304.56		419,934.03	4,031,751.90		**Area 17**	
417,272.59	4,027,466.98		420,098.50	4,031,630.34		**X-Coordinate**	**Y-Coordinate**
417,108.28	4,027,583.13		419,979.34	4,031,468.99		421,774.88	4,037,695.32
417,230.28	4,027,748.27		420,140.81	4,031,349.09		421,823.22	4,037,710.52
417,071.94	4,027,865.32		420,020.28	4,031,188.16		422,114.03	4,037,354.12
417,543.41	4,028,517.25		419,901.84	4,031,025.62		422,453.63	4,036,821.34
417,708.38	4,028,395.34		420,068.00	4,030,909.62		422,236.75	4,036,716.23
417,826.13	4,028,554.81		419,705.03	4,030,420.71		421,774.38	4,037,695.16
418,154.72	4,028,322.32		419,866.84	4,030,301.22		421,774.88	4,037,695.32
418,270.94	4,028,479.69		419,508.38	4,029,816.06			
418,438.72	4,028,355.74		419,184.78	4,030,055.11			
418,552.22	4,028,522.04		418,945.81	4,029,731.56			
418,875.81	4,028,283.00		418,791.09	4,029,860.80			
418,996.63	4,028,443.78		418,664.41	4,029,689.29			
419,321.13	4,028,204.06		418,497.78	4,029,812.42			
419,438.34	4,028,367.47		418,383.13	4,029,647.09			
			418,217.72	4,029,761.43			
			419,536.09	4,031,545.90			
			418,889.09	4,032,023.96			
Note: All coordinates are in Meters, UTM Zone11, NAD83(North American Datum 1983)							

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Exhibit 1 - Coordinate Description of Owens Lake 2006 Dust Control Areas							
Area 18			**Area 20 (Continued)**			**Area 22**	
X-Coordinate	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**
418,576.34	4,041,570.76		414,852.63	4,040,328.19		410,132.63	4,040,993.50
418,715.13	4,041,252.81		414,878.91	4,040,264.94		410,766.22	4,040,418.83
418,670.16	4,041,170.23		414,863.34	4,040,208.96		413,592.78	4,039,353.70
418,714.38	4,041,112.32		414,875.41	4,040,074.86		414,146.41	4,039,386.41
418,726.66	4,041,000.00		414,909.75	4,040,037.32		410,132.63	4,040,993.50
418,202.41	4,041,000.00		414,881.22	4,040,010.16			
418,156.13	4,041,076.09		414,905.72	4,039,737.55		**Area 23**	
417,792.31	4,042,118.50		415,102.22	4,039,351.95		**X-Coordinate**	**Y-Coordinate**
418,026.31	4,042,090.25		415,536.03	4,039,224.51		411,403.75	4,041,881.73
418,034.13	4,042,464.83		415,865.47	4,039,054.86		411,328.81	4,041,911.00
418,343.00	4,042,471.12		416,422.72	4,038,451.34		411,307.53	4,041,894.68
418,377.16	4,042,441.25		416,631.97	4,038,195.42		411,206.94	4,042,044.91
418,367.00	4,042,409.86		416,908.72	4,037,982.52		411,252.41	4,044,581.89
418,419.69	4,042,397.97		417,056.09	4,037,996.32		411,297.81	4,044,632.75
418,418.50	4,042,344.32		415,793.06	4,039,285.02		411,393.91	4,044,623.36
418,570.34	4,042,240.39		414,894.03	4,040,494.46		411,326.81	4,042,108.97
418,691.13	4,042,067.26		415,072.88	4,041,278.70		411,411.94	4,041,944.44
418,711.13	4,041,905.11					411,403.75	4,041,881.73
418,678.22	4,041,811.23		**Area 21**				
418,707.72	4,041,739.29		**X-Coordinate**	**Y-Coordinate**		**Area 24**	
418,639.09	4,041,587.48		414,528.03	4,039,697.76		**X-Coordinate**	**Y-Coordinate**
418,569.50	4,041,648.14		413,324.16	4,041,129.00		410,003.66	4,042,999.82
418,576.34	4,041,570.76		412,340.31	4,041,514.53		410,599.03	4,042,997.23
			412,688.94	4,041,508.80		410,577.94	4,042,452.28
Area 19			412,659.63	4,041,437.94		410,757.38	4,042,448.58
X-Coordinate	**Y-Coordinate**		412,692.06	4,041,412.16		410,754.66	4,042,002.54
417,792.31	4,042,118.50		412,828.00	4,041,418.80		410,000.00	4,042,003.42
416,000.00	4,042,347.51		412,835.41	4,041,506.39		410,003.66	4,042,999.82
416,004.50	4,042,566.26		413,230.84	4,041,499.67			
416,412.75	4,042,557.92		413,453.03	4,041,258.90			
416,414.78	4,042,999.71		413,483.38	4,041,163.39			
417,384.13	4,042,991.20		413,554.28	4,041,149.18			
417,370.06	4,042,784.35		413,722.66	4,040,966.69			
417,695.44	4,042,777.65		414,042.28	4,040,430.80			
417,792.31	4,042,118.50		414,016.31	4,040,409.57			
			414,009.38	4,040,379.25			
Area 20			414,053.94	4,040,299.05			
X-Coordinate	**Y-Coordinate**		414,233.72	4,040,325.19			
415,072.88	4,041,278.70		414,267.94	4,040,320.79			
414,928.66	4,041,572.82		414,341.63	4,040,340.88			
414,824.44	4,041,074.64		414,352.97	4,040,329.40			
414,847.75	4,041,049.90		414,544.19	4,039,918.50			
414,848.88	4,041,008.59		414,528.03	4,039,697.76			
414,806.84	4,040,990.52						
414,797.19	4,040,944.34						
Note: All coordinates are in Meters, UTM Zone11, NAD83(North American Datum 1983)							

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Exhibit 1 - Coordinate Description of Owens Lake Extreme 2006 Dust Control Areas							
		Extreme Violator Areas					
Area 25			**Area 26**			**Area 27**	
X-Coordinate	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**		**X-Coordinate**	**Y-Coordinate**
418,870.16	4,040,000.00		416,233.13	4,023,000.00		413,000.00	4,020,083.81
418,000.00	4,040,000.00		416,208.38	4,023,000.00		413,000.00	4,021,000.00
418,000.00	4,041,000.00		416,058.63	4,023,112.69		414,000.00	4,021,000.00
418,726.66	4,041,000.00		416,000.00	4,023,035.79		413,999.94	4,020,257.47
418,783.16	4,040,803.25		416,000.00	4,024,000.00		413,766.28	4,020,273.32
418,839.16	4,040,396.79		416,678.53	4,024,000.00		413,694.00	4,020,333.01
418,687.25	4,040,203.00		416,641.31	4,023,926.79		413,675.50	4,020,226.29
418,734.06	4,040,126.06		416,696.59	4,023,641.56		413,698.97	4,020,128.34
418,870.16	4,040,000.00		416,990.84	4,023,420.67		413,547.78	4,020,190.38
			416,940.44	4,023,306.49		413,443.09	4,020,190.38
			416,273.97	4,023,018.17		413,392.69	4,020,105.06
			416,233.13	4,023,000.00		413,342.25	4,020,101.19
						413,264.72	4,020,221.40
						413,090.19	4,020,217.52
						413,082.44	4,020,077.92
						413,000.00	4,020,083.81
Note: All coordinates are in Meters, UTM Zone11, NAD83 (North American Datum 1983)							

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----- End of Exhibit 1-----

EXHIBIT 2
OWENS VALLEY PLANNING AREA
SUPPLEMENTAL CONTROL REQUIREMENTS

CONDITIONS

The 2003 Dust ID Protocol (Attachment 4) contains the procedures to collect, screen, analyze and model the data used by the APCO to determine if Supplemental Controls are necessary. The following actions may be taken by the APCO and will not be considered a change to the Protocol:

- Add, remove or move PM_{10} monitors and meteorological stations
- Replace TEOMs with any other USEPA-approved Reference or Equivalent Method monitors that collect hourly concentration data
- Replace Sensits with any other sand flux monitor (SFM) that collects hourly data
- Replace Cox Sand Catchers with any other SFM
- Add, remove or move SFMs as long as the maximum grid cell size for modeling remains at one square kilometer
- Calculate “from-the-lake” wind directions for new PM_{10} monitor sites

The Dust ID Protocol (Protocol) and these Supplemental Control Requirements (SCR) specify many assumptions and decision trees to be followed that may need to be changed in the future. The following changes to the Protocol and the SCR may be made by written agreement of the APCO and the General Manager of the LADWP:

- The background value of 20 $\mu g/m^3$ may be changed to another value or a procedure to calculate the background from upwind/downwind lake bed monitors may be established
- The historic K-factors may be updated
- The default seasonal cut points may be updated
- The CalPUFF modeling system may be changed to another USEPA guideline model
- The procedure for determining the sand flux from a controlled area (DCM) may be updated
- The K-factor screening criteria may be updated
- From-the-lake wind directions in Attachment 2 may be changed to avoid including off-lake sources
- Non-reference or non-equivalent method special purpose PM_{10} monitors may be added
- Procedures for determining source area boundaries may be updated

DEFINITIONS

A ***shoreline or near-shore PM_{10} monitor*** is a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM_{10} Monitor located approximately on the 3600-foot elevation (historic shoreline) contour, or within the Owens Valley Non-Attainment Area above the 3600-foot elevation. The existing shoreline or near-shore PM_{10} monitors are at Dirty Socks, Keeler, Shell Cut, Lone Pine, Olancha, Ash Point and Flat Rock (see Attachment 1).

A ***special purpose PM_{10} monitor*** is a fixed or portable USEPA-approved Federal Reference Method or Equivalent Method PM_{10} Monitor installed upwind of or near potential dust source areas on the lake bed below the 3600-foot elevation. These lake bed PM_{10} monitors will be used to monitor new dust sources areas to generate new K-factors and to evaluate model predictions at the PM_{10} sites. They shall not be used to monitor compliance with the NAAQS and the data will not be submitted to USEPA's Aerometric Information and Retrieval System (AIRS).

An ***exceedance*** is a midnight to midnight Pacific Standard Time 24-hour average PM_{10} concentration greater than 150 µg/m³ measured by a shoreline or near-shore PM_{10} monitor.

From-the-lake wind directions are determined by extending two straight lines from the PM_{10} monitor site to the points on the 3600-foot contour of the Owens Lake bed that maximize the angle in the direction of the lake bed between the two straight lines. From-the-lake and non-lake wind directions for the six existing PM_{10} monitor sites and an example of the calculation of a from-the-lake wind direction are shown in Attachment 2.

Physical evidence of a source area boundary consists of Global Positioning System (GPS) data, visual observations, video observations, or any other method described for this purpose in the Dust ID Protocol.

BACM are Best Available Control Measures/Most Stringent Measures (MSM) defined as the dust controls determined to be BACM/MSM for Owens Lake in the Section in this Order 031113-01 entitled "Control Measures." If in the future the District changes or deletes existing BACM or adds new BACM, then the dust controls are those as revised by the latest District action.

Implements control measures means BACM are constructed and meeting the performance standards outlined in the Section in this Board Order 031113-01 entitled "Control Measures."

Extreme violators are areas currently required to implement BACM, but BACM are found to be insufficient to adequately control emissions.

Environmental analysis document complete means that a project level environmental document has been certified covering the location and BACM/MSM.

I. MONITORED EXCEEDANCES

1.1 – Do lake bed source areas cause or contribute to a monitored 24-hour average PM_{10} concentration greater than 150 µg/m³ at an historic shoreline PM_{10} monitor or at a near-shore PM_{10} monitor?

Any event that causes a monitored 24-hour average PM_{10} concentration greater than 150 µg/m³ at a shoreline or near-shore PM_{10} monitor will be evaluated to determine if lake bed dust source areas caused or contributed to the exceedance. The following steps will be used to screen hourly PM_{10} concentrations to determine if a lake bed source area caused or contributed to a monitored exceedance:

1) For hourly average from-the-lake wind directions, use the recorded hourly PM_{10} concentration.
2) For hourly average non-lake wind directions or missing data, replace the recorded hourly PM_{10} concentration with the background concentration of 20 µg/m³.
3) Average the adjusted hourly concentrations from steps 1 and 2 for the 24-hour period from midnight to midnight, Pacific Standard Time.

If the 24-hour average of the adjusted hourly PM_{10} concentrations exceeds 150 µg/m³ at the monitor site, go to 1.2. If not, go to 2.1.

1.2 – Is there physical evidence of lake bed emissions and/or air quality modeling sufficient to define boundaries for the area to be controlled?

Source Delineation.
The boundary of a dust source area will be delineated by a GPS survey. Under certain circumstances, the surveyed boundary of the dust source area will not result in a closed polygon. If the GPS survey yields a partial boundary and not a closed polygon, then the polygon area may be closed, if the length of the closure is equal to or less than one-half kilometer or is less than 20 percent of the surveyed source area perimeter, whichever is smaller. The ends of the partial surveyed area boundary will be completed with a straight line, unless survey notes or visual observations indicate that a different shaped boundary should be used. If the surveyed source area boundary has a complex shape, then the partial boundary to be closed will use the best available field and visual data to connect the two ends and form the polygon. Boundaries of existing controlled areas or other previously located boundaries will be used in place of a GPS survey boundary, if the survey notes or visual observations indicate the erosion area extends to that boundary.

If the GPS boundary described above is not available, the area will be defined by any one or a combination of GPS surveying, visual observations, and video observations or any other method described in the Dust ID Protocol (Attachment 4).

If neither the GPS boundary nor other physical evidence, as described above, is available, the default area size will be one square kilometer centered on the sand flux monitor (SFM), or one grid cell if the SFMs are in a closer array.

If there is physical evidence, as described above, to define the boundaries for the area to be controlled, and no K-factor for that area or no sand catch data above five grams for the sampling period from a sand flux sampler located within a 30 degree upwind cone centered on the wind direction of the defined source, then modeling cannot be performed. Go to 1.3.

Modeling.
If sand flux data is available for the exceedance identified in 1.1, the District will model the event. Modeling will be performed following the latest Dust ID Modeling Protocol using the source area determined above.

The order of priority for applying K-factors in the model will be:

1) When available, the District will use event specific storm-average K-factors to model dust events at the PM_{10} monitor if there are three or more hours of screened hourly K-factors for a 48-hour period. If not,

2) The District will use the most recent temporal and spatial 75-percentile hourly K-factors to model events, if there are nine or more screened hourly K-factors for a period and area determined by the methods described in the most current Dust ID Protocol. If not,

3) The District will use the K-factors in Attachment 3 to model events, based on the month of the event being investigated and the K-factor area.

Only those on-lake and off-lake dust sources with sand flux data will be included in the model. All data collected by the District pursuant to this Section shall be shared with the LADWP within 30 days of final data review.

The modeling results will be used to prioritize multiple upwind source areas for control, or to determine the fraction of a single upwind source area that needs to be controlled.

Go to 1.3

If neither physical evidence nor model results are available, go to 1.5.

1.3 – District directs LADWP to implement dust controls.

Source areas in 1.2 that cause or contribute to an exceedance may be new source areas, or may be extreme violators. The APCO will determine, in writing, that conditions specified in Section 1.1 were met for a specified area determined by 1.2. For extreme violators, the City will have the choice of increasing the controls on the extreme violator or controlling other contributing sources that will result in lowering the monitored impact below the 150 $\mu g/m^3$ exceedance threshold, if such areas exist. Within 30 days of that determination by the APCO, the City will be notified of that determination in writing. The City will be given 60 days to respond in writing to the APCO's determination by presenting an alternative analysis of the data. The APCO has full and sole discretion to accept, modify, reject or take no action on the City's alternative analysis. Unless the APCO takes action to withdraw or modify her/his original determination within 90 days of that determination, the requirement for BACM to be implemented on new areas or enhanced on extreme violator areas will automatically be triggered. Go to 1.4.

1.4 – LADWP implements dust controls within 2½ years if shallow flooding, otherwise within 4years.

Within one year of the date of the written direction from the APCO described in Section 1.3, the City must choose the BACM it wishes to implement in the area identified in 1.2, prepare the 30 percent construction design document for the implementation of BACM in that area, complete the environmental analysis document (if necessary) and apply for all necessary permits for construction. Within two years of the date of the written determination from the APCO described in Section 1.3, the LADWP must have all infrastructure for BACM constructed and operational. The LADWP shall have BACM implemented within 2½ years of the APCO's determination if implementing Shallow Flood, otherwise 4 years if implementing any other BACM.

1.5– District collects additional physical evidence and installs sand flux monitors in suspected areas.

If there is insufficient physical evidence and no sand flux monitor data to determine the emissive area on the lake bed that caused the monitored or modeled exceedance, the District will install Sensits and Cox Sand Catchers (CSC) sand flux monitors in the suspected area in a sampling array with a maximum spacing of one kilometer. The District will also continue to collect other physical evidence.

II. MODELED EXCEEDANCES

2.1 – Does the Dust ID model predict a shoreline concentration greater than 200 μg/m³, including background?

Dispersion Modeling Analysis.
At least once a year, the District will examine the Dust ID information and dispersion model to determine if there have been any modeled shoreline exceedances since the period included in the last model run. Modeling will be performed following the Dust ID Protocol (Attachment 4).

K-factors.
New K-factors may be generated from PM_{10} concentrations measured at any shoreline or near-shore PM_{10} monitor using the methods described in the Dust ID Protocol. The order of priority for applying K-factors in the model will be:

1) The current temporal and spatial 75th percentile hourly K-factors. The District will use the current modeling period temporal and spatial 75th percentile hourly K-factors to model events, if there are nine or more hourly K-factors for an agreed upon seasonal period and area determined by the methods described in the most current Dust ID Protocol.

2) If there is no agreement on seasonal cut-points, the default cut points, as shown in Attachment 3, will be used with number 1, above.

3) If there is no agreement on area, the default areas, as shown in Attachment 1, will be used with number 1, above.

4) If there are fewer than nine hourly K-factors for any area and period, go to 5), below.

5) Default K-factors from Attachment 3. The District will use the K-factors in Attachment 3 to model events, based on the month of the event being investigated and the K-factor area. If the new dust source area is not within a K-factor area shown in Attachment 3, the closest area with similar soil characteristics will be used.

Source Area Size, Location and Sand Flux.
The boundary of a dust source area will be delineated by a GPS survey. Under certain circumstances, the surveyed boundary of the dust source area will not result in a closed polygon. If the GPS survey yields a partial boundary and not a closed polygon, then the polygon area may be closed, if the length of the closure is equal to or less than one-half kilometer or is less than 20 percent of the surveyed source area perimeter, whichever is smaller. The ends of the partial surveyed area boundary will be completed with a straight line, unless survey notes or visual observations indicate that a different shaped boundary should be used. If the surveyed source area boundary has a complex shape, then the partial boundary to be closed will use the best available field and visual data to connect the two ends and form the polygon. Boundaries of existing controlled areas or other previously located boundaries will

be used in place of a GPS survey boundary, if the survey notes or visual observations indicate the erosion area extends to that boundary.

If the GPS boundary described above is not available, the area will be defined by any one or a combination of GPS surveying, visual observations, and video observations or any other method described in the Dust ID Protocol.

The details of how to delineate source area boundaries are contained in the Dust ID Protocol.

If neither the GPS boundary nor the other physical evidence as described above is available, the default area size will be one square kilometer centered on the SFM, or one grid cell if the SFM are in a closer array.

All data collected by the District pursuant to this Section shall be shared with the LADWP within 30 days of final data review. If the modeling shows that lake bed source areas have caused or contributed to any modeled shoreline PM_{10} impact greater than 200 µg/m³ for a 24-hour average, go to 2.7. If not, go to 2.2.

2.2 – Is the modeled concentration less than 100 µg/m³?

This refers to the modeled concentration calculated in 2.1 and includes the background. If yes, go to 2.6. If no, go to 2.3.

2.3 – District directs LADWP to commence environmental impact analysis, design and permitting.

The APCO will direct the LADWP in writing to choose the BACM it wishes to implement in the area identified in 2.1, prepare the 30 percent construction design document for the implementation of BACM in that area, complete the environmental impact document (if necessary) and apply for all necessary permits for construction. The LADWP will submit quarterly progress reports to the APCO. LADWP shall complete these steps within one year of the date of the written direction from the APCO. Go to 2.4.

2.4 – District deploys reference and/or non-reference method Special Purpose PM_{10} monitor(s) to confirm model (if not already deployed).

The District will deploy reference and/or non-reference method Special Purpose PM_{10} monitor(s) on the lake bed upwind and downwind of the identified emissive area, if there are no existing monitors at locations that can be used in Section 2.5 to refine the model predictions. Monitors will be sited between 250 and 5000 meters outside of any GPS'd or observed source area boundaries. These PM_{10} monitoring sites may be removed after the model confirmation procedure described in 2.5. Shoreline and near-shore PM_{10} monitors that are sited to confirm the model may be used for NAAQS compliance, if an exceedance is monitored. Go to 2.5.

2.5 – Is the refined model prediction greater than 150 µg/m³?

For each event measured under Section 2.4 that results in a 24-hour monitored concentration of greater than 100 µg/m³, the event-specific K-factor (defined in the Dust ID Protocol) will be used to model the concentration at the shoreline receptors. If the event-specific K-factor was derived for the same year and season as the original event modeled in 2.1, the Section 2.1 event will be remodeled using the new K-factor. If either that remodeled concentration for the Section 2.1 event, or the new modeled concentration for the on-lake monitored event, is greater than 150 µg/m³ at a shoreline receptor, go to 2.7. If not, go to 2.6.

The District will make a determination if any currently modeled event within the same season and K-factor area using the appropriate K-factors as determined by this procedure causes a shoreline receptor to exceed 150 µg/m³. If yes, go to 2.7.

2.6 – No action required.

No action is required of the City at this time. Data collected during this period can be used in conjunction with data collected at a later time to define emissive areas on the lake bed according to this protocol and to develop K-factors for emissive areas.

2.7 – District directs LADWP to implement dust controls.

Source areas in 2.1 and 2.5 that cause or contribute to an exceedance may be new source areas, or extreme violators.

The APCO will determine, in writing, that conditions specified in Sections 2.1 or 2.5 were met for the specified area. Within 30 days of that determination by the APCO, the LADWP will be notified of that determination in writing. For extreme violators, the LADWP will have the choice of increasing the controls on the implemented area or controlling other contributing sources that will result in lowering the modeled impact below the 150 µg/m³ exceedance threshold, if such areas exist. The LADWP will be given 60 days to respond in writing to the APCO's determination by presenting an alternative analysis of the data. The APCO has full and sole discretion to accept, modify, reject or take no action on the LADWP's alternative analysis. Unless the APCO takes action to withdraw or modify her/his original determination within 90 days of that written determination, the requirement for BACM to be implemented on the new area or enhanced on the extreme violator area will automatically be triggered. Go to 2.8.

2.8 – LADWP implements BACM within 2½ years if shallow flooding, otherwise within 4 years.

For source areas that arrive at 2.7 from 2.1, the LADWP shall within one year of the date of the written determination from the APCO described in Section 2.7 choose the BACM it wishes to implement in the area identified in 2.1, prepare the 30 percent construction design document for the implementation of BACM in that area, complete the environmental analysis document (if necessary) and apply for all necessary permits for construction. The LADWP shall within two years of the date of the written determination from the APCO described in Section 2.7 have all infrastructure for BACM constructed and operational. The LADWP shall have BACM implemented within 2½ years of the APCO's written determination in 2.7 if implementing Shallow Flood, otherwise 4 years for any other BACM.

For source areas that arrive at 2.7 from 2.5, all time periods in the above implementation schedule in 2.8 shall apply but be reduced by the time period elapsed since the date of the written direction from the APCO described in Section 2.3, or one year, whichever is less.

Attachments:

Attachment 1: Owens Lake Dust ID Monitoring Map
Attachment 2: From-the-lake and Non-lake Wind Directions for PM_{10} Monitor Sites
Attachment 3: Historic Spatial and Temporal K-factors for the Dust ID Model
Attachment 4: Owens Lake Dust Source Identification Program Protocol

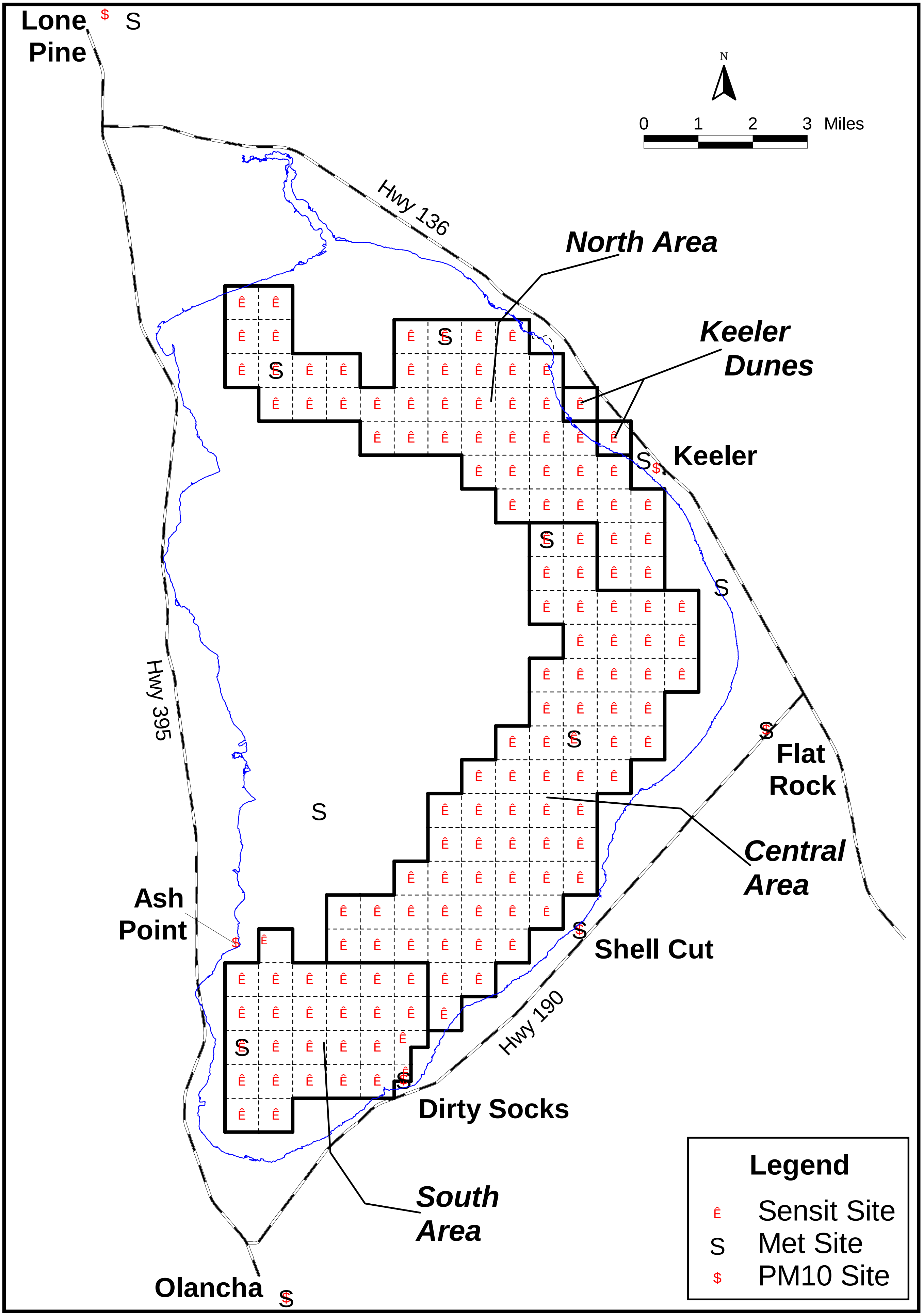

Exhibit 2, Attachment 1 - Owens Lake Dust ID Monitoring Map.

EXHIBIT 2 - ATTACHMENT 2a

From-the-Lake and Non-Lake Wind Directions for PM_{10} Monitor Sites

PM_{10} Monitor Site	From-the-Lake Wind Dir. (Deg.)	Non-lake Wind Dir. (Deg.)	Met Tower
Lone Pine	126≤WD≤176	WD<126 or WD>176	Lone Pine
Keeler	147≤WD≤290	WD<147 or WD>290	Keeler
Flat Rock	224≤WD≤345	WD<224 or WD>345	Flat Rock
Shell Cut	WD≥227 or WD≤ 33	33<WD<227	Shell Cut
Dirty Socks	WD≥234 or WD≤50	50<WD<234	Dirty Socks
Olancha	WD≥333 or WD≤39	39<WD<333	Olancha
New Sites	TBD	TBD	TBD

TBD – From-the-lake and non-lake wind directions will be determined for new sites by the APCO when sites are selected.

EXHIBIT 2 - ATTACHMENT 3

Default Spatial and Temporal K-factors for the Dust ID Model

AREA	K-factor **Jan.– Apr. & Dec.**	K-factor **May-Nov. (These are the default cutpoints.)**
Keeler Dunes	7.4×10^{-5}	6.0×10^{-5}
North Area	3.9×10^{-5}	1.5×10^{-5}
Central Area	12.0×10^{-5}	6.9×10^{-5}
South Area	4.0×10^{-5}	1.9×10^{-5}

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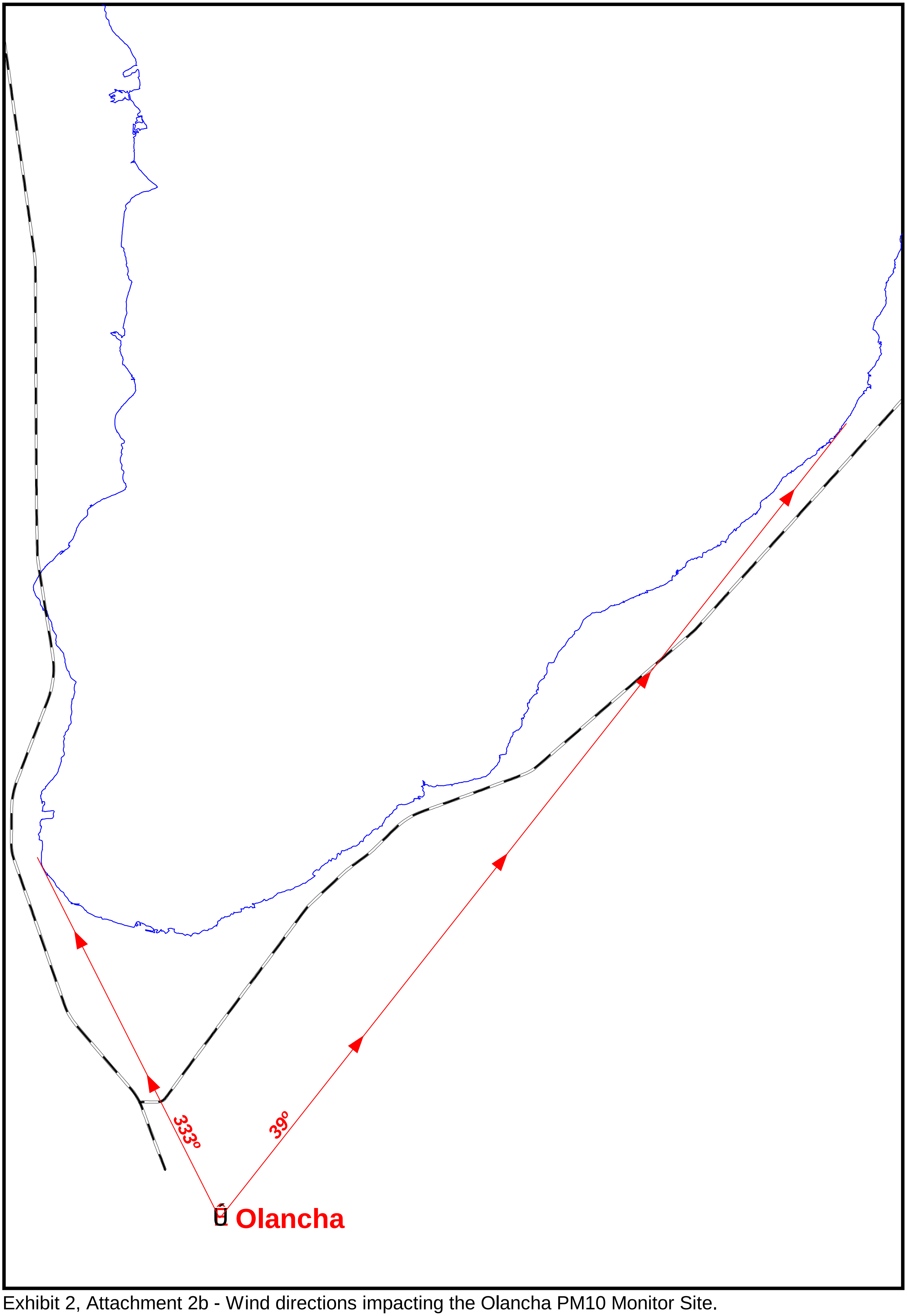

Exhibit 2, Attachment 2b - Wind directions impacting the Olancha PM10 Monitor Site.

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EXHIBIT 2 - ATTACHMENT 4

Owens Lake Dust Source Identification Program Protocol

June, 2003

Great Basin Unified Air Pollution Control District

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Owens Lake Dust Source Identification Program Protocol

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Glossary of Terms and Symbols

AIRS	US Environmental Protection Agency's Aerometric Information and Retrieval System
ATV	All-Terrain Vehicle
APCO	Air Pollution Control Officer
BACM	Best Available Control Measure
BACT	Best Available Control Technology
CAAA	Clean Air Act Amendments of 1990
CALMET	A meteorological preprocessor program for CALPUFF.
CALPUFF	An air pollution model
CARB	California Air Resources Board
CSC	Cox Sand Catcher, a passive sand flux measurement device.
DCA	Dust Control Area
DCM	Dust Control Measure
dS	decisiemens
Dust ID Program	Owens Lake Dust Source Identification Program
EIR	Environmental Impact Report
Event-specific K_f	Weighted-average of hourly K-factors for a dust event, weighted by the hourly PM_{10} concentration
Exceedance	Modeled or monitored PM_{10} > 150 µg/m^3 at the shoreline
FTEE	Full-time equivalent employee
GBUAPCD	Great Basin Unified Air Pollution Control District
GIS	Geographic Information System
GPS	Global Positioning System
KE	Kinetic energy
K-factor	Proportionality constant for sand flux and PM_{10} emissions, K_f
LADWP	City of Los Angeles Department of Water and Power
m^3	cubic meter
met	meteorological
mg	milligram
MSM	Most Stringent Measure
NAAQS	National Ambient Air Quality Standards
NEAP	Natural Events Action Plan
OVPA	Owens Valley PM_{10} Planning Area
PC	Particle count
PM_{10}	Particulate matter less than 10 microns aerodynamic diameter
QA	Quality Assurance
RASS	Radio Acoustic Sounding System
RSIP	Great Basin APCD 2003 Owens Valley PM_{10} Planning Area Revised State Implementation Plan
Sensit	An electronic sand motion detector.
Storm-average K_f	Arithmetic average of hourly K-factors for a dust event
SCR	Supplemental Control Requirements of the 2003 SIP
SFM	Sand flux monitor
TEOM	Tapered-Element Oscillating Microbalance, measures PM_{10}.
USEPA	United States Environmental Protection Agency

USGS	US Geological Survey
WD	Wind direction
2003 SIP	Great Basin APCD 2003 Owens Valley PM_{10} Planning Area Revised State Implementation Plan
µg	microgram

Owens Lake Dust Source Identification Program Protocol

1. Program Overview

The objective of the Owens Lake Dust Source Identification (Dust ID) Program is to identify dust source areas at Owens Lake that can cause or contribute to violations of the National Ambient Air Quality Standards (NAAQS) for PM_{10}. The Dust ID Program is a long-term monitoring program that is intended to identify dust source areas for control under the provisions of the Supplemental Control Requirements (SCR) in the 2003 Revised Owens Valley PM_{10} State Implementation Plan (RSIP).

2. Protocol for Measuring Sand Flux Rates and Operation of the Sensit and Cox Sand Catcher (CSC) Network

2.1. Objective

Sand flux measurements will be used as a surrogate to estimate PM_{10} emissions coming off the lake bed. The objective of the sand flux measurements is to provide an hourly emissions estimate for all active source areas on the lake bed.

2.2. Methods and Instrumentation

Sand flux will be measured with Sensits and CSCs. Co-located Sensits and CSCs are used to determine hourly sand flux rates at a number of different locations on the lake bed. The 2003 Sensit/CSC network locations are shown in Exhibit 2, Attachment 1. The instruments are placed with their sensors or inlets positioned 15 cm above the surface. Sensits are electronic sensors that measure the kinetic energy and the particle counts of sand-sized particles as they saltate, or bounce, across the surface. Sensits were used to time-resolve the CSC mass to provide hourly sand flux.

Figure 2.1 shows two Sensits suspended above the ground on the right and a CSC in the ground to the left. The photo was taken at a site that was used to test the accuracy of Sensits and CSCs before the Dust ID Program began. The battery powered Sensits are augmented with a solar charging system. A datalogger records five-minute data during active saltation periods. Each datalogger has a radio transmitter that will be set to send the Sensit data to the District's Keeler field office once a day to provide updates on erosion activity at each site. These daily updates will be used to alert field personnel to active source areas for possible Global Positioning System (GPS) mapping and inspection.

CSCs are passive collection instruments that capture sand-sized particles that are blown across the surface during a dust event. These instruments were designed and built by the District as a reliable instrument that could withstand the harsh conditions at Owens Lake. CSCs have no moving parts and can collect sand for a month or more at Owens Lake without overloading the collectors. Field personnel must visit the CSC sites to physically measure the sand catch masses. A diagram of the CSC is shown in Figure 2.2. Not shown in the diagram are an internal sampling tube and a height adjustment sleeve that can be seen in the photo in Figure 2.3. The internal sampling tube is removed from the PVC casing to measure the sand catch sample. The lengths of the sampling tubes and casings are adjusted during construction to accommodate the amount of sand flux in each area and to avoid overloading the CSCs. The CSC length ranges from about two to four feet. Because the PVC casing is buried in the ground, an adjustment sleeve is used to keep the inlet height at 15 cm to compensate for surface erosion and deposition.

Figure 2.4 shows an example of the linear relationship between the CSC collected sand mass and the kinetic energy measured with a co-located Sensit. Sensits measure saltation in terms of kinetic energy (KE) and particle count (PC). The District will use the output (KE or PC) that provides the best precision and accuracy for the range of saltation activity expected at each site.

Because the electronic Sensit response and calibration can vary, the Sensits were used in combination with CSCs to determine the hourly sand flux. This combination takes advantage of the good precision and accuracy of the CSC sand catch data, and the ability of Sensits to time-resolve the sand flux for each hour of the CSC sampling period. In this way, the sum of the hourly sand catches always matches the CSC sand catch for each sampling period, and it minimizes the error in the hourly sand flux. Sand flux samplers may be added to the network to monitor new source areas. Sensits and CSCs may be added in areas outside of the current network, if a new source becomes emissive, or inside the network if a new source area is smaller than 1 square kilometer in area size and fits between two existing Sensit sites. If Sensits and CSCs are added within the existing square kilometer array, the instruments may be placed at about ½ km spacing from other sites to provide sand flux data for a ¼ sq. km area around the new site. The addition of samplers to the network is not considered a change to this protocol, but is expected if dust source areas change.

2.3. Operating Procedures

The sand captured in the CSCs will be weighed in the field to the nearest one gram using a scale mounted on an ATV. A field technician will visit each site and weigh the sand catch about every one to three months.

Weighing the sand catch entails measuring and recording the inlet height (middle of sensor), removing the inlet from the CSC, removing the inner tube from the catcher and weighing the tube and catch using a scale. After the weight is recorded on the field form, the catch is dumped from the tube and the tube cleaned of any sand or crust. Then the technician weighs the empty tube and records the tare weight for the next catch on the field form. If the weight is less than five grams, the operator has the option not to dump the catch, but to carry over the catch to the next site visit. In that case, the tare weight for the last time the tube was emptied will be recorded if the catch is less than five grams and it will be noted that the catch is carried-over. The tube is then returned to the catcher and the inlet is reinstalled. A final measurement and adjustment of the inlet height is necessary to maintain the inlet height at 15 cm (± 1 cm). If a CSC catch is wet, then the tube is weighed in the field and brought back to the lab to be dried and weighed. Tubes with wet catches are replaced with clean tubes.

While at the site, Sensit data will be downloaded from the datalogger to a storage module. The Sensit sensor height will be measured to the center of the sensor and recorded on the field form. The sensor and radio transmitter wiring will be inspected and cleaning or repairs completed if needed. A field operational response test on the Sensit will be completed during each visit and the Sensit will be replaced, if it fails the test. The sensor height will be adjusted, if needed, to maintain the inlet height at 15 cm (± 1 cm).

2.4. Data Collection

A field form will be used to document the information for the CSC and Sensit (see example in Figure 2.5). The form will have the site number, date and time of measurement (Pacific Standard Time), "as is" CSC inlet and Sensit sensor height (± 1 cm), tube tare weight prior to sand catch (± 0.001 kg), total sand catch weight (± 0.001 kg), and post-catch tube weight (± 0.001 kg), Sensit response test (particle counts or kinetic energy), operator's initials, and a comments section where the condition of the sampler and any other relevant factors, such as surface condition can be documented. The net sand catch weight from the CSC will be calculated during data analysis by the Data Processing Department. After completion of the form, the field technician will make a copy of the completed form and file the copy at the Keeler office. The original form will be sent to Data Processing in the Bishop office. Data Processing will enter the data into an electronic file. The original hard copy form will be filed in the Bishop office.

Data from the Sensit storage modules will be downloaded to the computer at the Keeler office by the field technician at the end of a collection period. The data will then be sent to the Bishop office for final editing and archiving by the data processing staff.

Technicians will keep a log of all the repairs, maintenance, or replacement of Sensits or CSCs, radio transmitters, and datalogger equipment. This log will be kept in a field notebook and the field forms sent to Data Processing as they are completed. It is the technician's or operator's responsibility to review the data and notify the Air Monitoring Specialist and Data Processing who will decide whether any data should be edited or deleted and why.

2.5. Chain of Custody

Each field form will be initialed and dated by the field technician during each site visit. The form will be signed and dated by the person receiving the data when delivered to the Bishop office. If no person is available to sign the form in the Bishop office, the delivery person will sign and date the form and place it in the Data Processor's box.

2.6. Quality Assurance

Ten percent of the CSC sand catches will be brought back to the Keeler office and re-weighed on the bench-top scale in the Keeler laboratory. These sand catches will be stored for at least one year from the date of collection before discarding.

Both the field scale and Keeler bench-top scale will be checked at least every two months using Class I weights. In addition, the field scale will be checked more frequently because of the jarring produced by transporting the scale on an ATV in the field. It will be checked with a 100-gram Class F weight at each sample site before weighing the sand catch and the weight recorded on the field form. The bench-top scale in the Keeler office will be checked with the Class F weights before each set of sand catches are weighed or at least monthly. The test weights will be recorded on the scale log sheet in the laboratory. Both scales will be calibrated and certified at least once every year.

2.7. Sensit Calibration and Data Analysis

2.7.1 Sensit Calibration Check

Data Processing will track Sensits by their serial number. After each sample collection period, Sensit and CSC data will be added to data from other sample collections. Data Processing will determine the average sand catch to Sensit ratio for each Sensit. Sensit readings will be collected for particle counts and kinetic energy for each Sensit. Due to differences in individual Sensit responses, some Sensit have a more consistent sand flux to Sensit reading ratio using particle count rather than kinetic energy. This normally depends on the manufacturer’s electronic design (of which there are currently at least three different designs) and the range of sand flux activity at individual sites. Particle count (PC) is normally a better indicator at sites that have low sand flux rates. At high sand flux sites, kinetic energy provides a more linear response for most Sensits. If KE is used, a background KE is subtracted from the reading if it is not zero. A background KE is determined from the KE reading when the PC reading is zero.

The ratio of the Sensit response to the collected mass will be compared for each collection period to previous ratios for the same instrument to ensure that the Sensit is responding consistently. As seen in Figure 2.4 this ratio can vary, especially at low collection masses, so large deviations in the ratio should only be used as an indicator for a possible problem. Sensits will be replaced or repaired if they show no readings with significant sand collection, have significant readings during calm wind periods, or if they have an erratic response as compared to previous collection periods.

2.7.2 Replacing Missing Sand Catch Data.

Sand catch data can be lost if the CSC collector tube is full, or damaged, or if the sample is spilled during weighing. The lost sand catch data can be estimated using Sensit data. A cumulative sand catch to Sensit ratio is calculated by adding all of the valid sand catches and all of the corresponding Sensit data for that particular Sensit/CSC pair, and then dividing them to obtain the total ratio. The cumulative ratio is applied to the Sensit data to estimate the hourly sand flux. If there was a Sensit change, only data generated after the Sensit change is used to calculate the cumulative sand catch to Sensit ratio.

CSC collection tubes will be weighed and reset at the same time as any Sensit change at a site in order to maintain the time correlation between the two devices.

2.7.3 Replacing Missing Sensit Data.

Sensit data can be lost when the datalogger or Sensit fails. The sand catch data must be time resolved using a neighboring site. The historical hourly sand flux data are compared to determine which neighboring site behaves most similarly to the site with the lost data. The correlation coefficients between the data sets are used to determine which site behaves most similarly. If no adjacent sites were active during the period of lost Sensit data, then the nearest active sites are used for comparison.

2.7.4 Sand Catches Less Than Five Grams

The operational error in each sand catch weighing is roughly estimated at two to three grams based on the observation that tare weights are sometimes up to two or three grams different from subsequent empty weights. Since there are two weighings needed to determine the sand catch, the estimated error for each sand catch weight is up to five grams.

The sand catch weights less than five grams are considered within the error and are changed to zero before the hourly sand flux data are generated.

2.8 Calculating Hourly Sand Flux

For modeling purposes discussed in Section 6, hourly sand flux is calculated for each Sensit/CSC site using the sand catch to Sensit reading ratio for each collection period and apportioning the sand catch to the hourly Sensit reading. The hourly sand flux is divided by 1.435 cm^2, which is the equivalent inlet opening size of the CSC for flux calculation purposes.

Equation 2.1

For Sensits Using Kinetic Energy

$$q_{n,t} = (S_{n,t} - S_{n,bg}) \times \frac{CSC_{n,p}}{\sum_{t=1}^{N}(S_{n,t} - S_{n,bg})} \times \frac{1}{1.435} \qquad [g/cm^2/hr]$$

Where,

$q_{n,t}$ = hourly sand flux at site n, for hour t [$g/cm^2/hr$]
$CSC_{n,p}$ = CSC mass for site n, for collection period p [g]
$S_{n,t}$ = Sensit total KE reading for site n, for hour t [non-dimensional]
$S_{n,bg}$ = Sensit KE background reading for site n, [non-dimensional]
N = Total number of hours in CSC collection period p.

Equation 2.2

For Sensits Using Particle Count

$$q_{n,t} = S'_{n,t} \times \frac{CSC_{n,p}}{\sum_{t=1}^{N} S'_{n,t}} \times \frac{1}{1.435} \qquad [g/cm^2/hr]$$

Where,

$S'_{n,t}$ = Sensit total PC reading for site n, for hour t [non-dimensional]

Figure 2.1 Two Sensits are seen suspended above the ground on the right and a CSC is located to the left at this Owens Lake test site used to compare the performance of different saltation measurement instruments.

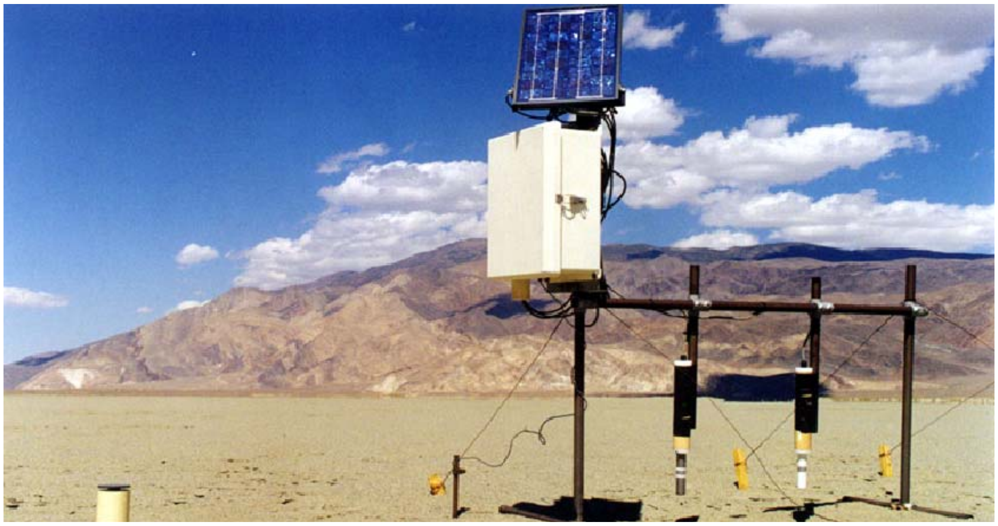


Figure 2.2. Diagram of the Cox Sand Catcher (CSC) used to measure sand flux at Owens Lake.

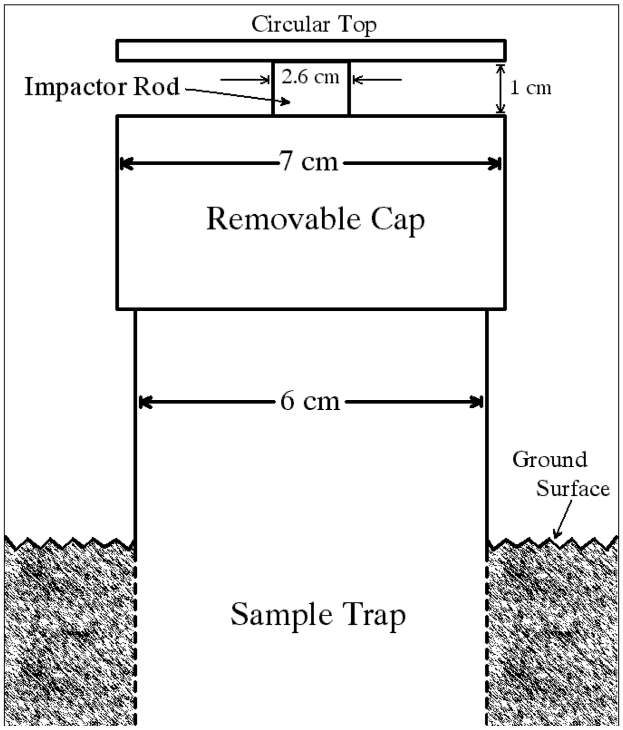


Figure 2.3 Photo of Cox Sand Catcher (CSC) with Inner Sampling Tube Removed

Figure 2.4 An example of the linearity between CSC mass and a Sensit reading (Sensit No. 7291 using total kinetic energy)

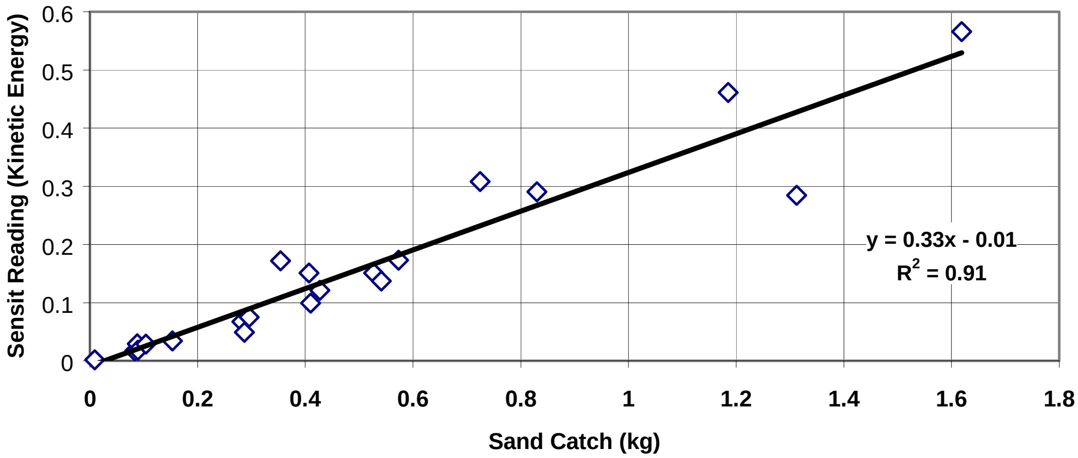


Figure 2.5 Example of a CSC and Sensit Field Documentation Form.

Sensit/CSC Field Form

Technician: Date (mm/dd/yyyy): / /

Site #	Time PST	Pre-Sensit Height, cm	Sensit Response	Final Sensit Height, cm	Pre-CSC Inlet Height, cm	Field Cal Weight, kg	CSC Full, kg	CSC Tare, kg	Final CSC Height, cm
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	
	:					.	.	.	

Marble Rankings: 0=No Crust 1=Complete Damage 2=Indent or Surface Damage 3=No Damage 4=Wet

Site #	Rank	Surface Description	Comments and Maintenance

Delivered By:	Date:
Received By:	Date:

3. Protocol for Measuring Ambient PM_{10} and Meteorological Conditions

3.1. Objective

Ambient PM_{10} monitors will be placed at locations around the shoreline of Owens Lake and on the lake bed to monitor the ambient air for exceedances of the PM_{10} NAAQS and to develop K-factors for modeling PM_{10} emissions from lake bed sources.

3.2. Methods and Instrumentation for PM_{10} and Meteorological Data

PM_{10} monitoring will be performed using USEPA-approved reference or equivalent method monitors. The current monitoring network shown in Exhibit 2, Attachment 1 includes seven PM_{10} monitor sites - Keeler, Lone Pine, Olancha, Dirty Socks, Shell Cut, Ash Point and Flat Rock. Each PM_{10} site is equipped with a Tapered Element Oscillating Microbalance (TEOM) PM_{10} monitor. TEOM monitors are capable of measuring hourly PM_{10} concentrations. The Dust ID Program will rely on the TEOM to determine if an exceedance is caused by a lake bed source, since the data can be correlated with hourly wind directions to determine dust source directions. TEOM data will also be used to generate K-factors to model the PM_{10} emissions from lake bed sources.

Ten-meter meteorological towers will be located near each PM_{10} monitor site and at other locations around the lakeshore and on the lake bed. The current met sites are shown in Exhibit 2, Attachment 1. The met data are used to create wind fields with the CALMET model that are used with CALPUFF to model air quality impacts. The met towers include instrumentation to measure wind speed, wind direction, and temperature. Two lake bed met sites (A & B Towers) measure wind speed at different heights to determine surface roughness and vertical wind speed profiles.

3.3. Operating Procedures, Instrument Calibration and Quality Assurance

PM_{10} monitoring will be performed in accordance with USEPA monitoring guidelines found in 40 CFR, Part 58 and meteorological monitoring will be performed in accordance with USEPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volumes I, II, and IV.

3.4. Data Handling and Data Access via Modem

TEOM PM_{10} data will be delivered to Data Processing on a routine monthly schedule. After the data pass the proper data review and QA checks they will be submitted to the USEPA's AIRS database. PM_{10} data from monitors located on the lake bed will not be submitted to the AIRS database.

Most PM_{10} sites and some met sites are equipped with modem links that allow for access to the hourly concentrations. These data are useful for alerting field personnel to possible new sources of PM_{10}, and for alerting the public in case of high concentrations. For hourly concentrations above 400 µg/m^3 the District will issue public health advisories when the communities of Keeler, Lone Pine or Olancha are affected.

4. Protocol for Observing and Mapping Source Areas and Dust Plume Paths

4.1. Objective

The objective for source area mapping is to use the best available information from visual observations, GPS mapping, and sand flux measurements to delineate the boundaries of dust source areas for as many events as possible. This information will be used to help delineate the control area boundaries for new sources.

4.2. Methods and Instrumentation

The Dust ID Program includes four methods to help locate dust source areas and to delineate the source area boundaries. The methods are: 1) visual mapping by trained observers, 2) time-lapse cameras, 3) surface inspections with GPS mapping, and 4) sand flux activity (as measured with Sensits and CSCs).

4.2.1 Mapping Dust Source Areas from Off-Lake Observation Sites

One or more trained observers will complete observations from viewpoints to best observe the active dust source areas. For instance, two observers may be at viewpoints on the east side of the dust plume in the Inyo and Coso Mountains and a third may be on the west side in the Sierra. The observers will map the visible boundaries of any dust source areas and the plume direction every hour. The observers will also note if a visible plume crosses the shoreline. Figure 4.1 shows an example of sand flux measurements and the cumulative information that can be collected by observers mapping the dust plumes from different locations.

4.2.2 Video Cameras

Remote time-lapse video cameras will record dust events during daylight hours. This information will be reviewed to help identify new source areas that may have been missed by observers, or to help confirm source area activity detected by PM_{10} monitors or the sand flux network. Remote time-lapse video can also be used to help verify modeled impacts that were not monitored by the PM_{10} network, to check compliance of dust control areas, and to identify off-lake sources not measured by any of the other methods.

4.2.3 Mapping Using GPS

4.2.3.1 "Trigger" Levels for Initiating Field Inspections and GPS Surveys

Dust observations, Sensit activity, elevated PM_{10} concentrations and video will be used as "trigger data" to determine the time and location for a Dust Source Area Survey (survey). Sensit and PM_{10} data will be automatically collected via radio transmission every workday morning. A technician will summarize and review the data each workday. The summary will list all Sensit activity greater than background output levels, and hourly TEOM PM_{10}

concentrations over 50 µg/m^3 with corresponding wind speed and direction data. If dust observations are available from a recent dust storm, they will be used to confirm the location of the dust source(s) that correspond with the Sensit activity and elevated PM_{10} concentration. Video will be used to identify a source or sources that were not identified by observations, Sensit data or PM_{10} information. The wind speed and wind direction data will be used to help determine if a lake bed dust source could have caused elevated PM_{10} concentrations. All of the trigger information will be used to identify any new dust source area to initiate a dust source survey and/or surface inspection. The survey should be completed the same day if weather conditions are favorable. For larger areas, surveying may continue for several days or until precipitation obscures the boundaries of the source area.

In addition to the above process, general field inspections will be completed after dust storms to verify lake bed emission activity and the need for a survey. A survey will be completed if the trigger data and /or field inspections indicate emissive conditions in an area that has not been previously surveyed during the current dust period (Section 4.3) or in an area that has been previously surveyed but has increased in size since its last survey. The priorities for completing a survey are: first, new areas outside the instrumented Sensit grid; second, new areas that have not been surveyed within the instrumented Sensit grid; and third, areas that have previously been surveyed, but have increased in size. Dust sources areas that are uncontrolled and are located within areas that have been identified for dust control measures do not need to be surveyed.

4.2.3.2 GPS Mapping Procedures

After a dust source is identified by dust observation, Sensit data, sand catch data, video, PM_{10} concentration or inspection of the lake bed surface, Great Basin staff will map the exterior boundary of as many of the source areas identified as possible during daylight hours, as weather conditions allow. The mapping will begin as soon as possible after a dust storm and continue until all the identified areas are mapped or precipitation occurs. The boundary of the emissive area(s) will be mapped using a Global Positioning System (GPS). Surveyors conducting the mapping will ride an ATV or walk around the outer boundary of the wind-damaged surface surveying a line with the GPS. A wind-damaged surface is defined as a soil surface with wind erosion evidence and/or aeolian deposition that has not been modified to an unrecognizable point by precipitation since the last identified dust storm.

GPS line data should be collected at an interval of one record every 10 seconds or less. Data should be collected in NAD83 UTM Zone 11 coordinates. Examples of acceptable GPS units include the Trimble Pro XRS, Trimble GeoXT, Ashtech Ranger or any other GPS unit capable of the continuous recording of line data. Data should be processed and corrected using base station data (either from a satellite service or using data from the District's Keeler base station) to ensure greater horizontal accuracy.

Before beginning a survey, the edge of the source area is determined by a visual review of the surface conditions within a representative one square meter area along the edge of the source area. An undamaged surface is evident if there is no visible evidence of a disturbed lake bed surface due to wind damage. As an aid to calibrate the level of disturbed surface, a surveyor will begin each survey by estimating the percentage of surface that is undamaged by the wind. The surveyor visually determines where a surface with 70 to 80 percent of undisturbed surface is located. The surveyor completes the survey by following a line of travel that closely represents the initial one-meter calibration. The following defined list, Boundary Conditions and Survey Procedures (see below), can be used to determine how to map the source boundary under differing surface boundary conditions.

Boundary Conditions and Survey Procedures:

Distinct Boundary: A visibly sharp transition, 25 feet or less in width, between a wind-damaged lake bed surface and an undamaged lake bed surface. The surveyor should travel directly along this distinct outside edge, if possible, and may deviate 25 feet to the inside or outside on occasion. Small (25-foot wide or less) channels, boundary indentations, roads, mounds, and other obstacles may be directly crossed if the continuation of the main source boundary is clearly visible on the opposite side.

Diffuse Boundary: A visibly distinct transition, 25 to 100 feet in width, between a wind-damaged lake bed surface and an undamaged lake bed surface. Every effort should be made to travel along the outermost edge of the visible distinction.

Indistinct Boundary: A boundary that is not obvious to the surveyor where the edge of the source is located. Mapping would be stopped at this point until a Distinct or Diffuse Boundary could be located.

Generally the surveyor will maintain a constant course of travel following the Distinct outer boundary of the wind-damaged area. As the boundary becomes less distinct it is recommended to move the course of travel further into or outside the source to maintain recognition of surface damage. It is acceptable to travel within approximately 50 feet of the outer or inner edge of the larger more noticeable active area if the boundary is Diffuse. When encountering an Indistinct Boundary condition the surveyor should note if the boundary can be found or if the boundary cannot be mapped during the existing survey and why. If the boundary cannot be mapped, the survey shall end at that point leaving an unclosed source area polygon.

It is possible for the surveyor to find himself or herself greater than 50 feet within or outside of the source area boundary. When this happens, the surveyor should turn perpendicular to the direction they were traveling and travel in the direction where the distinct edge should be located. For example, if the surveyor were inside the source area they would turn in the direction where erosion evidence was not observed earlier along their path. If the surveyor were outside the source area they would turn toward the side where they previously observed the source. Boundary loss may occur because of an Indistinct Boundary or unfavorable lighting conditions. The time and coordinates should always be noted when it is necessary to relocate the boundary during a survey.

Another alternative for relocating a source area edge is to pause the GPS unit from recording data until the boundary is located and then resume with data collection. This allows the surveyor to travel in any direction until the edge is relocated or end the survey if an edge cannot be located. The line produced between the point where the GPS unit was paused and then restarted would be deleted and considered un-surveyed during post processing.

The presence of Indistinct Boundaries or conditions that cause the ending of a survey must be annotated on the GPS data or explained in the field notes, including point coordinates. Examples would include dust storm, precipitation, lightning, mud, and channel with flowing water, pond, and time restraint or equipment malfunction.

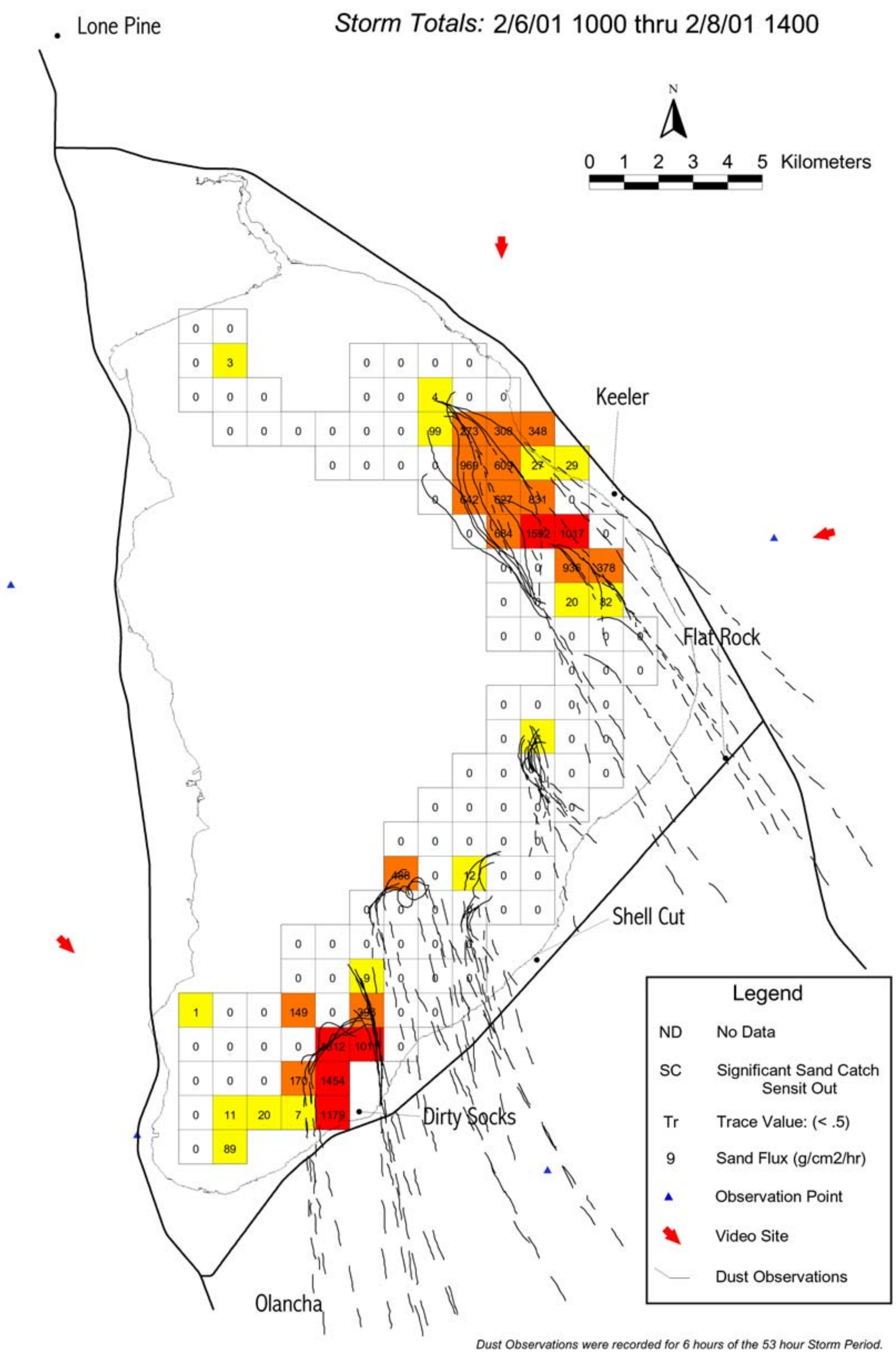
4.2.4 Using Sand Flux Monitors to Map Source Area Boundaries

Dust source area boundaries can be delineated or refined using the cell boundaries represented by active sand flux monitors. The area represented by the active SFM site may be shaped to exclude non-emissive areas, such as; DCM areas, wetlands, or areas with different soil texture where there is evidence that it is non-emissive.

4.3 Composite Dust Source Map Development

Data Processing will compile the cumulative mapping information from the visual observers and field inspections using the GPS into a GIS database for two periods each year, December through June and July through November. A new composite map will be developed for each period containing only those data collected during that period. Hand drawn observation maps will be scanned and translated into the GIS database. Observation maps will be compared with source area locations from other methods through the GIS generated layers. Overlays of the maps generated from sand flux monitors, video cameras, visual observers and GPS'd source areas will be compared qualitatively, considering the information may have been collected at different times.

Figure 4.1. Example of dust plume maps drawn by observers during daylight hours and total sand catch for a dust event on February 6-8, 2001.



5. Protocol for Determining K-factors and PM_{10} Emission Rates from Sand Flux Data

5.1. Objective

The objective of this portion of the Dust ID Program is to estimate the PM_{10} emission flux for each grid cell or area using the relationship *PM_{10} emission flux = sand flux x K-factor*. PM_{10} emissions for each area will be used with the CALPUFF modeling system or other USEPA approved model to determine if the PM_{10} emissions will cause or contribute to a NAAQS violation at the shoreline.

5.2. Method for Determining PM_{10} Emissions and New K-factors

5.2.1. PM_{10} Emission Flux = Sand Flux x K-factor

PM_{10} emissions will be estimated using the sand flux for each area represented by a Sensit and CSC and an appropriate K-factor for the area and period. The sand flux values will come from the Sensit and CSC data as discussed in Section 2. New K-factors for each area and period will be developed as discussed in this section, and default K-factors will be used to model dust events until newer K-factors are determined.

5.2.2. Default Temporal and Spatial Storm-average K-factors

PM_{10} emissions may be estimated from default K-factors that were developed from previous dust events that occurred in the same area and the same range of calendar months in previous years.

The areas for K-factor groupings are shown in Exhibit 2, Attachment 1; the North Area, Central Area, Keeler dunes, and the South Area. Any new source area within the depicted boundaries will be associated with that area for the spatial grouping of new K-factor values. If a new source area and K-factor is developed for an area outside these boundaries, the area and K-factor will be associated with the closest similar surface soil texture area for spatial grouping.

5.2.3. Method to Determine Sand Flux from Areas with Implemented Dust Control Measures (DCM)

As Dust Control Measures are implemented new K-factors will be calculated for the DCM area.

Shallow Flood

1) A number of Sensits and CSCs approximately equal to the number of square kilometers in a contiguous Shallow Flood area (Area) will be installed in normally dry portions of that Area. The Sensits will be sited in accessible portions and will be approximately evenly distributed over the Area.

2) The hourly sand flux measurements will be averaged over all the Sensits in an Area.

3) Each grid cell in the Area will be assigned a fraction of the area in that cell that is dry based upon the District's Shallow Flood performance standards compliance evaluation. This dry fraction will be updated with each compliance evaluation, and will apply to the CSC collection period(s) closest to the date of the compliance evaluation imagery.

4) The hourly sand flux for each grid cell (n) for hour t will be determined by

Equation 5.1

$$\bar{q}_{n,t} = DF_{n,t} \times \frac{\sum_{n=1}^{N} q_{n,t}}{N}$$

Where,

$\bar{q}_{n,t}$ = Average hourly sand flux for cell n during hour t (g/cm^2/hr)
$DF_{n,t}$ = Dry fraction of cell n for hour t (from compliance evaluation)
$q_{n,t}$ = hourly sand flux at site n, for hour t using Equation 2.1 or 2.2
N = number of cells with Sensits in the DCA.

5) For data collected before all the Sensits are moved to dry areas, $DF_{n,t}$ will be set to 1 in Equation 5.1.

Managed Vegetation

1) The existing Sensit and CSC network in the Managed Vegetation areas will be used.

2) All Sensit sand fluxes within a Managed Vegetation area will be averaged for that hour and applied to all cells in that Area for that hour.

Equation 5.1 can be used for managed vegetation DCA's to estimate the hourly average sand flux for each hour by assuming $DF_{n,t} = 1$.

5.2.4. New K-factors Seasonal Cut-points

The APCO will review the K-factor data and propose seasonal cut-points to the LADWP. LADWP will respond to the proposed cut-points within 30 days. If no agreement can be reached within 60 days, the default periods will be used.

The two default periods to be used are: the winter/spring period that includes the months of December, January, February, March and April, and the summer/fall period that includes May through November. These same calendar months will be used to generate new temporal K-factors for each area and to generate new 75-percentile hourly K-factor values for modeling PM_{10} emissions.

5.2.5. Using CALPUFF Modeling System to Generate New K-factors

New hourly K-factors can be inferred from the CALPUFF model by using hourly sand flux as a surrogate for PM_{10} emissions. Modeled PM_{10} predictions can then be compared to monitored concentrations at PM_{10} monitor sites to determine the K-factor that would correctly predict the monitored concentration for each hour. More information on the modeling procedures is included in Section 6.

A K-factor of 5×10^{-5} will be used initially to run the CALPUFF model and to generate concentration values that are close to the monitored concentrations. Hourly K-factor values will then be adjusted in a post-processing step to determine the K-factor value that would make the modeled concentration match the monitored concentration at the PM_{10} monitor site. The initial K-factor will then be adjusted using Equation 5.2.

Equation 5.2

$$K_f = K_i \left(\frac{C_{obs.} - C_{bac.}}{C_{mod.}} \right)$$

Where,

K_i = Initial K-factor (5×10^{-5})
$C_{obs.}$ = Observed hourly PM_{10} concentration. [µg/m^3]
$C_{bac.}$ = Background PM_{10} concentration
$C_{mod.}$ = Model-predicted hourly PM_{10} concentration. [µg/m^3]

5.2.6. Screening Hourly K-factors

K-factors will be calculated for every hour that has active sand flux in cells upwind from a PM10 monitor. These hourly K-factors will be screened to remove hours that did not have strong source-receptor relationships between the active source area (target area) and the downwind PM_{10} monitor. For example, the screening criteria will exclude hours when a PM_{10} monitor site is located on the edge of a dust plume. Because the edge of a dust plume has a very high concentration gradient a few degrees error in the plume direction could greatly affect the calculated K-factor.

The following criteria will be used to screen the hourly K-factors:

<u>Initial K-factor Screen</u>

1) Wind speed is greater than 5 m/s at 10-m height at any station in the Dust ID network.

2) Hourly modeled and monitored PM_{10} concentrations were both greater than 150 µg/m^3 at the same monitor-receptor site.

3) Hourly wind direction as listed in Table 5.1 for each monitor site.

4) The mean sand flux for all sites with non-zero sand flux is greater than 0.5 g/cm^2/hr.

Final K-factor Screen

5) At least one sand flux grid center located within the target area and within a 30-degree upwind cone has sand flux greater than 2 $g/cm^2/hr$.

6) All sources are within a distance of 15 km of the receptor.

7) More than 65 percent of the PM_{10} contribution at a monitor site came from the target source area (North Area, South Area, Central Area or Keeler dunes).

8) Eliminate hours when sand flux data are missing from one or more cells that are located within a 30-degree upwind cone and within 10-km of the shoreline monitor. For Olancha and Lone Pine, which are both located 5 to 10 km from the lake bed, the distance limitation is changed to 10 km upwind of the shoreline.

The from-the-lake wind directions for the initial K-factor screening criterion 3), above, are shown in the Table 5.1. From-the-lake wind directions for any new PM_{10} sites will be determined by the APCO as needed for the initial K-factor screen.

Hourly K-factors that pass through the screening criteria will be used to develop new event-specific spatial K-factors, and new 75-percentile hourly average temporal and spatial K-factors, if enough K-factors are available.

5.3. Temporal and Spatial Event-specific K-factors

5.3.1. Event-Specific K-factors

Screened hourly K-factors will be used to generate event-specific K-factors for the active source areas. The event-specific K-factor will be calculated as the arithmetic average using all the hours when the hourly K-factor passes the screening criteria for the target area.

5.3.2. Temporal & Spatial 75-Percentile K-factors

The statistical 75-percentile value will be determined from the distribution of the hourly K-factors that pass the screening criteria for that area and period, whenever there are nine or more hourly K-factors. The 75^{th} percentile will be calculated using the Microsoft Excel PERCENTILE function. The Microsoft Excel PERCENTILE function works by sorting values from lowest to highest, then assigns the 0^{th} percentile is the lowest value, the 100^{th} percentile is the largest value, and the values in between as (k-1)/(n-1) where n is the number of data values in the list and k is index of the k^{th} lowest value in the list. Thus, each value is placed 1/(n-1) apart. If a requested percentile does not lie on a 1/(n-1) step, then the PERCENTILE function linearly interpolates between the neighboring values.

5.3.3. Default K-factors

Table 5.2 shows the default K-factors for each of the K-factor areas and periods. These K-factors are derived for the temporal and spatial 75-percentile values from the screened hourly

K-factors for the 30-month Dust ID period used for the 2003 SIP. Each of the two temporal periods combines hourly K-factors from the same calendar periods for 2 or 3 years.

Table 5.1 Wind Directions for the Initial K-factor Screen

PM_{10} Monitor Site	From-the-Lake Wind Dir. (Deg.)	Met Tower
Lone Pine	110≤WD≤190	Lone Pine
Keeler	130≤WD≤330	Keeler
Flat Rock	210≤WD≤360	Flat Rock
Shell Cut	WD≥210 or WD≤50	Shell Cut
Dirty Socks	WD≥220 or WD≤65	Dirty Socks
Olancha	WD≥320 or WD≤55	Olancha
New Sites	TBD	TBD

Note: The "From-the-Lake" wind directions in the Supplemental Control Requirements are different from these K-factor screening wind directions.

Table 5.2 Default Spatial and Temporal K-factors for the Dust ID Model

AREA	K-factor Jan.– Apr. & Dec.	K-factor May-Nov.
Keeler Dunes	7.4×10^{-5}	6.0×10^{-5}
North Area	3.9×10^{-5}	1.5×10^{-5}
Central Area	$12. \times 10^{-5}$	6.9×10^{-5}
South Area	4.0×10^{-5}	1.9×10^{-5}

6. Protocol For Dispersion Modeling

This section of the *Protocol* discusses the dispersion model methods planned for the simulation of wind blown dust at Owens Lake using data from the Dust ID Program. The modeling procedures follow the methods used in the 2003 SIP, with refinements based on experience and modifications to support the provisions of the SCR. The modeling techniques will be used both diagnostically to infer emission rates for source areas and prognostically to predict PM_{10} concentrations at the historic shoreline. Following an overview of the modeling approach, the remainder of this section discusses construction of the meteorological data set, dispersion model options, background concentrations and source area characterization.

6.1. Overview of Modeling Procedures and Rationale for Model Selection

The CALPUFF modeling system was used in the 2003 SIP and has been selected for continuing studies in the Dust ID Program. CALPUFF is the USEPA recommended modeling approach for long-range transport studies and USEPA has proposed CALPUFF as a *Guideline Model* to be included in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W). Recently the modeling system is also being applied to near-field dispersion problems where the three-dimensional qualities of the wind field are important and for stagnation episodes when pollutants remain within the modeling domain over periods of several hours or more. Dust events on Owen Lake are sometimes influenced by complex wind patterns, with plumes from the North Sand Sheet traveling in different directions than plumes from the South Sand Sheet.

The proposed model domain shown in Figure 6.1 includes a 34 km-by-48 km area centered on Owens Lake. The meteorological and computational grid will use a one-kilometer horizontal mesh size with ten vertical levels extending from the surface to four kilometers aloft. The extent of the model domain was selected to include the “data rich” Dust ID Program study area, terrain features that act to channel winds, and receptor areas of interest. This same model domain and mesh size were used in the simulations supporting the 2003 SIP.

6.2. Meteorological Data Set Construction

Three-dimensional wind fields for CALPUFF will be constructed from surface and upper air observations using the CALMET meteorological preprocessor program and the procedures employed in the RSIP. CALMET combines surface observations, upper air observations, terrain elevations, and land use data into the format required by CALPUFF. Winds are adjusted objectively using combinations of both surface and upper air observations according to options specified by the user. In addition to specifying the three-dimensional wind field, CALMET also estimates the boundary layer parameters used to characterize diffusion and deposition by the CALPUFF dispersion model.

6.3. CALPUFF Options and Application

Surface Observations. The necessary surface meteorological data will come from the District’s network of ten-meter towers shown in Figure 1.1. The District may also install additional stations to better characterize winds near suspect source areas not currently near an existing site. Very few periods of missing data are typically contained in the District's database. Periods of missing data will be flagged and CALMET will construct the wind fields using the data from the remaining stations. In addition to the District's network, surface data from other field programs at Owens Lake will be used when available. In the past, wind data from Los Angeles Department of Water and Power's (LADWP's) monitoring program on the South Sand Sheet and Desert Research Institute's field programs on the North Sand Sheet and near the DIVIT site have been used.

Cloud cover data. The current version of CALMET also requires cloud cover and ceiling height observations. Cloud cover is a variable used by CALMET to estimate the surface energy fluxes and, along with ceiling height, is used to calculate the Pasquill stability class. Hourly cloud cover and ceiling height observations are being collected from the surrounding surface airways observations at China Lake and Bishop Airport. During dust event conditions, the sensitivity of the CALPUFF modeling system to these variables is reduced, as the stability class becomes neutral under moderate to high winds. Algorithms within the modeling system that depend on the surface energy fluxes are dominated by the momentum flux and tend to be insensitive to cloud cover under high winds. For these reasons, the absence of local cloud cover and ceiling height measurements are not expected to significantly affect the results of the modeling study.

Surface Characteristics and Terrain. The CALPUFF modeling system requires land use and terrain data. These data are used by CALMET to adjust the wind field and affect the calculations performed by the CALPUFF dispersion model. CALPUFF considers spatial changes in land use, including the surface roughness, and the input data are specified on a horizontal grid. The terrain data influence the constructed wind fields and plume trajectories in regions of sparse observations. Land use and terrain data have been obtained from the U.S. Geological Survey (USGS) data sets on the Internet. The resolution of these land use and terrain data sets are 200 m and about 30 m, respectively. MFG has prepared these data sets using the pre-processing software provided with the CALPUFF modeling system. The resulting grids have been plotted and checked against data from the District's GIS database where the modeling domain overlaps the District's data. The 1-km mesh size terrain used by CALMET and CALPUFF is shown in Figure 6.1.

Upper air data. Upper air data will be collected from a number of different sources for construction of the wind fields and estimation of mixing heights with CALMET. In the 2003 SIP, both local and regional data were collected as follows:

- A 915 MHz Radar Wind Profiler and Radio Acoustic Sounding System (RASS) were used to collect upper level wind and temperature measurements. The Wind Profiler was initially located at Dirty Socks then moved to the Mill Site during the 4th quarter of 2001. The Wind Profiler with RASS samples wind and temperature from 100 m, up to 5000 m with a vertical resolution as low as 60 m depending on the clutter environment, atmospheric scattering conditions, and pulse length. Experience at Owens Lake indicates wind data recovery is sometimes poor above 1000 m due to the dry environment and the RASS data are limited to the lower levels during windy conditions.

- Regional twice-daily upper air soundings from Desert Rock Airport (Mercury, Nevada) and China Lake Naval Air Station.

The District has decided to discontinue measurements with the Wind Profiler as of June 30, 2003. During high wind events, observations from the Wind Profiler at both the Mill Site and Dirty Socks indicate very little wind speed or wind direction shear with height. Previous CALPUFF simulations suggest concentrations predicted at PM_{10} monitoring sites and at the historical shoreline are not usually influenced by upper level winds because the sources are ground based. The highest impacts occur close to the source areas, and there is very little wind shear during high winds.

While still operating, hourly wind and temperature data from the Wind Profiler and RASS will be used for as many vertical levels as possible. In order to extend the profiles aloft near the profiler, 500-mb data will be stripped from the China Lake (Desert Rock when missing) sounding. Since the soundings are generally taken at 12-hour intervals, it is necessary to interpolate between the observation times to match the hourly Wind Profiler data.

Following removal of the Wind Profiler, soundings from China Lake and Desert Rock will be used to construct the data set. The China Lake and Desert Rock sounding will primarily be used for upper level temperature lapse rates. Winds aloft will be based on extrapolation of the surface wind measurements. The default algorithms employed by CALMET based on Similarity Theory often adjust the winds in the wrong direction and predict too much increase in wind speed with height even for very small surface roughness lengths. As an alternative, wind speeds aloft will be adjusted using the empirical results suggested by the previous Wind Profiler measurements. No wind direction turning with height will be assumed except near the Wind Profiler site where the actual data will be used until this program is discontinued.

CALMET options. The options employed for the application of CALMET to construct the wind fields were provided in the “Modeling Protocol” (MFG, 2001). The majority of the selected model options are based on the defaults incorporated in the code by the model author. Notable model options include:

- Ten vertical levels varying geometrically from the surface to 4000 m. The geometric spacing provides better resolution near the surface and the upper limit is high enough to be above the boundary layer height.

- Vertical extrapolation of surface winds aloft using the results of the Wind Profiler studies.

- Less than default smoothing of wind fields. LADWP contractors Air Sciences and Environ suggested less smoothing of the wind fields by CALMET after review of the *Owens Valley PM_{10} Attainment Demonstration Modeling Protocol*.

The wind fields constructed with CALMET will be randomly checked by plotting the resultant fields and the surface observations on a base map. The CALDESK^{TM} software package will also be used to view the CALMET wind fields.

The application of CALPUFF involves the selection of options controlling dispersion. Although the simulations are primarily driven by the meteorological data, emission fluxes, and source characterization, the dispersion options also affect predicted PM_{10} concentrations. The model options used in the RSIP will continue to be used for the Dust ID Program. Appendix B provides an example listing of a CALPUFF input file for simulation of June 2002. In this study, the following options will be used for the simulations:

- Dispersion according to the conventional Pasquill-Gifford dispersion curves. Sensitivity tests were also performed by applying CALPUFF with dispersion routines based on Similarity Theory and estimated surface energy fluxes. These tests did not indicate improved performance over the Pasquill-Gifford based simulations.
- Near-field puffs modeled as Gaussian puffs, not elongated "slugs." CALPUFF contains a computation intensive "slug" algorithm for improved representation of plumes when wind directions vary rapidly in time. This option was tested, but did not significantly influence the CALPUFF predictions.
- Consideration of dry deposition and depletion of mass from the plume. The particle size data used will be based on measurements taken within dust plumes on Owens Lake as discussed below.

Dry deposition and subsequent depletion of mass from the dust plumes depend on the particle size distribution. Several field studies have collected particle size distributions within dust plumes at Owens Lake. Based on results from Niemeyer, *et al*. (1999), the CALPUFF simulations will assume a lognormal distribution with a geometric mean diameter of 3.5 µm and a geometric standard deviation of 2.2.

6.4. Background PM_{10} Concentrations

The dispersion model simulations include only wind blown emissions from the source areas with sand flux activity measurements. During high wind events other local and regional sources of fugitive dust also contribute to the PM_{10} concentrations observed at the monitoring locations. In the 2003 SIP a constant background concentration of 20 $\mu g/m^3$ was added to all predictions to account for background sources. The constant background was calculated from the average of the lowest observed PM_{10} concentrations for each dust event when 24-hour PM_{10} concentrations at any of the sites were above 150 $\mu g/m^3$. To avoid including impacts from lake bed dust source areas in the background estimate, the procedures used a simple wind direction filter to exclude hours when the lake bed may have directly influenced observed PM_{10} concentrations. Such hours were removed and daily average background concentrations were recalculated based on the remaining data.

Additional PM_{10} monitors are proposed for installation at Owens Lake. These monitors can be used to measure hourly PM_{10} concentrations upwind from lake bed source areas. Some of these monitors may be representative of regional PM_{10} concentrations and others may be influenced by local sources that may indicate a higher PM_{10} concentration than the regional background level. A method to calculate background concentrations based on upwind monitor concentrations for each modeled-event approved by both the APCO and the General Manager of the LADWP may be developed in the future. Meanwhile, a default background of 20 $\mu g/m^3$ will be added to the model prediction for each receptor location.

6.5. Area Source Characterization

CALPUFF simulations at Owens Lake are sensitive to source configuration. Emissions will be varied hourly according to the methods described in Section 6.6 and dust sources represented as rectangular area sources. CALPUFF contains an area source algorithm that provides numerically precise calculations within and near the area source location. The area source configuration used in the 2003 SIP is shown in Figure 6.2. In most instances, the paired Sensit™ and CSC measurements were assumed to be representative of the horizontal sand flux for the one square kilometer surrounding the measurement location. In some instances, these one square kilometer areas contain wetlands where little or no significant PM_{10} emissions are expected. For these areas, the sources were divided into smaller pieces and the wetlands removed. In addition, for two regions shown in Figure 6.2 the source areas were extended to neighboring cells without Sensit™ measurements. These areas were included in the simulations based on visual inspection and GPS mapping of the erosive areas following dust events.

Source area boundaries in the simulations supporting the Dust ID Program will be refined from those used in the 2003 SIP. With implementation of the DCM's on the lake bed, emissions from the larger sources on the lake bed will be reduced allowing study of the smaller remaining sources. The District anticipates adding further sand flux monitoring sites and performing more visual inspections of the source area boundaries aided by GPS mapping when conditions permit. These data will be used to characterize source areas on the lake bed using the following general rules:

- Actual source boundaries will be used when available to delineate emission sources in the simulations. Actual source boundaries will be determined using a weight-of-evidence approach considering visual observations, GPS mapping, and surface erosive characteristics. Erosive characteristics that might be considered when defining a source boundary include properties of the soil, surface crusting, wetlands, and the proximity of the brine pool.

- Source boundaries will also be defined based on the DCM locations. For example, sand flux measurements outside the DCM will be assumed to apply up to the boundary of the DCM. Sand flux measurements inside the DCM will be assumed to apply to the area inside the DCM.

- Irregular shaped source areas will be represented by rectangular area sources in the simulations. The maximum area source size will be 1.0 x 1.0 km. The minimum size will be 250 m x 250 m. Close to the shoreline and monitoring sites, the District may elect to use even smaller rectangular area sources if the simulations prove to be sensitive to the size of the area sources.

- When actual source boundaries cannot be established, source areas will be simulated using the same configuration as used the 2003 SIP shown in Figure 6.2.

- As rectangular area sources are added to define irregular shaped dust emission sources, the total number of sources in the simulations will increase and there will be many more source areas in the simulations than sand flux monitoring sites. For each rectangular area source in the simulations, the APCO will assign a sand flux monitoring site to represent activity for that source.

6.6. Estimation of PM_{10} Emissions

Hourly PM_{10} emissions for each source area will be estimated using Dust ID sand flux data and K-factors following the procedures described in Section 5.

6.7. Simulation of Shoreline Concentrations

Under the provisions of the SCR in the 2003 SIP, CALPUFF simulations will be used to assess whether lake bed source areas cause or contribute to an exceedance of the PM_{10} NAAQS in areas without PM_{10} monitoring sites. Predictions will be obtained using the 2003 SIP receptor network that contains more than 460 receptor locations placed at the historic shoreline (approximately at the 3600' elevation) of Owens Lake (Figure 6.2). The receptor spacing along the historic shoreline ranges from 100 to 200 m. Note in several locations along the shoreline, receptors are very close to or even within potential source areas.

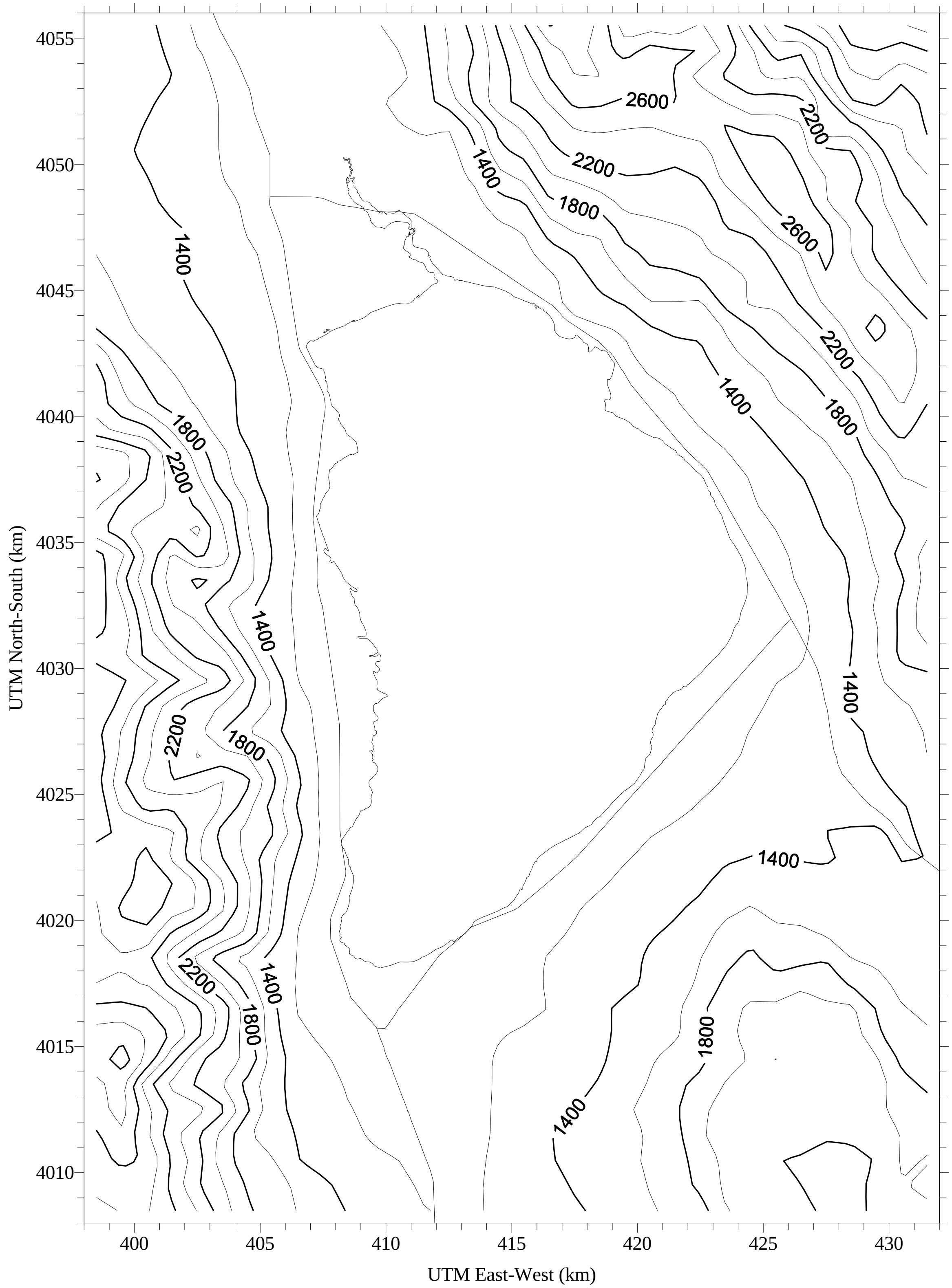


Figure 6.1 Model Domain and 1-km Mesh Size Terrain (m)

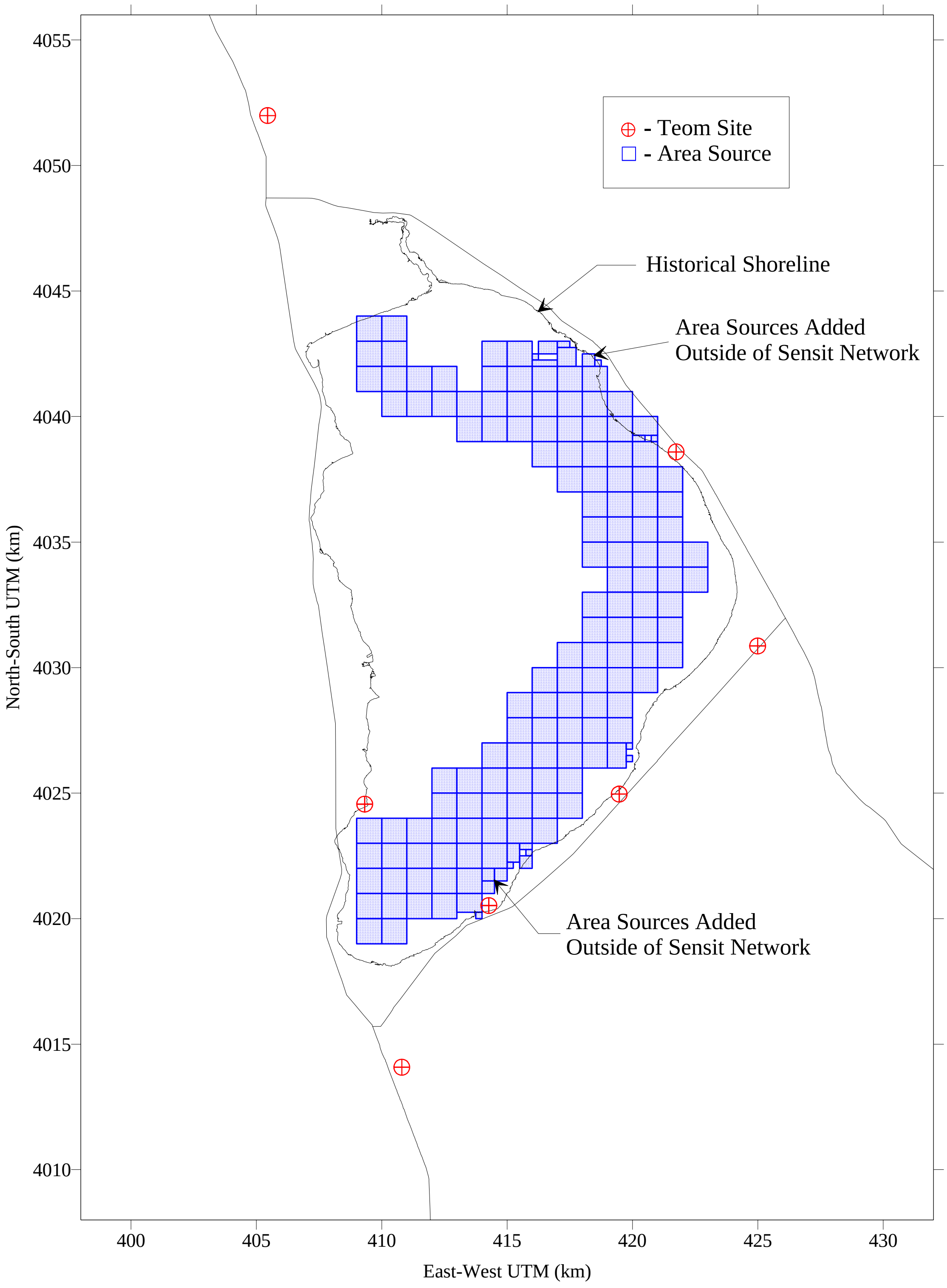


Figure 6.2 Area Source Configuration Used in the 2003 SIP

EXHIBIT 3
MODIFYING BACM FOR OWENS LAKE

The City may transition from one approved BACM to another provided that the performance standard of one or the other BACM is met at all times during the transition, and that the City makes a complete and technically well-supported demonstration of that performance, with a built-in margin of safety, to the satisfaction of the APCO in advance of any District approvals. There are three circumstances under which temporary modifications may be allowed to the BACM identified in this SIP, if certain conditions are met. The circumstances are:

1. Adjustments to existing BACM. Research to demonstrate that sufficient PM-10 control efficiency during the dust season can be achieved and the NAAQS can be attained everywhere on the historic shoreline with a different performance standard for an existing BACM.

2. Research on new BACM

3. Transition from one BACM to another that requires a time period where neither BACM's performance standards can be met.

The City may make an application for any of these modifications in writing to the APCO. The complete application must include all necessary data and other technical information to support the application. The APCO shall have full and sole discretion to accept, reject or condition the City's application for modifications to BACM on Owens Lake, to require additional technical information, and/or to independently monitor the results of the project, and shall provide her/his decision in writing. This same discretion shall apply to the APCO's consideration of each of the other applications that the City may make as further described below. The APCO will consider and respond to comments made by the City regarding any decision by the APCO to reject, condition or modify an application. Failure by the City to comply with any condition of the project approval may result in the APCO revoking the project approval and directing closure procedures be implemented for the project.

U.S. EPA's Natural Events Policy will not be applied to monitoring data used to make the determinations in this Exhibit. All monitored PM_{10} concentrations that meet the EPA quality-assurance requirements contained in 40 CFR Part 58 and are measured at stations located at or no more than 3 kilometers above the historic shoreline (shoreline monitors) will be used in the analysis. The monitored values will be used as measured, and will not be adjusted for from-the-lake and non-lake wind directions as they are for the Supplemental Control Requirements. The modeling for the determinations will be performed in accordance with the Dust ID Protocol (Exhibit 2, Attachment 4).

Requirements for BACM Adjustment

Requirements to Begin the Process
In 2008, and during each subsequent calendar year, the APCO will determine whether there were any monitored or modeled exceedances of the PM_{10} NAAQS in the previous calendar year near the historic shoreline of Owens Lake (3600-foot elevation). For the purpose of this document, NAAQS shall refer to the applicable PM_{10} standard for this RSIP, set at 150 µg/m^3 for a 24-hour average. The City will review and provide comments on the methodology and data used to make this determination. The APCO will consider and respond to the City's comments in his/her final determination. The APCO has full and sole discretion to make this determination.

If there were no monitored or modeled exceedances of the PM_{10} NAAQS as described above for the previous calendar year, each calendar year the APCO will do the following:

1) determine from the modeling if there are shoreline receptors where the model shows the combined predicted yearly maximum 24-hour contribution from all source areas on the lake bed contributing to those receptors plus background (24-hour average of 20 µg/m^3) is less than 120 µg/m^3, and

2) determine that there were no concentrations greater than 120 µg/m^3 measured at any shoreline or near-shore monitoring site in the area of those receptors.

The City may perform an independent assessment using the data and methods of the Dust ID Protocol in order to confirm the APCO's findings. The APCO will consider and respond to the City's assessment before making his/her final determination. The APCO has full and sole discretion to make this determination.

First Step on Test Areas
If there are receptors that meet the requirements described above, and provided that the City is in compliance with SIP control requirements on all areas of the lake bed, the APCO will inform the City that they may submit an application to reduce the level of control within a 1 to 2-square-mile test area of a Shallow Flooding Dust Control Measure (DCM) area or within a 160 to 320 acre test area of a Managed Vegetation DCM area that the modeling shows contributes to, and only to, the shoreline receptors described above where the yearly maximum 24-hour contribution from the lake bed plus background is less than 120 µg/m^3. Application may be made for more than one area to be tested simultaneously provided the test areas do not impact any of the same modeled shoreline receptors or monitors (no overlapping impacts).

For the Shallow Flooding DCM, water to the approved test areas may be reduced no more than 10% (one step). For the Managed Vegetation DCM, the cover may be reduced by no more than 5%, e.g. 50% to 45%, (one step). For other BACM or changes to compliance averaging areas (e.g., one acre for managed vegetation or one square mile for shallow flooding), the APCO will determine the permitted test area size, averaging area, test location and step amount. An area with a non-zero contribution to a receptor will be considered not to contribute to a receptor if the contribution from that area is less than 5 µg/m^3 and the yearly maximum 24-hour contribution from the lake bed plus background (20 $\mu g/m^3$) to that receptor is less then 140 $\mu g/m^3$. (A "zero contribution" is defined by the accuracy of the instruments used to collect the data, but in no case shall it be greater than 1 $\mu g/m^3$.)

The City's application to reduce the level of control over any area must be accompanied by a modeling analysis that demonstrates that increasing PM_{10} emissions within the test area will not cause the predicted yearly maximum 24-hour concentrations along the shoreline to exceed 120 $\mu g/m^3$, including background (20 $\mu g/m^3$).

The application must also include, but is not limited to:

1. A project description,
2. Site plan,
3. Any necessary environmental documentation,
4. A protocol to measure PM_{10} emissions and performance standards,
5. A time frame for project milestones and completion,
6. Plans to control PM_{10} emissions if they exceed project limits,
7. Project closure procedures if the project is discontinued,
8. Soil texture information, soil chemistry, groundwater chemistry and applied water chemistry, and
9. A protocol to evaluate control effectiveness, estimate emissions and determine whether the results are transferable to other areas of the lake bed.

In lieu of research results that demonstrate the relationship between the control efficiency and performance standards, the City may use the following method for shallow flooding:

For shallow flooding using a new performance standard, the estimated emissions for cell c and hour t (E_{ct}) within the proposed test area will be calculated from,

Equation 1:

$$E_{ct} = E_{uct} [1 - (0.28P+0.78)] \qquad [g/m^2/hr]$$

Where,
E_{uct} = Estimated uncontrolled emissions prior to mitigation for hour t
P = Performance standard for shallow flood, for the range $0.50 < P < 0.75$

Equation 1 cannot be used for any other BACM or outside the stated range.

The estimated uncontrolled emissions prior to mitigation for cell c (E_{uct}) will be determined from emissions measured through the Dust ID Program after implemention of BACM . Uncontrolled hourly emissions for cells within the test area will be based on the area-wide average hourly emissions for hour t in the dust control area (DCA), and the overall control efficiency for the existing BACM.

Equation 2:

$E_{uct} = E_{adt} / (1 - CE_d)$ [g/m^2/hr]

Where,

E_{adt} = average emissions for the DCA for hour t
CE_d = 0.99, or the demonstrated control efficiency based on the emissions measured in the DCA after implementing BACM.

For other BACM, the City will submit a relationship between control efficiency and performance standards based upon research results. The APCO has full and sole discretion to accept, reject, or modify that relationship. Except for the estimated emissions (E_{ct}) for cells located within the proposed test area, the modeling will be done according to the Dust ID Protocol.

Rectified aerial or satellite images of the area of adjusted BACM, or any other method approved by the APCO, will be used by the APCO to determine the performance standards for the adjusted BACM for this step and all subsequent steps.

All raw data must be shared with the APCO, and all data screening criteria must be approved (or disapproved) in writing by the APCO. The APCO may terminate the test at any time if modeling or monitoring show that modeled (including background of 20µg/m^3) or monitored emissions are increasing above trigger levels set by the APCO based upon a 140 µg/m^3 modeled or monitored PM_{10} concentration at the shoreline, or if the City is not following the APCO-approved protocol. The APCO has full and sole discretion to determine whether these conditions have been met.

The APCO has full and sole discretion to approve or reject the City's application or require conditions. The APCO will take action and notify the City in writing within 90 days of receipt of the written application. No changes may be made to BACM in advance of the APCO's approval. Any adjustments to BACM will be reported to EPA by the APCO within 60 days of the APCO's approval.

Subsequent Steps on Test Areas

The adjusted BACM shall be maintained by the City for one year. No other adjustments to BACM may be made during that year that impact any of the same set of model shoreline receptors. At the end of the year, the City may submit a new application to the APCO to reduce the level of control in the test area by another step provided:

1) the modeled yearly maximum 24-hour contribution at all of the shoreline receptors identified above from all lake bed sources including the test area, plus background (20 µg/m^3), during the test period is less than 120 µg/m^3, and

2) no concentrations greater than 120 µg/m^3 were measured at any shoreline monitor in the area of those receptors during the test period.

The new application must contain all the same elements as the original application, and all the data and modeling from the first step of the test. For shallow flooding, the test results for performance from a step must demonstrate a control efficiency greater than or equal to (within 0.5%) the predicted control efficiency based on Equation 1 in order to use Equation 1 for subsequent steps. For example, if the predicted control efficiency for a step is 95%, the test results must fall with the range 94.5% to 100% in order for Equation 1 to be used for the next step.

The APCO has full and sole discretion to approve or reject the City's application, or to require conditions. Subsequent steps may be made in the same manner. The APCO will take action and notify the City in writing within 90 days of receipt of the written application.

Requirement to Increase Controls on Test Areas

If, at the end of the year or any subsequent year before the SIP Revision to adjust BACM is approved by USEPA, the predicted yearly maximum 24-hour contribution from all lake bed sources including the test area plus background (20 $\mu g/m^3$) exceeds 140 $\mu g/m^3$ at any of the shoreline receptors identified above, and/or concentrations greater than 140 $\mu g/m^3$ were measured at a shoreline monitor in the area of the identified receptors, then the City must increase the control efficiency on the test area to the last step that achieved concentrations below the 140-$\mu g/m^3$ threshold. This action must be taken within 12 months of the written determination by the APCO that the requirements for adjusting BACM for Managed Vegetation were not met, and within 60 days of the written determination by the APCO that the requirements for adjusting BACM for Shallow Flooding were not met. The APCO has full and sole discretion to make that determination. The APCO will determine the time scale for compliance for other BACM as part of the approval of the application.

SIP Revision for BACM for the Test Area

After three consecutive years of successful operation of the adjusted-BACM test area (modeled and monitored concentrations less than 140 $\mu g/m^3$ as described above), the City may apply to the District for a SIP Revision to redefine BACM for that test area on the Owens lake bed provided:

1) the predicted yearly maximum 24-hour PM_{10} contribution for each year of the test from the test area plus background (20 $\mu g/m^3$) at all shoreline receptors is 140 $\mu g/m^3$ or less, and

2) no PM_{10} concentrations greater than 140 $\mu g/m^3$ were measured at any shoreline monitor during the three years of the test .

The APCO has full and sole discretion to determine whether these conditions have been met. After public notice and comment and a public hearing, the District Board has full and sole discretion to determine whether to adopt the SIP revision.

Lake-Wide SIP Revision for BACM for a Soil Type

If, after three consecutive years of successful operation of the adjusted-BACM test area, the predicted yearly maximum 24-hour contribution from the test area and all source areas on the lake bed plus background (20 $\mu g/m^3$) at all shoreline receptors for all three years of the test is 140 $\mu g/m^3$ or less and no concentrations greater than 140 $\mu g/m^3$ were measured at any shoreline monitor during the three years of the test, the research conducted on these test areas can be used to determine the relationship between the PM_{10} emissions, control efficiency and DCM performance standards. After the relationship has been identified, the City will use the research results in an updated modeling analysis that applies the test results to other areas on the lakebed with the same soil type (sand-dominated or clay-dominated) and under the same range of evaluated emissions or control efficiencies and performance standards as the test. The modeling will cover the entire test period, and will be done in accordance with the Dust ID Protocol. A DCM control map (map) will be prepared of lakebed control efficiencies (with corresponding DCM performance standards) that would be required to achieve the PM_{10} NAAQS everywhere along the historic shoreline with that DCM in the same soil type (sand-dominated or clay-dominated) as the test area and under the same range of control efficiencies, emissions, and performance standards evaluated in the test.

The City will then submit this draft map to the APCO for approval. The submittal must contain all the data from the test area and the modeling that produced the map. The APCO has full and sole discretion to approve, disapprove, or modify the draft map.

If the APCO approves the map, the City may apply to the District Board for a SIP Revision to redefine that BACM for that mapped area on the Owens lake bed. After public notice and comment and a public hearing, the District Board has full and sole discretion to determine whether to adopt the SIP Revision. If a SIP Revision identifying a redefined BACM for Owens Lake is adopted by the District Board and approved by USEPA, the redefined BACM may be implemented anywhere designated by the new DCM control map. If the City has implemented a different DCM in the mapped area, the requirements of the following Section titled “Transitioning From One BACM to Another BACM After 2006” must also be met. If any modeled or monitored exceedance of the PM_{10} NAAQS results from these adjustments to BACM, the requirements of this Board Order 031113-01, Paragraphs 3 and 4, Contingency Measures/Supplemental Controls, will automatically apply to increase controls on these extreme violators to restore attainment of the NAAQS.

Research on Potential New BACM

The City may test new dust control measures at any time on areas of the lakebed that are emissive, but do not fall within the 29.8 square mile 2003 SIP Revision footprint where BACM must be implemented by 2006 or any Supplemental Control Area where existing BACM has been implemented or is scheduled for implementation. If the City has tested a new control measure for three years in this manner, it may apply in writing to the APCO for a SIP Revision to designate the new dust control measure as BACM. The application must meet all USEPA requirements for BACM designation and demonstrate to the APCO’s satisfaction that the new control measure is sufficient to achieve the required PM_{10} emission reductions or control efficiency during the dust season and attain the NAAQS everywhere on the shoreline. The APCO has full and sole discretion to determine whether these conditions have been met.

The application shall include, but not be limited to:

1. A description of the new dust control measure,
2. A description of the test site and the meteorological conditions under which it was tested,
3. The measured PM_{10} emissions during the test,
4. The test time frame,

5. All raw data collected during the test,
6. All data screening criteria and final data sets,
7. Data supporting the conclusion that the required control efficiency was achieved,
8. A performance standard that the new dust control measure must meet in order to achieve the required emission reductions or control efficiency, and
9. An analysis of any environmental impacts of the dust control measure.

The application must include modeling that demonstrates that the required PM_{10} emission reductions or control efficiency can be achieved during the dust season anywhere this control measure may be implemented on Owens Lake, and the NAAQS can be met at all times everywhere along the historic shoreline.

If the APCO determines that the application is complete and the above conditions have been met, he/she will have full discretion to select or approve a method of determining compliance of the proposed new BACM with its performance standard and include that method in the description of the proposed BACM for the SIP Revision. The District Governing Board has full and sole discretion to determine whether to adopt a SIP Revision for approval of any new BACM.

Upon adoption by the District Board, approval by CARB, and submission to USEPA of a SIP Revision that identifies a new BACM for Owens Lake, the City may implement only this one new control measure on one-half square mile of the next area to be identified as needing control under the 2003 SIP Revision Supplemental Control Requirements until EPA approves this new measure as BACM. No other new control measures may be implemented on areas identified as needing control under the 2003 SIP Revision Supplemental Control Requirements until EPA approves this new measure as BACM. The District Governing Board may limit the new BACM to specific circumstances, for example, distance of the new dust control measure from the shoreline. Upon approval by USEPA, the new BACM may be implemented per the requirements described in the following section, “Transitioning From One BACM to Another BACM After 2006”, or on any subsequent areas requiring control under the 2003 SIP Revision Supplemental Control Requirements, subject to any limitation to specific circumstances.

Transitioning From One BACM to Another BACM After 2006

If the City wishes to transition from one existing BACM to another existing BACM without meeting the performance standard of one or the other BACM at all times, it may submit an application to the APCO in writing for permission to do so after 2006. The APCO has full and sole discretion to accept, reject or condition the City’s application. The transition may be done on no more than one and one-half square miles lakewide if the transition is to Shallow Flood, or 320 acres lakewide if the transition is to Managed Vegetation, at one time. The City shall not begin the transition in advance of the APCO’s written approval.

The application shall include, but not be limited to:

1. A protocol that includes a project description,

2. A site plan,
3. A plan to measure PM_{10} emissions,
4. A time frame for project milestones and completion,
5. Plans to control PM_{10} if emissions exceed any trigger value set by the APCO based upon a 140µg/m^3 modeled (including background of 20µg/m^3) or monitored PM_{10} concentration at the shoreline.
6. Data supporting the assumption that the transition can be completed and the BACM performance standards can be achieved within three years of the start-up of construction,
7. Project closure procedures if the project is discontinued for any reason or if the PM_{10} trigger value is exceeded, and
8. Any necessary environmental documentation.

The protocol must include modeling in accordance with the Dust ID Protocol that predicts that the NAAQS will be met at all times everywhere on the shoreline during the transition period, and must include a method to monitor emissions continuously throughout the transition period. The transition must be complete, and the new BACM performance standard achieved, within three years of written notification from the City to the APCO that they are no longer maintaining the performance standard for the existing BACM, and are beginning the transition.

All raw data must be shared with the APCO, and all data screening criteria must be approved (or disapproved) in writing by the APCO. The APCO may terminate the transition at any time if modeling or monitoring show that emissions are increasing above any pre-set trigger level described in 5. above or if the City is not following the APCO-approved protocol. The APCO has full and sole discretion to determine whether these conditions have been met.

If the data show to the APCO’s satisfaction that the transition has been accomplished while attaining the NAAQS everywhere at the shoreline, the City may submit an application to the APCO to allow another area to be transitioned. The APCO has full and sole discretion to accept, reject or condition the City’s application. The same procedures outlined above will apply.

CHAPTER 9

Summary of References

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CHAPTER 10

Glossary and List of Acronyms

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10-1 GLOSSARY

airshed	A geographical area that, because of topography, meteorology, and climate, shares the same air.
Board	The Governing Board of the Great Basin Unified Air Pollution Control District
CALPUFF	A multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation and removal.
City	The City of Los Angeles, including its Department of Water and Power
control measures	Those methods of PM_{10} abatement that could be placed into portions of the Owens Lake playa and, when in place, are effective in reducing the PM_{10} emissions from the surface over which they are implemented.
Cox Sand Catcher	A sand flux measuring device developed by Bill Cox of the GBUAPCD.
District	The Great Basin Unified Air Pollution Control District (a.k.a. GBUAPCD).
efflorescence	Efflorescence occurs when subsurface moisture is drawn upward through capillary action, carrying dissolved salts with it. As moisture evaporates, the salts are left at the surface in fine powdery deposits that can be lifted by turbulent winds. Powdery efflorescent salt surfaces have a very high PM_{10} content.
exceedance	A midnight to midnight Pacific Standard Time 24-hour average PM_{10} concentration greater than 150 µg/m³ measured by a shoreline or near-shore PM_{10} monitor.
historic shoreline	The elevation contour line below which is generally described as the area occupied by Owens Lake before large-scale anthropogenic diversions began. For the purposes of this RSIP the historic shoreline is defined as 3,600 feet above mean sea level.
K-factor (K_f)	An empirical ratio of the vertical PM_{10} emission flux to the horizontal sand flux at 15 cm above ground surface, as described in the Dust ID Protocol.
non-attainment area	An area that has not met state and USEPA air quality requirements.

Owens Lake playa	The surface area of the Owens Lake bed which is not covered by the Owens Lake brine pool; the actual size of the playa may change from year to year, and includes those portions of the lake bed which may be temporarily covered with water which is not high salinity.
Proposed Project	The sum of those activities that are proposed to be adopted by the Great Basin Unified Air Pollution Control District in the PM_{10} State Implementation Plan for the Owens Valley Planning Area and implemented to reduce fugitive PM_{10} emissions from the Owens Lake playa to meet the National Ambient Air Quality Standards for particulate matter smaller than 10 microns (PM_{10}); this would include all actions, whether undertaken on or off the playa.
Sensit™	An electronic time-resolved sand flux monitoring device.
SIP EIR	The Final Environmental Impact Report and any Negative Declarations, EIR addendums and/or supplements that were written to accompany and support the State Implementation Plan as required by the California Environmental Quality Act (CEQA).

10-2 LIST OF ACRONYMS

ADT	Average daily traffic
AIRS	US Environmental Protection Agency's Aerometric Information and Retrieval System
AMSL	Above mean sea level
AP-42	USEPA publication: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I
APCO	Air Pollution Control Officer
ATV	All-Terrain Vehicle
A&WMA	Air & Waste Management Association
BACM	Best Available Control Measures
BACT	Best Available Control Technology
BLM	U.S. Department of Interior, Bureau of Land Management
CAAA	Federal Clean Air Act Amendments of 1990
CALMET	A diagnostic 3-dimensional meteorological model.
CALPUFF	See Glossary.
CalTrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASAC	Clean Air Scientific Advisory Committee
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH&SC	Calif. Health & Safety Code
CSC	Cox Sand Catcher
DCA	Dust Control Area
DCM	Dust control measure
dS	decisiemens
EIR	Environmental Impact Report
EQPM	Reference Particulate Sampler
FEIR	Final Environmental Impact Report
FTEE	Full-time equivalent employee
GBUAPCD	Great Basin Unified Air Pollution Control District (a.k.a. District)
GIS	Geographic Information System
GPS	Global Positioning System
KE	Kinetic energy

LADWP	Los Angeles Department of Water and Power
MSM	Most Stringent Measures
NAAQS	National ambient air quality standards
NEAP	Natural Event Action Plans
NEPA	National Environmental Policy Act
NOAA	National Oceanographic and Atmospheric Administration
NSPS	New Source Performance Standard
OEHHA	Office of Environmental Health Hazard Assessment
OLSAC	Owens Lake Soda Ash Company
OVPA	Owens Valley PM10 Planning Area
PC	Particle count
PM_{10}	Particulate Matter less than 10 microns nominal aerodynamic diameter
PSD	Prevention of Significant Deterioration
R.	Range
RASS	Radio Acoustic Sounding System
RFPS	Reference Particulate Sampler
RSIP	This 2003 Revised State Implementation Plan
SCR	Supplemental Control Requirements of this 2003 SIP
SFM	Sand flux monitor
SIP	State Implementation Plan
SLC	California State Lands Commission
SSI	Size Selective Inlet
T.	Township
T/d	U.S. short tons per day
TEOM	Tapered Element Oscillating Microbalance, continuously measures ambient PM_{10}
TSP	Total suspended particulates
UCD	University of California at Davis
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VMT	Vehicle miles traveled

10-3 MEASUREMENT UNITS

ac	acre, 640 acres = 1 square mile
ac-ft	acre-feet, 1 ac-ft = 325,851 gallons = 43,560 cubic feet (1 ac-ft will cover a 1 acre area 1 foot deep with water.)
^{O}C	degrees Celsius
^{O}F	degrees Fahrenheit
dS/m	decisiemens per meter (a measure of electrical conductivity, used as an indication of salinity)
ft	feet, 1 foot = 0.3048 meters
g	grams, 1,000 grams = 1 kilogram
kg	kilogram, 1 kilogram = 2.2046 pounds
m	meters, 1 meter = 3.28 feet
m/s	meters per second, 1 meter per second = 2.237 miles per hour
mg	milligrams, 1 mg = 0.001 gram
mph	miles per hour, 1 mile per hour = 0.447 meters per second
ppm	parts per million
s	second
ton	US short ton, 1 ton = 2,000 pounds weight = 907.2 kilograms
yr	year
’	feet
”	inches
µg	microgram, 1 microgram = 10^{-6} grams
µm	micron, 1 micron = 10^{-6} meters

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CHAPTER 11

Declaration of the Clerk of the Board and Resolutions Certifying the EIR and Approving the SIP

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DECLARATION
OF
DONNA LEAVITT

I, Donna Leavitt, declare as follows:

1. I am the Clerk of the Governing Board of the Great Basin Unified Air Pollution Control District. The District is a unified air pollution control district consisting of Inyo, Mono, and Alpine counties in the State of California.

2. At least thirty (30) days before the November 13, 2003, public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the proposed 2003 revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan, I served, in sealed envelopes, true copies of the following documents:

   a) Notice of Public Hearing (attached hereto as **Exhibit A**); and

   b) The proposed final Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan 2003 Revision

   on the following persons or entities and addressed as indicated:

   - Administrator of the United States Environmental Protection Agency via the appropriate regional office by sending to:

     Federal Express Priority Overnight Delivery
     Mr. Wayne Nastri
     Regional Administrator
     U.S. EPA Region 9
     75 Hawthorne Street
     San Francisco, CA 94105

   - Each local air pollution control agency significantly impacted by sending to:

     Federal Express Priority Overnight Delivery
     Mr. Thomas Paxson
     Air Pollution Control Officer
     Kern County Air Pollution Control District
     2700 "M" Street, Suite 302
     Bakersfield, CA 93301

- California Air Resources Board by sending to:

  Federal Express Priority Overnight Delivery
  Ms. Catherine Witherspoon
  Executive Officer
  California Air Resources Board
  1001 “I” Street
  Sacramento, CA 95814

- City of Los Angeles and the Department of Water and Power of the City of Los Angeles by sending to:

  Federal Express Priority Overnight Delivery
  Mr. David H. Wiggs, General Manager
  Los Angeles Department of Water and Power
  111 N. Hope Street, Room 1455
  Los Angeles, CA 90012

  Federal Express Priority Overnight Delivery
  Mr. Gerald A. Gewe
  Assistant General Manager – Water Services
  Los Angeles Department of Water and Power
  111 N. Hope Street, Room 1455
  Los Angeles, CA 90012

  Federal Express Priority Overnight Delivery
  Mr. Richard F. Harasick
  Asst. Director of Water Resources
  Los Angeles Department of Water and Power
  111 N. Hope Street, Room 1460
  Los Angeles, CA 90012

c) At least thirty (30) days before the November 13, 2003, public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the proposed 2003 revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan, I caused to be published a notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District in the form attached hereto as **Exhibit A**, in the Mammoth Times, a newspaper of general circulation in Mono County, California, and in the Tahoe Daily Tribune a newspaper of general circulation in El Dorado County, California (a county adjacent to Alpine County, California, which has no newspaper of general circulation). Copies of the original proofs of such publication are attached hereto as **Exhibit B.**

d) At least thirty (30) days before the November 13, 2003, public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the proposed 2003 revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan, I caused to be published in the Inyo Register, a newspaper of general circulation in the County of Inyo, California, the county wherein the entire Owens Valley PM_{10} Planning Area is situated, notice of the public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District in the form attached hereto as **Exhibit C.** A copy of the original proof of such publication is attached hereto as **Exhibit B.**

e) At least thirty (30) days before the November 13, 2003, public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the proposed 2003 revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan, and continuously through the date of the public hearing, a copy of the Draft Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan 2003 Revision was made available for public inspection at the District's main office at 157 Short Street, Bishop, California, which office is located in Inyo County, California, the region in which the entire Owens Valley PM_{10} Planning Area, and the affected source are located.

f) At least thirty (30) days before the November 13, 2003, public hearing of the Great Basin Unified Air Pollution Control District Governing Board on adoption of the proposed 2003 revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan, I sent a copy of the notice of public hearing of the Governing Board of the Great Basin Unified Air Pollution Control District in the form attached here as **Exhibit A**, to each and every addressee shown in the list attached here as **Exhibit D** via the United States Postal Service, postage prepaid.

g) As authorized by the District Governing Board Resolution No. 2003-05, I hereby certify on behalf of the District that the within document is the authoritative compilation of the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan* and Incorporated Board Order adopted July 2, 1997, as revised by the 1998 Revision and Incorporated Board Order adopted November 16, 1998, and as revised by the 2003 Revision and Incorporated Board Order adopted November 13, 2003.

This compilation may be correctly referred to as the "Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order, 2003 Revision."

I declare that the foregoing is true and correct under penalty of perjury. Done at Bishop, Inyo County, California, this 21st day of November, 2003.

Donna Leavitt

Donna Leavitt, Board Clerk

EXHIBIT A

Ellen Hardebeck
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

October 1, 2003

NOTICE OF A PUBLIC HEARING ON THE PROPOSED 2003 REVISION TO THE OWENS VALLEY PM_{10} PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN

PLEASE TAKE NOTICE that on Thursday, November 13, 2003, the Governing Board of the Great Basin Unified Air Pollution Control District (District) will conduct a public hearing and consider for adoption a proposed 2003 revision to the previously-adopted Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (2003 SIP). The public hearing, and consideration for adoption, will occur at the District Governing Board's Regular Meeting on November 13, 2003 at 10:00 a.m. in the Inyo County Administrative Center, Board of Supervisor's Chambers, 224 North Edwards Street, Independence, California. In addition, the District Governing Board will consider approval of a Final Environmental Impact Report (EIR) that analyzes the environmental impacts of the proposed project. Members of the public will have an opportunity to submit written comments or make oral statements at the public hearing on both the Final EIR and the proposed 2003 SIP revision.

On November 16, 1998, the District adopted the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (1998 SIP). The 1998 SIP described how the District planned to attain the National Ambient Air Quality Standards (NAAQS) for fine particulate matter air pollution (PM_{10}) in the region surrounding Owens Lake in southern Inyo County, California. The 1998 SIP required the District to continue studying the sources of PM_{10} air pollution in the area and to revise the 1998 SIP before the end of 2003.

The proposed 2003 SIP revises the areas on the dried bed of Owens Lake on which dust control measures (DCMs) will be installed in order to meet the PM_{10} NAAQS. The 2003 SIP requires the placement of DCMs on 29.8 square miles of the dried bed of Owens Lake. These DCMs will be in place and fully operational by December 31, 2006. A combination of three dust control measures will be used to meet the PM_{10} NAAQS: shallow flooding, managed vegetation and gravel. The 2003 SIP also provides procedures to require additional controls, if necessary, and procedures to modify the types of controls used to meet the PM_{10} NAAQS. The 2003 SIP orders the City of Los Angeles to install, operate and maintain all DCMs.

EXHIBIT A

A draft of the 2003 SIP was made available for public review and comment between July 1, 2003 and August 26, 2003. The District received, reviewed and responded to the comments received. The draft 2003 SIP was then revised and the proposed final 2003 SIP is now available for public review.

The District staff encourages those who have comments on the proposed 2003 SIP to attend the meeting on November 13, 2003 and submit written comments or make oral statements to the District Governing Board prior to their approval of the Final EIR and adoption of the 2003 SIP.

Copies of the proposed final 2003 SIP are available upon request at the office of the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514. Interested parties may call the District at (760) 872-8211 to have a copy mailed. Copies are free of charge to residents of the Great Basin Unified Air Pollution Control District (Inyo, Mono and Alpine Counties) and all government agencies. All others will be charged a $25 copying and mailing fee. If you have any questions, please call Ted Schade at (760) 872-8211.

EXHIBIT B

Proof of Publication

#03-436

This space is for the County Clerk's Filing Stamp

STATE OF CALIFORNIA
COUNTY OF MONO

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and notentitled matter. I am the principal clerk of the printer of the

MAMMOTH TIMES

a newspaper of general circulation, published in

a party to or interested in the above

Mammoth Lakes, County of Mono.

The Mammoth Times was adjudicated on March 24, 1992, as a newspaper of general circulation for the Town of Mammoth Lakes and Mono County, CA. The notice, of which the annexed is a printed copy (set in type not smaller that nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dated, to wit:

10-9 10-16 10-23 10-30 11-6

all in the year's **2003**

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Mammoth Lakes, California,

the **16** day of **October, 2003**

Jennifer Warfield
Signature

NOTICE OF A PUBLIC HEARING

ON THE PROPOSED 2003 REVISION TO THE OWENS VALLEY PM10 PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN

PLEASE TAKE NOTICE that on Thursday, November 13, 2003, the Governing Board of the Great Basin Unified Air Pollution Control District (District) will conduct a public hearing and consider for adoption a proposed 2003 revision to the previously-adopted Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (2003 SIP). The public hearing, and consideration for adoption, will occur at the District Governing Board's Regular Meeting on November 13, 2003 at 10:00 a.m. in the Inyo County Administrative Center, Board of Supervisor's Chambers, 224 North Edwards Street, Independence, California. In addition, the District Governing Board will consider approval of a Final Environmental Impact Report (EIR) that analyzes the environmental impacts of the proposed project. Members of the public will have an opportunity to submit written comments or make oral statements at the public hearing on both the Final EIR and the proposed 2003 SIP revision.

On November 16, 1998, the District adopted the Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (1998 SIP). The 1998 SIP described how the District planned to attain the National Ambient Air Quality Standards (NAAQS) for fine particulate matter air pollution (PM10) in the region surrounding Owens Lake in southern Inyo County, California. The 1998 SIP required the District to continue studying the sources of PM10 air pollution in the area and to revise the 1998 SIP before the end of 2003.

The proposed 2003 SIP revises the areas on the dried bed of Owens Lake on which dust control measures (DCMs) will be installed in order to meet the PM10 NAAQS. The 2003 SIP requires the placement of DCMs on 29.8 square miles of the dried bed of Owens Lake. These DCMs will be in place and fully operational by December 31, 2006. A combination of three dust control measures will be used to meet the PM10 NAAQS: shallow flooding, managed vegetation and gravel. The 2003 SIP also provides procedures to require additional controls, if necessary, and procedures to modify the types of controls used to meet the PM10 NAAQS. The 2003 SIP orders the City of Los Angeles to install, operate and maintain all DCMs.

A draft of the 2003 SIP was made available for public review and comment between July 1, 2003 and August 26, 2003. The District received, reviewed and responded to the comments received. The draft 2003 SIP was then revised and the proposed final 2003 SIP is now available for public review.

The District staff encourages those who have comments on the proposed 2003 SIP to attend the meeting on November 13, 2003 and submit written comments or make oral statements to the District Governing Board prior to their approval of the Final EIR and adoption of the 2003 SIP.

Copies of the proposed final 2003 SIP are available upon request at the office of the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514. Interested parties may call the District at (760) 872-8211 to have a copy mailed. Copies are free of charge to residents of the Great Basin Unified Air Pollution Control District (Inyo, Mono and Alpine Counties) and all government agencies. All others will be charged a $25 copying and mailing fee. If you have any questions, please call Ted Schade at (760) 872-8211.

(03-436) r:10-9, 10/23, 11/6

Tahoe Daily Tribune

EXHIBIT B

Statement of Publication

3079 Harrison Avenue, South Lake Tahoe, CA 96150
Phone (775) 881-1201
Fax (775)887-2408

Account Number: #33100039

Great Basin Unified Air Pollution
Control District/ Shirley Ono
157 Short Street
Bishop, CA 93514-3537

VICTORIA CRUMP says:
That (s)he is a legal clerk of the **TAHOE DAILY TRIBUNE,** a daily newspaper published at South Lake Tahoe, in the State of California.

Notice of Public Hearing
Proposed 2003 Revision to the Owens Valley
Ad#82500941

of which a copy is hereto attached, was published in said newspaper for the full required period of **4 times** commencing on **October 2, 2003** and ending on **November 6, 2003,** all days inclusive.

Signed: Victoria Crump

STATEMENT:

Date	Amount	Credit	Balance
11/6/03	$376.02		$376.02

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
157 Short Street, Bishop, California 93514-3537
Tel: 760-872-8211 Fax: 760-872-6109

NOTICE OF A PUBLIC HEARING ON THE PROPOSED 2003 REVISION TO THE OWENS VALLEY PM10 PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN

PLEASE TAKE NOTICE that on Wednesday, November 13, 2003, the Governing Board of the Great Basin Unified Air Pollution Control District (District) will conduct a public hearing and consider for adoption a proposed 2003 revision to the previously-adopted Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (2003 SIP). The public hearing, and consideration for adoption, will occur at the District Governing Board's Regular Meeting on November 13, 2003 at 10:00 a.m. in the Inyo County Administrative Center, Board of Supervisor's Chambers, 224 North Edwards Street, Independence, California. In addition, the District Governing Board will consider approval of a Final Environmental Impact Report (EIR) that analyzes the environmental impacts of the proposed project. Members of the public will have an opportunity to submit written comments or make oral statements at the public hearing on both the Final EIR and the proposed 2003 SIP revision.

On November 16, 1998, the District adopted the Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (1998 SIP). The 1998 SIP described how the District planned to attain the National Ambient Air Quality Standards (NAAQS) for fine particulate matter air pollution (PM10) in the region surrounding Owens Lake in southern Inyo County, California. The 1998 SIP required the District to continue studying the sources of PM10 air pollution in the area and to revise the 1998 SIP before the end of 2003.

The proposed 2003 SIP revises the areas on the dried bed of Owens Lake on which dust control measures (DCMs) will be installed in order to meet the PM10 NAAQS. The 2003 SIP requires the placement of DCMs on 29.8 square miles of the dried bed of Owens Lake. These DCMs will be in place and fully operational by December 31, 2006. A combination of three dust control measures will be used to meet the PM10 NAAQS: shallow flooding, managed vegetation and gravel. The 2003 SIP also provides procedures to require additional controls, if necessary, and procedures to modify the types of controls used to meet the PM10 NAAQS. The 2003 SIP orders the City of Los Angeles to install, operate and maintain all DCMs.

A draft of the 2003 SIP was made available for public review and comment between July 1, 2003 and August 26, 2003. The District received, reviewed and responded to the comments received. The draft 2003 SIP was then revised and the proposed final 2003 SIP is now available for public review.

The District staff encourages those who have comments on the proposed 2003 SIP to attend the meeting on November 13, 2003 and submit written comments or make oral statements to the District Governing Board prior to their approval of the Final EIR and adoption of the 2003 SIP.

Copies of the proposed final 2003 SIP are available upon request at the office of the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514. Interested parties may call the District at (760) 872-8211 to have a copy mailed. Copies are free of charge to residents of the Great Basin Unified Air Pollution Control District (Inyo, Mono and Alpine Counties) and all government agencies. All others will be charged a $25 copying and mailing fee. If you have any questions, please call Ted Schade at (760) 872-8211.

Pub: Oct. 2, 9, 23, Nov. 6, 2003 Ad#82500941

PROOF OF PUBLICATION

EXHIBIT B

(2015.5 C.C.P.)

This space is for County Clerk's Filing Stamp

STATE OF CALIFORNIA,
COUNTY OF INYO

I am a citizen of the United States and a resident of the County aforesaid. I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the

The Inyo Register

a newspaper of general circulation,

Proof of Publication of

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

Bishop, California
County of Inyo

The Inyo Register has been adjudged a newspaper of general circulation by the Superior Court of the County of Inyo, State of California, under date of Oct. 5, 1953, Case Number 5414; that the notice, of which the annexed is a printed copy (set in type not smaller than non-pareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof, on the following dates, to wit:

October 11, 25;
November 8

in the year **2003**

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Bishop, California,
this **19th** day of **November, 2003**

Linda Buttler

Signature

Great Basin Unified Air Pollution Control District
Notice of Public Hearing
Revised Owens Lake Dust (PM_{10}) Control Plan
and Environmental Impact Report

The Great Basin Unified Air Pollution Control District (GBUAPCD) has prepared a proposed revised State Implementation Plan (SIP) for the control of fine dust emissions (PM_{10}) in the Southern Owens Valley, California. The document is known as the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan 2003 Revision*. The SIP and its associated Final Environmental Impact Report (EIR) will be considered for adoption by the Governing Board of the GBUAPCD at a public hearing to be held on:

Thursday, November 13, 2003 at 10:00 a.m.
in the Inyo County Administrative Center, Board of Supervisors Chambers
224 North Edwards Street, Independence, California.

The GBUAPCD encourages those who have comments on the proposed 2003 SIP or Final EIR to attend the meeting on November 13, 2003 and submit written comments or make oral statements to the District Governing Board prior to their approval of the Final EIR and adoption of the 2003 SIP.

Copies of the proposed final 2003 SIP and EIR are available upon request at the office of the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514. Interested parties may call the District at (760) 872-8211 to have a copy mailed. Copies are free of charge to residents of the Great Basin Unified Air Pollution Control District (Inyo, Mono and Alpine Counties) and all government agencies. All others will be charged a $25 copying and mailing fee. If you have any questions, please call Ted Schade at (760) 872-8211.

EXHIBIT C

Publication: ***Inyo Register***
Pub. Dates: **October 11, 2003**
October 25, 2003
November 8, 2003

Great Basin Unified Air Pollution Control District
Notice of Public Hearing
Revised Owens Lake Dust (PM_{10}) Control Plan and Environmental Impact Report

The Great Basin Unified Air Pollution Control District (GBUAPCD) has prepared a proposed revised State Implementation Plan (SIP) for the control of fine dust emissions (PM_{10}) in the Southern Owens Valley, California. The document is known as the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan 2003 Revision*. The SIP and its associated Final Environmental Impact Report (EIR) will be considered for adoption by the Governing Board of the GBUAPCD at a public hearing to be held on:

Thursday, November 13, 2003 at 10:00 a.m.
in the Inyo County Administrative Center, Board of Supervisors Chambers
224 North Edwards Street, Independence, California.

The GBUAPCD encourages those who have comments on the proposed 2003 SIP or Final EIR to attend the meeting on November 13, 2003 and submit written comments or make oral statements to the District Governing Board prior to their approval of the Final EIR and adoption of the 2003 SIP.

Copies of the proposed final 2003 SIP and EIR are available upon request at the office of the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514. Interested parties may call the District at (760) 872-8211 to have a copy mailed. Copies are free of charge to residents of the Great Basin Unified Air Pollution Control District (Inyo, Mono and Alpine Counties) and all government agencies. All others will be charged a $25 copying and mailing fee. If you have any questions, please call Ted Schade at (760) 872-8211.

EXHIBIT D

Agency	Contact	First Name (No Affil	Title	Street Address	Mailing Address	City	State	Zip
Agrarian Research & Management, Ltd.	Carla Scheidlinger			162 East Line Street		Bishop	CA	93514
Agrarian Research & Management, Ltd.	Frank Stradling			162 East Line Street		Bishop	CA	93514
Air Sciences	Mark Schaaf			421 SW 6th Avenue, Suite 1400		Portland	OR	97204
Alpine County Counsel	Dennis Crabb			99 Water Street	P.O. Box 456	Markleeville	CA	96120
Ancient Enterprises, Inc.	Helen Wells			3235 Lombardy Road		Pasadena	CA	91107
Avocet Tungsten, Inc. (U.S. Tungsten Corporation)	Jonathan Henry		General Manager	7th Floor 9 Berkeley Street		London	WIX5AD	England
Barnard Construction Company, Inc.	Scott Brady				P.O. Box 99	Boseman	MT	59771-0099
Big Pine Paiute Tribe of the Owens Valley	Jason Warren		Environmental Director	825 S. Main Street	P.O. Box 700	Big Pine	CA	93513
Big Pine Paiute Tribe of the Owens Valley			Tribal Chair	825 S. Main Street	P.O. Box 700	Big Pine	CA	93513
Bishop Paiute Tribe of the Owens Valley	Alan Spoonhunter		Environmental Manager	50 Tu Su Lane		Bishop	CA	93514
Bishop Paiute Tribe of the Owens Valley	Toni Richards		Air Quality Specialist	50 Tu Su Lane		Bishop	CA	93514
Bishop Paiute Tribe of the Owens Valley			Tribal Chair	50 Tu Su Lane		Bishop	CA	93514
Bridgeport Indian Colony	Shawn Minder		EPA Coordinator	355 Sagebrush Drive	P.O. Box 37	Bridgeport	CA	93517
Bridgeport Indian Colony			Tribal Chair	355 Sagebrush Drive	P.O. Box 37	Bridgeport	CA	93517
California Air Resources Board	Catherine Witherspoon		Executive Officer	1001 "I" Street	P.O. Box 2815	Sacramento	CA	95814
California Air Resources Board	Lucille van Ommering		SIP Development Section	1001 "I" Street	P.O. Box 2815	Sacramento	CA	95814
California Air Resources Board	Sylvia Oey		S. California Liaison Section	1001 "I" Street	P.O. Box 2815	Sacramento	CA	95812-2815
California Deparment of Transportation	Gayle Rosander			District 9 Office	500 South Main Street	Bishop	CA	93514
California Deparment of Transportation	Katy Walton		Deputy District Director for Planning &	District 9 Office	500 South Main Street	Bishop	CA	93514
California Department of Fish & Game	Alan Pickard		Deputy Regional Manager	407 West Line Street		Bishop	CA	93514
California Department of Fish & Game	Darrell Wong		Sr. Environmental Supervisor	407 West Line Street		Bishop	CA	93514
California Department of Fish & Game	Denyse Racine			407 West Line Street		Bishop	CA	93514
California Indian Legal Services			Managing Attorey	787 North Main Street, Suite D		Bishop	CA	93514
California Native American Heritage Commission	Debbie Pilas-Tredway		Environmental Specialist III	915 Capitaol Mall, Room 364		Sacramento	CA	95814-4801
California Native American Heritage Commission	Rob Wood			915 Capitaol Mall, Room 364		Sacramento	CA	95814-4801
California Native Plant Society	Daniel Pritchett		Conservation Chair, Bristle Cone Chap	401 E. Yaney Street	P.O. Box 364	Bishop	CA	93515
California State Clearinghouse	Terry Roberts			Office of Planning and Research	1400 Tenth Street, Room	Sacramento	CA	95814
California State Historic Preservation Office				1416 9th Street, Room 1442	P.O. Box 942896	Sacramento	CA	95814
California State Lands Commission	Barbara Dugal			100 Howe Avenue, Suite 100 South		Sacramento	CA	95825
California State Lands Commission	Dwight Sanders			100 Howe Avenue, Suite 100 South		Sacramento	CA	95825
California State Lands Commission	Greg Pelka		Sr. Mineral Resources Engineer	200 Oceangate, 12th Floor		Long Beach	CA	90802-4302
California State Lands Commission	Maurya Falkner			200 Oceangate, Suite 900		Long Beach	CA	90802-4331
Carol Keegan Co.				3400 Ave. of Arts, #C107		Costa Mesa	CA	92626
CH2M Hill	Amy Hiss			2485 Natomas Park Dr., Suite 600		Sacramento	CA	95833-2937
CH2M Hill	Ben Jacob			825 NE Multnomah, Suite 1300		Portland	OR	97232-2146
CH2M Hill	Greg Graber			3 Hutton Centre Drive, Suite 200		Santa Ana	CA	92707-5781
CH2M Hill	Jim Bard			2300 NW Walnut Blvd.		Corvallis	OR	97232-2146
CH2M Hill	John Castleberry			555 S. Flower Street, Suite 3550		Los Angeles	CA	90071
CH2M Hill	John Dickey			2525 Airpark Drive	P.O. Box 492478	Redding	CA	96049-2478
CH2M Hill	Maurice Hall			2525 Airpark Drive		Redding	CA	96049-2478

EXHIBIT D

Agency	Contact	First Name (No Affil	Title	Street Address	Mailing Address	City	State	Zip
CH2M Hill	Mike Concannon			155 Grand Avenue, Suite 1000		Oakland	CA	94612
CH2M Hill	Ray Romero			600 Beverly Court		Lancaster	CA	93535
CH2M Hill	Rich Coles		Vice President	3 Hutton Centre Drive, Suite 200		Santa Ana	CA	92707-5781
CH2M Hill	Tony DiJulio			3 Hutton Centre Drive, Suite 200		Santa Ana	CA	92707-5781
China Lake Naval Air Weapons Center	Brenda Abernathy			Code 870000D	1 Administration Circle	China Lake	CA	93555-6100
City of Bishop	Andy Boyd		City Engineer	377 West Line Street		Bishop	CA	93514
City of Bishop - Planning Deparment	Richard Pucci				P.O. Box 1236	Bishop	CA	93515
Cogstone Resource Management, Inc.	Sherri M. Gust			1801 E. Parkcourt Place	Building F, Suite 205	Santa Ana	CA	92701
DeWold Trona	Steve Mozenti			139 West 2nd Street, Suite 200		Casper	WY	82601
Eastern Sierra Audubon Society	James Wilson			2689 Highland Drive	P.O. Box 624	Bishop	CA	93515
Fanelli Stores Inc.	Peter Bogart				Box 3663	Incline Village	NV	89450-3663
Fanelli Stores Inc.				333 S. State Street, Unit 230		Lake Osewego	OR	97034
Fort Independence Indian Reservation	Carl Dahlberg		Environmental Director	128 US Hwy 395	P.O. Box 67	Independence	CA	93526-2159
Fort Independence Indian Reservation			Tribal Chair	128 US Hwy 395	P.O. Box 67	Independence	CA	93526-2159
Fresno County Planning and Resource Management	Carolina Hogg			2200 Tulare Street		Fresno	CA	93721
Great Basin Unified APCD Governing Board	The Honorable Chairman Herman Zellmer		Alpine County Supervisor	230 Zellmer Lane		Markleeville	CA	96120
Great Basin Unified APCD Governing Board	The Honorable Chris Gansberg, Jr.		Alpine County Supervisor	2277 Foothill Road		Markleeville	CA	96120
Great Basin Unified APCD Governing Board	The Honorable Joann Ronci		Mono County Supervisor		P.O. Box 580	June Lake	CA	93529
Great Basin Unified APCD Governing Board	The Honorable Linda Arcularius		Inyo County Supervisor	Route 2, Box 24A		Bishop	CA	93514
Great Basin Unified APCD Governing Board	The Honorable Mary Pipersky		Mono County Supervisor		P.O. Box 8474	Mammoth Lakes	CA	93546
Great Basin Unified APCD Governing Board	The Honorable Tony Barrett		Mammoth Lakes Town Council		P.O. Box 2294	Mammoth Lakes	CA	93546
Great Basin Unified APCD Governing Board	The Honorable Vice Chair Michael Dorame		Inyo County Supervisor	1564 Indian Springs		Lone Pine	CA	93545
Great Basin Unified APCD Governing Board	The Honorable Byng Hunt, Alternate		Mono County Supervisor		P.O. Box 7902 W	Mammoth Lakes	CA	93546
Great Basin Unified APCD Governing Board	The Honorable John Eastman, Alternate		Mammoth Lakes Town Council		P.O. Box 1305	Mammoth Lakes	CA	93546
Great Basin Unified APCD Governing Board	The Honorable Ted Williams, Alternate		Inyo County Supervisor	278 Pa Me Lane		Bishop	CA	93514
Gustavus Adolphus College	Robert Moline		Professor Emeritus	Department of Geography		St. Peter	MN	56082-1498
Hughes Land & Development Co.	Andrew Wallet			2215 Colby Avenue		Los Angeles	CA	90064
Indian Wells Water District	Tom Muluihill		General Manager		P.O. Box 1329	Ridgecrest	CA	93556-1329
Inyo County Board of Supervisors	The Honorable Michael Dorame		Board Chair	1564 Indian Springs		Lone Pine	CA	93545
Inyo County Clerk	Beverly Harry			168 N. Edwards Street	P.O. Drawer F	Independence	CA	93526
Inyo County Counsel	Paul Bruce			224 North Edwards Street	P.O. Box M	Independence	CA	93526
Inyo County Environmental Health	Bob Hurd			207 W. South Street		Bishop	CA	93514
Inyo County Library	Big Pine Branch			110 North Main Street		Big Pine	CA	93513
Inyo County Library	Bishop Branch			210 Academy Avenue		Bishop	CA	93514
Inyo County Library	Death Valley Branch					Death Valley	CA	92328
Inyo County Library	Independence Branch			168 N. Edwards Street	P.O. Drawer K	Bishop	CA	93514
Inyo County Library	Lone Pine Branch			Washington & Bush Street	P.O. Box 745	Lone Pine	CA	93545
Inyo County Library	Tecopa Branch				P.O. Box 177	Tecopa	CA	92389
Inyo County Planning Deparment					P.O. Drawer L	Independence	CA	93526
Inyo County Water Department	Greg James		Water Director	163 May Street		Bishop	CA	93514

EXHIBIT D

Agency	Contact	First Name (No Affil	Title	Street Address	Mailing Address	City	State	Zip
Inyo County Water Department	Leah Kirk		Environmental Specialist	163 May Street		Bishop	CA	93514
Keeler Community Service District	Alice Robertson				P.O. Box 63	Keeler	CA	93530
Keeler Community Service District	Nylia Swanson		Secretary	150 Railroad Avenue	P.O. Box 949	Keeler	CA	93530
Kern County Air Pollution Control District	Tom Paxson		Air Pollution Control Officer	2700 "M" Street, Suite 302		Bakersfield	CA	93301-2370
Kern County Planning Department	Ted James			2700 M Street		Bakersfield	CA	93301
Kern County Public Library	Ridgecrest Branch			131 East Las Flores		Ridgecrest	CA	93555
Lahontan Regional Water Quality Control Board	Cindy Mitton, P.E.		Senior WRCE	15428 Civic Drive, Suite 100		Victorville	CA	92392
Lahontan Regional Water Quality Control Board	Harold J. Singer, P.E.		Executive Officer	2501 Lake Tahoe Blvd.		South Lake Tahoe	CA	96150
Linscott, Law & Greenspan	Clare Look-Jeager			234 E. Colorado Blvd., Suite 400		Pasadena	CA	91101
Lone Pine Paiute-Shoshone Reservation	Debbie Becker		Air Quality Specialist	1103 S. Main Street	P.O. Box 747	Lone Pine	CA	93545
Lone Pine Paiute-Shoshone Reservation	Wilfred J. Nabahe		Environmental Coordinator	1103 S. Main Street	P.O. Box 747	Lone Pine	CA	93545
Lone Pine Paiute-Shoshone Reservation			Tribal Chair	1103 S. Main Street	P.O. Box 747	Lone Pine	CA	93545
Los Angeles Department of Water & Power	Gerald Gewe		Asst. General Manager-Water	111 North Hope Street, Room 14	Box 51111	Los Angeles	CA	90012
Los Angeles Department of Water & Power	Richard Harasick		Asst. Director of Water Resources	111 North Hope Street, Room 14	Box 51111	Los Angeles	CA	90051-0100
Los Angeles Department of Water & Power	Robert Prendergast			111 North Hope Street, Room 14	Box 51111	Los Angeles	CA	90051-0100
Los Angeles Department of Water & Power	Thayne DeVorss			111 North Hope Street, Room 14	Box 51111	Los Angeles	CA	90051-0100
Maturango Museum	Elva Younkin		Curator/Archeologist	100 E. Las Flores Avenue		Ridgecrest	CA	93555
MFG, Inc.	Ken Richmond			19203 36th Avenue W, Suite 101		Lynnwood	WA	98036
Mojave Desert Air Quality Management District	Chuck Fryxell		Air Pollution Control Officer	14306 Park Avenue		Victorville	CA	92392-2383
Mono County Counsel	Marshall Rudolph				P.O. Box 497	Bridgeport	CA	93517
Mono County Development Department	Scott Burns				P.O. Box 347	Mammoth Lakes	CA	93546
Morrison & Foerester, LLP	Donna Black		Attorney at Law	555 W. Fifth Street, Suite 3500		Los Angeles	CA	90013-1024
Morrison & Foerester, LLP	Peter Hsiao		Attorney at Law	555 W. Fifth Street, Suite 3500		Los Angeles	CA	90013-1024
Morrison & Foerester, LLP	Scott Birkey		Attorney at Law	555 W. Fifth Street, Suite 3500		Los Angeles	CA	90013-1024
Office of Planning and Research	Terry Roberts		State Clearinghouse	1400 Tenth Street, Room 121		Sacramento	CA	95814
Owens Valley Committee	Mike Prather				P.O. Drawer D	Lone Pine	CA	93545
Owens Valley Indian Water Commission	Teri Cawelti			46 Tu Su Lane		Bishop	CA	93514
Peter Bloom Consulting Services	Peter Bloom			13611 Hewes Avenue		Santa Ana	CA	92705
Press	Eastern Edge News Service		Paula Brown-Williams		P.O. Box 388	Bishop	CA	93515
Press	KDAY Radio		Benett Kessler	1280 N. Main Street		Bishop	CA	93514
Press	KIBS Radio		John Dailey		P.O. Box 757	Bishop	CA	93515
Press	Mammoth Times				P.O. Box 3929	Mammoth Lakes	CA	93546
Press	News Review		Patti Cosner	109 N. Sanders		Ridgecrest	CA	93555
Press	The Inyo Register			450 E. Line Street		Bishop	CA	93514
Press	USA Media				P.O. Box 787	Bishop	CA	93515
Rantec Corporation	Lloyd Marsden		Technical Sales	17 Kukuchka Lane	P.O. Box 729	Ranchester	WY	82839
San Bernardino Land Use Services Dept-Planning	Randy Scott			385 North Arrowhead Avenue		San Bernardino	CA	92415
Sapphos Environmental, Inc.	Claudia Anticona			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105
Sapphos Environmental, Inc.	David Bise			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105
Sapphos Environmental, Inc.	Dev Vrat			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105

EXHIBIT D

Agency	Contact	First Name (No Affil	Title	Street Address	Mailing Address	City	State	Zip
Sapphos Environmental, Inc.	Ed Paek			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105
Sapphos Environmental, Inc.	Kule McClure			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91115-0241
Sapphos Environmental, Inc.	Marie Campbell			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105
Sapphos Environmental, Inc.	Pete Choi			133 Martin Alley	P.O. Box 50241	Pasadena	CA	91105
Sierra Club - Range of Light Chapter	Mark Baglely			175 S. First Street	P.O. Box 1431	Bishop	CA	93515
Sierra Club - Range of Light Chapter	Wilma Wheeler		Chair	80 Larkspur Lane	P.O. Box 4008	Mammoth Lakes	CA	93546
Sierra Nevada Aquatic Research Laboratory	David Herbst			1016 Mt. Morrison Road	HCR 79, Box 198	Mammoth Lakes	CA	93546
Timbisha-Shoshone Tribe of Death Valley	Viola Kennison		EPA Director		P.O. Box 206	Death Valley	CA	92328-0579
Timbisha-Shoshone Tribe of Death Valley			Tribal Chair		P.O. Box 206	Death Valley	CA	92328-0579
Tulare County Resource Management Agency	George Finney			5961 South Mooney Blvd.		Visalia	CA	93277
U.S. Army Corps of Engineers	Bruce Henderson			2151 Allesandro Drive, Suite 100		Ventura	CA	93001
U.S. Army Corps of Engineers	Dr. Fred Egeler				P.O. Box 532711	Los Angeles	CA	90053-2325
U.S. Borax, Inc.	Paul Lamos			209 N. Main Street		Lone Pine	CA	93545
U.S. Bureau of Land Management	Hector Villalobos		Field Office Manager	300 S. Richmond Road		Ridgecrest	CA	93555-4436
U.S. Bureau of Land Management	William Dunkelberger		Field Office Manager	351 Pacu Lane		Bishop	CA	93514
U.S. Department of Agriculture Inyo National Forest	Forest Planner		Bishop Headquarters	351 Pacu Lane		Bishop	CA	93514
U.S. Department of Agriculture Inyo National Forest	Mary D'Aguero		Mt. Whitney Ranger Station	640 South Main Street	P.O. Box 8	Lone Pine	CA	93545
U.S. Department of Interior National Park Service	Dick Anderson		Environmental Specialist	Death Valley National Park	P.O. Box 579	Death Valley	CA	92328-0579
U.S. Department of Interior National Park Service	Frank Hays		Superintendent	Manzanar National Historic Site	P.O. Box 426	Independence	CA	93526
U.S. Department of Interior National Park Service	James T. Reynolds		Superintendent	Death Valley National Park	P.O. Box 579	Death Valley	CA	92328-0579
U.S. Department of Interior National Park Service	Judith Rocchio		Regional Air Quality Coordinator	1111 Jackson Street, Suite 700		Oakland	CA	94607
U.S. EPA, Region 9	Larry Biland			75 Hawthorne Street, AIR 2		San Francisco	CA	94105-3920
U.S. EPA, Region 9	Wayne Nastri		Regional Administrator	75 Hawthorne Street		San Francisco	CA	94105
U.S. Fish and Wildlife Service	George Walker			2493 Portola Road, Suite B		Ventura	CA	93003
Utu Utu Gwaitu Paiute Tribe	Rose Marie Salque		Tribal Chair	567 Yellow Jacket Road	Star Route 4, Box 56A	Benton	CA	93512
Utu Utu Gwaitu Paiute Tribe			Environmental Coordinator	567 Yellow Jacket Road	Star Route 4, Box 56A	Benton	CA	93512
Valley Sand & Gravel	Robert Shub				P.O. Box 364	Trona	CA	93592
VSA N Associates	Dr. Mahabir Atwal			12525 Lambert Road		Whittier	CA	90606
Wilson Geosciences	Wilson	Ken		1910 Pinecrest Drive		Altadena	CA	91001
	Chisholm	Charles			Box 8676	Reno	NV	89507
	Gemmill	David		32034 Via Saltio		Temecula	CA	92592
	Giuliani	Derham			P.O. Box 265	Big Pine	CA	93513
	Hannan	Patrick		1162 County Line Road		Ridgecrest	CA	93555-9072
	Hoffman	Norman			P.O. Box 111	Keeler	CA	93530
	Hunter	Kathleen		700 Indian Spring Drive		Lone Pine	CA	93545
	Kim	Sung Hwan		2945 Glendower Ave.		Los Angeles	CA	90027
	Macy	Jim			P.O. Box 131	Keeler	CA	93530
	McGill	William		1119 E. 106th Street		Los Angeles	CA	90002
	Patterson	Mike			P.O. Box 221	Keeler	CA	93530
	Patterson (Stewart)	Joanne			P.O. Box 221	Keeler	CA	93530

EXHIBIT D

Agency	Contact	First Name (No Affil	Title	Street Address	Mailing Address	City	State	Zip
	Prather	Mike			P.O. Drawer D	Lone Pine	CA	93545
	Roberts	George & Andriana		755 Fifth Avenue		Los Angeles	CA	90049
	Swift	Camm		346 W. LeRoy Avenue		Arcadia	CA	91107
	Szewczak	Joseph		3000 E. Line Street		Bishop	CA	93514
	Vanherweg	William		332 N. Stine Road		Bakersfield	CA	93309
	Wasson	Sam		2638 Sierra Vista Way		Bishop	CA	93514
	Wickman	Judy		101 Dominey Road		Lone Pine	CA	93545

ELLEN HARDEBECK
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

Board Order #031113-02

November 13, 2003

I HEREBY CERTIFY that at a meeting of the Great Basin Unified Air Pollution Control District Governing Board in the Inyo County Board of Supervisors chambers in Independence, California on November 13, 2003 an order was duly made and entered as follows:

Adoption of Resolution 2003-04

Resolution of the Governing Board of the Great Basin Unified Air Pollution Control District Certifying the Final Environmental Impact Report for the 2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order

A motion was made by Supervisor Joann Ronci, seconded by Supervisor Linda Arcularius adopting Resolution 2003-04 "Resolution of the Governing Board of the Great Basin Unified Air Pollution Control District Certifying the Final Environmental Impact Report for the 2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (Order Number 031113-01) and authorizing the Board Chair to sign the Notice of Determination. The motion carried 5/0 and so ordered.

Ayes: Supervisors: Michael Dorame, Joann Ronci, Chris Gansberg, Jr., Mary Pipersky and Linda Arcularius

Noes: Ø

Abstain: Ø

Absent: Town Council Member Tony Barrett and Supervisor Herman Zellmer

Attest:

Donna Leavitt

Donna Leavitt, Board Clerk

RESOLUTION NO. 2003-04

RESOLUTION OF THE GOVERNING BOARD OF THE GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT CERTIFYING THE FINAL ENVIRONMENTAL IMPACT REPORT FOR THE 2003 REVISION TO THE OWENS VALLEY PM_{10} PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND INCORPORATED BOARD ORDER

For reasons detailed below, the Governing Board of the Great Basin Unified Air Pollution Control District (the "Governing Board") certifies that the *2003 Final Environmental Impact Report* (FEIR) prepared for the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP) has been completed in compliance with the California Environmental Quality Act (CEQA) (Public Resources Code §21000 *et seq*.); that the Governing Board has reviewed and considered the information and analysis contained in the FEIR; and that the FEIR reflects the independent judgment of the Great Basin Unified Air Pollution Control District (District);

WHEREAS, pursuant to the federal Clean Air Act Amendments of 1990, the State of California is required to submit to the Administrator of the United States Environmental Protection Agency a State Implementation Plan for the Owens Valley Planning Area that demonstrates timely attainment of the National Ambient Air Quality Standards (NAAQS) for PM_{10}, defined as particulate matter having an aerodynamic diameter of a nominal 10 microns or less; and

WHEREAS, the Great Basin Unified Air Pollution Control District is the body vested by law with the authority and responsibility to develop and adopt the 2003 SIP, and to submit the 2003 SIP to the State Air Resources Board for its approval and submittal to the U.S. Environmental Protection Agency Administrator on behalf of the State of California; and

WHEREAS, on July 2, 1997, the Governing Board adopted the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (1997 SIP) to comply with the requirements of the state and federal air quality law; and

WHEREAS, on July 2, 1997, in conjunction with its adoption of the 1997 SIP, the Governing Board adopted a resolution certifying that the *Final Environmental Impact Report for the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (1997 EIR) had been completed in compliance with the California Environmental Quality Act; that the Governing Board had reviewed and considered the information and analysis contained in the 1997 EIR; and that the 1997 EIR reflected the independent judgment of the District; and

WHEREAS, on November 16, 1998, the 1997 SIP was revised with the adoption of the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and*

Incorporated Board Order (collectively, 1998 SIP) by the Governing Board to comply with the requirements of the state and federal air quality law; and

WHEREAS, on November 16, 1998, in conjunction with its adoption of the 1998 SIP, the Governing Board adopted a resolution certifying that Addendum Number 1 to the 1997 EIR had been completed in compliance with the California Environmental Quality Act; that the Governing Board had reviewed and considered the information and analysis contained in Addendum Number 1 to the 1997 EIR; and that Addendum Number 1 to the 1997 EIR reflected the independent judgment of the District; and

WHEREAS, the 1998 SIP requires the District to continue studying the sources of particulate matter air pollution from the Owens Lake bed area and to take appropriate actions to reduce particulate emissions so that the Owens Valley PM_{10} Planning Area will attain and maintain the NAAQS for particulate matter by the statutory deadlines, including a revision to the 1998 SIP in 2003; and

WHEREAS, the District determined that it is the appropriate public agency to act as Lead Agency under CEQA for the adoption of the proposed 2003 SIP; and

WHEREAS, the adoption of the proposed 2003 SIP revision to the 1998 SIP is a “project” as defined by CEQA; and

WHEREAS, for the reasons set out in the FEIR, the preparation of an environmental impact report was determined to be appropriate for the proposed adoption of the 2003 SIP under applicable CEQA statutory law and regulations; and

WHEREAS, the District prepared the FEIR, supported by consultants, with the District remaining responsible for managing the preparation of the FEIR and subjecting the consultant’s drafts to its own independent review and analysis; and

WHEREAS, the Governing Board has reviewed the FEIR in its entirety, has considered its contents, and has determined that the FEIR for the 2003 SIP meets all the requirements for certification under CEQA and reflects the independent judgment of the District;

NOW, THEREFORE, BE IT RESOLVED by the Governing Board of the Great Basin Unified Air Pollution Control District as follows:

1. It is hereby certified that the FEIR has been completed in compliance with CEQA;

2. It is hereby certified that this FEIR has been presented to the Governing Board of the Great Basin Unified Air Pollution Control District, which has reviewed and considered the information and analysis contained therein;

3. It is hereby certified that this FEIR reflects the independent judgment and analysis of the Great Basin Unified Air Pollution Control District;

4. This certification does not represent approval or disapproval of the 2003 SIP and does not constitute final action on the 2003 SIP by the Great Basin Unified Air Pollution Control District.

APPROVED AND ADOPTED by the Governing Board of the Great Basin Unified Air Pollution Control District this **13th** day of **November, 2003,** by the following vote:

AYES: Supervisors: MIchael Dorame, Joann Ronci, Chris Gansberg, Jr., Mary Pipersky and Linda Arcularius

NOES: ~~NOTES~~: Ø

ABSTAIN: Ø

ABSENT: ~~AYES~~: Town Council Member Tony Barrett and Supervisor Herman Zellmer

Michael Dorame, Chair of Governing Board

ATTEST:

Donna Leavitt
Clerk of the Governing Board

Notice of Determination

Form C

To: ☑ Office of Planning and Research
PO Box 3044, 1400 Tenth Street, Room 222
Sacramento, CA 95812-3044

☑ County Clerk
County of Inyo, P.O. Box F
Attn: Ms. Mary Roper
Independence, CA 93526

From: (Public Agency) Great Basin UAPCD
157 Short Street
Bishop, CA 93514
(Address)

Subject:
Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

Final EIR Owens Valley PM10 Planning Area Demonstration of Attainment SIP-2003 Rev.
Project Title

2002111020	Mr. Theodore Schade	(760) 872-8211
State Clearinghouse Number (If submitted to Clearinghouse)	Lead Agency Contact Person	Area Code/Telephone/Extension

Owens Lake dry lake bed at the southern end of Owens Valley, Inyo County, California
Project Location (include county)

Project Description:

See attached.

This is to advise that the Great Basin UAPCD has approved the above described project on
☑ Lead Agency ☐ Responsible Agency

November 13, 2003 (Date) and has made the following determinations regarding the above described project:

1. The project [☐will ☑will not] have a significant effect on the environment.
2. ☑ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☑were ☐were not] made a condition of the approval of the project.
4. A statement of Overriding Considerations [☐was ☑was not] adopted for this project.
5. Findings [☑were ☐were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval is available to the General Public at:
Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, CA 93514

Signature (Public Agency)	November 13, 2003 *Date*	Governing Board Chair *Title*

Date received for filing at OPR:

RECEIVED
NOV 14 2003
STATE CLEARING HOUSE

Revised May 1999

Project Description:

The Great Basin Unified Air Pollution Control District (District) approved a new air pollution control strategy to bring the Owens Valley PM_{10} Planning Area into attainment with the National Ambient Air Quality Standard (NAAQS) for PM_{10} (particulate matter within a diameter of 10 microns or less) by December 31, 2006, as required by the federal Clean Air Act Amendments of 1990. This new air pollution control strategy is known as the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan - 2003 Revision* (2003 SIP). The new 2003 SIP replaces the 1998 version of the Plan (1998 SIP).

The new 2003 SIP (project) is designed to improve air quality in all of the communities in the Owens Valley, the City of Ridgecrest in Kern County, Sequoia National Park, Death Valley National Park, the Manzanar National Historic Site, and the John Muir, Golden Trout, Dome Land, and South Sierra Wilderness Areas. The project may also improve air quality in more distant locations because, under certain circumstances, particulate emissions from Owens Lake have been recorded in the densely populated sections of southern California.

The project is located in the Owens Valley of Inyo County, in eastern-central California. The Owens Valley PM_{10} Planning Area is located at the southern end of the long, narrow Owens Valley, with the Sierra Nevada Mountains and Mount Whitney to the west, the Inyo Mountains to the east, and the Coso Mountain Range to the south. The project requires the City of Los Angeles (City) to install dust control measures (DCMs) within the exposed bed of Owens Lake. The District requires the City to have all DCMs installed and operational by December 31, 2006.

In addition to program-level differences between the 1998 SIP and the 2003 SIP, the District anticipates the need to apply DCMs to 5.5 square miles (3,537 acres) not analyzed at the project level under the 1998 SIP. Owens Lake remains the largest single source of PM_{10} air pollution in the United States. Dust storms originating from the emissive areas of the Owens Lake bed typically affect the entire Owens Valley, rise to the crest of the Sierra, and extend as far south as the City of Ridgecrest. These dust storms, which occur most frequently in the fall through spring months, create high ecological and human health concerns.

The project includes the 2003 SIP and the construction and operation of the following project elements:

- Dust Control Measures: (shallow flooding, managed vegetation)(the 2003 SIP also provides for the use of gravel blanket for dust control, however, no new gravel has been analyzed for environmental impacts at this time)
- Mainline and Drainline (brineline) Water Pipeline Connections
- Subsurface Drainage System
- Power Supply and Control
- Fertilizer and Water Treatment Injection Systems
- Corridors for Utilities, Power Cables, and Access Roads
- Construction Corridors

ELLEN HARDEBECK
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

Board Order #031113-03

November 13, 2003

I HEREBY CERTIFY that at a meeting of the Great Basin Unified Air Pollution Control District Governing Board in the Inyo County Board of Supervisors chambers in Independence, California on November 13, 2003 an order was duly made and entered as follows:

Adoption of Resolution 2003-05

Resolution of the Governing Board of the Great Basin Unified Air Pollution Control District Adopting the 2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order, Adopting a Mitigation Monitoring and Reporting Plan, and Making Findings of Fact

A motion was made by Supervisor Mary Pipersky, seconded by Supervisor Joann Ronci adopting Resolution 2003-05 "Resolution of the Governing Board of the Great Basin Unified Air Pollution Control District Adopting the 2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (Order Number 031113-01), Adopting a Mitigation Monitoring and Reporting Plan, and Making Findings of Fact," including the findings for Health and Safety Code 42316(a) and directing the Air Pollution Control Officer to forward the 2003 SIP and Order and Resolutions 2003-04 and 2003-05 to the California Air Resources Board. The motion carried 5/0 and so ordered.

Ayes: Supervisors: Michael Dorame, Joann Ronci, Chris Gansberg, Jr., Mary Pipersky, and Linda Arcularius

Noes: Ø

Abstain: Ø

Absent: Town Council Member Tony Barrett and Supervisor Herman Zellmer

Attest:

Donna Leavitt

Donna Leavitt, Board Clerk

RESOLUTION NO. 2003-05

RESOLUTION OF THE GOVERNING BOARD OF THE GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT ADOPTING THE 2003 REVISION TO THE OWENS VALLEY PM_{10} PLANNING AREA DEMONSTRATION OF ATTAINMENT STATE IMPLEMENTATION PLAN AND INCORPORATED BOARD ORDER, ADOPTING A MITIGATION MONITORING AND REPORTING PLAN, AND MAKING FINDINGS OF FACT

WHEREAS, in Resolution 2003-04, which is incorporated by reference herein, the Governing Board of the Great Basin Unified Air Pollution Control District (Governing Board) certified that the *2003 Final Environmental Impact Report* (FEIR) prepared for the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP) has been completed in compliance with the California Environmental Quality Act (CEQA); that the Governing Board has reviewed and considered the information and analysis contained in the FEIR; and that the FEIR reflects the independent judgment and analysis of the Great Basin Unified Air Pollution Control District (District); and

WHEREAS, prior to the Governing Board's action certifying the FEIR, the District and its consultants analyzed the environmental impacts of the proposed revisions contained in the 2003 SIP; and

WHEREAS, the proposed 2003 SIP was circulated for public and governmental agency comment; and;

WHEREAS, the FEIR identified certain significant effects on the environment that, absent the adoption of mitigation measures, would be caused by the City of Los Angeles' compliance with the 2003 SIP; and

WHEREAS, the District is required, pursuant to the California Environmental Quality Act (Public Resources Code §21000 *et seq*.), to adopt all feasible mitigation measures or feasible project alternatives that can substantially lessen or avoid any significant impacts on the environment associated with a project to be approved, such as the 2003 SIP; and

WHEREAS, the Findings of Fact adopted as Exhibit A to this Resolution demonstrate that all of the significant impacts on the environment associated with the 2003 SIP Revision can be avoided through the adoption of feasible mitigation measures; and

WHEREAS, the Governing Board has determined, for reasons set forth in Exhibit A hereto and described in the FEIR, that the 2003 SIP is superior to all feasible project alternatives, that feasible project alternatives would not reduce any potentially significant and unavoidable impact of the 2003

SIP to less-than-significant levels; and that the No Project Alternative, which would avoid these impacts, would fail to achieve most of the objectives and benefits of the 2003 SIP; and

WHEREAS, the Governing Board is required by Public Resources Code §21081.6(a), to adopt a mitigation monitoring and reporting program to ensure that the mitigation measures adopted by the District are actually carried out; and

WHEREAS, the final Mitigation Monitoring and Reporting Program for the 2003 SIP has been prepared, and is adopted as Exhibit B to this resolution;

NOW, THEREFORE, BE IT RESOLVED by the Governing Board of the Great Basin Unified Air Pollution Control District as follows:

1. Through this Resolution, the Governing Board hereby reaffirms each of its findings and resolutions made in Resolution 2003-04 which is incorporated herein by reference and approves and adopts the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP), which approval and adoption are effective immediately;

2. The Governing Board hereby adopts and issues Great Basin Unified Air Pollution Control District Order No. 031113-01 set forth in Chapter 8 of the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP), which adoption and issuance are effective immediately;

3. The Clerk of the Governing Board is hereby authorized to compile and publish the complete *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP) adopted on November 13, 2003 and shall certify on behalf of the District that said compilation is the authoritative version of the *Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (Final SIP)*. The Clerk of the Governing Board is further authorized to submit and distribute the Final SIP and any additional information necessary for its adoption by the State of California and its approval by the U.S. Environmental Protection Agency.

4. Through this Resolution, which incorporates by reference and adopts the Mitigation Monitoring and Reporting Program included as Exhibit B to this Resolution, the Governing Board has satisfied its obligations pursuant to Public Resources Code §21081.6(a);

5. By adopting this Resolution, including the exhibits attached hereto, the Governing Board has satisfied its obligations pursuant to Pubic Resources Code §21081 and California Code of Regulations, Title 14, §15091, in that the Governing Board has made one or more of the following findings with respect to the significant or potentially significant effects of the 2003 SIP: (a) Changes or alterations have been required in, or incorporated into the 2003 SIP which mitigate or avoid many of the significant environmental effects thereof as identified in the FEIR; (b) Some changes or alterations are within the responsibility and jurisdiction of another public

agency and such changes have been, or can and should be, adopted by that other agency;
(c) Specific economic, legal, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the environmental impact report. Based upon these findings and the information contained in the record, the Governing Board concludes that the adoption of the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* will not cause to occur any significant adverse effect on the physical environment.

APPROVED AND ADOPTED by the Governing Board of the Great Basin Unified Air Pollution Control District this **13th** day of **November, 2003,** by the following vote:

AYES: Supervisors: Michael Dorame, Joann Ronci, Chris Gansberg,Jr., Linda Arcularius and Mary Pipersky

~~NOTES:~~ NOES: Ø

ABSTAIN: Ø

~~AYES:~~ ABSENT: Town Council Member Tony Barrett and Supervisor Herman Zellmer

Michael Dorame, Chair of the Governing Board

ATTEST:

Donna Leavitt
Clerk of the Governing Board

Attachments: Exhibit A - Findings of Fact
Exhibit B - Mitigation Monitoring and Reporting Program

Governing Board of the Great Basin Unified Air Pollution Control District
November 13, 2003

RESOLUTION NO. 2003-05

EXHIBIT A - FINDINGS OF FACT

2003 Revision to the
Owens Valley PM_{10} Demonstration of Attainment
State Implementation Plan

Findings of Fact Under the Provisions of California Health & Safety Code §42316(a);
Findings of Fact on Significant Environmental Impacts of the Proposed Project (2003 SIP);
Findings of Fact on Project Alternatives; and
Other Findings of Fact

Related Documentation:
2003 Revision to the Owens Valley PM_{10} Planning Area
Demonstration of Attainment State Implementation Plan
dated November 13, 2003

2003 Owens Valley PM_{10} Planning Area
Demonstration of Attainment State Implementation Plan
Final Environmental Impact Report
(State Clearinghouse Number 2002111020)
dated November 13, 2003

Project Files May Be Reviewed at:
Great Basin Unified Air Pollution Control District
157 Short Street, Bishop, California 93514
(760) 872-8211

RESOLUTION NO. 2003-05

Exhibit A - Findings of Fact Relating to:

2003 Revision to the Owens Valley PM_{10} Demonstration of Attainment State Implementation Plan

Contents

A. Introduction and Purpose

The revisions contained in the proposed *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order* (collectively, 2003 SIP) is a "project" as defined by the California Environmental Quality Act (CEQA) (Public Resources Code §21000 *et. seq.)*. The Great Basin Unified Air Pollution Control District (District) is the lead agency for the project.

On July 2, 1997, the Governing Board of the Great Basin Unified Air Pollution Control District (Governing Board) adopted and certified the Final Environmental Impact Report (1997 EIR) for the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (1997 SIP) concurrently with the adoption of that 1997 SIP. The 1997 SIP was revised when the Governing Board adopted revisions to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order on November 16, 1998 (1998 SIP). The Governing Board, concurrently with the 1998 SIP adoption, certified an addendum to the 1997 EIR entitled Addendum No. 1 to the Final Environmental Impact Report for the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order (1998 EIR).

For consideration of the revisions contained in the 2003 SIP, the District has prepared a 2003 Final Environmental Impact Report (FEIR) for the 2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order. A draft of the proposed 2003 SIP was circulated to public agencies and the public for a 30-day review and comment period. Pursuant to the requirements of CEQA, the FEIR describes the 2003 SIP (also referred to herein as the 'Proposed Project') and affected environment; it identifies, analyzes and evaluates the potential significant environmental impacts that may result from the Proposed Project; it identifies measures to mitigate adverse environmental impacts; and it identifies and compares the merits of project alternatives.

CEQA Guidelines require a public agency's decision makers to consider the information in the FEIR along with other information that may be presented to the District when deciding whether to approve the Proposed Project. The FEIR sets forth the information to be considered in the Governing Board's evaluation of benefits and potential impacts to the environment resulting from the implementation of the 2003 SIP.

The FEIR for the proposed 2003 SIP identifies potential adverse environmental impacts in the following environmental issue areas: air quality, biological resources, cultural resources, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, transportation and traffic, and utilities and service systems. The FEIR determined that there was no potential for adverse environmental impacts in the following environmental issue areas: aesthetics, agricultural resources, geology and soils, mineral resources, population and housing, public services and recreation. It was concluded in the FEIR that no significant adverse impacts will remain after implementation of feasible mitigation measures.

This document presents findings to be made by the Governing Board prior to approval of the project pursuant to the requirements of CEQA and CEQA Guidelines. CEQA requires the District to make certain written findings explaining how it has dealt with each alternative and each significant environmental impact identified in the FEIR. The District may find that:

- Changes or alterations have been required in or incorporated into the project to avoid or substantially lessen the significant environmental effects identified in the FEIR;

- Such changes or alterations are within the purview and jurisdiction of another agency and have been or should be adopted by that agency; or

- Specific economic, social or other considerations make infeasible the mitigation measures or project alternatives identified in the FEIR and Mitigation Monitoring and Reporting Program (MMRP).

Each of these findings are supported by substantial evidence in the administrative record. Evidence from the FEIR, MMRP and elsewhere in the record of proceedings are relied upon to meet these criteria.

This document summarizes the significant environmental impacts of the Proposed Project and project alternatives and describes how these impacts are to be mitigated. An MMRP will be adopted concurrently with these findings (Exhibit B). The MMRP sets froth a program to ensure that required environmental impact mitigation measures are properly implemented.

B. Findings of Fact Under the Provisions of California Health & Safety Code §42316(a)

On the basis of substantial evidence in the record, and for the reasons set forth in:

- that certain *Staff Report to the Board: Compliance of the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan Control Measures with Requirements of Health & Safety Code §42316(a)* dated July 2, 1997;
- that certain *Staff Report to the Board Re: Revisions to the July 2, 1997 Owens Valley Planning Area State Implementation Plan* dated November 16, 1998;
- that certain *Staff Report to the Board: 2003 Owens Valley Planning Area SIP Revision* dated July 9, 2003; and
- that certain *Staff Report to the Board: Compliance of the 2003 Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan Control Measures with the Requirements of Health and Safety Code Section 42316(a)* dated November 13, 2003;

which are all hereby incorporated herein by reference, the Governing Board of the Great Basin Unified Air Pollution Control District makes the following findings:

1. The Governing Board finds that there are violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

2. The Governing Board finds that the dry bed of the Owens Lake causes and contributes to the violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

3. The Governing Board finds that the water diversions of the City of Los Angeles have uncovered essentially all of the dust source areas on the dry lake bed, thus causing and contributing to violations of the state and federal ambient air quality standards for PM_{10} in the Owens Valley PM_{10} Planning Area.

4. The Governing Board finds that shallow flooding, managed vegetation, and gravel, as required and permitted by the *2003 Revision to the Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan and Incorporated Board Order Number 031113-01* (collectively, 2003 SIP), will mitigate the air quality impacts caused by the City of Los Angeles' water diversions.

5. The Governing Board finds that shallow flooding, managed vegetation, and gravel, as required and permitted by the 2003 SIP, are reasonable control measures for controlling PM_{10} emissions from Owens Lake.

6. The Governing Board finds that the control measures required by the 2003 SIP do not affect the right of the City to produce, divert, store or convey water.

7. The Governing Board finds the control measures required by the 2003 SIP can be completed by the milestones and deadlines set forth in the 2003 SIP.

8. The Governing Board finds that the time period for implementation is a reasonable period to complete the implementation of the control measures.

9. The Governing Board makes each and every of the above findings on the basis of substantial evidence in the record. The District is the custodian of the materials that constitute the record of proceedings upon which the decision to approved the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

C. Other Findings of Fact

10. Based upon the fact that the Owens Valley PM_{10} Planning Area (Owens Valley) has been designated a serious non-attainment area by the USEPA, and that the Owens Valley is required by the Clean Air Act Amendments of 1990 to attain the PM_{10} 24-hour standard by December 31, 2001, the GBUAPCD Governing Board finds that the adoption of the 2003 SIP is necessary.

11. Based upon the fact that Health and Safety Code Section 42316 allows the District to require the City of Los Angeles to undertake reasonable measures to mitigate the air quality impacts of the City's water-gathering activities, the Governing Board finds that the District has the authority to adopt the 2003 SIP, including the adoption and issuance of District Order No. 031113-01.

12. Based upon public comment on the Plan, the Governing Board finds that the 2003 SIP and Order are written clearly so that they can be easily understood by the persons affected.

13. Based upon an examination of the legal and regulatory history of the Owens Valley PM_{10} Planning Area, and the above findings on the compatibility of the Plan and Order with Health and Safety Code Section 42316, the Governing Board finds that the 2003 SIP is consistent with existing statutes, court decisions, and state and federal regulations.

14. Based upon the fact that state law delegates to the District the responsibility for control of stationary sources of air pollution, the Governing Board finds that the 2003 SIP does not duplicate existing state or federal regulations.

15. The Governing Board references the Clean Air Act Amendments of 1990 and State of California Health and Safety Code Section 42316 as the laws that the District implements through the 2003 SIP.

16. The Governing Board finds that reasonable notice of the Governing Board's intention to hold a public hearing to adopt the 2003 SIP was given in compliance with the provisions of Title 40 of the Code of Federal Regulations, Section 51.102.

17. The Governing Board finds that notice of the public hearing to adopt the 2003 SIP was published in the following newspapers more than 30 days in advance of the hearing: the *Inyo Register* (Inyo County), the *Mammoth Times* (Mono County) and the *Tahoe Daily Tribune* (for Alpine County).

18. The Governing Board finds that the July 2003 Draft of the 2003 SIP was available for public inspection at the District's office in Bishop, California at least 30 days in advance of the public hearing to adopt the Plan.

19. The Governing Board finds that the Administrator of the U.S. Environmental Protection Agency (through the Regional Administrator) was given notice of the public hearing and a copy of the July 2003 Draft of the 2003 SIP at least 30 days in advance of the hearing.

20. The Governing Board finds that the Executive Officer of the California Air Resources Board was given notice of the public hearing and a copy of the July 2003 Draft of the 2003 SIP at least 30 days in advance of the hearing.

21. The Governing Board finds that the Kern County Air Pollution Control District was given notice of the public hearing and a copy of the July 2003 Draft 2003 SIP at least 30 days in advance of the hearing.

22. The Governing Board finds that the City of Los Angeles was given notice of the public hearing and a copy of the July 2003 Draft 2003 SIP at least 30 days in advance of the hearing.

23. The Governing Board finds that for the reasons and based on the facts set forth in the Final Environmental Impact Report (FEIR) for the 2003 SIP, that an environmental impact report was the necessary and sufficient environmental review document required to be prepared

under the California Environmental Quality Act (CEQA) for adoption of the 2003 SIP, and the District's decision not to prepare a subsequent environmental impact report, an addendum or other CEQA environmental document is both correct and adequately explained in the text of the FEIR. The Governing Board finds as true the facts cited in the FEIR to support the District's decision to prepare an environmental impact report in lieu of a subsequent environmental impact report, an addendum or other CEQA environmental document.

24. The Governing Board makes each and every of the findings in this Exhibit on the basis of substantial evidence in the record. The District is the custodian of the materials that constitute the record of proceedings upon which the decision to approve the Proposed Project is based. These materials are located at the District's offices at 157 Short Street, Bishop, California 93514.

D. Findings of Fact Regarding the Final Environmental Impact Report for the 2003 Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan (State Clearinghouse Number 2002111020)

The *Findings of Fact Regarding the Final Environmental Impact Report for the 2003 Owens Valley* PM_{10} *Planning Area Demonstration of Attainment State Implementation Plan (State Clearinghouse Number 2002111020)* dated November 13, 2003 have been bound separately and are hereby made part of this Exhibit. The Findings relating to the Final EIR contain the following sections:

I. Introduction
II. Potential Environmental Effects That Are Not Significant
III. Potential Environmental Effects That Can Be Mitigated to a Level of Insignificance
IV. Significant Unavoidable Adverse Impacts That Cannot Be Mitigated to a Level of Insignificance
V. Findings Regarding Alternatives
VI. Findings Regarding Mitigation Monitoring Program
VII. Findings Regarding Location and Custodian of Documents
VIII. Certification Regarding Independent Judgment
IX. Statement of Overriding Considerations
X. Section 15091 Findings

Resolution 2003-05

Exhibit A – Findings of Fact (Environmental Findings of Fact) and
Exhibit B – Mitigation Monitoring Program

are bound separately as **Appendix D** of the 2003 Owens Valley PM_{10} SIP
and are available upon request from the
Great Basin Unified Air Pollution Control District,
157 Short Street, Bishop, California 93514,
Telephone: 760-872-8211, E-mail: gb1@greatbasinapcd.org

Appendix A

PM_{10} Monitoring Data – All Sites 1987 through 2002

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Appendix A, which contains a summary of PM_{10} monitoring data,
is bound separately and is available upon request from
the Great Basin Unified Air Pollution Control District,
157 Short Street, Bishop, California 93514,
Telephone: 760-872-8211, E-mail: gb1@greatbasinapcd.org

Appendix B

Modeling Report

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This Appendix, which details the air quality modeling performed for the SIP,
is bound separately and is available upon request from the
Great Basin Unified Air Pollution Control District,
157 Short Street, Bishop, California 93514,
Telephone: 760-872-8211, E-mail: gb1@greatbasinapcd.org

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Appendix C

Public Comments on the Draft SIP and District Responses

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This Appendix, which contains copies of all the public comment letters received by the District and the District's responses to the comments, is bound separately and is available upon request from the
Great Basin Unified Air Pollution Control District,
157 Short Street, Bishop, California 93514,
Telephone: 760-872-8211, E-mail: gb1@greatbasinapcd.org

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Appendix D

Environmental Findings of Fact

and

Mitigation Monitoring Program

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This Appendix, which contains the Environmental Findings of Fact and the Mitigation Monitoring and Reporting Program adopted by Resolution 2003-05, is bound separately and is available upon request from the Great Basin Unified Air Pollution Control District, 157 Short Street, Bishop, California 93514, Telephone: 760-872-8211, E-mail: gb1@greatbasinapcd.org

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