Oceano Dunes State Vehicular Recreation Area
Dust Control Program

2020 Annual Report and Work Plan

August 2020

State of California

Department of Parks and Recreation

Off-Highway Motor Vehicle Recreation Division

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Oceano Dunes SVRA
Dust Control Program
2020 Annual Report and Work Plan

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List of Exhibits

2020 Annual Report and Work Plan Attachments (Separate Documents)

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

Acronym / Symbol	**Full Phrase or Description**
APCO	Air Pollution Control Officer
BSNE	Big Springs Number Eight
CAAQS	California Ambient Air Quality Standards
CCC	California Coastal Commission
CEQA	California Environmental Quality Act
DEM	Digital Elevation Model
DRI	Desert Research Institute
EIR	Environmental Impact Report
GCD	Geomorphic Change Detection
GNSS	Global Navigation Satellite System
LIDAR	Light Detection and Ranging
LSPDM	Lagrangian Stochastic Particle Dispersion Model
m^2	Square Meter
m^3	Cubic Meter
NOP	Notice of Preparation
OHMVR	Off-Highway Motor Vehicle Recreation
PI-SWERL®	Portable In-Situ Wind Erosion Laboratory
PMRP	Particulate Matter Reduction Plan
PM	Particulate Matter
PM_{10}	Coarse Particulate Matter
PPK	Post Processed Kinetic
REL	Reference Exposure Level
RTK	Real Time Kinetic
SAG	Scientific Advisory Group
SB	Straw Bale
SLOAPCD	San Luis Obispo County Air Pollution Control District
SOA	Stipulated Order of Abatement
SODAR	Sonic Detection and Ranging
SVRA	State Vehicular Recreation Area
UAS	Unmanned Aerial System
VG	Vegetation
WF	Wind Fence
WRF	Weather and Research Forecasting
µg	Micrograms
$	U.S. Dollar
%	Percent

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1 INTRODUCTION

The California Department of Parks and Recreation (CDPR), Off-Highway Motor Vehicle Recreation Division (OHMVR Division), has prepared this 2020 Annual Report and Work Plan for the Oceano Dunes State Vehicular Recreation Area (Oceano Dunes SVRA) Dust Control Program to comply with Condition 4 of the Stipulated Order of Abatement (SOA) approved by the San Luis Obispo County Air Pollution Control District (SLOAPCD) Hearing Board in April 2018 (Case No. 17-01) and amended in November 2019.

SOA Condition 4 requires the OHMVR Division to prepare and submit to the SLOAPCD, and the SOA Scientific Advisory Group (SAG), an Annual Report and Work Plan (ARWP) by August 1 of each year from 2019 to 2022. In general, SOA Condition 4 requires the Annual Report and Work Plan to:

- Review dust control activities implemented over the previous 12-month period and, using tracking metrics specified in the PMRP, document progress towards SOA goals.
- Identify dust control activities proposed to be undertaken or completed in the next 12-month period and, using tracking metrics specified in the PMRP, document expected outcomes and potential emission reductions for these activities.
- Using air quality modeling, estimate the downwind benefits and anticipated reductions in PM_{10} concentrations associated with proposed dust control activities.
- Describe the budgetary considerations for development and implementation for proposed dust control activities.
- Provide a detailed implementation schedule with deadlines associated with the physical deployment of proposed dust control actions.

Section 2 of this ARWP ***reports*** on projects implemented the previous year and associated information.

Section 3 of this ARWP provides ***plans*** for next year and associated information.

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2 ANNUAL REPORT

2.1 Dust Controls Implemented Over the Previous Year

From August 1, 2019 to July 31, 2020, the OHMVR Division began development of a 48-acre vegetated foredune, maintained 13.4 acres of existing wind fencing, maintained existing track out activities at the two vehicle entrances/ramps, installed 19.2 acres of backdune straw bale projects (4.2 acre plot specified in the amended SOA and 15 acres of Paw Print converted from wind fence to straw mulch in March 2020), installed 20 acres of backdune vegetation projects, and 40 acres of new wind fencing projects. The dust control measures implemented by the OHMVR Division over the past year are listed in Table 2-1, summarized in the sections below, and shown on Exhibit 1, *2020 SOA Dust Control Measures*.

Table 2-1: 2020 Annual Report Dust Control Projects Summary(A)

ID	Type	New Acres Controlled	Acres Converted to Vegetation Treatments	Acres of Supplemental Treatments	Net Increase in Acres of Dust Control
2019-VG-01	Vegetation	48.0	48.0	--	48.0
2019-SB-01	Straw Bale	4.2	--	--	4.2
2019-SB-01	Straw Bale	--	--	15.0	--
2019-VG-02	Vegetation	--	20.0	20.0	--
2019-WF-01	Wind Fencing	20.0	--	--	20.0
2019-WF-02	Wind Fencing	20.0	--	--	20.0
Totals		**92.2 Acres**	**68.0 Acres**	**35.0 Acres**	**92.2 Acres**

(A) All acreage values are approximate.

As shown in Table 2-1, there was a net increase of 92.2 acres of dust control at Oceano Dunes SVRA between August 1, 2019 and July 31, 2020. This is in addition to 84.7 acres of dust control implemented pursuant to the SOA in the 2018-19 season.

2.1.1 Development of a Vegetated Foredune (Project ID: 2019-VG-01)

Pursuant to the SLO APCD SOA as amended, the OHMVR Division has begun development of a vegetated foredune restoration zone just landward of the upper beach that is approximately 48 acres in size. Exhibit 2 to this report provides a diagram of the foredune development project implemented in the 2019-20 season. Exhibit 3 provides a list of the seed and plant stock used for the project in 2019-20 season.

The foredune restoration process started by enclosing planting areas with perimeter fencing. The areas closed off are not be continuous, but have gaps that allow the public to pass from the camping area to the west to the riding areas in the east. In addition, existing infrastructure near the foredune development area (most notably the vault toilet buildings) remain open to service vehicles and the public. Finally, the foredune is set back (northward) from the western snowy plover seasonal nesting exclosure to reduce potential impacts on nesting birds. If possible, paths of travel would follow the prevailing wind pattern to reduce long-term maintenance needs on the protective fencing.

Following installation of the perimeter fencing, development of the approximately 48-acre foredune project was based on a SAG design approach. The fenced plots were sub-divided into 6 different treatment areas (See Exhibit 2), as follows:

- Plot 1 (18.8 acres):
    - Treatment 1 (4 ac): no treatment other than sheep's foot surface texturing to create divots for seeds and create low-level aerodynamic roughness
    - Treatment 2 (5.2 ac): native seed mix with sheep's foot surface texturing
    - Treatment 3 (9.6 ac): sheep's foot to prepare soil with sterile ryegrass and native seed mix
    -
- Plot 2 (18.8 acres):
    - Treatment 4 (9.1 ac): low-density random node planting (spacing derived from natural analogue site near Oso Flaco Lake) with approximately 9 foredune specific plants per node planted within a 12' radius zone of straw to protect seedlings.
    - Treatment 5 (9.7 ac): high-density random node planting with the same planting and straw protection strategy.
- Plot 3 (9.9 acres):

- Treatment 6 (9.9 ac): ‘Parks Classic’, sheep’s foot surface texturing, spread straw over entire area, plant foredune specific species, seed area with native seed (at roughly 5 lb per ac)

Evaluation Metrics

The reportable metrics for actions necessary to develop a vegetated foredune are included in the Evaluation Metrics 2019-2020 Final Report (Attachment 1).

The metrics measure changes in plant coverage, sand flux (saltation) and volumetric changes, wind shear threshold wind shear velocity, and emissivity. This information will be used to guide future foredune development activities as well as other dust control efforts to be implemented pursuant to the SOA.

2.1.2 4.2 Acre Additional Backdune Treatment (Project ID: 2019-SB-01)

Pursuant to the SLO APCD SOA as amended, The OHMVR Division has begun development of 4.2 acres of additional backdune dust control treatments (see Exhibit 1). The area to be treated was selected through coordination with the SAG and SLO APCD. The 4.2-acre area was fenced off to exclude public access in December 2019 and received straw bales/mulch in January 2020. In Section 3 of this ARWP the 4.2-acre area is planned to be planted with native vegetation in 2020-21.

The reportable metrics for this project are included in the Evaluation Metrics (Attachment 1).

The metrics measure changes in plant coverage, sand volume, threshold wind shear velocity, and emissivity. This information will be used to guide future backdune dust control efforts to be implemented pursuant to the SOA.

2.1.3 Wind Fencing Conversion to Vegetation Treatments (Project ID: 2019-VG-02)

Consistent with SOA Condition 1.b., the OHMVR Division converted approximately 20 acres of the 48.6 acres of wind fencing installed in 2018 to vegetation treatments. The project area for the conversion from wind fencing to vegetation is located on the western edge of the approximately 35.2-acre wind fence array located adjacent to the Paw Print vegetation island (see Exhibit 7 and Exhibit 8 from the December 2019 ARWP). Wind fence removal occurred in September 2019 and dune scrub restoration treatment was completed in December 2019.

In September 2019, approximately 15 acres of wind fence on the eastern edge of the Paw Print vegetation island was removed and then covered with straw in March 2020. The fence removal was necessary at this site to facilitate restoration work on the western 20 acres of this treatment area as described above. Rather than replacing the wind fencing on the eastern portion of the project area, CDPR opted to place straw mulch in preparation for native plant planting during the 2020/21 planting season.

The reportable metrics for this project are included in the Evaluation Metrics (Attachment 1).

The metrics measure changes in plant coverage, sand volume, wind shear threshold wind shear velocity, and emissivity. This information will be used to guide future backdune dust control efforts to be implemented pursuant to the SOA.

2.1.4 Seasonal Wind Fencing Projects (Project ID: 2019-WF-01 and 2019-WF-02)

Pursuant to the SLO APCD SOA as amended, the OHMVR Division have installed approximately 40 acres of seasonal wind fencing in the back dune regions of Oceano Dunes SVRA. The wind fencing is comprised of two approximate 20 acre parcels shown on Exhibit 1. The location of the wind fencing project was informed by the SAG and approved by the SLO APCD. The reportable metrics for this project are included in the Evaluation Metrics (Attachment 1). The metrics measure the length of wind fencing installed per day. This information will be used to guide future wind fence dust control efforts to be implemented pursuant to the SOA.

The wind fencing is a temporary treatment and is planned to be removed in Fall 2020 to once again allow public vehicular access. In Section 3 of this ARWP, the two 20-acre areas are proposed to re-receive dust treatments prior to the beginning of the 2021 windy season.

2.1.5 Wind Fencing Maintenance Projects

Consistent with SOA Condition 1.b., the OHMVR Division maintains wind fencing installed in summer 2018 that has not been converted to vegetation by July 31, 2020. Maintenance activities included replacing fence posts, fencing materials, and installing new fence rows to maintain historical design control values for wind fencing arrays (greater than 80% to 90% control in the center of the array). In March 2020, approximately 13.4 acres of wind fencing was maintained in the Eucalyptus and Table Top Vegetation Islands as shown on Exhibit 1. These areas are scheduled for planting with native vegetation in 2020-21 (refer to Section 3).

2.1.6 Trackout Control Projects

Pursuant to SOA Condition 1.c, the OHMVR Division was required to install an APCO-approved trackout control device at the Grand Avenue and Pier Avenue entrances to Oceano Dunes SVRA in the City of Grover Beach and the unincorporated community of Oceano, respectively, by June 30, 2019.

In May 2019, the OHMVR Division installed two temporary trackout mats at the Pier Avenue exit. The mats abate track out onto public streets from vehicles exiting the park. The temporary mats are removed at least once per week and all accumulated sand is removed from the street and disposed at an approved facility.

In addition to the new trackout mats, the OHMVR Division continued its program of street sweeping Grand and Pier Avenues a minimum of five times per week. The OHMVR Division also contracts with a private sweeping firm to cover a portion of Pier Avenue a minimum of two days per week from Air Park Drive to the State Park boundary. This sweeping complements the work that San Luis Obispo County conducts on Pier Avenue.

A permanent Trackout Control Program is currently being developed for the Grand and Pier Avenue entrances. The proposal involves installation V-shaped, grooved concrete panels west of the entrance kiosks at Grand Avenue and Pier Avenue. The design phase of this permanent solution has been completed and the Construction phase of this permanent program has been approved for capital outlay funding through the 2020-2021 California State Budget.

2.2 Statement of Progress Achieved

The dust control measures identified in Section 2.1 reduce saltation and dust emissions within the control area and reduce PM_{10} concentrations downwind of the treatment areas. The methodology for assessing progress relies on tracking of the Evaluation Metrics, outputs from the DRI model on mass emissions and PM10 concentrations, and actual changes in PM10 concentrations detected at SLO APCD monitors adjusted for variability of meteorological conditions.

Included as Attachment 1 and 2 to this ARWP are the Evaluation Metrics established through the SOA. Attachment 1 is the final report of the Evaluation Metrics for 2019-20 and Attachment 2 is the initial report of the 2020-21 Evaluation Metrics. Review of the outcomes from these metrics over time will assist in determining progress.

As discussed in more detail in Section 3.3, outputs generated from the DRI Model indicate the dust control projects implemented in the 2019-20 season reduced PM10 mass emissions, from the Oceano Dunes SVRA camping and riding area, by 8.7 metric tons per day based on the established baseline using the 10 highest PM10 emission days from 2013. This would represent a 4.6% reduction in PM10 emissions, based on the established baseline (See Attachment 3 and Section 2.4.1). Taken together, all of the dust control projects implemented thus far pursuant to the SOA reduced PM10 mass emissions from the Oceano Dunes SVRA camping and riding area by 27.7 metric tons per day for the baseline scenario. This would re represent a 14.7% reduction in PM10 emissions based on the established baseline.

The DRI model is also used to evaluate potential changes in downwind PM_{10} concentrations at selected receptor sites such as CDF and MESA2. With no controls in place and using the 2013 PI-SWERL emission grid, the model-predicted value for the CDF site is 123 μg m^{-3}. With the dust control areas as of spring 2020 in place and at the hypothetical effectiveness of 100% reduction for all controls the model-predicted value for the CDF site is 57 μg m^{-3}, a reduction of 54%. Using the 2019 PI-SWERL emissions grid the modeled value at CDF for the 10 baseline emissions days is 52 μg m^{-3}, a reduction of 58%. These model results suggest that the dust controls are effective at reducing the downwind PM_{10} concentrations at receptor sites to a greater degree than is indicated by the reduction in total mass emissions, which the model estimates at 14.7%.

In June 2020, the SLO APCD published a *Frequently Asked Questions* document regarding recent air quality concerns in South San Luis Obispo County. That document is included as Attachment

4 to this ARWP. SLO APCD reviewed data on actual spring 2020 PM10 concentrations being detected at their monitors. The following excerpt was in part the product of that review:

> ***"Q3: What effect have the dust mitigations had on downwind air quality?***
>
> ***A3: The short answer is that we have seen real, significant improvements in air quality, especially at CDF, and especially after taking meteorology (wind) into account."***

2.3 Monitoring Activities Conducted Over the Previous Year

During the 2019-20 season, the OHMVR Division continued monitoring activities and updating the DRI model inputs to reflect new meteorological, air quality, and other data collection efforts described in Chapter 2 of the December 2019 ARWP.

The following sections describe the monitoring/modeling activities conducted in the 2019-20 season.

2.3.1 Meteorological, Pm and Saltation Monitoring

Beginning in 2018, the OHMVR Division installed 15 meteorological and air quality monitoring stations across Oceano Dunes SVRA (Fig. 2.1) to help assess individual project effectiveness and update the meteorology used in the DRI emissions model (see Exhibit 6, 2019 Work Plan Meteorological Monitoring). This network of meteorological and air quality instruments was deployed with spatial and temporal resolution equivalent to the 2013 network that helped to define the SOA's baseline time period (May 1, 2013 to August 31, 2013). The air and meteorological monitoring is ongoing. The data collected are integrated into the modeling exercises discussed in Attachment 3.

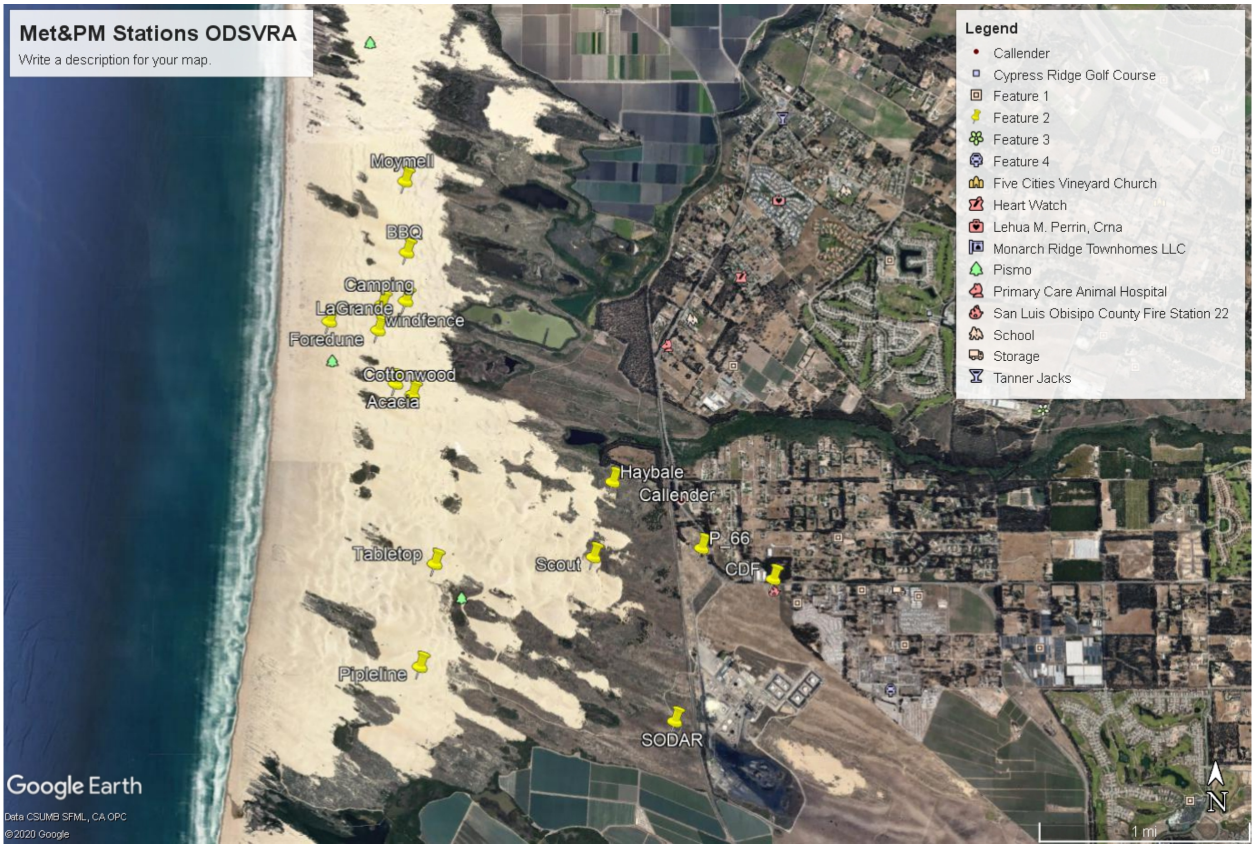

Figure 2-1. The locations of the ODSVRA meteorological and PM monitoring stations. The SLOCAPCD PM_{10} monitoring station designated is CDF is also shown.

The instrumentation at each station is placed on a 3 m tripod that sits on a platform above the sand surface (Fig. 2-2). The instrumentation measures wind speed, wind direction, temperature, relative humidity (RH), and air pressure (ClimaVue500). Tipping bucket rain gauges are located at 4 of the stations. Saltation is monitored using Sensits at all stations. MetOne Particle Profilers are deployed at each site to measure particle numbers in 8 size bins every 60 s. These instruments are collocated with a BAM prior to deployment in DRI's dust chamber to develop a calibration relationship between PM_{10} concentration measured with a reference BAM and each MetOne instrument (including 2 spares). This is repeated at the end of the dust season to evaluate how the instruments may be affected by the environmental conditions.

In 2020 a second calibration between a BAM and the MetOne instruments is being carried out within the ODSVRA to evaluate the effect of dynamic meteorological conditions (i.e., wind speed and RH) on the relationship between the two instruments. The instrument set up is shown in Fig. 2-3 and an example of the relationships between the BAM and two MetOne instruments is shown in Fig. 2-4. Two MetOne units from the 15 stations are paired with the BAM over a sufficient length of time to expose them to high winds and high PM_{10} concentrations to establish the calibration relationships. Then the next pair is swapped out.

Figure 2-2. One of the 15 meteorological, saltation, and PM monitoring stations in the ODSVRA.

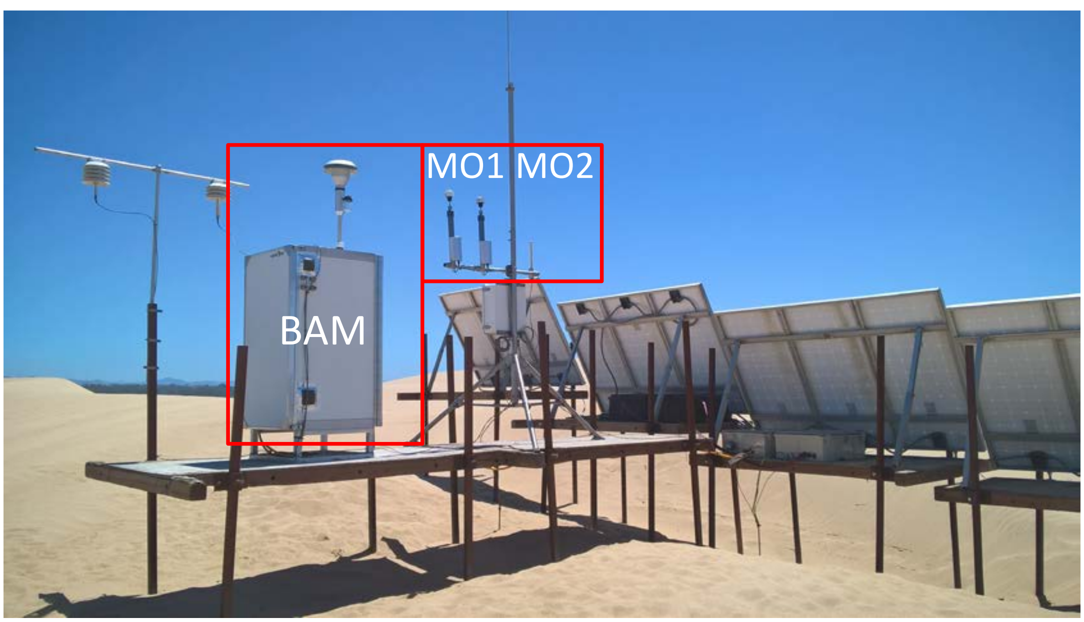

Figure 2-3. The BAM and MetOne (M01 and MO2) calibration set-up in the ODSVRA near the BBQ Monitoring site (Fig. 1).

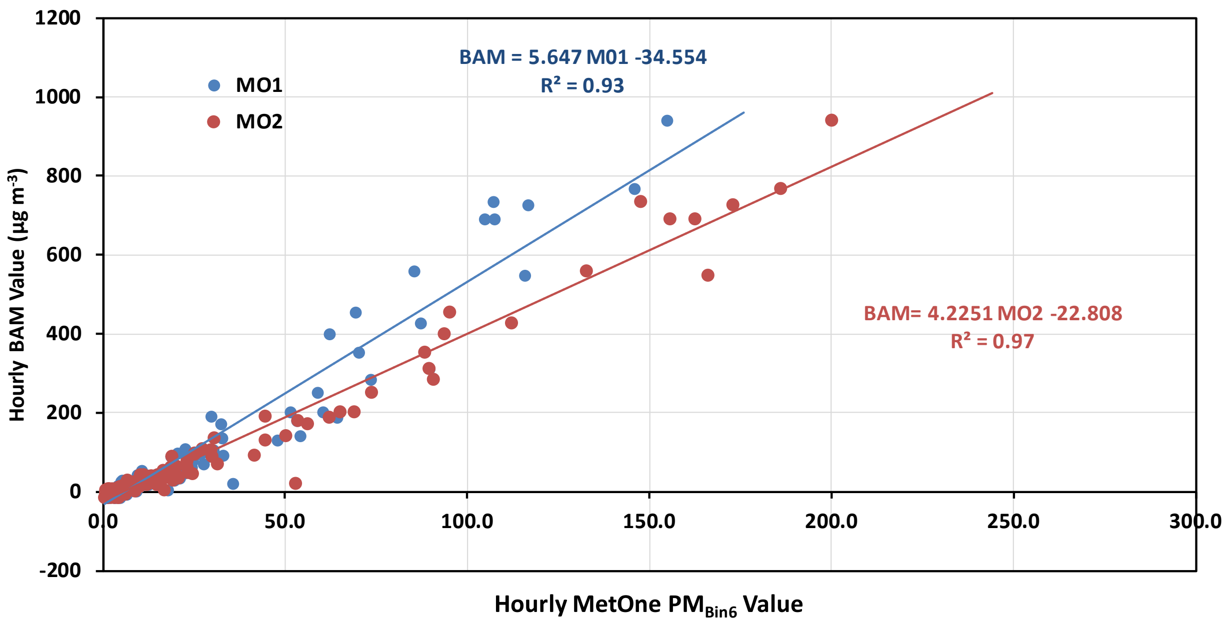

Figure 2-4. In situ calibration of two MetOne instruments with the in-PARK BAM unit.

The operation of the BSNE sampling network that quantifies sand flux in the dust control areas is carried out by personnel from the Coastal San Luis Resource Conservation District following training received from DRI personnel. The sampling strategy is to have the traps installed, the opening set at 15 cm above the surface, prior to a sand transport event. Following an event (typically the next morning), each BSNE is visited and the collected sand is put into Ziploc bags with the date of collection and the unique identifier for the BSNE. The empty BSNE is returned to its holder and the height set to 15 cm making it ready for the next collection. The sample bags are returned to the RCD office for latter weighing on an electronic balance to a precision of 0.01 g.

Saltation flux measurements were made in the 37.7 acre temporary sand fence array and 7 acre re-vegetation area in 2019, and are being made in two temporary sand fence arrays established in spring 2020. In 2019, 32 traps were placed in the fence array area and 20 in the re-vegetation area. In 2020, 12 traps were placed in each of the fence arrays area. In 2019 and 2020, BSNE traps in the array of sand fences were placed between consecutive sand fences at a distance of 6 fence heights from the upwind (western) fence based on the positioning shown in

Table 2-2. The locations of the BSNE sand traps in the temporary sand fence arrays in 2020 are shown in Table 2-3.

Control effectiveness of the array to reduce sand flux is defined by the Normalized Sand Flux (*NSF*):

NSF=sand flux internal to the array/sand flux upwind of the array

The overall control effectiveness is based on the change of *NSF* as a function of downwind distance through a dust control area (sand fence array or vegetation).

In the temporary sand fence array 2019, the *NSF* decreased rapidly between the first two sets of traps (upwind and between rows 2 and 3) and the traps through to Rows 4-5 (32.9 m). The *NSF* then stabilized to a relatively constant value between Rows 6-7 (50 m) to Rows 14-15 (118.3 m). Beginning at Rows 18-19 (144 m) the *NSF* fluctuated between 0.1 and 0.5 through to the end of transect. As in 2018, *NSF* reached a maximum value at 255 m. This corresponds with the maximum elevation of the transect where maximum wind speeds are likely to occur.

The mean *NSF* for all measurement positions for distances >24.4 m was 0.21 (±0.13), indicating a mean percent reduction in sand flux of 79.1% for 94% of the array.

Table 2-2. Sand trap positions in the temporary sand fence array and re-vegetation site, 2019.

	37.7 Acre Fence Array		7 Acre Re-Vegetation Site		
Row #	Distance (m)	Normalized Distance (Distance/Fence Height)	Row #	Distance (m)	Normalized Distance (Distance/Total Length of Transect)
0	0.0	0	0-1	0.0	0.00
2-3	15.9	13	1-2	8.5	0.10
3-4	24.4	20	2-3	15.9	0.19
4-5	32.9	27	3-4	24.4	0.29
6-7	50.0	41	4-5	32.9	0.39
8-9	67.1	55	5-6	41.4	0.49
10-11	84.2	69	6-7	50.0	0.59
14-15	118.3	97	7-8	58.5	0.69
18-19	144.0	118	8-9	67.1	0.80
22-23	186.7	153	9-10	75.6	0.90
26-27	220.8	181	10-11	84.2	1.00
30-31	255.0	209			
34-35	289.1	237			
38-39	323.1	272			
42-43	357.5	293			
46-47	391.6	321			
50-51	425.8	349			

Table 2-3. The positions of BSNE sand traps within the two temporary sand fence arrays, 2020.

Row #	Distance (m)	D/H	BSNE* (Area 1, 43 rows)	BSNE (Area 2, 36 rows)
0	0	0	X X	X X
2-3	16	13	X X	X X
3-4	24	20		X
4-5	33	27	X X	X X
8-9	67	55	X	X
12-13	101	90	X	X
18-19	144	118	X X	X X
30-31	255	209	X	X
38-39	323	272	X	
*X X indicates 2 BSNEs spaced 2 m apart, N-S				

In the 7-acre revegetation area in 2019, at distances >24.4 m from the leading (western) edge the *NSF* values stabilized and ranged between 0.012 and 0.022. In this span of distance, representing 61% of the transect of instruments the mean *NSF* was 0.019 (±0.003), indicating a sand flux reduction of 98.1%. In the distance from 0 to 24.4 m the mean *NSF* was 0.58 (±0.42) across 39% of the transect.

Monitoring of the two temporary sand fence arrays established in Spring 2020 is ongoing.

Meteorological, PM, and Saltation Monitoring: Foredune Restoration Area

The developing foredune restoration areas will begin to modify the localized meteorological conditions as the vegetation evolves and due to the initial modification to the surface by the treatment type. To characterize the changes in wind and to monitor saltation activity through time, in each test area a suite of instruments on a 3 m tripod on a platform (Fig. 2-5) was deployed near the eastern edge of the areas, approximately 10 m west of the eastern fence line and halfway along the north-south length of an area. A monitoring station has almost the same configuration as those deployed across and exterior to the ODSVRA to measure temperature, RH, wind speed, wind direction, and pressure (ClimaVue500). The restoration area stations do not have PM measurements.

Sensit saltation sensors are located at each station to provide data on threshold wind speed for sand transport. A web-cam is deployed at each station to provide addition information on the frequency and magnitude of sand transport events providing a wider field of view than the point-measurement of the Sensit. Three tipping bucket rain gauges are deployed across the restoration area (north, middle, south).

Sand flux in the 6 foredune restoration treatment areas is measured using BSNE-style sand traps. A linear transect consisting of 5 BSNEs oriented with the major sand transporting wind direction, i.e., 292° at the north-south midpoint of each defined test area was established in April 2020. A BSNE is placed on the western side of a treatment area approximately 2 m from the security fence to receive the incoming sand flux. The next 4 traps in a treatment area are positioned at 4 m (12 feet), 13 m (42 feet), 45 m (148 feet), and 160 m (525 feet) along the 292° transect line. A map of the BSNE locations in the foredune restoration area is shown in Fig. 2-6.

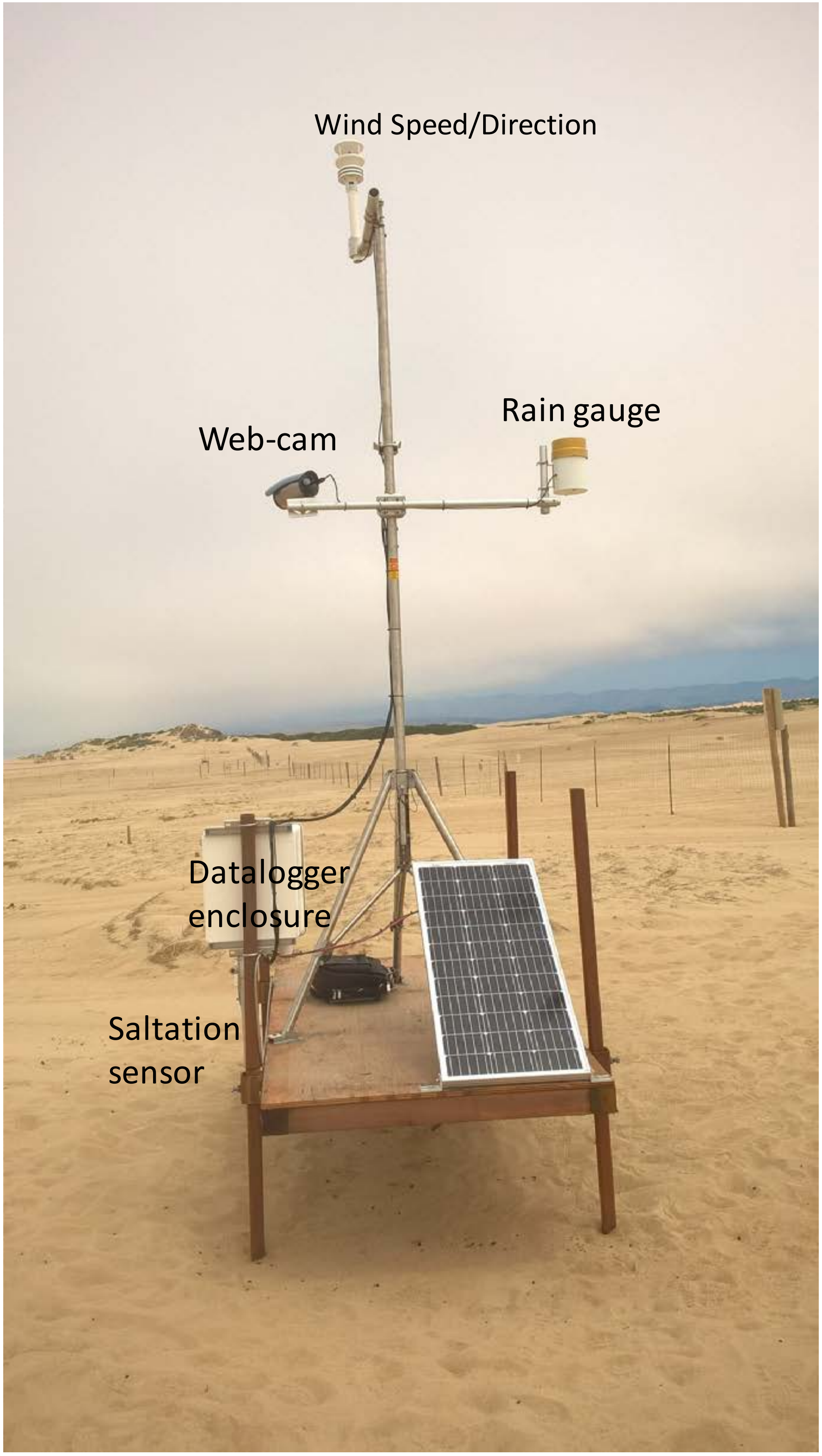

Figure 2-5. A meteorological and saltation monitoring system deployed in the foredune restoration area.

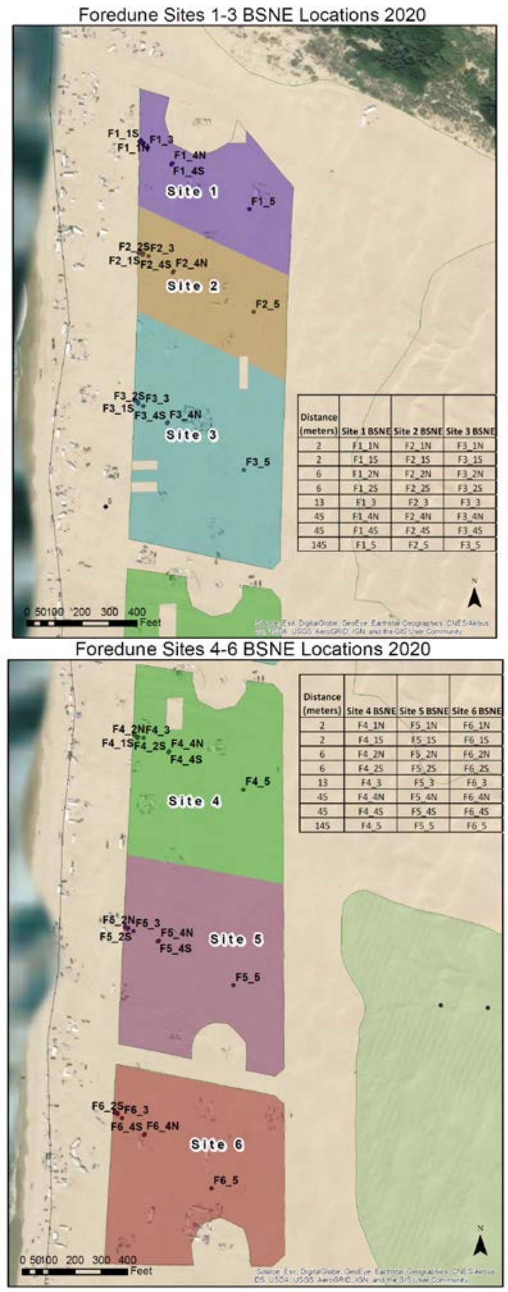

Figure 2-6. Locations of the BSNE samplers in the foredune restoration area.

The information obtained by these stations will provide data on how the developing foredune modifies the boundary-layer flow over the test areas and on the lee side. The station data will also be used to evaluate how the evolving foredune modulates sand transport characteristics (i.e., threshold wind speed and sand flux). These data will also be used to evaluate the effectiveness of each treatment to modulate the sand flux through the test area providing information to inform a decision whether to adopt a specific treatment to apply to the other five areas to enhance foredune restoration.

2.3.2 Digital Elevation Modeling (ASU)

To assess the impacts of implemented dust control measures and inform future adaptive management decisions, monitoring of landscape-scale changes in beach and dune geomorphology and vegetation cover is required. Aerial LIDAR mapping and unmanned aerial systems (UAS, or drone) platforms have both been used recently within Oceano Dunes SVRA to provide limited assessments of landscape changes. ASU began UAS mapping of the foredune restoration zone in October 2019 and subsequently in February 2020. On the recommendations of SAG, a decision was made to expand the domain of UAS surveys to approximately 1500 acres to cover a much larger area of emissive surfaces within Oceano Dunes SVRA (see Fig. 2-7, 2-8). This expanded domain will include key reference sites of high OHV activity, protected non-riding areas, high sand transport (saltation activity), and other highly emissive areas.

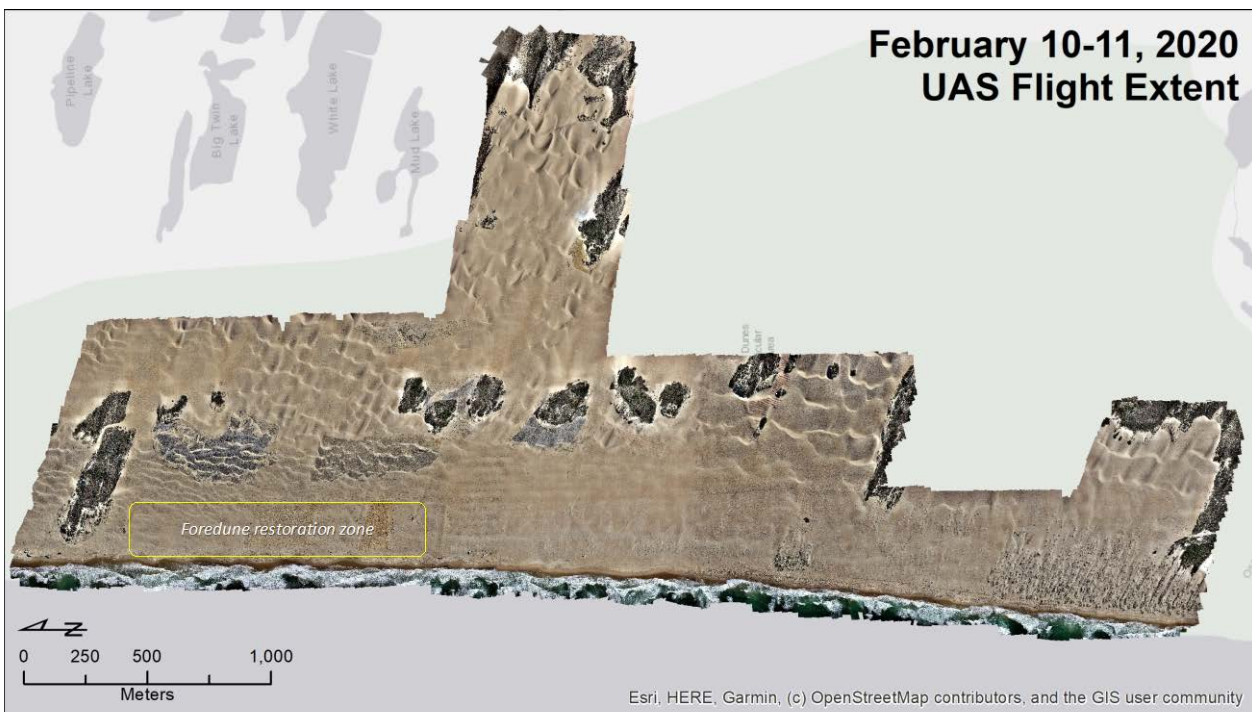

Figure 2-7. Orthophoto mosaic showing the approximate extent of the expanded UAS DEM mapping domain derived from February 2020 imagery collected by ASU. General area of the foredune restoration zone shown by the yellow polygon. Further details in Attachment 5.

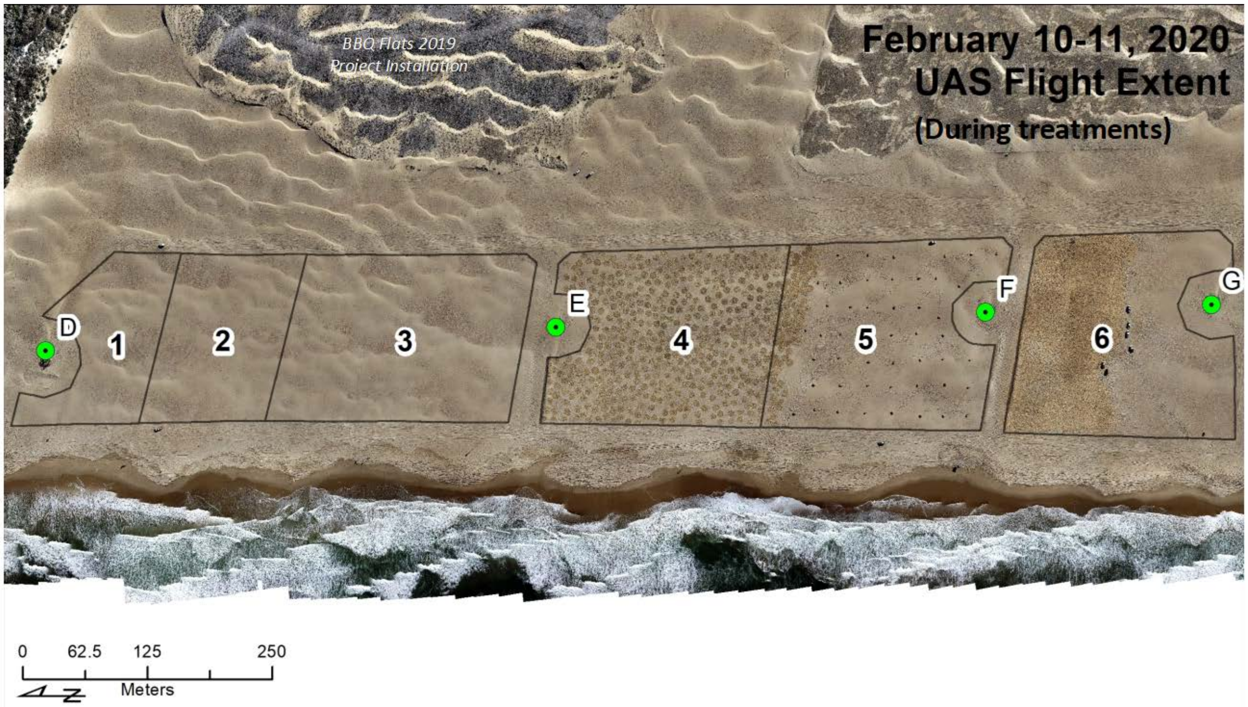

Figure 2-8. Aerial imagery of the foredune restoration zone and related treatments described in section 2.1.1. derived from February 2020 UAS imagery collected by ASU. Initial installation of the randomly spaced node treatments (4,5) and 'parks classic' treatment (6) are visible.

2.3.3-DRI Model Verification

Pursuant to Section 2.c of the SOA, modeling "shall be carried out by the California Air Resources Board (CARB), or other modeling groups subject to the review of the Scientific Advisory Group (SAG)." The use of the DRI model was formally approved by SAG, APCD, and CDPR at the October 2018 SAG meeting.

As part of the ongoing effort to provide confidence that the DRI emission, dispersion and source attribution dust model produces reasonable estimates of the concentration of PM_{10} at selected receptor sites, a verification analysis was undertaken in 2020 using PM_{10} concentration data measured at the CDF and Mesa2 air quality monitoring stations in 2013 as well as for in-Park measurements collected in 2013.

Measurements of PM_{10} made across the spatial domain of the Oceano Dunes SVRA in 2013, as well as external to the Oceano Dunes SVRA, (i.e., at CDF and Mesa2) and model-estimated values at the same locations for the environmental conditions defined by the 10 baseline days were compared to provide an evaluation of the veracity of the DRI dust emission and dispersion model (Mejia et al., 2019) prediction with available measurements. Results of that exercise are discussed in the following sections.

2.3.3.1 2013 BAM 24 Hour PM_{10} versus Modeled 24 Hour PM_{10}, CDF and Mesa2

The comparison of the BAM-measured mean 24-hour PM_{10} and the model-predicted mean 24-hour PM_{10} values for the CDF and Mesa2 locations for the 10 baseline days are shown in Figs. 2-9 and 2-10, respectively. For clarity the measured and modeled mean 24-hour PM_{10} values shown in Figs. 2-9 and 2-10 are provided in Table 2-4.

The greatest percentage difference between a measured and modeled value is 36.5% (05-19-2013, CDF), with the average considering both sites being 17% (±11%), based on the absolute values of the % difference for each baseline day. The mean value of the observed to model-predicted value ratios for the 10 baseline days are 1.09 (±0.26) and 0.97 (±0.25) for CDF and Mesa2, respectively. The close agreement between the (SLOCAPCD quality assured/quality controlled) measured and the DRI model-predicted values verifies that the DRI model is performing at a level much greater than is accepted by the US EPA when using models for predicting the magnitude of scalar quantities (such as PM) (Rhoads, 1981; Hanna, 1993).

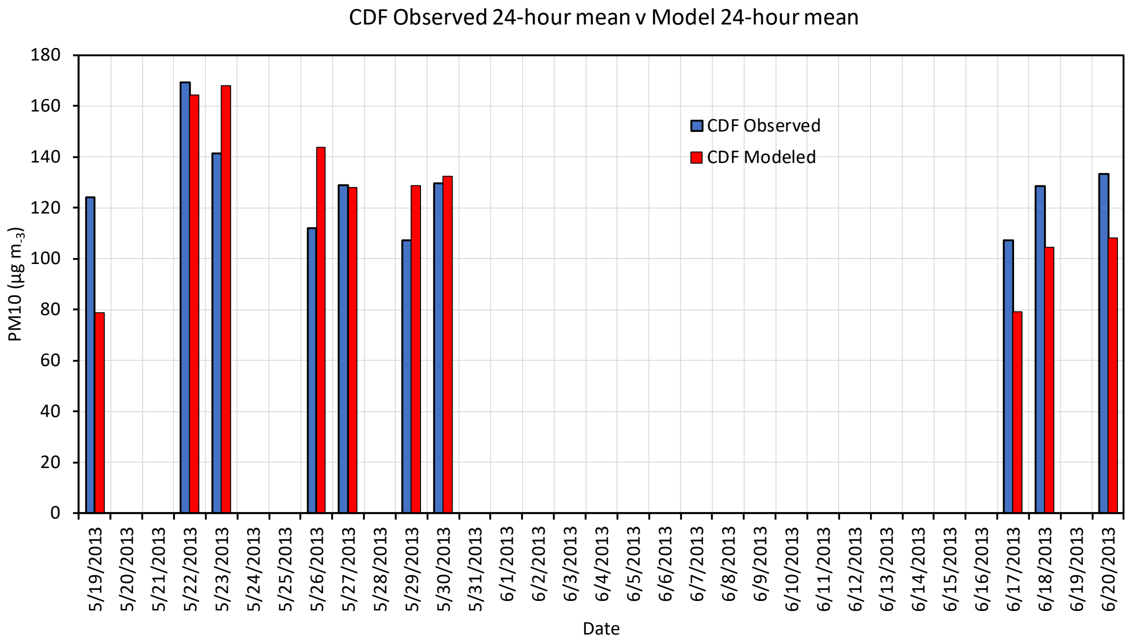

Figure 2-9. Comparison of the mean PM_{10} 24-hour observed value and the mean modeled value for the 10 Baseline days at the CDF site based on 2013 winds and 2013 emission grid.

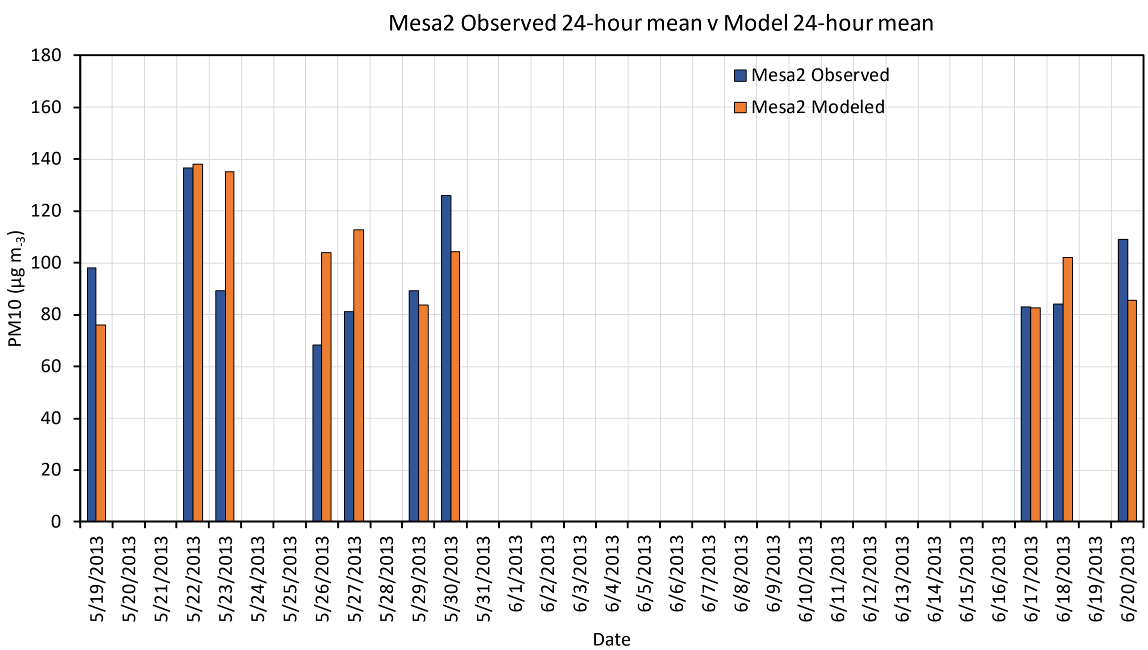

Figure 2-10. Comparison of the mean PM_{10} 24-hour observed value and the mean modeled value for the 10 Baseline days at the Mesa2 site based on 2013 winds and 2013 emission grid.

Table 2-4. Measured and modeled mean 24-hour PM_{10} values for the 10 Baseline Days.

	CDF ($\mu g\ m^{-3}$)		Mesa 2 ($\mu g\ m^{-3}$)	
Date	**Obs**	**Mod**	**Obs**	**Mod**
5/19/2013	124	79	98	76
5/22/2013	169	164	137	138
5/23/2013	141	168	89	135
5/26/2013	112	144	68	104
5/27/2013	129	128	81	113
5/29/2013	107	129	89	84
5/30/2013	130	133	126	104
6/17/2013	107	79	83	82
6/18/2013	129	104	84	102
6/20/2013	133	108	109	85
Mean	128	124	96	102
Std. Dev	18	31	21	22

2.3.3.2 2013 In-Park E-BAM 24 Hour PM_{10} versus Modeled 24 Hour PM_{10}

In 2013 E-BAM instruments were placed on instrumented towers within the Oceano Dunes SVRA as part of the initial monitoring of PM_{10} to evaluate its magnitude and spatial variation. The locations (latitude and longitude), distances between transect monitoring positions and their elevation above sea level are listed in Table 2-5. A comparison of the 24 Hour PM_{10} versus modeled 24 Hour PM_{10} for in-Park E-BAMs located at positions denoted as T1C, T2C, T3C, and T4B (Fig. 2-11) was carried out as part of the model verification procedure as requested by Parks, for Baseline-defined days. The E-BAM data used to derive the 24-hour mean PM_{10} were corrected using colocation correction factors provided by the contractor Sonoma Technology (STI). STI collocated the E-BAMs with a BAM unit to derive the correction factors. Upon review of the observational data the confidence in the measurements at T1C was low for that E-BAM, as the values were considerably lower than the T2C values by a factor of 4, so no comparison was carried out for this site. Due to instrument malfunction not all 10 Baseline days are available at each Station. In addition, some of the available Baseline days did not have all 24 one-hour data records. Figures 2-12, 2-13, and 2-14 show the observed (E-BAM measured) 24-hour mean values compared with model estimates for the same positions for all available baseline days as measured at the identified locations on the four transects that were operated in 2013.

Figure 2-11. The locations of E-BAM measurements in 2013 identified as T1C, T2C, T3C, and T4B. The SLOCAPCD PM_{10} monitoring locations CDF and MESA2 are also shown.

Table 2-5. The positional data for E-BAMs located at stations T1C, T2C, T3C, and T4B in 2013. Meteorological data were collected at these positions as well.

Transect ID	Latitude	Longitude	Distance from Shoreline (m)	Elevation (m)
T1A	35.088257	-120.6235	700	17.95
T1B	35.087615	-120.6216	893	29.05
T1C	35.086687	-120.6186	1185	21.15
T2A	35.071805	-120.6263	409	13.09
T2B	35.070713	-120.6243	628	19.04
T2C	35.069508	-120.6193	1101	32.35
T3A	35.056977	-120.6261	500	19.64
T3B	35.052712	-120.6181	1365	34.31
T3C	35.048821	-120.6076	2420	24.31
T4A	35.023906	-120.6269	859	18.6
T4B	35.021225	-120.6218	1411	37.28
T4C	35.018632	-120.6173	1913	37.08

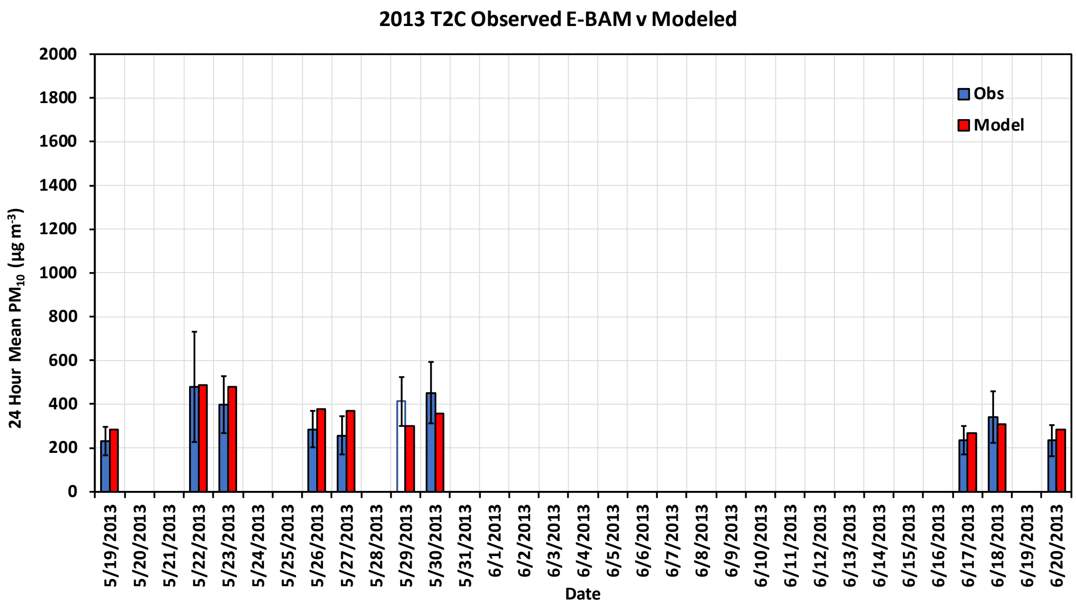

Figure 2-12. Observed 24-hour mean PM_{10} at Station T2C. Error bars show the standard error (i.e., std. dev./[$n^{0.5}$], where n is the number of samples). White bars with blue border indicate missing hours in the observational data record for estimating the mean. Error bars were not calculated for the modeled values.

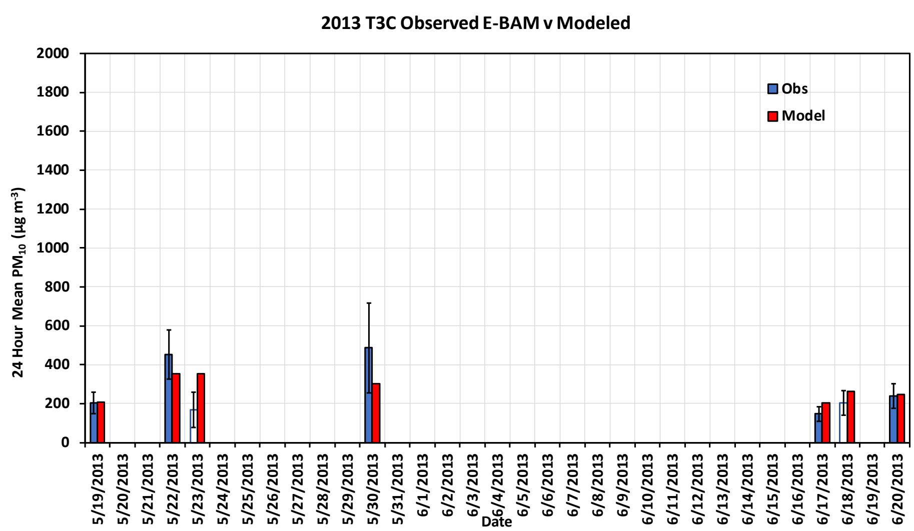

Figure 2-13. Observed 24-hour mean PM_{10} at Station T3C. Error bars show the standard error (i.e., std. dev./[$n^{0.5}$]). Error bars were not calculated for the modeled values. White bars with blue border indicate missing hours in the observational data record for estimating the mean. Error bars were not calculated for the modeled values. Not all 10 Baseline days had E-BAM data.

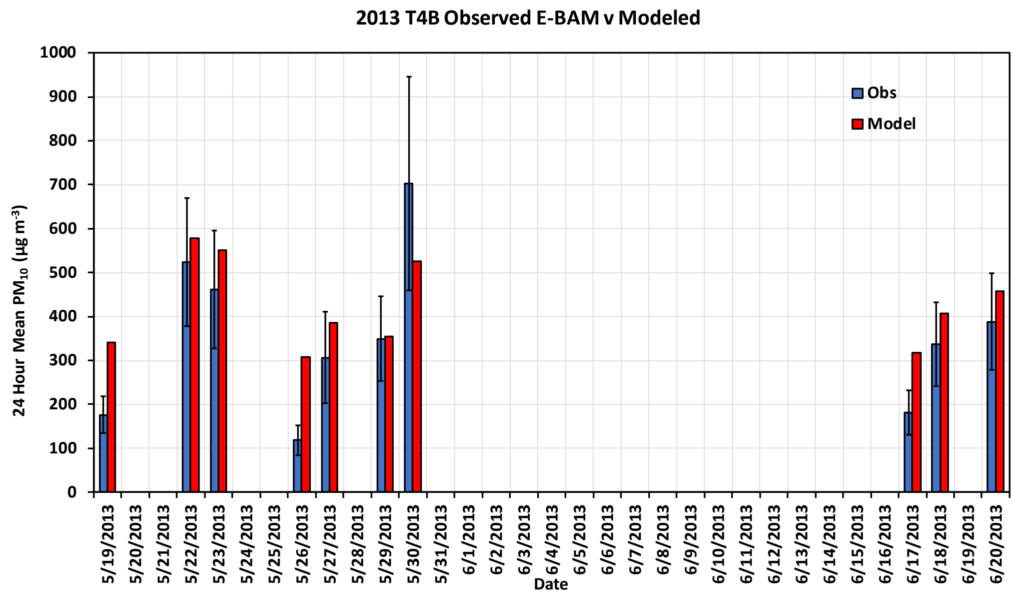

Figure 2-14. Observed 24-hour mean PM_{10} at Station T4B. Error bars show the standard error (i.e., std. dev./[$n^{0.5}$]). Error bars were not calculated for the modeled values.

For the three Stations, T2C, T3C, and T4B, the mean of all available 24-hour PM_{10} concentration values are compared with the mean of the model-predicted 24-hour PM_{10} concentration values in Fig. 2-15. The ratio of observed to modeled for the baseline days with valid observations are, respectively, 0.95 (±0.23), 0.97 (±0.38), and 0.80 (±0.27). For all Stations combined the mean value of the observed to modeled ratio is 0.90 (±0.29). The analysis presented here provides confidence that the DRI model is operating in a predictive capacity at a high level of performance. It should also be noted that the in-Park monitoring locations are subject to much greater dynamic conditions than those downwind of the Park with both emission and dispersion occurring coincidentally. Downwind of the Park away from the active sand sheets only dispersion and particle deposition are affecting the mass concentration of PM_{10}.

For the three Stations, T2C, T3C, and T4B, the mean of all available 24-hour PM_{10} concentration values are compared with the mean of the model-predicted 24-hour PM_{10} concentration values in Fig. 2-15. The ratio of observed to modeled for the baseline days with valid observations are, respectively, 0.95 (±0.23), 0.97 (±0.38), and 0.80 (±0.27). For all Stations combined the mean value of the observed to modeled ratio is 0.90 (±0.29). The analysis presented here provides confidence that the DRI model is operating in a predictive capacity at a high level of performance. It should also be noted that the in-Park monitoring locations are subject to much

greater dynamic conditions than those downwind of the Park with both emission and dispersion occurring coincidentally. Downwind of the Park away from the active sand sheets only dispersion and particle deposition are affecting the mass concentration of PM_{10}.

PM_{10} data from CDF, Mesa2, and the 15 monitoring stations within the Park in 2018, 2019 and 2020 will be used for additional model verification analysis.

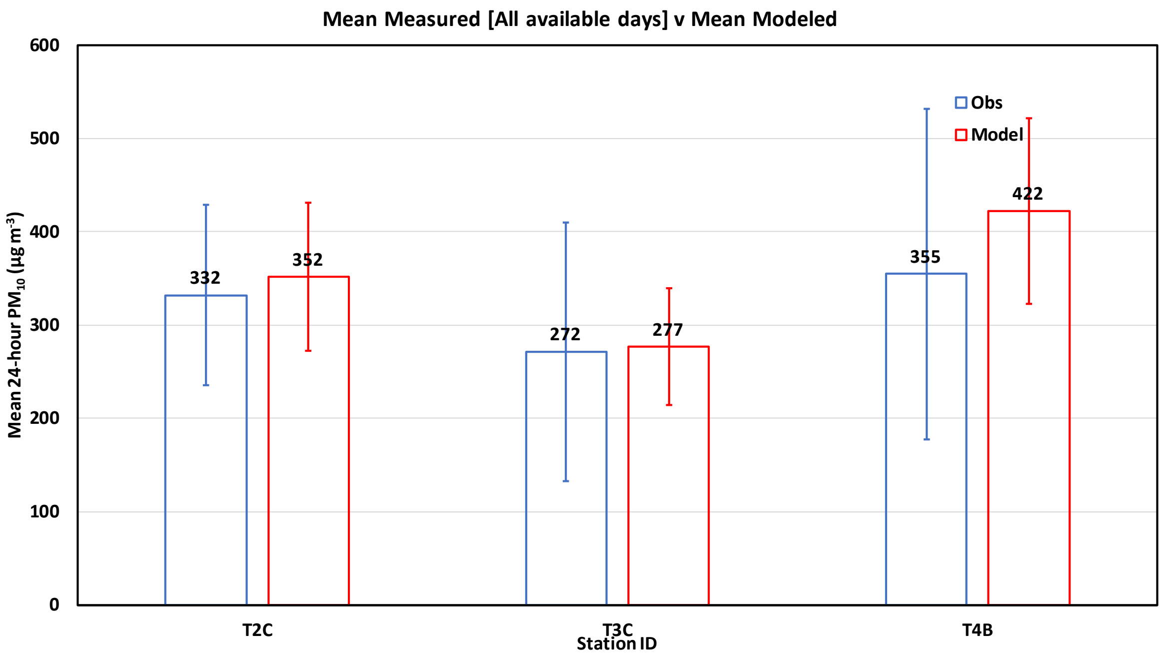

Figure 2-15. Comparison of the mean observed value (E-BAM measured) and the mean modeled value for the available Baseline days.

2.3.3.3 PI-SWERL Measurements, May 2020

In May 2020, DRI carried out PI-SWERL sampling of emissivity for a sub-set of the 2019 sampling grid. A bootstrapping analysis was performed on the 2019 data, as it represents the largest and most general sampling available to determine a robust sampling size, which was evaluated to be 100.

DRI expected to carry out PI-SWERL sampling at 100 locations (a subset of the 2020 sampling grid) that covered both riding and non-riding areas in 2020 (Fig. 2-16). Unfortunately, due to unfavorable environmental conditions the sampling as of May 2020 was only completed for 86 locations that were only within the riding area.

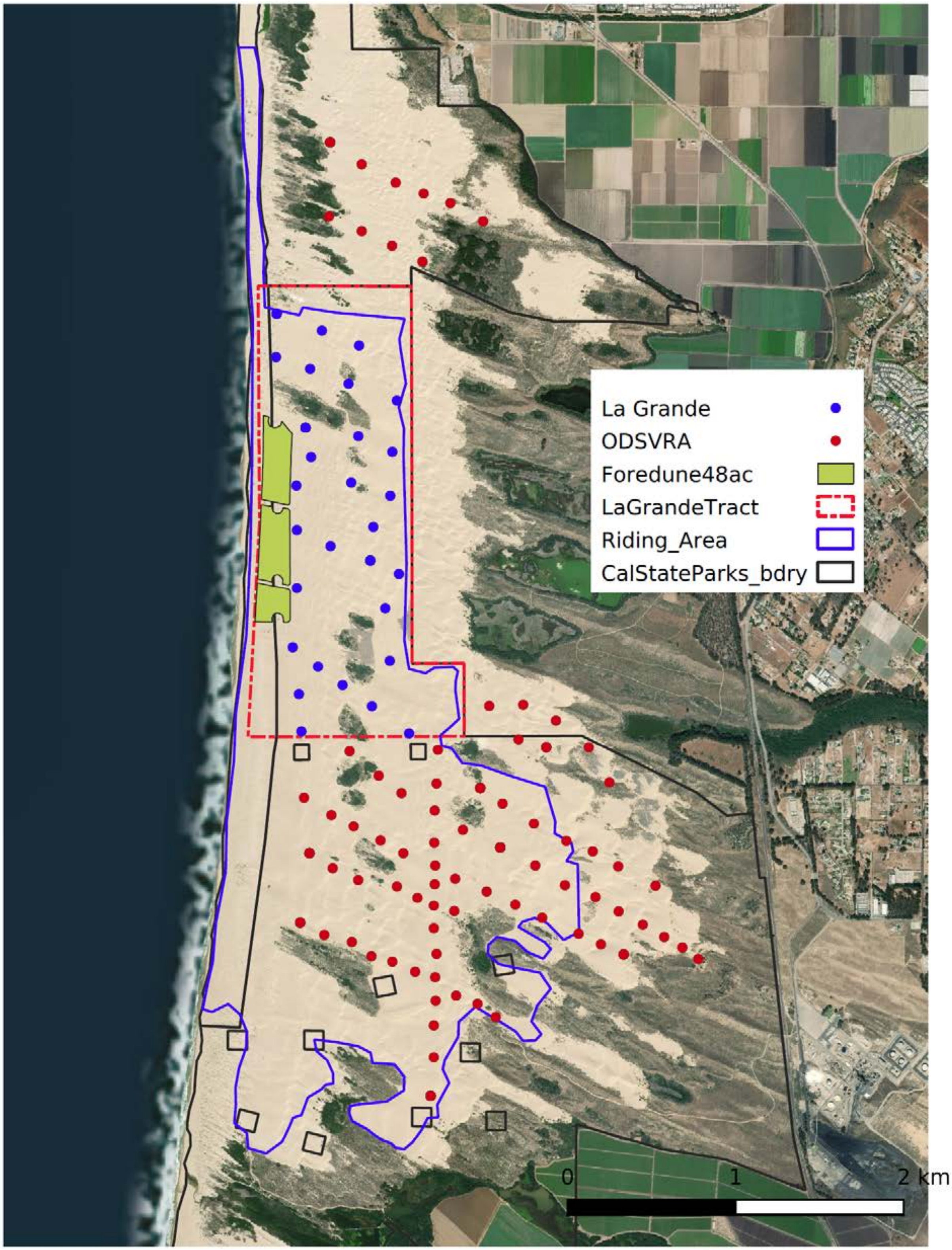

Figure 2-16. The PI-SWERL test locations for 2020.

Due to the same unfavorable environmental conditions and the subsequent hatching/fledging of western Snowy Plovers within the foredune restoration area and areas around the restoration area, PI-SWERL measurements have not yet been made within the foredune restoration area. The locations of the PI-SWERL sampling in the foredune restoration area are shown in Fig. 2-17.

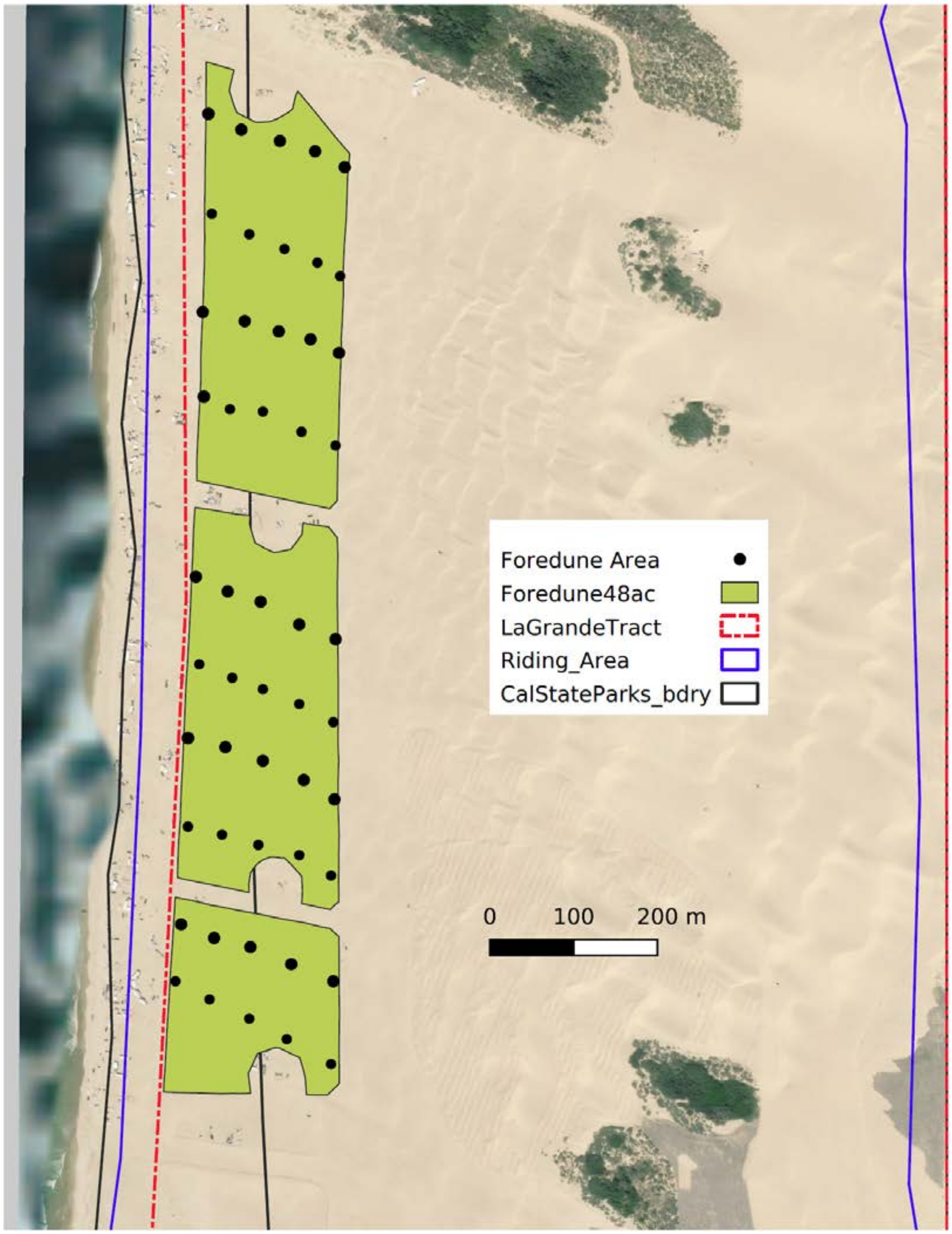

Figure 2-17. The locations for PI-SWERL tests in the foredune restoration area.

2.4 Other Relevant Actions

2.4.1 SOA Baseline Update

The SAG was consulted to refine the SOA baseline approach. Attachment 6 to this report describes the SAG review and analysis. Based on this analysis it was determined to use the 10 days in the 2013 monitoring period (April-August) with the highest DRI model-estimated 24-hour mean mass emissions of PM_{10} to define the baseline. The baseline is used for comparison with later years to establish the percent difference in mass emissions in subsequent years.

This new refined baseline approach was updated into the DRI Model and reflected in the modeling results discussed in this report.

2.4.2 Analysis of Other Potential PM Sources

Section 7.3 of the PMRP identifies opportunities for studying contributions to PM_{10} on the Nipomo Mesa from potential sources of PM_{10} external to Oceano Dunes SVRA recreational operations. Potential contributing sources include: PM from marine sources, agricultural sources, and combustion sources.

The Scripps Institution of Oceanography (Scripps), in collaboration with the OHMVR Division, continued into year two of its three-year investigation into the constituents that comprise the airborne particulate matter at Oceano Dunes and vicinity. For three weeks, from April 27 to May 16, 2020, air filter samples were collected at the APCD's CDF location and in the Oceano Dunes SVRA, near shore. Samples were collected on carbon filters and on EBAM fiberglass tape segments. Analyses conducted and to be conducted include elemental speciation, gravimetric analysis, carbon-source identification using Fourier-transform infrared spectroscopy, and DNA analysis for determining marine and terrestrial biogenic particulate sources. It is anticipated the analytical work will be completed in late August/early September 2020.

The SAG has provided a review of the 2019 Scripps Study, which is included as Attachment 7 to this ARWP.

Based on the required action to identify "other PM_{10}" sources that affect the CDF site, a targeted sampling of PM_{10} and its chemical constituents using the sampling resources of the SLO APCD was initiated in May 2020. If necessary, it will be extended into 2021.

The samples are being acquired using a Partisol sampler (property of the APCD) located at the CDF monitoring site. This type of sampler meets regulatory (i.e., US EPA Federal Reference Method) monitoring requirements for PM_{10} to collect samples of PM_{10}. Samples are acquired during high winds and dust emission events within the ODSVRA, when the probability for exceeding the 24 hour average State (50 µg m^{-3}) and Federal (150 µg m^{-3}) standards for particulate matter is most likely. Samples are also being taken for lower wind days when PM_{10} will likely be dominated by sources other than wind-generated dust emissions. The Partisol will be loaded with paired 47 mm Teflon-membrane (pre-weighed) and quartz fiber filters supplied by DRI.

These paired filters will be received/installed/run for 24 hours and return-shipped by APCD personnel to DRI for analyses by DRI's Environmental Analysis Facility (EAF). Analyses include: gravimetry, elemental and organic carbon (using thermal/optical reflectance and transmittance), elements (Na to U, using energy dispersive X-ray florescence [EDXRF]), and anion and cation concentrations by ion chromatography IC, automatic colorimetry, or atomic absorption.

Gravimetric analysis establishes the mass concentration of PM_{10} for a 24 sampling period. Carbon analysis provides information on contributions from combustion sources (e.g., gasoline and diesel vehicles, open burning, agricultural burning), elemental analysis identifies mineral sources, and anion and cation analysis identifies agricultural sources (specifically abundance of nitrate). As part of "Other Source" monitoring DRI will provide quantification of methanesulfonic acid (MSA), CH_3SO_3H using IC, which can be used as an indicator of contributions to PM by marine phytoplankton sources. MSA is the oxidative product of dimethylsulfide (CH_3SCH_3) that is produced by marine phytoplankton. A number of source apportionment studies have found MSA to be strong indicator for marine biogenic contributions to PM mass (e.g., Calzolai et al., 2015).

2.4.3 COVID Closure Study

The Oceano Dunes SVRA was closed in March 2020 to limit the spread of the COVID19 virus. The SAG produced a statement on the impact of the COVID 19 closure on dust emissions which is included as Attachment 8 to this ARWP.

In response to the closure and the cessation of OHV activity, the DRI implemented two observationally-based strategies to evaluate the potential changes to the ODSVRA dust emission system in the absence of OHV activity.

The first strategy was the re-establishment of the 15 PM_{10}/saltation/meteorological stations within Oceano Dunes SVRA (Figure 2-1) that have been operated in previous years as soon as was logistically feasible for the personnel required to carry out the installations. This included personnel from T&B Systems, CDPR and DRI. These data will be used to evaluate if the PM_{10} concentrations at these locations has, or has not, changed from 2019, due to the cessation of OHV activity. Comparisons will be made based on the occurrence of similar atmospheric conditions (e.g., wind speed, wind direction, RH, temperature) and climatic conditions (e.g., days between precipitation events) to minimize confounding factors that affect emissivity.

The second strategy was to implement PI-SWERL sampling for a sub-set of locations that were measured in 2019. Since April 2020, PI-SWERL emissivity measurements have been made on a weekly basis (conditions permitting) at the same 29 locations, chiefly within the LaGrande tract area (Figure 2-18). This sampling has been carried out by personnel from the Coastal San Luis resource Conservation District following training received from DRI personnel. These data will be used to evaluate if the emissivity of these locations has, or has not, changed from 2019, due to the cessation of OHV activity. DRI will also evaluate whether emissivity changed during the period from the initiation of SVRA closure to its eventual re-opening.

In addition, pending approvals for UAS flight campaigns and approval of the ASU contract amendment (Attachment 5), the ASU team plans to collect another set of UAS imagery and DEM of Oceano Dunes SVRA in late September 2020. These data can be used to assess the impacts of the covid-19 closure on beach-dune morphodynamics, sediment movements, and the initial efficacy of the foredune restoration treatments in the complete absence of OHV activity. This will provide an invaluable dataset on an additional 'baseline' condition resulting from limited OHV action on landscape dynamics.

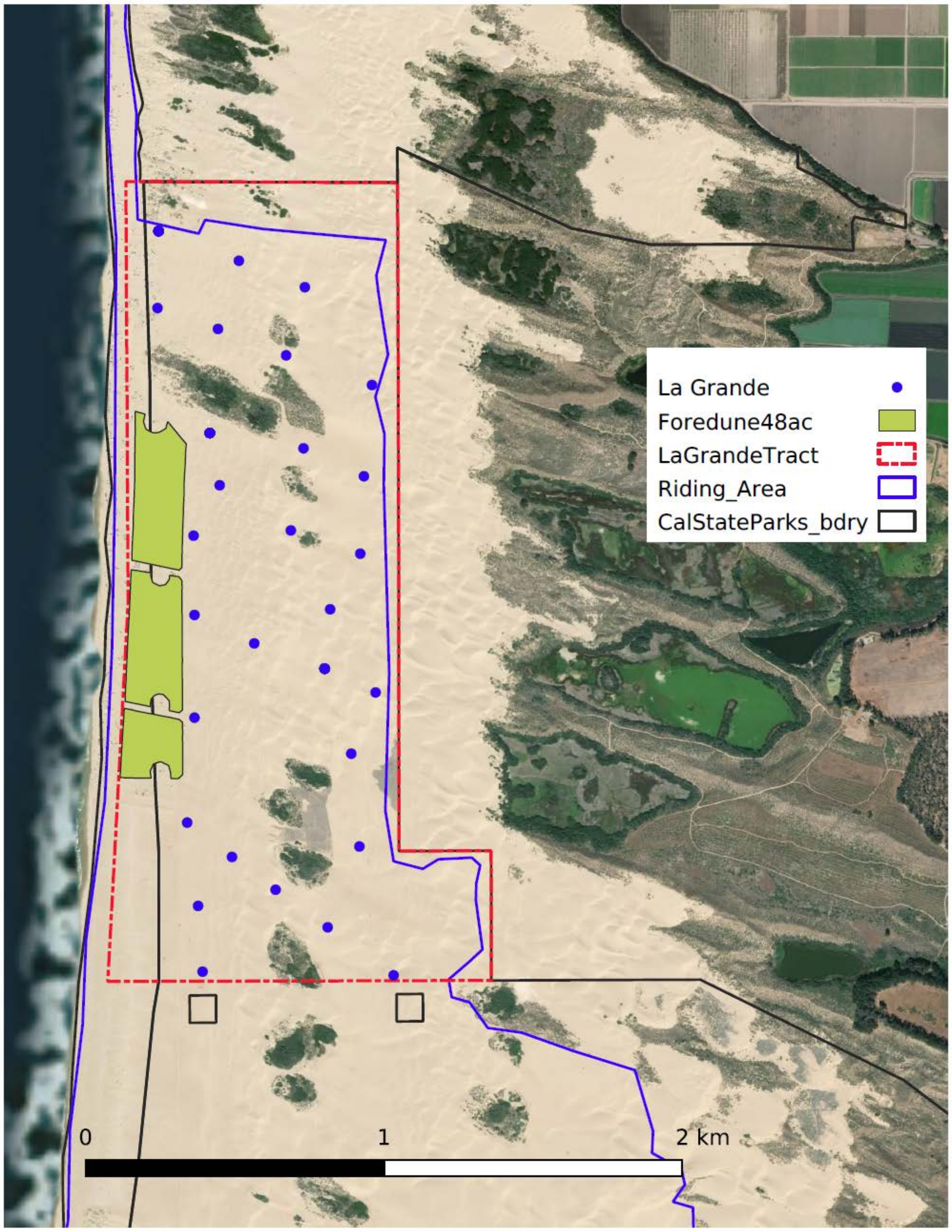

Figure 2-18. The PI-SWERL test locations in the LaGrande tract for repeat testing during the Covid closure period.

3 WORK PLAN

3.1 Dust Control Actions Proposed for the Next Year

For the time period from approximately August 1, 2020 to July 31, 2021, the OHMVR Division is proposing to undertake and/or complete the following dust control activities:

- Supplemental foredune planting to achieve positive net balance of sediment reduction.
- Remaining Initial SOA wind fence - conversion to native dune vegetation
  - 13.5 acres of wind fence (Eucalyptus (8) and Table Top (5.5))
  - 15 acres of current straw mulch (Paw Print aka Bigfoot)
- SOA amendment 4.2-acre permanent dust treatment – current straw mulch conversion to native dune vegetation.
- Removal of 2019-2020 seasonal wind fencing (two 20-acre arrays)
  - Re-deploying the northern 20-acre temporary wind fencing array
  - Dust control treatment for southern 20-acre temporary wind fencing array to be carried out in 2021 with the method to be determined based on SAG consultation.
- **New** temporary vehicle exclosure/seasonal dust treatment -wind fence or straw mulch (40 acres) location(s) to be determined through SAG consultation.
- Continued SAG consultation and evaluation.
- Continued monitoring and modeling activities.

These actions are briefly summarized below. Each summary includes a table that identifies the main implementing actions, whether the action is underway or would be undertaken, and what preliminary evaluation metrics (if applicable) are anticipated to be collected and reported over the coming year. The Evaluation Metrics listed in this chapter are based on the metrics contained in Attachment 2 of this report.

3.1.1 Supplemental foredune planting to achieve positive net balance of sediment reduction

The OHMVR Division has begun development of a vegetated foredune just beyond the tidal zone that is approximately 48 acres in size.

The adaptive management strategy on supplemental plantings first requires assessment of the effectiveness of the initial planting treatments (section 2.3.2., Fig. 2-8). To inform this, CDPR staff are collecting plant inspection and viability monitoring and the ASU team are conducting seasonal UAS surveys from which geomorphic, sand volume, and plant cover changes can be detected and quantified. No action on supplemental planting will be taken until these datasets are reviewed by SAG and CDPR. SAG suggests that monitoring data from at least one growth season from both methods is required to assess treatment performance. Currently, the UAS surveys are constrained by the timing of the western snowy plover exclosure (March-September), so it is likely that this assessment might not occur until spring 2021 at the soonest.

Table 3-1 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary to develop a vegetated foredune.

Table 3-1: Vegetated Foredune Actions, Status, and Metrics

Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
Native seed collection and/or native plant cultivation		X				Quantities of seed (W8) Numbers of plants (W9)
Vegetation planting/restoration		X				Acres planted (W1,W2) Increase in area covered by live plants (P4)
Monitoring activities		X				Plant inspection/viability monitoring (W3) Change in fraction of plant cover (P4)

						Change in foredune sand volume/sediment monitoring (P5) Change in hummocks and topographical variability (P8,P9) Increase in silhouette profile (P11) Foredune sand flux (P10) Remote Sensing (W13,W14,W15) PISWERL emissivity (P7) PM_{10} emissions reductions (P1) Meteorological monitoring (P6)

3.1.2 Remaining Initial SOA wind fence - conversion to native dune vegetation

Consistent with SOA Condition 1.b., the OHMVR Division proposes to convert to vegetation approximately 28.5 acres remaining from the 48.6 acres of wind fencing installed in summer 2018 (See Exhibit 4).

- 13.5 acres of current wind fence (Eucalyptus (8) and Table Top (5.5))
- 15 acres of current straw mulch (Paw Print)

Following removal of the existing wind fencing as needed, the OHMVR Division will proceed with restoration of the project area. The OHMVR Division's restoration methods are fully described in Chapters 6 and 7 of the June 2019 Draft PMRP.

The OHMVR Division will coordinate with the SAG on preparation of a planting palette with targets for container stock and native seed needed for dust control projects over the next year. It is estimated that a total of approximately 90,600 native dune plants and more than 900 pounds of native dune seed are needed for proposed 2020/21 vegetation planting projects. Table 3-2 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary to convert existing wind fencing to vegetation.

Table 3-2: Convert Wind Fencing To Vegetation Actions, Status, and Metrics						
	2020 Work Plan Status					
Implementing Action, Task, and/or Requirement	*Already Complete*	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
Native seed collection and/or native plant cultivation		X		X		Quantities of seed (W8) Numbers of plants (W9)
Wind fence removal		X		X		Length of fencing removed (W7)
Vegetation planting/restoration			X			Acres planted (W3)
Monitoring activities		X		X		Acres replanted (W4) Remote Sensing (W13,W14,W15) PM_{10} emissions reductions (P1)

3.1.3 Amended SOA 4.2 Acre Additional Permanent Dust Treatment

Pursuant to the SLO APCD SOA as amended, CDPR has begun development of 4.2 acres of additional backdune dust control treatments. The area to be treated was selected through coordination with the SAG and SLO APCD. The 4.2-acre area was fenced off to exclude public access in December 2019 and received straw bales/mulch in January 2020. The area is planned to be planted with native vegetation in 2020-21.

Table 3-3 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary for this project.

Table 3-3: Amended SOA 4.2 Acre Additional Permanent Dust Treatment						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
Native seed collection and/or native plant cultivation		X		X		Quantities of seed (W8) Numbers of plants (W9)
Vegetation planting/restoration		X	X			Acres planted (W3)
Monitoring activities		X		X		Acres replanted (W4) Remote Sensing (W13,W14,W15) PM_{10} emissions reductions (P1)

3.1.4 Removal of 2019-2020 seasonal wind fencing (two 20-acre arrays)

Removal of 2019-2020 seasonal wind fencing (two 20-acre arrays) shown on Exhibit 1. These particular dust control treatments as described in Section 3.1.5 of the 2019 ARWP, were planned to be seasonal in nature. Once the strong seasonal onshore winds subside in the Fall, the seasonal wind fence treatments will be removed, once again allowing public vehicular recreation to occur during the time of the year in which air quality is less of an issue. This seasonal approach is imperative to CDPR fulfilling its mission of providing high-quality outdoor recreation at Oceano Dunes SVRA. This approach also provides flexibility to dust control project locales as the model driven process thus far has yielded varying outputs relative to the emissivity of particular areas of the recreation area. If a seasonal treatment turns out to have a high confidence of resulting in substantive dust emission reduction, it can be moved to a permanent (non-seasonal) treatment. Likewise, if a seasonal treatment turns out to not have the substantive impact it was envisioned to have, it can be relocated to a new location based on current DRI Model data and consultation with the SAG.

Table 3-4 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary for this project.

Table 3-4: Removal of 2019-2020 seasonal wind fencing						
	2020 Work Plan Status					
Implementing Action, Task, and/or Requirement	*Already Complete*	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
Wind fence removal			X			Length of fencing removed (W7)

3.1.5 Re-deploying the northern 20-acre wind fence array from 2019-2020

Based on the model results presented by DRI in May 2020 (Attachment 3), The OHMVR Division proposes to re-deploy the northern 20-acre wind fence array from 2019-2020 (See Exhibit 1) in 2021.

Table 3-5 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary for this project.

Table 3-5: Re-deploying the northern 20-acre wind fence array from 2019-2020						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
California Coastal Commission Permitting			X	X		NA
Install perimeter fencing around treatment area (as necessary)			X	X		NA
Install wind fencing			X	X		Length of wind fencing installed and fence spacing (W7) Area stabilized by fencing (W5)
Monitoring activities		X				Remote Sensing (W13,W14,W15) PM_{10} emissions reductions (P1)

3.1.6 Dust Control Treatment for southern 20-acre wind fence array from 2019 - tbd

Based on the model results presented by DRI in May 2020 (Attachment 3), The OHMVR Division proposes to implement dust control treatments for the southern 20-acre wind fence array from 2019-2020 (See Exhibit 1) in 2021. The treatment is to be determined based on consultation with the SAG.

Table 3-6 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary for this project.

Table 3-6: Dust Control Treatment for southern 20-acre wind fence array from 2019 -tbd						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
California Coastal Commission Permitting			X			NA
Install perimeter fencing around treatment area (as necessary)			X			NA
tbd						
tbd						
tbd						

3.1.7 New Temporary vehicle exclosure/seasonal dust control treatment – wind fence or straw mulch (40 acres)

The OHMVR Division proposes to implement new temporary dust control treatments for 40 acres of the recreation area. This would be above and beyond the redeployment of the 2019-20 seasonal wind fence areas and would be intended to reduce PM10 within the zone downwind of the SVRA that is characterized by the Mesa2 monitor. Exact location to be determined thought SAG consultation.

Table 3-7 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary for this project.

Table 3-7: New Temporary vehicle exclosure/seasonal dust control treatment (40 acres)						
	2020 Work Plan Status					
Implementing Action, Task, and/or Requirement	*Already Complete*	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
SAG consultation on exclosure location(s)			X	X		
California Coastal Commission Permitting			X	X		NA
Install perimeter fencing around treatment area (as necessary)			X			NA
Install posts, fencing materials or straw bales, and fence rows as needed			X	X		Length of wind fencing installed and fence spacing (I12) Area stabilized by fencing (I10)
Monitoring activities		X				Remote Sensing (W13,W14,W15) PM_{10} emissions reductions (P1)

3.1.8 Continued SAG Consultation and Evaluation

Pursuant to the SLO APCD SOA as amended, CDPR will continue to utilize the SAG for consultation and evaluation.

OHMVR Division will consult with the SAG on the development of a ***Public Outreach and Education Campaign.*** This effort will focus on topics such as:

- Progress of Oceano Dunes dust control treatments
- Purpose of foredune restoration project
- Role of the DRI Model
- Health issues associated with respiration of fine particulate matter

Table 3-8 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary to continue SAG consultation and evaluation.

Table 3-8: Continued SAG Consultation and Evaluation						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
Quarterly Meetings with SAG		X				NA
Public Outreach Campaign Development			X			NA

3.1.9 Additional Actions to Address Reducible Uncertainty and Gaps in Information

The OHMVR Division will continue to work with the SAG and the SLOAPCD to take action to address reducible uncertainty associated with the DRI Model as well as fill in other gaps in information necessary to best meet SOA objectives. These include:

Computational Fluid Dynamics Modeling of the Foredune

In addition to reduced dust emissivity within its footprint (i.e. areal dimensions), the foredune and other dust treatment areas may further reduce sand flux and wind shear stress downwind, thus contributing to additional dust emission reductions that are currently not accounted for in the DRI model. The secondary effects on emissions and air quality from the foredune restoration project are expected to be significant based on scientific arguments made by the SAG, including roughness modification of the boundary layer, but quantification of the added benefits to air quality needs to be carried out.

The current mass emission/dispersion modeling being undertaken to estimate the effect of implementing dust controls to lower mass emissions and improve air quality is not sufficiently sophisticated to take into account the changes in flow that will result from changes in the surface as the foredune develops.

DRI will undertake a measurement and modeling effort to develop a Computational Fluid Dynamics (CFD) model that can be used to evaluate how the evolving foredune will modulate the boundary-layer flow (wind speed, direction, and surface shear velocity) over the foredune area, in the lee of the foredune area, and with the re-vegetation areas that lies east of the foredune restoration area. The use of CFD modeling to understand the flow patterns around aeolian landforms and their potential to modulate boundary-layer flow are not without precedent (e.g., Smyth, 2018; Smyth et al., 2019). There is also published work specifically related to foredunes (Hesp and Smyth, 2016; Hesp et al. 2015), erosional blowouts (Smyth et al., 2019), and nebkhas (Hesp and Smyth, 2017) that can aid in guiding development of a CFD model for the developing Oceano foredunes.

The methodological approach will be to use the open-source finite volume toolbox openFOAM as the basis for developing the flow model. The goal will be to use the model to evaluate how the flow is changed by the developing foredune and subsequently use this information to inform CALMET in terms of wind speed, wind direction, and surface shear over and in the lee of the foredune. The changes in flow will subsequently affect the mass emissions (modify wind shear by an established fractional change for the affected grid cells) and provide a more realistic wind field for the particles that are being dispersed by the wind.

Development of the modeling inputs will also require some measurements be made in the established foredune areas of the SVRA to parameterize boundary conditions (e.g., vertical wind speed profiles, horizontal flow gradients in the lee of select dunes). The DEMs from ASU's UAS land survey program will be required to (digitally) construct the topography of the evolving foredune as well as a DEM of the mature Oso Flaco foredune that has been used as a model for the fully-evolved foredune that is being restored.

Benefits that can arise from this work are: 1) a means to provide more realistic estimates of the aerodynamic roughness lengths (z_0) for different areas of the ODSVRA. This parameter plays a critical role in CALMET in the estimation of wind shear (which drives dust emissions), and at present its representation in CALMET remains simplistic; 2) better estimates of shear velocity based on topographic position on the dunes and in their lee, which will also provide better estimates of emissions.

DRI Emission-Dispersion-Source Attribution Model

DRI will develop wind and turbulence fields for scenarios based on 2019 and 2020 conditions using the approach described in Mejia et al. (2019) using the in-Park surface meteorological station data, buoy observations available in the domain, and the SODAR measurements of upper-air wind vectors to be provided by ASU (available as of 7-24-2020). These local measurements will provide better representation of the upper air flow compared to those from Vandenberg Air Force Base, which were used previously.

A weakness of the CALMET meteorological model is the way it estimates friction velocity and the vertical distribution of wind speed and direction at the surface and throughout the boundary layer. For the 2013 CALMET simulations, DRI assumed that Vandenberg AFB operational sounding, available only once a day (12h UTC, equivalent to 4h PST) and 35 km due south from the Oceano dunes, provided a reasonable vertical wind and instability profile. DRI expects that the ASU SODAR measurements will help constrain, within the domain, the vertical winds while filling the gaps between the source and sink sites in the horizontal plane. Adding these measurements can have significant impacts in the particle trajectories and in the turbulent diffusion of dust.

CALMET parameterizes the surface friction effect and flow regime considerations using Monin–Obukhov (M-O) similarity theory (Foken, 2006). The M-O parameterization scheme relies on prescribed values of aerodynamic roughness length, which affects the estimates of the friction velocity and directly impacts dust emissions (dust emissions scales as a power function of friction velocity). There is a need to reconcile this parameter and assess the uncertainties involved in its selection. DRI's development of the CFD model of the foredune will hopefully provide additional insight into the proper parameterization of aerodynamic roughness within CALMET for the topography of the ODSVRA.

The current version of the DRI model assumes that dust deposition is negligible. DRI recognizes that deposition of PM_{10} does occur and that it becomes increasingly important to account for this process with increasing distance from source areas. To improve model estimates DRI is evaluating deposition velocity schemes to incorporate into the component dispersion model in an effort to relax the zero deposition assumptions and provide a more realistic treatment of the process with the expectation being that this will improve model performance. This is important for both CDF and Mesa2, but more important for Mesa2 which is further east than CDF and has almost double the distance from the Park boundary.

DRI Other Sources Study

Following receipt of the 10 pairs of filters collected by the SLOCAPCD from the 2020 sampling days, the chemical analyses of the filters will be carried out by the Environmental Analysis Facility of the Desert Research. Once completed the chemically-speciated data of PM_{10} component mass concentrations and the associated uncertainties will be delivered to SLOAPCD (K. Tupper) and CARB (E. Withycombe) to carry out source apportionment analysis. The method of source apportionment will be selected by SLOAPCD and CARB.

Analysis of results from the DRI Other Sources study will include consideration of the ongoing results being produced by the Scripps study.

OHV Closure Study

The PI-SWERL data collected from repeated surveys in the LaGrande tract will be used to evaluate if the emissivity of these locations has, or has not, changed from 2019, due to the cessation of OHV activity.

DRI will also evaluate whether emissivity changed during the period from the initiation of Park closure to its eventual re-opening.

The meteorological, PM, and Sensit measurements from the 15 stations will provide an important data source to interrogate how the range and distribution of PM concentrations may have changed as a result of the Park closure between 2018, 2019 and 2020. It will also offer the opportunity to evaluate how the PM concentrations may have changed as a function of time during the closure period.

Table 3-9 summarizes the main implementing actions, work plan status, and reportable metrics for actions necessary to address reducible uncertainty and gaps in information.

Table 3-9: Address Reducible Uncertainty Actions, Status, and Metrics						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
Computational Fluid Dynamic Modeling		X		X		NA
DRI Other Sources /COVID Closure Study		X		X		NA

3.1.10 Other Possible Dust Control Measures

WeatherSolve Structures (WSS), a private company, submitted a proposal for installation of industrial style wind fencing at Oceano Dunes SVRA to address the elevated PM10 issues. The SAG reviewed and rejected this proposal as described in Attachment 9 to this ARWP.

The SAG determined that beyond the various logistical considerations for installing such a fence in a dynamic beach-dune environment, the wind fence would be ineffective. As described in the WSS proposal, the wind fence would be installed on the downwind edge of the Oceano Dunes SVRA. Thus, the vast majority of emissive surfaces within Oceano Dunes SVRA would experience no change in surface wind speed or shearing stress and, thus, no change in particulate dust emissions.

Table 3-10: Other Possible Dust Control Measures						
Implementing Action, Task, and/or Requirement	*2020 Work Plan Status*					*Evaluation Metrics and/or Success Criteria To Document In 2021 Annual Report*
	Already Complete	*Already Underway*	*To Be Undertaken*	*To Be Completed*	*Not Proposed*	
WeatherSolve Fence					X	NA

3.2 Expected Outcomes, Effectiveness, and Potential Emissions Reductions

The proposed dust control measures identified in Section 3.1 are intended to reduce dust emissions downwind of Oceano Dunes SVRA. The estimated emission reductions and effectiveness of the dust control measures on downwind PM_{10} concentrations, based on air quality modeling conducted by DRI, are discussed in greater detail in this section.

It is important to note the information below is based on the DRI model results as presented in the May 2020 Oceano Dunes, Emission, Dispersion, an Attribution Model Results and Treatment Assessment (Attachment 3). Further, it is important to note the current modeling results differ significantly from the modeling results and projections published in the 2019 ARWP due to changes in the model discussed further in the DRI report.

3.2.1 Installation of a Vegetated Foredune

The DRI Model estimates the installation of the approximately 48 acre foredune would equate to reductions of approximately 4.0 metric tons per day for the baseline 10 highest modeled emission days. This is compared to the estimated reduction of 9.2 metric tons for the foredune described in the 2019 ARWP. The projected reduction of 4.0 metric tons equates to a 2% reduction in PM10 mass emissions.

Although this modeled outcome is small, the SAG stresses that, as with any modelling approach, there are notable simplifications particularly related to the parameterization of aerodynamic roughness, incorporation of local upper air data, and estimation of shear stress within and downwind of the foredune zone that generate appreciable uncertainty in the mass emission estimates. The CFD modelling discussed in section 3.1.9. and planned field measurements in 3.2.3. are designed to improve our understanding and modelling of mass emissions related to the foredune restoration treatment.

3.2.2 Preliminary Estimate of Progress to be Gained

As shown in Table 3-11, The DRI Model estimates that given all the dust control projects implemented since the baseline year of 2013, an expected reduction of 14.7% in PM10 mass emissions across the ODSVRA riding area (pre-2013 extent) relative to the pre-restoration condition, compared to the initial goal of a 50% reduction required by SOA.

Table 3-11: Modeled estimate of PM10 Mass Emission Reductions (%)			
Riding Area Only		**10 Highest Emission Days (2013)**	
Scenarios	**Cumulative Area Treated (Acres)**	**Metric tons/day**	**Reduction %**
Baseline, 2013, no controls	0	188.6	-
Controls through 2019	137	169.6	10.1
Foredune Addition	185.6	165.6	12.2
Spring 2020	230.9	160.9	14.7

The DRI model is also used to evaluate potential changes in downwind PM_{10} concentrations at selected receptor sites such as CDF and MESA2. With no controls in place and using the 2013 PI-SWERL emission grid, the model-predicted value for the CDF site is 123 µg m^{-3}. With the dust control areas as of spring 2020 in place and at the hypothetical effectiveness of 100% reduction for all controls the model-predicted value for the CDF site is 57 µg m^{-3}, a reduction of 54%.

3.2.3 Planned Field Measurements

Digital Elevation Modeling

Digital elevation models (DEMs), or three-dimensional topographic maps, will be constructed from UAS imagery of the site using 'Structure-from-Motion' processing by the ASU team. UAS flights will occur at least twice a year bracketing the nesting season of endangered bird species. Repeat imagery and DEMs will then be used to detect significant changes in surface elevation (sand volume), sand transport pathways, beach and dune geomorphology, and vegetation cover. Spatial-temporal statistics can then be used to detect and quantify areas (and volumes) of statistically significant change, as shown in Fig. 2-9. These maps and related imagery, coupled with data from the on-ground meteorological and sand transport stations, will be used to: i) detect and quantify sand volumetric and dune morphology changes, ii) assess the relations between OHV activity, sand transport, morphological changes, and dust emissions, iii) monitor vegetation re-establishment, and, iv) quantify the effectiveness of the foredune restoration treatments.

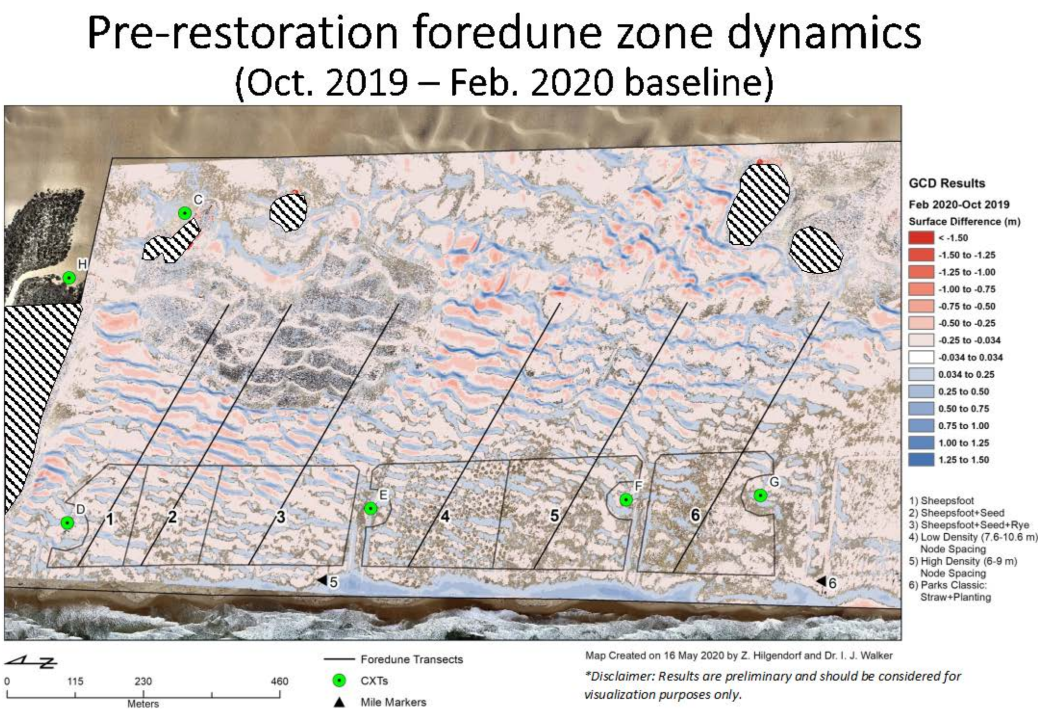

Figure 3-1. Geomorphic change detection map derived using spatial-temporal statistics to detect significant areas of sediment erosion (red) and deposition (blue) in the proximity of the foredune restoration site. This map is derived from UAS-based DEMs captured prior to restoration treatments (October 2019, February 2020) and, thus, provides baseline conditions of sediment transport and dune dynamics before foredune re-establishment.

Further details on the rationale and specifics of the ASU UAS-based DEM modeling is provided in Attachment 5.

As done previously CDPR, DRI, and SAG will evaluate the effectiveness of proposed dust control measures in the field through a combination of PI-SWIRL, sand flux, and PM_{10} monitoring equipment and associated measurements.

<u>Baseline Sand Flux Measurements</u>

The degree of success of planned dust control projects is judged, in part, on the change in sand flux across a treatment area. Wind-blown sand transport is the primary driver of dust emissions, so reducing sand flux will reduce dust emissions. To quantify the changes in the mass flux of sand within dust control project areas, measurements of sand flux are made using multiple BSNE saltation traps (Fryrear, 1986)[1]. These simple, but effective sand traps have been used extensively at Oceano Dunes SVRA (and elsewhere) to measure sand transport following its modification by control measures such as sand fencing (Gillies et al., 2017)[2] and re-vegetation involving spreading straw followed by planting of native species. The relative change in sand flux from uncontrolled to controlled conditions is used to define the effectiveness of the control measure to reduce sand transport.

The methodological approach to quantify control effectiveness uses multiple BSNE traps, with their collection orifice at the same height above the ground surface (15 centimeters), spaced closer together on the windward side of an area modified by a sand/dust control project, followed by a more even spacing of traps through to the downwind edge of the control area. This pattern is used because it is well-documented that roughness, whether it be in the form of a sand fence, or distributed roughness elements, modifies the sand flux as a function of downwind travel distance in a non-linear fashion (Gillies et al., 2017, Gilies et al., 2018)[3,4]. The relative reduction in sand flux (i.e., sand flux internal to the control area/sand flux upwind and external to the control area) defines the effectiveness of the control measure and is quantified on a scale of 0 to 1, where 0 represents a complete arresting of the sand flux and an effectiveness of 100%. The control effectiveness over the spatial extent of a control measure is quantified as the mean of the flux measurements made at each downwind measurement position (furthest east)/corresponding sand flux made at the upwind position.

As it is not feasible to have a sufficiently long period to define the sand flux across a control area prior to any restoration activities (due to time constraints and planting schedules), the methodological approach of Gillies et al. (2018) is used to quantify the relative changes in sand

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[1] Fryrear, D. (1986). A field dust sampler. Journal of Soil and Water Conservation 41: 117-120.
[2] Gillies, J.A., V. Etyemezian, G. Nikolich, R. Glick, P. Rowland, T. Pesce, M. Skinner (2017). Effectiveness of an array of porous fences to reduce sand flux: Oceano Dunes, Oceano CA. Journal of Wind Engineering and Industrial Aerodynamics 168: 247-259, doi: 10.1016/j.weia.2017.06.015.
[3] IBID.
[4] Gillies, J.A., V. Etyemezian, G. Nikolich, W.G. Nickling, J. Kok (2018). Changes in the saltation flux following a step-change in macro-roughness. Earth Surface Processes and Landforms, 43: 1871-1884, doi: 10.1002/esp.4362.

flux in a dust control or restoration area caused by the restoration activities[5]. BSNEs are maintained on the upwind edge of the control area to the west of all restoration activities (but within the exclusion fencing) to quantify the incoming sand flux. Multiple west-east transects of BSNEs are emplaced.

The sand samples within the traps are collected following a regional high wind/sand transport/elevated PM_{10} event. Samples are collected if the leading edge traps contain multiple grams of sand. Traps downwind of the leading edge traps are collected if they contain multiple grams of sand. If the downwind traps, checked following collection of the leading edge traps, do not contain sufficient sand for accurate weighing they are noted as containing a trace amount (less than 1 gram). BSNE traps that record trace amounts of sand within them will be considered to show zero flux when included in the calculation of effectiveness. Sand flux reduction, and control effectiveness, attributable to dust control projects are determined by maintaining this sampling network throughout the duration of the treatment. Effectiveness of the control is reported on an annual basis.

PM_{10} Measurements

Measuring emissions (in terms of micrograms per square meter per second) of PM_{10} from an actively emitting surface is a challenge due to the complexity of the configuration of instruments required as well as the necessary quality of the measurements in terms of precision, accuracy, and time resolution. At Oceano Dunes SVRA, it is assumed that dust emission scales with saltation flux, such that a reduction in sand flux creates a commensurate reduction in dust or PM_{10} flux. To provide confidence that this does occur PM_{10} monitors (MetOne Particle Profilers) are placed upwind and in the immediate downwind position of selected control measures. The expectation is that if sand flux reduction is observed, PM_{10} concentrations will not increase across the horizontal distance of the area under control. To date, when this measurement procedure has been used at Oceano Dunes SVRA for areas that have had sand flux controls in place, the

[5] IBID.

difference between upwind and downwind PM_{10} has shown a decrease (e.g., Gillies et al., 2017; Gillies et al., 2019)[6,7]. This suggests that the emission of PM_{10} within the area being controlled has been reduced along with the sand flux. In future years, dust control projects will be selected for upwind and downwind monitoring of PM_{10} to provide record of how the relative concentration (downwind/upwind) changes through time to provide confirming data of the effectiveness of the developing foredune to modulate dust emissions from the area.

PM_{10} Emissivity Measurements – PI-SWERL

In 2020, PI-SWERL (Etyemezian et al., 2007, 2014) has been used to measure surface emissivity (mg m^{-2} s^{-1}) of PM_{10} within the riding area in May 2020 to provide data to evaluate changes in emissivity across the ODSVRA for riding and non-riding areas and through time. Due to unsuitable environmental conditions and constraints on access due to Plover breeding activities, the measurements were curtailed and stopped in May 2020. DRI plans to complete the PI-SWERL measurements for the ODSVRA and the foredune restoration area when conditions are suitable. Unfortunately this will be outside of the time period (May) that represents the windy season when dust emissions are expected. This will affect the continuity of measurements making comparisons between years more uncertain due to the different time frames of measurement.

DRI is also planning to carry out PI-SWERL measurements in 2021. This will be either a repeat of the complete 2019 sampling grid or another sampling of a sub-set of the 2019 grid.

3.3 Sensitivity Analysis / Projection of Additional Controls Necessary to Achieve a 50% Reduction in Maximum Baseline Emissions

During 2019 and the first half of 2020, several significant data collection campaigns were undertaken to update the DRI Model. DRI developed an updated emission grid based on the

[6] See footnote 7.
[7] See footnote 4.

recently collected data. DRI also developed an interpolation scheme different from the 2018-CARB method and expanded measurement and input parameters of meteorological data from CALMET. As a result of these modeling updates, different outcomes relative to progress toward SOA goals were produced as compared to those results previously reported thought this SOA process. A report on this process is included as Attachment 3 to this report.

Utilizing the newly updated modeling tool, DRI evaluated the effectiveness of dust treatments implemented thus far under the SOA and examined effectiveness of possible future treatments. Following are excerpts from the DRI report on this subject:

- *DRI's emission modeling suggests that reduction in emissions is a linear relation between area under control and emission reductions, i.e., a 1% reduction in emissive area under control lowers mass emission by 1%.*
- *The expected benefit of targeting "hot spots" as identified initially in the CARB modeling has not resulted in "extra" emission reduction, because that "map" over-emphasized the presence of high emission areas.*
- *Either modeling method indicates that the scale of control required to meet the 50% mass emission reduction of the SOA is considerable, and a challenge both from an engineering and Park operations perspective, as well as an ecological/dune dynamics perspective.*
- *This emissions "accounting" method does not take into account any secondary effects that the control measures (e.g., foredune) may have on erosion, emissions, and transport.*

Discussions between the SAG, DRI staff and CDPR staff on this topic included discussions around possible alternatives to the existing SOA goals that appear unachievable. All parties will continue coordination on possible SOA Goal Alternatives, noting that the foremost goal is to achieve reductions in PM10 concentrations toward attaining state and federal air quality standards while minimizing impacts to public recreation opportunities.

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4 BUDGETARY CONSIDERATIONS

The OHMVR Division's estimated budget to develop and implement the 2020/2021 dust control actions described in Chapter 3 is $2,642,230. A detailed breakdown of this estimated budget is provided in Table 4-1. This budget roughly covers all activities from July 1, 2020 through June 30, 2021 including existing contracts with SAG members.

Table 4-1: Estimated 2020 Work Plan Budget

Dust Control Activity	3rd Party Contract Costs	Other Costs	Total Costs
Vegetation Plantings (Conversion of Wind Fencing, Foredune, and Supplemental Plantings)			
Support Services	$343,000	$0	$343,000
Labor	$257,000	$104,000	$361,000
Materials	$0	$95,000	$95,000
Equipment	$97,000	$125,000	$222,000
Greenhouse Facilities	$150,000	$0	$150,000
Subtotals	*$847,000*	*$324,000*	*$1,171,000*
Maintenance and Installation of Wind Fencing			
Labor	$156,000	$18,000	$174,000
Materials	$0	$50,000	$50,000
Equipment	$100,000	$0	$100,000
Subtotals	*$256,000*	*$68,000*	*$324,000*
Monitoring (Sand Flux, Air Quality, Meteorological, and Other Monitoring) &Modeling			
Instrument Operations	$229,000	$29,000	$258,000
Data Analysis	$300,000	$0	$300,000
Subtotals	*$529,000*	*$29,000*	*$558,000*
Dust Control Project Design and Technical Assistance			
Scientific Expertise	$368,000	$0	$368,000
Subtotals	*$368,000*	*$0*	*$368,000*
Other Items of Expense			
Miscellaneous	$221,230	$0	$221,230
Subtotals	*$221,230*	*$0*	*$221,230*
TOTAL COSTS	**$2,221,230**	**$421,000**	**$2,642,230**

Note: Cost estimate does not include permanent CDPR staff positions assigned to these duties but does include seasonal staff time and overtime for permanent staff.

The approximately $2.64 million budget shown in Table 4-1 is similar to the costs the OHMVR Division incurred from summer 2019 to July 31, 2020. Compared to the previous 12 months:

- Costs for greenhouse services (to grown native plants) continue to increase at off-site growing facilities (private facilities and Cal Poly San Luis Obispo facilities)
- Labor costs have increased to install native dune plants and restoration materials;
- Contract costs for scientific and technical assistance for additional field investigations (PI-SWERL, air quality monitoring) and scientific analysis (DRI Model, analysis of new field measurements, etc.).

5 IMPLEMENTATION SCHEDULE

The tables below present schedules for implementing the dust control activities identified in Chapter 3 over the August 1, 2020 to July 31, 2021 time period.

Table 5-1 Supplemental Foredune Planting

Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
Native seed collection and native plant cultivation/procurement	May '20	Oct '20												
Straw bales/mulch	Feb '21	Mar '21												
Vegetation planting	Feb '21	Mar '21												
Monitoring activities	May '20	Dec '23												
UAS Campaign (DEM)	Oct '20	May '21												

Table Key:

	Action start.
	Action in progress.
	Action complete.

Table 5-2 Removal of Seasonal Wind Fencing (2 – 20 acre arrays)														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
Wind Fence Removal	Sep '20	Oct '20												
Table Key:														
	Action start.													
	Action in progress.													
	Action complete.													

Table 5-3 Remaining Initial SOA wind fence areas - Conversion to Native Dune Veg														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
Native seed collection and native plant cultivation/procurement	May '20	Oct '20												
Wind Fence Removal	Sep' 20	Sep' 20												
Straw bales/mulch	Oct '20	Nov '20												
Vegetation planting	Dec '20	Jan '21												
Table Key:														
	Action start.													
	Action in progress.													
	Action complete.													

Table 5-4 Amended SOA 4.2 acre Permanent Dust Treatment – Planting Veg														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
Native seed collection and native plant cultivation/procurement	May '20	Oct '20												
Vegetation planting	Dec '20	Jan '21												
Table Key:														
	Action start.													
	Action in progress.													
	Action complete.													

Table 5-5 Re-deploying the northern 20-acre wind fencing array														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
California Coastal Commission Approval	Oct '20	Nov '20												
Install Perimeter Fencing	Mar '21	Apr '21												
Wind Fence Installation	Mar '21	Apr '21												
Table Key:														
	Action start.													
	Action in progress.													
	Action complete.													

Table 5-6 Dust control treatment for southern 20-acre wind fencing array tbd														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
California Coastal Commission Approval	Aug '20	Sep '20	(Action start)	(Action complete)										
Install Perimeter Fencing	tbd	tbd												
Treatment tbd	tbd	tbd												

Table Key:	
(green)	Action start.
(blue)	Action in progress.
(pink)	Action complete.

Table 5-7 New Temporary vehicle exclosure/ seasonal dust control treatment - wind fence or straw mulch (40 acres)														
Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
SAG Consultation to determiner location	Aug '20	Sep '20												
California Coastal Commission Approval	Oct '20	Nov '20												
Perimeter Fence Installation	Mar '21	Mar '21												
Wind Fence Installation	Mar '21	Apr '21												
Straw bales/mulch	Mar '21	Apr '21												
Fence Removal	Oct '21	Oct '21												

Table Key:

	Action start.
	Action in progress.
	Action complete.

Table 5-8 SAG Consultation and Evaluation

Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug '20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May'21*	*Jun '21*	*Jul '21*
Monthly SAG Phone meetings as needed	May '20	Jul '21												
SAG full-day meetings	May '20	Jul '21												
Prepare an outline 2021 Work Plan	Mar '21	May '21												
SAG feedback on outline 2021 Work Plan	Jun '21	Jun '21												
Prepare Full 2021 Work Plan	Jun '21	Jul '21												
Consult on Public Education Campaign	Sep `21	Jul `21												

Table Key:

	Action start.
	Action in progress.
	Action complete.

Table 5-9 2019/2020 Continued monitoring and modeling activities

Implementing Action, Task, or Requirement	*Task Start Date*	*Task End Date*	*2020/2021 Implementation Schedule*											
			Aug'20	*Sep '20*	*Oct '20*	*Nov'20*	*Dec '20*	*Jan '21*	*Feb '21*	*Mar'21*	*Apr '21*	*May, 21*	*Jun '21*	*Jul '21*
Meteorological and PM data acquisition	Aug-20	Dec-23	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress
PI-SWERL measurements	May-19	Jun-23	Complete								Start	In progress		
PI-SWERL analyses	Jul-19	Oct-23			Start	In progress	In progress	Complete						
Updated modeling	Dec-19	Mar-23						Start	In progress	Complete				
Compare model predictions with PM data measurements	Dec-19	Mar-23						Start	In progress	Complete				
Improve DRI Model performance	Jun-19	Dec-23	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress	In progress

Table Key:

Green	Action start.
Blue	Action in progress.
Pink	Action complete.

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Oceano Dunes SVRA Dust Control Program

2020 Annual Report and Work Plan

EXHIBITS

Exhibit 1: 2019-20 SOA Dust Control Measures

Exhibit 2: SAG Foredune Treatment Diagram

Exhibit 3: 2019-20 Foredune Planting List

Exhibit 4: 2020-21 Wind Fence to Vegetation Areas

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Oceano Dunes SVRA Dust Control Program

2020 Annual Report and Work Plan

EXHIBITS

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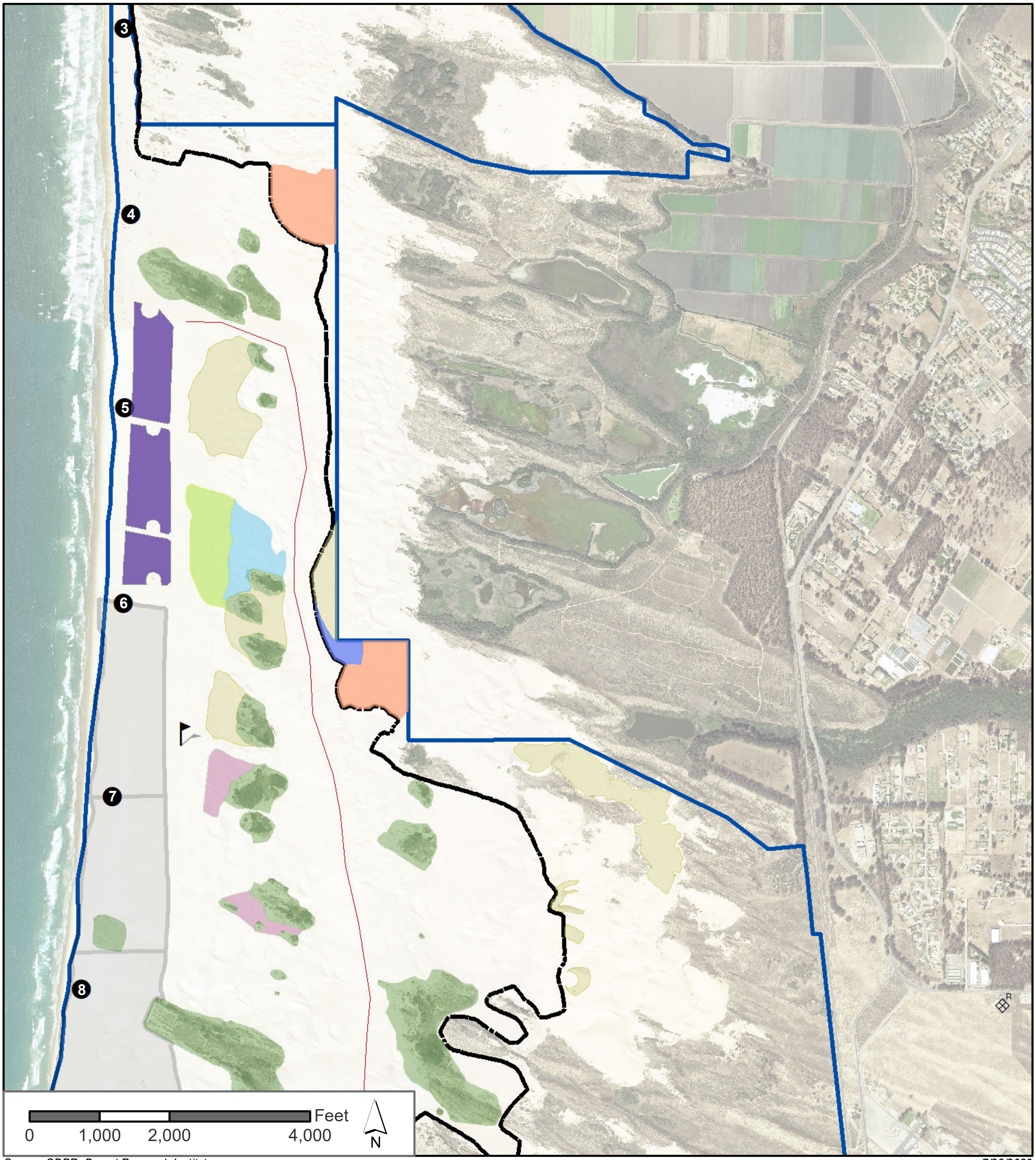


Source: CDPR, Desert Research Institute

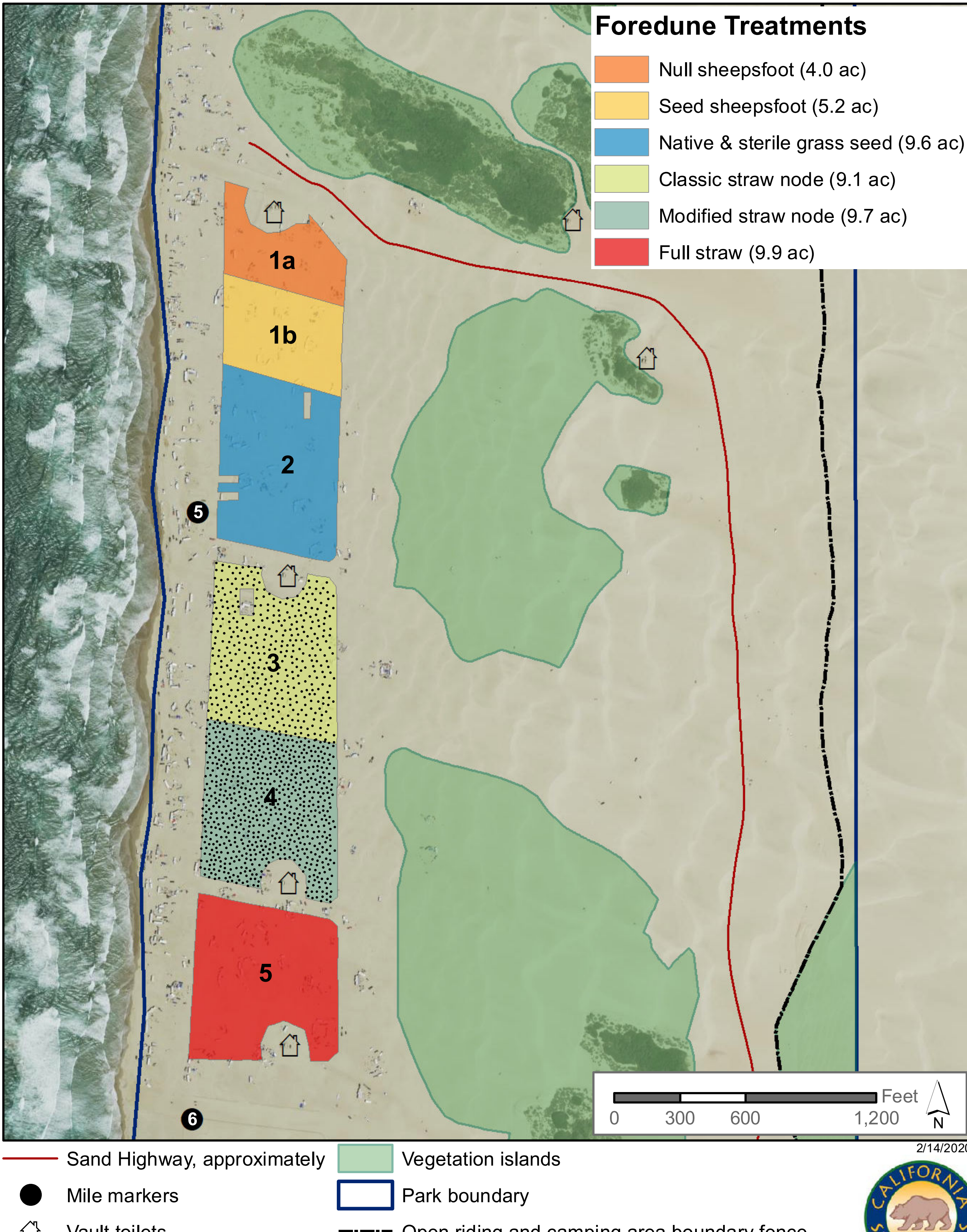
7/23/2020

- Vegetated Foredune (2019-VG-01)
- 4.2 Acre Additional Backdune treatment (2019-SB-01)
- Wind Fencing Conversion to Straw Bales (2019-SB-02)
- Wind Fencing Conversion to Vegetation (2019-VG-02)
- Seasonal Wind Fencing Projects (2019-WF-01 and 2019-WF-02)
- Wind Fencing Maintenance Projects
- Prior Vegetation Projects
- Existing fenced vegetation islands (186 acres)
- Open riding and camping area boundary fence
- Sand Highway, approx.
- Marker post
- Nesting exclosure
- Park boundary
- S1 wind tower

SOA Dust Control Treatment Areas

Oceano Dunes SVRA 2020

Exhibit 2



2020 Dust Control Project

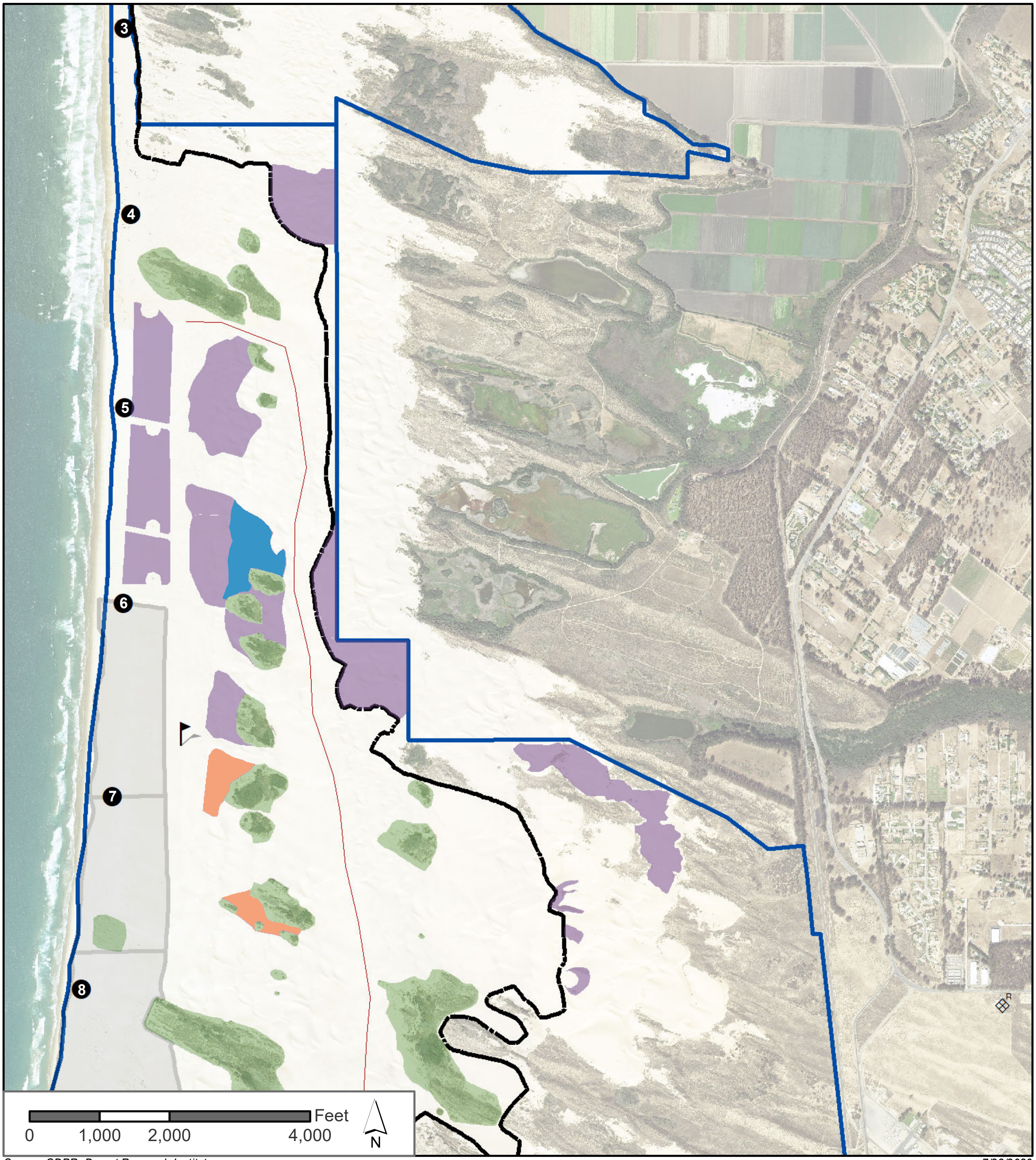
Oceano Dunes SVRA Amended Stipulated Order of Abatement Treatment Area

Exhibit 3

Foredune 48 Acre Project Totals				1. Sheepsfoot Only (Control)	2. Sheepsfoot with Native Seed		3. Sheepsfoot with Native Seed and Sterile Triticale (rye/wheat hybrid) Seed		4. Nodes - Low Density (432 nodes)					5. Nodes - High Density (742 nodes)					6. Park Treatment			
				4.72 acres	4.79 acres		9.56 acres, 50 lbs/acre Triticale seed		9.33 acres. 9 plants and native seed within nodes with 1 meter radius. 12 ft radius nodes covered in straw. Total area straw coverage=47.10%					9.66 acres. 9 plants and native seed within nodes with 1 meter radius. 12 ft radius nodes covered in straw. Total area straw coverage=74.02%					9.94 Acres. Plants, native seed, sterile Triticale seed (50lbs/acre) and straw.			
Scientific Name	Common Name	Total Plant Inventory	Total Seed Inventory (lb)		Seed (lb)	Seed per Treated Acre	Seed (lb)	Seed per Treated Acre	Plants per Node	Total Plants	Plants per acre (9.33 acres)	Total Seed (lb)	Seed per Treated Acre	Plants per node	Total Plants	Plants per Acre (over 9.66 acres)	Total Seed (lb)	Seed per Treated acre	Total Plants	Plants per Acre (9.6 acres)	Total Seed (lb)	Seed per Acre
Abronia maritima	Sticky sand verbena	207	124.40		23.65	4.94	47.21	4.94	0.17	72	7.72	1.6378	4.94	0.17	124	12.80	2.8130	4.94	11	1.14	49.0864	4.94
Abronia latifolia	Yellow sand verbena	125	3.39		0.64	0.13	1.29	0.13	0.08	36	3.86	0.0446	0.13	0.08	62	6.40	0.0767	0.13	27	2.73	1.3376	0.13
Achillea millefolium	Common yarrow	2,070	25.55		4.86	1.01	9.70	1.01	1.00	432	46.30	0.3364	1.01	1.00	742	76.81	0.5778	1.01	896	90.14	10.0817	1.01
Ambrosia chamissonis	Beach bur	5,586	169.45		32.22	6.73	64.31	6.73	2.00	864	92.60	2.2309	6.73	2.00	1484	153.62	3.8318	6.73	3,238	325.75	66.8625	6.73
Atriplex leucophylla	Sea scale	269	0.71		0.14	0.03	0.27	0.03	0.17	72	7.72	0.0093	0.03	0.17	124	12.80	0.0161	0.03	73	7.38	0.2802	0.03
Camissoniopsis cheiranthifolia	Beach evening-primrose	4,288	10.55		2.01	0.42	4.00	0.42	1.25	540	57.88	0.1389	0.42	1.25	928	96.01	0.2386	0.42	2,821	283.75	4.1629	0.42
Malacothrix incana	Dunedelion	4,018	0.30		0.06	0.01	0.11	0.01	1.25	540	57.88	0.0039	0.01	1.25	928	96.01	0.0068	0.01	2,551	256.59	0.1184	0.01
Eriogonum parvifolium	**Coastal buckwheat**	**784**	**10.36**		**1.97**	**0.41**	**3.93**	**0.41**	**0.17**	**72**	**7.72**	**0.1363**	**0.41**	**0.17**	**124**	**12.80**	**0.2342**	**0.41**	**588**	**59.19**	**4.0865**	**0.41**
Eriophyllum staechadifolium	**Seaside golden yarrow**	**10,000**	**15.18**		**2.89**	**0.60**	**5.76**	**0.60**	**3.00**	**1296**	**138.91**	**0.1998**	**0.60**	**3.00**	**2226**	**230.43**	**0.3432**	**0.60**	**6,478**	**651.71**	**5.9890**	**0.60**
Lupinus chamissonis	**Dune lupine**	**200**	**0.18**		**0.04**	**0.01**	**0.07**	**0.01**	**0.17**	**72**	**7.72**	**0.0024**	**0.01**	**0.17**	**124**	**12.80**	**0.0042**	**0.01**	**4**	**0.44**	**0.0728**	**0.01**
Fragaria chiloensis	**Beach strawberry**	**31**	**0.00**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0**	**0.00**	**0.0000**	**0.00**	**0.00**	**0**	**0.00**	**0.0000**	**0.00**	**31**	**3.12**	**0.0000**	**0.00**
SUB TOTAL Regular		16,563.00	385.35		73.27	15.30	146.24	15.30	6	2556	273.95	5.0733	15.2971	6	4390	457.31	8.7139	15.2971	9,616.83	1,001.75	152.0535	15.84
SUB TOTAL Bold		**10,984.00**	**25.72**		**4.89**	**1.02**	**9.76**	**1.02**	**3**	**1440**	**154.34**	**0.3386**	**1.0210**	**3**	**2473**	**257.64**	**0.5816**	**1.0210**	**7,101.67**	**739.76**	**10.1483**	**1.06**
TOTAL		27,578.00	411.07		78.16	16.32	156.00	16.32	9	3996	428.30	5.4119	16.3181	9	6864	714.95	9.2954	16.3181	16,718.50	1,741.51	162.2018	16.90

Total Native Seed Acreage=25.19	Foredune Pioneer Plants
Total Plant Acreage=15.83	Foredune Adapted Plants
Total Straw Acreage=21.48	
Total Straw Bales (small)=2048	

BOLD are species which were not part of the original platn list but we feel would support foredune succession. These species all appear in Dune Preserve.



Source: CDPR, Desert Research Institute

7/23/2020

- 15 acres of current straw mulch (Paw Print)
- 13.5 acres of current wind fence (Eucalyptus (8) and Table Top (5.5))
- Dust Control Projects
- Existing fenced vegetation islands (186 acres)
- Open riding and camping area boundary fence
- Sand Highway, approx.
- Marker post
- Nesting exclosure
- Park boundary
- S1 wind tower

CALIFORNIA STATE PARKS SINCE 1864 OHV

28.5/48.6 Acres Remain to be Vegetated of Wind Fence Installed Summer 2018

Oceano Dunes SVRA 2020