LAX MASTER PLAN

MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)

2017 ANNUAL PROGRESS REPORT

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Los Angeles World Airports

LOS ANGELES INTERNATIONAL AIRPORT (LAX)

MASTER PLAN PROGRAM

MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)

2017 ANNUAL PROGRESS REPORT

Prepared by

Los Angeles World of Airports
Environmental Programs Group

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LAX Master Plan MMRP Documents

LAX Master Plan MMRP as adopted December 2004, BWP MMRP dated September 2009, WAMA MMRP dated February 2014, and MSC MMRP dated June 2014

For a copy of these MMRPs, reference LAWA Website https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program, LAX Master Plan Documents

1 Project Background

On December 7, 2004, the Los Angeles City Council certified the LAX Master Plan Final Environmental Impact Report (FEIR) and related entitlements for future development of LAX and adopted the LAX Master Plan Mitigation Monitoring and Reporting Program (MMRP). The 2004 MMRP is available online at https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program under LAX Master Plan Documents. Following certification of the LAX Master Plan FEIR, the Los Angeles City Council certified a number of project-level EIRs for individual Master Plan components, including the South Airfield Improvement Project (SAIP) (certified on January 11, 2006), Crossfield Taxiway Project (CFTP) (certified on February 9, 2009), Bradley West Project (BWP) (certified on October 14, 2009), West Aircraft Maintenance Area (WAMA) Project (certified on April 1, 2014), and Midfield Satellite Concourse (MSC) Project (certified on July 21, 2014). The Board of Airport Commissioners (BOAC) and the Los Angeles City Council adopted MMRPs for these projects to mitigate or avoid potentially significant effects on the environment during construction of these projects. As a result, current project-specific mitigation measures are included in this report for the BWP (baggage optimization component), WAMA project (Delta Air Lines hangar component), and the MSC project (North Concourse and associated improvements, including the gateway and far east tunnel). LAWA previously completed the mitigations for the SAIP and CFTP.

This report provides a status update on applicable mitigation activities, policies, and programs that were implemented by LAWA to ensure compliance with mitigation measures identified in the LAX Master Plan FEIR and subsequent environmental documents tiered from the FEIR. This report covers the period January 1, 2017 through December 31, 2017. Separate tables are provided for mitigation measures where no action was required during the reporting period, on-going or in-progress measures, completed measures, and measures that are no longer applicable.

2 Non-Project Specific Mitigation Measures for Reporting Period

The LAX Master Plan MMRP contains a number of general/non-project specific mitigation measures associated with the LAX Master Plan. The LAX Master Plan MMRP as adopted December 2004, is available online under LAX Master Plan Documents at https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program. This section addresses those non-project specific mitigation measures that were implemented in 2017. Measures are shown by resource and mitigation measure as presented in the MMRPs.

Table 2-1
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
LAND USE		
MM-LU-4: Provide Additional Sounds Insulation for Schools Shown by MM-LU-3 to be Significantly Impacted by Aircraft Noise		
MM-LU-4	Provide Additional Sound Insulation for Schools Shown by MM-LU-3 to be Significantly Impacted by Aircraft Noise	LAWA actively assists the Lennox and Inglewood School Districts in their efforts to mitigate noise impacts to schools, per Settlement Agreements with each of these school districts.
MM-LU-4	Lennox School District	In 2011, LAWA submitted an application to the FAA for authorization to collect and use Passenger Facility Charge (PFC) funds to sound insulate impacted schools in the Lennox School District (the District). The FAA approved the application and authorized the expenditure of up to $34,089,058 in PFC funds to insulate impacted schools in Lennox. Since 2011, Lennox has completed sound attenuation work at Dolores Huerta Elementary School, Animo Leadership High School, Lennox Middle School, Felton Elementary School, and part of Jefferson Elementary School. As of December 2017, Buford Elementary sound attenuation work was ongoing and scheduled to be completed in 2018.
MM-LU-4	**Inglewood Unified School District**	In 2013, the FAA approved LAWA's PFC application for $44,378,659 to use PFC funding

Table 2-1
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
		for sound attenuation projects in the Inglewood Unified School District (IUSD).at the following schools: • Morningside High School • Oak Street Elementary School • Payne Elementary School • Woodworth Elementary School • Monroe Middle School • Child Development Center at Woodworth Elementary In 2015, BOAC approved an initial funding allocation of $10 million for the IUSD's First Workplan covering Payne Elementary, Woodworth Elementary, and the Child Development Center and Woodworth Elementary. In 2016, IUSD amended their First Workplan to accommodate for logistical and planning issues. Monroe Middle School and Morningside High School were moved up on the schedule ahead of Woodworth Elementary. The First Workplan now includes Payne Elementary, Monroe Middle School and Morningside High School. LAWA also requested that the FAA reconsider exclusion of Inglewood High School from the FAA-approved schools. The school is bisected by the 2020 Noise Exposure Map (NEM). In 2017, the Division of the State Architect approved design plans for sound attenuation at Payne Elementary School.
BIOTIC COMMUNITIES		
MM-BC-3	Conservation of Floral Resources: Mature Tree Replacement	LAX Master Plan projects did not require the removal of mature trees during in 2017.
MM-BC-9	Conservation of Faunal Resources Associated with the SAIP (San Diego black-tailed jackrabbit and the loggerhead shrike)	The San Diego black-tailed jackrabbit and the loggerhead shrike were not impacted by LAX Master Plan projects in 2017.
MM-BC-13	Replacement of State-Designated Sensitive Habitats	State-designated sensitive habitat within the Dunes Area was not impacted due to LAX

Table 2-1 Summary of General Mitigation Measures in the 2017 Monitoring Period Measures for Which No Action is Required at this Time		
Mitigation Measure		**Status**
		Master Plan projects in 2017.
MM-ET-3	El Segundo Blue Butterfly Conservation: Dust Control	LAWA did not grade or stockpile soil within 100 feet of occupied habitat of the El Segundo Blue Butterfly as part of the LAX Master Plan in 2017.
ENDANGERED AND THREATENED SPECIES		
MM-ET-4	El Segundo Blue Butterfly Conservation: Habitat Restoration Biological Opinion	No action was required during the 2017 reporting period for this component of the measure.

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
NOISE		
N-1	Maintenance of Applicable Elements of Existing Aircraft Noise Abatement Program (ANAP)	LAWA complied with this commitment in 2017 by maintaining the LAX Aircraft Noise Abatement Program (ANAP) and submitting Quarterly Reports to the County of Los Angeles.
LAND USE		
MM-LU-1	Implement Revised Aircraft Noise Mitigation Program	The ANMP describes ongoing LAWA efforts to convert existing incompatible land uses surrounding LAX to compatible land uses through the implementation of two noise mitigation strategies: (1) sound insulation of structures; and (2) acquisition of property followed by the conversion of incompatible land use to compatible land use. The ANMP is implemented to reduce adverse noise impacts and achieve airport standards as set forth in Title 21 of the California Code of Regulations. ANMP reports are also required by the State of California as a condition of the three-year Variance granted to LAWA airports that have not achieved land use compatibility. LAWA continues to implement two programs to convert existing incompatible land uses to compatible land uses through sound insulation of structures and acquisition and conversion of incompatible land use to compatible land use (LAWA's Residential Acquisition program). LAWA completed the LAX Soundproofing program for the City of Los Angeles in 2014. In 2017, LAWA acquired 31 properties in Manchester Square as part of the Residential Acquisition program. Please see the 2016 MMRP Annual Progress Report for more information.
MM-LU-2	Incorporate Residential Dwelling Units Exposed to Single Event Awakenings Threshold into Aircraft Noise Mitigation Program	In 2015, LAWA produced the 2015 N94 contour that identified newly impacted incompatible residential properties. The current eligibility boundary, the 2020 NEM 65 dB contour, did not expand eligibility areas within the Cities of Los Angeles and El Segundo. There are parcels within the County of Los Angeles that were within the N94 Contour, and are now outside the 2020 NEM of the current Program Boundary. However, these parcels are included in FAA-approved Block Rounding areas, and are therefore eligible.

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		Within the City of Inglewood, there are several parcels located within the 2015 N94 contour that are outside of the current Program Boundary. All of these parcels are in close proximity to the 2020 NEM contour, but were not requested by the City to be included in the City of Inglewood's Block Rounding areas because these properties are planned for industrial or commercial uses and are not planned for residential use. These properties may be acquired for conversion to compatible land use. If the City of Inglewood wishes to include residential properties (planned for industrial or commercial use) in an acquisition program, eligibility will be evaluated at that time, based on current FAA-eligible contours.
MM-LU-3	Conduct Study of the Relationship Between Aircraft Noise Levels and the Ability of Children to Learn	The Transportation Research Board's Airport Cooperative Research Program (ACRP) completed the study entitled "Evaluating the Impact of Aviation Noise on Learning" in 2017 to determine when aircraft noise impacts student learning and what noise metric(s) best defines impact on learning. In addition, ACRP funded follow-up research, entitled Assessing Aircraft Noise Conditions Affecting Student Achievement – Case Studies (Case Studies research). The objectives were to (1) develop and implement a case study methodology to identify and measure factors at the individual classroom, student, and teacher level influencing aircraft noise impacts on student achievement (2) identify metrics to define the level and characteristics of aircraft noise that impact student achievement; and (3) develop guidance for use by decision makers on how to reduce the impact of aircraft noise on student achievement. The final report was completed in 2017, and LAWA began assessing the conclusions of the studies against the goal of setting replacement thresholds for classroom disruption by aircraft noise events. If the goals are met, then further study will not be necessary. If the goals are not met, or only partially met, then LAWA will assess the need for additional

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		study.
SURFACE TRANSPORTATION		
MM-ST-14	Ground Transportation/Construction Coordination Office Outreach Program	In 2017, LAWA's Construction and Logistics Management (CALM) team worked in cooperation with LAWA staff including Terminal Operations, Airport Police, Environmental Programs Group, and Commercial Development Group, to monitor construction traffic, coordinate lane and roadway closures and analyze the need for additional traffic controls.
ENVIRONMENTAL JUSTICE		
EJ-1	Aviation Curriculum	LAWA regularly coordinates with local school districts to develop aviation-related curriculum. In 2017, LAWA worked on a pilot program with Orville Wright Middle School in Westchester to offer an on-site Flight Simulation training program for their students. Also in 2017, LAWA began coordinating aviation-related activities with Thirty-Second Street Elementary and Normandie Elementary Schools in South Los Angeles, Wish Elementary School in Westchester and Graham Elementary School in the Watts area of South Los Angeles.
EJ-2	Aviation Academy	LAWA's Aviation Career Education (ACE) Academy is a free, week-long motivational program to provide seventh and eighth grade, and high school students in communities surrounding LAX, including El Segundo, Hawthorne, Inglewood, Lennox, South Los Angeles, and Westchester/Playa del Rey, with a basic understanding of career opportunities within the aviation industry, as well as a general knowledge about LAX. Thirty-six (36) local students participated in the program during the summer of 2017. In 2017 LAX hosted its second Aviation Career Day bringing more than 650 LAX area and Los Angeles area high school students to the LAX airfield for a career fair focusing on aviation and aviation-related services.
EJ-3	Job Outreach Center **Construction and Other LAX-Related Job Outreach**	The First Source Hiring Program (FSHP) provides residents from the communities immediately surrounding the airport and those most impacted by airport operations – South Los Angeles, El Segundo, Hawthorne, Inglewood, and Lennox access to airport jobs. FSHP focuses much of its

Table 2-2
Summary of General Mitigation Measures in the 2017 Monitoring Period
Ongoing Measures

<table>
<tr><th colspan="2">Mitigation Measure</th><th>Status</th></tr>
<tr><td></td><td></td><td>outreach in these areas.

FSHP works closely with local Community Organizations such as Work Source Centers, One-Stop Centers, and faith-based organizations to promote airport jobs for LAX employers. FSHP provides training to these organizations on how to apply for jobs at LAX and what is needed to obtain a job at LAX. FSHP also promotes jobs through social media and currently has over 4,450 followers on Facebook. In 2017, LAWA attended 44 job-related/community events.

Also in 2017, FSHP participated in several events to promote the LAX Landside Access Modernization Program and inform potential LAX contractors of the ability to advertise airport-related employment opportunities with the FSHP.

During 2017, FSHP performed as follows:

<table><tr><th></th><th>2017</th></tr><tr><td>Job Openings</td><td>13,713</td></tr><tr><td>Registered Job Seekers</td><td>60,770</td></tr><tr><td>Website Visits</td><td>697,595</td></tr><tr><td>Job Referrals to LAX Employers</td><td>87,899</td></tr><tr><td>LAX Employers</td><td>183</td></tr><tr><td>Community Partners</td><td>189</td></tr></table>
For more information on the FSHP, please visit the program website at: http://www.lawa.org/bjrc/Employment.aspx?id=2058 and the Jobs@LAX website at www.jobsatlax.org.</td></tr>
<tr><td>EJ-3</td><td>Job Outreach Center

Community Job Database</td><td>LAWA’s FSHP has an online website named Jobs@LAX.org. The website allows airport employers to have their jobs automatically or manually posted to the website from their company website.

LAWA’s Business and Jobs Resources Center (BJRC) works closely with local Community Organizations such as Work Source Centers, One-Stop Centers, and faith-based organizations to</td></tr>
</table>

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		promote airport jobs for LAX employers. FSHP provides training to these organizations on how to apply for jobs at LAX and what is needed to obtain a job at LAX.
EJ-3	Job Outreach Center **MBE/DBE & SBE Business Outreach**	In collaboration with the Procurement Services Division, LAWA's BJRC Outreach Unit (BOU) conducts a monthly workshop, "Doing Business with LAWA". In 2017, approximately 209 business representatives attended the monthly workshops. In October 2012, the Board of Airport Commissioners (BOAC) adopted the Small Business Enterprise (SBE) program to replace the Minority/Women/Other Business Enterprise (M/W/OBE) program. LAWA departments set an SBE goal for each project. The selected contractor submits a SBE participation pledge that they must meet or exceed. There is a penalty if the contractor fails to meet the mandatory pledged percentage. The federal Disadvantage Business Enterprise and the local Minority/Women Business Enterprise programs require prospective contractors to meet good faith effort requirements at the time of proposal submission. The selected contractors are required to report their subcontractor participation during the life of the contract.
EJ-4	Community Mitigation Monitoring	In October, 2017, the Stakeholder Liaison Office was discontinued, however, LAWA continues to provide stakeholders with direct access to applicable LAX Master Plan projects through its website.at https://www.lawa.org/en/lawa-our-lax.
AIR QUALITY		
AQ-2	School Air Filters	On December 3, 2013, LAWA requested that the FAA make a determination on whether airport revenues may be used to provide funding for MMRP Commitment AQ-2, School Air Filters. LAWA did not receive FAA's formal response in 2017.
MM-AQ-1	LAX Master Plan – Mitigation Plan for Air Quality (Framework)	Plan established; implementation is ongoing. In 2005, LAWA completed a Mitigation Plan for Air Quality that established the overall framework for the implementation of specific measures for mitigating air quality impacts associated with the LAX Master Plan. BOAC adopted the MM-AQ-1 Plan in December 2005, in conjunction with approval of the SAIP.

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
MM-AQ-2	Construction-Related Mitigation Measures	Plan established; implementation is ongoing. LAWA completed a Construction-Related Mitigation Plan that set forth specific implementation requirements for the measures in the LAX Master Plan Final EIR. BOAC adopted the MM-AQ-2 Plan in December 2005, in conjunction with approval of the SAIP and LAWA has integrated required measures into the individual project construction specifications as appropriate, including those projects described herein. The execution of MM-AQ-2 Plan occurs in conjunction with construction of each Master Plan project.
MM-AQ-4	Operations-Related Mitigation Measures	In April 2015, BOAC adopted a Ground Support Equipment (GSE) Emissions Reduction Policy to reduce emissions from GSE. This requirement is in effect at LAX.
LAX-AQ-4 Operations-Related Control Measures		
LAX-AQ-4f	Available and sufficient infrastructure for alternative fueled vehicles and equipment	LAWA has a private liquefied natural gas (LNG)/compressed natural gas (CNG) facility located on the west side of the airport property for LAWA vehicles, and Clean Energy operates three public CNG fueling stations near LAX at 10400 Aviation Blvd, 9601 Aviation Boulevard, and 9131 Aviation Boulevard. In 2017, LAWA had 102 level 2 electric vehicle chargers at LAX, including 89 for public use. LAWA is currently developing a plan to provide additional electric vehicle chargers at LAX.
BIOTIC COMMUNITIES		
MM-BC-1	Conservation of State-Designated Sensitive Habitat Within and Adjacent to the El Segundo Blue Butterfly Habitat Restoration Area Restoration ***Restoration***	LAWA continues to maintain and manage the El Segundo Blue Butterfly (ESBB) Habitat Restoration Area, including restoration, monitoring, and public awareness. LAWA's Maintenance Services Division (MSD) - Landscaping crew removed windblown trash, invasive plant species, and applied permitted herbicide throughout the Dunes and along the fence perimeter during 2017. These activities allow for the natural spread of native plant species and remove invasive species, such as ice plant, that are choking the resident coast buckwheat.
MM-BC-1	Conservation of State-Designated Sensitive Habitat Within and	LAWA completed 2017 annual monitoring of the ESBB and the coast buckwheat host plant in

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
	Adjacent to the El Segundo Blue Butterfly Habitat Restoration Area Restoration ***Monitoring***	August. The ESBB population at the ESBB Habitat Preserve remained adversely affected despite above-average rainfall during the 2016 to 2017 wet weather season, due to the previous six consecutive years of severe drought. The ESBB populated decreased by 7.5 percent over the 2016 survey results. See Appendix A for the LAX El Segundo Blue Butterfly 2017 Report dated January 26, 2018.
MM-BC-8	Replacement of Habitat Units	During the reporting period, targeted weed abatement in the Coastal Dunes Improvement Project (CDIP) area on the northernmost portion of the Dunes resulted in the removal of invasive plant species in 11.6 acres. In addition, 26 Friends of the LAX Dunes (FOLD) events were held, where a total of 671 volunteers participated in 1,826 hours of weeding activities in targeted areas in the LAX Dunes. The Bay Foundation (TBF) commenced invasive weed management in the northern section of the dunes in late 2017, with a primary focus on the CDIP area.
-ENDANGERED AND THREATENED SPECIES		
MM-ET-1	Riverside Fairy Shrimp Habitat Restoration	LAWA continued to coordinate with USFWS to find a suitable habitat for the Riverside Fairy Shrimp.
MM-ET-4	El Segundo Blue Butterfly Conservation: Habitat Restoration	LAWA continued to maintain Block 23, where 325 coast buckwheat plants were planted in 2011 in clusters of 3 to 5 plants. In 2015, a survey showed a 21 percent survival rate, and 69 plants. This does not meet the requirement for 1.25 acres of coast buckwheat at a long-term density of 130 plants per acre. Although the ESBB were not observed in Block 23 during the 2017 ESBB survey, after six continuous years of drought and an above average rainfall during the 2016 to 2017 wet weather season in Southern California, the ESBB 2017 Flight Monitoring Report indicates that there were 20 mature coast buckwheat, three senescent buckwheat, and one juvenile buckwheat living within block 23. Weather conditions and invasive weed growth have adversely affected the health of the coast buckwheat. Block 23 was targeted by LAWA landscaping maintenance staff for removal of invasive, non-native plants to allow for better

Table 2-2 Summary of General Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		exposure for coast buckwheat growth and seed germination. During 2017, under the guidance of a biologist with Glenn Lukos Associates, LAWA Maintenance Services Division – Landscaping crew worked on manually removing ice plant and Bermuda grass from coast buckwheat plants, where possible, leaving a space of approximately 5 feet around each plant for seed set/natural recruitment and ESBB larvae deposit.
SOLID WASTE		
SW-1	Implement an Enhanced Recycling Program	Plan completed; implementation is ongoing. LAWA completed an enhanced recycling plan in 2011 for LAX. In addition, LAWA complies with Assembly Bill 939. The LAX Procurement Services Division (PSD) promotes resource efficiency with contract language that includes recycling requirements and through direct purchase of products with sustainable attributes and certifications.
LAW ENFORCEMENT		
LE-1	Routine Evaluation of Manpower and Equipment Needs	LAWA's Police Department monitors law enforcement needs on an ongoing basis to adjust law enforcement assignments and services at LAX in light of changes in conditions/circumstances including, but not limited to, passenger activity level changes. The ongoing monitoring and adjustments include officers, administrative staff, and equipment. Operational meetings are conducted regularly, and steps are taken to adjust resources as needed. In addition, the CALM team is responsible for coordinating with LAWAPD to ensure adequate law enforcement services associated with LAX Master Plan construction projects. In 2017, no additional staffing was required at several airfield access posts used by construction vehicles.

Table 2-3 Summary of General Mitigation Measures in the 2017 Monitoring Period Completed Measures		
Mitigation Measure		**Status**
NOISE		
MM-N-5	Conduct Part 161 Study to Make Over-Ocean Procedures Mandatory	The Part 161 Study Process was completed in 2014 when FAA issued a formal rejection of the application. All materials related to this application and study, and all formal communications with LAWA and FAA may be found at: http://www.lawa.org/LAXPart161.aspx?id=7203
LAND USE		
LU-1	Incorporation of City of Los Angeles Ordinance No. 159,526 (Q) Zoning Conditions for LAX Northside into the LAX Northside/Westchester Southside Project	The (Q) Zoning Conditions were incorporated into the updated LAX Specific Plan that was adopted in 2016. The 2016 LAX Specific Plan update for the Northside includes development standards and design guidelines that captured the (Q) Zoning Conditions.
LU-2	Establishment of a Landscape Maintenance Program for Parcels Acquired Due to Airport Expansion	LAWA completed the LAX Street Frontage and Landscape Development Plan (LDP) in March 2005. It addresses landscaping requirements for parcels acquired under the LAX Master Plan. Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the LAX Landside Access Modernization EIR. Any land acquisition associated with those projects is addressed in those documents. There are no ongoing or future Master Plan projects that would require land acquisition. Therefore this measure is considered completed.
LU-4	Neighborhood Compatibility Program	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the LAX Landside Access Modernization Program EIR and the project associated with those programs. There are no remaining Master Plan projects that are located near a boundary; therefore, this measure has been completed.
MM-LU-5	Upgrade and Expand Noise Monitoring Program	On February 4, 2010, CalTrans approved LAWA's Noise Monitoring Plan for LAX, Ontario, and Van Nuys airports that included the upgraded and expanded Aircraft and Noise Monitoring and Management System (ANMMS). The system is fully functional at this time.
AIR QUALITY		
AQ-1	Air Quality Source Apportionment Study	LAWA completed the LAX Air Quality and Source Apportionment Study (AQSAS) in 2013. The study and informational materials can be found on the

Table 2-3 Summary of General Mitigation Measures in the 2017 Monitoring Period Completed Measures		
Mitigation Measure		**Status**
		web page titled, *Final Report and Materials,* at https://www.lawa.org/en/lawa-environment/lax/lax-air-quality-and-source-apportionment-study.
AQ-3	Mobile Health Research Lab	The funding and implementation of the Master Plan commitments, as well as the MMRP mitigation measures, are subject to LAWA's ability to use airport revenue to the extent permissible under federal law and policies, or to develop other state or federal funding sources. On November 23, 2015, LAWA received a letter from the FAA stating that airport revenues may not be used to provide funding for MMRP Commitment AQ-3, Mobile Health Research Lab.
MM-AQ-3: Transportation-Related Mitigation Measure		
MM-AQ-3	Development of New FlyAway Capacity	In calendar year 2016, LAWA completed the transportation-related air quality mitigation measure to develop and construct at least eight additional sites with FlyAway service similar to Van Nuys. The following eight sites similar to Van Nuys service were developed and constructed: • Union Station • Westwood at UCLA • Irvine at Irvine Transportation Center • La Brea/Expo at La Brea Expo Line Station • Hollywood at Hollywood Boulevard/Argyle; relocated to Vine, south of Hollywood Boulevard. • Santa Monica on Main Street, north of Pico Boulevard • Long Beach at Long Beach Boulevard and 1st Street • Orange Line at Victory Boulevard and Woodley Avenue All eight required facilities were in service and operational by 2015. Some locations proved not to be economical, practical, and did not reduce air pollutant emissions due to low ridership despite frequent service and competitive fares.

Table 2-3 Summary of General Mitigation Measures in the 2017 Monitoring Period Completed Measures		
Mitigation Measure		**Status**
MM-AQ-3	Public Outreach Program for FlyAway Service	Outreach programs were provided for the opening of each new terminal, and included advertisements to target audience, signage, bus service advertisements, light rail service advertisements, Google Maps, Apple Maps, MapQuest, and Bing maps inclusion, press releases, dedicated website pages and a dedicated url and phone number (www.LAXFlyAway.org), and other custom marketing efforts. Each of the above emphasized low cost, convenience, and availability of frequent service.
HYDROLOGY AND WATER QUALITY		
HWQ-1	Conceptual Drainage Plan	LAWA completed a Conceptual Drainage Plan which was adopted in conjunction with the SAIP.
HISTORICAL/ARCHITECTURAL AND ARCHAEOLOGICAL/CULTURAL RESOURCES		
MM-HA-4	Discovery	LAWA prepared an Archaeological Treatment Plan (ATP) in June 2005. In addition to fulfilling the requirements of MM-HA-4, the ATP incorporates the requirements of LAX Master Plan Mitigation Measures MM-HA-4 through MM-HA-10 and provides details regarding compliance with these measures. Master Plan projects comply with the ATP and thus comply with Mitigation Measure MM-HA-4.
ENDANGERED AND THREATENED SPECIES		
MM-ET-4	El Segundo Blue Butterfly Conservation: Habitat Restoration **LAWA shall coordinate with the USFWS to create educational materials on the El Segundo blue butterfly for integration into LAWA's public outreach program.**	LAWA created an educational, two-sided, tri-fold brochure in 2017 to be used in LAWA's public outreach program.
DESIGN, ART AND ARCHITECTURE APPLICATIONS/AESTHETICS		
DA-2	Update and Integrate Design Plans and Guidelines	The Street Frontage and Landscape Plan was updated in March 2005. The LAX Air Cargo Facilities Development Guidelines were updated in August 2002. These plans include requirements to be incorporated into Master Plan projects. The LAX Northside Design Plan and Development Guidelines (1989) were updated in 2016 and renamed the LAX Northside Design Guidelines and Standards. The LAX Northside Design Guidelines and Standards provide a framework for

Table 2-3
Summary of General Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
		appropriately scaled development that is consistent with airport needs and neighborhood conditions. The design guidelines and standards address issues of urban design, architecture, landscape materials and design, pedestrian infrastructures, and signage. Similarly, LAX Design Guidelines for the Landside Access Modernization Program were developed and adopted in 2017. They are intended to integrate the design of new and existing facilities and to create an improved passenger experience that honors LAX's history and Mid-Century Modern architecture, while providing design guidance for new construction and major renovations as part of the modernization of LAX.
HAZARDOUS MATERIALS		
HM-2	Handling of Contaminated Materials Encountered During Construction	A Hazardous Materials Management Plan was developed and revised in December 2005, and all LAWA contractors were required to comply with its provisions as they apply to the different projects.
WATER		
W-2	Enhance Existing Water Conservation Program	The Street Frontage and Landscape Plan was updated in March 2005 and it includes policies pertaining to the use of reclaimed water in Master Plan-related landscaping and new policies enhancing the ongoing use of water conservation practices at LAX.

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
NOISE		
MM-N-4	Update the Aircraft Noise Abatement Program Elements as applicable to adapt to the future Airfield configuration	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. No runway relocations or reconstructions will be done as part of the Master Plan; therefore this mitigation measure no longer applies.
MM-N-11	Automated People Mover (APM) Noise Assessment and Control	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA refined the alignment of the Automated People Mover (APM). Noise impacts associated with the refined alignment were evaluated in the LAX Landside Access Modernization Program EIR. As stated in that EIR, with implementation of the proposed APM, transit noise impacts would be less than significant at all locations, including at the Courtyard by Marriott and the Four Points Sheraton hotels. Therefore, this mitigation measure no longer applies.
LAND USE		
LU-5	Comply with City of Los Angeles Transportation Element Bicycle Plan	The City of Los Angeles approved the 2010 Bicycle Master Plan (independent of LAWA) in March 2011. The Bicycle Master Plan was subsequently incorporated into the Mobility Plan 2035 and is no longer a stand-alone plan. Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Northside Project and LAX Landside Access Modernization Program were approved. The LAX Northside MMRP incorporates this measure as well as other project-specific measures regarding bicycle facilities. Therefore, compliance with this measure relative to this portion of the airport property will be implemented and monitored in conjunction with the LAX Northside MMRP. Other bicycle enhancements in the Mobility

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
		Plan 2035 are located in the portion of the airport that is being developed in accordance with the LAX Landside Access Modernization Program. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. Therefore, this measure does not apply to the LAX Landside Access Modernization Program facilities.
SURFACE TRANSPORTATION		
ST-2	Non-Peak CTA Deliveries	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Specific Plan Amendment Study (SPAS) was approved. The LAX SPAS facilities replace the facilities that were identified in the LAX Master Plan. Among these changes, SPAS eliminated the terminal reconstruction elements that were identified in the LAX Master Plan. Therefore, this measure is no longer applicable.
ST-7	Adequate GTC, ITC, and APM Design	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. The LAX Landside Access Modernization Program facilities replace the facilities that were identified in the LAX Master Plan, including the Ground Transportation Center (GTC), Intermodal Transportation Facility (ITC), and the LAX Master Plan version of the Automated People Mover (APM). Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. Therefore, this measure does not apply to the LAX Landside Access Modernization Program facilities.
ST-8	Limited Short-Term Lane Closures.	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. The LAX Landside Access Modernization Program

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
		facilities replace the facilities that were identified in the LAX Master Plan, including the LAX Master Plan version of the Century Boulevard/Sepulveda Boulevard interchange, Ground Transportation Center (GTC), Intermodal Transportation Facility (ITC), and the LAX Master Plan version of the Automated People Mover (APM). Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. Therefore, this measure does not apply to the LAX Landside Access Modernization Program facilities.
MM-ST-1	Require CTA Construction Vehicles to Use Designated Lanes	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Specific Plan Amendment Study (SPAS) was approved. SPAS refined the facilities originally contemplated in the LAX Master Plan. The SPAS facilities replace the facilities that were identified in the LAX Master Plan. Among these changes, SPAS eliminated the CTA reconstruction projects that were identified in the LAX Master Plan. Therefore, this measure is no longer applicable.
MM-ST-2	Modify CTA Signage	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Specific Plan Amendment Study (SPAS) was approved. SPAS refined the facilities originally contemplated in the LAX Master Plan. The SPAS facilities replace the facilities that were identified in the LAX Master Plan. Among these changes, SPAS eliminated the CTA reconstruction projects that were identified in the LAX Master Plan. Therefore, this measure is no longer applicable.
MM-ST-3	Develop Designated Shuttle Stops for Labor Buses and ITC-CTA Buses	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. The LAX Landside Access Modernization Program facilities replace the facilities that were identified in the LAX Master Plan, including the Ground Transportation Center (GTC),

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
		Intermodal Transportation Facility (ITC), and the LAX Master Plan version of the Automated People Mover (APM). Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. Therefore, this measure does not apply to the LAX Landside Access Modernization Program facilities and MM-ST-3 is no longer applicable.
ST-20	Stockpile Locations	With respect to the Master Plan facilities located in the eastern portion of the airport, subsequent to the adoption of the LAX Master Plan MMRP, LAWA modified the location and nature of the facilities to be constructed within the eastern portion of the airport. Transportation impacts associated with the refined facilities were evaluated in the LAX Landside Access Modernization Program EIR and mitigation measures pertaining to transportation impacts are included in that project's MMRP, therefore this measure no longer applies.
ST-21	Construction Employee Parking Locations	This measure applies to the Master Plan facilities located in the eastern portion of the airport, and is no longer applicable. Subsequent to the adoption of the LAX Master Plan MMRP, LAWA modified the location and nature of the facilities to be constructed within the eastern portion of the airport. Transportation impacts associated with the refined facilities were evaluated in the LAX Landside Access Modernization Program EIR and mitigation measures pertaining to transportation impacts are included in that project's MMRP.
ST-23	Expanded LAX Gateway Improvements/Greening of Impacted Communities	On November 23, 2015, LAWA received a letter from the FAA stating that airport revenues may not be used to provide funding for LAX Master Plan Commitment ST-23.
ST-24	Fair Share Contribution to Congestion Management Plan (CMP)	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. There

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
	Improvements	will be no "substantial completion of the LAX Master Plan" and, therefore, this fare-share contribution no longer applies. It should be noted that the LAX Landside Access Modernization Program MMRP includes measures pertaining to fair-share contributions.
MM-ST-6	Add New Traffic Lanes	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the project and identified applicable mitigation measures for traffic, including the addition of traffic lanes and other improvements to various intersections. These mitigation measures replace MM-ST-6. Therefore, MM-ST-6 is no longer applicable.
MM-ST-7	Restripe Existing Facilities	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the respective projects and identified applicable mitigation measures for traffic, including restriping existing traffic lanes at various intersections. These mitigation measures replace MM-ST-7. Therefore, MM-ST-7 is no longer applicable.
MM-ST-8	Add ATSAC, ATCS or Equivalent	Per the LAX Master Plan traffic mitigation program, no action was required in 2017. Subsequent to the adoption of the LAX Master

Table 2-4 Summary of General Mitigation Measures in the 2017 Monitoring Period Measures that are No Longer Applicable		
Mitigation Measure		**Status**
		Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the respective projects and identified applicable mitigation measures for traffic, including the upgrading the traffic signal control equipment at select intersections. These mitigation measures replace MM-ST-8. Therefore, MM-ST-8 is no longer applicable.
MM-ST-10	Modify Signal Phasing	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the respective projects and identified applicable mitigation measures for traffic, including modifying signal phasing at select intersections. These mitigation measures replace MM-ST-10. Therefore, MM-ST-10 is no longer applicable.
MM-ST-12	Provide New Ramps Connecting I-105 to LAX Between Aviation Boulevard and La Cienega Boulevard	LAWA amended the LAX Specific Plan in 2013. The amended Specific Plan removed the Intermodal Transportation Center (ITC) and the Ground Transportation Center (GTC). Therefore, this measure no longer applies to the LAX Master Plan or individual Master Plan projects.
MM-ST-13	Create a New Interchange at I-405 and	Subsequent to the adoption of the LAX Master Plan MMRP, the Landside Access

Table 2-4 Summary of General Mitigation Measures in the 2017 Monitoring Period Measures that are No Longer Applicable		
Mitigation Measure		**Status**
	Lennox Boulevard	Modernization Program was approved. A new interchange at I-405 and Lennox Boulevard is not included in LAX Landside Access Modernization Program; therefore, Mitigation MM-ST-13 is no longer applicable.
MM-ST-15	Provide Fair-Share Contributions to Transit Improvements	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the respective projects and identified applicable mitigation measures for traffic, including fair-share contributions to transit improvements. These mitigation measures replace MM-ST-15. Therefore, MM-ST-15 is no longer applicable.
MM-ST-16	Provide Fair-Share Contribution to LA County's project to extend the Marina Expressway	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The LAX Landside Access Modernization Program EIR evaluated traffic impacts of the respective projects and identified applicable mitigation measures for traffic. These mitigation measures replace MM-ST-16. Therefore, MM-ST-16 is no longer applicable.
RELOCATION OF RESIDENCES AND BUSINESSES		
RBR-1	Residential and Business Relocation Program	LAWA completed an LAX Master Plan Program, Alternative D Draft Relocation Plan in April 2004 to address proposed acquisition and relocation of properties under Alternative D of

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
		the LAX Master Plan. Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The Alternative D Relocation Plan is no longer applicable, as there are no Master Plan projects remaining that require property acquisition in the Alternative D acquisition area.
MM-RBR-1	Phasing for Business Relocations	See RBR-1, above.
MM-RBR-2	Relocation Opportunities through Aircraft Noise Mitigation Program	See RBR-1, above. In addition, the ANAP only applies to residential properties, while the Alternative D Relocation Plan only applies to business properties. The Alternative D relocation area does not include properties in the City of Inglewood or Los Angeles County.
HYDROLOGY AND WATER QUALITY		
MM-HWQ-1	Update Regional Drainage Facilities	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. LAWA has never been responsible for implementing this mitigation measure, but evaluated the post-construction drainage conditions for ongoing and future projects to determine if regional drainage facilities should be upgraded. There are no remaining Master Plan projects to evaluate; therefore, this measure is no longer applicable.

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
HISTORICAL/ARCHITECTURAL AND ARCHAEOLOGICAL/CULTURAL RESOURCES		
HR-1	HR-1 Preservation of Historic Resources	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. There are no remaining Master Plan projects that would impact Historic Resources; therefore this component of the measure is no longer applicable.
MM-HA-1	MM-HA-1 Historic American Buildings Survey (HABS) Document	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. As the ITC and GTC no longer are going to be implemented as part of the Master Plan, the International Airport Industrial District no longer will be affected by the remaining Master Plan projects. Therefore, this mitigation is no longer applicable.
MM-HA-2	Historic Educational Materials	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
		considered a stand-alone project subject to separate environmental review. As the ITC and GTC no longer are going to be implemented as part of the Master Plan, no historic resources will be affected by the remaining Master Plan projects. Therefore, this mitigation is no longer applicable.
BIOTIC COMMUNITIES		
MM-BC-2	Conservation of Floral Resources: Lewis' Evening Primrose	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. The north runway will not be relocated, and there are no remaining Master Plan projects that would impact Lewis' Evening Primrose, therefore this measure is no longer applicable.
SOLID WASTE		
MM-SW-1	Provide Landfill Capacity	LAWA has no jurisdiction regarding this mitigation measure which must be implemented by state, county, and local solid waste planning authorities.
DESIGN, ART AND ARCHITECTURE APPLICATIONS/AESTHETICS		
DA-1	Provide and Maintain Airport Buffer Areas	Subsequent to the adoption of the LAX Master Plan MMRP, LAWA approved both the LAX Northside EIR and the Landside Acquisition Modernization Program EIR and the projects associated with those programs. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. There are no remaining Master Plan projects that are located near an airport boundary area; therefore, this measure is no longer applicable.

Table 2-4
Summary of General Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
DA-3	Undergrounding of Utility Lines	Subsequent to the adoption of the LAX Master Plan MMRP, the LAX Landside Access Modernization Program was approved. This project refined the facilities originally contemplated in the LAX Master Plan. Because the proposed LAX Landside Access Modernization Program is not the same project evaluated in the LAX Master Plan EIS/EIR, the LAX Landside Access Modernization Program project is considered a stand-alone project subject to separate environmental review. Certain LAX Landside Access Modernization Program elements, particularly the Automated People Mover, will require the undergrounding of some existing utility lines; this work will be completed as part of those projects. Therefore, this measure is no longer applicable.
WASTEWATER		
MM-WW-1	Provide Additional Wastewater Treatment Capacity to Accommodate Cumulative Flows	LAWA has no jurisdiction regarding this mitigation measure which will be implemented by the City of Los Angeles Department of Public Works, Bureau of Sanitation.

3 Bradley West Project Mitigation Measures for the Reporting Period

On September 21, 2009, the City of Los Angeles certified the Bradley West Project (BWP) FEIR and approved the project's MMRP. The BWP MMRP dated September 2009, is available online at https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program under LAX Master Plan Documents. The BWP is a component of the LAX Master Plan. As of 2016, LAWA has implemented all major components of the BWP as initially proposed. In 2017, LAWA initiated construction of a component of the BWP known as the Baggage Optimization Project. This project component was evaluated in an Addendum to the BWP EIR, prepared in 2016. The construction staging and laydown area for the Baggage Optimization Project is within the general boundaries of the project site. The construction activities that occurred within the 2017 reporting period included: demolition and removal of the existing apron, and initial grading and excavation.

Following are those LAX Master Plan and project specific mitigation measures that were implemented in 2017 in association with the Baggage Optimization Project. Measures are shown by resource and mitigation measure as presented in the MMRP. The mitigation measures that are still applicable are identified as "no action required at this time" or "ongoing." Also listed below are mitigation measures that were "completed" in this or a prior period, as well as those measures "no longer applicable" as of this period.

Table 3-1
Summary of BWP Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
HISTORICAL/ARCHITECTURAL AND ARCHAEOLOGICAL/CULTURAL RESOURCES		
HR-1	HR-1 Preservation of Historic Resources ***Engage qualified architectural historian or historic architect when Soundproofing in Morningside Park Neighborhood***	The City of Inglewood is responsible for soundproofing the homes in the Morningside Park Neighborhood, and did not soundproof any homes in this neighborhood to activate this measure in 2017.
MM-HA-6	Excavation and Recovery	The construction activities that occurred within the 2017 reporting period did not activate this measure.
MM-HA-8	Archaeological/Cultural Monitor Report	The construction activities that occurred within the 2017 reporting period did not activate this measure.
MM-HA-9	Artifact Curation	The construction activities that occurred within the 2017 reporting period did not activate this measure.

Table 3-1 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Measures for Which No Action is Required at this Time		
Mitigation Measure		**Status**
MM-HA-10	Archaeological Notification	The construction activities that occurred within the 2017 reporting period did not activate this measure.
PALEONTOLOGICAL RESOURCES		
MM-PA-4	Paleontological Resources Collection	Compliance with this measure is accomplished through implementation of MM-PA (BWP)-1. The construction activities that occurred within the 2017 reporting period did not activate this measure.
MM-PA-5	Fossil Preparation	Compliance with this measure is accomplished through implementation of MM-PA (BWP)-1. The construction activities that occurred within the 2017 reporting period did not activate this measure.
MM-PA-6	Fossil Donation	Compliance with this measure is accomplished through implementation of MM-PA (BWP)-1. The construction activities that occurred within the 2017 reporting period did not activate this measure.
MM-PA-7	Paleontological Reporting	Compliance with this measure is accomplished through implementation of MM-PA (BWP)-1. The construction activities that occurred within the 2017 reporting period did not activate this measure.
LIGHT EMISSIONS		
LI-2	Use of Non-Glare Generating Building Materials	Selection of exterior finish materials had not yet begun in the 2017 reporting period.
LI-3	Lighting Controls	Design of the exterior lighting system had not yet begun in the 2017 reporting period.

Table 3-2 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
AIR QUALITY		
MM-AQ-2: Construction-Related Mitigation Measures		
MM-AQ-2.1	Fugitive Dust Source Controls	The contractor implemented measures to minimize fugitive dust in compliance with mitigation requirements and with SCAQMD Rule 403, including regular watering of construction areas, watering or covering of soil stockpiles, street sweeping of roadways and exits, use of track out plates, and covers for trash and haul trucks.
MM-AQ-2.2	On-Road Mobile Source Controls	Regular shift times were scheduled to avoid peak periods. Lunch trucks periodically visited sites near the construction activity areas, as well as the construction site office.
MM-AQ-2.3	Nonroad Mobile Source Controls	Construction vehicles were parked in areas away from sensitive receptors and employees were shuttled from a construction employee parking lot to the work site by bus, which served to reduce employee vehicle emissions. Vehicle operators were instructed that no vehicle idling is permitting in excess of 5 minutes during periods of non-active vehicle use; no written violations pertaining to excessive equipment idling occurred. An on-site rock crushing facility was used during the reporting period.
MM-AQ-2.4	Stationary Point Source Controls	Project-related construction trailers use grid power.
MM-AQ-2.5	Mobile and Stationary Source Controls	Prior to mobilization, construction contractors were required to submit documentation for each piece of diesel equipment to be utilized or planned for possible utilization on the project relative to compatibility with Best Available Emissions Control Devices. Mitigation monitors developed and implemented a monitoring process to track each piece of equipment and document compliance. Ultra-low sulfur diesel (ULSD) fuel was the only fuel commercially available, and was used in construction equipment. In addition, mitigation monitors reviewed maintenance plans for construction equipment.
MM-AQ-2.6	Administrative Controls	Contractor personnel, LAWA inspectors and mitigation monitors are responsible for ensuring implementation of all components of the construction-related measure. Monitoring includes direct inspections, reviews of monthly reports, and investigation of complaints.

Table 3-2 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
SURFACE TRANSPORTATION		
ST-9	Construction Deliveries	No lane closures were required for construction deliveries in 2017.
ST-12	Designated Truck Delivery Hours	Truck deliveries are strictly enforced by LAWA inspectors and mitigation monitors. Truck waivers were not requested during 2017.
ST-17	Maintenance of Haul Routes	Off-airport roadways did not require maintenance by construction contractors during 2017.
ST-18	Construction Traffic Management Plan	Plan completed, implementation ongoing. LAWA reviewed BWP construction traffic plans in conjunction with the MSC Traffic Management Plan.
MM-ST (BWP)-6	Modify the Intersection of Imperial Highway and Sepulveda Boulevard (Intersection #71)	As the intersection is within Caltrans' jurisdiction, Caltrans must approve the design plans prior to construction. Caltrans reviewed the engineering plans prepared by LAWA's consultant, T.Y. Lin International. A follow-up meeting was scheduled to take place with Caltrans in 2018.
MM-ST (BWP)-7	Modify the Intersection of La Cienega Boulevard and I-405 Ramps N/O Century Boulevard (Intersection #96)	LAWA proposed to LADOT and Caltrans to substitute the widening of southbound La Cienega Boulevard for the widening of the southbound off-ramp from the I-405 Freeway at La Cienega Boulevard. This refined improvement will mitigate the impact at this intersection.
MM-ST (BWP)-8	Modify the Intersection of La Tijera Boulevard and Sepulveda Boulevard (Intersection #101)	In 2014, it was requested that LAWA postpone implementation of this traffic mitigation and instead monitor the level of service at this intersection and report back to Los Angeles Department of Transportation (LADOT) for a determination as to when the traffic mitigation should be implemented. In 2017, there were approximately 15.5 million annual international passengers at TBIT. A traffic analysis conducted using August 2017 traffic volumes revealed that this intersection is operating at Level of Service B during the AM, mid-day and PM peak hours, which is better than the Level of Service D which was projected to occur during these peak hours when TBIT reached 18.7 million annual international passengers. This information was sent via e-mail to LADOT on December 14, 2017. An updated analysis is scheduled to be performed in August 2018.
MM-ST	Modify the Intersection of Sepulveda	In 2014, LADOT changed the signal phasing and

Table 3-2 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
(BWP)-9	Boulevard and 76th/77th Street (Intersection #136) 2	installed a crosswalk on the north leg of the intersection, which resulted in a conflict with the proposed mitigation measure. In an e-mail on May 18, 2016, LADOT staff informed LAWA that the implementation of closed circuit television cameras (CCTV) and other upgrades such as controllers, cabinets and loops could be used as an alternative mitigation and would not conflict with the phasing change that LADOT implemented. In 2017, LAWA consultants began designing the installation of CCTV cameras along the Sepulveda Boulevard corridor between 76th/77th Street and Imperial Highway.
HISTORICAL/ARCHITECTURAL AND ARCHAEOLOGICAL/CULTURAL RESOURCES		
MM-HA-5	Monitoring	Compliance with this measure is accomplished through implementation of MM-HA (BWP)-1.
MM-HA (BWP)-1	Conformance with LAX Master Plan Archeological Treatment Plan	In conjunction with the MSC construction, an archeological/paleontological monitor was retained. Ongoing monitoring of grading occurred in 2017 with no resources found. Archeological resource monitoring will continue during the excavation phase.
PALEONTOLOGICAL RESOURCES		
MM-PA-2	Paleontological Authorization	Compliance with this measure is accomplished through implementation of MM-PA (BWP)-1.
MM-PA (BWP)-1	Conformance with LAX Master Plan Paleontological Management Treatment Plan	In conjunction with the MSC construction, an archeological/paleontological monitor was retained. Ongoing monitoring of grading occurred in 2017 with no resources found. Paleontological resource monitoring will continue during the excavation phase.

Table 3-3 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Completed Measures		
Mitigation Measure		**Status**
SURFACE TRANSPORTATION		
MM-ST (BWP)-1	Trip Reduction Measures	In 2017, LAWA operated FlyAway service between LAX and the following locations: • Van Nuys • Union Station • Westwood • Hollywood • Long Beach • Orange Line Busway station at Woodley Avenue in the San Fernando Valley. Marketing included the manufacturing, printing and distribution of FlyAway brochures, and information published on LAWA's website and on LAWA's Twitter and Facebook feeds. The FlyAway network has also been included in Google Transit since 2012. Google Transit provides route, location, fare, and schedule information for the FlyAway network as well as connecting transit service information from Santa Monica Big Blue Bus, Metro, and other participating agencies. In January 2017, LAWA implemented mandatory single level busing for private parking shuttles on the upper level roadway of the CTA and for hotel shuttles on the lower level of the CTA to reduce the number of shuttle trips on airport roadways. In Summer 2017, LAWA initiated a voluntary single level busing program for rental car shuttles on the lower level. See MM-AQ-3 in Table 2-3 for more information.
MM-ST (BWP)-2	Improve the Intersection of Center Way and World Way South	This project was completed in the third quarter of 2015.
MM-ST (BWP)-3	Widen World Way Across from TBIT	This improvement was completed in June 2013 as part of the Central Utility Plant upgrade.
MM-ST (BWP)-4	Modify the Intersection of Airport Boulevard and Manchester Avenue (Intersection #9)	In 2014, this intersection improvement was completed as part of another project unrelated to the airport.
MM-ST (BWP)-10	Modify the Intersection of Imperial Highway and Main Street (Intersection #68)	LAWA completed this project on February 14, 2012.
MM-ST (BWP)-11	Modify the Intersection of Imperial Highway and Pershing Drive (Intersection #69)	LAWA completed this project on February 14, 2012.

Table 3-3 Summary of BWP Mitigation Measures in the 2017 Monitoring Period Completed Measures		
Mitigation Measure		**Status**
MM-ST (BWP)-12	Distribution of Contractor Employee Parking between the Northwest Construction Staging/Parking Area and the East Contractor Employee Parking Area or Southeast Construction Staging/Parking Area	Completed.
ST-14	Construction Employee Shift Hours	This measure was completed in association with the Construction Traffic Management Plan reviewed and approved for the project.
ST-16	Designated Haul Routes	This measure was completed with the initial approval of haul routes.
ST-19	Closure Restrictions of Existing Roadways	Completed.
ST-22	Designated Truck Routes	This measure was completed with the initial approval of truck routes.
HISTORICAL/ARCHITECTURAL AND ARCHAEOLOGICAL/CULTURAL RESOURCES		
MM-HA-7	Administration	This measure was completed upon approval of excavation and grading plans and prior to initiation of excavation and grading activities.
PALEONTOLOGICAL RESOURCES		
MM-PA-1	Paleontological Qualification and Treatment Plan	The Paleontological Management Treatment Plan (PMTP) was prepared and revised in December 2005. In addition to fulfilling the requirements of MM-PA-1, the PMTP incorporates the requirements of LAX Master Plan Mitigation Measures MM-PA-2 through MM-PA-7 and provides details regarding compliance with these measures. Master Plan projects comply with the PMTP and thus comply with Mitigation Measure MM-PA-1.
MM-PA-3	Paleontological Monitoring Specifications	This measure (as implemented through MM-PA (BWP)-1) was completed upon approval of construction contract.
MM-PA (BWP)-2	Construction Personnel Briefing	Completed.
BIOTIC COMMUNITIES		
MM-BC (BWP)-1	Conservation of Floral Resources: Southern Tarplant	This mitigation was completed in 2015, when the number of tarplants successfully achieved the success criteria of 329 germinating, flowering, or senesced individuals required for Year 5.
MM-BC (BWP)-2	Conservation of Floral Resources: Lewis' Evening Primrose	Prior to the implementation of construction staging, laydown, and parking areas associated with the Bradley West Project, LAWA conducted focused plant surveys in November 2008 for the Lewis' evening-primrose (Camissonia lewisii) and California spineflower (Mucronea californica). Neither species was observed during the

Table 3-3
Summary of BWP Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
		focused surveys. No additional mitigation is required.
MM-BC (BWP)-3	Conservation of Floral Resources: California Spineflower	See status of MM-BC (BWP)-2 above.
MM-BC (BWP)-4	Conservation of Faunal Resources: Burrowing Owl	Prior to the implementation of construction staging, laydown, and parking areas associated with the Bradley West Project, LAWA conducted focused surveys in June 2009 for the western burrowing owl (Athene cunicularia hypugea). The burrowing owl was not observed during the spring surveys. However, based on previous reports of burrowing owl within the western portion of LAX, it was recommended that monthly surveys be conducted between September and January 2009. These surveys were undertaken by the LAX USDA wildlife biologist under contract to LAWA. No burrowing owls were observed during these monthly surveys. No additional mitigation is required.
MM-BC (BWP)-5	Conservation of Faunal Resources: Loggerhead Shrike	Vegetation that was required to be removed to develop construction staging and parking areas associated with the Bradley West Project was removed in 2010 prior to the nesting season for the loggerhead shrike.
MM-BC (BWP)-6	Conservation of Faunal Resources: San Diego Black-Tailed Jackrabbit	Prior to clearing operations associated with development of construction staging and parking areas for the Bradley West Project, surveys for the presence of black-tailed jackrabbits were conducted by the LAX USDA wildlife biologist from September 2009 through February 2010 under contract to LAWA. No black-tailed jackrabbits were observed. No additional mitigation is required.
MM-BC (BWP)-7	Conservation of Floral Resources: Mature Tree Replacement	In conjunction with the implementation of the Bradley West Project's Northwest Construction Staging Area, LAWA entered into letters of agreement with TreePeople, a non-profit environmental organization, and funds were provided to plant 66 native mature trees at Westchester Park and 64 trees at Morningside High School and the adjacent, student-run Empowerment Community Garden. The mature tree plantings were initiated in 2010 and were completed by June 2012. As of June 2012, 67 trees had been planted at Westchester Park as part of the TreePeople project, 66 of which are associated with Mitigation Measure MM-BC (BWP)-7. The Morningside High School/Empowerment Community Garden project was expanded to encompass a large-scale greening plan in the City of Inglewood, in conjunction with the non-profit Social Justice Learning Institute. In addition

Table 3-3
Summary of BWP Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
		to the 41 trees that had been planted in in 2011, TreePeople and community volunteers planted 32 trees at Vincent Park in Inglewood. As of June 2012, 73 trees had been planted as part of the TreePeople project in Inglewood, 64 of which are associated with Mitigation Measure MM-BC (BWP)-7.
MM-BC (BWP)-8	Conservation of Faunal Resources: Nesting Birds/Raptors	Prior to the removal of trees associated with implementation of the North Construction Staging Area for the Bradley West Project, LAWA conducted surveys for nesting raptors in April 2010. No birds exhibiting breeding behavior or active nests were observed during the survey. Moreover, according to the LAX USDA wildlife biologist, the West Construction Staging Area does not contain suitable habitat for raptors to nest and no nesting raptors have been observed in this area in the past 8 years. As a result, surveys for nesting raptors were not conducted for this construction staging area prior to the removal of vegetation. No additional mitigation is required.
ENDANGERED AND THREATENED SPECIES		
MM-ET (BWP)-1	Mitigation for Riverside Fairy Shrimp	Prior to the implementation of the Southeast Construction Staging/Parking Area associated with the Bradley West Project, two wet season surveys and one focused dry season survey for Riverside fairy shrimp (Streptocephalus woottoni) were conducted in 2009 and 2010 in accordance with USFWS protocol guidelines. No Riverside fairy shrimp were observed within the survey area.
ENERGY SUPPLY		
E-1	Energy Conservation and Efficiency Program	The design of the BWP Baggage Optimization Project incorporates the energy efficiency requirements of the Los Angeles Green Building Code, which, in addition to compliance with Title 24 standards, serve to support the energy efficiency of the project.
E-2	Coordination with Utility Providers	Utility design for the BWP Baggage Optimization Project (included coordination with affected utility providers including, but not limited to, LADWP and was conducted in conjunction with the MSC project.
PU-1	Develop a Utility Relocation Program	Design and construction plans formulated for the Baggage Optimization Project included preparation of utility relocation plans.
SOLID WASTE		
SW-2	Requirements for the Use of Recycled Materials During Construction	Contractor bid documents specify requirements pertaining to recycled materials.
SW-3	Requirements for the Recycling of Construction and Demolition	Contractor bid documents specify requirements pertaining to recycled construction and demolition waste materials.

Table 3-3
Summary of BWP Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
	Waste	
CONSTRUCTION IMPACTS		
C-1	Establishment of a Ground Transportation/Construction Coordination Office	In 2017, the CALM team and LAWA monitors worked with the BWP Baggage Optimization Project staff and contractors to coordinate construction traffic related to the demolition of apron and grading activities during the reporting period. Such activities were successfully coordinated with the CALM team and there were no notable BWP-related construction traffic problems, nor were there any detours required during the 2017 reporting period.
C-2	Construction Personnel Airport Orientation	Pre-construction meetings were held for the BWP Project in 2015, for the early enabling projects, to make contractors aware of parking areas, construction staging areas, and construction policies. The information and requirements from those meetings were carried into the 2017 construction activities.
DESIGN, ART AND ARCHITECTURE APPLICATIONS/AESTHETICS		
MM-DA-1	Construction Fencing	Completed.
HAZARDOUS MATERIALS		
HM-2	Handling of Contaminated Materials Encountered During Construction	Completed.
WATER USE		
W-1	Maximize Use of Reclaimed Water	Completed.
FIRE PROTECTION		
FP-1	LAFD Design Recommendations	Completed.
PS-2	Fire and Police Facility Space and Siting Requirements	Completed.
LAW ENFORCEMENT		
LE-2	Plan Review	Completed.

Table 3-4
Summary of BWP Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
NOISE		
MM-N-7	Construction Noise Control Plan	The BWP Baggage Optimization Project does not require construction within 600 feet of any noise-sensitive uses. Therefore, a construction noise control plan is not required for this project component.
MM-N-8	Construction Staging	Construction staging for the Baggage Optimization Project occurs on-site, which is near the middle of the airport, well-away from any noise-sensitive uses.
MM-N-9	Equipment Replacement	The construction site is not within 600 feet of any noise-sensitive uses.
MM-N-10	Construction Scheduling	The construction site is not within 600 feet of any noise-sensitive uses.
SURFACE TRANSPORTATION		
MM-ST (BWP)-5	Modify the Intersection of Arbor Vitae Street and Aviation Boulevard (Intersection of Imperial Highway and Sepulveda Boulevard (Intersection #71)	Subsequent to the adoption of the LAX Master Plan MMRP, the Landside Access Modernization Program was approved. A revised intersection improvement at Arbor Vitae Street and Aviation Boulevard is proposed as part of the LAX Landside Access Modernization Program. The improvement proposed in MM-ST (BWP)-5 will be included in the LAX Landside Access Modernization Program improvement at this intersection. This revised improvement will be designed and constructed as part of the LAX Landside Access Modernization Program. This LAX Landside Access Modernization Program mitigation measure replaces MM-ST (BWP)-5. Therefore, MM-ST (BWP)-5 is no longer applicable.
FIRE PROTECTION		
PS-1	Fire and Police Facility Relocation Plan	Completed.

4 West Aircraft Maintenance Area Mitigation Measures for the Reporting Period

On March 18, 2014, the FEIR for the LAX West Aircraft Maintenance Area (WAMA) was certified and the MMRP was approved. The WAMA MMRP dated February 2014, is available online at https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program under LAX Master Plan Documents. The WAMA Project includes the development of approximately 84 acres in the southwestern portion of the airfield, including development of approximately 68 acres of the 84 acres with taxiways and aircraft parking apron areas, maintenance hangars, employee parking, service roads, and ancillary facilities. The first part of the WAMA project, including the Qantas Hangar and the aircraft parking area, service road and taxiway, was completed in 2016. In 2017, the construction of a second hangar for Delta Air Lines – referred to as the "Delta Hangar" – was started. Development of the Delta Hangar in the 2017 reporting period involved raising the base elevation of the site, which required the import of fill material; no notable excavation down into the soils of the site was needed.

Following are those LAX Master Plan and project specific mitigation measures that were implemented in 2017 in association with the Delta Hangar. Measures are shown by resource and mitigation measure as presented in the MMRP. The mitigation measures that are still applicable are identified as "ongoing." Also listed below are mitigation measures that were "completed" in this or prior reporting periods, as well as those measures "no longer applicable" as of this period.

Table 4-1
Summary of WAMA Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
AIR QUALITY		
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1d	Cover or treat all ground surfaces prior to final occupancy	Previously completed components of the project have all been paved. The remainder of the project site was unpaved and under active construction during the reporting period.
LAX-AQ-1e	Complete paved surfaces as soon as possible	The project site was under active construction during the reporting period.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2h	Suspend use of construction equipment during second state smog alert	Not applicable during the 2017 reporting period.

Table 4-1
Summary of WAMA Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
LAX-AQ-4: Operations-Related Control Measures		
LAX-AQ-4a	GSE Conversion	Previously completed components of the project are required to comply with LAWA's Ground Support Equipment (GSE) Emissions Reduction Policy. GSE associated with the Delta Air Lines hangar currently under construction will comply with this policy.
LAX-AQ-4f	Available and sufficient infrastructure for alternative fueled vehicles and equipment	Sufficient infrastructure for alternative fueled vehicles and equipment associated with previously completed components of the project is available. Infrastructure will be provided in association with the Delta Air Lines hangar currently under construction.

Table 4-2 Summary of WAMA Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
AIR QUALITY		
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1a	Water twice daily	The contractor implemented measures to minimize fugitive dust in compliance with mitigation requirements and with SCAQMD Rule 403, including regular watering of construction areas at least three times a day.
LAX-AQ-1b	Ultra-low sulfur diesel in construction equipment	Only ultra-low sulfur diesel (ULSD) fuel was used in construction equipment, as this is the only fuel commercially available.
LAX-AQ-1f	Prohibit idling or queuing of diesel-fueled vehicles in excess of 5 minutes	Vehicle operators were instructed that no vehicle idling is permitting in excess of 5 minutes during periods of non-active vehicle use; no written violations pertaining to excessive equipment idling occurred.
LAX-AQ-1g	Maintain on-site construction equipment	LAWA mitigation monitoring staff did not observe any onsite equipment that appeared to be malfunctioning; all equipment appeared to be properly maintained.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2a	Outfit construction diesel-fueled equipment with the best available emission control devices	The MMRP requirement for the WAMA project requires off-road equipment to have Tier 3 engines and on-road haul trucks with a GVWR of at least 19,500 pounds to be 2007 or newer. The vast majority of equipment and trucks used in 2017 were Tier 4 and 2010 or newer, respectively, which, by design, incorporated best available emissions control devices that serve to minimize PM and NOx emissions. No on-road trucks older than 2007 were utilized in 2017.
LAX-AQ-2b	Water three times daily	Watering of construction areas occurred at least three times a day.
LAX-AQ-2d	Have construction employees work/commute during the off-peak hours to the extent feasible	Standard construction shift hours did not coincide with the heaviest commuter traffic periods during the 2017 reporting period – workers typically arrived before 7:00 am and departed by approximately 3:30 pm.
LAX-AQ-2e	Make on-site lunch trucks available during construction	Lunch trucks visited a nearby location on the northeast corner of World Way West and Maintenance Road on a regular basis.
LAX-AQ-2g	Provide electricity from power poles and portable generators using clean-burning diesel	Project-related construction trailers use grid power.
LAX-AQ-2i	Use construction equipment having the minimum practical	Utilization of construction equipment having the minimum practical engine size (i.e., lowest

Table 4-2 Summary of WAMA Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
	engine size	appropriate horsepower rating for intended job) is a requirement included in the lease with Delta Air Lines. There were no written violations in 2017.
LAX-AQ-2j	Prohibit construction equipment engine tampering	Prohibition of tampering with construction equipment to increase horsepower or to defeat emission control devices is a requirement included in the lease with Delta Air Lines. There were no written violations in 2017.
LAX-AQ-2k	Designate a person(s) to ensure implementation of construction-related measures	A number of people are responsible for ensuring implementation of all components of the construction-related measure, including contractor personnel, LAWA inspectors and mitigation monitors. Monitoring includes direct inspections, reviews of monthly reports, and investigation of complaints.
LAX-AQ-2m	Provide infrastructure for alternative-fueled vehicles	Sweepers are fueled by alternative fuels (compressed natural gas). In addition, many staff vehicles and some construction contractor vehicles are alternative-fueled vehicles. There is sufficient infrastructure available in the local area to provide fuel to these alternatively-fueled vehicles.
LAX-AQ-2n	Off-road trucks with a gross vehicle weight rating of at least 19,500 pounds shall comply with USEPA 2007 on-road emission standards	All construction equipment is subject to review and approval by LAWA monitors prior to being allowed to operate at the airport. All on-road trucks with a gross vehicle weight rating of at least 19,500 pounds comply with USEPA 201 on-road emission standards for PM10 and NOx.
LAX-AQ-4: Operations-Related Control Measures		
LAX-AQ-4e	Conversion of sweepers to alternative fuels or electric power and roadway maintenance	LAWA provides sweepers for the access taxilane at the WAMA construction site. LAWA's 1999 Alternative Fuels Vehicle program for LAWA owned and operated vehicles includes the replacement of existing fossil fuel powered vehicles and equipment with alternative fuel vehicles (AFVs) whenever possible during the scheduled vehicle and equipment replacement program. In addition, the LAX Alternative Fuel Vehicle Requirement, updated in 2017 to reflect new clean vehicle technologies, requires on-road vehicles weighing 8,500 lbs. gross vehicle weight rating or more and used in operations at LAX to be alternative fuel or clean vehicles as defined in

Table 4-2 Summary of WAMA Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		the AFV Requirement. Also see LAX-AQ-4a regarding the LAX GSE Emissions Reduction Policy. These programs apply to sweepers used at WAMA.
MM-AQ (WAMA)-1	On-Road Trucks	The Delta Hangar component of the WAMA project did not require new/additional diesel construction equipment in 2017 that was not reviewed/cleared in prior years.
HAZARDS AND HAZARDOUS MATERIALS		
MM-HAZ (WAMA)-1	Abandoned/Plugged Oil Wells	During construction of the Delta Hangar, an old abandoned oil well was encountered, which is being re-abandoned in compliance with state and local regulations.
CONSTRUCTION		
C-1	Establishment of a Ground Transportation/Construction Coordination Office	In 2017, the CALM team and LAWA monitors worked with the Delta Hangar project staff and contractors to coordinate deliveries, monitor traffic conditions, and monitor and enforce delivery times and routes. There were no detours required for the Delta Hangar component of the WAMA project during the 2017 reporting period.
SURFACE TRANSPORTATION		
ST-9	Construction Deliveries	No lane closures were required for construction deliveries in 2017.
ST-12	Designated Truck Delivery Hours	Truck deliveries are strictly enforced by LAWA inspectors and mitigation monitors. No truck waivers were requested during 2017.
ST-14	Construction Employee Shift Hours	Construction employee shift hours were approved by LAWA at the initiation of construction. LAWA inspectors and construction monitors monitored shift hours during the reporting period.
ST-16	Designated Haul Routes	Haul routes were designated at the initiation of project construction. LAWA inspectors and construction monitors monitored construction traffic, including haul routes, during the reporting period.
ST-17	Maintenance of Haul Routes	Off-airport roadways required no maintenance by construction contractors during 2017.
ST-18	Construction Traffic Management Plan	Prior to the initiation of demolition, the contractor developed a Construction Traffic Management Plan, which LAWA reviewed. LAWA inspectors and construction monitors monitored construction traffic, including haul routes, delivery hours, construction employee

Table 4-2 Summary of WAMA Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		shift hours, construction employee parking locations, and other considerations. Construction employees working on the Delta Hangar component parked on-site.
ST-22	Designated Truck Routes	Truck routes were designated at the initiation of project construction. LAWA inspectors and construction monitors monitored construction traffic, including truck routes, during the reporting period.
PROJECT DESIGN FEATURES		
WAMA-PDF-1	Quarterly Reporting	LAWA leased the WAMA aircraft parking area in front of the blast fence to Delta airlines in May 2017. LAWA requires Delta to comply with all WAMA restrictions and to record all aircraft engine run ups at the blast fence. All other airlines must request the use of the blast fence through LAWA Airport Operations. Airport Operations recorded all requests for use of the blast fence by airlines other than Delta.
WAMA-PDF-1	Develop a Tiered Penalty Program	During 2017, LAWA developed a proposed penalty program for noise violations that must be approved by BOAC and adopted as a City Ordinance. In 2017, there were no violations of the curfew and, therefore, there was no need for enforcement.
WAMA-PDF-2	APU Usage While Aircraft is Parked	LAWA's Airfield Operations monitored aircraft parked at the WAMA site in 2017 to determine if on-board auxiliary power units were used. No violations were noted.
WAMA-PDF-3	Aircraft Taxiing	LAWA's Airfield Operations monitored aircraft traveling to or from WAMA during nighttime hours in 2017 to ensure aircraft were not taxiing under their own power without approval by LAWA. No violations were noted.
WAMA-PDF-4	Aircraft Engine Ground Run-Ups	LAWA's Airfield Operations monitored aircraft engine ground run-ups in 2017. No violations were noted.
WAMA-PDF-5	Use of WAMA Site	LAWA's Airfield Operations monitored aircraft parking spaces at WAMA w in 2017. No violations were noted.
WAMA-PDF-6	Automated Run-Up Monitoring System	LAWA installed a ground run-up monitoring system at WAMA in 2015. Information is accessible via LAWA's website at www.lawa.org/laxwamagru/.
WAMA-PDF-7	Resurfacing a Portion of Imperial Highway	LAWA is contributing up to $3 million for the resurfacing of westbound Imperial Highway

Table 4-2 Summary of WAMA Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		from Douglas Street to Vista del Mar. The City of Los Angeles' Bureau of Street Services is expected to complete the project in 2018.

Table 4-3
Summary of WAMA Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
AIR QUALITY		
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1c	Post of publicly visible sign	A publicly visible dust complaint sign was posted on Pershing Drive at the outset of construction.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2c	Pave Construction Access Roads	The entrance to the construction area is World Way West, which is paved with asphalt.
LAX-AQ-2f	Utilize on-site rock crushing facility	An on-site rock crushing facility was used in the first phase of the project to crush stockpiles located on the project site. The crushed material was used as fill onsite.
LAX-AQ-2l	Locate rock crusher and stockpiles away from residents	The rock-crushing operation and related stockpiles were located in a central portion of the WAMA site during the first phase of the project, away from adjacent residents.
ARCHAEOLOGICAL RESOURCES		
ARCHAEO-1	Untitled	This measure was completed as part of the first phase of WAMA construction when an archaeologist was retained during excavation and grading activities and is not applicable to the current phase of construction.
PALEONTOLOGICAL RESOURCES		
PALEO-1	Conformance with LAX Master Plan Paleontological Management Treatment Plan: (PMTP)	This measure was completed as part of the first phase of WAMA construction when a paleontologist was retained during excavation and grading activities and is not applicable to the current phase of construction.
PALEO-2	Construction Personnel Briefing	This measure was completed as part of the first phase of WAMA construction and is not applicable to the current phase of construction.
HAZARDOUS MATERIALS		
HM-2	Handling of Contaminated Materials Encountered During Construction	Delta Air Lines conducted soil investigations prior to commencement of grading. In addition, Delta contractors complied with LAWA policies regarding the handling of impacted soils encountered during construction.
CONSTRUCTION		
C-2	Construction Personnel Airport Orientation	Pre-construction meetings were held in 2015 for the WAMA project to make contractors aware of parking areas, construction staging areas, and construction policies; the information and requirements from those meetings were carried into the 2017 Delta Hangar construction activities.

Table 4-4
Summary of WAMA Mitigation Measures in the 2017 Monitoring Period
Measures that are No Longer Applicable

Mitigation Measure		Status
HAZARDOUS MATERIALS		
HM-1	Ensure Continued Implementation of Existing Remediation Efforts	No groundwater remediation wells are located on the WAMA project site and no wells were taken offline during construction. As such, Delta Hangar construction activities did not adversely affect continued implementation of existing remediation efforts.
NOISE		
MM-N-7	Construction Noise Control Plan	The Delta Hangar does not require construction within 600 feet of any noise-sensitive uses. Therefore, a construction noise control plan is not required for this project component.
MM-N-8	Construction Staging	The construction site is not within 600 feet of any noise-sensitive uses.
MM-N-9	Equipment Replacement	The construction site is not within 600 feet of any noise-sensitive uses.
MM-N-10	Construction Scheduling	The construction site is not within 600 feet of any noise-sensitive uses.
AIR QUALITY		
LAX-AQ-4: Operations-Related Control Measures		
LAX-AQ-4d	Electric lawn mowers and leaf blowers for WAMA landscape maintenance	The WAMA site only has drought tolerant landscaping in one limited area and there is no turf that requires mowing or maintenance. Therefore, this component of Measure LAX-AQ-4 is no longer applicable.

5 Midfield Satellite Concourse North Project Mitigation Measures for Reporting Period

On July 21, 2014, the FEIR was certified for the Midfield Satellite Concourse-North (MSC) Project. The MSC MMRP dated June 2014, is available online under LAX Master Plan Documents at https://www.lawa.org/en/lawa-our-lax/studies-and-reports/mitigation-monitoring-reporting-program under LAX Master Plan Documents The MSC Project consists of a 12-gate concourse, aircraft parking aprons, taxiways/lanes, utilities and provision for conveyance systems, including a potential automated people mover. In 2017, the main MSC project component being constructed was the North Concourse and Associated Improvements (i.e., Gateway and Far East Tunnel).

Following are those LAX Master Plan and project-specific mitigation measures that were implemented in 2017 in association with the MSC project. Measures are shown by resource and mitigation measure as presented in the MMRP. The mitigation measures that are still applicable are identified as “no action required at this time” or “ongoing.” Also listed below are mitigation measures that were “completed” in this or prior reporting periods, as well as those measures “no longer applicable” as of this period.

Table 5-1
Summary of MSC Mitigation Measures in the 2017 Monitoring Period
Measures for Which No Action is Required at this Time

Mitigation Measure		Status
AIR QUALITY		
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1d	Cover or treat all ground surfaces prior to final occupancy	The project site was unpaved and under active construction during the reporting period.
LAX-AQ-1e	Complete paved surfaces as soon as possible	The project site was under active construction during the reporting period.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2h	Suspend use of construction equipment during second state smog alert	Not applicable during the 2017 reporting period.
LAX-AQ-4: Operations-Related Control Measures		
LAX-AQ-4a	GSE Conversion	This component was not applicable during the 2017 reporting period because the MSC project was not operational. In April 2015, BOAC adopted a Ground Support Equipment Emissions Reduction Policy to reduce emissions. This requirement is in effect at LAX and will apply to airlines and other GSE

Table 5-1 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Measures for Which No Action is Required at this Time		
Mitigation Measure		**Status**
		operators that use MSC once the project is operational.
LAX-AQ-4b	Passenger Gate Electrification	This component was not applicable during the 2017 reporting period because the MSC project was not operational.
LAX-AQ-4e	Conversion of sweepers to alternative fuels or electric power and roadway maintenance	This component was not applicable during the 2017 reporting period because the MSC project was not operational.
LAX-AQ-4f	Available and sufficient infrastructure for alternative fueled vehicles and equipment	This component was not applicable during the 2017 reporting period because the MSC project was not operational. The MSC concourse design includes 72 eGSE chargers, 2 at each of the 12 gates. The remainder will be at banks on the north and south ends of the concourse.
CULTURAL RESOURCES		
MM-HA-6	Excavation and Recovery	MSC's compliance with this measure is accomplished in conjunction with implementation of MM HA (MSC)-1. No artifacts requiring excavation and recovery were discovered during the reporting period.
MM-HA-8	Archaeological/Cultural Monitor Report	MSC's compliance with this measure is accomplished in conjunction with implementation of MM-HA (MSC)-1. This measure applies upon completion of grading and excavation. In 2017, grading and excavation activities had not yet been completed.
MM-HA-9	Artifact Curation	MSC's compliance with this measure is accomplished in conjunction with implementation of MM-HA (MSC)-1. Grading and excavation is ongoing; no artifacts requiring curation were discovered during the reporting period.
MM-HA-10	Archaeological Notification	MSC's compliance with this measure is accomplished in conjunction with implementation of MM-HA (MSC)-1. No human remains were found during the reporting period.
MM-PA-4	Paleontological Resources Collection	MSC's compliance with this measure is accomplished through implementation of MM-PA (MSC)-1.
MM-PA-5	Fossil Preparation	MSC's compliance with this measure is accomplished through implementation of MM-PA (MSC)-1.
MM-PA-6	Fossil Donation	MSC's compliance with this measure is

Table 5-1 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Measures for Which No Action is Required at this Time		
Mitigation Measure		**Status**
		accomplished through implementation of MM-PA (MSC)-1.
MM-PA-7	Paleontological Reporting	MSC's compliance with this measure is accomplished through implementation of MM-PA (MSC)-1.

Table 5-2 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
SURFACE TRANSPORTATION		
MM-ST (MSC)-1	Restripe Manchester Avenue at Sepulveda Boulevard	Since construction of the MSC is currently underway, this intersection is being monitored each August. In August 2017, traffic volumes revealed that this intersection was operating with a volume/capacity of 0.747 and a Level of Service C during the PM peak hour. This is better than the 0.843 volume/capacity level which, per the MSC EIR, would trigger implementation of this mitigation measure. Therefore, there is no need to implement this mitigation at this time. This intersection will be evaluated again in August 2018.
AIR QUALITY		
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1a	Water twice daily	The contractor implemented measures to minimize fugitive dust in compliance with mitigation requirements and with SCAQMD Rule 403, including regular watering of construction areas at least three times a day.
LAX-AQ-1b	Ultra-low sulfur diesel in construction equipment	Only ultra-low sulfur diesel (ULSD) fuel was used in construction equipment, as this is the only fuel commercially available.
LAX-AQ-1f	Prohibit idling or queuing of diesel-fueled vehicles in excess of 5 minutes	Vehicle operators were instructed that no vehicle idling is permitting in excess of 5 minutes during periods of non-active vehicle use; no written violations pertaining to excessive equipment idling occurred.
LAX-AQ-1g	Maintain on-site construction equipment	LAWA mitigation monitoring staff did not observe any onsite equipment that appeared to be malfunctioning; all equipment appeared to be properly maintained.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2a	Outfit construction diesel-fueled equipment with the best available emission control devices	Compliance with provisions relating to diesel-fueled equipment and vehicles is accomplished through MM-AQ (MSC)-1.
LAX-AQ-2b	Water three times daily	Watering for dust control during construction activities was done in accordance with SCAQMD Rule 403.
LAX-AQ-2d	Have construction employees work/commute during the off-peak hours to the extent feasible	Standard construction shift hours did not coincide with the heaviest commuter traffic periods during the 2017 reporting period.
LAX-AQ-2e	Make on-site lunch trucks available during construction	Lunch trucks visited sites near the various MSC construction activity areas, as well as the construction site office located near World Way

Table 5-2 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		West.
LAX-AQ-2f	Utilize on-site rock crushing facility	An on-site rock crushing facility was used during the reporting period.
LAX-AQ-2g	Provide electricity from power poles and portable generators using clean-burning diesel	Project-related construction trailers use grid power.
LAX-AQ-2i	Use construction equipment having the minimum practical engine size	Utilization of construction equipment having the minimum practical engine size (i.e., lowest appropriate horsepower rating for intended job) is included in the construction specifications for the MSC project. There were no written violations in 2017.
LAX-AQ-2j	Prohibit construction equipment engine tampering	Prohibition of tampering with construction equipment to increase horsepower or to defeat emission control devices is included in the construction specifications for the MSC project. There were no written violations in 2017.
LAX-AQ-2k	Designate a person(s) to ensure implementation of construction-related measures	A number of people are responsible for ensuring implementation of all components of the construction-related measure, including contractor personnel, LAWA inspectors and mitigation monitors. Monitoring includes direct inspections, reviews of monthly reports, and investigation of complaints.
LAX-AQ-2l	Locate rock crusher and stockpiles away from residents	The rock-crushing operation and related stockpiles were located away from adjacent residents.
LAX-AQ-2m	Provide infrastructure for alternative-fueled vehicles	Some of the construction equipment is fueled by alternative fuels (compressed natural gas). In addition, many staff vehicles and some construction contractor vehicles are alternative-fueled vehicles. There is sufficient infrastructure available in the local area to provide fuel to these alternatively-fueled vehicles.
MM-AQ (MSC)-1	On-Road Trucks	For the 2017 reporting period, a total of 974 pieces of equipment were evaluated for the MSC project. For on-road vehicles, 481 trucks were evaluated; these vehicles met or exceeded USEPA 2007 standards and were either equipped with a factory installed VDECS or had undergone a retrofit with a Level 3 VDECS. With respect to off-road diesel equipment, a total of 493 pieces of construction equipment were subject to independent

Table 5-2 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		monitoring. Of these, 107 pieces of off-road equipment were either withdrawn by the construction contractor or not granted airfield access by LAWA. 284 pieces of equipment were certified by the USEPA as compliant with Tier 4 Final, and 55 pieces of equipment as Tier 4 Interim Emissions Standards – this equipment is configured with a factory-installed diesel emission control system. 31 pieces of equipment were certified as Tier 3, 13 as Tier 2, and 3 pieces of equipment as Tier 1. Additionally, 13 pieces of equipment were registered as portable equipment, and 20 did not specify a certification level. 4 pieces of equipment were granted a "20-day" exemption and 8 were granted an exemption because a compatible VDECS is not available.
CULTURAL RESOURCES		
MM-HA-5	Monitoring	Compliance with this measure is accomplished through implementation of MM-HA (MSC)-1.
MM-HA (MSC)-1	Conformance with LAX Master Plan Archaeological Treatment Plan	During the reporting period, an on-site Cultural Resource Monitor (CRM) was retained for the MSC project. During the 2017 reporting period, excavation that extended down into native material (where the potential exists for encountering archaeological resources); however, no archaeological resources were found during monitoring.
MM-PA-2	Paleontological Authorization	MSC's compliance with this measure is accomplished through implementation of MM-PA (MSC)-1.
MM-PA (MSC)-1	Conformance with LAX Master Plan Paleontological Management Treatment Plan	During the 2017 reporting period, an on-site Archaeological/Paleontological Resource Monitor was retained for the MSC project. During the 2017 reporting period, excavation extended down into native material (where the potential exists for encountering paleontological resources); however, no paleontological resources were found during monitoring.
HAZARDS AND HAZARDOUS MATERIALS		
MM-HM (MSC)-2	Hazardous Materials Contingency Plan	The construction contract specifications developed by LAWA for the MSC include provisions for addressing hazardous materials should they be unexpectedly encountered during construction, including the requirement

Table 5-2 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		that the contractor prepare a Hazardous Materials Management Plan. Construction activities are conducted in accordance with this plan.
MM-HM (MSC)-3	Hazardous and Solid Waste Disposal	Hazardous soils were encountered during the 2017 reporting period and were disposed of off-site in accordance with all federal, state, and local laws and regulations.
CONSTRUCTION		
C-1	Establishment of a Ground Transportation/Construction Coordination Office	In 2017, the CALM team and LAWA monitors worked with the MSC project staff and contractors to coordinate construction traffic related to the demolition of apron and grading activities during the reporting period. Such activities were successfully coordinated with the CALM team and there were no notable MSC related construction traffic problems, nor were there any detours required for the MSC project during the 2017 reporting period.
SURFACE TRANSPORTATION		
ST-9	Construction Deliveries	No lane closures were required for construction deliveries in 2017.
ST-12	Designated Truck Delivery Hours	Truck deliveries are strictly enforced by LAWA inspectors and mitigation monitors. During the course of time sensitive soil movement, waivers were requested. Although granted during peak hours, traffic was moving opposite traffic (the trucks did not contribute to peak congestion).
ST-14	Construction Employee Shift Hours	Construction employee shift hours were approved by LAWA at the initiation of construction. LAWA inspectors and construction monitors monitored shift hours during the reporting period.
ST-16	Designated Haul Routes	Haul routes were designated at the initiation of project construction. LAWA inspectors and construction monitors monitored construction traffic, including haul routes, during the reporting period.
ST-17	Maintenance of Haul Routes	Off-airport roadways required no maintenance by construction contractors during 2017.
ST-18	Construction Traffic Management Plan	Prior to the initiation of demolition, the contractor developed a Construction Traffic Management Plan, which LAWA reviewed. LAWA inspectors and construction monitors

Table 5-2 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Ongoing Measures		
Mitigation Measure		**Status**
		monitored construction traffic, including haul routes, delivery hours, construction employee shift hours, construction employee parking locations, and other considerations. Demolition employees parked in the project office (trailers) area, located within the western portion of the project site.
ST-19	Closure Restrictions of Existing Roadways	No closure restrictions of existing roadways were required in 2017.
ST-22	Designated Truck Routes	Truck routes were designated at the initiation of project construction. LAWA inspectors and construction monitors monitored construction traffic, including truck routes, during the reporting period.

Table 5-3
Summary of MSC Mitigation Measures in the 2017 Monitoring Period
Completed Measures

Mitigation Measure		Status
AIR QUALITY		
MM-AQ-3	Transportation-Related Mitigation Measures	Completed. See MM-AQ-3 in Table 2-3.
LAX-AQ-1: General Air Quality Control Measures		
LAX-AQ-1c	Post of publicly visible sign	A project information sign for the MSC project was posted by the entrance road at the outset of the project.
LAX-AQ-2: Construction-Related Control Measures		
LAX-AQ-2c	Pave Construction Access Roads	The entrance to the construction area is paved with asphalt.
CULTURAL RESOURCES		
MM-PA-1	Paleontological Qualification and Treatment Plan	The Paleontological Management Treatment Plan (PMTP) was prepared and revised in December 2005. In addition to fulfilling the requirements of MM-PA-1, the PMTP incorporates the requirements of LAX Master Plan Mitigation Measures MM-PA-2 through MM-PA-7 and provides details regarding compliance with these measures. Master Plan projects comply with the PMTP and thus comply with Mitigation Measure MM-PA-1.
MM-PA-3	Paleontological Monitoring Specifications	This measure was completed upon approval of the construction contract.
MM-PA (MSC)-2	Construction Personnel Briefing	Construction personnel briefings regarding paleontological resources were conducted in December 2016.
CONSTRUCTION		
C-2	Construction Personnel Airport Orientation	Pre-construction meetings were held for the MSC project in 2015, for the early enabling projects, to make contractors aware of parking areas, construction staging areas, and construction policies. The information and requirements from those meetings were carried into the 2017 construction activities.
HAZARDS AND HAZARDOUS MATERIALS		
MM-HM (MSC)-1	Asbestos-Containing Materials and Lead Based Paint	Prior to construction activities, an evaluation of all buildings (built prior to 1980) to be demolished was completed to evaluate the presence of asbestos-containing materials and lead-based paint.
PUBLIC SERVICES – FIRE PROTECTION		
FP-1	LAFD Design Recommendations	Prior to plan sign-off, the Los Angeles Fire Department (LAFD) was consulted to address how the MSC project could avoid compromising fire prevention and protection.

Table 5-4 Summary of MSC Mitigation Measures in the 2017 Monitoring Period Measures that are No Longer Applicable		
Mitigation Measure		**Status**
CULTURAL RESOURCES		
MM-HA-7	Administration	This measure only applies where known resources are present. No known resources are present at the construction site.
AESTHETICS		
DA-1	Provide and Maintain Airport Buffer Areas	Project construction areas are not located along major public approach or perimeter roadways. Construction fencing is not required for this project.
MM-DA-1	Construction Fencing	See DA-1, above and in Table 2-4.
PUBLIC SERVICES – FIRE PROTECTION		
PS-1	Fire and Police Facility Relocation Plan	The MSC project will not affect on-airport fire and police facilities.
PS-2	Fire and Police Facility Space and Siting Requirements	The MSC project will not affect on-airport fire and police facilities.
SURFACE TRANSPORTATION		
ST-21	Construction Employee Parking Locations	The MSC project is not an eastern airport facility.
MM-ST (QA) (SPAS)-2	Change Departures and Arrivals Level Commercial Vehicle Curbside Operations Under Future (2025) Conditions	Subsequent to the adoption of the MSC EIR, the LAX Landside Access Modernization Program was approved. The LAX Landside Access Modernization Program addresses this mitigation.

APPENDIX A

LOS ANGELES INTERNATIONAL AIRPORT
EL SEGUNDO BLUE BUTTERFLY
2017 FLIGHT SEASON MONITORING REPORT
DATED JANUARY 26, 2018

El Segundo Blue Butterfly 2017 Flight Season Monitoring Report

Los Angeles International Airport

26 January 2018

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Acronyms and Abbreviations

CNPS	California Native Plant Society
ESA	Endangered Species Act
ESBB	El Segundo Blue Butterfly
LAWA	Los Angeles World Airports
LAX	Los Angeles International Airport
GIS	Geographic Information Systems
GPS	Global Positioning System
USFWS	United States Fish and Wildlife Service
WCS	Wildlands Conservation Science, LLC.

1.0 Introduction

At 203 acres, the El Segundo Blue Butterfly Habitat Restoration Area (Preserve) was established in 1986 and is one of the last remaining relatively-intact stretches of the coastal sand dune habitat along the southern coast of California (Figure 1). The Preserve is managed by the Los Angeles World Airports (LAWA) and provides habitat for a variety of sensitive species such as the San Diego horned lizard (*Phrynosoma coronatum blainvillii*) and the Southern California legless lizard (*Anniella stebbinsi*), both state and federal Species of Special Concern; the California spineflower (*Mucronea californica*) a California Native Plant Society (CNPS) Rare Plant Rank of 4.2; Lewis' evening primrose (*Camissoniopsis lewisii*) a CNPS Rare Plant Rank of 3; the federally threatened coastal California gnatcatcher (*Polioptila californica californica*); and the Preserve's namesake, the federally endangered El Segundo blue butterfly (ESBB; *Euphilotes battoides allyni*).

A member of the gossamer-winged (Lycaenidae) family, the ESBB was listed as federally endangered on June 1, 1976 by the United State Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA; 41 FR 22041). At LAX, this dune obligate subspecies is reliant on seacliff buckwheat (*Eriogonum parvifolium*) at most life stages; as a larval host and as an adult nectar plant.

After a long history of land use and development, the ESBB population at the LAX dunes dwindled to only hundreds of adult butterflies. Pursuant to Section 4 of the ESA, LAWA has a duty to maintain and restore the ESBB population. Starting in 1986, the Preserve was set aside to protect and monitor the Los Angeles population of the butterfly. Since then a diverse and collaborative team through LAWA has been responsible for the conservation of the subspecies including Dr. Rudi Mattoni who established the historical sampling methodologies and Dr. Richard Arnold who further refined sampling methodologies. Currently, LAWA's Maintenance Services Division conducts invasive plant and trash removal activities to support of the ESBB's habitat. Wildlands Conservation Science, LLC (WCS), under subcontract from Polytechnique Environmental, has been conducting surveys to monitor the population and to effectively guide conservation strategies for the subspecies since 2015.

This report summarizes WCS's monitoring activities and provides the population estimate for the 2017 ESBB flight season. All survey activities were conducted under recovery permit TE-203081-2.

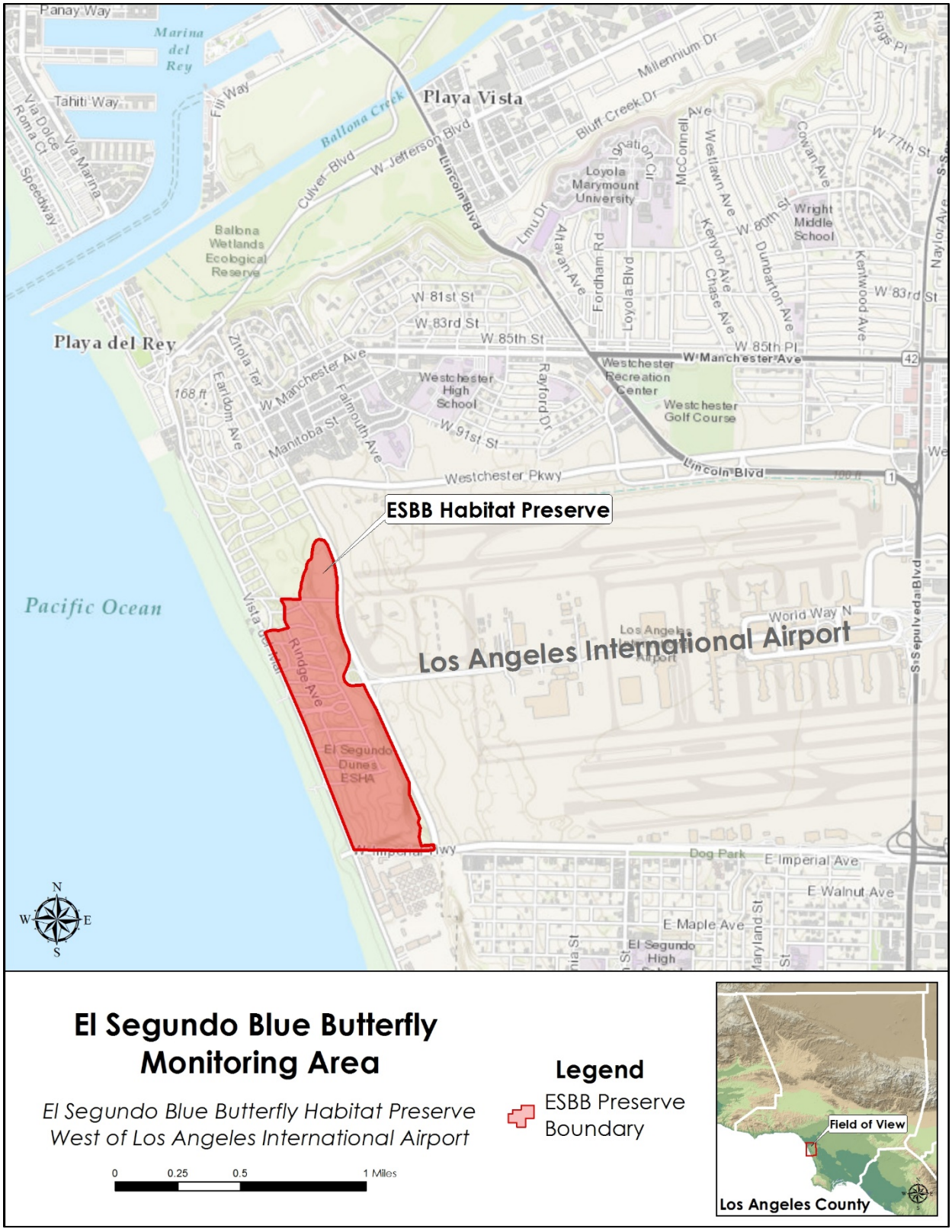

Figure 1. Regional location of the El Segundo Blue Butterfly Habitat Preserve in Los Angeles County and the site of the 2017 flight season monitoring activities.

1.1 El Segundo Blue Butterfly Life History and Range

The ESBB is one of eight subspecies comprising the polytypic square-spotted blue butterfly (*Euphilotes battoides;* Pelham 2008). *Euphilotes battoides* inhabits southern California, southern Nevada, Arizona, and northern Mexico. Extant populations of ESBB exist in Los Angeles County at the Ballona Wetlands, the Los Angeles International Airport (LAX), the Chevron Butterfly Preserve, Malaga Cove and scattered bluff locations of the Palos Verdes Peninsula, Dockweiler State Beach, the beach along Esplanade St. in Redondo Beach, and lastly, a disjunct population at and in the vicinity of Vandenberg Air Force Base in Santa Barbara County.

The ESBB belongs to Lycaenidae, the second-largest family of butterflies which constitutes approximately 30 percent of known butterfly species (Pierce et al. 2002). The taxonomy of the *Euphilotes* genus is complex. Species often converge on the same host plants and often exhibit convergent morphology to the degree that they appear superficially similar to one another than to more closely related species and subspecies occupying different niches (Pratt 2006). For example, coastal populations of the Bernadino blue (*Euphilotes bernardino*) and the square spotted blue (*Euphilotes battoides*) have demonstrated convergence of phenotypes when occupying similar habitats as have populations of Pacific dotted blue (*Euphilotes enoptes*) (Mattoni 1992, Pratt 2006). Preliminary genetic studies on the taxonomic status conducted in 2008 of the Santa Barbara County ESBB population have proven inconclusive and are currently under further investigation.

This species undergoes complete metamorphosis—four distinct phases of development from egg to larva to pupa to adult. The adult butterfly has a wingspan of 0.75 to 1.25 inches. The wings of males are a brilliant blue color with an orange border on the rear of the upper hindwings. The females have dull brown colored wings with an orange border on the upper distal surface of the hindwings (Figure 2).

Figure 2. El Segundo blue butterfly perched on a seacliff buckwheat flowerhead.

ESBB adults may be on wing from mid-June through September and are closely associated with their host plant, seacliff buckwheat (*Eriogonum parvifolium*). Eggs are deposited on buckwheat flowerheads where the larvae feed until maturation. Once mature, larvae burrow into the soil and pupate below the host plant. Most pupation occurs within the root and debris zone of seacliff buckwheat (Mattoni 1992). Pupae remain in diapause until the beginning of the flowering of seacliff buckwheat, typically in early June. The number that eclose on a given year is dependent on environmental conditions with most of the population remaining in diapause on any given year (Pratt pers. com.).

1.2 Site History

The Preserve occupies 203 acres in the El Segundo sand dunes, which used to be the largest coastal sand dune system between the mouth of the Santa Maria River in Santa Barbara County to Ensenada in Baja California, Mexico.

The Los Angeles coastal prairie was the predominant herbaceous plant community with extensive vernal pool habitat that covered about 37 square miles from Ballona Wetlands to the Palos Verdes Peninsula. The last significant remnant existed at the Preserve but was completely extirpated in the late 1960s (Mattoni et al. ND).

The current native plant communities at El Segundo sand dunes include southern foredune, southern dune scrub and valley needlegrass grassland; however, nearly all native vegetation communities have been degraded by past land use activities and invasive plant infestations.

2.0 Monitoring Methodology

In order to generate an accurate ESBB population estimate, a combination of monitoring measures has been developed and refined over the history of monitoring at the Preserve. These include surveying a 1.1-mile historical transect nearly every week of the ESBB's flight season and a population census conducted at the peak of flight season.

2.1 Historical Transect Survey

A transect route established by Dr. Mattoni in 1984 was slightly modified in 1996 to better survey suitable and non-suitable ESBB habitat and has been used for monitoring in subsequent years. The historical transect is divided by 35 intervals of varying lengths and traverses portions of the Preserve where seacliff buckwheat has been abundant in previous years, areas where buckwheat is currently abundant, some hillside areas where native flora have self-recruited, areas where non-native plants have been removed, areas infested with invasive plants, and portions where restoration has occurred in prior years.

An observer walked the historical transect from beginning to end (Intervals 1 through 35; Figure 3) approximately once during every seven-day period during the flight season with the exception at the height of flight season when surveys were intended to capture the peak numbers of ESBB observed. At peak flight season, three transect surveys were conducted over the course of five consecutive days to estimate the date of peak flight season to the greatest extent possible.

Prior to beginning the surveys, an Xplore Technologies XC6 ruggedized tablet operating ESRI ArcPad 10.2 Geographic Information Systems (GIS) software and equipped with a global positioning system (GPS) was loaded with the transect route overlaid on a high-resolution orthophotograph of the Preserve. The number and sex of adult ESBBs that were observed along the route within ten feet on either side of the transect were recorded. Behaviors including flying, perching, basking, courting, mating, nectaring and ovipositing were also recorded. No ESBBs were captured or handled during the transect surveys in 2017.

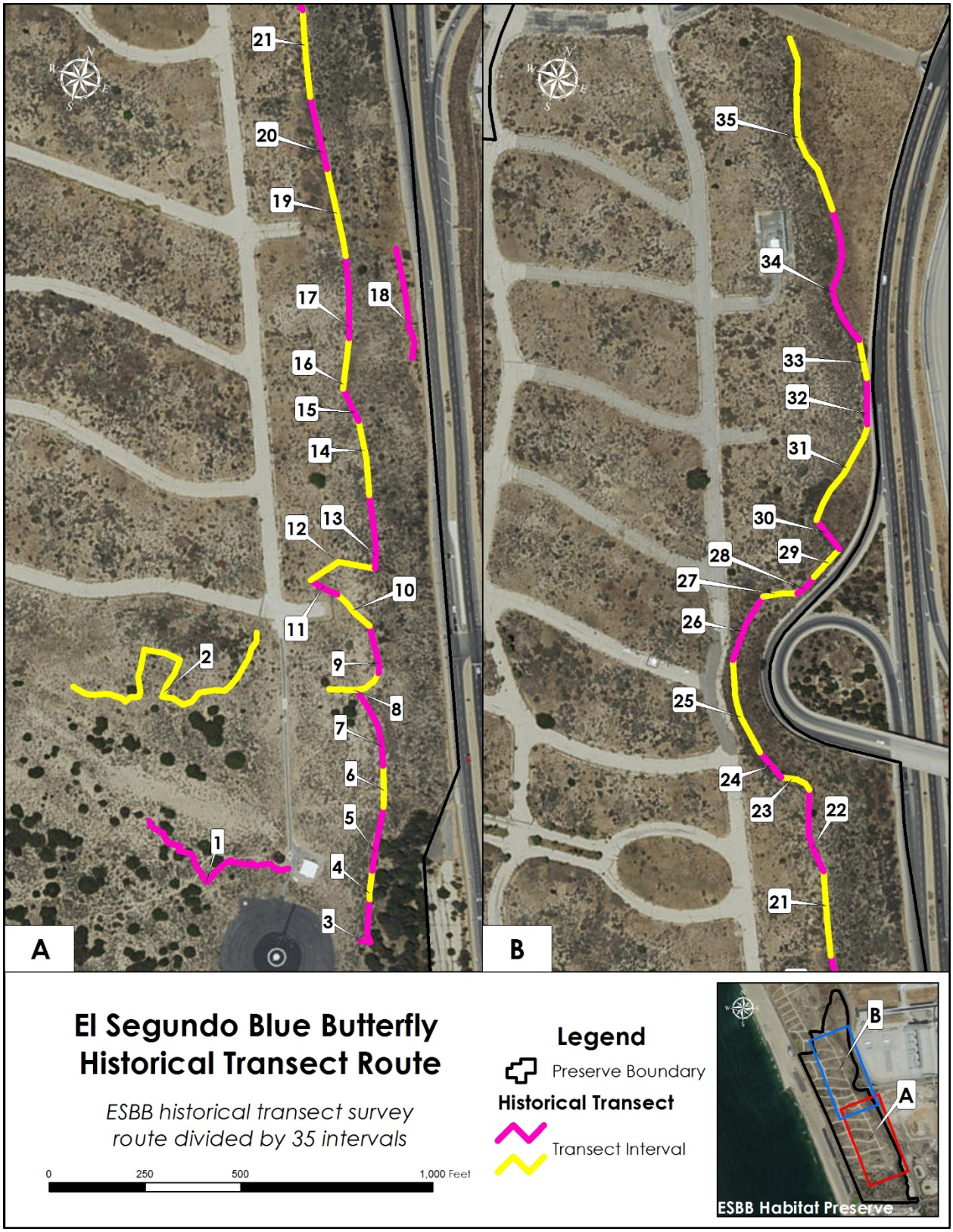

Figure 3. Location of the historical transect route within the Preserve divided by 35 intervals.

2.2 Block Count Census

In 1996, a census survey was added to the sampling design to represent all varying habitat conditions and the total area of the Preserve. During the peak of flight season, ESBB localities and counts have been conducted in 62 blocks, which are distributed across the entirety of the 203-acre Preserve (Figure 4). The approximate peak of the ESBB flight season was estimated while the ESBB season was in progress by examining the trend in the numbers of butterflies observed on the transect counts and the sex ratio of males to females.

Prior to block counts, an Xplore Technologies XC6 tablet was loaded with the block boundaries overlaid on a high-resolution orthophotograph of the Preserve. During the block count, an observer walked meandering transects and systematically searched each of the 62 blocks while visiting every buckwheat once. The number and sex of adult ESBBs that were observed was recorded for each block. Behaviors including flying, perching, basking, courting, mating, nectaring and ovipositing were also recorded. No ESBBs were captured or handled during block counts in 2017.

The block count totals are used in conjunction with the historical transect count data to estimate the seasonal population size of the ESBB for the Preserve.

Figure 4. Location of the block count boundaries across the Preserve.

2.3 Vegetation Sampling

In 1985, Dr. Arnold demonstrated that a positive correlation exists between seacliff buckwheat plant and flowerhead numbers with ESBB numbers (Arnold 1985). Since information on the numbers of buckwheat plants and flowerheads provide insight as to why ESBB numbers increase or decrease annually, Dr. Arnold initiated seacliff buckwheat monitoring and flowerhead counts in 2002 and performed them annually through 2015. In 2016, WCS continued the monitoring protocol which recorded buckwheat age class, number of flowerheads and GPS locations across 126 transects stratified throughout the entirety of the Preserve. However, due to prolonged drought and the incursion of multiple invasive plant species since the initiation of the buckwheat monitoring methodology—the health and flowerhead of buckwheat is no longer the primary variable affecting the number of ESBB annually. Lack of rainfall and invasive plant species are important covariables that additionally affect the health of the ESBB population. Because the health of seacliff buckwheat has been successfully identified as a strong contributor to ESBB numbers and because the expansion of invasive plant species poses such a significant threat to the health of seacliff buckwheat; a monitoring methodology should incorporate both these metrics.

Therefore, in 2017 WCS initiated a new quantitative sampling method that was based on 150 five-meter circular plots distributed throughout the Preserve (Figure 5). The total number of plots (150) and the size (five meter) was selected to fit within the existing budget as well as could yield repeatable data for future years. In ESRI ArcMap 10.4, WCS executed the *Create Random Points* tool to distribute spatially random plot locations throughout all blocks excluding any that fell within streets or other infrastructure.

During the peak of the ESBB flight season, WCS installed monuments at all plot locations and enacted a modified CNPS relevé-type data collection methodology. At each plot location, WCS recorded the number of mature, juvenile, seedling, and senescent seacliff buckwheat plants; the number of flowerheads present on all seacliff buckwheat plants; the total percent native cover; total percent non-native cover; and the percent bare ground occurring at each plot. Additionally, WCS identified non-natives to species level when possible and recorded the percent cover for each category within several binned cover classes; trace (less than one square meter of cover), 1-5, 6-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80, 81-90, and 91-100 percent.

Data was summarized by summing the midpoint of each binned cover class for native plant cover, non-native plant cover, and bare ground values and then averaged by the number of plots in each block. For specific non-native plant species, the midpoints of each were also summed and averaged by the number of plots in each block.

The total number of buckwheat plants of all age classes was summed by block and for the Preserve and the total number of flowerheads was also summed by block and for the Preserve. The number of buckwheat per block and the number of flowerheads per block was then divided by the total number of buckwheat across the Preserve. This value represented the “Percent of Buckwheat/Flowerheads Counted” and was then divided by the number of plots within the block to derive the *Block Value* to proportionally examine the relationship of buckwheat/flowerheads and the ESBB population on a similar spatial scale (Equation 1).

Equation 1. The equation used to determine a proportional value across all blocks of buckwheat plants and flowerheads.

$$\left[\frac{\left(\frac{q}{n}\right)}{p}\right] = \textit{Block Value}$$

Where q = the number of seacliff buckwheat in one block
n = all seacliff buckwheat counted across the Preserve
p = number of plots within block

This vegetation sampling and data collection effort represents a true randomized sampling scheme that can be efficiently repeated on an annual basis to monitor the expansion (or reduction) of native and non-native species in addition to seacliff buckwheat health.

Figure 5. *Left and inset:* Locations of the 150 vegetation plots distributed throughout the Preserve. *Bottom right*: WCS biologists install monuments to ensure repeatable data collection in the future.

2.4 Seasonal ESBB Population Estimate

Using data from both the historical transect and block count census, a low and a high estimate of the seasonal ESBB population was calculated using the Holmes and Arnold method based on recommendations by Dr. Arnold (Arnold 2015). This method is an extension of the Huang and Arnold calculation which had been in used at the Preserve for several years, but this method also incorporates actual adult lifespan frequencies from an earlier capture-recapture study of the ESBB. This ensures a more accurate estimate of the seasonal population size of the butterfly (Holmes and Arnold 2015, Arnold 1986).

Appendix A describes the Holmes and Arnold methodology in detail and presents the formulas used for calculations of the seasonal population size. Holmes and Arnold also provides computer program code for use with the R-statistical package to perform this method's calculations (Holmes and Arnold 2015).

This method first estimates the seasonal population numbers for the area of the historical transect route. This population size is then scaled up to estimate the seasonal population size for the 203-acre portion of the Preserve where ESBB occur. Since the block count data were obtained at or near the peak of the flight period, the scaling factor is simply the ratio of the block count to the peak count of observed ESBB on the historical transect. Thus, the ESBB seasonal population size for the Preserve is obtained by multiplying the estimated seasonal population size of the transect survey by this scaling factor.

3.0 Results and Discussion

WCS conducted the first survey of the ESBB flight season on May 24, 2017 and the last survey August 9, 2017. The first ESBB were observed in the Preserve and on transect on June 6. The ESBB 2017 flight season lasted for approximately 69 days and represented the first flight season with average to above-average rainfall following the 2011 - 2017prolonged drought in Southern California.

3.1 Historical Transect Survey Results and Discussion

Between late May and mid-August 2017, WCS conducted a total of 14 transect surveys. ESBB were observed on 11 of the transect surveys with a total of 422 ESBB on the historical transect; 249 males and 173 females (Table 1, Figures 6 and 8). Most observations (92 percent) occurred while ESBB were flying. Other behaviors observed included 0.47-percent perching, 0.24-percent basking, 2.13-percent courting, 2.37-percent mating, 1.90-percent nectaring and 0.95-percent of females ovipositing. WCS observed a normal ratio of males to females; approximately 1.44 males were observed per female. Transect ESBB localities are strongly correlated to the presence of seacliff buckwheat and expectedly, ESBB were not observed far distances from buckwheat plants and thus were clustered in locations along the transect (Figure 8).

The number of observed ESBB during transect surveys is a 7.5-percent decrease in observed butterflies between 2016 and 2017 and is 78-percent below the transect mean of 1,929 butterflies, calculated from 1996 to current (Figure 6). Annual transect differences from year-to-year are assessed from 1996, the year the historical transect survey was slightly modified to

accommodate additional ESBB habitat, through 2017 to reflect consistency between the transect area surveyed between years.

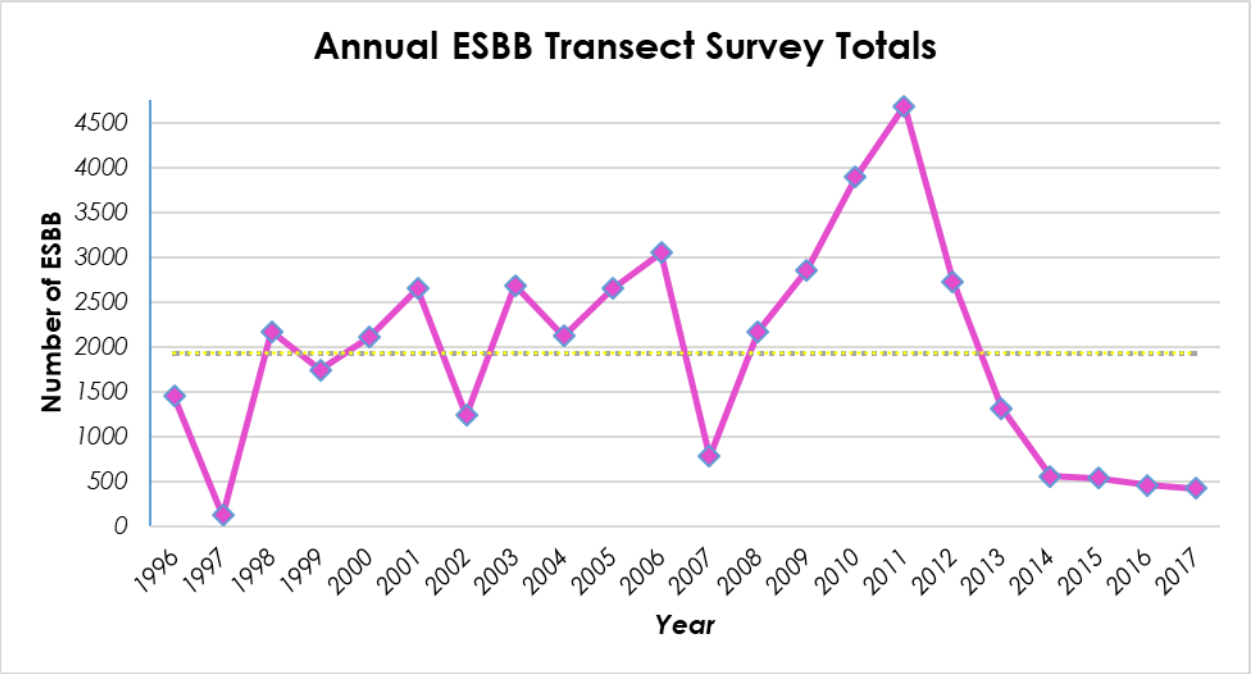

Figure 6. Annual numbers of ESBB observed while conducting the historical transect.

It is well established that most faunal populations (and specifically single-generation insect populations) experience wide fluctuations in annual population estimates above and below the mean (Varley et al. 1974). Therefore, it is expected to see large variation above and below the mean. Although it is too soon to determine a statistical trend, the development of a potential trend for multiple consecutive seasons (approximately six years of a decline) below the mean is cause for closer examination and monitoring (Figure 6).

ESBB populations are affected by predatory and parasitism pressures, invasive species, and the health of their food plant, seacliff buckwheat. Perhaps due to the prolonged California drought, buckwheat health and flowerhead production has declined in recent years and potentially more so along the length of the transect due to aging plants and extensive incursion of invasive plants.

Additionally, the infestation of invasive species such as non-native grasses (*Avena* spp., *Vulpia* spp., *Poa* spp., *Bromus* spp., etc.), most notably veldt grass (*Ehrharta calycina)* and bermuda grass (*Cynodon dactylon*), and iceplant (*Carpobrotus edulis* and *Carpobrotus chilensis*) along the transect route and elsewhere throughout the Preserve threaten the existence of seacliff buckwheat and are actively reducing available habitat for ESBB (Figure 7). California buckwheat (*Eriogonum fasciculatum*) also presents a threat to ESBB because it carries with it an assemblage of generalist insect species and their associated parasitoids that can exploit the later-blooming seacliff buckwheat, thereby increasing insect competition with and likely parasitism of ESBB (Longcore *et al.* 1997).

Due to the combination of multiple years of reduced rainfall, senescing buckwheat, and various invasive plant species infestations, ESBB transect detections are likely to continue to decline

unless a targeted effort at combating invasive species is pursued in combination with multiple years of average rainfall.

Figure 7. Veldt grass and iceplant infestations crowding out native seacliff buckwheat plants along the historical transect. These infestations can smother native plants and reduce the food availability and pupation requirements of ESBB.

Table 1. Summary of ESBB observed and behavior on the historical transect in 2017.

Date of Transect Survey	Total of M Flying	Total F Flying	Total M Perching	Total F Perching	Total M Basking	Total F Basking	Total M Courting	Total F Courting	Total M Mating	Total F Mating	Total M Nectaring	Total F Nectaring	Total F Ovipositing	Total M Observed on Transect	Total F Observed on Transect
Wednesday, May 24, 2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday, June 1, 2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday, June 6, 2017	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Wednesday, June 14, 2017	5	2	0	0	0	0	0	0	0	0	0	0	0	5	2
Monday, June 19, 2017	14	1	0	0	0	0	1	1	0	0	0	0	1	15	3
Tuesday, June 27, 2017	12	3	0	1	0	0	0	0	1	1	1	2	0	14	7
Wednesday, July 5, 2017	35	7	0	1	0	0	2	2	2	2	0	3	0	39	15
Monday, July 10, 2017	56	40	0	0	0	0	1	1	0	0	0	0	0	57	41
Wednesday, July 12, 2017	37	28	0	0	0	0	0	0	1	1	0	0	3	38	32
Friday, July 14, 2017	42	24	0	0	0	0	0	0	0	0	0	1	0	42	25
Thursday, July 20, 2017	12	22	0	0	1	0	1	0	0	0	0	1	0	14	23
Tuesday, July 25, 2017	12	15	0	0	0	0	0	0	1	1	0	0	0	13	16
Wednesday, August 2, 2017	11	9	0	0	0	0	0	0	0	0	0	0	0	11	9
Wednesday, August 9, 2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				M = males	*F = females*						**2017 Grand Total of ESBB Observed on the Historical Transect**			249 males	173 females
														422	

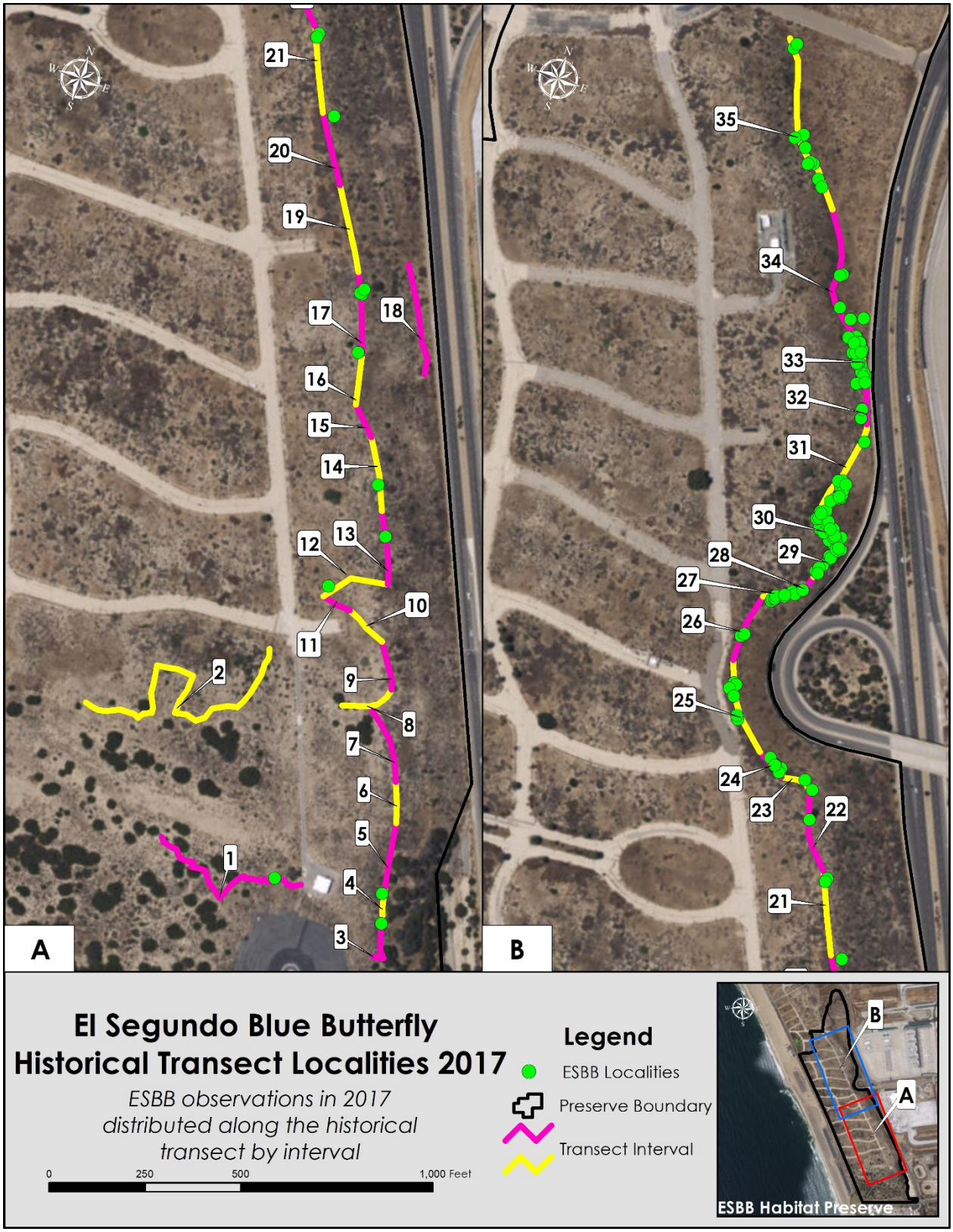

Figure 8. Locations of ESBB observations along the historical transect in 2017. Butterfly locations are strongly correlated to the location of healthy seacliff buckwheat plants. Note: Localities may indicate more than a single butterfly observation.

3.2 Block Count Results and Discussion

The block count census was performed over a five-day period from July 10, 2017 to July 14, 2017 and coincided with the peak of ESBB flight season as estimated from the transect surveys (Table 1). During the five-day count period, WCS observed a total of 758 ESBB across the area of the Preserve (Table 2, Figures 11 and 14).

Similar to transect detections, most observations occurred while ESBB were flying (87 percent). Other behaviors observed included 2.5 percent perching, 0.9 percent basking, 4.0 percent courting, 1.3 percent mating, and 4.2 percent nectaring. No females were observed ovipositing during the block counts (Table 2).

The number of observed ESBB during block counts is a five-percent decrease in observed butterflies between 2016 and 2017 and is a 78-percent decrease from the block count mean of 3,414 butterflies, calculated from 1996 to current. Annual block count differences from year-to-year are assessed from 1996 through 2016 (Figures 11 and 12).

Localities of ESBB are strongly correlated to the presence of seacliff buckwheat and expectedly, ESBB were not observed far distances from buckwheat plants leading to clustering of localities (Figure 14). Conducting counts and documenting ESBB localities across the entirety of the Preserve localities serves as an excellent representation of the ESBB's distribution and range and can indicate potential future restoration areas. For example, the southern portion of the Preserve has extensive growth of acacia (*Acacia retinodes*, *A. cyclops*, *A.* spp.) and reduced cover of seacliff buckwheat. Thus, Blocks 17 through 27 saw reduced ESBB detections as compared to other areas of the Preserve and indicate the need for acacia control, in addition to other invasive species (Figures 8, 9 and 13). Additionally, species such as iceplant, various non-native grasses, and in particular veldt grass have seen expansion across the entire area of the Preserve and are out-competing native and likely rare species such as Lewis' evening primrose (*Camissoniopsis lewisii*; Figure 9).

Because ESBB are not marked and it is not feasible to conduct a true census across the entire Preserve simultaneously, some individuals may have been missed and/or counted more than once. It is nearly impossible to obtain a precise count of a dynamic insect population because birth and death rates are continual and may go unobserved. Regardless, the block counts are essential to extrapolate an accurate population estimate for the entire Preserve. Although the transect and block counts can be used separately to estimate the ESBB population size to make comparisons from year-to-year; however, when used together these two sampling methodologies provide a seasonal population estimate for the entire Preserve.

Like the wide fluctuation in year-to-year transect observations, there are wide fluctuations in year-to-year block count observations as well. Although these fluctuations are to be expected, any development of a trend well below the mean is cause for closer examination and necessary monitoring to determine if a population is at risk (Figures 11 and 12). Not only do the transect surveys possibly establish a trend toward a declining ESBB population, but the block counts conducted across the Preserve also confirm a decrease in the species' presence. This may be attributed to increased pressures from invasive species, parasitism, predation, disease, the prolonged California drought, or a combination thereof.

One factor established by Arnold to influence annual ESBB population numbers is rainfall, which in turn influences flower production of seacliff buckwheat (Arnold 2015). Figure 13 illustrates the positive correlation between ESBB numbers obtained during block counts and annual rainfall during a 22-year period. While dramatic fluctuations in this population have previously been observed and may be within normal variation for a single generation insect population, a consecutive annual trend toward the species' decline has developed over the last seven years and appears to be correlated to the drought (Figures 11-13). Though 2017 saw the first year of above-average rainfall, the increased pressure from consecutive years of a declining population and reduced rainfall, declining buckwheat flowerhead production, and the expansion of various invasive species in combination has still impacted the LAX ESBB population.

Figure 9. Beach primrose, a species closely related to Lewis' evening primrose, encroached upon by iceplant. Iceplant roots at the nodes, has a creeping habit, and often forms deep mats covering large areas that can quickly outcompete native plants.

Figure 10. Veldt grass in the foreground, acacia in the background and iceplant largely dominate the landscape at the Preserve and threaten the ESBB's habitat.

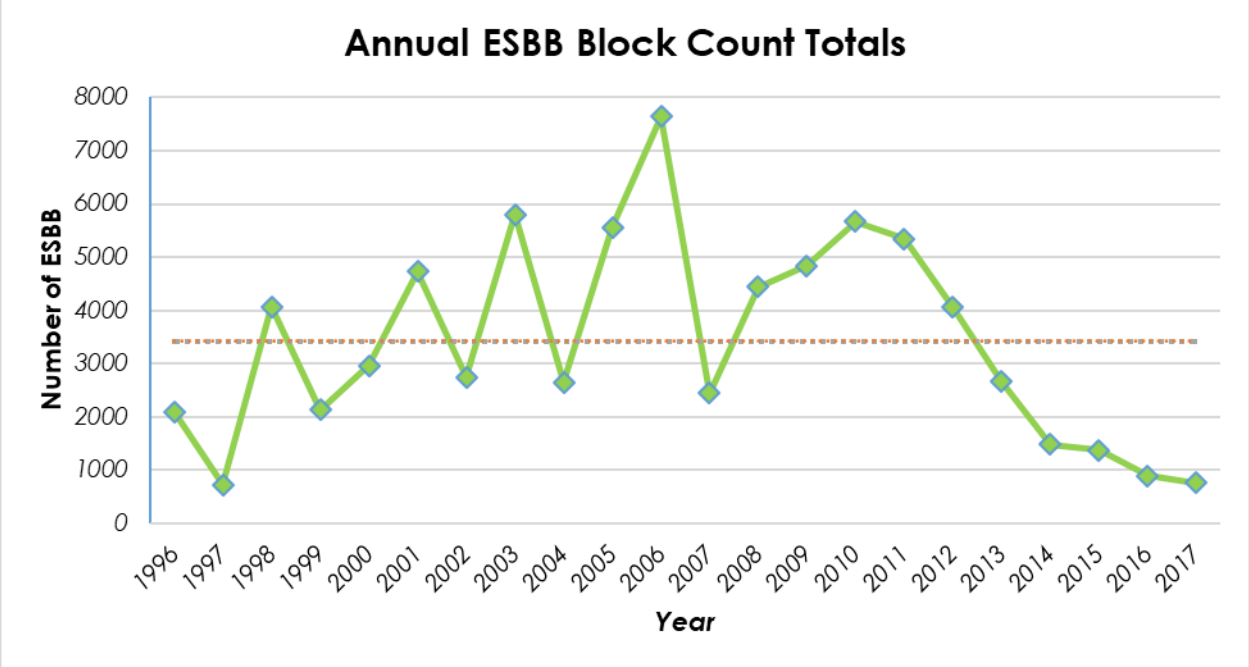

Figure 11. Summary of block count totals from 1996 to 2017.

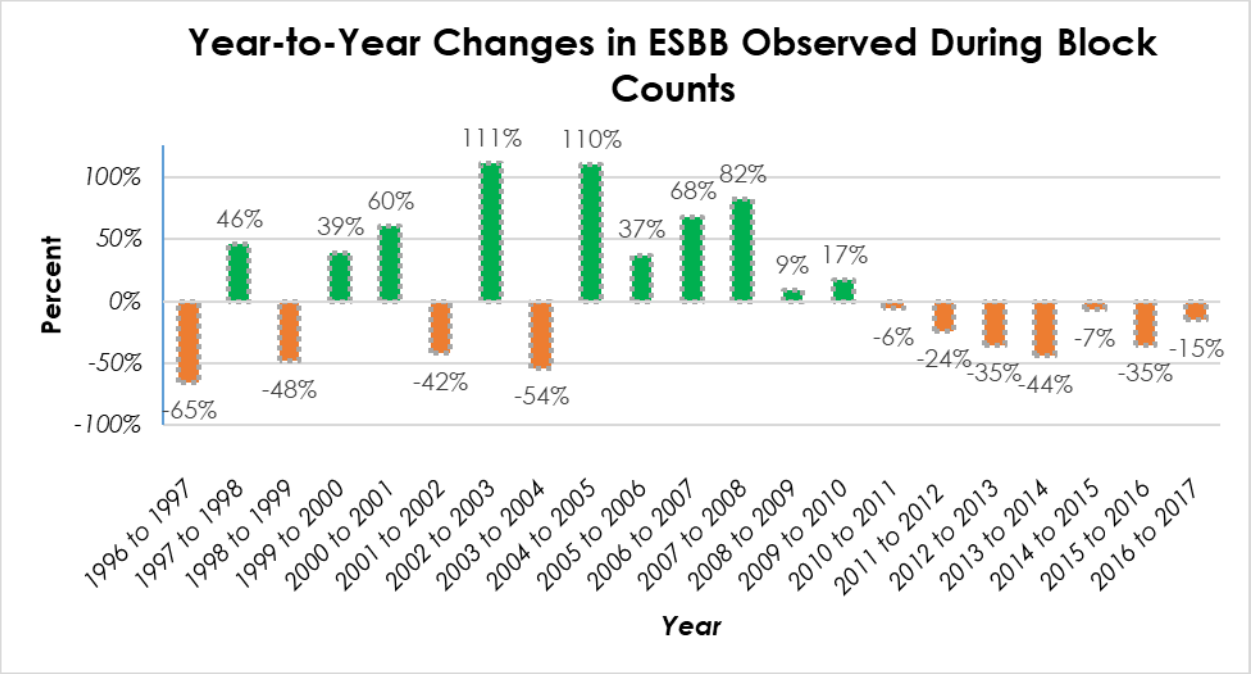

Figure 12. Year-to-year changes between block count totals.

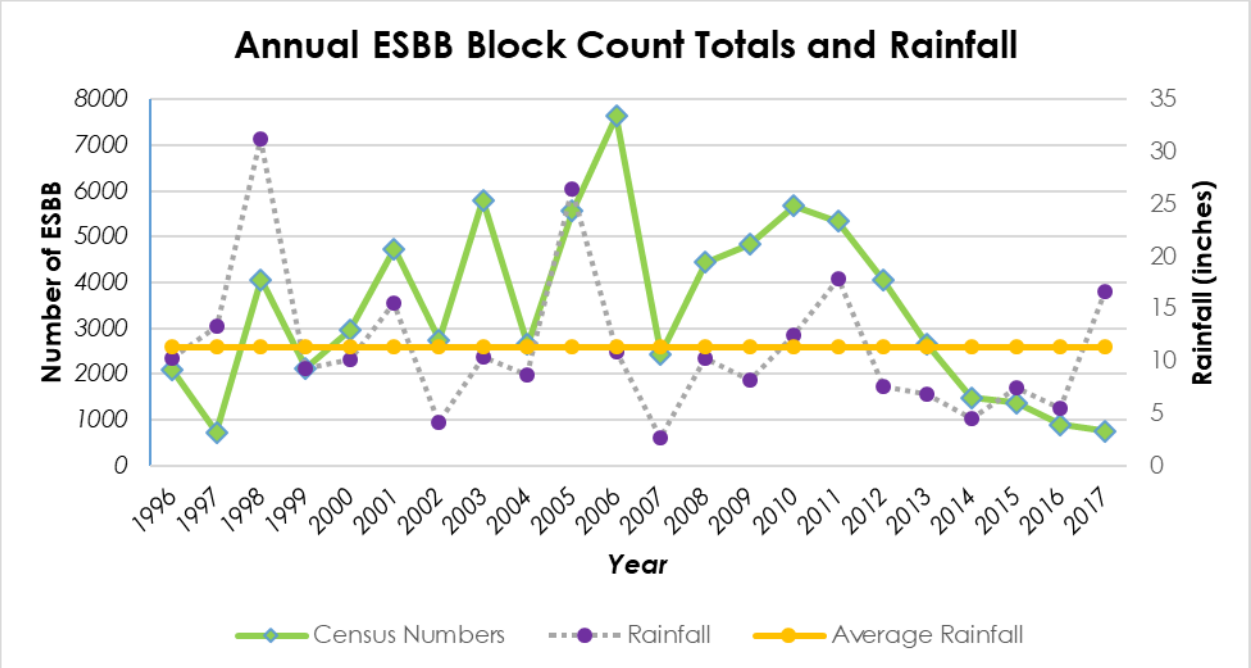

Figure 13. Relationship between rainfall and observed butterflies.

Table 2. Summary of ESBB observed and behavior during block counts in 2017.

Date of Block Count	Block ID	Total M Flying	Total F Flying	Total M Perching	Total F Perching	Total M Basking	Total F Basking	Total M Courting	Total F Courting	Total M Mating	Total F Mating	Total M Nectaring	Total of F Nectaring	Total F Ovipositing	Total M Observed in Block	Total F Observed in Court
Monday, July 10, 2017	*1*	25	14	0	0	0	0	0	0	0	0	0	0	0	25	14
	2	31	26	0	2	0	0	1	1	0	0	0	2	0	32	31
	4	2	2	0	0	0	0	0	0	0	0	0	0	0	2	2
	6	4	4	0	0	0	0	0	0	0	0	0	0	0	4	4
Tuesday, July 11, 2017	*35*	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	38n	16	16	0	0	0	0	0	0	0	0	0	0	0	16	16
	38s	10	8	0	2	0	0	0	0	0	0	0	0	1	10	11
	39n	1	6	0	1	0	0	0	0	0	0	0	0	0	1	7
	39s	10	14	0	0	0	0	0	0	0	0	0	0	0	10	14
	42n	9	8	0	0	0	0	1	1	0	0	0	2	0	10	11
	42s	14	11	0	0	0	0	0	0	1	1	0	1	1	15	14
	43e	7	7	0	0	0	0	1	1	1	1	0	0	0	9	9
	43n	10	12	0	1	0	1	0	0	0	0	0	0	0	10	14
	43w	2	0	0	0	0	0	0	0	0	0	0	1	0	2	1
Wednesday, July 12, 2017	*36n*	14	24	0	0	0	0	0	0	0	0	0	0	0	14	24
	36s	9	20	0	0	0	0	0	0	0	0	0	0	0	9	20
	37n	14	14	0	0	0	0	0	0	1	1	0	0	1	15	16
	37s	4	11	0	0	0	0	0	0	0	0	0	0	0	4	11
	25	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
	26	2	1	0	0	0	0	0	0	0	0	0	0	0	2	1
	27	3	2	0	0	0	0	0	0	0	0	0	0	0	3	2
	31	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
	40n	22	16	0	1	0	0	0	0	0	0	0	0	0	22	17
	40s	11	10	5	5	0	1	0	0	0	0	1	2	0	17	18
Thursday, July 13, 2017	*41n*	23	21	0	0	0	0	0	0	0	0	0	3	0	23	24
	41s	13	10	0	1	0	0	0	0	0	0	0	0	0	13	11
	44n	2	2	0	1	0	0	0	0	0	0	0	1	0	2	4
	44s	11	13	0	0	0	0	0	0	0	0	0	0	0	11	13
	45s	3	3	0	0	0	0	0	0	0	0	0	0	0	3	3
	5	3	2	0	0	0	0	0	0	0	0	0	0	0	3	2
	7	5	4	0	0	0	0	0	0	0	0	0	0	0	5	4
	8	11	17	0	1	0	0	0	0	0	0	0	0	0	11	18
Friday, July 14, 2017	*10*	5	5	0	0	0	0	0	0	0	0	0	0	1	5	6
	13	9	7	0	0	0	0	0	0	0	0	0	0	0	9	7
	14	5	1	0	1	0	0	0	0	0	0	1	1	0	6	3
	15	10	12	0	0	0	0	0	0	0	0	0	0	0	10	12
	16	14	7	5	4	0	0	0	0	0	0	1	1	0	20	12
	18	5	3	0	0	0	0	0	0	0	0	0	1	0	5	4
	20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
	9	7	5	0	0	0	0	0	0	0	0	0	1	1	7	7
				M = males	*F = females*								**2017 Grand Total of ESBB Observed in Blocks**		366	392
															758	

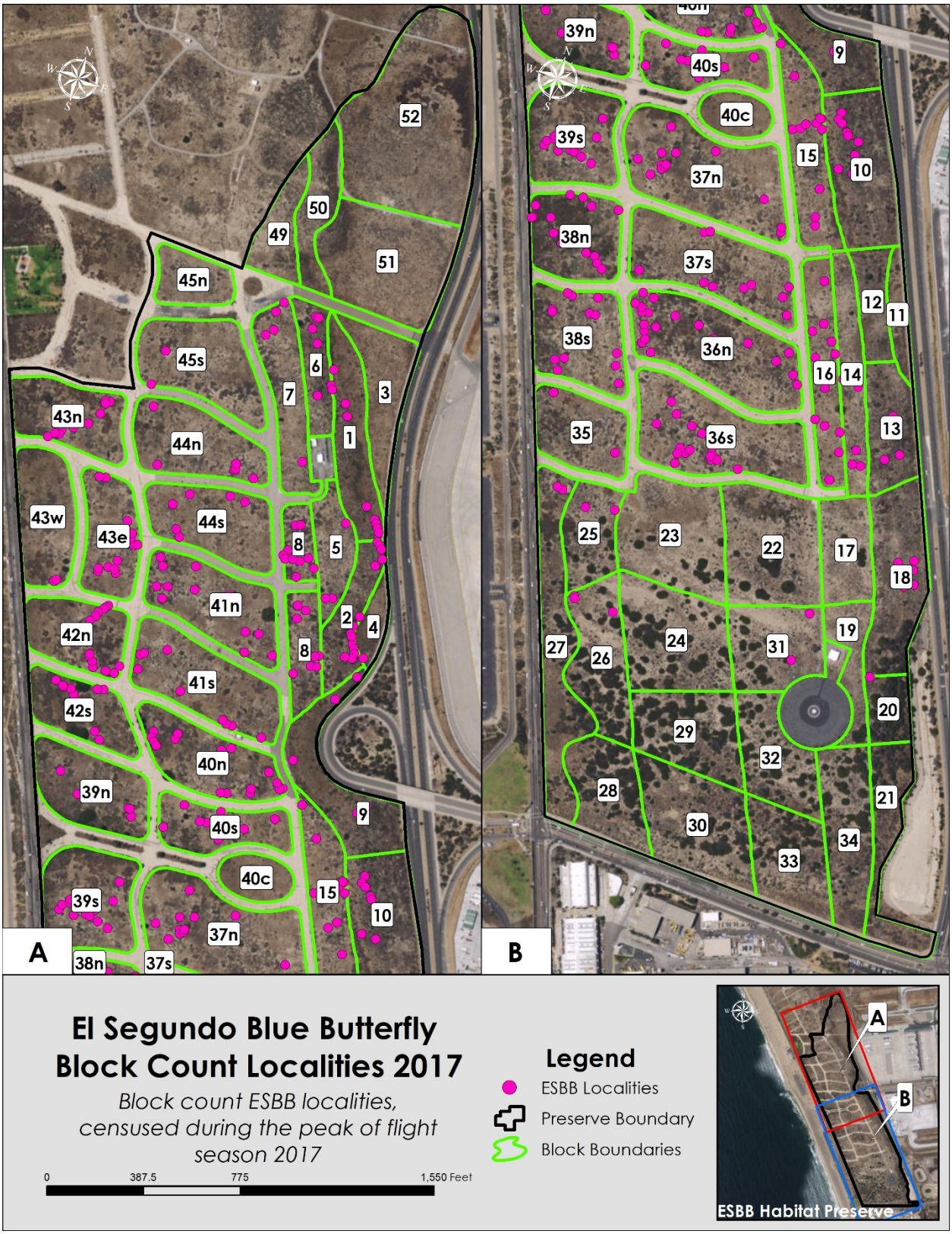

Figure 14. ESBB block count localities in 2017. Butterfly locations are strongly correlated to the location of healthy seacliff buckwheat plants. Note: Localities do not necessarily indicate single butterfly observations and buckwheat locations are from data gathered from buckwheat monitoring transects

3.3 Vegetation Monitoring Results and Discussion

WCS sampled all 150 vegetation plots concurrently with the peak of the ESBB's flight season and documented native, non-native, and bare ground cover values across 48 sampled blocks. Because WCS employed a truly randomized GIS-based method to distribute vegetation plots, some blocks were not sampled. In total, very few blocks (eight) had higher than 50-percent native cover out of 48 sampled blocks. The eight highly native blocks also correlated to higher bare ground cover values (Table 3, Figure 15). Inversely, high non-native cover values correlated to lower bare ground cover values and low native vegetation cover (Table 3, Figure 15).

Additionally, there is a loose spatial correlation between the cover values of native and non-native vegetation and the number of ESBB documented in each block. WCS proportionally considered the number of butterflies documented on the block census and displayed these against the cover class values of native, non-native, and bare ground percentages (Figure 15). Overall, most butterflies are observed in "more native" vegetation communities as opposed to "less native" vegetation communities. This further reinforces the relationship of the ESBB to its hostplant and in turn, seacliff buckwheat's relationship to its surrounding vegetative community and interstitial space amongst shrubs. If non-native plants are occupying the interstitial space in a dune or coastal scrub habitat (indicated by low bare ground percentages and high non-native cover values), buckwheat can in effect be outcompeted by other plants—whether by other buckwheat species or invasive plant species. This in turn, will reduce butterfly numbers observed in blocks.

Coastal dunes are dynamic interfaces that boast unique assemblages of flora and fauna found in no other habitats. Many species are restricted to this system and rely on shifting, un-stabilized sand sheets and flourish in the interdunal basins within an otherwise arid landscape. Ecologically sensitive species such as the silvery legless lizard burrow into loose sandy soil. The San Diego horned lizard feeds on harvester ants which in turn disperse seacliff buckwheat seed throughout the dunes. Rare and sensitive plants such as the California spineflower and Lewis' evening primrose provide forage for pollinator species not yet described as at risk. Unfortunately, as with many other unique habitats in California, dunes have been tremendously affected by habitat fragmentation, development, and invasive species infestations—some of which stabilize dune sheets and prevent normal ecological processes for many flora and fauna.

The bare ground cover value is an important indicator for the health of the dune system itself—it can indicate a healthy community of plants with high values of unvegetated and shifting sand between shrubs or inversely; it can indicate dense, monocultural stands of invasive plant infestations. Recording this metric is an important part of the bigger ecological picture at the Preserve and in turn it can become a metric for restoration success criteria if higher bare ground cover values are recorded in the future.

Additionally, a total of 250 buckwheat plants were counted in sampled blocks. Only 24 juvenile plants and no seedlings were documented indicating for yet another year that buckwheat is trending towards low-recruitment (Table 4, Figure 16). It should be noted that this low number of plants is indicative of a sampling methodology rather than a census. In order to elucidate a stronger relationship of the ESBB, buckwheat, and non-native species infestations, more vegetation plots should be installed and should also be stratified by block rather than by the

entirety of the Preserve. In a randomized methodology, some plots will cluster and other areas will not be sampled as is the case in 2017. However, if *stratified* and randomized, all blocks could be represented.

Lastly, of all non-native plant taxa recorded, non-native grasses (defined as species within the genera *Poa, Vulpia, Bromus, Avena*, etc.), iceplant (*Carpobrotus* spp.), filaree (*Erodium* spp.), and Russian thistle (*Salsola* spp.) were the four taxa with the highest average cover values observed in plots and generally are the most frequently occurring throughout plots (Table 5). Out of sampled plots, non-native grasses and iceplant are generally the densest of infestations; however, invasives such as Veldt grass should not be discounted with a maximum cover value recorded as 85.5 percent (Table 5).

WCS established the new vegetation sampling protocol in 2017 and in the future will elucidate a trend of non-native plant infestations and their relationship to buckwheat and the ESBB. However, in the meantime, a management plan is imperative to strategically manage each non-native species since not all infest equally (Section 4).

Table 3. Blocks and their averaged percent cover values organized by least amount of native vegetative cover. Red indicated high invasive cover and low native plant cover to illustrate the competitive relationship between native and non-native vegetation.

Block ID	Number of Plots	Averaged Percent Native Cover*	Averaged Percent Non-Native Cover**	Averaged Percent Bare Ground ł
40c	2	0.0%	96.5%	3.5%
9	1	2.0%	91.0%	7.0%
34	3	4.7%	77.3%	19.3%
26	1	6.0%	79.0%	15.0%
29	1	9.0%	66.0%	27.0%
42n	4	11.3%	69.5%	13.0%
3	1	14.0%	67.0%	19.0%
18	1	15.0%	61.0%	24.0%
52	4	15.8%	75.8%	8.5%
44s	6	15.8%	70.5%	13.7%
45n	1	18.0%	69.0%	13.0%
43w	3	18.0%	48.3%	27.0%
28	1	20.0%	65.0%	15.0%
14	1	21.0%	61.0%	18.0%
51	3	21.3%	66.3%	12.3%
4	2	21.5%	47.0%	6.5%
1	1	22.0%	68.0%	10.0%
43n	5	23.0%	65.6%	11.4%
16	3	24.3%	58.7%	17.0%
22	2	25.0%	39.0%	36.0%
40n	6	25.5%	62.5%	12.0%
35	5	27.6%	48.2%	24.2%
39n	4	30.3%	61.8%	8.0%
42s	4	31.5%	56.5%	12.0%
31	3	32.0%	9.0%	59.0%
27	2	33.0%	35.0%	32.0%
38s	5	33.2%	36.4%	22.0%
41n	6	33.8%	44.8%	19.2%
41s	7	36.3%	44.1%	17.4%
37s	4	37.3%	41.3%	21.5%
44n	5	39.6%	48.8%	11.6%
45s	4	40.0%	38.5%	11.0%
13	1	41.0%	48.0%	11.0%
50	1	41.0%	39.0%	20.0%
40s	5	42.2%	39.4%	18.4%
39s	5	44.6%	34.8%	20.6%
23	3	46.7%	17.7%	35.7%
38n	5	48.0%	34.0%	15.2%
8	2	49.0%	31.5%	19.5%
37n	5	49.6%	34.8%	15.2%
12	2	51.0%	27.5%	21.5%
2	2	55.5%	33.5%	11.0%
15	2	56.5%	33.0%	10.5%
36n	6	58.0%	27.0%	15.0%
43e	2	60.0%	17.5%	22.0%
24	1	60.0%	12.0%	28.0%
6	1	61.0%	5.0%	34.0%
36s	6	64.2%	12.7%	23.2%

** Red values indicate very little native plant cover*
*** Inversely, red values indicate very high non-native plant cover*
ł Red values indicate very little bare ground

Table 4. Blocks and the total number of buckwheat plants by age class and total number of flowerheads.

Block ID	Number of Plots	Total MATURE buckwheat	Total SENESCENT buckwheat	Total SEEDLING buckwheat	Total JUVENILE buckwheat	Total Flowerheads
40c	2	0	0	0	0	0
9	1	6	0	0	0	700
34	3	0	0	0	0	0
26	1	0	0	0	0	0
29	1	0	0	0	0	0
42n	4	8	5	0	5	292
3	1	0	0	0	0	0
18	1	0	0	0	0	0
52	4	0	0	0	0	0
44s	6	1	0	0	0	28
45n	1	0	0	0	0	0
43w	3	25	5	0	4	1054
28	1	0	0	0	0	0
14	1	0	0	0	0	0
51	3	0	0	0	0	0
4	2	0	0	0	0	0
1	1	0	0	0	0	0
43n	5	4	2	0	3	2270
16	3	0	0	0	0	0
22	2	0	0	0	0	0
40n	6	0	0	0	0	0
35	5	0	0	0	0	0
39n	4	1	0	0	0	12
42s	4	9	1	0	3	5950
31	3	3	1	0	1	1020
27	2	0	0	0	0	0
38s	5	11	3	0	0	2450
41n	6	8	0	0	0	2165
41s	7	10	2	0	6	890
37s	4	0	0	0	0	0
44n	5	1	0	0	0	40
45s	4	0	0	0	0	0
13	1	12	2	0	0	4300
50	1	26	9	0	1	9805
40s	5	2	2	0	0	1160
39s	5	8	3	0	0	2340
23	3	20	3	0	1	2000
38n	5	4	0	0	0	300
8	2	4	0	0	0	450
37n	5	2	0	0	0	49
12	2	1	0	0	0	320
2	2	1	0	0	0	80
15	2	8	5	0	0	1010
36n	6	0	0	0	0	0
24	1	4	4	0	0	940
43e	2	0	0	0	0	0
6	1	0	0	0	0	0
36s	6	0	0	0	0	0
Grand Total		**250 buckwheat plants**				**39,625**

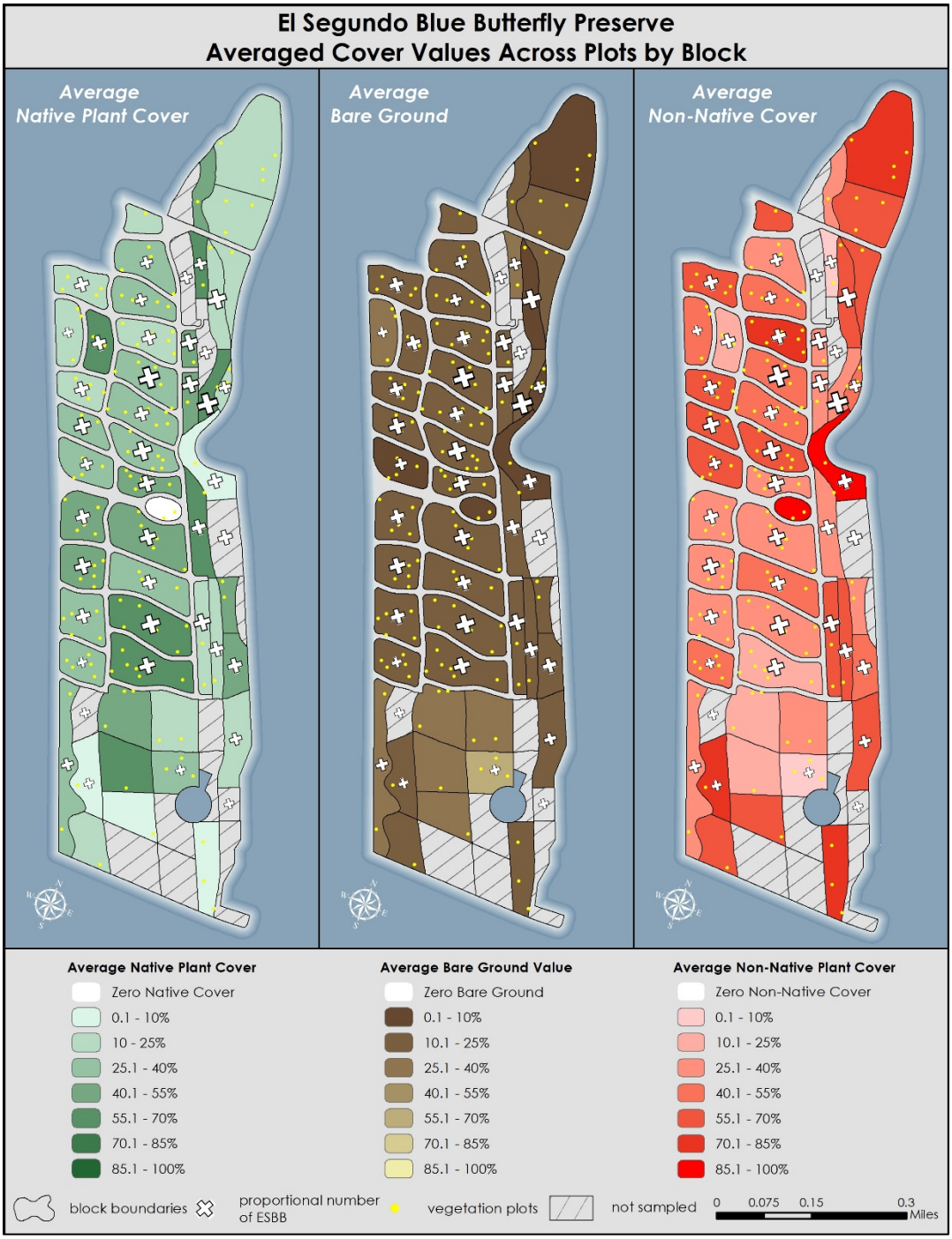

Figure 15. Averaged cover values of native, non-native, and bare ground cover by block. Also note the loose correlation between the cover value and the proportional number of ESBB by block.

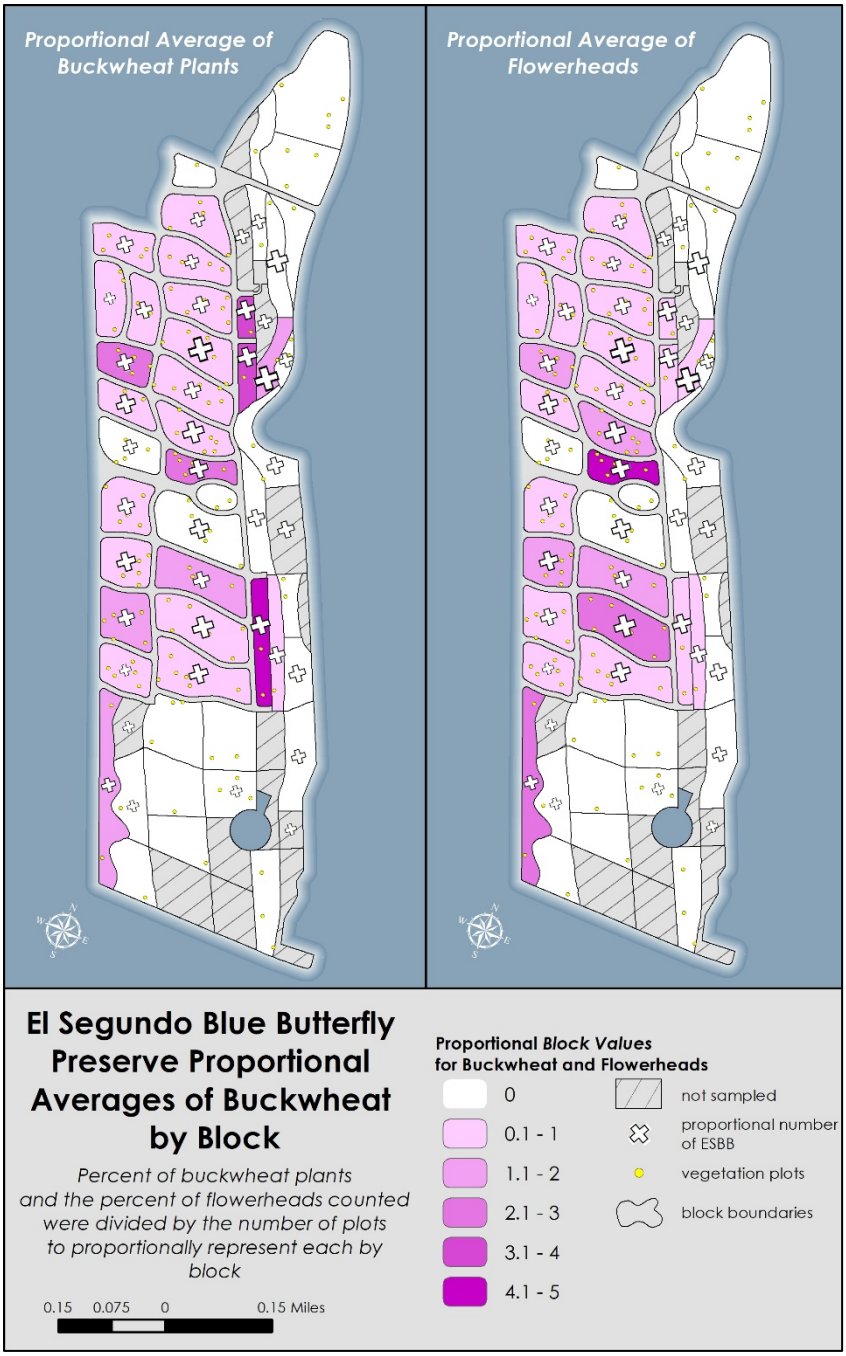

Figure 16. Proportional averaged values of buckwheat plants and flowerheads by block. Also note the loose correlation between the *Block Value* and the proportional number of ESBB by block. Plots with a color indicate that the vegetation plots documented seacliff buckwheat. Darker color indicates higher numbers of detected buckwheat and flowerheads and loosely correlates to the number of observed butterflies in each block. However, also note the number of blocks where vegetation plots did not detect buckwheat—either due to low abundance or the absence of buckwheat in the block all-together.

Table 5. Non-native plant species detected in vegetation plots organized from the higher average cover (red values) to the lowest average cover (green values). Minimum and maximum recorded values are also displayed (midpoint of the binned cover values). Generally, non-native plant species with the highest cover values also occur more frequently than other non-native plant species.

Species	Average Cover	Minimum	Maximum	Frequency
Non-Native Grasses	17.1%	0%	95.5%	84.7%
Iceplant (*Carpobrotus* spp.)	7.3%	0%	95.5%	23.3%
Filaree (*Erodium* spp.)	6.8%	0%	55.5%	52.7%
Russian Thistle (*Salsola* spp.)	3.1%	0%	25.5%	62.0%
Bermuda Grass	2.1%	0%	35.5%	12.7%
Wattle (*Acacia* spp.)	1.8%	0%	75.5%	8.7%
Ornamental Succulents	1.7%	0%	75.5%	4.0%
Carnation Spurge	1.7%	0%	45.5%	34.0%
California Buckwheat	1.3%	0%	65.5%	5.3%
Veldt Grass	1.1%	0%	85.5%	6.0%
Wild Radish	0.3%	0%	45.5%	1.3%
Peruvian Peppertree	0.3%	0%	35.5%	1.3%
Ashyleaf Buckwheat	0.2%	0%	25.5%	0.7%
Saharan Mustard	0.1%	0%	8.0%	3.3%
Jade Plant	0.1%	0%	8.0%	1.3%
Red Iceplant	0.1%	0%	3.0%	2.0%
Mexican Fan Palm	0.0%	0%	3.0%	0.7%
Castor Bean	0.0%	0%	0.5%	0.7%

3.4 Seasonal ESBB Population Estimate Results

Based on recommendations made by Dr. Arnold in 2016, population estimates were only calculated using the Holmes and Arnold estimator in 2017 (Olthof and Arnold 2016). In 2016, seasonal population sizes for the ESBB using the Holmes and Arnold estimator were calculated for the years 2002 through 2016 and compared to population sizes generated by Huang's estimator (Huang and Arnold 1998). The trends in seasonal population sizes during this 15-year period were essentially identical except that the Huang estimates were approximately 2.30 to 2.44 times greater than Holmes and Arnold estimates. The primary reason for this differential is due to the use of actual lifespan frequencies in the Holmes and Arnold estimator. Since the observed lifespans from an earlier capture-recapture study of the ESBB were longer than those estimated by Huang, this results in lower population size estimates (Arnold 1986). For this reason, only the Holmes and Arnold estimator will be used to estimate future seasonal population sizes of the ESBB at LAX.

The seasonal population curve for 2017 created using the Holmes and Arnold is displayed in Figure 18. The open circles in this graph are the actual numbers of ESBB adults observed on the historical transect counts for each survey date. The line fitted to these counts is the seasonal population curve for the 2017 ESBB adult population. The area under the population curve represents the total number of butterflies during the adult flight season. Using the Holmes and Arnold method, WCS calculated the ESBB's 2017 seasonal population estimate to be between 3,751 and 4,166 individuals (Figure 18).

While calculating the seasonal population estimates for 2017, WCS detected a data pivoting error in the 2016 dataset. This error was due to an initial unfamiliarity with the dataset before inclusion

in the generation of the population estimate by Dr. Arnold and has since been resolved. Therefore, the 2016 estimate of 10,084 to 11,284 butterflies was corrected to 5,100 to 5,676 butterflies for the 2016 flight season.

Unfortunately, the 2011 – 2017 California drought directly corresponds to the steep six-year decline in the ESBB population at the Preserve as well as the decline of seacliff buckwheat recruitment. Although the 2017 rain year saw above-average rainfall, six years of below-average precipitation is still affecting its toll on the ESBB population in combination with invasive plant species infestations (Figure 13).

Additionally, this model relies on the number of days butterflies are detected on the historical transect in combination with the block count census. Historically, once weekly transect surveys were adequate to obtain accurate population estimates. However, in recent years there appears to be a trend towards shorter flight seasons as evidenced by later first emergence dates and earlier end-of-season dates. A shorter flight season and in effect fewer days of detected butterflies may affect the statistical model and, in turn, provide poorer estimates of ESBB population numbers. WCS recommends that a statistical power analysis is conducted to determine if there is a statistical trend towards shorter seasons. If a power analysis determines that seasons are in fact becoming shorter, the number of ESBB surveys may need to be increased in future years to obtain accurate population estimates.

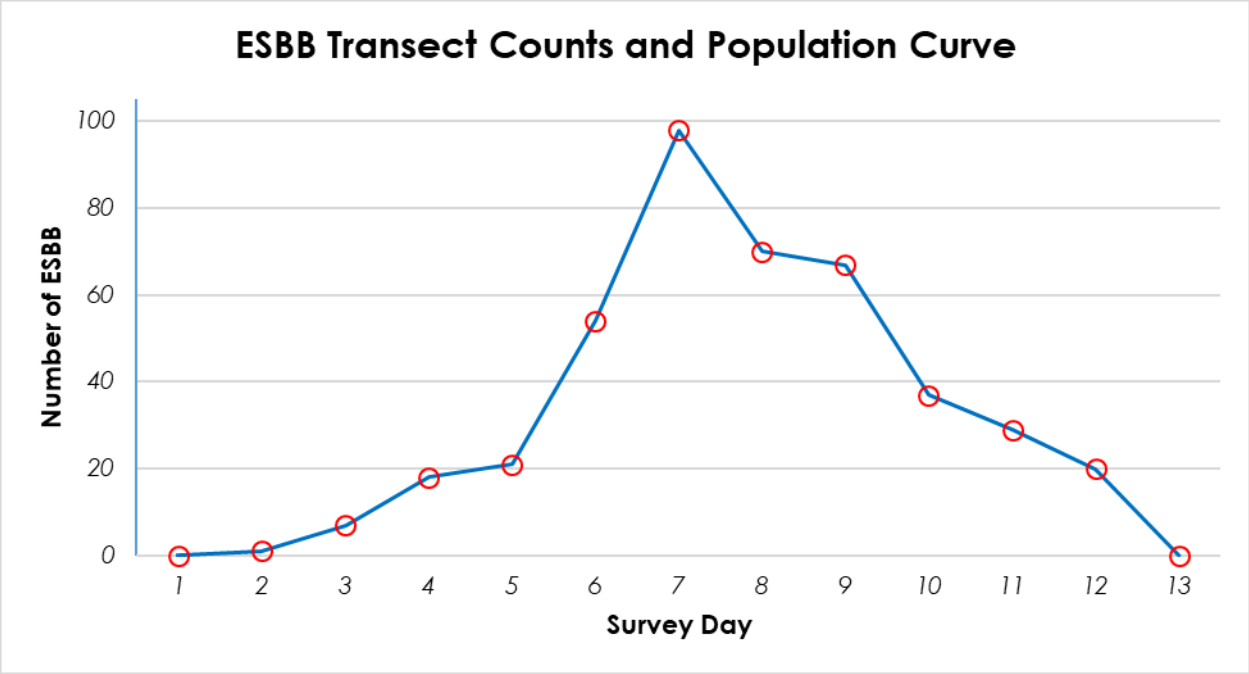

Figure 17. ESBB population curve for 2017 historical transect surveys at the El Segundo Blue Butterfly Habitat Restoration Area.

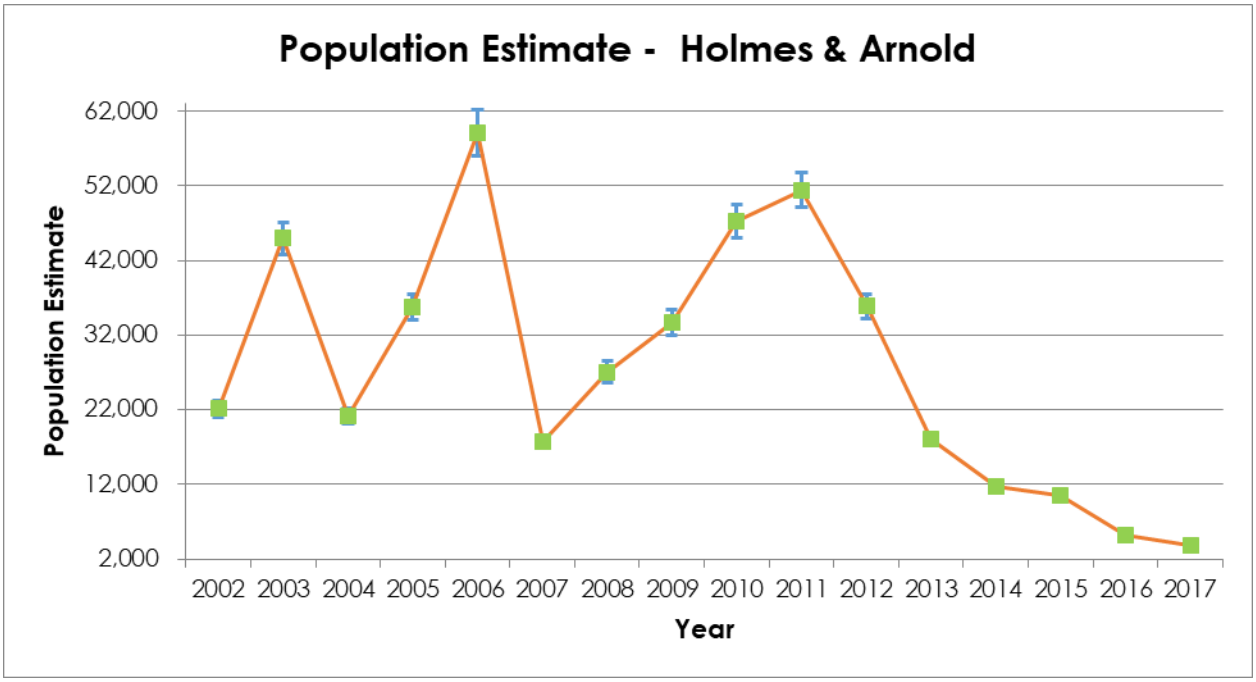

Figure 18. Population estimate generated using the Holmes and Arnold method. Blue error bars indicate the standard error each year.

4.0 Invasive Plant Management Strategies

The ESBB is emblematic of the conservation success story at the Preserve—a charismatic subspecies brought back from the brink of extinction and is heralded as the unofficial mascot of

LAX. However, species-specific conservation may happen at the expense of other taxa and an entire system can be left vulnerable and becomes a feedback loop negatively affecting the butterfly. Although seacliff buckwheat still currently supports an ESBB population, the butterfly and its host plant buckwheat including many other plant and animal species are at risk of displacement due to the incursion of invasive species. Not only do invasive plants displace rare and common native plants, but because most of these species form dense colonies, they impede the natural processes of dune movement. In natural communities, dunes continually move in response to wind pressure and wave action, typically forming morphologically and floristically distinct smaller foredune and larger back dune communities which have been prevented at the Preserve. Invasive species such as non-native grasses, filaree, Bermuda grass, veldt grass, and iceplant prevent the natural migration of sand, which leads to an impoverished native vegetation community and a subsequent decrease in value of this system to wildlife.

In 1992 and 1994, the City of Los Angeles officially protected the 203-acre Preserve by re-zoning it for nature preservation-related land uses only (City of Los Angeles Ordinances No. 167,940 and 169,676). The Preserve is currently protected as an Environmentally Sensitive Habitat Area by the California Coastal Commission under the California Coastal Act of 1976, as habitat for sensitive species of concern by the California Department of Fish and Wildlife (CDFW) under various California laws, and of course as part of the El Segundo Blue Butterfly Preserve by the USFWS under the ESA.

Therefore, management objectives must be clearly defined to protect the vulnerable, last-remaining dune system and its sensitive species contained within based on current, quantifiable data.

4.1.1. Invasive Plant Map

In an effort to define management objectives clearly and beyond the conservation of a single species, baseline inventories of the threats against these species should be gathered. Invasive plant distribution and cover are critical to accurately and responsibly identifying the species that are threats to the Preserve at LAX. Geospatial invasive plant occurrence data assists landscape managers in determining which species and populations should be targeted for control (or eradication when possible) based off the current management objectives, available resources, and threatened natural resources. These baseline data and maps also give landscape managers a quantifiable way to show measurable progress towards achieving defined management goals.

An up-to-date and complete invasive species map should be generated for the ESBB Preserve to effectively determine which species are posing the greatest risks on the landscape. Maps should include a combination of point and polygon data in addition to grid cover density estimates. Grid density estimates should be used for species that are widespread, do not have discernable population boundaries that are easily delineated, such as iceplant species and *Salsola* spp., or are diffuse across the landscape. Two examples are included in Figures 19 and 20 that display point and polygon data as well as grid cover estimates. These maps were generated for Guadalupe National Wildlife Refuge, a similar dune system, to further define their management objective of returning the refuge to natural dune processes.

4.1.2. Invasive Plant Prioritization

Newly introduced invasive species often spread quickly. Early detection and monitoring can help land managers prioritize species likely to cause the most ecological damage before species become entrenched and too costly to effectively control.

The Invasion Curve is a concept in conservation biology that shows that eradication of an invasive species becomes less likely and control costs increase as an invasive species spreads over time (Figure 21). Prevention is the most cost-effective solution, followed by eradication if conducted in a timely manner. If a species is not detected and removed early, intense and long-term control efforts become unavoidable and are done as asset-based protection, for instance in the case of the ESBB.

Identifying where a species falls on the invasion curve is the first step to taking management action, followed by defining quantifiable characteristics of each invasive species. Once invasive species inventories and baseline data are acquired and an understanding of where species fall on the invasion curve, an accompanying prioritization is necessary to manage multiple invasive species at the landscape level in an ecologically sensitive manner. This requires a systematic and transparent methodology that is easily communicated to all management stakeholders.

Identifying quantifiable invasive plant characteristics that can be subjected to a ranking scheme allows for the consistent prioritization of key elements to be objectively compared across all species. These ranking elements can then be compared to the management objectives to develop customizable management prioritization schemes in a cost-effective way.

An example of a Prioritization Ranking Scheme is presented in Table 6. A series of index values ranging from 1 to 3 were developed for each prioritization variable. An index rank of 3 was assigned to variables that correlate with high priority treatment conditions such as small number and size of infestations; small net and gross acreages; California Invasive Plant Council's inventory rating for ecological damage caused by each species; invasive plants infesting high quality or high priority habitat areas; and other site-species variables. An index ranking of 1 was designated for inverse conditions that correlate with low priority treatment conditions. These various index values were then compiled to develop an overall invasive plant priority ranking system to determine species from highest to lowest priority for management action.

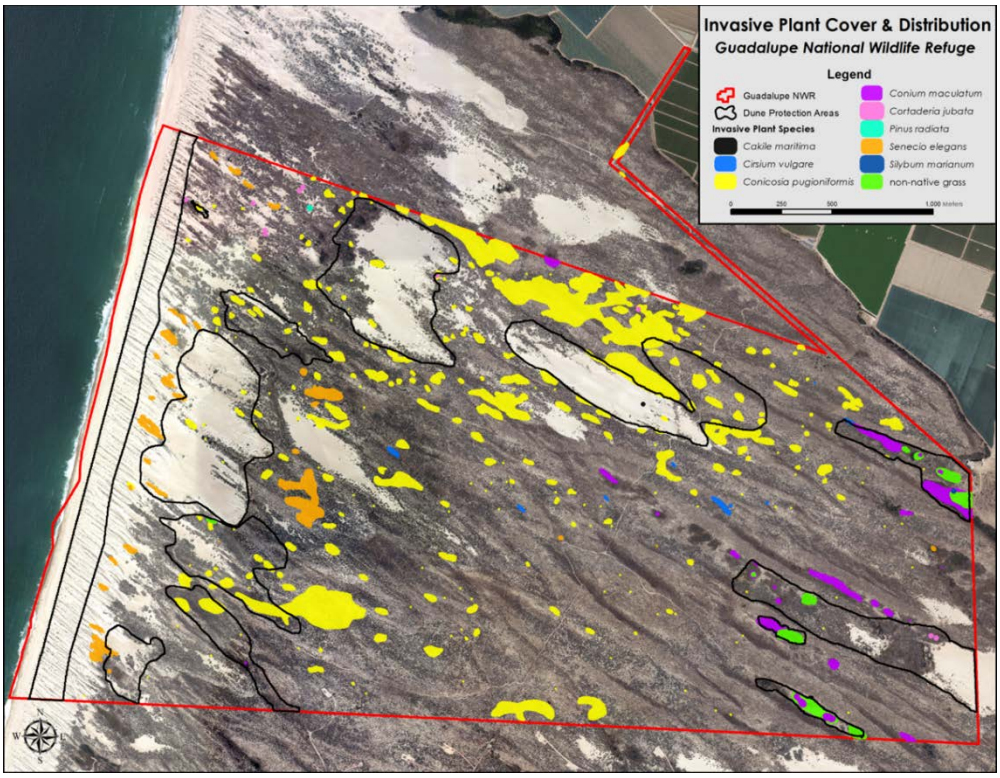

Figure 19. Sample invasive plant cover and distribution map generated by WCS for Guadalupe National Wildlife Refuge.

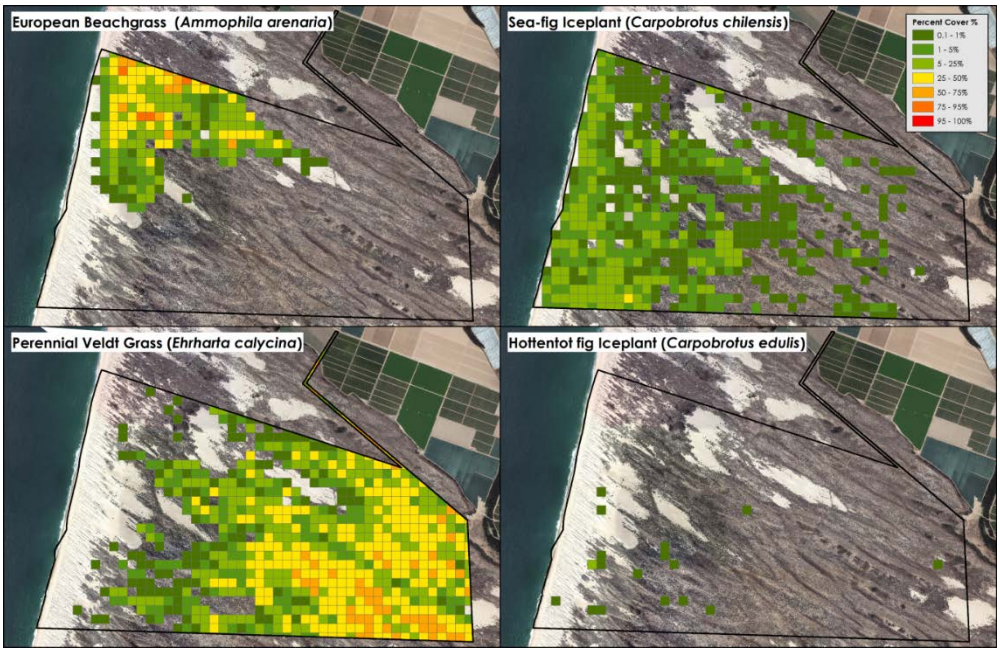

Figure 20. Sample grid cover densities of selected invasive plant species generated by WCS for Guadalupe National Wildlife Refuge.

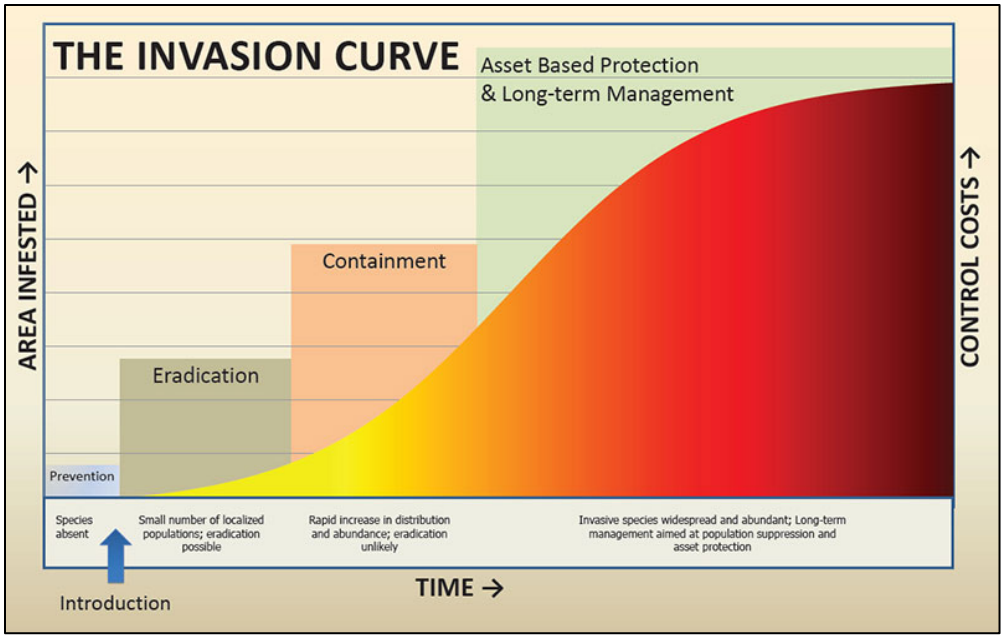

Figure 21. View of the classic *Invasion Curve* showing the relationship between invasive plant infestation "size" and control costs. Photo courtesy of the North American Invasive Species Network (http://www.naisn.org).

Table 6. Example of a customizable invasive plant prioritization index that guides management decisions on treatment strategies for various invasive plants.

Species Name	Common Name	Stand Total Index Weighting Factor	Stand Total Index	Gross Area Index Weighting Factor	Gross Area Index	Net Area Index Weighting Factor	Net Area Index	Cal-IPC Rank Index Weighting Factor	Cal-IPC Rank Index	Habitat Priority Index Weighting Factor	Habitat Priority Index	Life Cycle Index Weighting Factor	Life Cycle Index	Fecundity Index Weighting Factor	Fecundity Index	Seed Longevity Weighting Factor	Seed Longevity	Additive Priority Score	Weighted Priority Score
Conium maculatum	poison hemlock		3		3		3		2		2.63		3		3		2	21.63	23.63
Cirsium vulgare	bull thistle		3		3		3		2		2.01		3		3		2	21.01	23.01
Senecio elegans	red-purple ragwort		3		3		3		2		1.97		3		3		2	20.97	22.97
non-native grasses	non-native grasses		3		3		3		2		2.12		3		3		1	20.12	22.12
Cortaderia jubata	jubata grass		3		3		3		3		2.07		1		3		1	19.07	22.07
Silybum marianum	milk thistle		3		3		3		1		3.00		3		3		2	21.00	22.00
Carpobrotus edulis	hottentot fig iceplant	x1	3	x1	3	x1	3	x2	3	x1	1.98	x1	1	x1	2	x1	2	18.98	21.98
Cakile maritima	European searocket		3		3		3		1		2.00		3		3		2	20.00	21.00
Conicosia pugioniformis	slender-leaved iceplant		1		2		3		1		1.98		3		2		2	15.98	16.98
Ehrharta calycina	perennial veldt grass		1		1		1		3		1.72		1		3		2	13.72	16.72
Pinus radiata	Monterey Pine		3		3		3		1		2.51		1		1		1	15.51	16.51
Carpobrotus chilensis	sea-fig iceplant		1		1		2		2		1.96		1		2		2	12.96	14.96
Ammophila arenaria	European beachgrass		2		1		1		3		1.81		1		1		1	11.81	14.81

Cal-IPC Rank Index values displayed in RED are species that have yet to be assessed by Cal-IPC. Instead, the rankina value was inferred based on WCS observations on the GNWR and the central coast reaion of California as a whole.

4.1.3. Management Plans

After invasive plant data have been acquired, compiled, and analyzed, multi-phase management plans with thorough treatment methodologies compliant with National Environmental Policy Act and California Environmental Quality Act constraints should be established. Invasive plant control activities should be treated as the beginning stages of a management plan, followed by a second-phase or concurrent restoration plan.

While executing various stages of invasive plant removal work, previously denuded areas cleared of infestations will be primed for restoration efforts as a second phase. While conducting invasive plant removal work, efforts should be made to identify good propagule material of rarer species so they can be spread throughout the dune system that have been denuded through time.

At present, it appears that some rare native plant species are present in extremely limited numbers or not at all, but a persistent seedbank may still exist. Dunes are prone to self-healing if invasive plants can be managed first and foremost.

5.0 Literature Cited

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