FOR CONTRACT NO: 04-013524
PROJECT ID: 04-12000608

INFORMATION HANDOUT

WATER QUALITY

WQ1 California Regional Water Quality Control Board Order 01-120
(Issued October 17, 2001)

WQ2 California Regional Water Quality Control Board Order R2-2002-0011
(Issued January 23, 2002)

PERMITS, LICENSE, AGREEMENT & CERTIFICATION

P1 California Department of Fish and Game (CDFG) Incidental Take
Permit No. 2081-2001-021-03
(Issued November 19, 2001)

P2 CDFG Incidental Take Permit No. 2081-2001-021-03 Minor Amendment #1
(Issued October 14, 2009)

P3 CDFG Incidental Take Permit No. 2081-2001-021-03 Major Amendment #2
(Issued February 23, 2012)

P4 CDFG Incidental Take Permit No. 2081-2001-021-03 Minor Amendment #3
(Issued September 6, 2012)

P5 U.S. Army Corps of Engineers (ACOE) Permit No. 023013S
(Issued December 04, 2001)

P6 U.S Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued April 2, 2002)

P7 U.S Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued November 12, 2002)

P8 U.S Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued April 11, 2005)

P9 U.S Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued August 15, 2005)

P10 U.S Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued September 23, 2005)

P11 U.S. Army Corp of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued May 20, 2008)

P12 U.S. Army Corp of Engineers (ACOE) Permit No. 023013S Time Extension
(Issued November 16, 2011)

P13 U.S. Army Corp of Engineers (ACOE) Permit No. 023013S Letter of Modification
(Issued July 6, 2012)

P14 San Francisco Bay Conservation and Development Commission (BCDC)
Permit No. 2001.008.34, Issued November 20, 2001
Last Amended January 23, 2014, Reflects Amendments 1-34

P15 National Marine Fisheries Service (NMFS) Biological Opinion and Incidental Take Statement
(Issued October 30, 2001)

P16 NMFS Supplemental Biological Opinion and Conference Opinion
(Issued April 10, 2009)

P17 NMFS Supplemental Biological Opinion and Conference Opinion
(Issued August 21, 2009)

P18 NMFS Supplemental Biological Opinion and Conference Opinion
(Issued February 6, 2012)

P19 NMFS Incidental Harassment Authorization
(Issued December 18, 2013)

P20 U.S. Fish and Wildlife Service (USFWS) Biological Opinion
(Issued October 29, 2001)

P21 U.S. Coast Guard (USCG) New Bridge Permit 3-01-11
(Issued December 11, 2001)

P22 U.S. Coast Guard (USCG) New Bridge Permit Amendment 3a-01-11
(Issued November 18, 2011)

MATERIALS INFORMATION

M1 SFOBB 504' & 288' Spans Inspection Reports

M2 SFOBB 504' & 288' Spans Original Construction Sequence

M3 SFOBB East Span Design Specifications – Superstructure Circa 1933

M4 Existing Bridge Modification Contract 4011 Resident Engineers Report on Deck Paving –East Bay July 19 1963 (Testing Reports and Contract Specifications)

M5 Existing Bridge Modification Contract 4030 Resident Engineers Report on Steel Work – East Bay Sept 18 1963 (Testing Reports and Contract Specifications)

M6 Original Bridge Contract 7 Superstructure East Bay Crossing Final Report March 24 1937 (Material Specifications and Testing Reports)

M7 Original Bridge Contract 7 Superstructure East Bay Crossing Specifications March 8 1933 (Contract Specifications and Cantilever Erection Procedure)

M8 Original Bridge Tests of Heavy Riveted Joints – Second Progress Report (1936)

M9 Original Bridge Tests of Heavy Riveted Joints – Special Report on Manganese Steel Specimens (1936)

M10 Original Bridge Tests on Riveted Tension Members and Their Connections (1934)

M11 SFOBB East Span Floor System Original Design Calculations (1933)

M12 SFOBB East Span Original Construction Photographs from Bancroft Library

M13 Pile Installation Demonstration Project (PIDP) Geotechnical Report: Main Text and Appendices

M14 Ground Motion Report: Main Text and Appendices

M15 Final Marine Geophysical Survey Report:
Volume-1, Main Text and Appendices
Volumne-2, Maps

M16 Final Marine Geotechnical Site Characterization Report:
Volume-1, Main Text and Illustrations
Volume-2A through Volume-2H

M17 Phase I Subcontractor Reports - Preliminary Geotechnical Site Characterization
Volume-1 through Volume-4

M18 Phase-II Subcontractor Reports - Final Geotechnical Site Characterization
Volume-1 through Volume-3

M19 Analysis and Design Procedures for Pile Foundations Supporting Temporary Towers Skyway Structures: Main Text and Appendices dated March 2001

M20 Revised Final Oakland Shore Approach Geotechnical Site Characterization Report, dated March 2001: Volumes 1, 2A, 2B, 3, and 4

M21 1920 Geology Reports

M22 1930 Boring Logs for Original Bay Bridge

M23 Final Geotechnical Foundation Report for Oakland Shore Approach Structures

M24 Caltrans Bathymetric Survey Report No. 23.00007024 R1 (2103)

M25 San Francisco-Oakland Bay Bridge East Span Underwater Debris Diagram, dated May 2001

M26 SFOBB East Span Survey Information, Control Diagram dated December 30, 2002

M27 USCG Private Aid to Navigation Sample Application Form

M28 Geotechnical & Material Report for YBI

M29 Ground Penetration Report No. 6488-01, GEO Vision, November 2006

M30 Historical Maps (1917, 1932, 1933)

M31 Construction Vibration Monitoring Field Data Form

M32 Water Quality Information Handout (Contract No. 04-01352) dated December 2012

M33 Correspondence with United States Custom Service regarding Jones Act and use of crane/barge, 2002 and 2005

M34 Phase 1 Archaeological Survey Report- Maritime Archaeology, September 1999

M35 Addendum to Archaeological Survey Report-Maritime Archeology, December 6, 1999

M36 Addendum to Archaeological Survey Report-Maritime Archeology, March 2000

M37 Addendum to Archaeological Survey Report-Maritime Archeology, August 17, 2000

M38 SFOBB 504' & 288' Spans Construction Photographs

M39 Addendum Original Bridge Contract 7 Superstructure East Bay Crossing Shop Drawings

M40 Partial BrIM model for the 504' & 288' Spans

M41 Lead concentration data for the roadway asphalt by Advanced Technology Laboratories dated April 30, 2014

M42 Air Dispersion Modeling and Risk Assessment Summary Report for SFOBB 504/288 Spans Demolition

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M43 Air Dispersion Modeling and Risk Assessment Summary Report for SFOBB Cantilever Truss Demolition

M44 Air Quality Monitoring Program Summary Report SFOBB Cantilever Truss Demolition (November 2013 through April 2014)

M45 Steel Beam Test-Cut Simulations Air Monitoring Results for SFOBB Oakland Touchdown Demolition

M46 Bare Steel Risk Assessment – SFOBB Cantilever Truss Demolition Project

M47 Structure Type Selection and Seismic Retrofit Strategy Report (Wharf Condition Report), January 2014

M48 Technical Memorandum - PCB Risk Evalution, Old East Span Deconstruction by AMEC dated October 17, 2014

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M49 Technical Report - 504/288 Contract, Nesting Bird Deterrence Measures dated September 2014

M50 Bird Management Plan for Bridge Dismantling - 504/288 Contract dated September 2014

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M49 Technical Report - 504/288 Contract, Nesting Bird Deterrence Measures dated September 2014

4 REPLACED PER ADDENDUM NO.4 DATED JANUARY 16, 2015

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	M2	1.2	504' & 288' Spans Original Construction Sequence
	M3	1.3	SFOBB East Span Design Specifications - Superstructure Circa 1933
	M4	1.4	Existing Bridge Modification Contract 4011 Resident Engineers Report on Deck Paving - East Bay July 19, 1963 (Testing Reports and Contract Specifications)
04-013524-IH-Vol02.pdf	M5	1.5	Existing Bridge Modification Contract 4030 Resident Engineers Report on Steel Work - East Bay Sept 18, 1963 (Testing Reports and Contract Specifications)
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	M7	1.7	Original Bridge Contract 7 Superstructure East Bay Crossing Specifications March 8, 1933 (Contract Specifications and Cantilever Erection Procedure)
	M8	1.8	Original Bridge Tests of Heavy Riveted Joints - Second Progress Report (1936)
04-013524-IH-Vol03.pdf	M9	1.9	Original Bridge Tests of Heavy Riveted Joints - Special Report on Manganese Steel Specimens (1936)
	M10	1.10	Original Bridge Tests on Riveted Tension Members and Their Connections (1934)
	M11	1.11	SFOBB East Span Floor System Original Design Calculations (1933)
	M12	1.12	SFOBB East Span Original Construction Photographs from Bancroft Library
04-013524-IH-Vol04.pdf	M13	2.1	Pile Installation Demonstration Project (PIDP) Geotechnical Report: Main Text and Appendices
	M14	2.2	Ground Motion Report: Main Text and Appendices
	M15	2.3	Final Marine Geophysical Survey Report: Volume-1, Main Text and Appendices
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	M23	2.11	Final Geotechnical Foundation Report for Oakland Shore Approach Structures
	M24	2.12	Caltrans Bathymetric Survey Report No. 23.00007024 R1 (2013)

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04-013524-IH-Vol09.pdf	P1	3.1.1	California Department of Fish and Game (CDFG) Incidental Take Permit No. 2081-2001-021-03. Issued November 19, 2001
	P2	3.1.2	CDFG Incidental Take Permit No. 2081-2001-021-03 Minor Amendment #1. Issued October 14, 2009
	P3	3.1.3	CDFG Incidental Take Permit No. 2081-2001-021-03 Major Amendment #2. Issued February 23, 2012
	P4	3.1.4	CDFG Incidental Take Permit No. 2081-2001-021-03 Minor Amendment #3. Issued September 6, 2012
	P5	3.1.5	U.S. Army Corps of Engineers (ACOE) Permit No. 023013S. Issued December 04, 2001
	P6	3.1.6	U.S. Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification. Issued April 2, 2002
	P7	3.1.7	U.S. Army Corps of Engineers (ACOE) Permit No. 023013S Letter of Modification. Issued November 12, 2002
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04-013524ad3-IH.pdf	M49	3.21	Technical Report - 504/288 Contract, Nesting Bird Deterrence Measures dated September 2014
▽3	M50	3.22	Bird Management Plan for Bridge Dismantling - 504/288 Contract dated September 2014
04-013524ad4-IH.pdf ▽4	M49	3.21	Technical Report - 504/288 Contract, Nesting Bird Deterrence Measures dated September 2014

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San Francisco – Oakland Bay Bridge

East Span Seismic Safety Project

CALIFORNIA DEPARTMENT OF TRANSPORTATION

TECHNICAL REPORT

504/288 Contract
NESTING BIRD DETERRENCE MEASURES:
MATERIALS AND APPLICATIONS

September 2014

EA 04-013521
04-SF-80 KP 12.2/KP 14.3
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San Francisco-Oakland Bay Bridge East Span Seismic Safety Project

504/288 Nesting Bird Deterrence

Materials and Applications

EA 04-013521

September 2014

STATE OF CALIFORNIA
Department of Transportation

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Appendices

ACRONYMS AND ABBREVIATED TERMS

2014 BMP	San Francisco-Oakland Bay Bridge East Span Seismic Safety Project Bird Management Plan for Bridge Dismantling - 504/288 Contract (Supplement to the 2003 Final (Revised) Bird Monitoring and Management Plan)
504/288	The 504-foot Truss Spans and 288-foot Truss Spans of the original east span of the SFOBB
BCDC	San Francisco Bay Conservation and Development Commission
BDP	Bird Deterrence Plan
CDFW	California Department of Fish and Wildlife (formally: California Department of Fish and Game)
CFGC	California Fish and Game Code
CESA	California Endangered Species Act
Department	California Department of Transportation
FEIS	San Francisco-Oakland Bay Bridge East Span Seismic Safety Project Final Environmental Impact Statement
FESA	Federal Endangered Species Act
MBTA	Migratory Bird Treaty Act
OTD	Oakland Touchdown
PLAC	Permits Licenses Agreements and Certifications
RWQCB	Regional Water Quality Control Board
SFOBB	San Francisco-Oakland Bay Bridge
SFOBB Project	San Francisco-Oakland Bay Bridge East Span Seismic Safety Project
USFWS	United States Fish and Wildlife Service

CHAPTER 1 – INTRODUCTION

1.1 Project Description

The California Department of Transportation (Department) has replaced the east span of the San Francisco-Oakland Bay Bridge (SFOBB) with a new bridge immediately to the north of the original span. The SFOBB East Span Seismic Safety Project (SFOBB Project) site is located in the central San Francisco Bay, between Yerba Buena Island in the City and County of San Francisco, and the City of Oakland, in Alameda County, in California (Figure 1.1). The SFOBB Project includes both the construction of the new east span and the dismantling of the original east span (Figure 1.2 and Appendix A). The SFOBB Project is a multi-year effort that involves a number of construction activities on land as well as in San Francisco Bay. Some of these activities could potentially affect protected bird species.

Figure 1.1 SFOBB project and vicinity

Figure 1.2 SFOBB new and original east spans

To address potential impacts to environmental resources, the Department and Federal Highway Administration prepared the SFOBB Project Final Environmental Impact Statement (FEIS), dated May 2001, pursuant to the National Environmental Policy Act. The Department also obtained approvals from regulatory agencies for all activities associated with both the construction of the new east span and the dismantling of the original east span. Regulatory agency approvals obtained from the United States Fish and Wildlife Service (USFWS), the California Department of Fish and Wildlife (CDFW), formerly the California Department of Fish and Game (CDFG), and the San Francisco Bay Conservation and Development Commission (BCDC) specifically addressed potential impacts to birds. When the FEIS was prepared and agency approvals were obtained in 2001, three federally and/or state listed bird species were identified as being present in or near the project area. These species are the California least tern, California brown pelican, and American peregrine falcon. The California least tern is also listed as endangered under both the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA). The formerly state and federally endangered California brown pelican was delisted from both FESA and CESA in 2009. The formerly state and federally endangered American peregrine falcon was delisted from FESA in 1999 and delisted from CESA in 2008. The California least tern, California brown pelican, and American peregrine falcon, remain fully protected by the California Fish and Game Code (CFGC).

In addition to birds identified in SFOBB Project approvals, the Department also observes other applicable state and federal regulations, such as the federal Migratory Bird Treaty Act (MBTA) and the CFGC, to protect birds and their nests within the SFOBB Project area.

1.2 SFOBB and the Dismantling of the 504-ft and 288-ft Spans of the Original East Span

The purpose of this report is to identify bird deterrence requirements for the SFOBB Project Construction Contract to remove the 504-foot and 288-foot spans (504/288) and steel support towers of the Original East Span beginning during the 2015 nesting season. The Department expects the 504/288 contractor to submit a work sequence for dismantling the SFOBB Original East Span from commencement of work and continuing through the duration of the contract. Based on this work sequence, the risk of impacts to nesting birds over multiple nesting seasons can be assessed. Impacts may result from the numerous construction activities, including construction of temporary marine falsework, dismantling of the original east span superstructure east of Pier E4 (see Appendix A for all pier locations), and dismantling of the pier towers.

In this report, we identify structural member groups, their characteristics with regards to nesting birds, and bird deterrence measures to potentially mitigate risk to schedule that may occur if bird nesting results in work stoppages during dismantling activities. This report provides a detailed summary of recommended deterrence measures, deterrence measure installation methods, maintenance, access, staging and scheduling requirements, as well as recommendations for the contractor-supplied Bird Deterrence Plan (BDP).

CHAPTER 2 – STRUCTURAL MEMBER GROUPS AND CHARACTERISTICS

2.1 Overview

The 504/288 spans are composed of multiple structural member groups all of which provide some historic or potential nesting bird habitat. Each member group is best suited to specific deterrence measure applications. These structural member groups are: marine foundations, support towers, below lower deck structure, lower deck, upper deck, superstructure, concrete Oakland shore structure, access platforms and temporary supports. In many areas unique location-specific deterrence measures are required. Deterrents discussed in this report are described by material specifications presented in Chapter 5 and shall be installed as shown in 504/288 Contract Specifications. Unique, and general, member-defined requirements are presented in this chapter. In many cases, deterrence measures implemented for one member group must overlap with those of adjacent member groups to create a seamless deterrence system covering both groups. Deterrence measures are to be monitored and maintained daily for effectiveness by the contractor supplied biologist(s).

2.2 Structural Member Groups

Marine Foundations

The 504/288 spans are constructed on 20 marine foundations (Piers E4-E22) of concrete construction and consisting of multiple horizontal and vertical planes. The marine foundations provide access points to bridge support towers as well as suitable nesting habitat for birds. These habitat areas include: horizontal concrete surfaces (Piers E4-E22), wooden fenders (Piers E4-E5), corner areas defined by vertical and horizontal surfaces at the bases of concrete pedestals (Piers E4-E22), weep holes (Piers E9, E17-E22), and concrete pedestal tops (Piers E9, E17-E22).

Horizontal Concrete Surfaces

Location: Piers E4-E22

Description: Flat, open areas between concrete pedestals defined by tops of concrete foundations (Figure 2.1).

Nesting habitat: Anywhere on surface

Deterrence measure(s): Large, flat surfaces are not feasibly covered by exclusionary deterrence measures and may need to be left open for access to construction area. These areas shall be managed by contractor biologist(s) to prevent or remove nest starts. Management strategies for these areas may include, but are not limited to monitoring, bird-hazing, and removal of nest starts

Figure 2.1 Marine foundation at Pier E7 with raised pedestals, ledge areas around pedestals, and large open area between pedestals.

Wooden Fenders

Location: Piers E4-E5

Description: Complex lattice of vertical and horizontal wooden beams, constructed around marine foundations as protection against potential collision from vessels and debris (Figure 2.2)

Nesting habitat: Multiple protected recesses within interstices of fender constructions as well as tops of fenders

Deterrence measure(s): Remove, or cover entire fender with netting to block access. To avoid creating flat horizontal surfaces with netting, extend netting at a diagonal from top of bumper to wall of concrete foundation and secure tightly. Slope panels may be used in areas where it is not feasible to attach netting to avoid creating a flat surface. Any remaining flat surfaces must be filled with bird spikes, or blocked to prevent access by nesting birds

Figure 2.2 Wooden fender at Pier E5

Concrete Pedestal Bases

Location: Piers E4-E22

Description: Intersections between the base of semi-vertical concrete pedestal sides with the horizontal concrete surface on marine foundations (Figures 2.1-2.5)

Nesting habitat: Semi-protected, corner areas defined by vertical and horizontal slab surfaces

Deterrence measure(s): Fill corner areas with slope panels, and welded hardware cloth

Weep Holes

Location: Concrete pedestals at Piers E9, E17-E22

Description: Narrow openings through concrete pedestals to allow water to pass from depressed pedestal tops (Figure 2.3)

Nesting habitat: Cavity created by weep hole

Deterrence measure(s): Survey weep holes for presence of birds and/or active nests prior to blocking. If weep hole is uninhabited, cover with welded hardware cloth.

Concrete Pedestal Tops

Location: Tops of concrete pedestals at Piers E9 and E17-E22

Description: Recessed areas on concrete pedestals tops and associated connection points with support towers (Pier E9, Figure 2.3) or superstructure support beams (Piers E17-E22, Figure 2.4), as well as flat pedestal tops ((Piers E4-8 and E10-E16, Figure 2.5)

Nesting habitat: Horizontal surfaces and corners within recessed areas

Deterrence measure(s): Cover entire area with netting to block access. Fill difficult-to-cover areas with supplemental bird spikes, or slope panels to prevent bird access. The contractor-supplied biologist is required to flush out potential nesting birds as part of monitoring duties

Figure 2.3 Pier E9 pedestal top and weep holes.

Figure 2.4 Typical pedestal top for Piers E17-E22

Figure 2.5 Pedestal top and tower typical for Piers E4-E8 and E10-E16

Steel Support Towers

The 504/288 spans are supported by 13 steel towers (Piers E4-E16) anchored to concrete marine foundations. Towers E4-E8 and E10-E16 (Figure 2.5) each have two legs, connected by horizontal and diagonal truss-beams. Pier E9 (Figure 2.6) is composed of four tower legs, also connected by horizontal and diagonal truss-beams. For the purposes of bird management, the support towers are addressed by member type. Support tower member types include: legs, diagonal braces, and lateral top beams. Within each steel support tower member type are nesting bird habitat areas, for which specific deterrence measures are required. Deterrence measure requirements are presented below.

Tower Legs

Location: Piers E4-E16

Description: Vertical, steel, truss-members with tower legs have a number of vertically elongated, rectangular, recessed alcoves along the vertical length of their east and west faces (Figure 2.7) Piers 5-8 also have additional alcoves along the vertical length of the north and south faces of each leg

Nesting habitat: Horizontal areas within each recess (Figure 2.7) and at base of steel support tower legs (Figure 2.8)

Deterrence measure(s): Wrap legs with netting to block all access to recessed alcoves. Netting must be securely attached to bridge members via bolts, clamps, or other effectively equivalent method

Figure 2.6 Pier E9

Figure 2.7 West-facing recess (with peregrine falcon nestlings) in Pier E8 tower leg

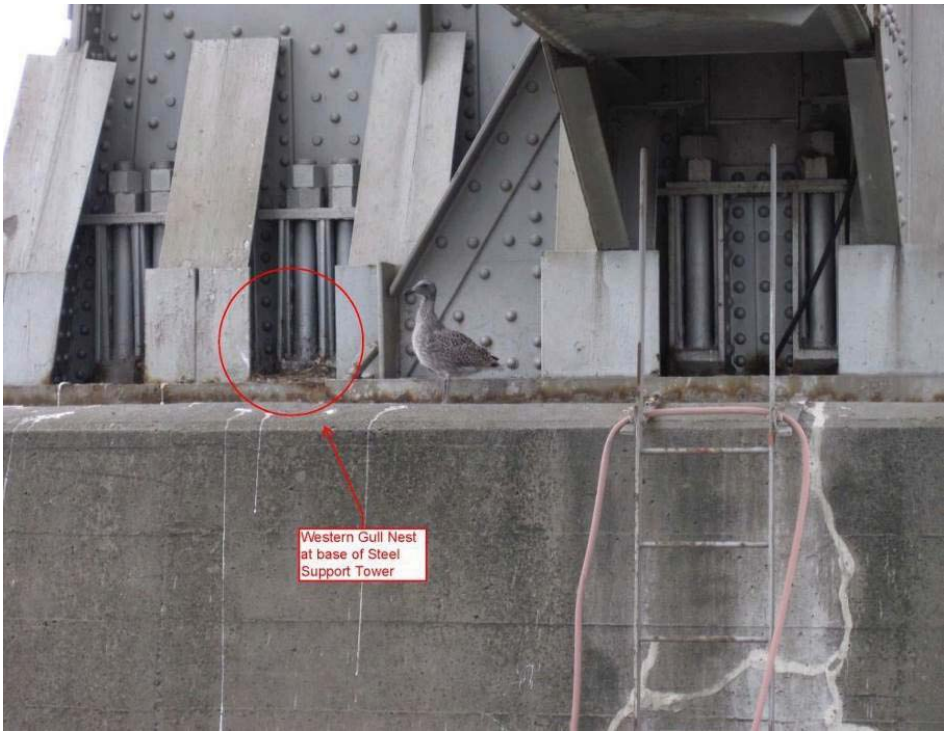


Figure 2.8 Western gull nest at base of steel support tower

Tower Diagonal Braces

Location: Between north and south tower legs, Piers E4-E16

Description: All tower braces are four-sided members constructed of latticed steel beams connected to each other and the tower legs via gusseted plates (member joints) (Figures 2.1, 2.2, 2.5, and 2.6)

Nesting habitat: Horizontal surfaces wider and longer than three inches occur at some member joints

Deterrence measure(s): Bird spikes must be attached to all horizontal surfaces at member joints indicated in Contract plan sheets for bird deterrents

Tower Tops

Location: Tops of tower legs, Piers E4-E16

Description: Areas associated with connection points between tower supports and 504-ft or 288-ft span superstructure

Nesting habitat: Horizontal surfaces wider and longer than three inches

Deterrence measure(s): Bird spikes must be attached to all horizontal surfaces that are accessible to nesting birds

Below Lower Deck Structural Members

The structural members below the lower deck of the 504-ft and 288-ft spans of the SFOBB Original East Span include a network of stringers, transverse beams, lower diagonal, eye bars, and lower chords. Between Pier E4 and Pier E9 there are five 504-ft bridge sections. Between Pier E9 and Pier E23 there are fourteen 288-ft sections (Figure 2.9).

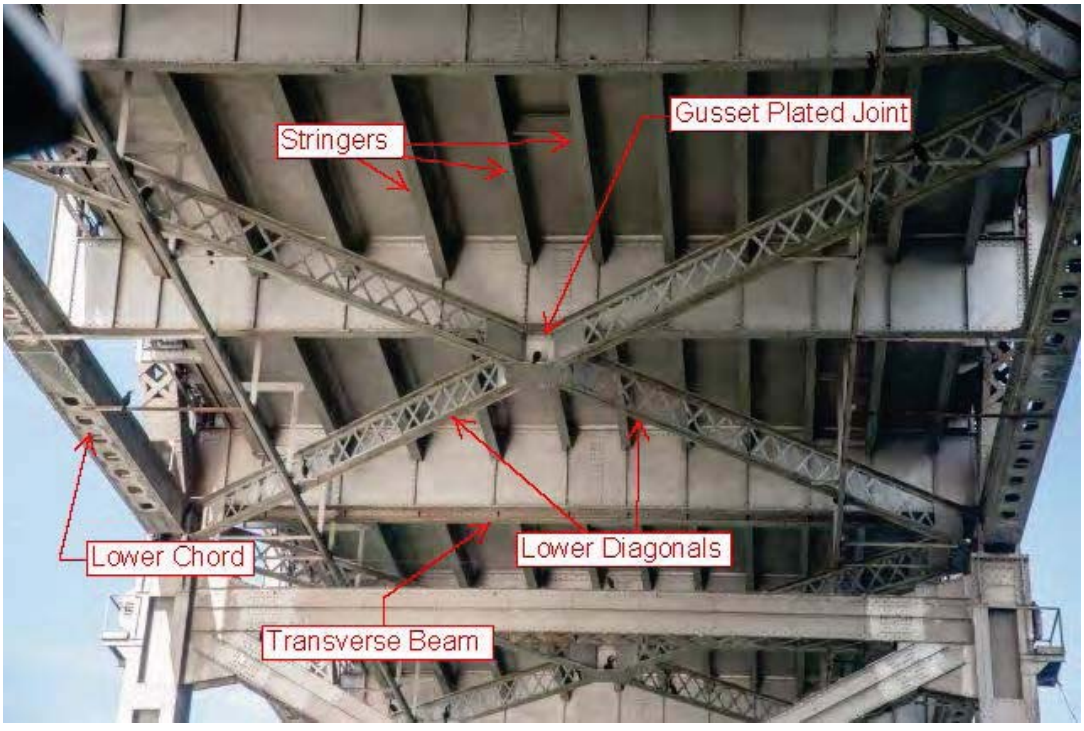


Figure 2.9 288-ft span, lower members

The joints among transverse beams and lower diagonals provide the most extensive nesting bird habitat on the bridge as well as the least accessible areas for deterrence measure installation. The transverse beams of both sections are composed of solid web I-beams with narrow ledges that are not suitable for nesting. The lower diagonals are laterally mounted, lattice web I-beams wide enough to provide suitable nesting habitat both along the top lengths and lower ledge surfaces of each member.

Historic nesting activity has left guano built up along the bottom superstructure members including the transverse beams, lower diagonals, and at joints connecting members.

A double-crested cormorant colony is located primarily within the lower members of the bridge, therefore nesting bird deterrence measures for the bottom of the bridge will require complete exclusion. Use of a suspended scaffolding system netted at all open ends and scaffolding deck openings will provide bird exclusion from these areas. If a scaffolding system fails to provide exclusion, wrap all diagonals with netting, clean and spike all flat surfaces at joints and install bird-wire system on top surfaces of all lateral members that are accessible to birds. The suspended scaffolding system will also provide nesting bird monitoring and deterrence monitoring access to the below-deck structural members.

Transverse Beams (Floor Beams)

Location: 504 and 288-ft spans; Large I-beams beneath road deck stringers mounted perpendicular to roadway

Description: Steel plated beams (Figure 2.9)

Nesting habitat: No significant nesting habitat, except at joints with lower diagonals

Deterrence measure(s): Block access to underside of bridge with a suspended scaffolding system enclosed with netting, or equivalent deterrence measures

Lower Diagonals

Location: 504-ft spans: integrated within level of below lower deck transverse beams; 288-ft spans: beneath below lower deck transverse beams

Description: Steel I-beams with lattice web mounted below the lower deck laterally and diagonal to roadway (Figure 2.9)

Nesting habitat: Tops of members, lower ledges and within lattice; these members present the largest area of historic nesting by the double-crested cormorant colony

Deterrence measure(s): Block access to underside of bridge with a suspended scaffolding system and netting, except at working ends for immediate removal. Any spans with the bridge bottom exposed, wrap horizontal members individually with netting. Install bird spikes on tops of wrapped members, fill member joints with bird spikes, or block with welded wire hardware cloth

Joints/Gusseted plates

Location: 504-ft and 288-ft spans; connection points among lateral and/or vertical members

Description: Steel plates connecting bridge members and associated areas (Figure 2.9)
Nesting habitat: Horizontal surfaces with a length and width of three inches or more
Deterrence measure(s): Block access to underside of bridge with a suspended scaffolding system and netting. In areas not excluded by the suspended scaffolding system install spikes within lateral surfaces ofall plated member joints as directed by the Contract plan sheets for bird deterrents

Eye-bars

Location: Installed on the north and south facing sides of the 504ft spans; level with the diagonal bracing. Eye-bars are installed parallel to each other on the outer sides of the 504ft spans
Description: Heat-treated carbon steel eye-bars in varying configurations of four at the outer ends of 504-ft spans and six at mid-plate sections of the 504-ft spans
Nesting habitat: Eye-bars in groups of six spaced less than 5 inches apart from each other present potential nesting surfaces (Figure 2.10)
Deterrence measure(s): Install a suspended scaffolding system below the lower deck. Such a system shall extend beyond the north and south side of the bridge. The side-space between the suspended scaffolding system platform and the bridge shall be sealed with netting to exclude birds from nesting areas. Securely attach netting to the side of the lower deck. Seal all openings between the suspended scaffolding system and the lower deck with netting

Figure 2.10 Double-crested cormorant nest on eye-bars

Lower Chords

Location: North and south sides of the 288-ft spans

Description: Four-sided members constructed of steel plates and lattice, running parallel with the roadway and level with the lower diagonals (Figure 2.9)

Nesting habitat: Horizontal steel plates wider and longer than three inches at ends of lower chords provide suitable habitat. Lower chord lattice areas do not provide suitable nesting habitat

Deterrence measure(s): Install a suspended scaffolding system below the lower deck. Such a system shall extend beyond the north and south side of the bridge. The side-space between the suspended scaffolding system platform and the bridge shall be sealed with netting to exclude birds from nesting areas. Securely attach netting to the side of the lower deck. Seal all openings between the suspended scaffolding system and the lower deck with netting

Upper Superstructure

For this technical report, the upper superstructure refers to the bridge members extending above the bottom lateral structures, including the lower deck, the upper deck, and upper laterals (Figure 2.11, Appendix B). Most locations in these structures will be highly accessible during the dismantling process. Based on this accessibility as well as low incidence of historical nesting locations in upper superstructure locations, deterrence measure requirements for these areas emphasize daily monitoring, hazing, nest-start removal, supplemental deterrents and installation of deterrents as shown in Contract plans.

Figure 2.11 Typical superstructure for 504-ft span

Lower Deck

Location: 504-ft and 288-ft spans; lower roadway and associated bridge members

Description: Stringers, road surface, shoulder walkways, railings and truss members

Nesting habitat: Horizontal surfaces greater than 3 inches by 3 inches provide potential nesting area. Probability of nesting in these locations is low, as this area will be at the center of an active construction zone

Deterrence measure(s): Implement daily monitoring, hazing, nest-start removal, and installation of supplemental deterrents

Upper Deck

Location: 504/288 spans; above lower deck

Description: Floor beams, crossbeams, stringers, road surface, shoulder walkways, railings

Nesting habitat: Horizontal surfaces greater than 3 inches by 3 inches

Horizontal surfaces greater than 3in by 3in provide potential nesting area. Probability of nesting in these locations is low, as this area will be at the center of an active construction zone

Deterrence measure(s): The upper deck road surface, walkways and railings may be removed early in the dismantling Contract, thereby eliminating most of the upper deck nesting surfaces. If they are not removed prior to the onset of the bird nesting season, proceed with installation of deterrence measures as shown in plan sheets. Probability of nesting in this area is low. In areas where potential nest sites remain, implement daily monitoring, hazing, nest-start removal, and installation of supplemental deterrents

Upper Laterals

Location: 504-ft spans; steel superstructure surrounding upper deck

Description: Steel truss members, beams and connecting joints

Nesting habitat: Horizontal surfaces greater than 3 inches by 3 inches provide potential nesting area. Areas include, but not limited to, horizontal surfaces in joints, recesses within hollow members, and along the tops of truss members

Deterrence measure(s): Install bird spikes in joint locations shown on bird deterrent plan sheets. Cover access holes to members with suitable recesses. Access holes to recesses may be covered by wrapping the entire member with netting secured by clamp or equivalent means. Implement daily monitoring, hazing, nest-start removal, and installation of supplemental exclusions

Existing Access Platforms

Within the attached support tower legs and parts of the superstructure there are a total of 78 existing maintenance platforms on both the north and south side of the bridge. These existing maintenance platforms are associated with electrical boxes, access ladders, or other structures on the bridge requiring regular access (Figure 2.12, 2.13). Platforms occur at general locations shown in Appendix C.

Location: North and south side of the superstructure; tower legs.

Description: Horizontal platforms, with approximately 4-foot railing.
Nesting habitat: Platform surface
Deterrence measure(s): Platforms that are not critical in accessing other parts of the bridge structure should be removed prior to the nesting season. If removal of platforms prior to the bird nesting season is not feasible, platforms must be made inaccessible to birds by installing bird spikes, slope paneling, or netting. On remaining access platforms, during the nesting season, implement daily monitoring, hazing, nest-start removal, and installation of supplemental deterrents.

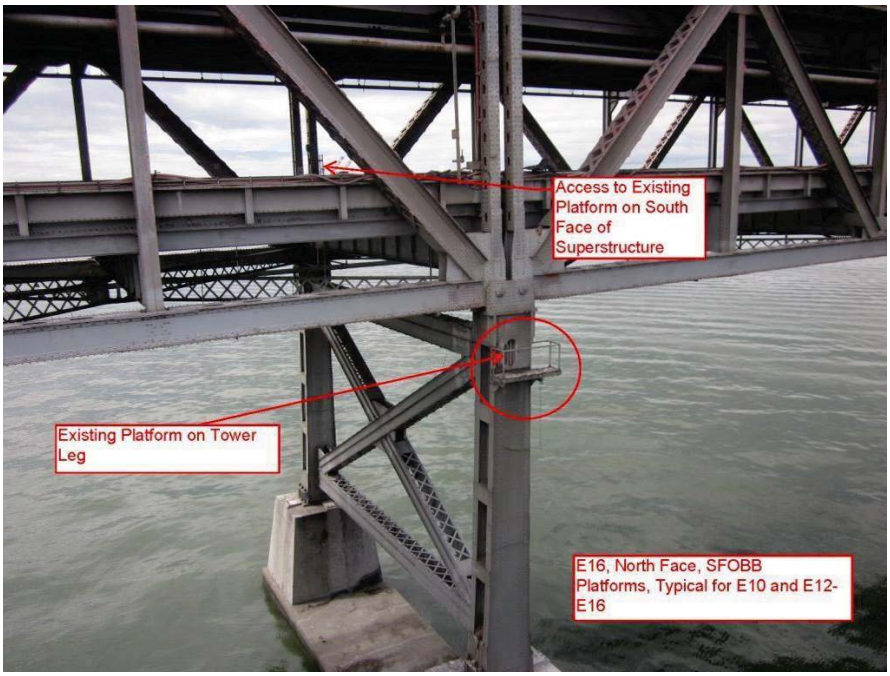


Figure 2.12 Pier E16 existing access platforms on tower leg

Figure 2.13 Pier E22 existing access platforms typical on 288-ft spans

Concrete Oakland Shore Structure

Additional SFOBB Original East Span land-based foundations occur east of Pier E22, on which the Oakland Touchdown (OTD) is built. Within this structure are multiple protected overhangs located on several concrete bents (Pier E23, Bents E24-E28). Protected overhangs provide nesting habitat for some bird species (Figure 2.14). Deterrence measures are given below.

Protected Overhangs

Location: Pier E23, Bents E24-E28 (OTD)
Description: Concrete foundations and road structure
Nesting habitat: Junction of vertical and horizontal surfaces, which create protected overhangs
Deterrence measure(s): During the nesting season, implement daily monitoring, hazing, nest-start removal, and installation of supplemental deterrents.

Figure 2.14 Black phoebe nest on OTD concrete bent

Temporary Supports

Temporary support structures may be required during the dismantling of the 504/288 spans. These temporary supports will be built and maintained by the contractor. It is the contractor's responsibility to demonstrate that temporary supports within the Project are in compliance with all environmental and safety laws and Project permits. Any nesting habitat created by temporary supports will be the responsibility of the contractor. Deterrence measure implementation and maintenance will also be the responsibility of the contractor, and must be in accordance with the Department's 2014 Bird Management Plan (2014 BMP) and reflected in the contractor biologists' Bird Protection Plan and Bird Deterrence Plan. All deterrence measures for temporary supports shall comply with all environmental laws and Permits Licenses Agreements and Certifications (PLACs) issued to the SFOBB Project. The Department will not be responsible for work stoppage as a result of failure to install or maintain deterrence measures on temporary supports.

CHAPTER 3 – BIRD MANAGEMENT

Bird management within the SFOBB Project area will rely on two phases of management. Phase 1 management focuses on activities during the non-nesting season (September 1 through January 31). This includes performing construction activities during the non-nesting season to avoid nesting birds and proactive prevention of nesting birds for the next nesting season, through the removal of nesting habitat and installation of deterrence measures. By preventing birds from nesting within the SFOBB Project area, the Department and contractor will avoid, and minimize, impacts to nesting birds. Bird-associated delays to the construction progress within the SFOBB Project area will be minimized as well. Phase 2 management will take place during the nesting season (February 1-August 31). Phase 2 strategies include ongoing monitoring of nesting bird activity, removal of nest starts before eggs may be laid, installation of supplemental deterrence measures, hazing, implementation of buffers around occupied nests, and (in specific cases to be determined by the 504/288 Contract RE and Department biologist(s)) occupied nest removal.

3.1 Phase 1: Non-Nesting Season (September 1-January 31)

Seasonal Avoidance

Active demolition may be performed outside of the nesting season without the constraints of nesting bird deterrence measures. Impacts to nesting birds may be avoided by maximizing scheduled construction activities during the non-nesting season. Note: some birds may establish a nest during the non-nesting season (September 1-January 31). Occupied bird nests occurring during the non-nesting season are protected under the MBTA and CFGC. The contractor is responsible for protecting nesting birds within the 504/288 Project area, regardless of the season.

Historic Nest Removal

Many bird species re-use or build on top of old nests remaining from the previous years. Removal of unoccupied old nests from within the SFOBB Project area may act as a deterrence measure to nesting birds. Nests will be physically removed by hand or with small handheld tools. All nests will need to be placed in containment. Nesting material is not permitted to fall into the bay. Access must be provided to nest removal personnel. California Occupational Safety and Health Administration approved respirators and other applicable personal protective equipment must be worn by the nest removal personnel.

Deterrence Measures

The following section presents the deterrence measures to be installed on the SFOBB Original East Span. These deterrence measures include bird spikes, bird-slope panels, netting, bird-wire, welded hardware cloth and suspended scaffolding system. The areas of application for deterrence measures correspond with, but are not limited to, the structural member groups presented above and the engineering plans in Appendix I (Appendix I).

The majority of deterrence measure installation is to be performed during the non-nesting season. Prior to installation of deterrence measures directly onto bridge members, those members must be cleaned. As with removal of historic nesting materials, guano and other materials cleaned from members is not permitted to fall into the bay. The contractor is responsible for removal and containment of waste materials from the construction site. If water is used in the cleaning of members, the contractor is responsible for containment and removal of effluent and debris resulting from this process. Any discharge of water into the Bay must be done in accordance with and permitted by the Regional Water Quality Control Board (RWQCB). The contractor is responsible for seeking approval before pursuing use of any device or methods that will discharge water into the Bay.

The contractor is responsible for all deterrence measure installation, maintenance, replacement, as well as access to nesting sites, staging and scheduling requirements. Project areas scheduled for removal during a nesting season must have a minimum of 1,560 ft. of contiguous suspended scaffolding system and all other deterrence measures installed prior to the start of upcoming nesting seasons. For example, if the contractor plans to remove trusses between February 1 and August 31, deterrence measures must be implemented along at minimum 1,560 ft. of expected removal work area, and must be applied to the entire scheduled work area that is to be active during the upcoming nesting season by January 31. The contractor is responsible for providing the Department schedule information prior to construction activities in a timely manner to ensure accurate planning of bird deterrence implementation. The contractor is responsible for maintaining a work schedule appropriate to bird nesting season limitations and informing the Department in a timely manner of changes to the work schedule. The contractor will provide the Department with plan sheets clearly showing specific locations and types of deterrence measures to be installed, as well as photos documenting bird deterrence measures.

3.2 Phase 2: Nesting Season (February 1-August 31)

Nest-Start Removal

Nest start removal can be an effective measure to deter nesting. Occupied nests are nests that contain birds or eggs and are protected by the MBTA. Removal of occupied nests by the contractor is not permitted.

Birds may initiate nesting at any time during the nesting season. Nest-building may take between one day and several weeks to complete. During this period, nest removal is an effective nesting deterrent. Nest starts without contents must be removed as soon as they are discovered, throughout the nesting season. A nest becomes occupied the moment an egg is laid in it. A nest remains occupied until the young have fledged. The contractor, monitored by a Department biologist, may remove unoccupied nests and nest starts. As with Phase 1 nest removal, no nesting materials must be allowed to enter the San Francisco Bay. The contractor is responsible for disposal of removed nesting materials. Once a nest start is removed, the contractor must

install supplementary deterrence measures (described below) to prevent further nesting in that location.

Paint Ball Gun and Water Cannon (for nest-start removal only)

In calm conditions high-pressure water hoses may be able to remove nest starts at heights up to 30 meters (100 feet). Windy conditions may greatly reduce this range. Paint ball guns would be effective for use when a nest start is encountered that is difficult to remove using other means. Paint balls used for nest removal must be filled with bio-degradable oils or equivalent. If water or paint balls are used to remove nest starts, the contractor is responsible for containment and removal of effluent and debris resulting from this process. Use of either of these methods must be in used in accordance with all PLACs including those issued by the RWQCB. The contractor is responsible for acquiring approval from the Department and all applicable agencies for the use of any means or methods that create discharge into the Bay before they are implemented.

Supplemental Exclusionary Deterrence Measures

Additional nesting habitat may be discovered throughout the nesting season. The contractor is responsible for identifying suitable habitat and implementing bird nesting deterrence measures as needed.

Hazing

During daily monitoring, the contractor may use hazing as a deterrence measure. Hazing covers all activities designed to flush birds from Project areas. For the purposes of this Project, hazing will be limited to flushing birds from areas by means of approaching, waving, calling, shouting, and the use of laser pointers directed exclusively at the bird's feet. Under no circumstances shall the contractor attempt to attack, throw objects at, shoot, or otherwise attempt to cause physical harm to any bird(s) they are hazing. If any individual bird is physically harmed, or displays behavioral harm during hazing, the Department must be notified of the incident immediately and an incident report must be submitted by a contractor supplied biologist.

Buffers (for occupied nests)

An initial no-work buffer must be established around any newly discovered occupied nest to avoid impacts to that nest. Upon discovery of an occupied nest, the contractor will immediately establish a no-work buffer around the nest with an initial radius of 76 meters (250 feet) for raptors (including peregrine falcon) and 15 meters (50 feet) for non-raptors. After establishing the initial no-work buffer, the Department's biologists and contractor's biologists will monitor the nest-site. The Department, in consultation with USFWS, CDFW (for peregrine falcons only), and the contractor will make a determination to maintain, decrease, enlarge, or remove the buffer. Buffer size will be dependent on the species, nest location, and type of construction activities. All no-work buffers will be determined on a case-by-case basis.

Occupied Nest Removal

The Department and Agencies recognize that in spite of all efforts, some birds may succeed in establishing a nest within the Project area. In certain circumstances if an active nest is established, the CDFW and USFWS may allow removal of an individual nest and its contents. In 2013, the USFWS issued the Department Special Purpose-Miscellaneous permit (permit no. MB22730B-0) authorizing specific Department biologists to remove active nests on a case-by-case basis. If the presence of an occupied nest occurs within the Project critical path, and is determined to either delay construction, or if the outcome of that nest is doomed by construction activities, the Department biologist may remove the nest contents (i.e., eggs and/or nestlings), and transfer them to an approved wildlife care facility, where the young birds would be raised for future release. Due to the lack of wildlife rehabilitation centers capable of hatching songbird eggs and successfully raising hatchlings for release, limited quantities of songbird nests containing eggs may be destroyed by the Department biologist.

Under the Special Purpose-Miscellaneous Permit, occupied nest removal shall only be employed after all deterrence, protection and management measures have been exhausted and the occupied nest is under imminent threat. Removal of nest contents will be addressed on a case-by-case basis and in certain circumstances will require close communication with agencies. Removal of nest contents is the sole responsibility of the Department and is to be carried out by Department biologists exclusively. contractor supplied biologists are not authorized, under any circumstance, to handle active-nest contents.

CHAPTER 4 - CONTRACTOR DETERRENCE PLAN

A final Bird Deterrence Plan (BDP) written by the contractor's approved biologist(s) shall be submitted by the contractor 60 days before the initiation of construction activities on the original east span of the SFOBB and must be approved by the Department 15 days prior to the initiation of installation of deterrence measures. The BDP must include detailed accounts of the means, methods, locations, maintenance, expected results and access to all bird deterrents employed by the contractor. The BDP must also include a schedule clearly displaying all expected construction activities, bird deterrent installations, seasonal nesting times of nesting bird species expected in the Project area, as well as a schedule of monitoring and maintenance activities through the duration of the contract.

The BDP will demonstrate how the contractor intends to avoid and minimize impact on nesting birds during construction activities on the 504/288 spans using the following means and methods:

- Seasonal avoidance
- Deterrents
- Buffers (for occupied nests)
- Occupied Nest Removal

The contractor will be responsible for all strategies to minimize impacts to nesting birds.

4.1 Seasonal Avoidance

By restricting some construction activities to the non-nesting period between September 1 and January 31, the contractor can minimize the potential take of most nesting birds. Major installation of deterrents for areas to be experiencing final demolition activities in the following nesting period is expected to occur during the previous non-nesting period. The contractor shall develop their schedule and BDP in accordance with the nesting period.

4.2 Deterrents

Bird deterrents and exclusion devices to be used on the SFOBB Project include, but are not limited to:

- A Suspended Scaffolding System
    - Prior to the nesting season a suspended scaffolding system is to be installed below the lower deck of the original 504/288 spans scheduled for dismantling during the following nesting season, and shall be used as an exclusion device. This system must be netted at the sides and cover any openings to completely exclude nesting birds from their historical nesting areas. The contractor's BDP shall describe the system they choose to use and the netting strategies employed to ensure that it excludes birds from bottom bridge members
- Removal of Historic Nests

- All removal of historic nest material is to be monitored by a Department biologist in collaboration with the contractor supplied biologist to ensure that proper nest material disposal procedure is followed. The contractor's BDP is to offer explicit protocol for the handling and disposal of historic nest material during removal

- Exclusionary Deterrents
  - Bird Spikes: The contractor's BDP shall specify the dimensions and materials of their chosen bird spike deterrents. It shall also specify all locations that bird spike is to be used on the Project area
  - Netting: The contractor's BDP shall specify the material specifications for the netting they choose to use, and use their chosen netting material consistently. It shall also specify all locations that netting is to be used on the Project area. Damaged netting must be maintained and prevented from entering the Bay by the contractor.
  - Bird Slope Panels: The contractor's BDP shall specify the material specifications for the bird slope panels they choose to use. It shall also specify all locations that bird slope panels are to be used on the Project area
  - Bird Wire System: The contractor's BDP shall specify the material specifications for the bird wire system they choose to use. It shall also specify all locations where a bird wire system is to be used on the Project area
  - Welded Hardware Cloth: The contractor's BDP shall specify the material specifications for the welded hardware cloth they choose to use. It shall also specify all locations where welded hardware cloth is to be used in the Project area
  - One Way Flaps: The contractor's BDP shall specify the material specifications for one way flaps they choose to use. It shall also specify all locations where one way flaps are to be used on the Project area.
- Nest and nest start removal
  - Manual Removal: The contractor's BDP shall put forth protocol for nest start material removal that includes oversight by a contractor supplied biologist and proper handling of nest start material that is equivalent to historic nest material removal procedure
  - Water cannon and paint-ball gun (nest start only): Use of water cannon and paint ball guns for nest start removal must be approved by Department biologists and Project permitting Agencies. The contractor will be responsible for any discharge associated with the use of either device. The contractor's BDP shall put forth a containment plan for any potential discharge into the bay from the use of a water cannon or paint ball gun. It shall also illustrate all compliance measures required by the PLACs on the SFOBB Project for use of such devices
- Flushing Birds:
  - The contractor's BDP shall describe protocol to be used by individuals flushing birds from perches and potential nest areas. It shall describe a process where one disturbs an animal's sense of security to an extent that it moves on. Flushing by

individuals shall cause no physical harm to birds and shall be carried out without the use of any tools or devices that may cause harm. Flushing techniques are not to be used during the nesting season on nesting birds

4.3 Occupied Nest Removal

Status of USFWS Miscellaneous Take Permit:

- Under the authority of statute 16 USC 703-712, the SFOBB Project has been issued a miscellaneous take permit by the USFWS (permit no. MB22730B-0) allowing for the relocation of a limited number of active bird nests for specific bird species. This permit does not cover species that are fully protected under sections 3511, 4700, 5050 and 5515 of the CFGC. Fully protected species include, the California least tern, the California brown pelican and the American peregrine falcon. It does not allow for intentional take of any bird species protected by the MBTA, USFWS, or CDFW. The contractor's BDP shall illustrate a complete understanding of the miscellaneous permit, the species it covers, the amount of take permitted, the specifically named biologists allowed to use this permit and all other laws that protect bird species present, or expected, in the SFOBB Project area. It shall also show understanding that occupied nest removal is authorized only by a Department biologist with approval from the Department.

4.4 Buffers for Occupied Nests

The contractor's BDP shall display a complete understanding of buffers that are to be employed for nesting incidents in active construction zones. It shall also illustrate protocol for encounters with nesting birds that reflect those put forward in the Department's 2014 BMP.

4.5 Deterrent Location, Means, and Methods for Installation

The contractor's BDP shall also include the following information:

- Means and methods used to apply, install and secure each type of deterrent to bridge members
- Means, methods and containment plans for cleaning members in preparation of deterrence measure application
- Deterrent maintenance monitoring schedules
- Deterrent maintenance monitoring data sheets
- Proposal of means and methods to be used to safely access all Project areas during installation and maintenance of deterrents
- A schedule that includes staging, installation, removal and completion of bird deterrence measures used through the duration of the contract

CHAPTER 5 - DETERRENT MATERIALS SPECIFICTIONS

Throughout this Report specific bird deterrent devices have been prescribed. The following section outlines for each deterrent its name, materials, specifications, installation, application, and other requirements and gives at least two proprietary examples. For many of these deterrents there will be other product providers available than what is listed here and it is the contractor's responsibility to procure or manufacture deterrents that are equivalent to the examples given and meet minimum specifications shown for each.

5.1 Deterrent Materials

Bird Spikes

Material: Stainless steel wire spikes; polycarbonate or stainless steel base

Specifications: Spike Diameter = 0.04" to 0.055"(1.0mm-1.4mm)
Spike Length = 4"to 8"(10.16cm to 20.32cm)
Spike Number per cluster = 2 to 10
Cluster Width = 4" to 8.5"(10.16cm to 21.59cm)

Installation: Adhesive, bolt, or clamp

Application: Install bird spikes on any flat surface. Bird spike strips must be installed no more than two inches apart and at a density such that no flat surface greater than two inches is exposed. Bird spikes are appropriate for narrow ledges greater than 3-inches deep. Application areas include, but are not limited to historic or suitable nest locations on the tops of marine foundations, protected depressions at the base of support towers, horizontal ledges created by flanges, gusseted plates/joints, and protected alcoves

Other requirements: Adhesives cannot be used to attach bird spikes on guano-encrusted surfaces. Guano-encrusted surfaces must be cleaned prior to attachment of bird spikes when using adhesive. The contractor is responsible for removal of waste materials from the construction site. If water is used in the cleaning of members, the contractor is responsible for maintaining compliance and approval with all Project PLACs and permitting agencies before any discharge. The contractor is responsible for containment and removal of all effluent and debris resulting from leaning operations

Examples:

Brand	spike_material	spike_length	cluster_width	spike_diameter	spikes_per_cluster	Installation
Spec requirements	stainless steel	4-8"	4-8.5"	~0.04" 0.055"(1.0mm-1.4mm)	2 to 10	Clamp-On, or adhesive
bird-b-gone mega spike	stainless steel/polycarbonate base	7"	5"		3	glue, screw, tie-down (clamp?)
bird-b-gone girder bird spikes	stainless steel/polycarbonate base		3"; 5"; or 8"			clamp
Nixalite premium model-S	stainless steel/stainless steel base	4"	4"	1mm (0.041")	10	Clamp, glue, screw
Bird-X Extra Tall Spikes	stainless steel/polycarbonate base	5.75"	8.5"		5	
Bird X regular	stainless steel/polycarbonate base	4.3125"	4.5"		5	glue, screw, tie-down (clamp?)
Bird X Extra Wide	stainless steel/polycarbonate base	4.3125"	7.5"		5	glue, screw, tie-down (clamp?)
Bird Barrier 5 in. wide	stainless steel/polycarbonate base	?	5"		3	screw or glue
Bird barrier extra wide	stainless steel/polycarbonate base	?	8"		5	screw or glue

Vendors:

Bird-B-Gone
(800) 392-6915
http://www.birdbgone.com

Nixalite of America Inc.
PO Box 727
East Moline, IL
(888) 624-1189
http://www.nixalite.com/

Bird-X
300 N Oakley Blvd.
Chicago, IL 60612
Phone: 800.662.5021
http://www.bird-x.com

Bird Barrier
20925 Chico Street, Carson, CA
(800) 503-5444
http://www.birdbarrier.com

Slope Panels:

Material: Metal, wood, polycarbonate

Specifications: Depth = 6" (15.24cm)
Height = 6" (15.24cm)
Width/Length (typically produced in 4' (1.22m) lengths)
Horizontal landing surface at 45^0 angles

Installation: Typically glued, bolted, or clamped. Slope panels may be purchased or fabricated on site

Application: Surfaces with 90^o angle. May be constructed along tops of beams to create a non-horizontal surface. Slope panels are appropriate for protected corner areas or exposed horizontal surfaces. Application areas include, but are not limited to historic or suitable nest locations on marine-foundations, horizontal ledges created by flanges, gusseted plates/joints, maintenance platforms and protected alcoves

Other requirements: Ends must be capped to prevent creation of protected alcove under slope panel

Examples:

brand	width	height	length	material	installation
Spec Requirements	6"	6"	any	metal, wood, polycarbonat or any combination of	Any
Bird-b-gone bird slope	6"	6"	4'	UV protected PVC	adhesive, screw, clips
Bird barrier bird slide	6"	6"	4'	UV stabilized polycarbonate	adhesive, screw, clips

*Extenders are available for wider ledges.

Vendors:

Bird-B-Gone
(800) 392-6915
http://www.birdbgone.com

Bird Barrier
20925 Chico Street
Carson, CA 90746
800-503-5444
http://www.birdbarrier.com

Netting:

Material: High density knitted polyethylene mesh

Specifications: Density = 50-70% netting
Flame retardant and UV treated

Installation: Tied, bolted, or clamped. Netting may be wrapped around members with ends attached by cable ties, bungee ties, or tie wire. Ends may also be stretched across openings and clamped to bridge members with boards, bars, or equivalent materials

Application: To exclude large birds (i.e., gulls, cormorants, and peregrine falcons) from historic or suitable nesting areas

Other requirements: Must be monitored and maintained to prevent occurrence of tears or other openings that may provide access to nesting birds

Examples:

Brand	Width	Length	Weave (% Light block)	Material	Installation
Spec Requirements	Variable	Variable	70%	High density polyethylene mesh, flame retardant and UV treated	Any
Eagle Enclosures	8'	150'	70%	Knitted polyethylene mesh	Any
Debris Netting Inc.	2m-10m	50m-100m	50%, 70%, 90%	Knitted, knotless virgin HDPE	Any
InCord	Variable	Variable	70%	Knitted polyethylene mesh	Any

Vendors:

Eagle Enclosures
Western Sales: Rodney Normand
Office: (888) 692-2490
Cell: (504) 982-7553
email: Rnormand@eagleencl.com
http://eagleenclosures.com

InCord
226 Upton Rd.
Colchester, CT 06415
(800) 596-1066
Email: netting@incord.com
http://www.incord.com/netting_hardware/index.htm

Kenjoy Debris Netting Inc.
Industrial Development Zone
Anping County, Hebei Province, China.
Tel: +86 318 5821607
Fax: +86 318 5821607
e-mail: sales@debris-netting.com
http://www.debris-netting.com

Suspended Scaffolding System:

Material: Horizontal scaffolding platform of plywood and/or steel. Components include: joists, nodes, connecting pins, deck supports, beam clamps, chain or cable, plywood decking, guardrails, toe boards

Specifications: Platform = 4' X 8' plywood or steel sheets connected by steel joint sections. Size may be modified to fit purpose

Installation: Clamp or bolt to bridge members

Application: To exclude large birds (i.e., gulls, cormorants, and peregrine falcons) from historic or suitable nesting areas. Also gives access to difficult-to-reach areas on the underside of the bridge for deterrence measure monitoring

Other requirements: Openings between hanging scaffolding and bridge members must be covered with netting

Examples:

Brand	Specification	Material	Installation	Strength
QuikDeck	4'X8' sections	Steel and wood	Clamp, chain, cable	25-75 psf
Safspan	variable	steel	Clamp or bolt, Cable	25-50 psf

Vendors:

QuikDeck
Safway Services, LLC
Corporate Headquarters
N19 W24200 Riverwood Drive
Waukesha, WI 53188
Toll free: (800) 558-4772
Telephone: (262) 523-6500
https://www.safway.com

SafeSpan
252 Fillmore Avenue
Tonawanda, NY 14150
phone: 877-997-SPAN
fax: 716-694-1188
http://www.safespan.com

Welded Hardware Cloth:

Material: Galvanized Steel

Specifications: Maximum 0.25” (6.35mm) mesh and minimum 19 gauge wire

Installation: Adhesive, clamp, or screw

Application: To exclude birds from suitable nesting areas in open recesses or alcoves

Other Requirements: None

Examples:

Brand	Material	Mesh	Wire Gauge	Installation
Spec Requirement	Galvanized Steel	0.5" (6.35 mm)	19	Adhesive, clamp, screw
Wireclothman	Galvanized Steel	0.5" (6.35 mm)	19	Adhesive, clamp, screw
Home Depot	Galvanized Steel	0.5" (6.35 mm)	19	Adhesive, clamp, screw

Vendors:

Wire Cloth Manufacturers Inc.
110 Iron Mountain Rd.
Mine Hill, NJ 07803
Tel: (973) 328-1000 • 1-800-WIRE MAN (947-3626)
Fax: (973) 328-0919
http://www.wireclothman.com

Home Depot
1-800-430-3376
http://www.homedepot.com

Bird-Wire System:

Material: Monofilament or stainless steel wire

Specifications: Wire = 0.55 mm to 0.75mm stainless steel wire cable coated with nylon, or manufactured from non-corrosive metal cable or equivalent

Installation: Clamp, Bolt

Application: To exclude birds from suitable nesting and perching areas along the tops of beams and railings. Wire may be installed in a parallel, grid, or spoke configuration to deter birds from nesting, roosting, or loafing in a treated area

Other Requirements: None

Examples:

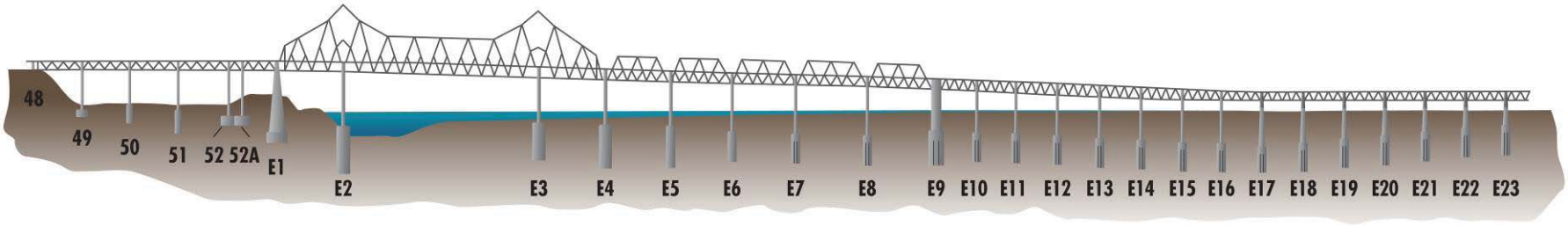
Brand	Material	Thickness	Break-Strength	Installation
Spec Requirement	Stainless steel wire coated with nylon, or other non-corrosive metal cable	0.5mm-0.75mm	> or = 100 lbs	Crimped and connected to spring
bird-b-gone Bird Wire	Stainless steel wire coated with UV stabilized nylon	0.55mm	110 lbs	Crimped and connected to spring
Bird barrier: birdwire stainless	Stainless steel wire coated with UV stabilized nylon	0.7mm	100 lbs	Crimped and connected to spring

Vendors:

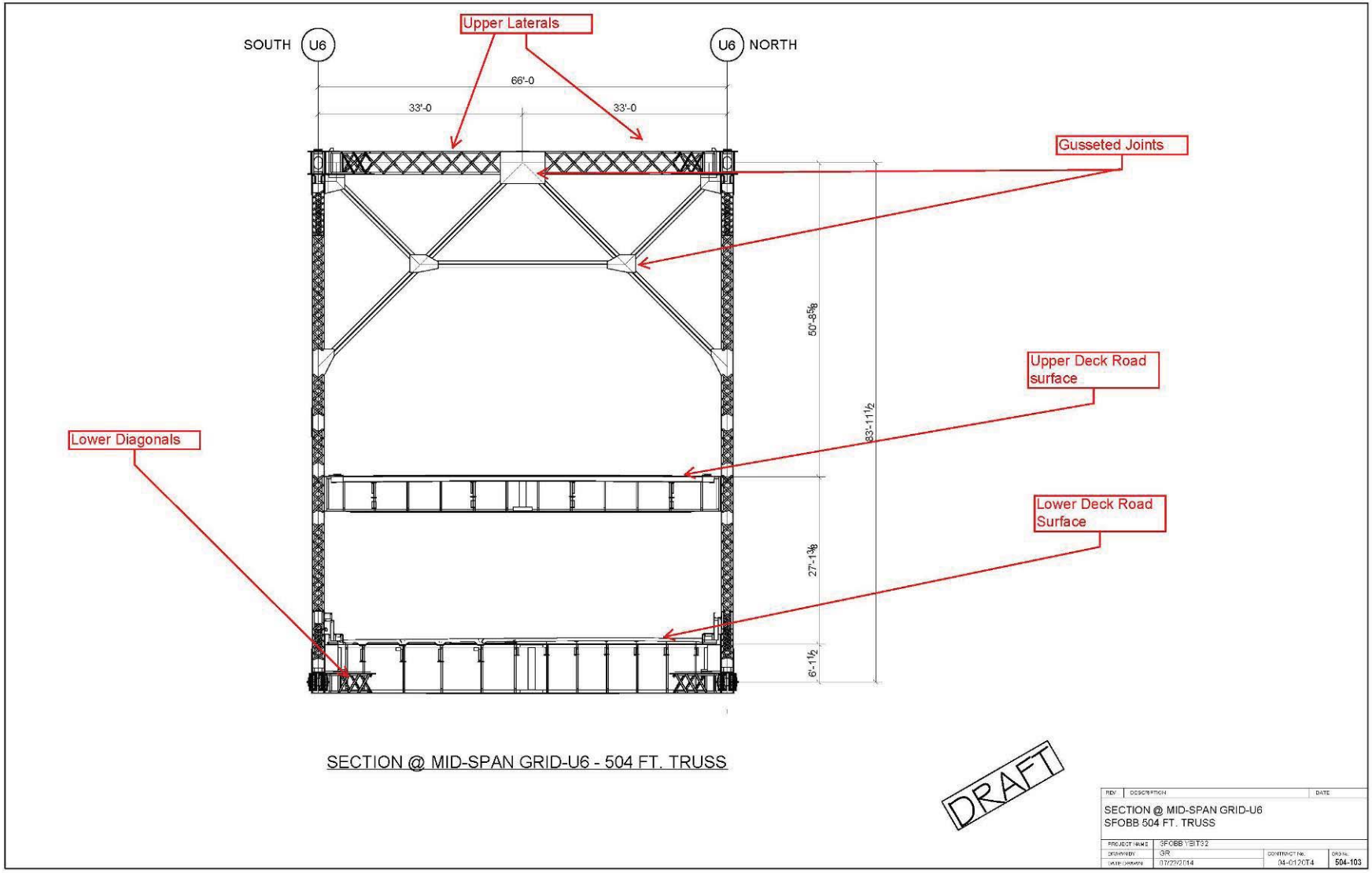
Bird-B-Gone
(800) 392-6915
http://www.birdbgone.com

Bird Barrier
20925 Chico Street
Carson, CA 90746
800-503-5444
http://www.birdbarrier.com

Appendix A - SFOBB Original East Span Piers



Appendix B – 504-ft Span Superstructure Cross Section



Appendix C – Existing Access Platforms, General Locations