

# Public Draft BDCP: Overview for Independent Science Review Panel on BDCP Effect Analysis

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- Revisions since Feb. 2012 Admin Draft
  1. Changes to proposed project (David Zippin)
  2. Changes to terrestrial effects analysis (Ellen Berryman)
  3. Changes to aquatic effects analysis (Rick Wilder)
  4. How previous Science Panel comments addressed (Jennifer Pierre)

**BDCP**

BAY DELTA CONSERVATION PLAN

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# REVISIONS TO PROPOSED PROJECT

# Revisions to Proposed Project

- July 2012 State/Federal announcement
  - 5 intakes (15,000 cfs capacity) reduced to 3 intakes (9,000 cfs capacity)
  - Tunnels designed to move water with gravity; removed intermediate pumping plant
  - Project capacity reduced to minimize risks to
    - Local communities
    - Migrating salmon as they pass intakes

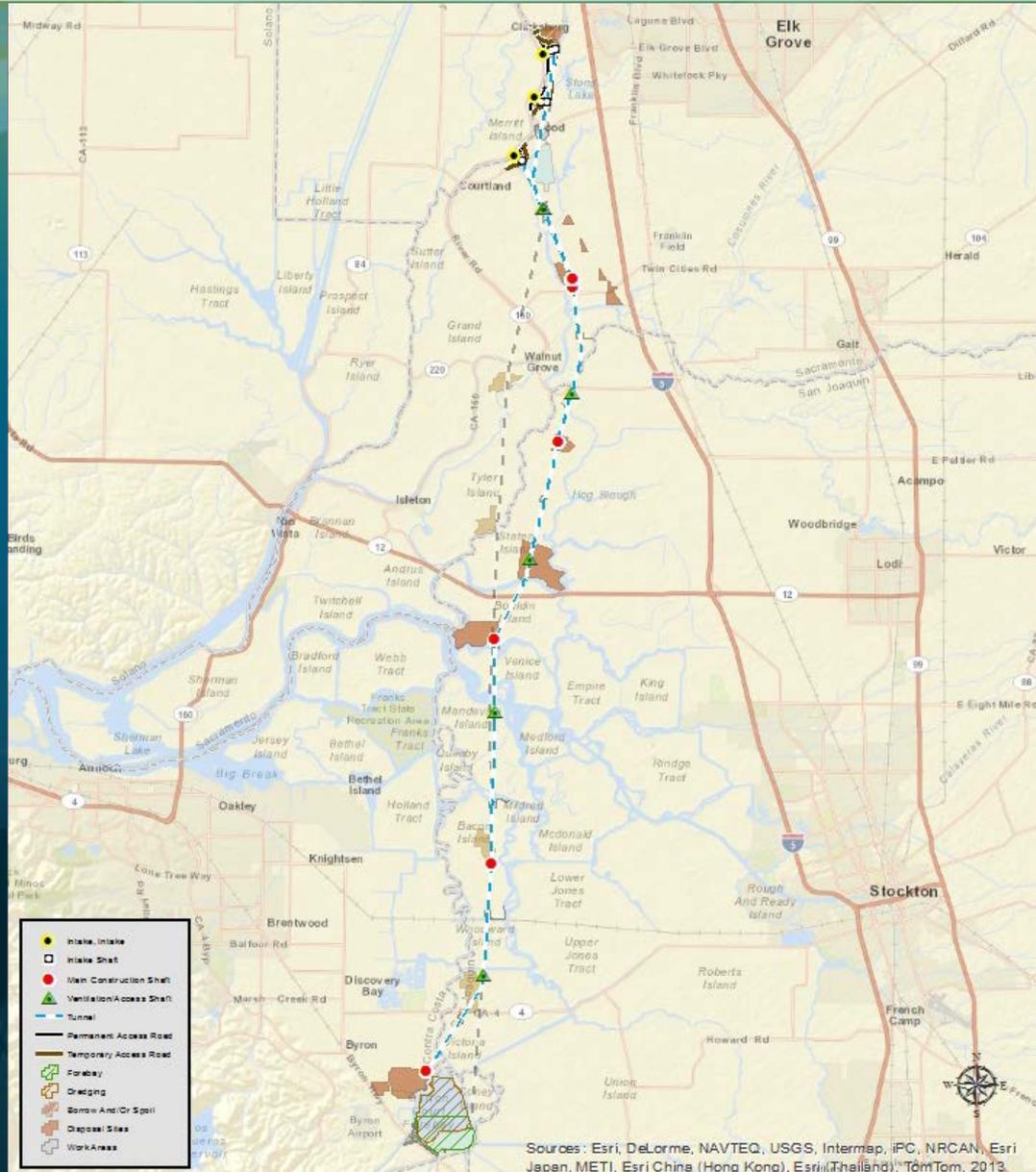
# Revisions to Proposed Project (con't)

- August 2013: Announcement of optimization of water facility alignment
  - Reduce impacts to local communities
  - Reduce impacts to biological resources
  - Reduce impacts to Stone Lakes National Wildlife Refuge
- Revised water operations
- See Sect. 3.4.1 for description of new water facility and operations

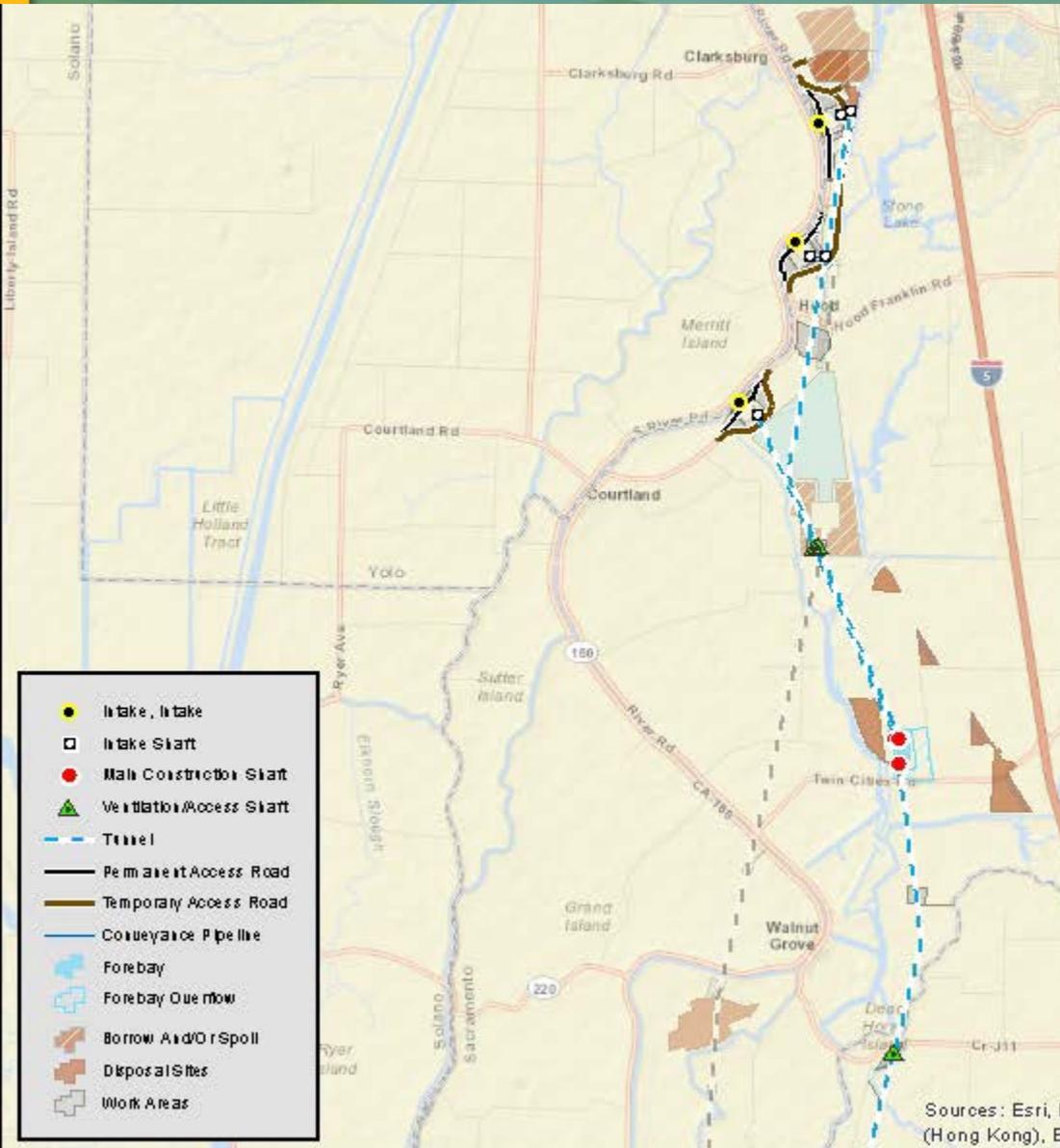
# Reusable Tunnel Material (RTM)

- Soil excavated from Tunnel Boring Machines mixed with non-toxic, biodegradable conditioners
- RTM transported to surface to dry
- Physical and chemical tests performed to confirm suitability for beneficial reuse
- > 99% of material expected to be reused for project construction needs, levees, tidal marsh restoration, or Delta roadways

# Old and New Alignments



# Old and New Intakes / Forebay



## Key Changes:

- Eliminated borrow pits
- Reduced drainage impacts
- Improved Hwy 160, saving 5 homes
- 3 northern tunnels instead of one tunnel and 2 pipelines, saving Hood Fire Department
- Realigned and shorter main tunnels
- Relocated and smaller intermediate forebay (40 ac instead of 750ac)
- Used DWR parcels for RTM storage sites/staging area

# Key Biological Changes

- Revised south Delta operations (more restrictive), including head of Old River barrier
- Revised outflow criteria (decision tree)
- Change to natural communities impacts (some more, some less)
- Reduce impacts to Stone Lakes National Wildlife Refuge
- New impacts on Staten Island and Vicinity
- Shifted impacts at Clifton Court Forebay

# CM1 Impacts by Natural Community

	Total in Plan Area	Permanent	RTM	Borrow and Spoil	Other Temporary
<b>Tidal Perennial Aquatic</b>	86,263	178	0	0	2,101
<b>Tidal Brackish Emergent Wetland</b>	8,501	0	0	0	0
<b>Tidal Freshwater Emergent Wetland</b>	8,856	5	1	0	10
<b>Valley/Foothill Riparian</b>	17,966	16	18	1	29
<b>Grassland</b>	78,047	211	249	0	158
<b>Alkali Seasonal Wetland Complex</b>	3,723	0	0	0	2
<b>Vernal Pool Complex</b>	12,133	15	0	0	16
<b>Other Natural Seasonal Wetland</b>	842	0	0	0	0
<b>Nontidal Freshwater Perennial Emergent Wetland</b>	1,509	1	1	0	5
<b>Nontidal Perennial Aquatic</b>	5,567	2	55	0	7
<b>Managed Wetland</b>	70,798	7	0	0	28
<b>Cultivated Lands</b>	487,106	1,448	3,140	199	1,196
<b>TOTAL</b>	<b>781,311</b>	<b>1,883</b>	<b>3,464</b>	<b>200</b>	<b>3,552</b>

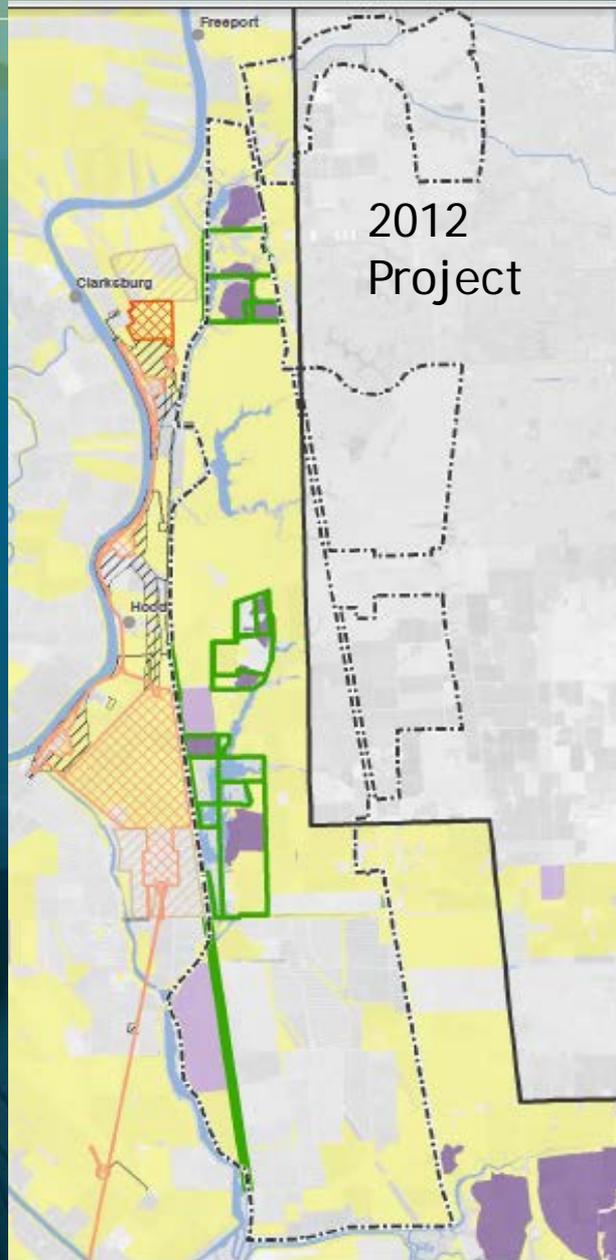
# Stone Lakes National Wildlife Refuge

-  RTM
-  Permanent Impact
-  Temporary - Borrow Area Impact
-  Temporary - Spoil Area Impact
-  Temporary Impact

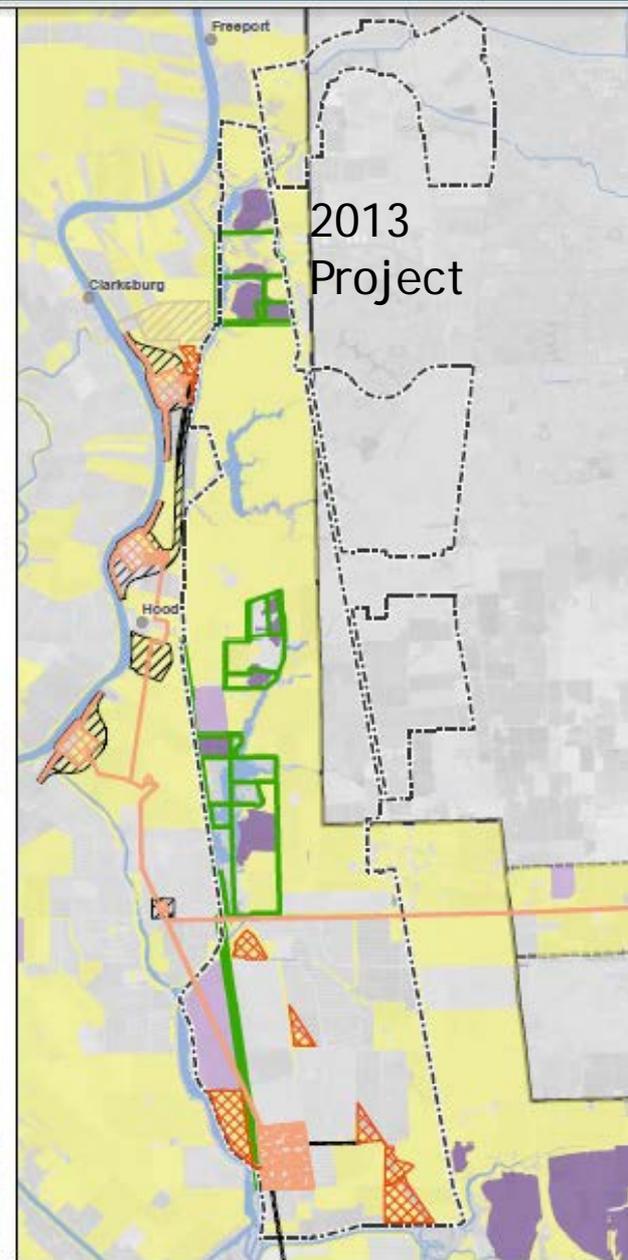
## Greater Sandhill Crane

### Habitat Type

-  Foraging
-  Roosting-Permanent
-  Roosting-Temporary

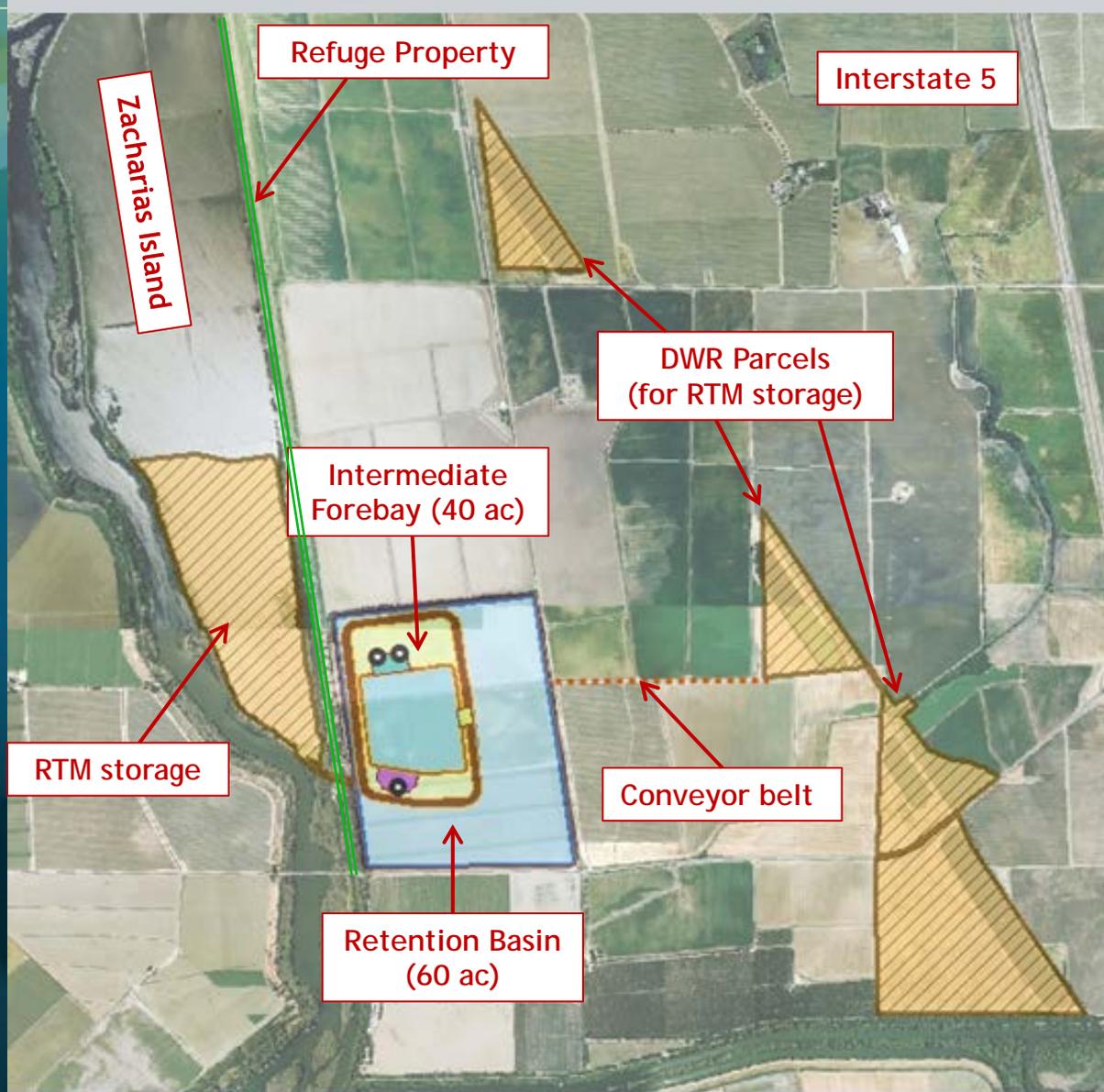


2012  
Project

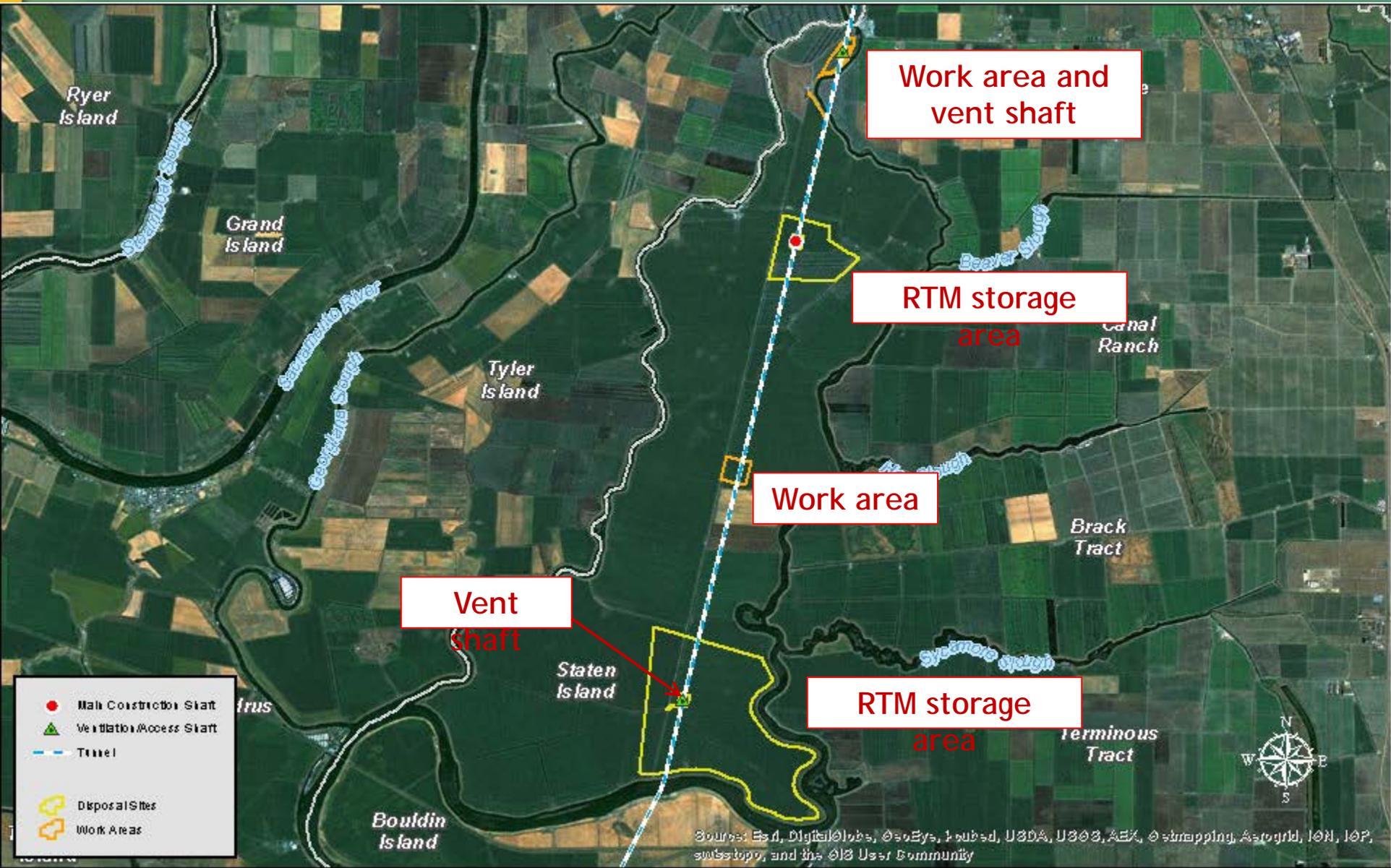


2013  
Project

# Forebay Detail (Glanvale Tract)

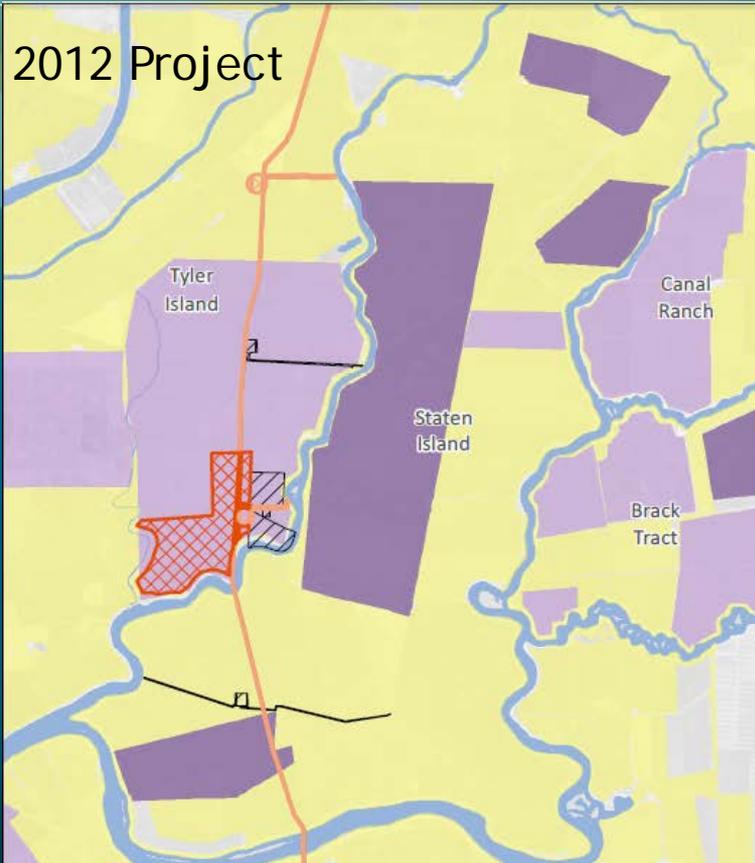


# Staten Island Detail

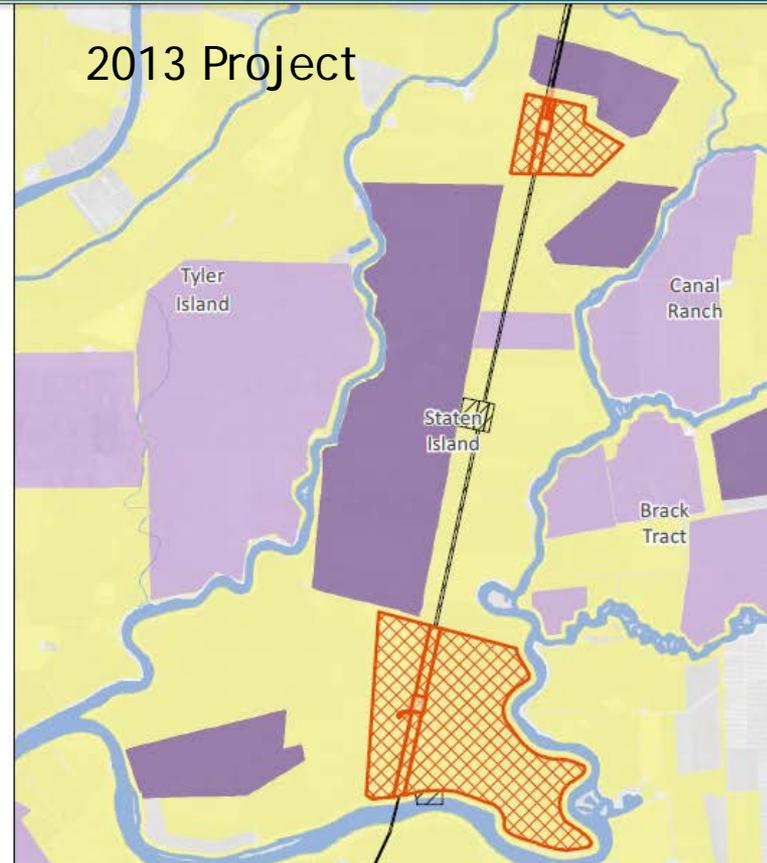


# Sandhill Crane Habitat

2012 Project



2013 Project



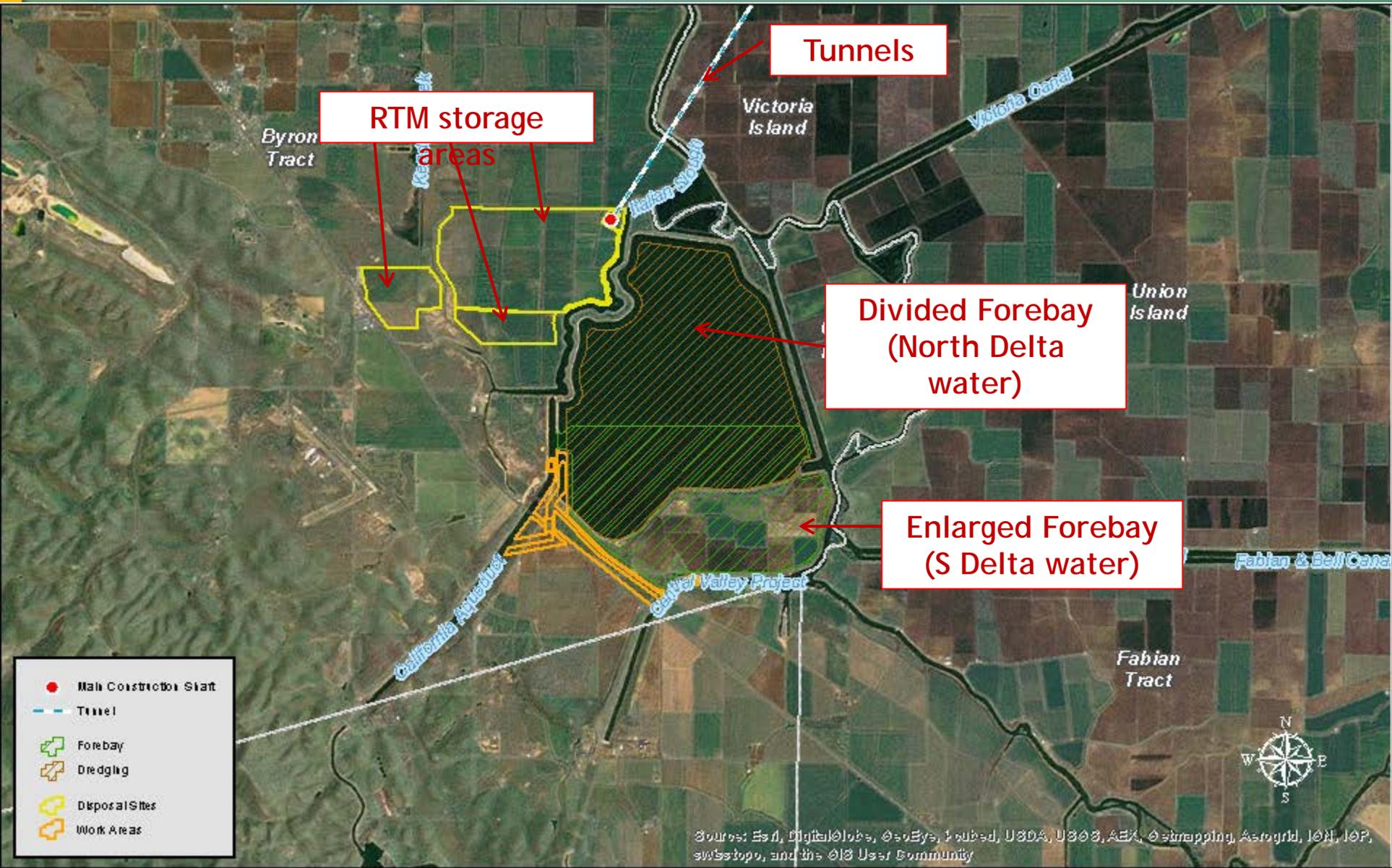
**Greater Sandhill Crane**

**Habitat Type**

- Foraging
- Roosting-Permanent
- Roosting-Temporary

- RTM
- Permanent Impact
- Temporary - Borrow Area Impact
- Temporary - Spoil Area Impact
- Temporary Impact

# Clifton Court Forebay Detail



# Clifton Court Forebay

2012 Project

2013 Project

**Natural Community**

-  Cultivated Lands
-  Alkali Seasonal Wetland Complex
-  Grassland
-  Valley/Foothill Riparian
-  Vernal Pool Complex
-  Developed

-  RTM
-  Permanent Impact
-  Temporary - Borrow Area Impact
-  Temporary - Spoil Area Impact
-  Temporary Impact

Reduced loss of grasslands

Vernal pool complex impact, but avoiding pools

# Revised Water Operations

- South Delta operations more protective of fish (Scenario 6)
- Real-time operations procedures and decision-making
- Decision Tree process: addresses uncertainty in outflow needs for
  - delta smelt (fall)
  - longfin smelt (spring)

## Overview:

### Revisions to -

- Covered species list
- Conservation strategies
- Avoidance and minimization measures
- Species accounts
- Effects analyses

# Revisions to Covered Species List

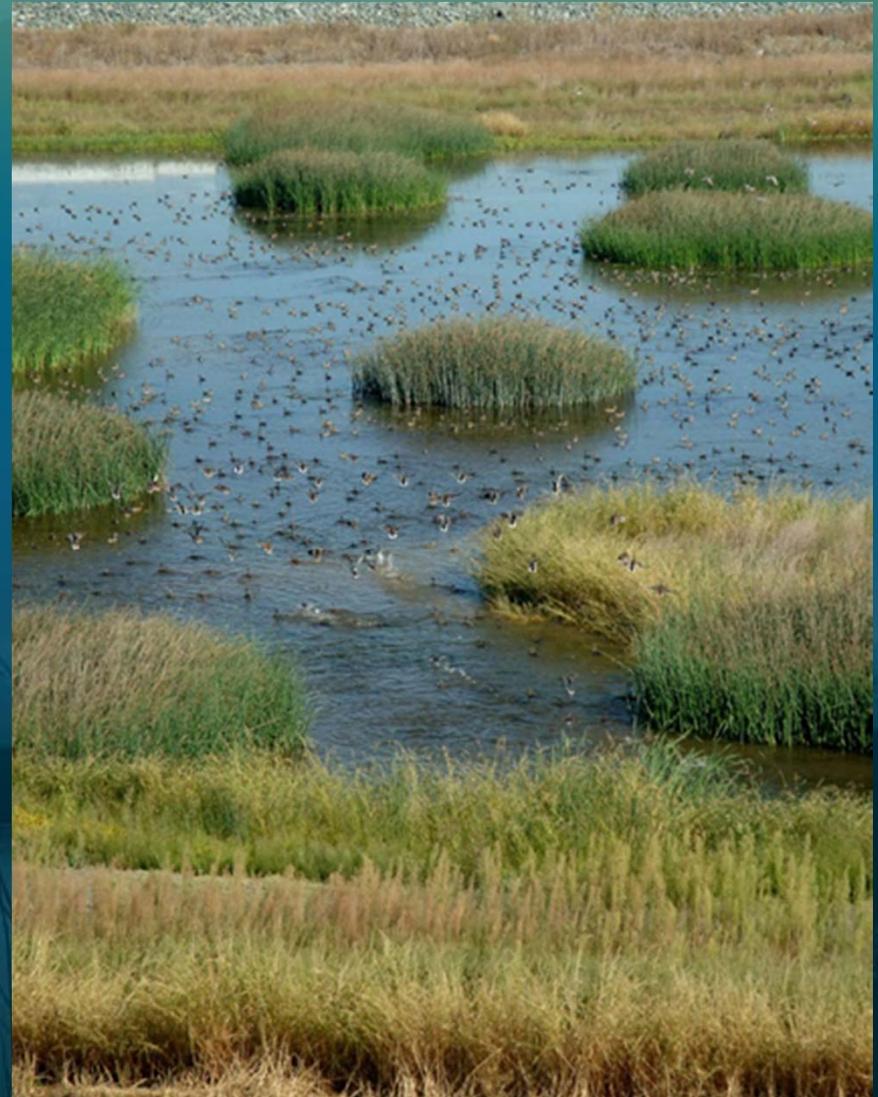
Removed the following species:

- Townsend's big eared bat (no records in Plan Area, low chance of take, and few if any conservation opportunities)
- California least tern (covered activities not expected to result in take)
- Western spadefoot (no records from Plan Area or within likely dispersal distance)
- Caper-fruited tropidocarpum (only known extant population is Monterey, far from the Plan Area)

# Revisions to Terrestrial Conservation Strategy

Increased  
conservation for

- Giant garter snake
- Salt marsh harvest mouse
- Greater sandhill crane
- Swainson's hawk



# Revisions to Terrestrial Conservation Strategy

More specific conservation requirements for

- **Riparian brush rabbit** - at least 800 acres riparian to be suitable, and provide adjacent grasslands (Objectives RBR1.2 and RBR1.6)
- **California black rail** (added species specific objective for marsh: Objective CBR1.1)
- **Greater sandhill crane** (specified locations for conservation: Objectives GSHC1.1- 1.5)



# Revisions to Terrestrial Conservation Strategy

## Giant garter snake:

- Substantially increased conservation acreage, and added specificity for consistency with USFWS' internal draft recovery strategy (Goals GGS1, 2, and 3, and associated objectives)



# Revisions to Terrestrial Conservation Strategy

## Salt marsh harvest mouse:

- Added specificity for consistency with recovery plan (e.g., “viable habitat areas”)
- Increased tidal brackish marsh restoration from 4,800 acres to 6,000 acres (Objective TBEW1.1)
- Added tidal restoration detail for sequencing restoration to minimize loss of populations and maximize opportunities to colonize new habitat (Section 3.4, Conservation Measure 4)

## Salt Marsh Harvest Mouse (cont.)

- Added population targets for restored tidal marsh and enhanced managed wetlands (Objectives SMHM1.1 and 1.2)
- Added requirement for 200 feet of uplands beyond restored wetland habitat (Objective GNC1.4)



## Greater sandhill crane

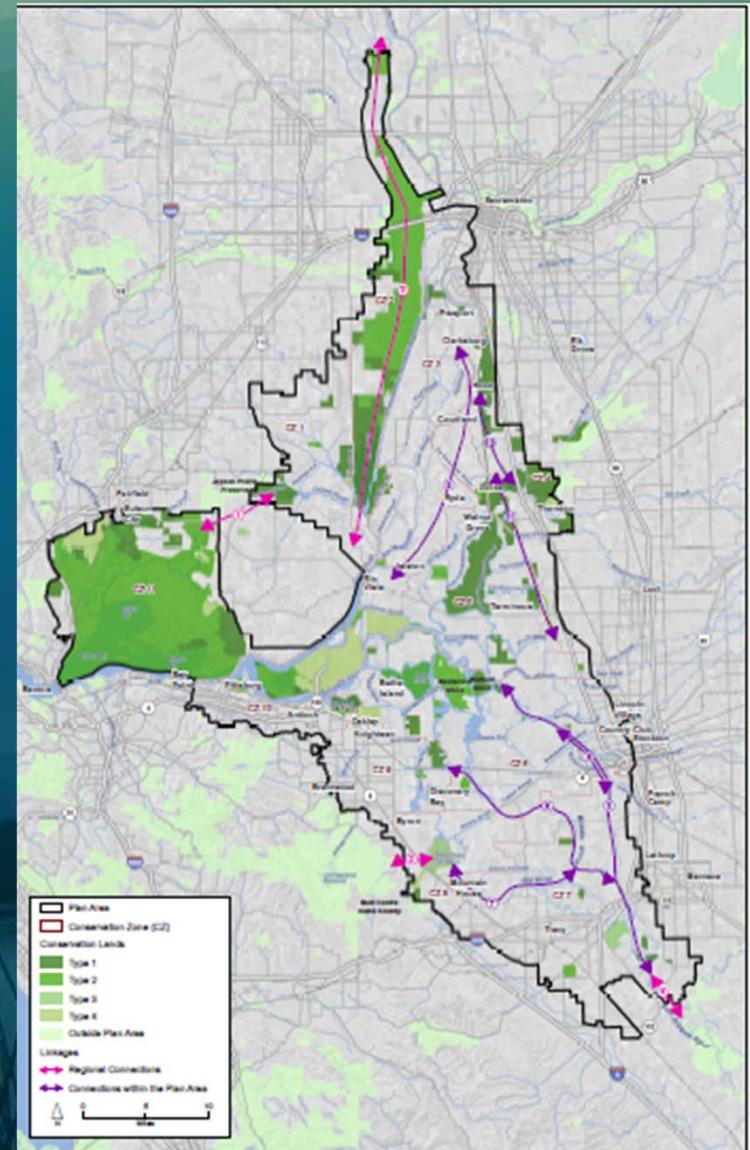
- Added specificity on location of conservation in relation to impacts and potential flooding (Objective GSHC1.1 - 1.5)
- Added minimum patch sizes for restored habitat (Objective GSHC 1.3 - 1.5)
- Added 180 acres of roost site restoration in SLNWR project boundary, with surrounding uplands at 2:1 ratio (Objective GSHC1.4)
- Added requirement for roost site creation, no longer contingent on cranes abandoning old site (Objective GSHC1.5)

## Swainson's Hawk

- Increased cultivated land habitat conservation from 33,700 acres to 43,325 acres, with 50% to be managed as alfalfa (Objectives SH1.1 and SH1.2)
- Added an elevation requirement for a portion of the conservation (Objective SH1.3)
- Added conservation of other natural community types (grasslands, etc.) for foraging (Objective SH1.4)

# Revisions to Terrestrial Conservation Strategy

Identified key landscape linkages (Figure 3.2-16) and described linkage protection and enhancement in Conservation Measures 3 and 11 (Section 3.4)



## Revisions to Avoidance and Minimization Measures (App. 3C)

### Sandhill Crane (AMM20):

- Measures to avoid and minimize indirect effects of CM1 construction, and bird strikes from transmission lines
- Performance standard: no net loss of crane use days on Staten Island (to address new impact in this high use area)
- Performance standard: no net increase in bird strike risk from transmission lines



# Revisions to Avoidance and Minimization Measures (App. 3C)

## Swainson's hawk (AMM18)

- Minimize loss of nest trees during near-term implementation
- Near-term replacement of mature nest trees to avoid temporal loss



# Revisions to Species Accounts (Appendix 2A)

- Revised species habitat models and model descriptions to enhance repeatability
- Included clear description of minimum habitat mapping units



## Revisions to Terrestrial Effects Analyses (Section 5.6)

- Revised assessments of habitat loss and fragmentation to reflect revisions to models and new CM1 footprint
- “Reusable Tunnel Material” (RTM) treated as permanent impact but will likely be removed and land restored to habitat
- Revised effects analyses to incorporate new conservation strategies, avoidance and minimization measures

## Revisions to Terrestrial Effects Analyses (Section 5.6)

- Added assessment of the effects of covered recreational activities in the reserve system
- Expanded descriptions of indirect effects of methylmercury on covered species
- Assessed effects of managed wetland enhancement on covered species
- Added analysis of bird strike risk from transmission lines (Appendix 5.J-C)
- Added detailed assessment of potential indirect effects to cranes from CM1 (Appendix 5.J-D)

## Revisions to Terrestrial Effects Analysis (Section 5.6)

### Conservation Measure 2 Operation:

- Revised method for analyzing periodic effects from Yolo Bypass flooding (Section 5.6, subsections for each species on periodic inundation)
- Added assessment of potential loss of giant garter snake rice habitat as a result of flooding Yolo Bypass (Appendix 5.J-E)

## Revisions to Terrestrial Effects Analyses (Section 5.6)

- Revised beneficial effects sections to better clarify how quantitative habitat benefits were derived
- Where needed, refined or added objectives to better ensure estimated benefits will be achieved
- Added references to biological objectives and conservation measures for beneficial effects
- Revised net effects descriptions to better clarify how quantitative net effects estimates were derived

## Adaptive Management and Monitoring Program (Section 3.6)

- Added specificity to Section 3.6, Appendix 3D, and the Conservation Measures (Section 3.4) related to monitoring and adaptive management, and addressing key uncertainties
- Work in progress - coordinating with wildlife agencies to provide more specificity, prioritize species for monitoring, and identify additional key uncertainties for select terrestrial species

## Changes Since Last Delta Science Panel Review



- Global Changes to Chapter 5 and Appendices
  - Updated to reflect new operations, including range of decisions tree outcomes:
    - Evaluated Starting Operations (ESO)
    - High Outflow Scenario (HOS)
    - Low Outflow Scenario (LOS)
  - Updated to address Science Panel and agency comments
  - Added and updated model documentation to allow better reader understanding of models

- Global Changes to Chapter 5 and Appendices (cont.)
  - Incorporated new literature and tools, as relevant and available
  - Revised Net Effects Analysis
    - Significantly revised for more logical flow and better understandability
    - Attributes updated and more accurately defined to address agency concerns

- Global Changes to Chapter 5 and Appendices (cont.)
  - Revised Net Effects Analysis (cont.)
    - Incorporated agency staff input on attribute ranking and effect scores using systematic methodology
    - Separated discussion of salmonids by stock, watershed of origin, and in-Delta duration (foragers vs. migrant)
    - Tied net effects back to biological goals and objectives

- Appendices Not Previously Reviewed by Panel
  - 5A: Climate Change
  - 5E: Habitat Restoration
  - 5G: Life Cycle Models

- Appendix 5A-Climate Change
  - New to this Panel review
  - Describes the effects of climate change on covered species independent of BDCP

- Changes to Appendix 5B-Entrainment
  - Refined entrainment methods applied to adult delta smelt to be consistent with USFWS BiOp
  - Updated Particle Tracking Results
    - Revised starting distributions for delta smelt
    - Additional hydroperiods for broader range of flow conditions
  - Results show reduced entrainment across all species (compared to baselines and to previous analysis)

- Changes to Appendix 5C-Flows
  - Global
    - Conclusions moved to Ch. 5
    - Greatly streamlined and standardized presentation for consistency and ease of reading
    - Improved accuracy and consistency of timing of life stages
    - Provided discussion of discrepancies between model results
    - Effects limited to Plan Area and Feather River

- Changes to Appendix 5C-Flows (cont.)
  - In-Delta and Passage
    - Updated Delta Passage Model Results for Chinook salmon
    - Added particle tracking model nonlinear regression analysis
    - Added analysis of through-Delta spring-run and fall-run Chinook salmon smolt survival (Newman 2003)
    - Added analysis of reverse flows entering Georgiana Slough

- Changes to Appendix 5C-Flows (cont.)
  - In-Delta and Passage (cont.)
    - Added and refined analyses related to Yolo Bypass
      - Evaluation of proportion of Chinook salmon benefiting from CM2
      - Evaluation of Chinook salmon fry growth in Yolo Bypass
      - Evaluation of effects of Fremont Weir notching on lower Sutter Bypass Inundation

- Changes to Appendix 5C-Flows (cont.)
  - In-Delta and Passage (cont.)
    - Added analyses related to North Delta Diversion
      - Evaluation of reverse flows
      - Evaluation of salmon survival
    - Expansion of turbidity analyses

- Changes to Appendix 5C-Flows (cont.)
  - Upstream
    - Revised upstream temperature analyses
    - Confirmed no effect to separate salmonid runs in Trinity River
    - Added a “worst case scenario” (<100,000 juveniles) analysis using SALMOD outputs

- Changes to Appendix 5D-Contaminants
  - Updated mercury model
    - Central Valley Regional Water Quality Control Board model added and compared to previous model results
    - Results were similar; both analyses reported
  - Updated selenium model
    - Added white sturgeon analysis in western Delta
    - Results indicate small increase relative to baseline

- Appendix 5E-Restoration
  - New to this Panel review
  - Describes effects of BDCP habitat restoration and enhancement on suitable habitat, food production, and other ecosystem-level effects
  - Results show potential for substantial benefits related to suitable habitat and increased food resources for all covered fish species, while acknowledging uncertainty

- Appendix 5F-Biological Stressors
  - Refinement of predation loss analyses at North Delta Diversions (bioenergetics modeling)
  - Addition of *Microcystis* analyses

- Appendix 5G-Fish Life Cycle Models
  - New to this Panel review
  - Reviews and screens available life cycle models potentially applicable to BDCP
  - Identifies two models, IOS and OBAN, for winter-run Chinook salmon

- Appendix 5G-Fish Life Cycle Models (cont.)
  - Results are mixed regarding the effects of BDCP on winter-run Chinook salmon, depending on outflow scenario
  - Models highly sensitive to upstream temperatures; BDCP does not propose changes in Shasta operations

- Appendix 5H-Aquatic Construction
  - Small revisions only

# Summary of How ICF Addressed Previous (Phase 2) Panel Comments

## Uncertainty Requires Adaptive Management;

### Describe Specific Approaches and Link to Effects Analysis

- Adaptive management is integral to plan implementation (Section 3.6).
- An Adaptive Management Team oversees monitoring and adaptive management tasks and is responsible for tracking both monitoring and changes in best available science.
- Adaptive management workflow is essentially the same as in the final Delta Science Plan

## Consistent Application and Assessment of Biological Objectives

- Assessed where possible, often qualitatively
- In many cases assessment not possible because adequate data/models do not exist
- Assessment generally would occur during implementation (monitoring/adaptive management) **to address uncertainty**
- See Chapter 5, Table 5.2-8. *Biological Objectives for Covered Fish Species and their Assessment in the Effects Analysis*

# Application of Biological Objectives to Ecosystems and Landscapes

## Chapter 3.3, *Conservation Strategy*

- Biological objectives for landscape scale areas and for specific natural communities (such as tidal mudflats and for riparian areas)

## Chapter 5, *Effects Analysis*

- Analyzes interactions among covered species.

# Net Effects Scores Should be Summed

- Scores were not summed:
  - Each effect conclusion is independent
  - There is overlap in attributes, and it is challenging to integrate
  - Approach is transparent and consistent to arrive at overall net effects conclusions independent of an overall 'score'.
  - Each species' net effects conclusion justified based on the preceding conclusions for individual effects.

## Include Species Account Information in Chapter 5

- A brief overview is provided in the beginning of the discussion of each species in the net effects
- Chapter 2 Species Accounts (Appendix 2.A) has been updated

## Extend the Quantitative Net Effects Analysis to Sturgeon and Lamprey

- The sturgeon net effects analysis has been substantially improved, including the application of the quantitative net effects method
- Lamprey analysis was updated, but scoring was not applied due to lack of information about most stressors

## Net Effects Approach Used for Fish Should be Applied to Terrestrial Species

- Habitat loss/fragmentation is primary stressor for terrestrial species
- Tables 5.6-7 and 5.6-8 provides quantitative analysis of net habitat effects
- Qualitative narrative assessment of net effects is sufficient to evaluate other stressors

## Chapter 5 Should Include a Map of the Plan Area and Larger Watershed

- Plan Area map showing ROAs is included in Chapter 5 (Figure 5.2-2)

## Chapter 5 Should Include Background on Current Restoration Efforts

- Appendix 5E.B includes a description of restoration and unintentional breaches that have occurred and lessons learned from these events
- Explores lessons learned
- Identifies uncertainties in outcomes

## Report Findings of Appendices in Chapter 5

- Net effects analysis for fish (Section 5.5) includes frequent and clear references to key analyses and results of Chapter 5 appendices
- Section 5.2 provides a summary of methods used
- Section 5.3 includes a description of the ecosystem and landscape level effects

## Show How Life Cycle Models Were Used in Chapter 5

- OBAN and IOS were used for winter run Chinook; results reported in Chapter 5 and Appendix 5.G
- Very few life cycle models applicable or useful for BDCP
- Appendix 5.G describes available life cycle models and why they were or were not used

## Include a List of Critical 'Unknowns' and Standardize the Description of Uncertainty

- Key uncertainties are identified for each conservation measure and are summarized in Appendix 3.D, *Monitoring and Research*.
- Net effects uses scoring to identify level of uncertainty

## Develop Conclusions for Fish in Section 5.1

- No conclusions are presented in Section 5.1
- All conclusions are presented in Sections 5.3 through 5.6
- Conclusions are often complex and require explanation
- Each species has a concluding section that articulates the full conclusion

## Clarify Baseline Conditions of Species and Habitat

- The environmental baseline is defined in Chapter 5, Section 5.2.3
- Species accounts in Appendix 2.A include a robust description of the current status of each species
- Habitat conditions are better characterized
  - Quantitatively within the Habitat Suitability Index (HSI) analysis in Appendix 5.E
  - Qualitatively within the description of restoration and breaches to date in Attachment 5E.B
- Adaptive management, baseline studies, and other commitment in BDCP will be used to establish baseline understanding and measure BDCP changes

## Develop Clear and Specific Criteria for Sequencing and Implementing Conservation Strategy

- Section 3.4, Conservation Measures 3-10, describe criteria for habitat protection and restoration
- Required timeline for implementation in Tables 6-1 and 6-2
- Sequencing will be evaluated and adjusted through adaptive management (Nine-Step Plan, Section 3.6.3.4.4)

## Negative Effects of Conservation Strategy Should be Analyzed

- Additional analysis has been conducted to explore potential adverse effects on covered species
- Net effects scoring reflects these negative changes, along with positive changes
- Appendix 5.H evaluated construction and maintenance effects on fish

## Describe Changes in Sedimentation

- Section 5.3 summarizes expected changes in each ROA; fish net effects incorporate changes in turbidity
- Appendix 5.C (Attachment 5C.D) summarizes the expected changes in sediment load into the Delta
- Ongoing efforts to better quantify and understand this change
- Current estimates of 8-9% reduction in sediment entering Plan Area; overall effect is highly uncertain and very localized

## Better Describe Restoration Uncertainty

- The net effects analyses in Chapter 5 describes restoration uncertainty
- Substantial detail has been added to Appendix 5.E to acknowledge and incorporate uncertainties related to
  - Invasive clams, nonnative predators, invasive aquatic vegetation
  - Specific site characteristics of restored areas
  - Species use of these areas
  - Food production and export

## Analyze Foodweb-Based Contaminant Effects on Fish

- Quantitative selenium model used in Appendix 5.D
  - Affects primarily sturgeon
- Minimal potential changes in contaminants
- Overall, no major adverse effects

## Food Quality and Quantity, Including Sources Other than Plankton Should be Considered

- Net effects includes specific analysis of food communities and types
- Appendix 5.E, *Habitat Restoration*, food analysis has been substantially expanded to include all possible types of food sources produced by BDCP

## Hydrodynamic Modeling as a Tool to Develop New Operating Criteria

- Adjustments to south Delta criteria in revised project
- Ongoing evaluation of North Delta bypass flow criteria
- DSM2 used to assess several effects of BDCP: changes in salinity, particle tracking, travel time, survival

## Describe Effects on San Francisco Bay

- Proportion of freshwater removed by BDCP is minimal compared to tidal flux in Bay
- So no measurable effects on any terrestrial or aquatic covered species or natural communities
- Will add more discussion about downstream effects evaluation in Final Draft

## Separate Salmon Runs, Stock, and Life Stages; Maximize Use of Yolo Bypass

- Net effects analyses are conducted for each individual population of Chinook salmon and steelhead
- Conclusions are made separately for each population for each attribute (i.e., stressor)
- Additional Yolo Bypass analysis conducted; implementation will require active adaptive management

# Use Sensitivity Analyses and Model Verification for Analyses Related to Covered Fish

- Conducting sensitivity analysis in response to agency comment (Delta Passage Model)
  - Structural uncertainty (Delta entry distribution; Yolo Bypass survival)
  - Parameter uncertainty (Sobol' sensitivity indices on main parameters)
  - Model demonstration (illustrating importance of changes in flows and exports)
  - (Identified erroneous functions that did not give results similar to historic values - now corrected)
- Included new information on model sensitivity analyses where available (e.g., Zeug et al. 2012: IOS)

## Include Actions in the Conservation Strategy that Will Immediately Benefit Declining Populations (i.e., Longfin Smelt) Pre-Restoration

- Multi-stressor approach
- Restoration will occur before most other components of the Plan affecting LFS
- Decision-tree is used to determine necessary spring and fall outflow
- Current BiOps govern operations until North Delta facility is operable