

**DELTA SCIENCE PROGRAM
INDEPENDENT SCIENCE PANEL REVIEW**

**Methodology and Scientific Basis to Support a Delta Levee
Investment Strategy**

SCOPE AND CHARGE TO REVIEWERS

BACKGROUND

The Delta provides many assets and services important on local, regional, statewide, and national levels. At the confluence of the Sacramento and San Joaquin Rivers, the Delta receives more than 40% of California's freshwater flow, and partially supplies water to 25 million Californians. California's water supply system diverts flows originating in the northern region of the State and distributes them to areas south and west of the Delta that need high-quality fresh water. A large portion of the San Joaquin Valley agricultural region is dependent upon Delta water to sustain food production important to local through international markets. Several San Joaquin Valley communities are entirely dependent on the Delta for water and many other communities, including large metropolitan areas, receive a portion of their municipal and industrial water from the Delta. The Delta supports critical infrastructure including energy transmission lines; transportation routes for ships, trains and trucks; and water delivery structures. The Delta is also home to historic towns, vibrant communities, working farms, and waterways popular with boaters, birders, and other recreationalists. (See Delta Plan Chapter 5; Water Code § 85085.)

TODAY'S DELTA

The Delta of today consists of over 1,000 miles of levees that define more than 50 islands and tracts. The Delta is a legally defined region characterized by large rivers, sloughs, highly productive soils, islands, and an extensive system of levees that prevent flooding from tidal flows and floods. Beginning in the 1850s, settlers started reclaiming Delta marsh lands for farming by channelizing sloughs, building levees, and creating islands. Pre-existing low embankments, formed by natural processes and flow conditions, were enhanced and enlarged, creating the Delta's current island configuration. Island soils, composed largely of organic peat, are highly susceptible to oxidation and compaction. Consequently, many Delta islands, particularly in the Central Delta, are now greater than 15 feet below sea level (Figure 1) and threatened by flooding on a daily basis. Ad hoc levee design and age requires frequent alteration and maintenance to ensure the necessary strength and integrity to resist the daily flood threat (CALFED Levee Stability Program 2008).

Delta levees are continually vulnerable to damage from daily tides, winter storms, burrowing mammals, seepage, slumping, earthquakes, sea level rise and the continued degradation of peat soils. A major earthquake or large storm has the potential to produce levee damage or failure to individual or multiple islands. Island failures could draw saltwater in from San Francisco Bay jeopardizing many freshwater diversions and potentially forcing federal (CVP) and state (SWP) water project operators to limit or suspend fresh water exports from the south Delta. Projected sea level rise of 4 feet or more by 2100 will cause additional stress on Delta levees requiring more robust structures to preserve existing Delta assets and services.

DELTA ECOSYSTEM

The Delta is a heavily impacted ecosystem, with most of the approximately 700,000 acres of historical tidal marsh and floodplain habitats eliminated. Currently, only a thin channel margin, isolated terrestrial habitats, and in-channel islands are available to support remaining aquatic and terrestrial species that rely on edge habitat. In addition, the Delta has been compromised by exotic species introduced through ballast water, discarded aquarium contents, and other sources. Despite these impacts, the Delta's habitat is critical to hundreds of plant and animal species including over 50 currently listed as threatened, endangered or of special-concern. There are significant plans to restore many Delta habitat types including but not limited to the Bay-Delta Conservation Plan, the Ecosystem Restoration Program, and smaller local efforts supported by various public and private entities.

POLITICAL BOUNDARIES

Parts of six counties comprise the Delta region and each exercise control over their sphere of influence. Management of Delta land, water, and other assets is loosely cooperative, interdependent, and subject to approval of multiple local, state, and federal agencies. The Delta Protection Commission, created in 1992 and strengthened by the Delta Reform Act of 2009, oversees development activities in the Delta's core area called the Primary Zone. However, this authority does not extend to the peripheral Secondary Zone, where development is regulated but not restricted (Figure 2).

THE DELTA PLAN

In 2013, the Delta Stewardship Council (Council) adopted the Delta Plan (Plan). This is a comprehensive, long-term management plan for the Delta and provides new regulations and recommendations to further the state's coequal goals of providing a more reliable water supply for California and protecting restoring, and enhancing the Delta ecosystem (coequal goals). These coequal goals will be pursued in a manner that "...protects and enhances the unique cultural, and recreational, natural resource, and agricultural values of the Delta as an evolving place (Delta as place)" (Delta Plan, Executive Summary, pg. 3).

DELTA LEVEE SYSTEM

From the beginning, the Delta levee system has been important to control flood waters (tidal or riverine) while defining islands and land ownership. Private interests built original levees in response to the provisions of the “Swamp and Overflowed Lands Act of 1850”. Today islands or tracts are managed by a variety of separate local public agencies (Local Agencies).

For many years after the State and federal water projects were operating, no State funding was available to maintain or repair the Delta levee system; however, after a 1972 levee failure at Brannan Island, resulting in saltwater contamination of fresh water designated for export, the State recognized the critical importance of Delta levees to protect the water supply for major agricultural, domestic, and industrial interests. These interests contribute significantly to the State’s economic health, and in 1973 the legislature prepared the foundation for the current Delta Levees Program when it authorized Senate Bill 541, known as the Way Bill, and established the Delta Levee Maintenance Subventions Program. Subsequent legislation authorized State funding for Delta levee maintenance, repair, and improvement to protect assets of State interest. The State now funds the Subventions and Special Projects Programs to provide individual Local Agencies funding to repair, maintain, operate, and improve Delta levees. Net habitat enhancement is also a component of these programs.

STATE FUNDING FOR DELTA LEVEES

The responsibility to administer the Subventions and Special Projects Programs was given to the California Department of Water Resources (DWR) with oversight provided by the Central Valley Flood Protection Board (CVFPB) and the California Water Commission, respectively. Guidance documents for administering these Programs have been developed by DWR staff.

Subventions Program funding is available to any eligible Delta levee district and provides up to 75 percent of levee maintenance and improvement costs after a minimum cost threshold has been paid by that district. The Special Projects Program is tailored to achieve specific State interests and can fund up to 100 percent of projects that include design and construction, habitat enhancement, research, and other limited activities. These programs have supported significant structural improvements to the Delta levee system and enhanced response mechanisms to mitigate levee-threatening incidents.

LEVEE PRIORITIZATION

The Delta Reform Act (Act) of 2009 established the Delta Stewardship Council (Council) and formalized the coequal goals for the Delta. The Act also directs the Council, in consultation with the CVFPB, to prioritize investments in support of operation, maintenance, repair, and improvement of the Delta levee system (Delta Plan

recommendation RR R4 Actions for the Prioritization of State Investments in Delta Levees). Currently, there is no comprehensive method to quantify the effects of state levee investments. To facilitate the development of a transparent, reproducible, and effective methodology to prioritize the State's funding for levee work, DWR prepared an interagency agreement with the Council. This interagency agreement is to develop a methodology and tool collectively that uses existing data to quantify assets and other benefits associated with each island and tract to establish a basis to judge the effectiveness of State funds to accomplish State objectives. A competitive proposal solicitation was prepared and a consulting team led by ARCADIS was awarded the contract for this project. The supporting methodology will be based on the best available science and modeling. The subsequent tool will be used to prioritize and classify islands to guide a long-term State levee investment strategy.

INDEPENDENT SCIENTIFIC REVIEW PANEL

An Independent Scientific Review Panel (Panel) will be convened by the Delta Science Program (see Delta Science Plan; Appendix I) to review the methodology and scientific basis developed by ARCADIS. This review will ensure the approach taken is transparent, robust and sufficiently sensitive to quantify and prioritize the assets and risks to State interests associated with each leveed island and tract in the Delta. The outputs of this methodology will support the identification of no less than three prioritized groups of islands and define the significance of each group to State investments. This grouping will be used to develop a near-term State levee investment strategy that may be updated as needed over a longer time frame. The methodology and tool will allow for adjustments as State priorities and conditions in the Delta change over time.

METHODOLOGY OBJECTIVES AND PERFORMANCE

This methodology must consider and quantify all aspects associated with local, regional, State, and national benefits produced or protected by levees surrounding Delta islands. It must also consider costs of levee system improvements on each island with special consideration given to achieving the coequal goals and supporting the Delta as place. This methodology must have the capacity and flexibility to adjust parameters, as needed, to compare outputs across all islands and allow for the alteration and/or expansion of parameters over time. The final objective for this methodology is to support a tool to quantify the assets and risks associated with economic, environmental, and social attributes of all Delta islands and objectively lead to a prioritization of islands into three or more tiers. These tiers will provide the rationale and information needed to develop a long-term levee investment strategy with targeted funding to support the operation, maintenance, repair, and restoration of specific Delta islands that are important to State interests in the Act.

REVIEW PROCESS TIMELINE

1. April 2015 – ARCADIS will deliver the methodology, assumptions, source data and all supporting materials (report) to the Delta Science Program for distribution to the Independent Scientific Review Panel (Panel).
2. Fifteen days after receiving the methodology, assumptions, source data and all supporting materials (report), staff from DSC Science will teleconference with Panel members for a preliminary assessment that will be used to focus ARCADIS' materials so their presentations may address items of initial interest to the panel. The results of the teleconference will be summarized in a short summary document that will be presented to Council staff and DWR representatives with the understanding that it is preliminary information only and subject to change/augmentation.
3. After receiving the methodology, assumptions, source data, and all supporting materials (step 1 above), the Panel will be given a total of at least 30 calendar days to evaluate this information before a two-day public meeting held in Sacramento, California. During this meeting the Panel will receive presentations from ARCADIS and others regarding development of the report. Also, during this meeting the Panel will discuss the strategy for developing their review.
4. The Panel will submit its final review to the Delta Science Program - Lead Scientist, 30 calendar days after the public meeting.
5. No more than 2 weeks later the final review will be posted to the Council website for public access.

REVIEW PANEL CHARGE

This Panel is charged with reviewing the methodology developed to identify no less than three prioritized groups of Delta islands based on their importance to maintain economic, social, and environmental assets-of-State-interest and their ability to mitigate risks to those State interests associated with flooding on Delta islands. The Panel is, also, charged with evaluating the degree to which the methodology contained in the report can be used to guide a long-term State levee investment strategy. This strategy would be used to establish funding levels for each group to support the maintenance, repair, and improvement of Delta levees to achieve the coequal goals, and support the Delta as place, as established in the Delta Reform Act. The following review questions and criteria are organized around three guiding principles: relevance, credibility and transparency.

Relevance

- Does the methodology require each and all leveed Delta islands and tracts to be treated as separate and distinct entities?
- Does the methodology account for the contribution of individual leveed islands and tracts to the interconnectedness and function of the Delta and the levee system as a whole?

- Does the methodology consider appropriate economic and environmental factors and beneficiaries to accurately quantify assets and risks?
- Will the flexibility included in the methodology allow for updates based on changing environmental conditions, new data, changes in the physical configuration of the Delta, shifting policy objectives, etc.?
- Will this methodology contribute to achieving the coequal goals and support the Delta as place?

Credibility

- Is the methodology valid and based on appropriate theories and technical literature?
- Are assets, risks, social considerations, and boundary conditions appropriately assigned and weighted?
- Do the data, assumptions, and literature employed by this process provide practical thresholds and appropriate recommendations while identifying important data gaps and uncertainties?
- Are the technical basis and interoperability of different components clearly defined?
- Are the uncertainty and information sensitivity of the methodology for island prioritization relative to the assumptions clearly addressed?
- Are results sufficiently sensitive and robust to changing conditions, inputs, and scenarios to distinguish between different islands?

Transparency

- Is the methodology clearly defined, described, and documented?
- Are the rationale, assumptions, and supporting information used in this methodology clearly identified across all major steps of the development process?
- Are factors and interactions clearly defined and weighted?
- Are weightings adjustable and sensitive to varying conditions?
- Will the subsequent tool be usable and understandable?

Additional Perspectives

- Overall, will this tool provide staff and decision-makers the objective analysis needed to prioritize islands for receipt of State funding assistance and guide a long-term levee investment strategy?
- Please provide any additional comments related to the suitability, robustness and sensitivity of this innovative methodology.

REVIEW PANEL MEMBERSHIP

The Review Team will include experts of high standing from the science community with expertise representing the following areas:

- Geotechnical/Seismic

- Integrated Risk Management
- Flood Management/Hydrology
- Human and Social Issues
- Economics
- Environmental/Land Use Change
- Integrated Modeling

ADDITIONAL INFORMATION

1. DRMS – excerpts, not the entire report
2. Appendix D of the Framework
3. Add additional materials, to be developed by the Planning Committee, here.

REFERENCES

Sacramento-San Joaquin Delta Reform Act of 2009 – SBX7 1

http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx7_1_bill_20091112_chaptered.html

Delta Stewardship Council. 2013. Delta Plan

<http://deltacouncil.ca.gov/delta-plan-0>

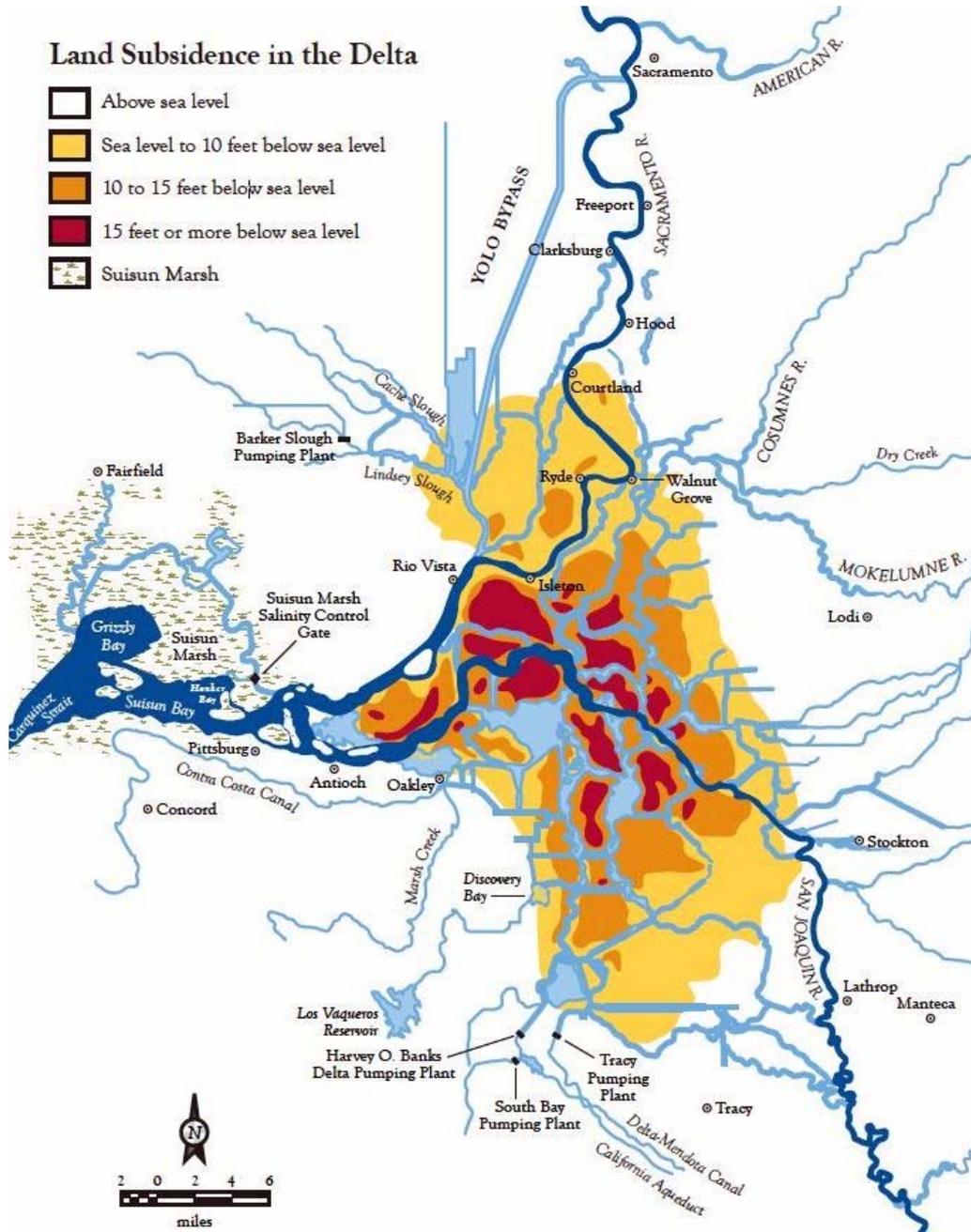
Accessed August 2014

Delta Stewardship Council. 2013. Delta Science Plan

<http://deltacouncil.ca.gov/science-program/delta-science-plan>

Accessed August 2014

Figure
Map



depicting the variation of land subsidence around the Delta Region. Map source: California Department of Water Resources (1995)

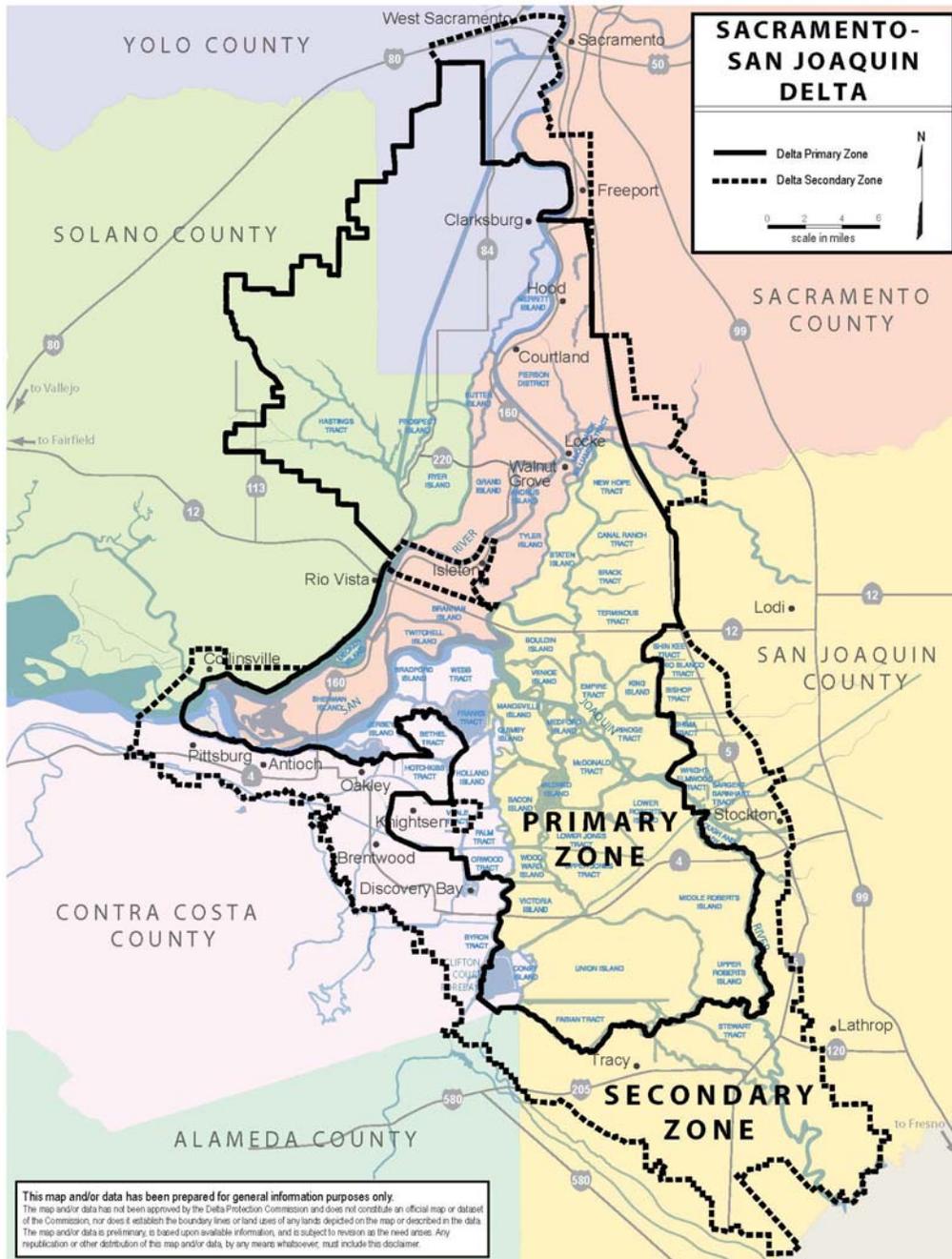


Figure 2 – Political boundaries of the 6 Delta counties and the Primary and Secondary zones. Map taken from the Delta Protection Commission website on August 11, 2014 - http://www.delta.ca.gov/res/docs/plan/Delta_Map_Exhibit.pdf