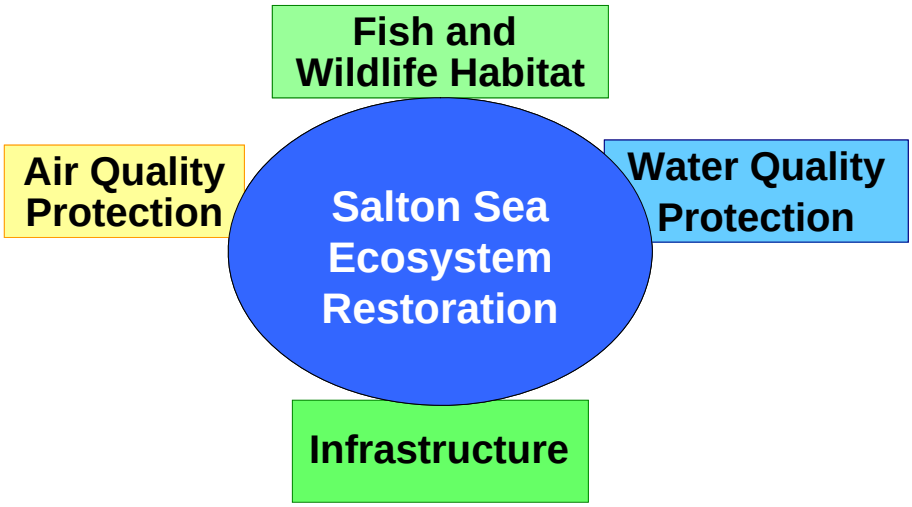
Development of the Range of Configurations

Advisory Committee
December 8, 2005

Purpose of this Session

- **Confirm methods used to define Configurations and incorporate uncertainties**
- **Describe assumptions used for preliminary cost estimates for Configurations**
- **Describe how variability of inflows was applied to Configurations**

Components Identified for Each Concept to Define Configurations



Development of Configurations

- **Considered "criteria" in Habitat Working Group**
  - Focused on function and value of habitat for marine sea and saline habitat complex
- **Considered guidelines in Air Quality Working Group**
  - Exposed playa responses
  - Construction limitation responses
- **Developed Water Quality Management based upon flows and water quality limits for specific habitats/uses**
- **Developed support infrastructure**

Configurations Developed to Respond to These Uncertainties

- **Response of fish and wildlife populations to restoration of habitat function and value is difficult to predict**
- **Extent of Air Quality Management requirements will depend upon soil emissivity**
- **Inflow water quality may change over time**
- **Site conditions for stability of barriers, perimeter dikes, and berms**
- **Water quality and habitat protection for Import/Export to Gulf of California or Pacific Ocean**

Concepts Recommended to be Developed into Configurations

- **Import water from Gulf of California or Pacific Ocean Whole Sea**
  - Export salts to Gulf of California or Pacific Ocean
- **North Sea Combined and South Sea Combined Partial Sea**
  - Salt disposal into in-sea brine sink
- **Concentric Rings Partial Sea**
  - Salt disposal in in-sea brine sink
- **Minimal Barrier**
  - Salt disposal in in-sea brine sink

Habitat Assumptions

Overall Habitat Assumptions

- **Provide pupfish connectivity and protection**
- **Provide mosaic habitat types in each configuration**
  - Different mosaics of marine sea, brackish water, and saline habitat complex for each configuration
    - Marine sea and brackish water habitat are relatively well defined
    - Saline habitat complex would be developed in an adaptive management manner
  - Location of habitats defines infrastructure requirements and construction methods

Habitat Assumptions

- **Habitat restoration areas should be maximized at the southern end of the Sea**
- **Other areas of existing high use by birds and pupfish should be protected and where possible enhanced**

Approach to Meet Habitat Assumptions

- ***Proposal - develop range of configurations***
  - *North Sea Combined with Saline Habitat Complex*
  - *South Sea Combined with Saline Habitat Complex*
  - *ADDITIONAL CONFIGURATION: Maximize Saline Habitat Complex with North Sea*
  - *Concentric Rings*
  - *Minimal Barrier*
  - *Import/Export to Gulf of California or Pacific Ocean*
- ***Proposal - Integrate adaptive management***

Air Quality Management Assumptions - Exposed Playa and Construction

Approach to Management of Exposed Playa

- **Extent of control**
  - 100% management of exposed playa where no other land use is specified (such as canals, roads)
- **Approach for control**
  - Conduct research and monitoring as playa is exposed
  - If soils are not emissive, monitor to confirm that conditions do not change
  - If soils are emissive or become emissive, apply dust control

Preliminary Surface Stabilization Options Considered

- Options that require water
  - Stabilization with brine
  - Water-efficient vegetation
  - Climatic event-driven surface wetting
  - Event-driven sprinkler irrigation
  - Regular watering
  - Seasonal surface wetting
- Options that require minimal water
  - Limited access
  - Salt crust
  - Gravel blanket
  - Chemical stabilizers
  - Tillage
  - Sand fences

Response to Uncertainty

- **Extent of Air Quality Management will depend upon soil emissivity**
  - *Proposed Assumptions:*
    - Approximately 50 percent of exposed playa (not covered by other uses or brine sink) assumed to not require specific actions
    - Area intermittently exposed (such as area surrounding the brine pond) planned for control by intermittent irrigation to form salt crust when necessary

Air Quality Limitations During Construction

- **Construction activities will likely exceed General Conformity *de minimis* thresholds for NOx and PM10 triggering requirements for demonstration of conformity with approved State Implementation Plans (SIPs)**
  - If future SIPs do not include provisions for Salton Sea Ecosystem Restoration Program, construction for major barriers alone could easily require phasing over 20 or 25 years to keep emissions below *de minimis* thresholds
  - SIPs also must incorporate other construction and emitting activities - such as development in communities around Sea

Air Quality Management Uncertainties

- **Could assume that current SIP emissions budgets will be maintained requiring extension of the construction period to keep emissions below *de minimis* thresholds**
- **Could assume that agencies will commit to modify SIP emissions budgets in future plans to allow project emissions**
- ***Need input from Air Quality Management Agencies***

Water Quality Management Assumptions

Water Quality Issues Related to Nutrients (Nitrogen, sulfur, and phosphorus compounds)

- **Nutrients in inflow**
  - High concentrations cause eutrophication
  - Not a problem for air quality management flows used for irrigation of air quality management vegetation
  - Primary source is tailwater runoff
- **Nutrients in deep sea sediments**
  - Sediments are a potential source for leaching nutrients back into the water column
  - Compounds naturally removed over time

Water Quality Issues Related to Selenium

- **Selenium in inflow**
  - High concentrations enter food chain through invertebrates and fish - Causes reproductive problems in some birds
  - Not a problem for air quality management flows used for irrigation of air quality management vegetation if selenium uptake is low in the plants
  - Primary source is tilewater runoff
- **Selenium in deep sea sediments**
  - As water quality improves, selenium in sediment becomes available to biota

Water Quality Management Options Related to Nutrients

- **Removal of nutrients upstream of Salton Sea**
  - Future implementation of Total Maximum Daily Loads
  - Source controls through management of farming practices will reduce not eliminate nutrients in tailwater
  - Use of natural treatment wetlands along drains & rivers
    - May not be feasible if selenium in excess of 2 ppb
- **Removal of nutrients in Alamo and New rivers at Salton Sea**
  - Minimum biological treatment - similar to food processing waste treatment process
- **Low nutrient concentrations in Whitewater River may eliminate need for treatment there**

Water Quality Management Related to Selenium

- **Removal of selenium upstream of Salton Sea**
  - Future implementation of Total Maximum Daily Loads
  - Source controls may require separation of tilewater with high selenium concentrations and local treatment
- **Removal of selenium in Alamo and New rivers at Salton Sea**
  - Treat water following removal of nutrients
- **Low selenium concentrations in Whitewater River may eliminate need for treatment**
- **Could selenium removal be avoided with mitigation wetlands?**
  - Need to develop methods to calculate acreage of mitigation wetlands and for which species?

Water Quality Management Uncertainties

- **Inflow water quality may change over time**
  - Current inflows have high nutrient and selenium concentrations that could cause ecological risk
  - Nutrients and selenium concentrations may be reduced by future regulations - but affects private property
    - Natural treatment wetlands could be used if selenium concentrations were below regulatory threshold
  - Amount of water to be treated for nutrients or selenium could be reduced by segregating inflows
    - Nutrients primarily in tailwater and selenium primarly in tilewater
  - *Proposal: Assume conventional water treatment initially - may be totally/partially eliminated if not needed*

Water Quality Management for Habitat Protection for Import/Export to Ocean

- **Protection of Salton Sea Habitat**
  - Concern about introduction of species that would adversely affect biota that use the Sea
- **Protection of Gulf of California or Pacific Ocean**
  - Concern about introduction of species or chemicals (such as nutrients) into ocean
  - Concern about mixing zone in ocean for higher salinity water with lower salinity water in ocean
  - Concern about entrainment of organisms into intakes located on ocean floor

Water Quality and Habitat Uncertainties

- **Water quality and habitat protection for Import/Export to Gulf of California or Pacific Ocean**
  - Must comply with ocean plan water quality requirements- however, specific requirements would not be known until specific habitat studies
  - *Proposal: Assume need to filter water import/export supplies to prevent introduction of exotic species in Salton Sea and ocean waters. Assume need to provide long outfall diffusers and screened intakes to minimize impacts to ocean fish and other organisms*

Inflow Assumptions

Inflow Projections

- **Alternatives do not affect inflows to Sea**
- **No Action Alternative**
  - Completely identified actions
  - Average annual inflows over 75 years = 958,000 af/yr
- **Variability**
  - Possible actions - either no plans or not approved
  - Average annual inflows over 75 years - greater than 600,000 af/yr - still being refined

Inflow Uncertainties

- **Develop configurations with maximum-sized facilities to determine upper limit of costs**
- **Modify configurations under site specific analyses to reflect level of acceptable risk**
- ***Proposed Assumptions:***
  - Large infrastructure (barriers, canals, etc)
    - Locate for lowest average annual inflow over 75 years
    - Determine operations with higher flows
    - If possible, build in modules or extensions
  - Smaller infrastructure (berms, habitat)
    - Construct as sea recedes
    - Monitor and change criteria as appropriate

Infrastructure Assumptions

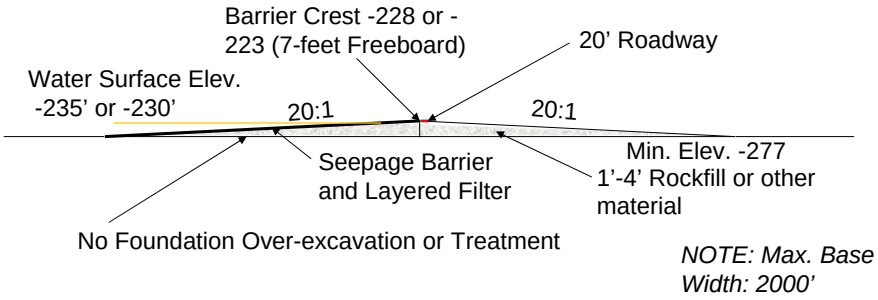
Infrastructure Components

- **Barriers and Perimeter Dikes**
- **Habitat Berms**
- **Conveyance - canals and pipelines**
- **Pump Stations**
- **Water Treatment Plants**

Barriers

- **Major structure across Sea**
  - Between 20 and 55 feet tall
  - Division of Safety of Dams jurisdiction
  - USBR Public Protection Guidelines
- **Design Criteria**
  - Seismic
  - Settlement
  - Seepage
  - Offsets
  - Flooding/overtopping
  - Constructability

Proposed Barrier Section

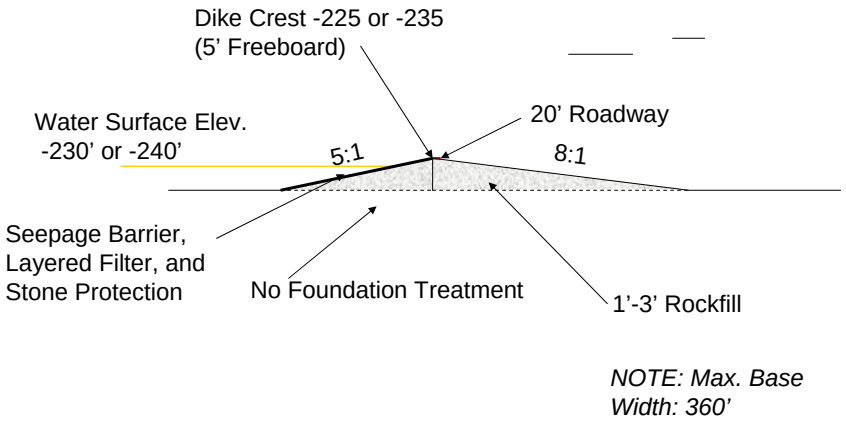


NOTE: Max. Base Width: 2000'

Perimeter Dikes

- **Major structure along shoreline**
  - Between 15 and 20 feet tall
  - Division of Safety of Dams jurisdiction
  - USBR Public Protection Guidelines
- **Design Criteria**
  - Seismic
  - Settlement
  - Seepage
  - Offsets
  - Flooding/overtopping
  - Constructability

Proposed Perimeter Dike Section

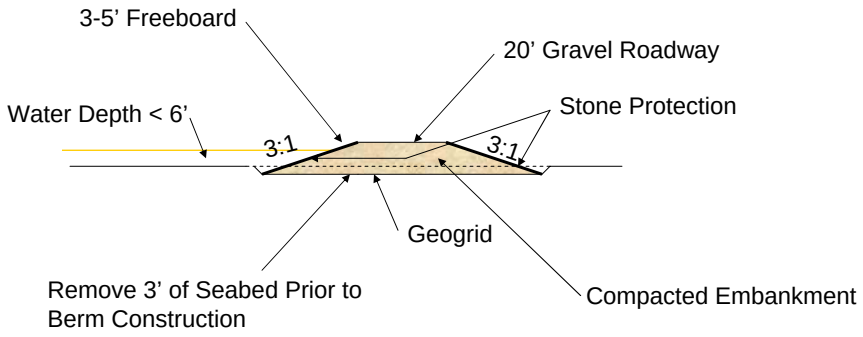


NOTE: Max. Base Width: 360'

Habitat Berms in Saline Habitat Complex

- **Constructed on dry exposed playa**
- **Can be designed per the Division of Safety of Dams requirements to be non-jurisdictional**
- **Minimal loss of facility or habitat if failure due to modular/cellular construction**
- **Local compacted embankment material**

Habitat Berm



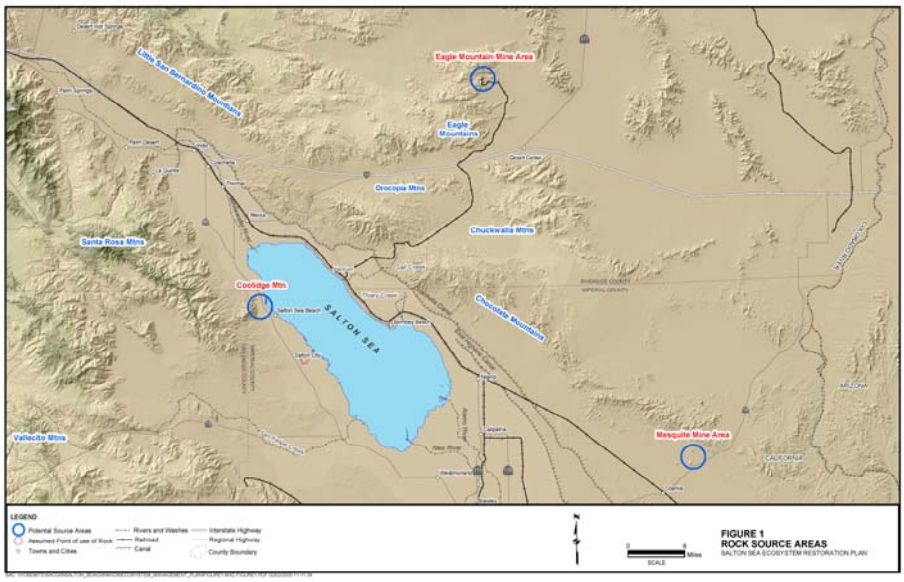
Uncertainties in Site Conditions for Structures

- **Site conditions for stability of barriers, perimeter dikes, and berms**
  - Area is extremely seimically active and sea-bed foundation conditions are poor
  - If barriers or perimeter dikes fail, extensive loss of habitat and extensive construction time to repair
  - If berms fail, less extensive loss of habitat and less extensive construction time to restore
    - Habitat loss would be less than for Partial Sea because of cellular nature of Saline Habitat Complex
  - *Proposal: Assume design of barriers, perimeter dikes, and berms per State and Federal standards*

Rock Quarry/Material Challenges

- **Barrier and perimeter dike quantities may range from 60 to130 million cubic yards**
  - Majority assumed to be “well graded” rock from 1 to 4 foot in diameter
  - Equipment limitations
- **Quarry Sites**
  - May need to be located on each side of the Sea to reduce haul distances
  - Methods of handling of material at quarries and at Sea
- **Rock placement**
  - Water
  - Land

Rock Sources under Investigation



Construction Challenges

- **Foundation**
  - Lack of Data / Data extrapolation
  - Sea floor deposits (organics)
  - Overexcavation
  - Treatment
  - Settlement
  - Liquifaction Potential
- **Dredging Disposal**
  - In-Sea Disposal
  - Use for habitat berms and islands, as appropriate

Construction Challenges - continued

- **Air Quality**
  - Construction emissions for rock transport ONLY
    - Transport of 100 million cubic yards of rock to site by truck (assuming a round trip of 20 miles) for construction of major barriers alone could easily require phasing over 20 or 25 years to keep emissions below *de minimis* thresholds
    - Trains will reduce emissions, but emissions will still occur at quarry and where rock is off-loaded to the Sea
  - At Sea, use of electric conveyors would be less emissive, but large rock cannot easily placed on electric conveyors

Example of Construction Phasing

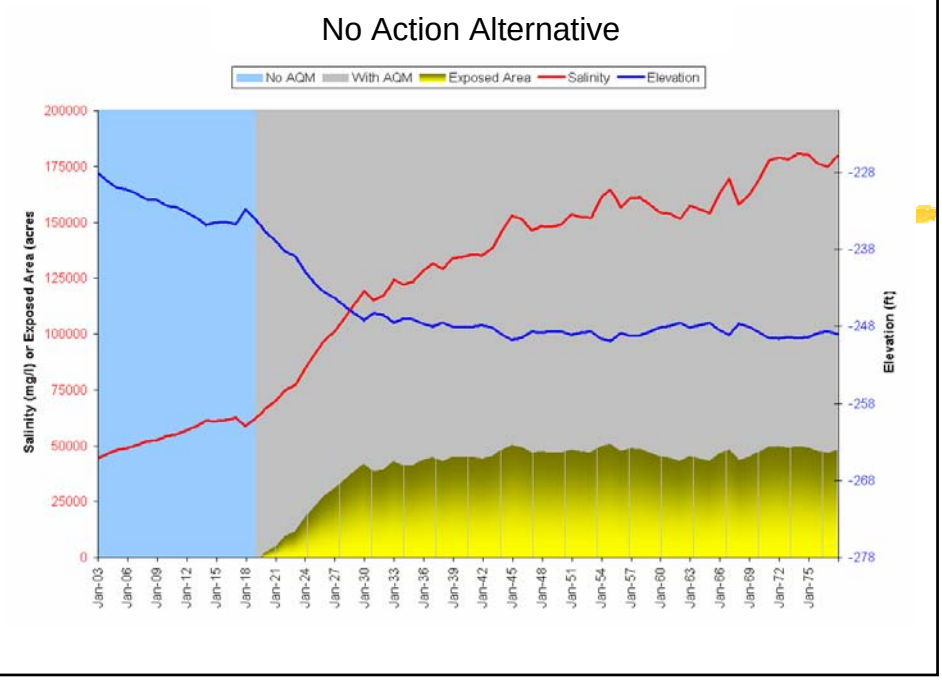
Project Phasing for Partial Sea Configuration and No Delays for Air Quality Compliance

- **Schedule**

PEIR with Preferred Alternative	December 2006
Project Specific EIR	July 2008
Preliminary Design	July 2008
Final Design	July 2009
Permits	July 2009
Construction Bids/Award	July 2010
Mobilization	July 2011
End Initial Construction	July 2018
Continued Construction for Air Quality Management	Continues as Sea recedes

Construction Period will Affect Salinity and Elevation of Sea Prior to Restoration

- **Salinity and elevation without restoration is considered the baseline**
- **Salinity will decline and the elevation will stabilize as facilities after constructed**
  - Construction period affects timing of benefits



Basis of Preliminary Cost Estimates

Purpose of Cost Estimates

- **Provided to allow comparison of configurations**
- **Significant work is still required to develop final cost estimates and construction phasing for Final Alternatives**
- **All cost estimates developed to same level of detail**

Cost Assumptions for December 8, 2005 Advisory Committee Meeting

- **Capital Cost for Total Project**
  - Available information
  - General design criteria
  - Assumed construction methods
  - Potential physical limitations
- **Annual Costs**
  - Materials and Energy costs
  - Maintenance and operations labor
  - Replacement costs over 75 years

Response to Uncertainties and Need to Develop a Life Cycle Cost Estimate

- **Configurations are recommended to be developed in a conservative manner**
  - Subsequent site-specific documents and pilot studies/initial actions will be used to focus responses - reduce costs
  - Subsequent water quality actions may reduce nutrients and selenium concentrations and allow less intensive treatment