Development of Ecosystem Restoration Plan Alternatives

May 18, 2005

Development of Ecosystem Restoration Plan Alternatives

- **Working assumptions**
- **Drivers and objectives**
- **Alternatives are affected by:**
  - **Habitat and water treatment**
  - **Barrier configurations and water balance**
  - **Water conveyance needs**
  - **Exposed area and air quality management options**
- **Phasing**
- **Future work group meetings**

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Location of Water Treatment Affects Alternatives

- **In-Valley**
  - Could impact agricultural production
  - Could be phased in early
- **In-River**
  - Available area is limited
  - Local effort underway
- **Salton Sea "Shoreline"**
  - Phasing restricts available area for alternatives with Sea elevation at - 230 ft MSL
- **Salton Sea "Center of Sea"**
  - Isolated areas may require inflow pipelines under open water areas of Salton Sea
  - Requires pumping of treated outflow to the Salton Sea
  - Available area limited until Sea levels recede and/or barrier is operational

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Options Considered for Today's Water Treatment Discussion

- **In-Valley or In-River water treatment**
  - Primarily selenium removed in these systems
  - No space allocated within Sea
- **On exposed seabed (shoreline and center of Sea) natural treatment systems**
  - Selenium removal occurs upstream
  - Nutrients removed in system

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Alternatives Must Balance Inflows, Sea Elevation, and Salinity

- **Vary barrier location and configuration**
  - **Volume and area of sea depend on bathymetry and surface elevation**
- **Vary acreage of habitat, natural treatment, and air quality management**
  - **Evaporation and evapotranspiration**
- **Account for canal evaporation**

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For Today's Discussion

- **Assume average inflow of 950 TAF in developing alternatives**
  - **Investigate water balance sensitivity to determine flexibility**
- **Alternatives will be completed based on work group input**

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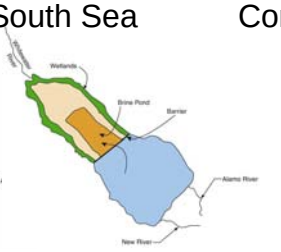
Water Balance Results will Differ with Each Configuration

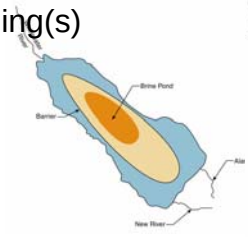
North Sea

South Sea



Combined

Concentric Ring(s)



Connection to Gulf

Evolving Sea

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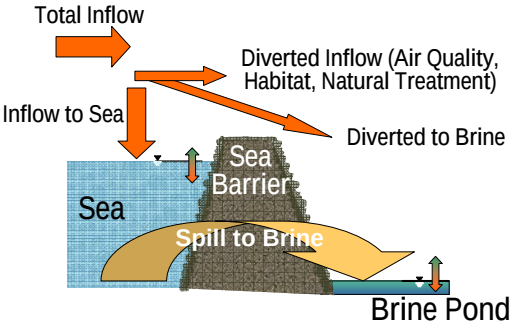
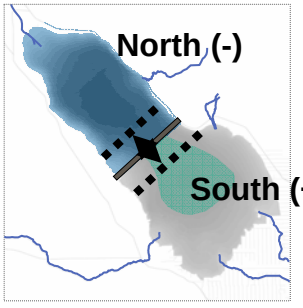
Water Balance Example - North Sea *Sensitivity to Barrier Location and Spill to Brine for Sea at -230 and Salinity Objective*





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Water Balance Example - North Sea
Sensitivity to Barrier Location and Spill to Brine for Sea at -230 and Salinity Objective

	<= Div to Brine =>			Balanced	<= Reduced TMT, HAB, AQ =>		
	Dike Location (miles from North Sea Dike location)						
	North				South		
Water Budget Summary (average)	**-1.5**	**-1**	**-0.5**	**0**	**+0.5**	**+1**	**+1.5**
Inflow (af/yr)	950000	950000	950000	950000	950000	950000	950000
Inflow Diverted to TMT, HAB, AQ (af/yr)	290000	290000	290000	290000	280000	260000	240000
Inflow Diverted to Brine (af/yr)	55000	39000	20000	0	0	0	0
Net Inflow to Sea (af/yr)	610000	620000	640000	660000	680000	700000	720000
Marine Sea Evaporation (af/yr)	560000	570000	590000	610000	620000	640000	660000
Spill to Brine (af/yr)	48000	50000	52000	55000	55000	55000	55000
Marine Sea Elevation (ft)	-230	-230	-230	-230	-230	-230	-230
Marine Sea Salinity (mg/l)	35000	35000	35000	35000	35000	35000	35000
Natural Treatment (acres)	40000	40000	40000	40000	38000	33000	29000
Habitat (acres)	15000	15000	15000	15000	15000	15000	15000
Air Quality Management (acres)	15000	15000	15000	15000	15000	15000	15000

Alternative Tradeoff (maintain TMT, HAB and AQ; spill to Sea; allow elevation/salinity deviations)

Marine Sea Elevation (ft)	*-230*	*-230*	*-230*	*-230*	*-230*	*-230*	*-230*
Marine Sea Salinity (mg/l)	*20000*	*23000*	*28000*	*35000*	*42000*	*53000*	*68000*

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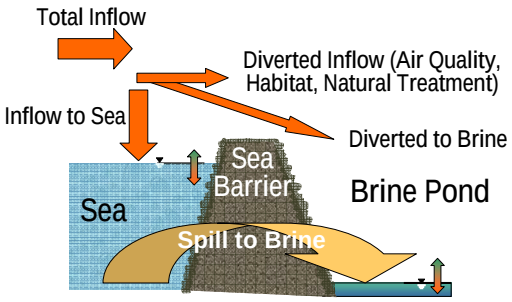
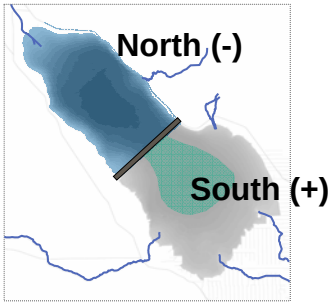
Water Balance Example – North Sea
Sensitivity to Inflows with Shortest Mid-Sea Barrier for Sea at -230 and Salinity Objective





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Water Balance Example – North Sea *Sensitivity to Inflows with Shortest Mid-Sea Barrier for Sea at -230 and Salinity Objective*

	<= Div to Brine =>			Balanced	<= Reduced TMT, HAB, AQ =>		
	Inflow change from 950 taf/yr						
Water Budget Summary (average)	**+ 300 taf**	**+200 taf**	**+100 taf**	**0**	**-100 taf**	**-200 taf**	**-300 taf**
Inflow (af/yr)	1300000	1200000	1100000	950000	850000	750000	650000
Inflow Diverted to TMT, HAB, AQ (af/yr)	290000	290000	290000	290000	190000	90000	0
Inflow Diverted to Brine (af/yr)	320000	220000	110000	0	0	0	0
Net Inflow to Sea (af/yr)	640000	650000	650000	660000	660000	660000	650000
Marine Sea Evaporation (af/yr)	610000	610000	610000	610000	610000	610000	610000
Spill to Brine (af/yr)	33000	37000	45000	55000	55000	55000	45000
Marine Sea Elevation (ft)	-230	-230	-230	-230	-230	-230	-230
Marine Sea Salinity (mg/l)	34000	35000	35000	35000	35000	35000	44000
Natural Treatment (acres)	40000	40000	40000	40000	20000	0	0
Habitat (acres)	15000	15000	15000	15000	15000	15000	0
Air Quality Management (acres)	15000	15000	15000	15000	15000	15000	0

Alternative Tradeoff (maintain TMT, HAB and AQ; spill to Sea; allow elevation/salinity deviations)

Marine Sea Elevation (ft)	*-230*	*-230*	*-230*	*-230*	*-238*	*-253*	*-262*
Marine Sea Salinity (mg/l)	*5700*	*8000*	*14000*	*35000*	*95000*	*190000*	*>250000*

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Examples of Conveyance Options for Various Alternatives and Concepts

- **North Sea alternative**
  - **<u>without</u> and <u>with</u> treatment on exposed seabed**
- **Combined Sea alternative**
  - **<u>without</u> and <u>with</u> on exposed seabed**
- **South Sea concept**
- **Evolving Sea concept**

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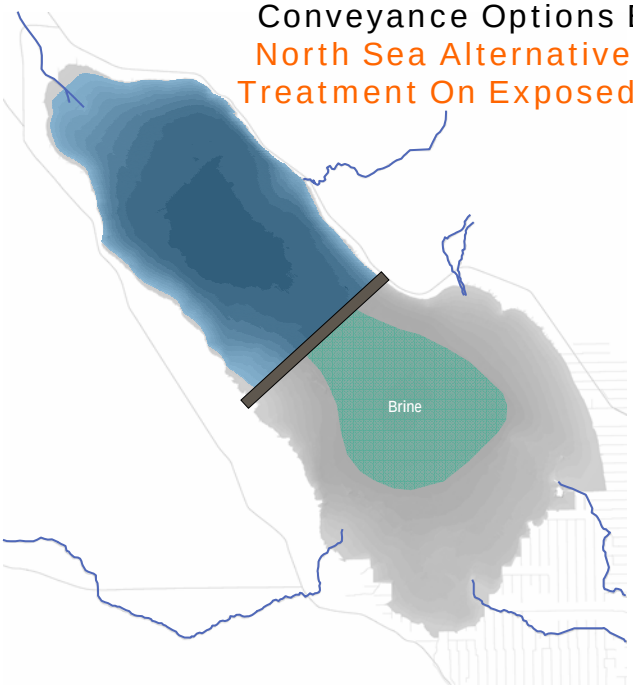
Conveyance Options Example
North Sea Alternative Without Treatment On Exposed Seabed



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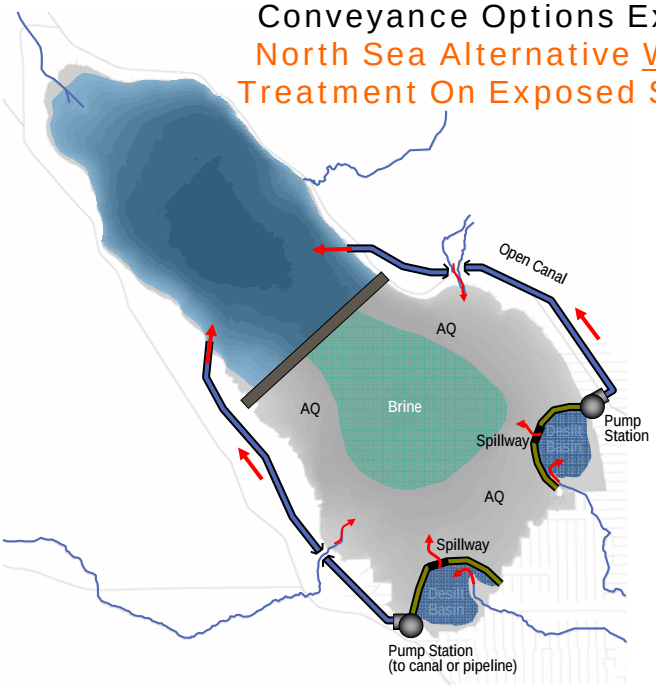
Conveyance Options Example
North Sea Alternative Without Treatment On Exposed Seabed



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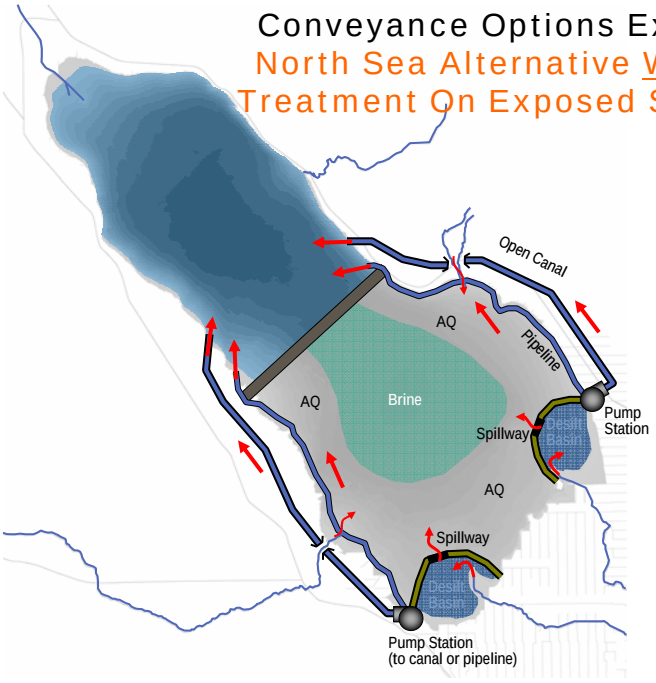
Conveyance Options Example
North Sea Alternative Without Treatment On Exposed Seabed



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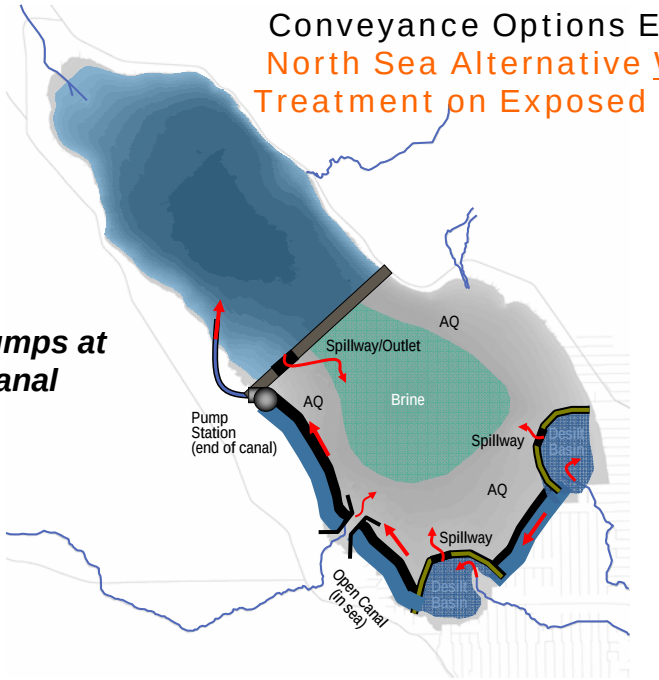
Conveyance Options Example
North Sea Alternative Without Treatment on Exposed Seabed

Note: Pumps at end of canal



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