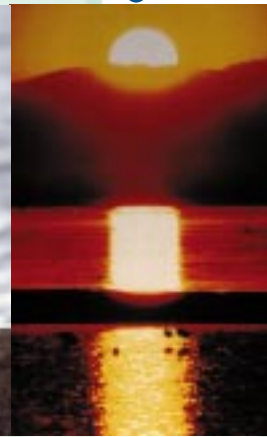


SALTON SEA RESTORATION



alternatives packet



November 2 - 4, 1999

For Additional information Contact:

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["www.lc.usbr.gov"](http://www.lc.usbr.gov)

SALTON SEA RESTORATION PROJECT OVERVIEW

I. SUMMARY OF PROCESS

EIS/EIR PROCESS

18 Month Time frame

- Final Draft Alternative Report September 1997
- Secretary visits Salton Sea Announces Joint Effort with the Salton Sea Authority - December 1997
- Current EIS/EIR Effort Initiated - June 1998 Notice of Intent/Notice of Preparation
- Published - June 1998
- Public Scoping Workshops - July 1998
- Public Comment Period - July 1998 - September 1998
- Additional Public Workshops - October 1998
- Pre-appraisal Level Alternatives developed - March 1998 - September 1998
- Alternative Screening Process - September 1998 - November 1998
- Alternatives Selected for further Study - December 1998 - April 1999
- Public Workshops on Alternatives - May 1999
- Completed Draft Biological Assessment - September 1999 Completed Appraisal Level
- Effort work on five selected alternatives - October 1999
- Finalize Appraisal Report - December 1999

Next Steps

- Selection of Preferred Alternative - November 1999
- Finalize Biological Assessment - December 1999
- Prepare draft EIS/EIR - November 1999 - January 2000
- Release Draft EIS/EIR to Public and Congress - January 2000
- Install and operate selected demonstration projects - January 2000 - October 2002
- Send Preferred Alternative Report to Congress - January 2000
- Finalize feasibility design - June 2000
- File final EIS/EIR - June 2000
- Seek Congressional Authorization for Project - January 2000 - July 2000
- Obtain permits for construction - January 2001
- Complete detailed specification designs - December 2002

SCIENCE PROCESS

Initial 18 months

- Secretary establishes the Research Management Committee - December 1997
- Secretary establishes the Salton Sea Science Subcommittee - December 1997
- Identified scientific data gaps and established collection priorities -January/May1998
- Initiated data gathering, synthesis , and evaluation process - August 1998
- Contracted for issue specific synthesis documents - October - December 1998
 - ◆ Avifauna of the Sea
 - ◆ Fish and fisheries of the Sea

- ◆ Chemical and Physical Analyses of the Sea
- ◆ Biological Limnology of the Sea
- ◆ Survey of Algal Toxins in the Sea
- ◆ Reconnaissance of Microbial Pathogens in the Sea
- ◆ Sediment, Physical Characteristics of the Sea
- ◆ Impact of Rising Salinity on the Ecosystem of the Sea
- ◆ A Brief History and Biology of the Sea
- ◆ Avian Disease at the Sea
- ◆ Literature Synthesis Bibliographic Reports
- Contracted for Reconnaissance Investigations
 - ◆ Survey of Algal Toxins in the Sea
 - ◆ Avifauna of the Sea, Annual Phenology, Numbers, and Distribution
 - ◆ Fish Ecology and fisheries biology of the Sea
 - ◆ Salton Sea Desert Pup fish Investigations
 - ◆ Biological Limnology of the Sea
 - ◆ Limnology of the Sea - Chemical and Physical Analyses of the Sea
 - ◆ Survey of Selected Microbial Pathogens in the Sea
 - ◆ Environmental Reconnaissance - Sediment Contaminants
- Contracted Bird Mortality Investigations
 - ◆ Avian Botulism
 - ◆ Tilapia Food Habits
 - ◆ Identification and Ecology of Disease-Causing Agents for Eared Grebes
 - ◆ Identification of Natural Toxins
 - ◆ Investigation of the Cause of Eared Grebe Mortality-Algal Blooms and Biotoxins

Next Step

* Preparation and Submittal of the Strategic Science Plan to Congress - January 2000

II. SUMMARY OF GOALS AND OBJECTIVES

The Salton Sea Reclamation act of 1998 (Public Law [PL] 105-372) directs the Secretary of Interior to "complete all studies...of various options that permit the continual use of the Salton Sea as a reservoir for irrigation drainage and:

- reduce and stabilize the overall salinity of the Salton Sea;
- (ii) stabilize the surface elevation of the Salton Sea;
- (iii) reclaim, in the long term, healthy fish and wildlife resources and their habitats, and
- (iv) enhance the potential for recreational uses and economic developments of the Salton sea."

Development of such a restoration project requires compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) through the preparation of an environmental impact statement/environmental impact report (EIS/EIR). The Salton Sea Authority and the Bureau of Reclamation, working jointly with stakeholders and members of the public, developed five goals that comply with the direction contained in PL. 105-372 and provide guidance for the preparation of the EIS/EIR.

In order to measure the effectiveness of any actions designed and implemented to achieve the five goals, objectives were developed to further define each goal. In many cases, objectives overlap and result in mutual benefits. The goals and objectives have been used to guide the development of alternatives for this project. The same objectives ultimately would be used to guide efforts to monitor and evaluate the effectiveness of any restoration actions that are implemented.

GOAL 1: Maintain the Sea as a Repository for Agricultural Drainage

Objectives:

- Stabilize water surface elevation within a range allowing for climate and drainage-induced annual fluctuations (preferably +/- -230 m.s.l); and
- Maintain agricultural drainage accessibility to the Sea.

GOAL 2: Provide a Safe, Productive Environment at the Sea for Resident and Migratory Birds and Endangered Species

Objectives:

- Enhance fresh water marsh habitat
- Maintain of open water habitat and a food base for fish-eating birds

Typical Species Affected

Yuma clapper rail

American white pelican
California brown pelican

- | | |
|--|---|
| ● Protect/provide appropriate habitat for roosting and nesting | double-crested cormorants
great blue heron |
| ● Maintain a broad array of avian foraging habitat | black-necked stilt
ruddy ducks |
| ● Enhance stability of shoreline pools and creeks | desert pupfish
western snowy plover |
| ● Sustain water levels suitable for desert pupfish | desert pupfish |
| ● Minimize losses from disease | pelicans, eared grebes |

GOAL 3: Restore Recreational Uses of the Sea

Objectives:

- Stabilize water surface elevation within a range, allowing for climate and drainage-induced annual fluctuations (preferably +/- -230 m.s.l.);
- Address selenium health advisory on eating fish;
- Improve aesthetics by minimizing odor
- Reduce occurrence of algal blooms; and
- Maintain State Class I recreational quality status

GOAL 4: Maintain a Viable Sport Fishery at the Sea

- Maintain a healthy habitat for orange mouth corvina;
- Reduce and maintain salinity at 40,000 milligrams per liter (mg/L) or lower;
- Reduce fish die-offs

GOAL 5: Identify Opportunities for Economic Development around the Sea

- Implement objectives for sport fisheries
- Implement objectives for fish and wildlife
- Implement and maintain a clean shoreline

III. SUMMARY OF ALTERNATIVES

- **Salton Sea Alternative Evaluation Final Draft Report - September 1997**
 - ◆ Considered 54 alternative ways to reduce the Sea's Salinity
 - ◆ Five alternatives were identified for further study
 - ◆ All alternatives were rated and evaluation criteria applied

- **Pre-appraisal Report - September 1998**
 - ◆ Considered 74 alternative ways to reduce the Sea's salinity
 - ◆ Each alternative evaluated at the pre-appraisal level
 - ◆ Balance of alternatives were screened out based upon unproven technology,
 - ◆ inability to control salinity and/or elevation
 - ◆ 39 alternatives were considered for further evaluation

- **Alternatives Screening Process - November 1998**
 - ◆ Participated in by Bureau of Reclamation, Salton Sea Authority, Salton Sea Authority Technical Advisory Committee members, Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, and Tetra Tech
 - ◆ Described "No Project" Alternative
 - ◆ Developed specific scoring levels for each criterion
 - ◆ 39 Alternatives were evaluated based on screening criteria
 - ◆ Scored each alternative for each criterion
 - ◆ Identified areas for further refinement of alternatives
 - ◆ Directed Engineers to focus on five specific alternatives for further refinement

- **Highest Rated Alternatives - November 1998**
 - ◆ Reclaimed Water from Yuma/Pump-out to Gulf of California
 - ◆ Reclaimed Water from Yuma/Pump-out to Pacific Ocean
 - ◆ South Half of Sea Evaporation Pond
 - ◆ Desalinization with brine pump-out to Gulf of California
 - ◆ Desalinization/solar pond with brine pump-out to Gulf of California

- **Three No Action Levels of Average Inflows - November 1998**
 - ◆ 1.36 million acre-feet/year
 - ◆ 1.06 million acre-feet/year
 - ◆ 0.80 million acre-feet/year
 - ***At 1.36 million acre-feet/year average in-flow level***
 - Salinity increases from 44,000 PPM to 90,000 PPM in 100 years
 - Water surface elevation varies from -227 to -226 m.s.l.
 - Surface area of the Sea varies between 240,000 to 245,000 acres
 - Existing wetlands continue to exist but with higher salinity
 - Habitat will change from what exists today

■ **At 1.06 million acre-feet/year average in-flow level**

- Salinity increases from 44,000 PPM to 142,000 PPM in 100 years
- Water surface elevation varies from -227 to -240 m.s.l.
- Surface area of the Sea reduced from 240,000 to 201,000 acres
- Existing wetlands lost
- Habitat will change from what exists today

■ **At 0.80 million acre-feet/year average in-flow level**

- Salinity increases from 44,000 PPM to 202,000 PPM in 100 years
- Water surface elevation varies from -227 to -250 m.s.l.
- Surface area of the Sea reduced from 240,000 to 170,000 acres
- Existing wetlands lost
- Habitat will change from what exists today

● **Adopted a Phased Approach to the Project - March 1999**

- ◆ Phase 1 - Project Level Analysis
- ◆ Phase 2 - Programmatic Level analysis

● **Phase 1 Alternatives**

- ◆ Construct two Evaporation Ponds - near Salton Sea Test Base
- ◆ Construct Enhanced Evaporation System (EES) - Bombay Beach
- ◆ Construct EES - Salton Sea Test Base
- ◆ Construct Evaporation Pond and an EES - Salton Sea Test Base
- ◆ Construct In-Sea EES within an Evaporation Pond near the Salton Sea Test Base

● **Phase 1 Common Components of All Alternatives**

- ◆ Fish Harvest
- ◆ Integrated Wildlife Disease Control Program
- ◆ Improved Recreational facilities
- ◆ Shoreline cleanup
- ◆ Strategic Science Program
- ◆ Long-term Management Plan
- ◆ Shorebird Habitat Areas
- ◆ Colorado River Flood Flows as available

● **Phase 2 Alternatives**

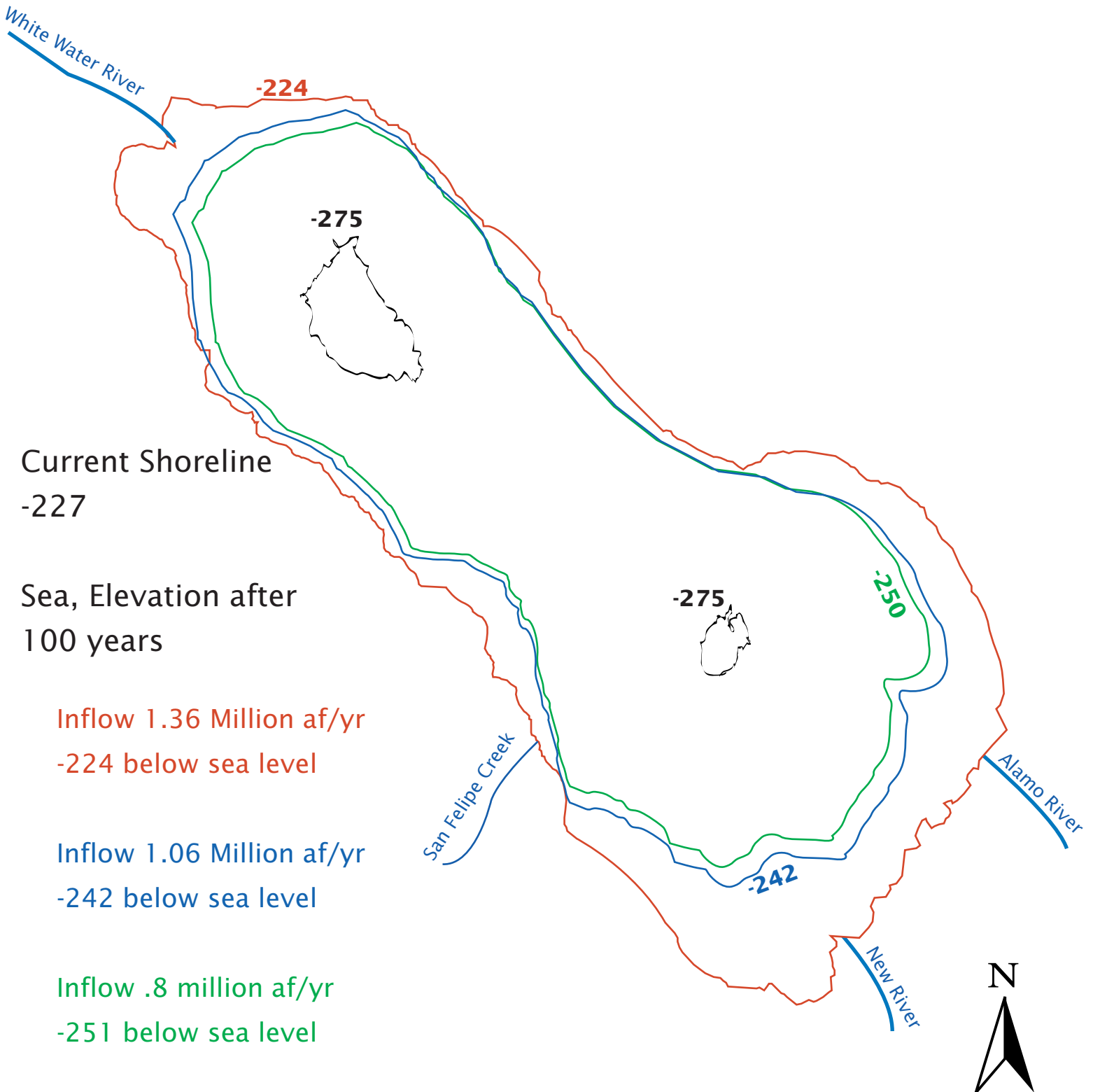
- ◆ Displacement Options for elevation control
 - Construction of displacement dike
 - Construction of an island
 - Importation of additional water
 - Central Arizona Salinity Interceptor water
 - Exchanges with San Bernardino, California

- ◆ Export Options to Reduce Salinity
 - Gulf of California
 - Larger Enhanced Evaporation System - Bombay Beach area
 - Larger Enhanced Evaporation System - Salton Sea Test Base area
 - Pacific Ocean
 - Dry lake Bed

- ◆ Import Options to Reduce Salinity
 - Central Arizona Salinity Interceptor water
 - Exchanges with San Bernardino, California

No Action

Salton Sea Alternatives



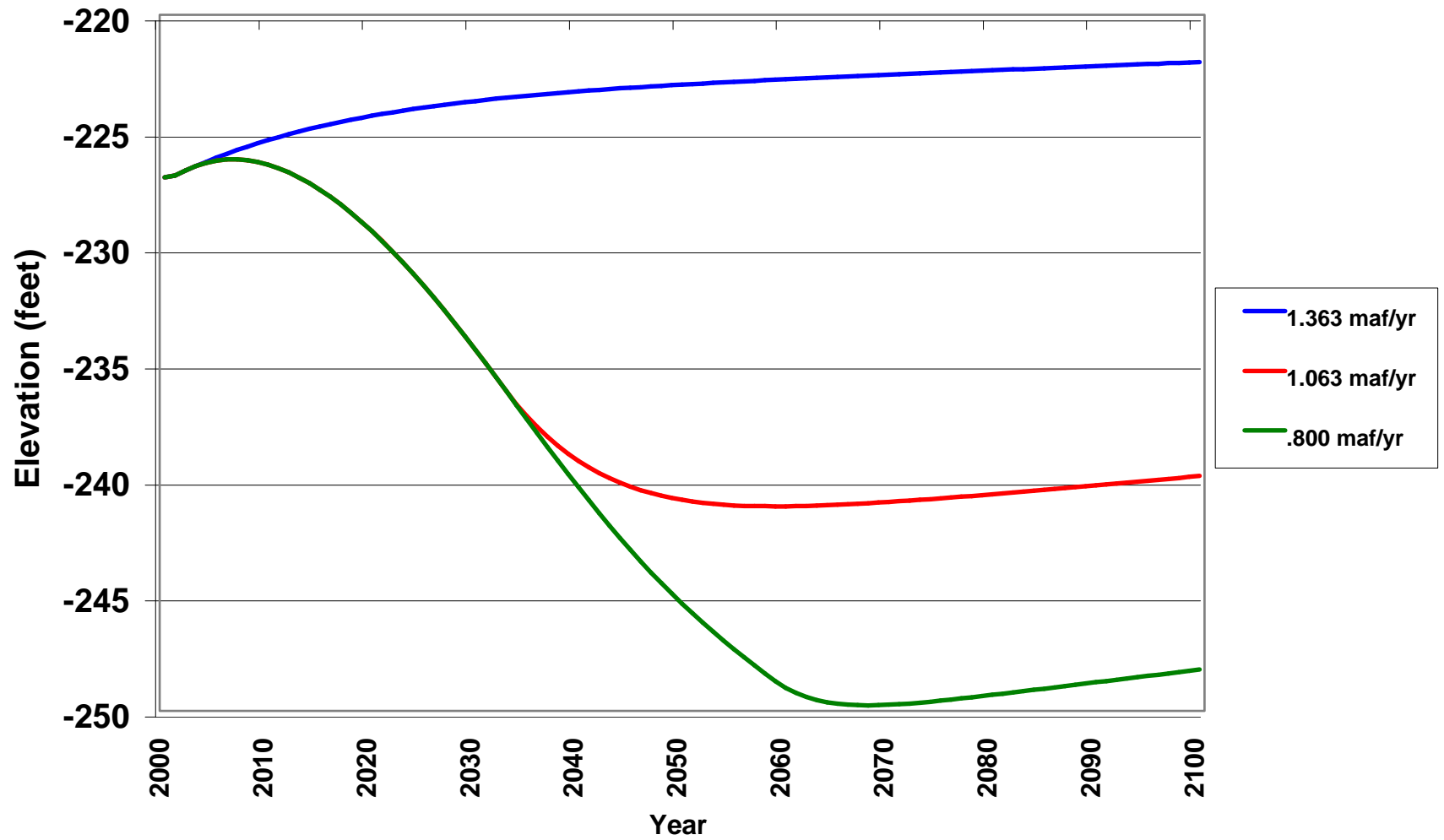
af/yr=acre feet per year

NO ACTION

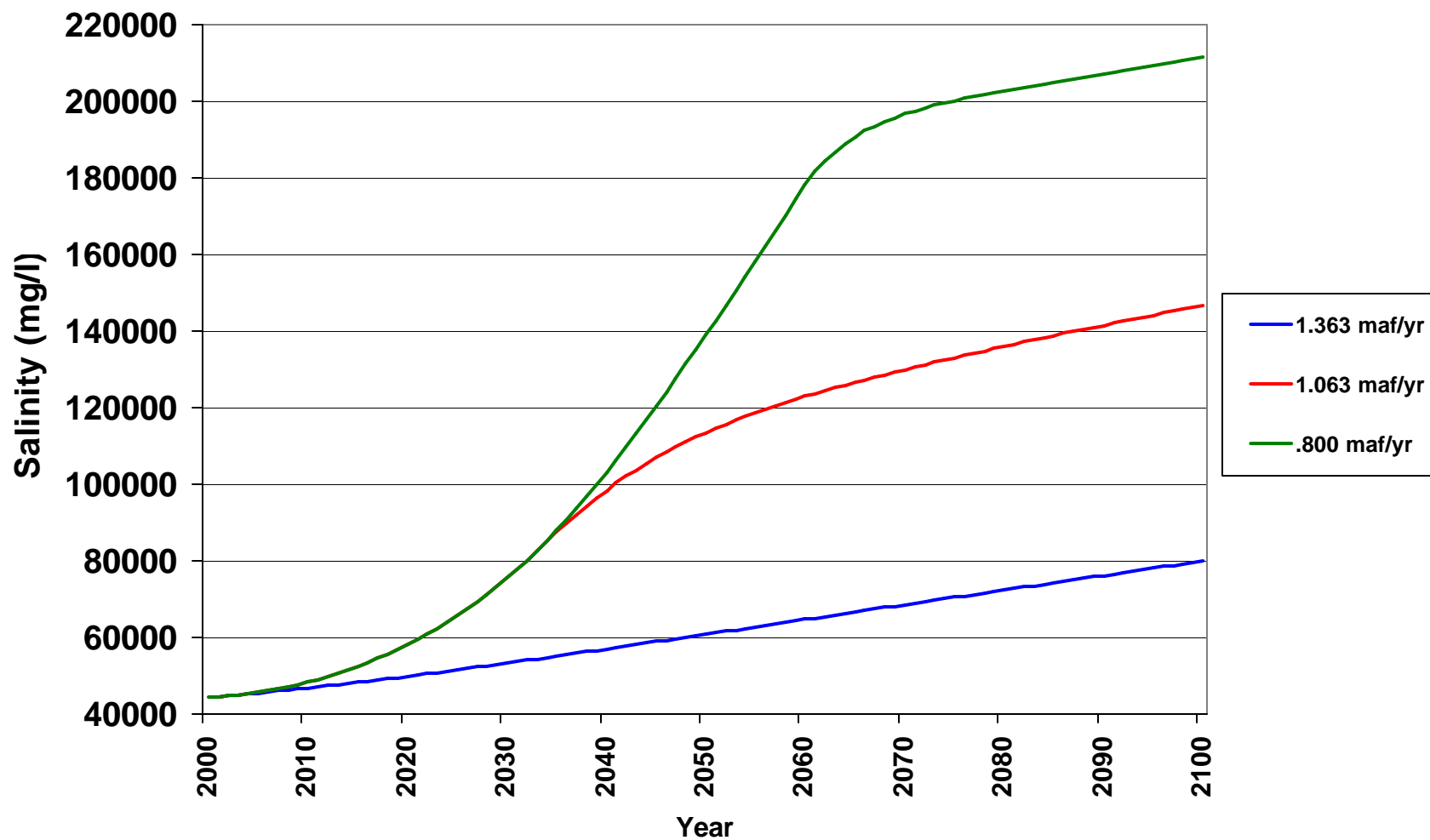
Environmental Impacts

- Significant impact to fisheries would result from increases in salinity
- Bird species would be threatened by loss of fisheries
- A significant drop in Sea elevation and decrease in surface area could occur if inflows to the Sea decrease in the future
- Local economic conditions and recreational opportunities would continue to decline

No-Action Alternative Elevation



No-Action Alternative



SALTON SEA RESTORATION PROJECT

Phase 1 and 2 Alternatives

November 2, 1999

Annual Inflow (maf)	Phase 1			Phase 2	
	2003	2008	2015	2030	2060
Alternative 1					
1.36	<ul style="list-style-type: none"> - Fish Harvesting - Improve Recreational Facilities - Shoreline Cleanup - Wildlife Disease Control 	<ul style="list-style-type: none"> - Two Ponds at 98 kaf/yr Until Year 2038 - Southwest (SW) Shorebird/Pupfish Protection Pond 	<ul style="list-style-type: none"> - Accelerated Export – 150 kaf/yr¹ 	<ul style="list-style-type: none"> - Southeast (SE) Shorebird Pond/Island Protection With Deep Water Habitat - North (N) Shorebird Pond 	
1.06	Same as above	Same as above	<ul style="list-style-type: none"> Same as above, plus - Accelerated SE Shorebird Pond/Island Protection With Deep Water Habitat - Accelerated N Shorebird Pond - Displacement Dike 	<ul style="list-style-type: none"> Same as above, plus - Import Central Arizona Salinity Interceptor (CASI) Water (up to 304.8 kaf/yr, as required) 	
0.8	Same as above	Same as above	Same as above	<ul style="list-style-type: none"> Same as above, plus - Import Flood Flows² 	
Alternatives 2 and 3					
1.36	<ul style="list-style-type: none"> - Fish Harvesting - Improve Recreational Facilities - Shoreline Cleanup - Wildlife Disease Control 	<ul style="list-style-type: none"> - 150 kaf/yr Enhanced Evaporation System (EES) (Showerline Technology) - SE Shorebird Pond/Island Protection With Deep Water Habitat 			
1.06	Same as above	Same as above	<ul style="list-style-type: none"> Same as above, plus - Displacement Dike - Import Flood Flows - SW Shorebird/Pupfish Protection Pond - N Shorebird Pond 	<ul style="list-style-type: none"> - Import CASI Water (up to 304.8 kaf/yr, as required) 	
0.8	Same as above	Same as above	Same as above	Same as above	<ul style="list-style-type: none"> - Additional Displacement or Inflow
Alternative 4					
1.36	<ul style="list-style-type: none"> - Fish Harvesting - Improve Recreational Facilities - Shoreline Cleanup - Wildlife Disease Control 	<ul style="list-style-type: none"> - 100 kaf/yr EES (Showerline Technology) - One Evaporation Pond (SW) at 68 kaf/yr Until Year 2038 - SW Shorebird/Pupfish Protection Pond - SE Shorebird Pond/Island Protection With Deep Water Habitat 		<ul style="list-style-type: none"> - Increase EES capacity to 150 kaf/yr - N Shorebird Pond 	
1.06	Same as above	Same as above	<ul style="list-style-type: none"> Same as above, plus - Displacement Dike - Import Flood Flows - Accelerated N Shorebird Pond 	<ul style="list-style-type: none"> Same as above, plus - Import CASI Water (up to 304.8 kaf/yr, as required) - Reduce EES to or maintain EES at 100 kaf/yr EES 	
0.8	Same as above	Same as above	Same as above	Same as above	

¹ Accelerated export implemented as a Phase 2 action

² Flood flow diversions implemented as a Phase 2 action

SALTON SEA RESTORATION PROJECT

Phase 1 and 2 Alternatives

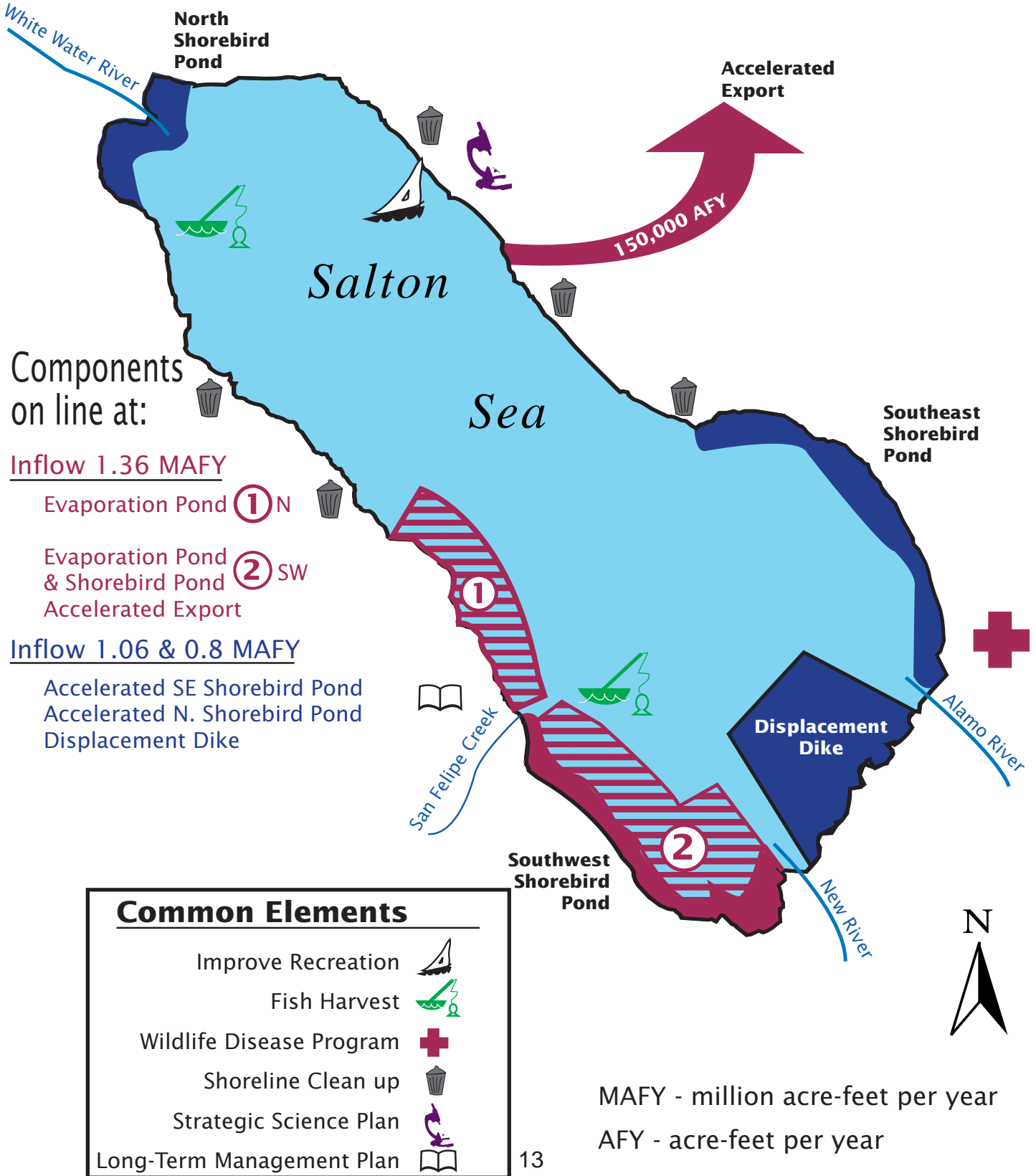
November 2, 1999

Annual Inflow (maf)	Phase 1			Phase 2	
	2003	2008	2015	2030	2060
Alternative 5					
1.36	<ul style="list-style-type: none"> - Fish Harvesting - Improve Recreational Facilities - Shoreline Cleanup - Wildlife Disease Control 	<ul style="list-style-type: none"> - 150 kaf/yr EES in Sea NW Evaporation Pond (23 years Using Ground Based EES Tech with Salt Stockpiling in Pond) - SE Shorebird Pond/Island Protection With Deep Water Habitat 	<ul style="list-style-type: none"> - N Shorebird Pond - SW Shorebird/Pupfish Protection Pond 	<ul style="list-style-type: none"> - Export 150 kaf/yr 	
1.06	Same as above	Same as above	Same as above, plus <ul style="list-style-type: none"> - Displacement Dike - Import Flood Flows 	Same as above, plus <ul style="list-style-type: none"> - Import CASI Water (up to 304.8 kaf/yr, as required) 	
0.8	Same as above	Same as above	Same as above	Same as above	<ul style="list-style-type: none"> - Additional Displacement or Inflow

Alternative 1

Salton Sea Alternatives

Major Actions in the First 30 Years



Alternative # 1

Environmental Impacts

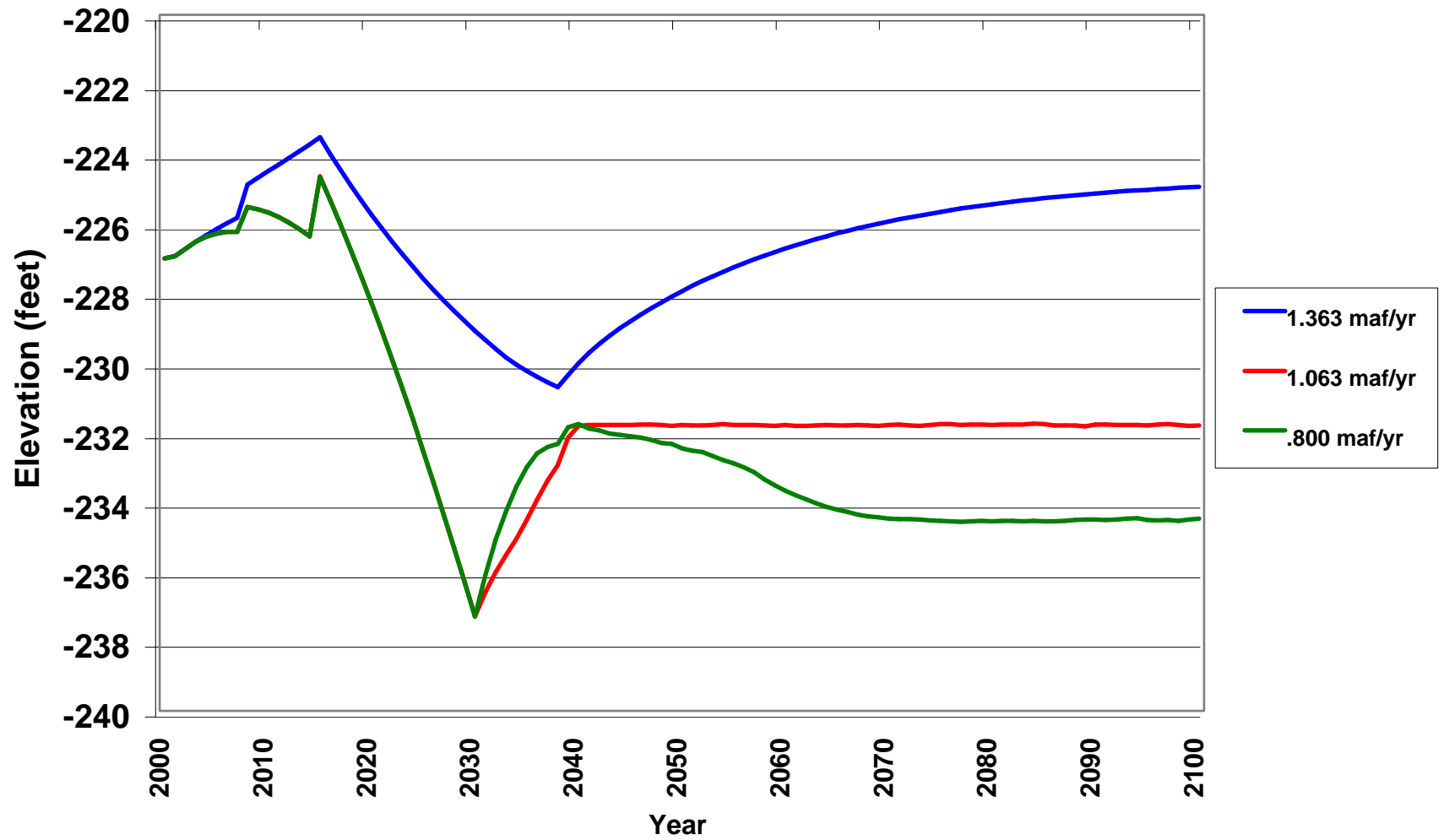
- Long term benefits compared to No Action for fisheries and bird species
- Beneficial effects to recreation and the local economy from restoration activities
- Visual changes due to alterations in the landscape in the vicinity of ponds and dike structures
- Potential traffic impacts (delays) between material borrow site and the Sea during construction activities
- Fugitive dust problems could occur during construction
- Temporary disturbance of fisheries would occur during construction
- Possible disturbance of cultural and Native American resources
- Additional effects associated with export options could occur during Phase 2.

Summary of Estimated Costs

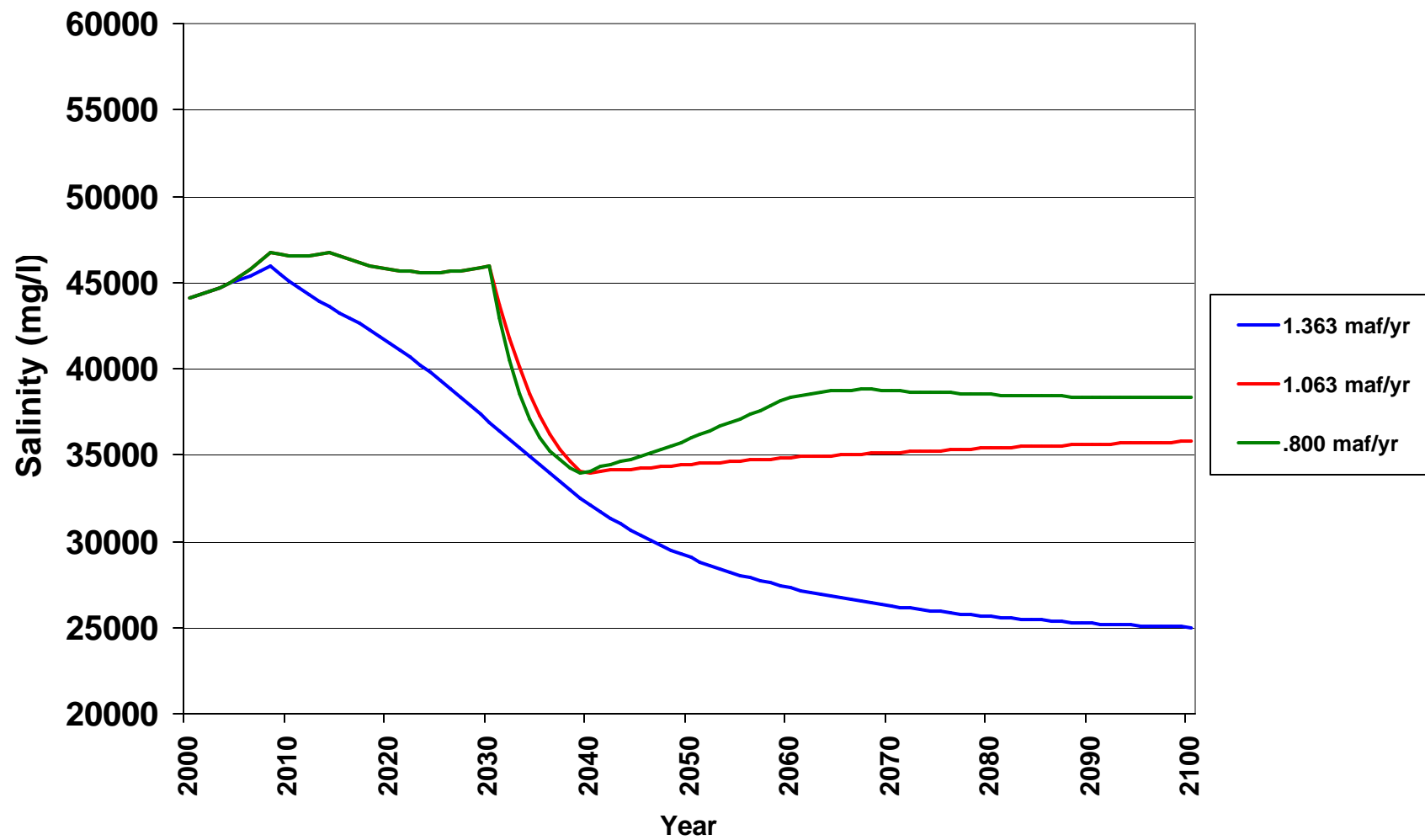
Total Cost by Component:

Item	Inflows Ac-ft/yr	Construction Costs (\$ M/yr)	O,M&R (\$ M/yr)	Energy (\$ M/yr)
Evaporation				
Ponds:	1.36	456.0	1.2	0.2
	1.06	906.0	2.6	0.2
	0.80	906.0	2.6	0.2
Fish Harvesting		2.0	TBD	
Recreation facilities		2.0	0.1	
Shoreline Cleanup		0.5	0.2	
Wildlife Disease		0.0	0.1	
Shorebird Ponds		TBD	TBD	
Displacement Dike		TBD	TBD	
Flood flows (existing)		10.0	0.4	

Alternative #1 Water Surface Elevation



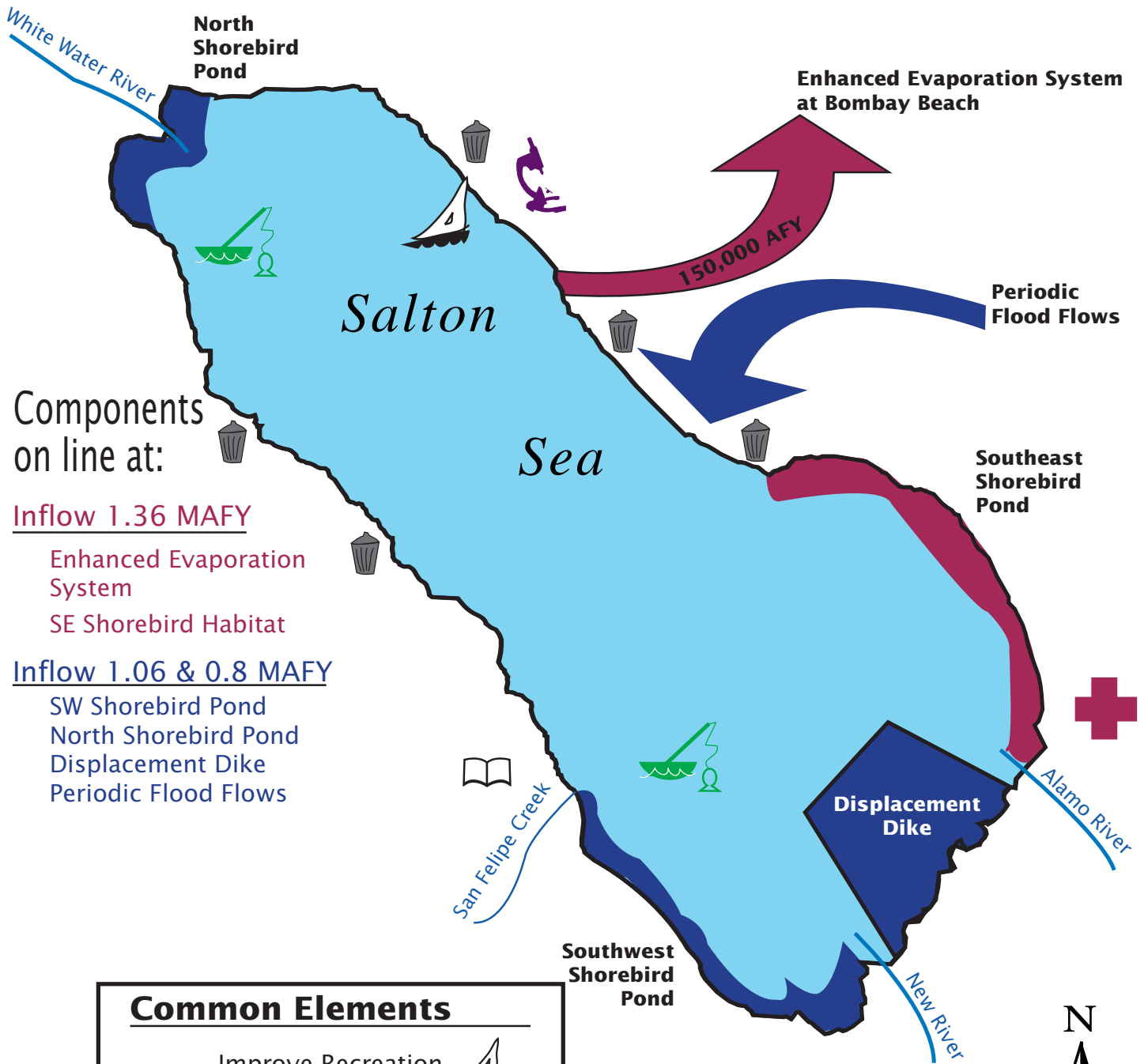
Alternative #1 Salinity



Alternative 2

Salton Sea Alternatives

Major Actions in the First 30 Years



Components on line at:







Inflow 1.36 MAFY

- Enhanced Evaporation System
- SE Shorebird Habitat

Inflow 1.06 & 0.8 MAFY

- SW Shorebird Pond
- North Shorebird Pond
- Displacement Dike
- Periodic Flood Flows

Common Elements

- Improve Recreation 
- Fish Harvest 
- Wildlife Disease Program 
- Shoreline Clean up 
- Strategic Science Plan 
- Long-Term Management Plan 

MAFY - million acre-feet per year
AFY - acre-feet per year

Alternative #2

Environmental Impacts

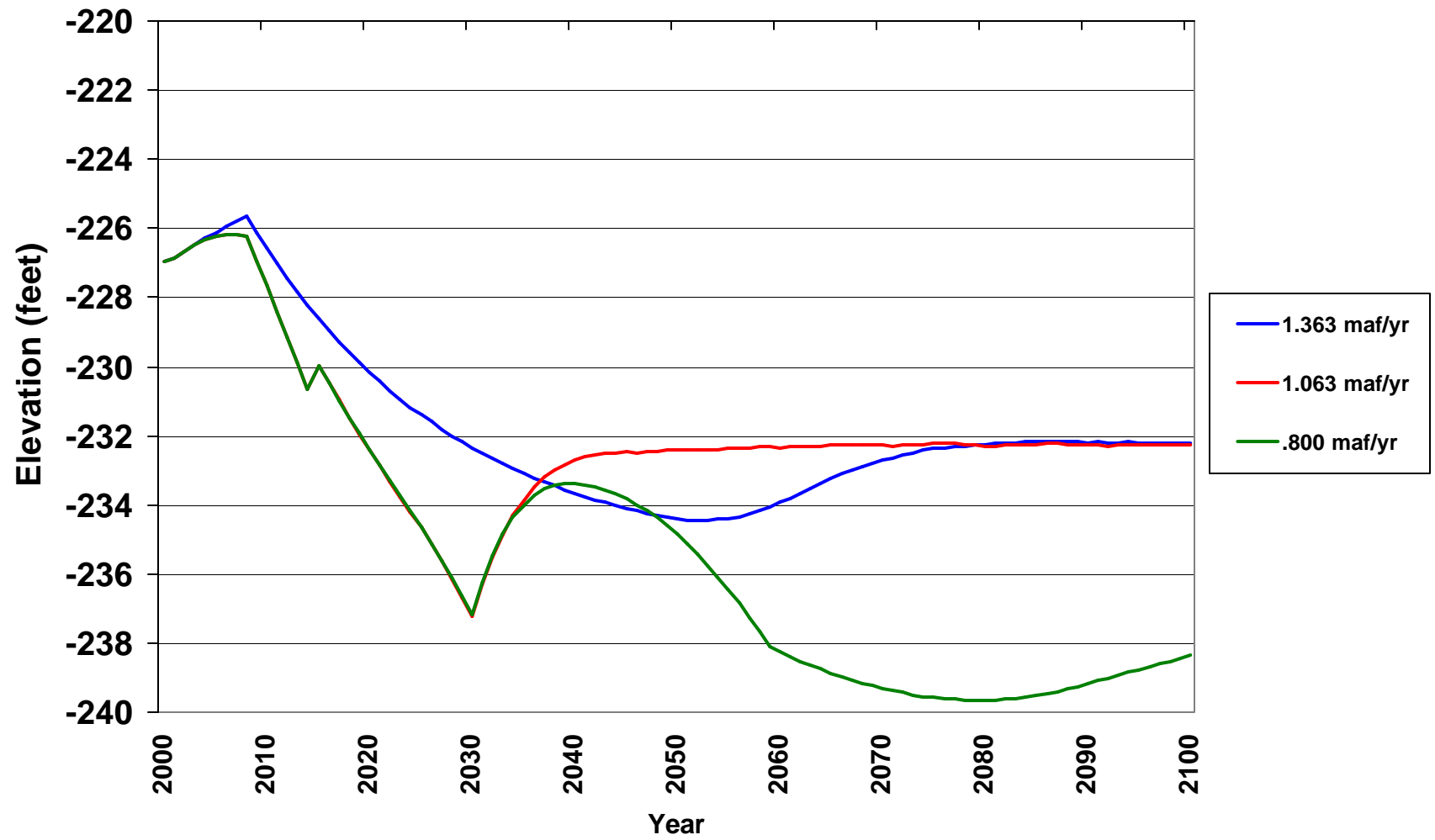
- Long term benefits compared to the No Action for fisheries and bird species
- Beneficial effects to recreation and the local economy from restoration activities
- Fugitive dust problems could occur during constructio
- Possible disturbance of cultural and Native American resources
- Loss of desert habitat and possible salt drift at and near Enhanced Evaporation System sites
- Visual changes due to alterations in the landscape in the vicinity of ponds, dike structures, and Enhanced Evaporation System towers at the Bombay Beach site
- Potential adverse impacts to migrating birds due to tower configuration and height, and salt mist

Summary of Estimated Costs

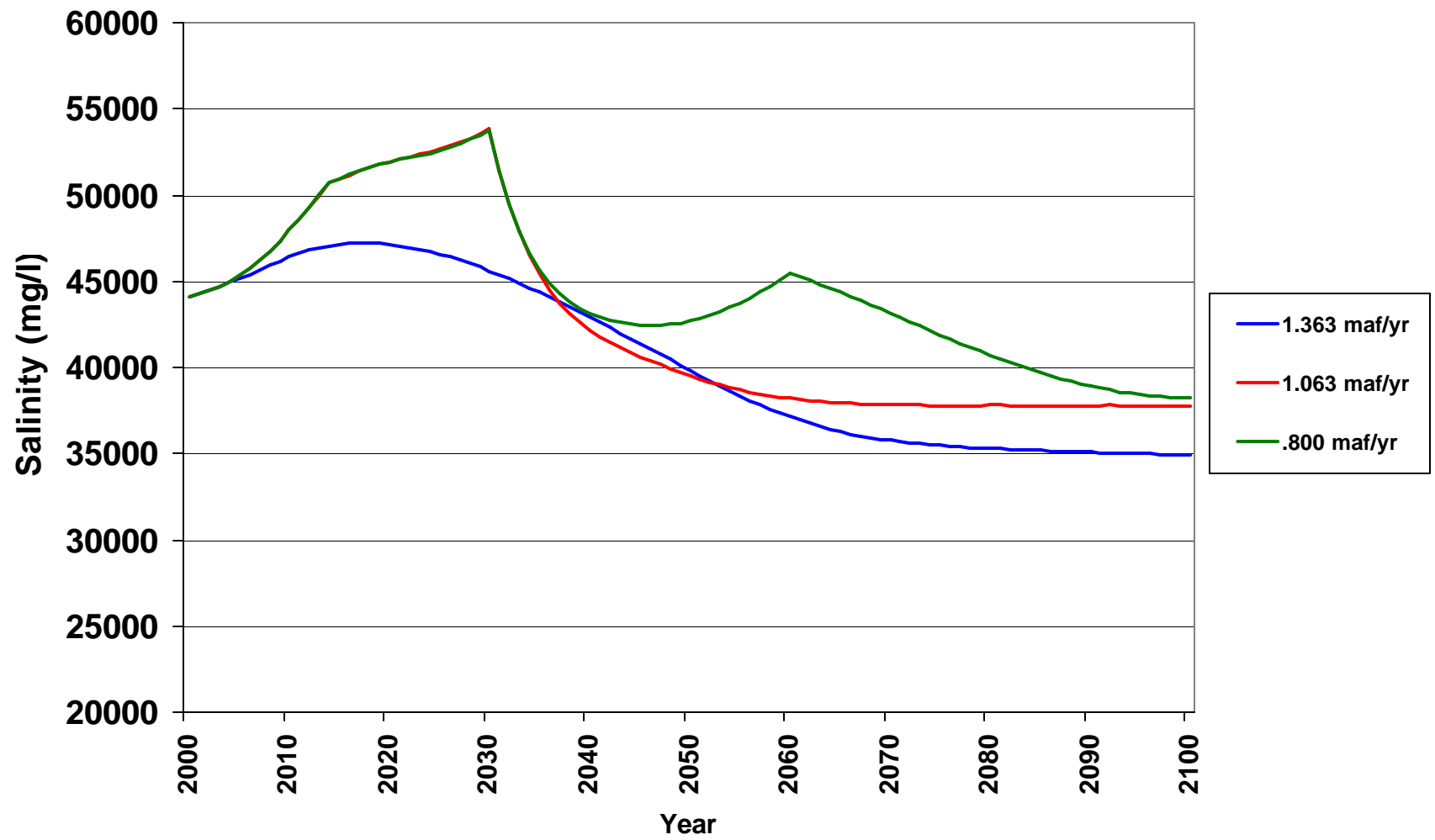
Total Cost by Component:

Item	Inflows Ac-ft/yr	Construction Costs (\$ M/yr)	O,M&R (\$ M/yr)	Energy (\$ M/yr)
Enhanced Evaporation System	1.36	303.0	8.7	3.0
	1.06	787.0	10.1	3.0
	0.80	787.0	10.1	3.0
Fish Harvesting		2.0	TBD	
Recreation facilities		2.0	0.1	
Shoreline Cleanup		0.5	0.2	
Wildlife Disease		0.0	0.1	
Shorebird Ponds		TBD	TBD	
Displacement Dike		TBD	TBD	
Flood flows (existing)		10.0	0.4	

Alternative #2 Elevation



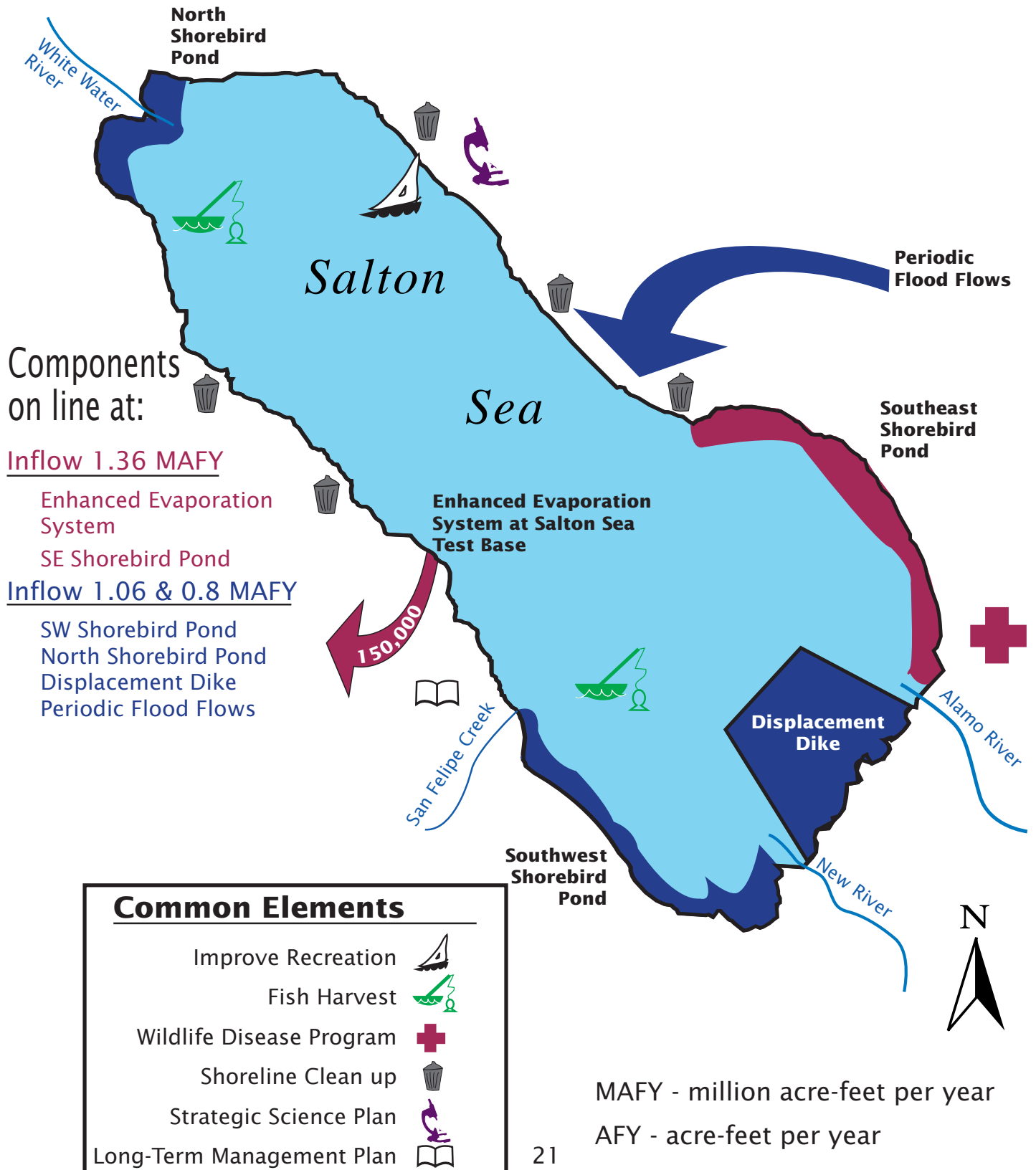
Alternative #2 Salinity



Alternative 3

Salton Sea Alternatives

Major Actions in the First 30 Years



Alternative #3

Environmental Impacts

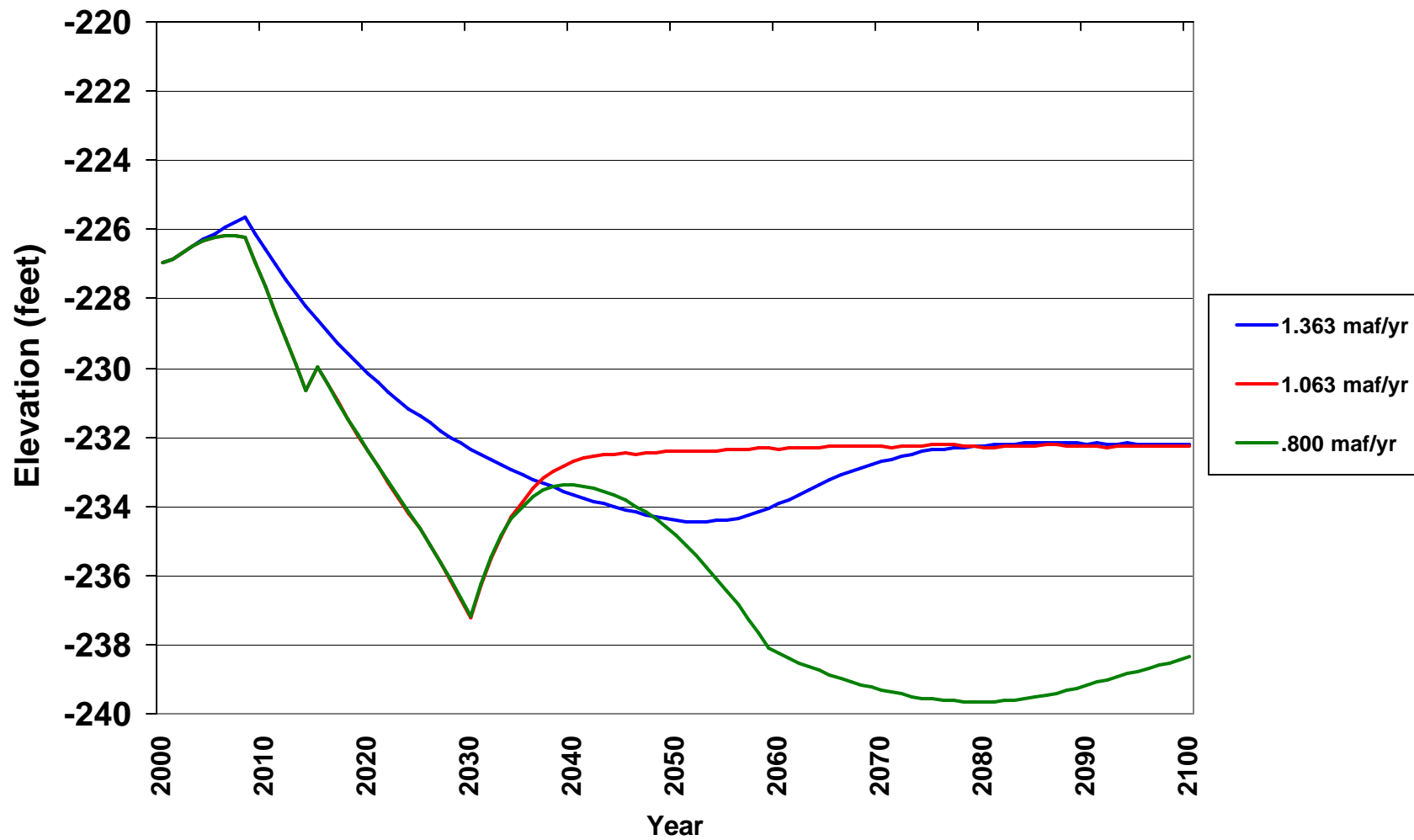
- Long term benefits compared to the No Action for fisheries and bird species
- Beneficial effects to recreation and the local economy from restoration activities
- Fugitive dust problems could occur during construction
- Possible disturbance of cultural and Native American resources
- Loss of desert habitat and possible salt drift at and near Enhanced Evaporation System sites
- Visual changes due to alterations in the landscape in the vicinity of ponds, dike structures, and Enhanced Evaporation System towers at the Salton Sea Test Base Site
- Potential adverse impacts to migrating birds due to tower configuration and height, and salt mist

Summary of Estimated Costs

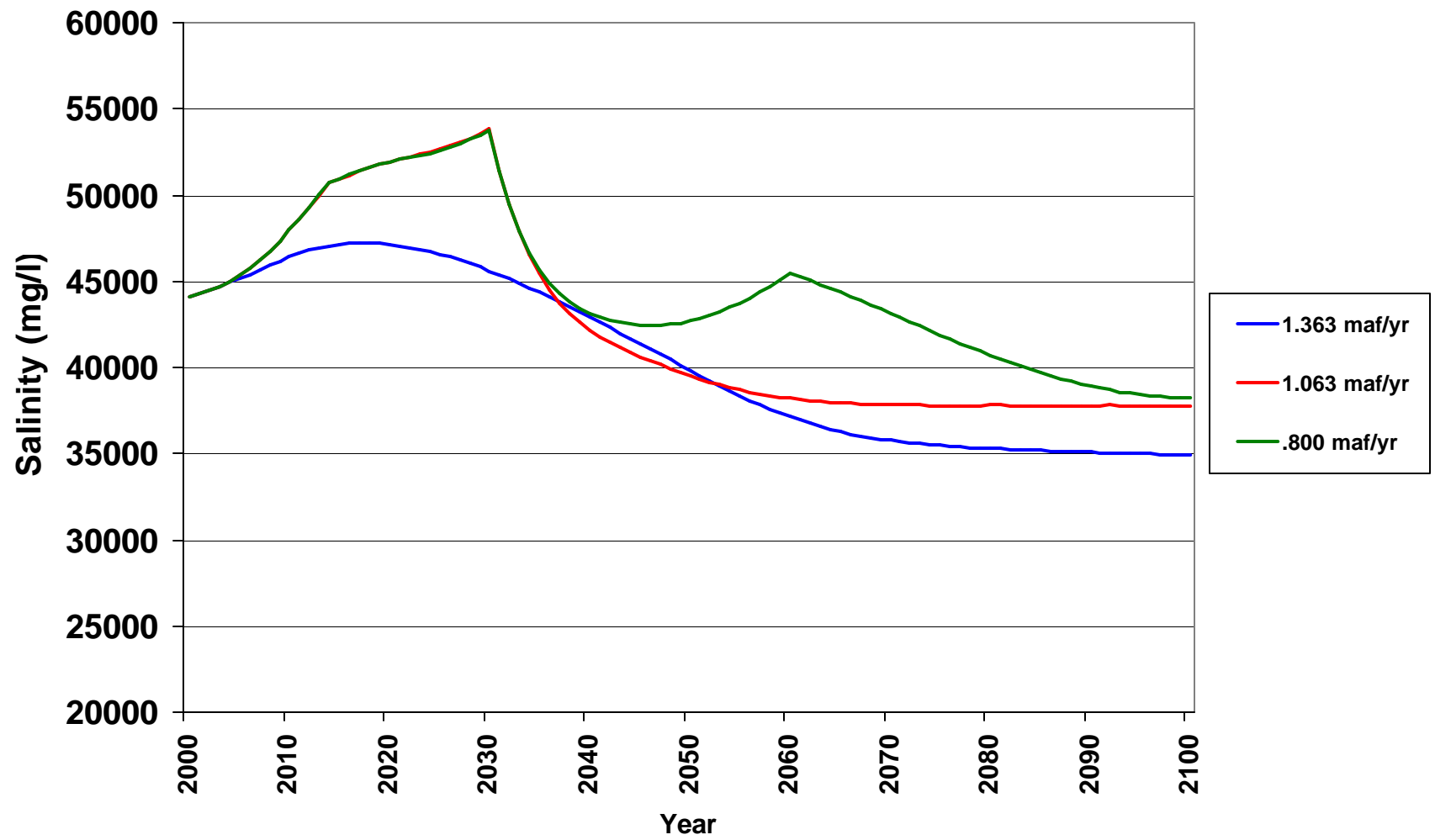
Total Cost by Component:

Item	Inflows Ac-ft/yr	Construction Costs (\$ M/yr)	O,M&R (\$ M/yr)	Energy (\$ M/yr)
Enhanced Evaporation System	1.36	427.0	9.1	3.0
	1.06	910.0	10.5	3.0
	0.80	910.0	10.5	3.0
Fish Harvesting		2.0	TBD	
Recreation facilities		2.0	0.1	
Shoreline Cleanup		0.5	0.2	
Wildlife Disease		0.0	0.1	
Shorebird Ponds		TBD	TBD	
Displacement Dike		TBD	TBD	
Flood flows (existing)		10.0	0.4	

Alternative #3 Elevation



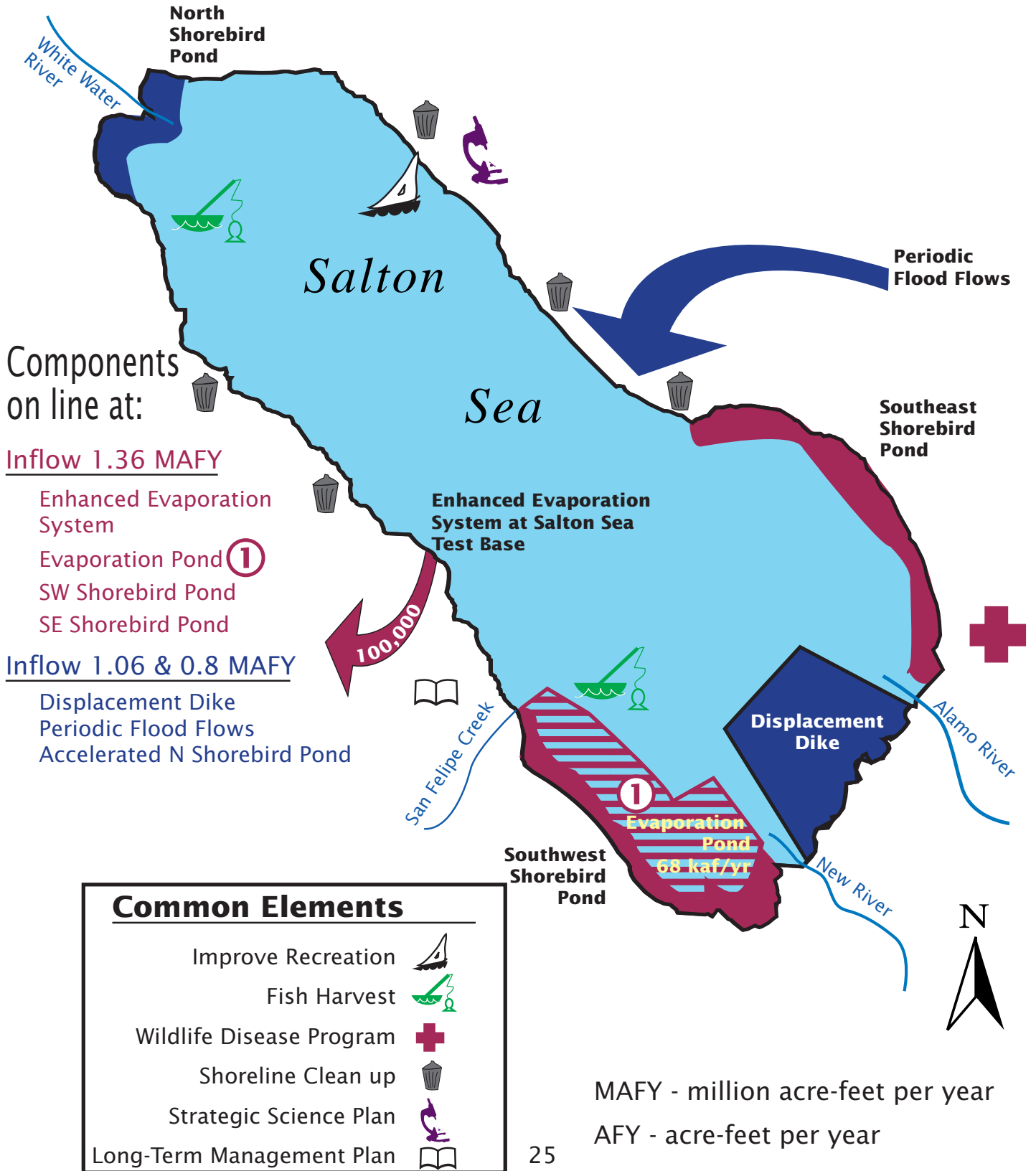
Alternative #3 Salinity



Alternative 4

Salton Sea Alternatives

Major Actions in the First 30 Years



Alternative #4

Environmental Impacts

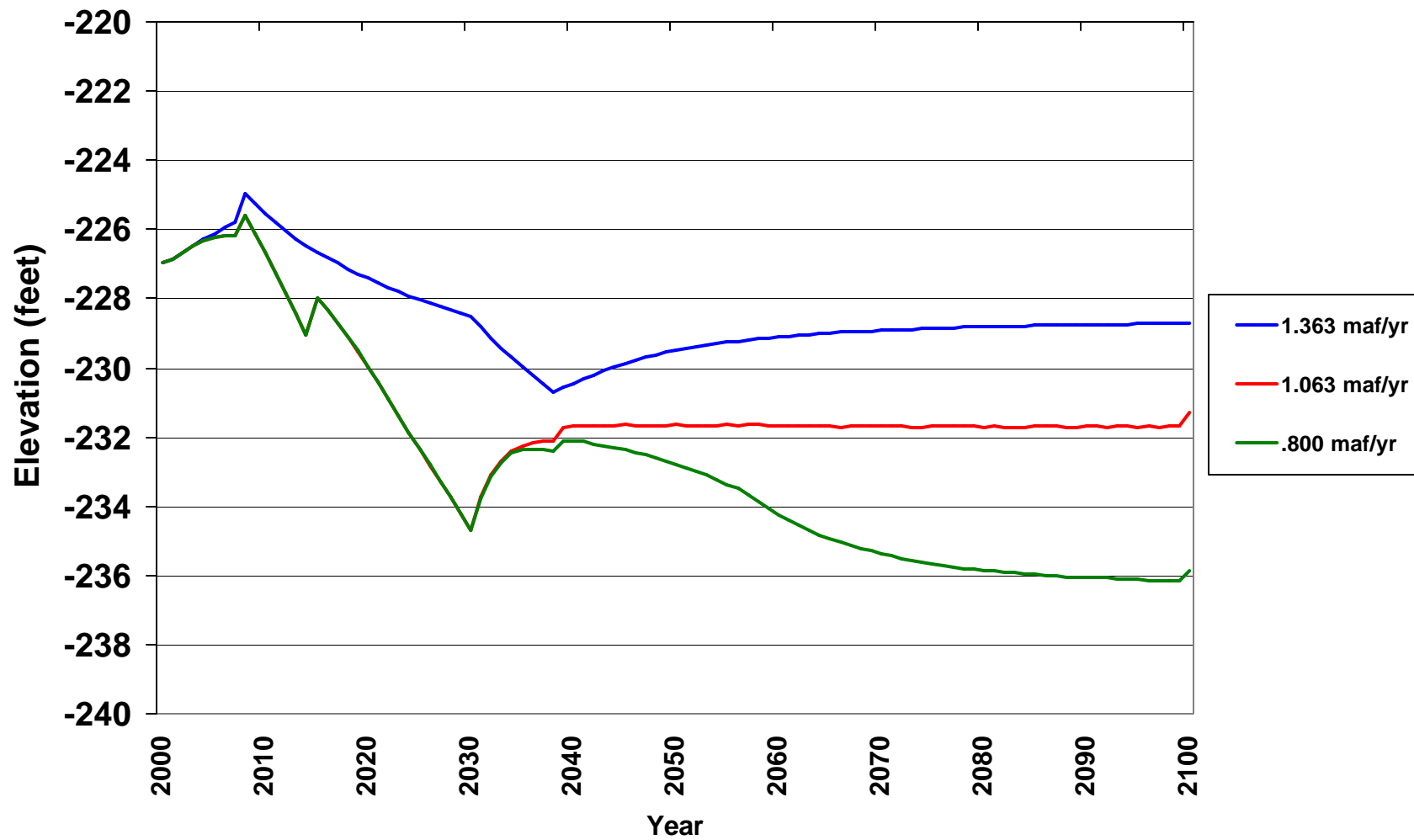
- Long term benefits compared to the No Action for fisheries and bird species
- Fugitive dust problems could occur during construction
- Loss of desert habitat and possible salt drift at and near Enhanced Evaporation System sites
- Possible disturbance of cultural and Native American resources
- Beneficial effects to recreation and the local economy from restoration activities
- Visual changes due to alterations in the landscape in the vicinity of ponds, dike structures, and Enhanced Evaporation System towers at the Salton Sea Test Base Site
- Potential traffic impacts (delays) between material borrow site and the Sea during construction activities

Summary of Estimated Costs

Total Cost by Component:

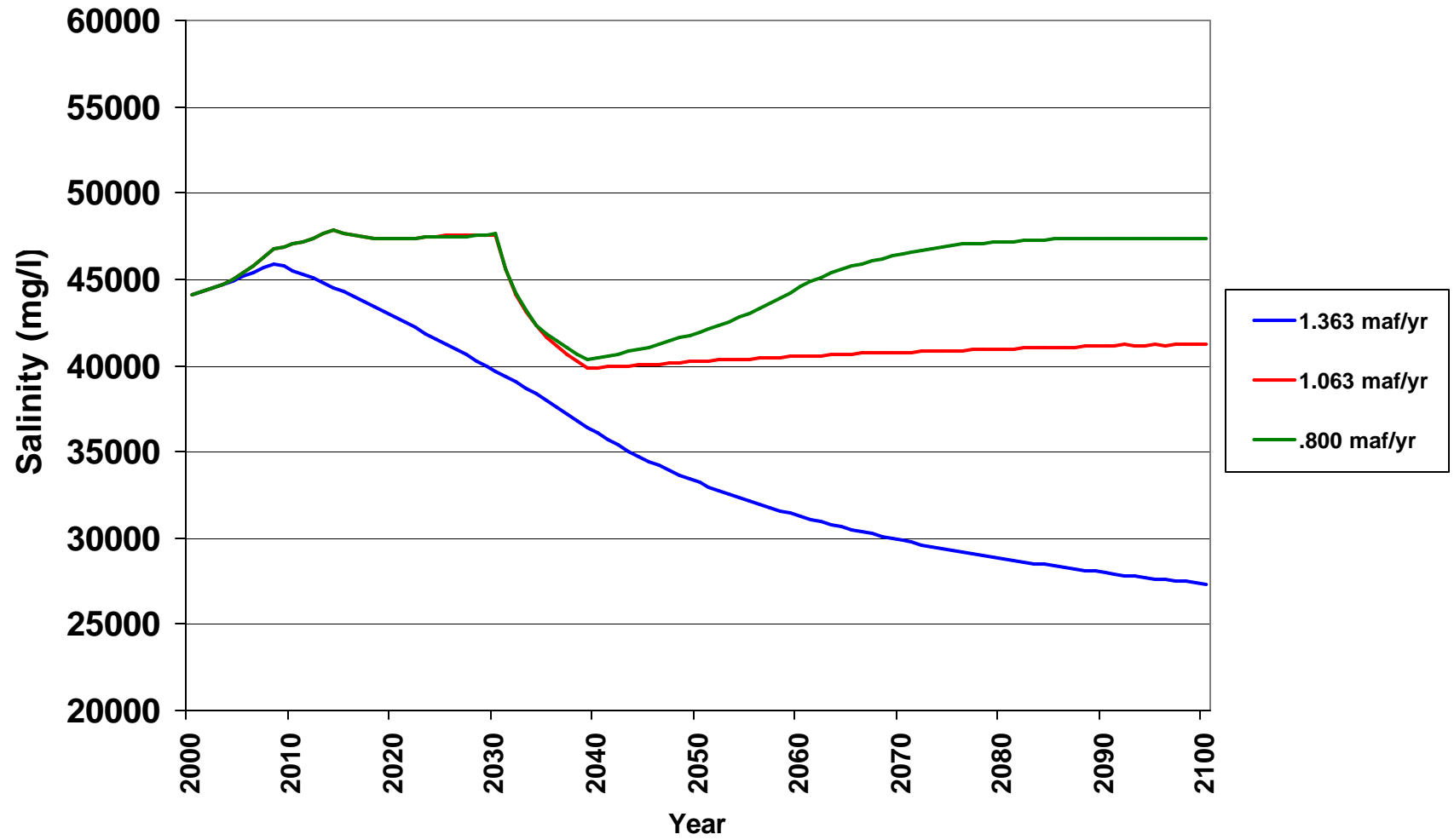
Item	Inflows Ac-ft/yr	Construction Costs (\$ M/yr)	O,M&R (\$ M/yr)	Energy (\$ M/yr)
Evaporation Pond				
And EES	1.36	574.0	6.7	2.1
	1.06	1024.0	8.1	2.1
	0.80	1024.0	8.1	2.1
Fish Harvesting		2.0	TBD	
Recreation facilities		2.0	0.1	
Shoreline Cleanup		0.5	0.2	
Wildlife Disease		0.0	0.1	
Shorebird Ponds		TBD	TBD	
Displacement Dike		TBD	TBD	
Flood flows (existing)		10.0	0.4	

Alternative #4 Elevation



Alternativ

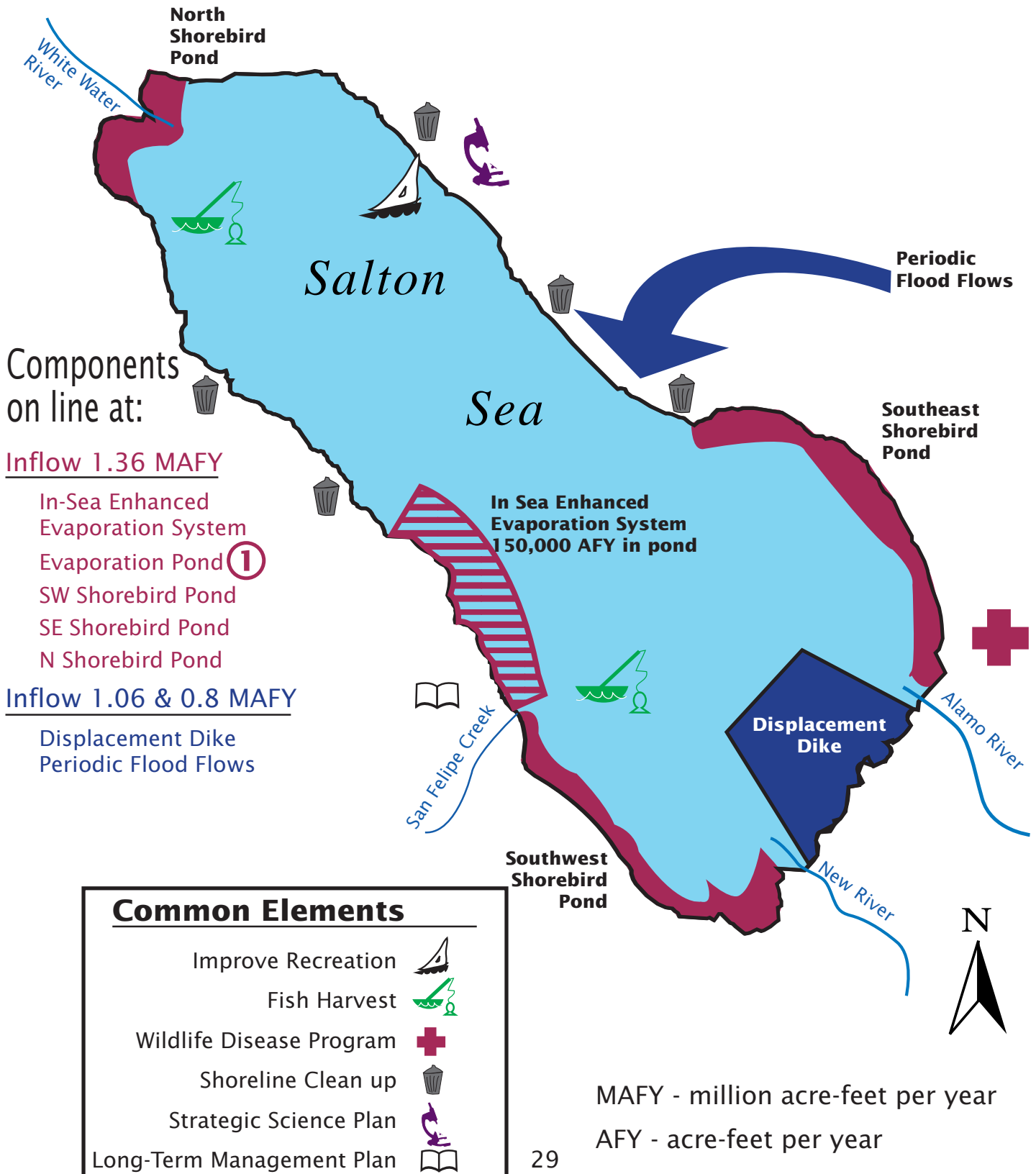
#1



Alternative 5

Salton Sea Alternatives

Major Actions in the First 30 Years



Alternative #5

Environmental Impacts

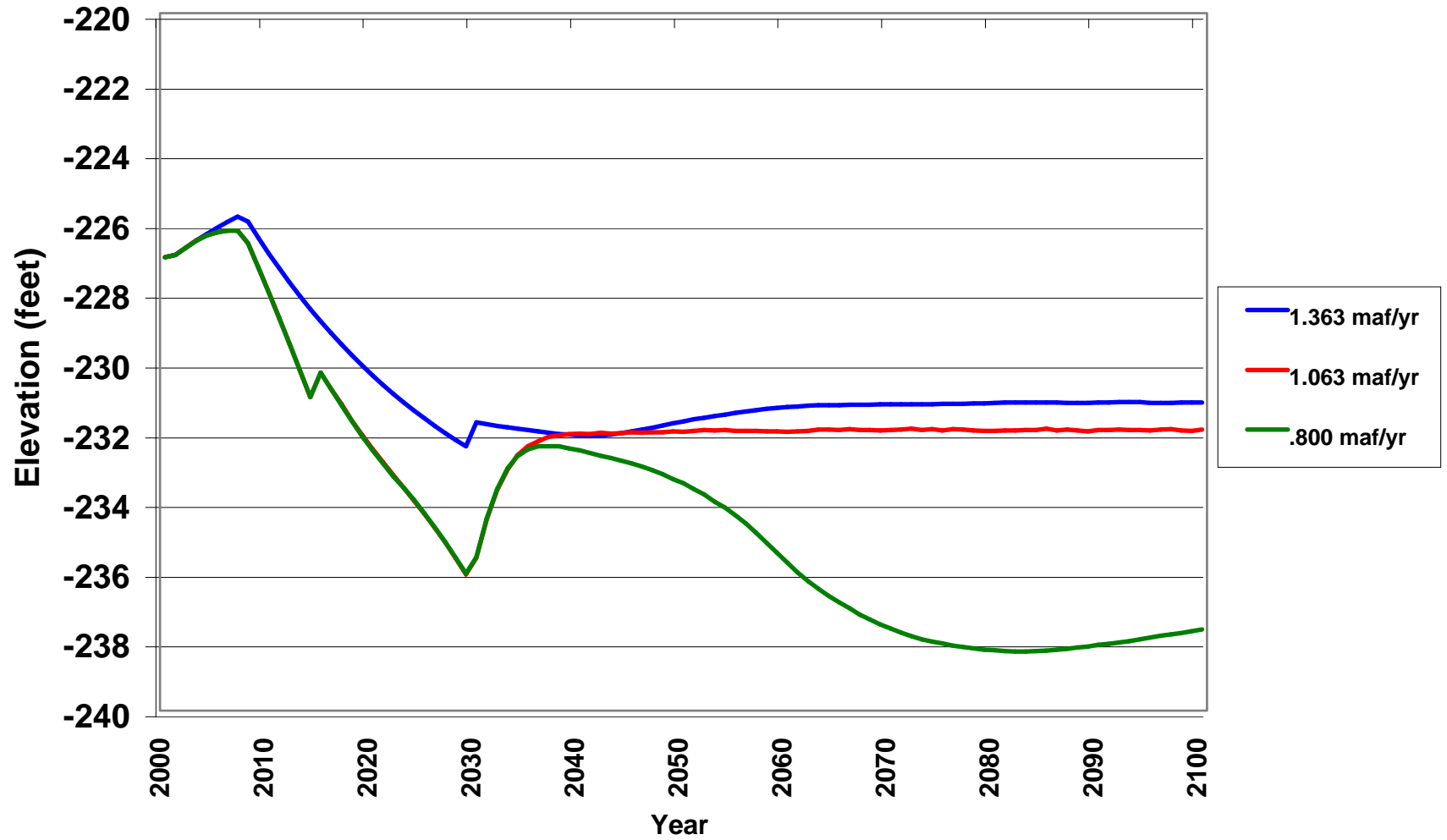
- Long term benefits compared to the No Action for fisheries and bird species
- Fugitive dust problems could occur during construction
- Temporary disturbance of fisheries would occur during construction
- Possible disturbance of cultural and Native American resources
- Beneficial effects to recreation and the local economy from restoration activities
- Additional effects associated with export options could occur during Phase 2.
- Visual changes due to alterations in the landscape in the vicinity of ponds, dike structures, and Enhanced Evaporation System towers at the Salton Sea Test Base Site
- Potential traffic impacts (delays) between material borrow site and the Sea during construction activities

Summary of Estimated Costs

Total Cost by Component:

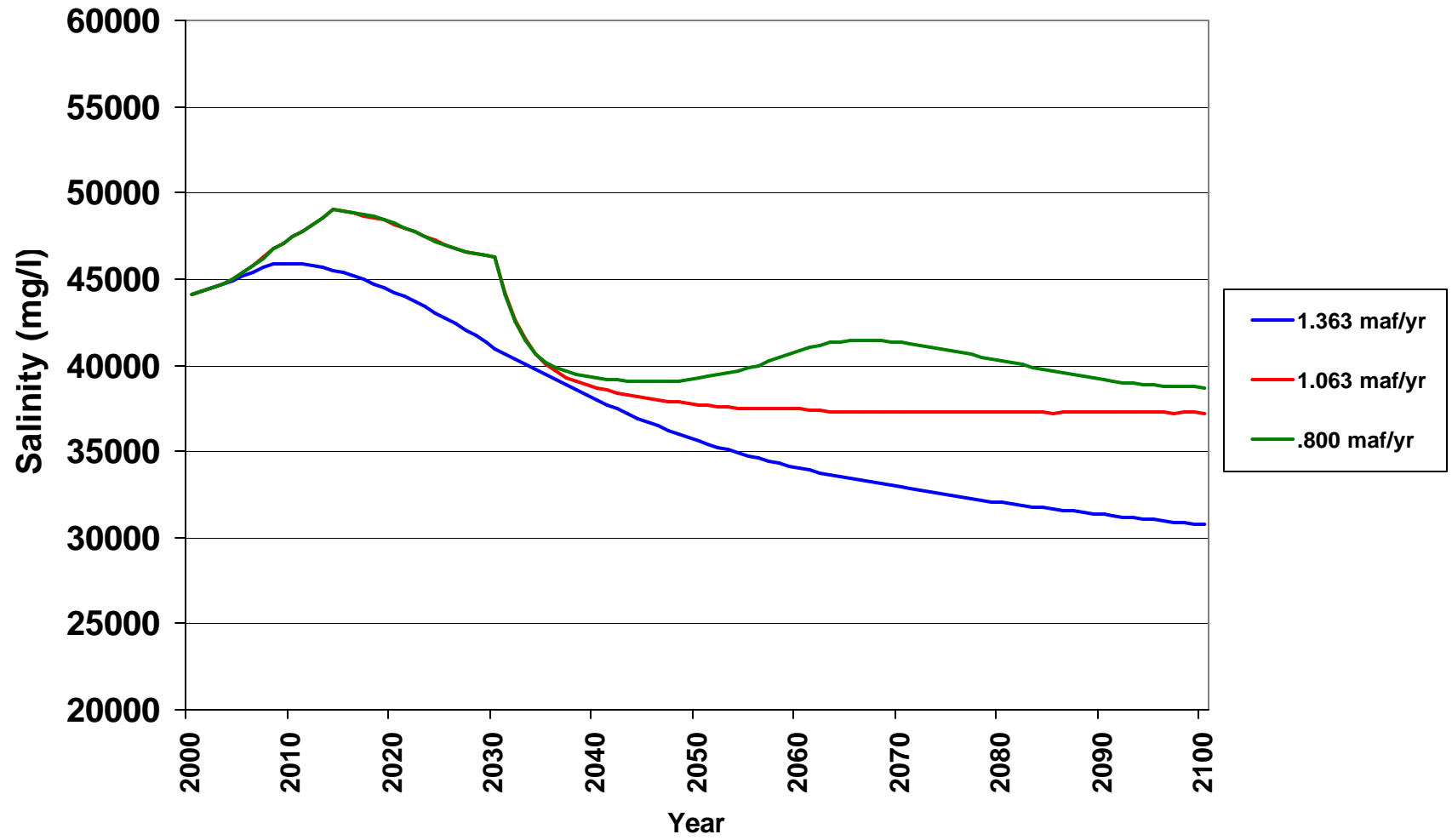
Item	Inflows Ac-ft/yr	Construction Costs (\$ M/yr)	O,M&R (\$ M/yr)	Energy (\$ M/yr)
In-Sea Evaporation				
Pond/EES	1.36	400.0	6.0	16.4
	1.06	850.0	7.4	16.4
	0.80	850.0	7.4	16.4
Fish Harvesting		2.0	TBD	
Recreation facilities		2.0	0.1	
Shoreline Cleanup		0.5	0.2	
Wildlife Disease		0.1	0.1	
Shorebird Ponds		TBD	TBD	
Displacement Dike		TBD	TBD	
Flood flows (existing)		10.0	0.4	

Alternative #5 Elevation



Alternativ

#5



Other Possible Long Term Actions

Salton Sea Alternatives

