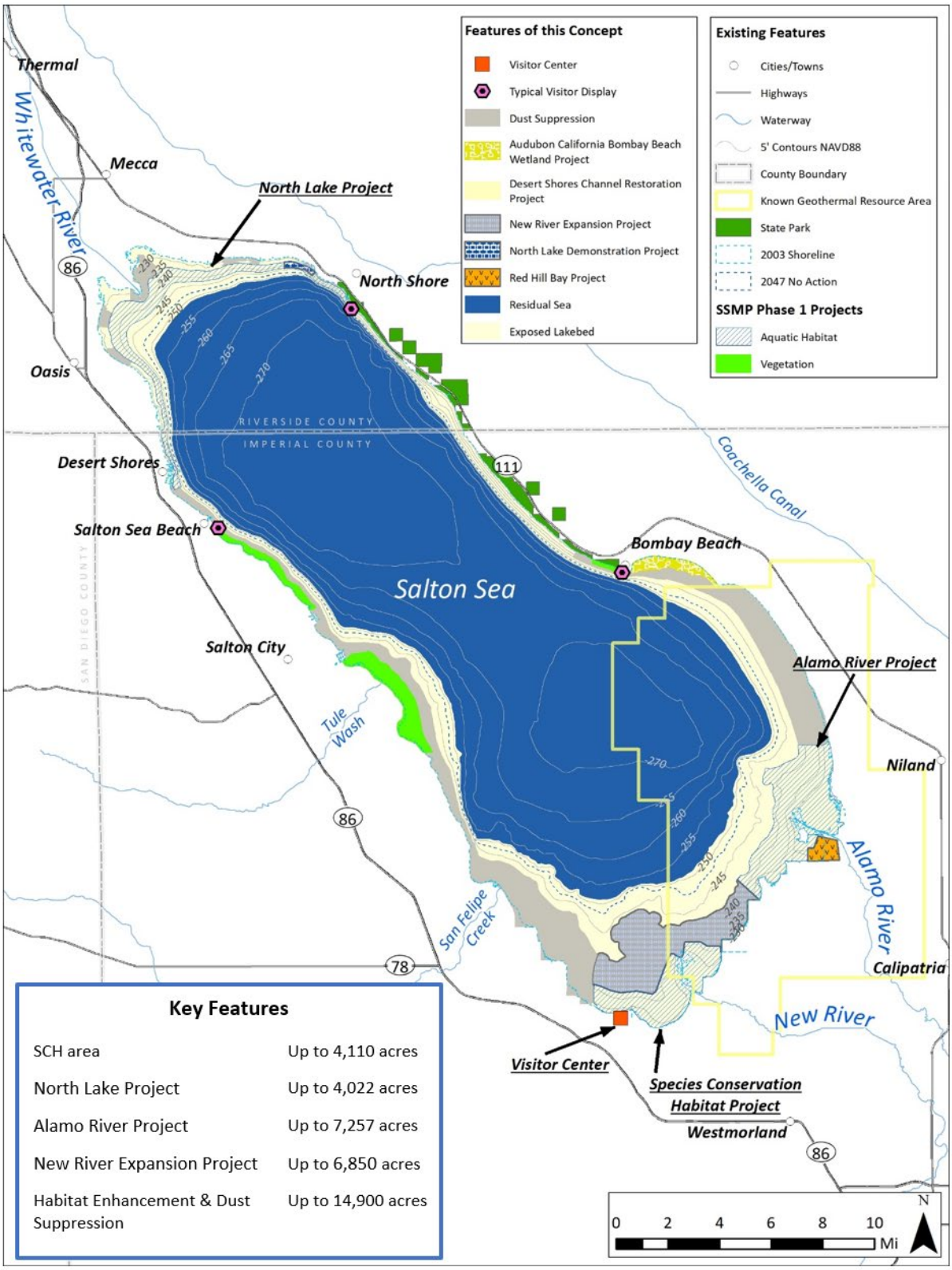
Salton Sea Long-Range Plan
Preliminary Non-Water Importation (In-Basin) Concepts

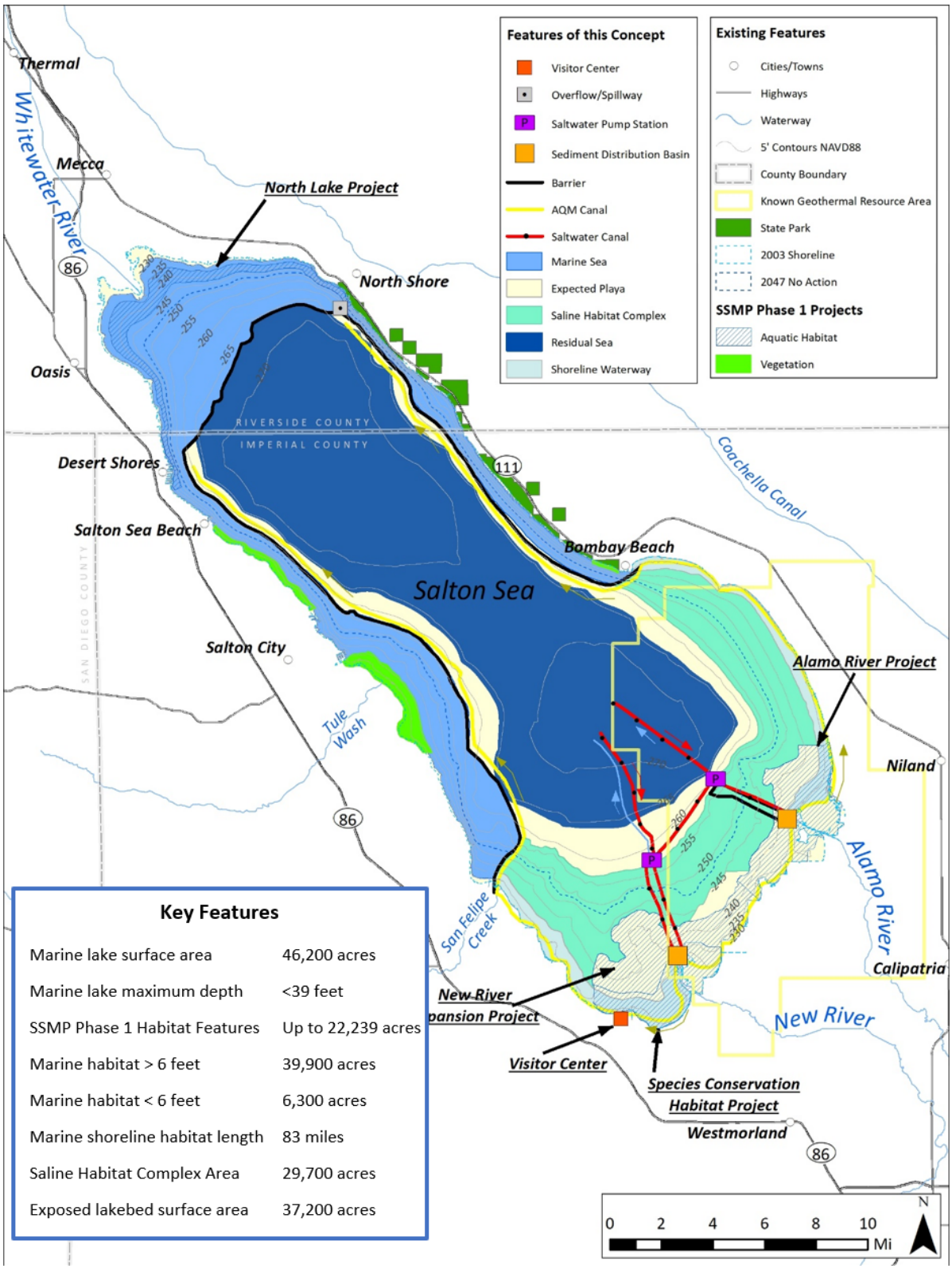
Baseline: 10-Year Plan
The 'reasonably foreseeable future' which concepts will be compared against. In this instance, the baseline is that the habitat and dust suppression projects planned as part of California Natural Resource Agency (CNRA)'s Phase 1: 10-Year Plan described in the Updated Draft Salton Sea Management Program Phase 1: 10-Year Plan Project Description are built. The 10-Year projects will collectively cover 28,900 acres of playa in Imperial and Riverside County. These projects include the: 1. Species Conservation Habitat (SCH) Project (4,110-acres of pond habitat for fish-eating birds); 2. North Lake Demonstration Project (a 160-acre lake located near the North Shore Yacht Club which is a stand-alone, first phase component of a larger North Lake project); 3. North Lake Project (up to 4,022 acres project designed with interconnecting ponds from near Desert Shores to the Salton Sea State Recreation Area); 4. Alamo River Project (up to 7,257 acres of habitat ponds at the Alamo River); 5. New River Expansion Project (up to 6,850 acres of habitat ponds near the outlet of the New River surrounding the SCH Project); 6. Desert Shores Channel Restoration Project (30 acres created by refilling five boat channels in the Desert Shores Marina); and 7. Audubon California's Bombay Beach Wetland Project (stabilizing, preserving and enhancing 650 acres of emergent wetland and brine pool habitat near Bombay Beach). Many of these projects are already in development. (The Army Corps of Engineer (ACOE)'s draft Environmental Assessment of the 10-Year Plan will likely be released in June 2022.) Each concept assumes the projects in the 10-Year Plan are built, but Long-Range Plan concepts do not have to be compatible with the baseline to move forward.



Baseline Condition (Phase 1: 10 Year-Plan Projects)

Note: The maps show projected conditions in 2050 with inflow assumptions that include climate change and period droughts. Areas on all maps are subject to change as inflow projections and modeling continue to be refined.

Concept #1: North/South Marine Sea	
Key elements	• A horseshoe-shaped Marine Sea from Bombay Beach to San Felipe Creek, supporting North Shore, Oasis, Desert Shores, Salton Sea Beach and Salton City • Saline Habitat at the South End of the Sea • Air quality management facilities • Building berms in deep water requires complex engineering • Large lake in the northern portion of Sea
How does it work?	A rock barrier stretching from Bombay Beach to San Felipe Creek creates an up-to-39 ft deep "marine sea". A shallow residual water body with salinities of about 280 PPT would be surrounded by a salt crust
How salty (saline) would the Sea be?	The horseshoe-shaped Marine Sea would have salinity similar to ocean water.
How deep would the water be?	Shallow along the shoreline and up to 39 feet at the barrier.
Habitat	Marine habitat in the horseshoe lake, plus the Saline Habitat Complex and the habitat features of the Baseline 10-Year Plan.
Air Quality	Air Quality Management Canals would move water from the Sedimentation/Distribution Basins to a series of 2-square mile units on the playa with water filtration and chemical treatment units. Drains would be constructed under the irrigated area and drainage water would be conveyed to the brine sink. Salt bush or similar vegetation would be planted. Salt crusts that form around the residual water bodies would also help control dust.
Community	Opportunities for walking and bike paths, fishing/swimming/ boating, visitors center. Water elevation is maintained near historic 2000 levels so there is minimal exposed playa adjacent to seaside communities.
Where did the idea come from?	This idea was generated and previously analyzed in CNRA's 2006 Programmatic Environmental Impact Report (PEIR).



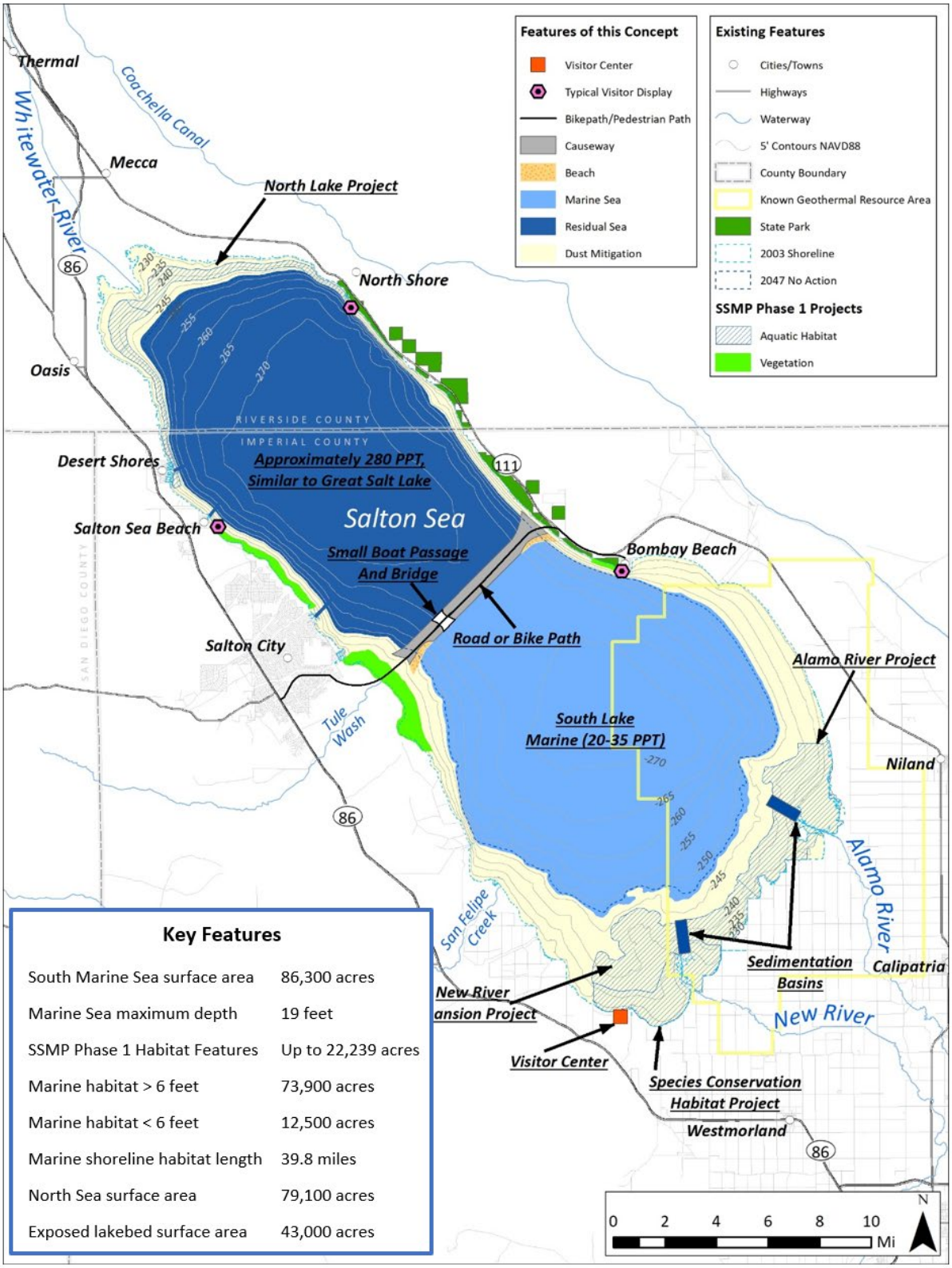
Key Features

Marine lake surface area	46,200 acres
Marine lake maximum depth	<39 feet
SSMP Phase 1 Habitat Features	Up to 22,239 acres
Marine habitat > 6 feet	39,900 acres
Marine habitat < 6 feet	6,300 acres
Marine shoreline habitat length	83 miles
Saline Habitat Complex Area	29,700 acres
Exposed lakebed surface area	37,200 acres

North/South Marine Sea

Note: With further inflow reductions, the central residual Sea could form two separate shallow basins around the two depth contours shown in the south and north.

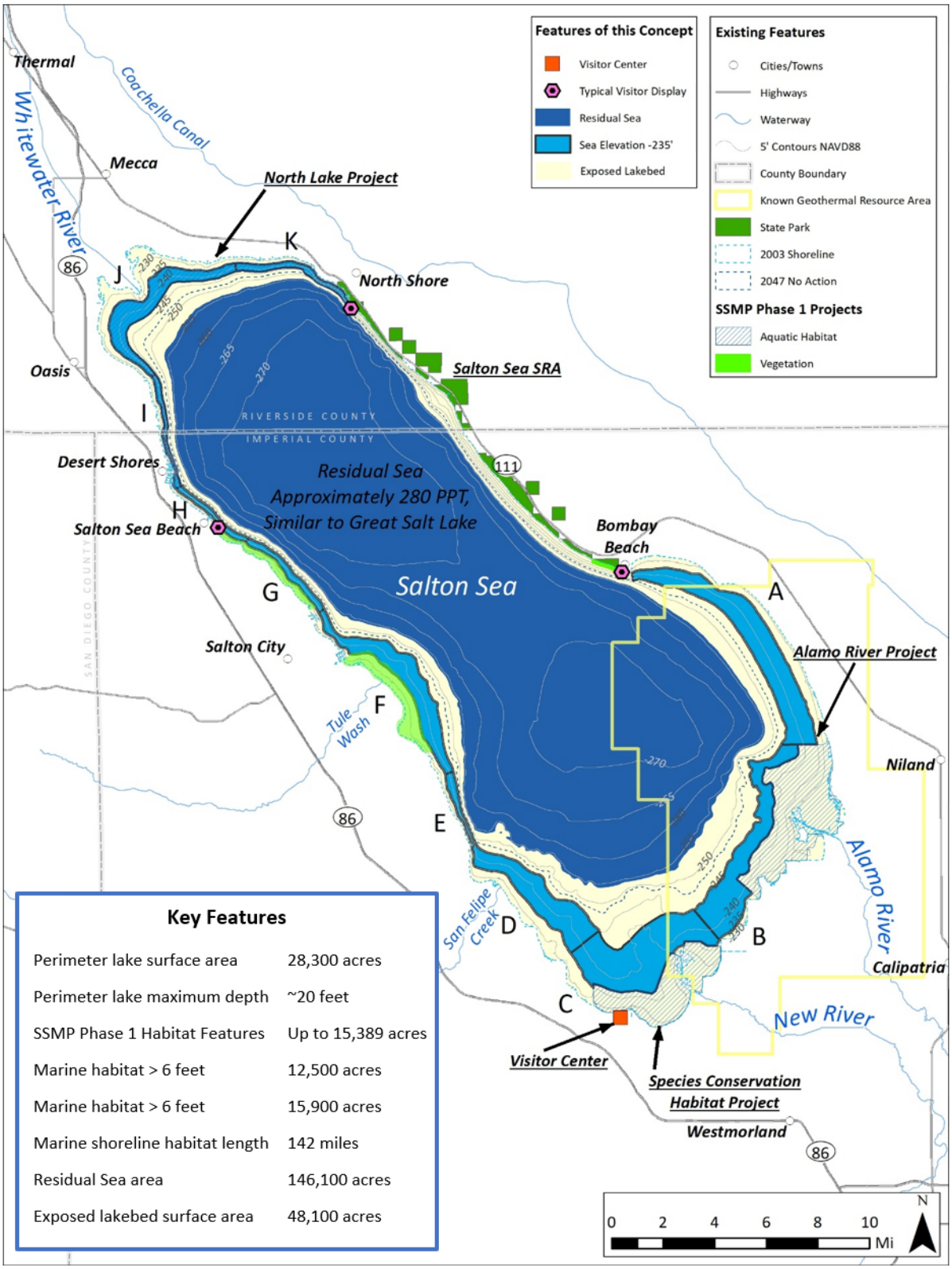
Concept #2: Divided Sea/Marine Sea South	
Key elements	• A large Marine Lake on the south side of the Sea benefiting the communities of Bombay Beach, Niland, and Calipatria • Phase I SSMP habitat and dust control features • Salinity control • Salt crust in areas around the north basin • Mid-sea causeway with water on both sides requiring less complicated engineering and construction than water retention structures
How does it work?	The Sea would be divided by a causeway (raised track or road) across the middle of the Sea.
How salty (saline) would the Sea be?	The north side would rise in salinity until it achieves a level of around 280 PPT, like the Great Salt Lake. The south basin would be similar to ocean water or could be less salty. Depending on the quantities of future water inflows, the surface area of the two basins could shrink or grow.
How deep would the water be?	The greatest depth in the south basin would depend on future inflows, but it's expected to be 15 to 20 feet.
Habitat	The water entering the Sea from the south would support a large marine habitat.
Air Quality	Salt crusts around the north basin will help control dust. Other methods would be used for other dusty areas.
Community	Similar to the North-South Marine Sea, the south basin would provide opportunities for walking and bike paths, fishing/swimming/boating and a visitor center. In addition, a boat passage is envisioned from the north basin to the south basin.
Where did the concept come from?	Bureau of Reclamation Summary Report: Restoration of the Salton Sea, 2007, with recent updates.



Key Features	
South Marine Sea surface area	86,300 acres
Marine Sea maximum depth	19 feet
SSMP Phase 1 Habitat Features	Up to 22,239 acres
Marine habitat > 6 feet	73,900 acres
Marine habitat < 6 feet	12,500 acres
Marine shoreline habitat length	39.8 miles
North Sea surface area	79,100 acres
Exposed lakebed surface area	43,000 acres

Divided Sea / Marine Sea South

Concept #3: Updated Perimeter Lake	
Key elements	• Narrower lake up to 20 feet deep along the entire edge of the Sea (rather than in one area) as salty as the ocean • A salty "residual lake" (or central pool) in the middle of the Sea would ultimately be as salty as the Great Salt Lake • 65 miles of levee • Small sections could be constructed in stages • Benefits multiple communities • Salt deposits around the residual lake create a crust to control dust • Water flows through interconnected ponds
How does it work?	Series of connected lakes along the perimeter of the Sea**.** Perimeter lake sections would vary in width (distance from the shoreline) from 500 ft to over 2 miles. Water entering the Perimeter Lake system would arrive in a wide area at the south end of the Sea, flow northward along the western shore, and arrive at another wide area in the north. Excess water would be channeled into a permanent saline pool in the center of the Sea.
How salty (saline) would the Sea be?	Perimeter lake would be as salty as the ocean. The residual lake in the middle of the Sea would be as salty as the Great Salt Lake.
How deep would the water be?	Up to about 20 feet in the perimeter lake.
Habitat	There would be a mix of shallow and deep-water habitat in the perimeter lake; dredging would create the deep-water habitat.
Air Quality	If water inflows continued to decline, the residual Sea would become smaller, but salt deposits around the perimeter would form a hard crust to reduce dust. The perimeter lake could provide water for controlling dust in areas between the perimeter lake and the salt crust area.
Community	Water elevations in the perimeter lake would be maintained near historic levels, reducing exposed playa near communities, and allowing for community access. Boat passageways between cells would allow recreational boating throughout the lakefront.
Where did the idea come from?	Salton Sea Authority's 2016 Funding and Feasibility Action Plan which was funded with a grant from CNRA.

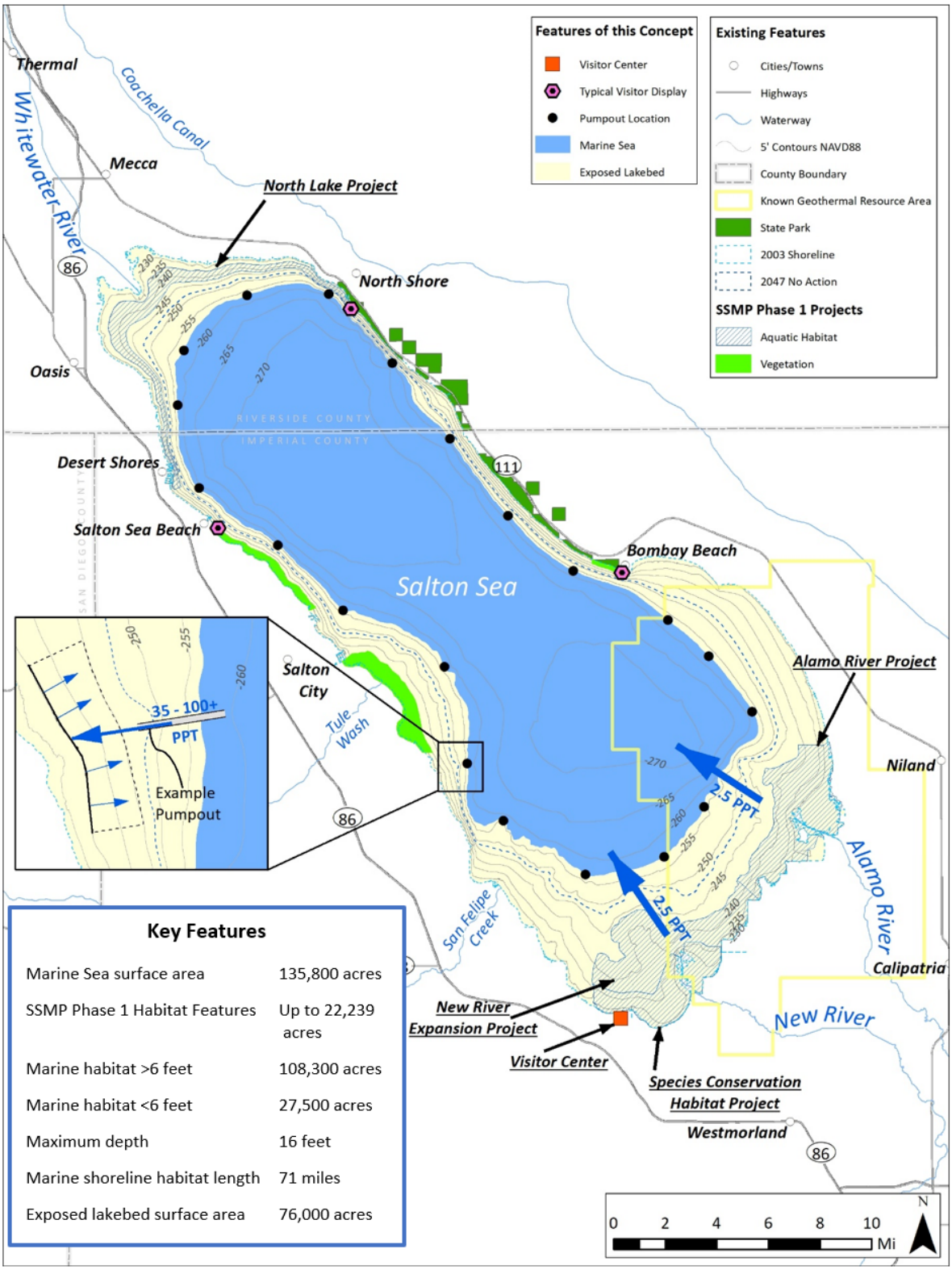


Key Features

Perimeter lake surface area	28,300 acres
Perimeter lake maximum depth	~20 feet
SSMP Phase 1 Habitat Features	Up to 15,389 acres
Marine habitat > 6 feet	12,500 acres
Marine habitat > 6 feet	15,900 acres
Marine shoreline habitat length	142 miles
Residual Sea area	146,100 acres
Exposed lakebed surface area	48,100 acres

Updated Perimeter Lake

Concept #4: Pump Out Options	
Key elements	● Because the Sea has no outlet, as water evaporates, the minerals and salts concentrated in the Sea increase. This concept would provide this outlet to address salt, through: ○ Multiple Small Pump-Outs for Dust Control, or ○ Large Pumping Facility via pipeline, or ○ Combined Small and Large Pumping Stations. ● The concept has high energy needs ● Relatively simple engineering ● The higher- quality Sea will be further away from historic shoreline, so more exposed playa
How does it work?	Only about 5% of the inflow needs to be removed to balance the inflowing salt load, but more pumping would be needed to reduce the salt enough to support fish habitat.
How salty (saline) would the Sea be?	Ocean-level.
How deep would the water be?	Up to about 16 feet.
Habitat	The smaller Sea will restore bird and fish habitat. However, depending on inflows it might take 20 to 30 or more years to restore the habitat.
Air Quality	Dust control programs are necessary on the exposed playa.
Community	The smaller Sea could be used for recreational opportunities as it was in the past. However, this smaller Sea will be farther away from communities with more exposed playa.
Where did the idea come from?	Salton Sea Authority's 2016 Funding and Feasibility Action Plan evaluated a pump out concept and pipeline to the Gulf.



Pump Out for Dust Control Concept

Concept #5: Water-Optimization Concept	
Key elements	• Low-tech approach maximizing flexibility and resilience, with thousands of acres of shallow habitat cells spread out across exposed playa. • Pond sizes could vary from 25 to 100 acres or more, based on site conditions and information gleaned from operation of higher-gradient ponds. • Distributes water via gravity around the historic Salton Sea shoreline, creating shallow habitat 'cells' and dust suppression projects • North Lake with shallow habitat cells and dust suppression downgradient
How does it work?	Captures water in two or more interceptor canals. Distributes water via gravity around the historic Salton Sea shoreline, creating shallow habitat 'cells' and dust suppression projects. Recaptures and redistributes water exiting these shallow cells into subsequent downgradient cells
How salty (saline) would the Sea be?	Ranging from brackish (slightly salty, similar to where the river meets the ocean) to hypersaline (saltier than the ocean).
How deep would the water be?	Nominal depth would be only about a foot, with relatively low berms impounding the water.
Habitat	Thousands of acres of shallow habitat cells at different levels of saltiness supporting a range of broad ecological diversity.
Air Quality	Dispersed habitat cells will reduce wind fetch and dust emissions. Additional dust suppression projects would be located atop emissive playa.
Community	Amenities to be identified by local communities. These could include boating and fishing access, as well as birding and hiking paths, picnic areas, and other amenities.
Where did the idea come from?	Adapted by Mike Cohen with the Pacific Institute from an NGO proposal in 2006, building off of the Imperial Irrigation District's Salton Sea Restoration and Renewable Energy Initiative.

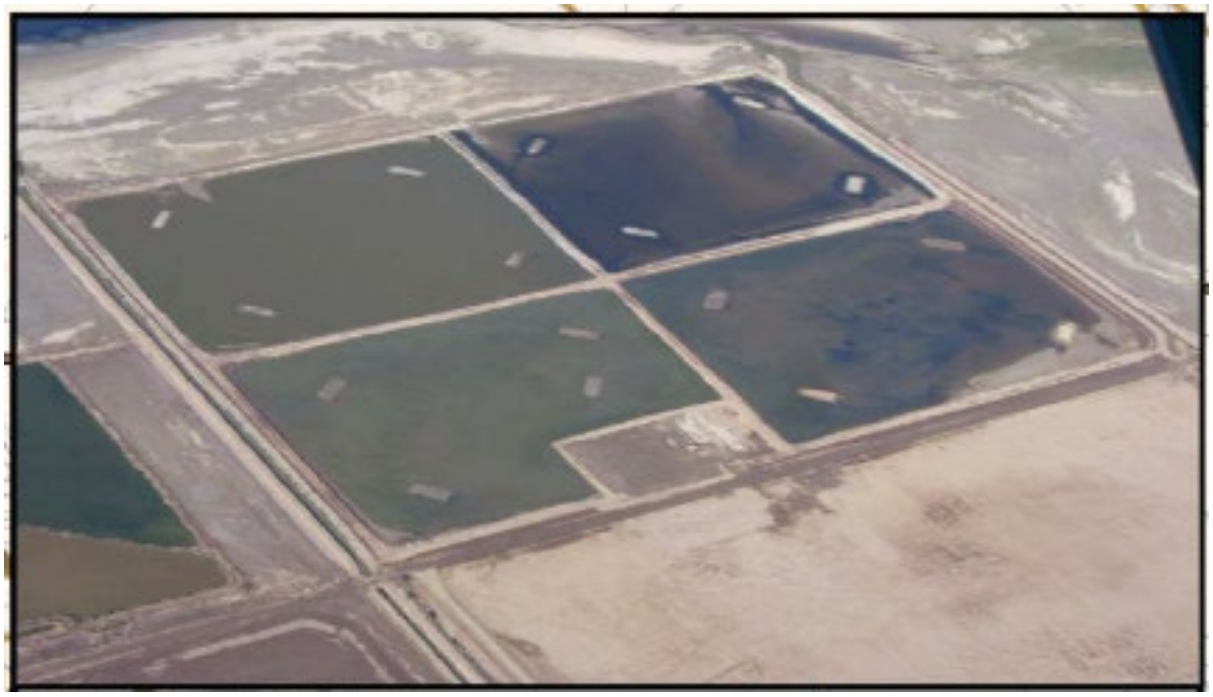


Image from the USGS/Reclamation Shallow Saline Habitat project. This would be the general template for the ponds, though they would be adapted based on performance and site conditions.

Concept #6: Southlake Restoration and Enhanced Vegetation	

Key elements	• Uses plants to improve the water quality of inflowing water (Phytoremediation)
	• Concept is quick to construct and compatible with all current and planned projects and water importation
	• Mitigates 41,000 acres of exposed playa for dust suppression, provides 41,000 acres of wetland habitat, and "conserves and transfers" about (246,000 - 143,500 = 102,500) acre feet per year of treated environmental water to the lower portions of future exposed playa in the Northern portion of the sea.
	• Could include islands and floating islands for habitat and recreation
	• Could include multitech waste conversion facilities to create no-sulfur diesel fuels from waste plastic repurposing
	• Concept is constructed in phases:
	  • Phase I: Low-Cost Southlake Separation Berm for Playa Mitigation and salinity reduction and to create a new Southlake
	  • Phase II: Channels & Phytoremediation create 41,000 acres of enhanced vegetation.

How does it work?	Enhanced vegetation and phytoremediation can be installed in the New and Alamo rivers as well as the deltas on floating islands for immediate water quality improvements. A dredged gravity fed irrigation ditch will provide water for wetlands.
How salty (saline) would the Sea be?	Expected to be 10.27 PPT.
How deep would the water be?	Mix of shallow and deep water habitat, to be developed.
Habitat	41,500+ acres of habitat restoration within the Salton Sea. New River and Alamo River Restoration with floating islands and channel planting
Air Quality	41,500+ acres of projects to address dust.
Community	Islands and silt berms provide habitat and restoration' zones'.
Where did the idea come from?	Nathan White and Rob Simpson, AGESS, Inc.

Renderings of proposed Southlake Restoration and Enhanced Vegetation concept

Concept #7: Salton Sea Water Recycling Project	
Key elements	• 3-6 million tons of pure salt created by a distillation/desalting process at the Salton Sea is sold annually to fund restoration efforts. • Pure distilled water is returned to the Sea or to habitat projects around the Sea. • Dust Control with Salt Crust from Brine Concentrate eliminates all playa dust by 2060. • Recycled Water and Salt Delivery to habitat and recreation projects by Perimeter Pipeline Returns Salton Sea to ocean-level salinity within 30 years. • Restore fish and fish-eating bird population within 20 years.
How does it work?	Water from the Salton Sea is drawn into water recycling plants near new and geothermal plants. desalination plants to create fresh water. Non-purified mixed salt brine from the desalination process is used to create salt for sale or used to control dust on the playa. Distilled water is re-mineralized and piped to restoration projects around the Sea through a perimeter pipeline. The process is powered by local geothermal projects. The remaining 5% volume of mixed salt brine concentrate is piped to dust control evaporation ponds to create a salt crust to cover the playa. This Salt crust would begin to reduce PM10 dust from unpopulated areas of shoreline by 2030 and eliminates all playa dust by roughly 2060.
How salty (saline) would the Sea be?	Ocean-level in 30-years.
How deep would the water be?	About 27 feet in the deepest areas.
Habitat	164,000 acres of restored Salton Sea would support a large population of fish and birds by 2050. Pure water delivery prevents selenium accumulation in habitat projects in the near-term. 15,000 acres of Floating In-Sea Habitat (FISH) along unpopulated areas of the Salton Sea shoreline could provide interim habitat.
Air Quality	Salt brine in evaporation ponds near uninhabitated areas could control dust as discussed above. For areas like West Shores, Northshore, and Bombay Beach, shoreline recreational lakes and

	windbreaks formed by mesquite and palo verde trees addressess dust control.
Community	The restored Sea could be used for recreational opportunities. Recreational lakes restore the historic shorelines of Salton City, Salton Sea Beach, Desert Shores, and Bombay Beach. Native trees and plants supplied by the perimeter pipeline create green space for access and recreation.
Where did the idea come from?	Tom Sephton, LRP Committee Member.