



U.S. Borax Inc.

Owens Lake Operations



Owens Lake Geological History

- Owens Lake is one of a string of Pleistocene lakes extending from Mono Lake to Owens Lake to China Lake to Searles Lake to Panamint Lake and finally to Lake Manley in Death Valley
- It last overflowed 10 - 15 thousand years ago, since that time runoff from the Owens valley and surrounding mountains has been evaporating there.
- Dissolved minerals in the runoff were being concentrating to make Owens Lake brackish
- The Los Angeles Aqueduct was completed in 1913 diverting the Owens River and tributary streams away from Owens Lake
- This diversion accompanied by a severe drought in the early 1920's caused Owens Lake to desiccate completely by 1928



Owens Lake Geologic History

- The Owens Lake deposit primarily contains four sodium based salts
 - » Sodium Carbonate Na_2CO_3
 - » Sodium Bicarbonate NaHCO_3
 - » Sodium Chloride NaCl
 - » Sodium Sulfate Na_2SO_4
- These salts with the exception of sodium chloride or Halite, mostly occur as combinations of hydrates and double salts, the most prevalent being the minerals Trona and Burkeite
- Trona is a double salt of sodium carbonate and sodium bicarbonate with two waters of hydration $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$
- Burkeite is a double salt of sodium sulfate and sodium carbonate $2\text{Na}_2\text{SO}_4 \cdot \text{Na}_2\text{CO}_3$



Owens Lake Trona Deposit

- Owens Lake is the third largest trona deposit in the Americas
- Searles Lake (Trona, California) is second largest
- Lake Gosuite (Green River, Wyoming) is the largest deposit



Owens Lake Mineral Extractions

- The first mineral extraction occurred in 1877 near the town of Keeler on the east side of the lake by Inyo Development
- Early soda ash plants were on the east side of the lake because of the location of the narrow gauge railroad which extended north to Nevada
- With the construction of the Los Angeles Aqueduct came the standard gauge railroad from Mojave and later soda ash plants were located on the west side of the lake. These plants processed lake brine to produce soda ash
- The last operating soda ash plant operated by Pittsburgh Plate Glass was closed in 1968
- In 1962 Morrison and Weatherly Chemical Corporation (M&W) obtained mineral extraction leases on Owens Lake and began to mine trona



1947-1952

- Soda ash plants around the lake
- Inyo Development –Keeler 1883 to WWI
- Natural Soda Products – Keeler 1912 – 1953
- California Alkali / Inyo Chemical– Cartago – 1917- 1932
- Pacific Alkali / Columbia Southern / PPG 1928 – 1967
- Kaiser Permanente 1947-1952



NSP digging out pipe line to Keeler after 38-39 flood



Owens Lake Mineral Extractions

- M & W supplied trona to Boron Operations and others
- In the early 1970's M & W constructed a road to the west side of the lake and installed a calciner to make crude soda ash for stack gas scrubbing at Moapa
- In 1976 Agricultural and Industrial Minerals exercised an option to buy out M & W and formed Lake Minerals Corporation (LMC)
- LMC did not operate the calciner
- LMC developed a soda ash extraction process based on mining and processing the solid trona
- In 1982 Cominco American Incorporated purchased LMC



Owens Lake Mineral Extractions

- In 1989 LMC formed a joint venture with Vulcan to build a soda ash plant at Owens Lake called Owens Lake Soda Ash Company (OLSAC)
- From 1989 to 1995 OLSAC conducted feasibility studies, pilot studies, environmental studies, permitting and engineering for a 600,000 tpy soda ash plant
- In 1996 OLSAC tried to sell the soda ash project without the final permits in place and in 1998 offered the mine to U.S. Borax
- After LMC obtained a COE 404 permit, Lahontan 401 certification and, a Fish and Game 1603 agreement, Borax purchased the mine in May 1999
- Borax which is owned by Rio Tinto was placed into an industrial minerals group and renamed Rio Tinto Minerals in 2006



Owens Lake Operations Today

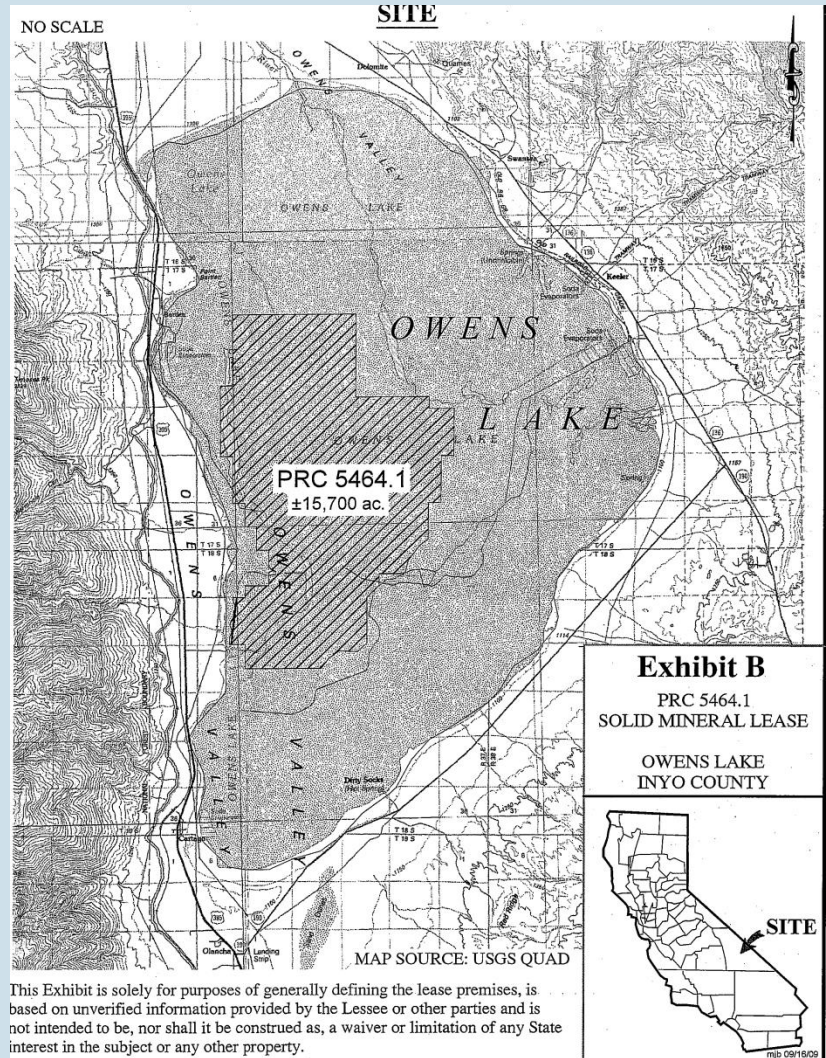
- The State of California owns Owens Lake because the state owns all navigable waterways.
- Owens Lake in the 1870's had two steam ships the Bessie Brady and the Molly Stevens, carrying Cerro Gordo silver to Cartago, charcoal to Swansea, and food from Ferguson's Landing on the north to be used in the mining camps
- The state owns to the high water mark determined in a 1913 survey
- Borax owns 339 acres of land in fee, in several parcels along the west side of Owens Lake
- Borax has three leases from the state, two Right of Way and one mineral extraction lease which covers over 15,700 acres
- The mineral lease has renewals through 2048



Mineral Lease Area

Approx. 24.5 square miles located in the western center of Owens Lake, mostly in the brine pool area (Waters of the US)

The ore deposit contains about 70 million tons of trona



This Exhibit is solely for purposes of generally defining the lease premises, is based on unverified information provided by the Lessee or other parties and is not intended to be, nor shall it be construed as, a waiver or limitation of any State interest in the subject or any other property.



Owens Lake Operations Today

- The newly formed crystalline deposit (liquid to crystal in 15 years) is porous and brine flows through the salts
- the ore deposit sets on a relatively impermeable clay pan that was the lake bottom
- blocks of ore are isolated from the main ore body and from lateral movement of brine with a vertical wall of mud in the form of a clay slurry seal
- the isolated blocks of ore (panels) are dewatered by pumping brine from internal drainage ditches back to the brine pool with diesel engine driven pumps
- Ore grade used to determine panel configuration , now it is salt depth : >2 feet, <5 feet



–A hydraulic excavator is used to place a windrow of ore from the edge of the isolated panel onto the ore block



Mining today



–this windrow of wet trona ore is spread with a low ground pressure dozer away from the mining face in a thin layer.



Pushing “dry ore” after it is disced to dry



- This drying pad is disked to break up the trona and expose it to air drying
- Successive mining cuts and spreading create a thickened drying pad



More discing



–The dried trona is later pushed into stockpiles of ore on the drying pad with a dozer and front end loader.

–The dried trona is then loaded into dump trucks for shipment

05/07/2003



Ship by truck



Owens Lake Operations Today

- A stockpile of dried trona is also kept near the highway so shipments can continue uninterrupted in wet weather when the dirt roads on the lake become impassible to trucks
- We maintain about thirteen miles of road
- We do most of our own maintenance
- We sample shipments and ore
- We have 4 miners, one administrative assistant, and a superintendent
- We have an office and laboratory about 18 miles north of the mine in Lone Pine
- We have worked over 31 years without a lost time injury



Lone Pine Office



Laboratory



Maintenance



Dust Control and Road Maintenance



Road Maintenance



Mined out area with red brine



Owens Lake Operations Today

- We are ISO 14001 certified
- We have a Community Partnership with the Lone Pine Unified School District
- We amended our Conditional Use Permit, Surface Mine Reclamation Plan and mineral lease (with an associated approved EIR) for a trona upgrade project to reduce impurities in our ore by washing the trona
- Questions?