Abstract

of the

Environmental impact statement

Desalination Plant Project,

Rosarito, B.C.

April 2014

Prepared by:
INTRODUCTION

NSC Water, S.A. de C.V., legally represented by Ismael Sánchez González, and office address at 10488 Blvd. Sánchez Taboada, 22320 Tijuana, B.C., contracted development of an environmental impact statement (EIS) for a desalination plant project to be built at Rosarito, B.C.

Enrique Noriega Spinola, with professional licence No. 86240, and office address at 336 Veracruz St., 22890, Ensenada, B.C., was hired to develope the EIS.

PROJECT OVERVIEW

Since the 1960’s, rainfall forecasts and groundwater sources were determined as insufficient to meet regional demand. Studies concluded the need to build in 1975 the Río Colorado-Tijuana aqueduct. By 1992 the nominal flow of this project reached 4 m³/s. The geohydrology Tijuana Valley Study, prepared in 1979 by the National Water Commission, led to the conclusion that this project would reduce or eliminate saline intrusion to aquifers in the region. The aqueduct drives water through approximately 100 miles of irrigation channels and 140 km of pipeline to Tijuana, and requires overcoming a hydraulic load of 1,060 meters to cross the Sierra La Rumorosa, resulting in a high cost of operation due to electric power.

The proposed reverse osmosis project was specified to produce 4.4 m³/s, demanding only 36% of electricity currently demanded by the aqueduct, and will require no further purification.

Given the ever increasing demand and limited availability of water, desalination is expected to provide the additional flow required, that is of mayor importance given that traditional sources are no longer viable, or that aquifer extraction implies irreparable damage as has been observed in different parts of the region, in the form of saline intrusion to coastal aquifers.

![Figure 1](image_url)

**Figure 1. Design of supply and demand for potable water CESPT for 2010 to 2030**

The project objective is to serve Tijuana potable water demand, a letter of intent has been negotiated with the State Commission of Public Services at Tijuana (CESPT) who will be the principal client. It is also planned to sell part of the water north of the border. Based on this information, it is clear that the intender production of potable water will attend a major regional demand, providing significant social, economic and environmental benefits, in addition to reliably produce an effective return on investment.
This project will provide a better supply and quality of potable water, and possibly, less expensive rates. A secure water flow, allows for economic and social development.

**Technology in which the project is based**

The technology chosen for this project is semi-permeable reverse osmosis with spiral wound polyamide membranes. Implicates forcing salt water to pass, under high pressure, through a semi-permeable membrane to remove salts and impurities. Figure 2 illustrates the filtering process with the use of reverse osmosis membranes of this type. As seen, water flows through a mesh, because of pressure a fraction of it passes through the membrane to the interior tube leaving the salt behind. The fraction of water that does not pass through the membrane, continues through the mesh to the rejection outlet, dragging the salt left by the filtered water, thus increasing its salinity.

![Figure 2 Organization of the semipermeable membrane used in the reverse osmosis](image)

The engineering firm in charge of design is Korean, but integration of a project of this magnitude involves provision of complementary technologies from diverse backgrounds, so it can be considered that this is a global project. The original investment is from United States, a large part of financial resources will be Mexican.

The quality of the water produced by the technology will be much greater than that of water supplied at present, so it is possible that the project will impact consumption patterns of "bottled" water.

The desalination process of sea water is composed of the following six steps: 1) sea water intake, 2) pre-treatment of seawater, 3) desalination, 4) purification, 5) transport/delivery of treated water to customers, and 6) disposal of waste generated by the process.

1. **Sea water intake** - Water supplied to this project is expected to be the wastewater generated by the cooling process of units 8, 9, 10 and 11 of the CT President Juárez CFE, because these units are the most efficient and modern in the thermoelectric complex and as such, serve base demand, stopping only during the annual maintenance processes. During periods when one or more of these units do not operate, and demand of feed water to the desalination plant exceeds the available flow of discharged cooling water, an emergency intake box will be built at the intake CFE channel. All these works require appropriate aqueducts that feed water to the desalination plant. Almost all these works will be located in the premises of the CFE.

2. **Pre-treatment of seawater** – Previous to desalinization, is necessary to separate suspended solids. This action is performed by first dispensing small amounts of chemicals that coagulate and destabilize suspended solids, second, physically separating the solids by flotation, and third, using a filter medium.
The pre-treatment will result in the generation of a significant amount of sludge coming from the solids separated from the seawater.

3. Desalination - desalination will be performed using reverse osmosis membranes. This process requires pumps to raise pressure to the level required to perform the flow of water through the membranes. The exit pressure of the rejected water, will be converted into electrical energy to be used for the same gain may redeem pressure feed flow, substantially reducing energy demand process.

4. Purification - desalinated water is unfit for human consumption, is also too corrosive for transport systems, for this reason is involved in a process of mineralization, carbonation and disinfection. The latter is not really disinfection rather is the addition of chlorine to protect water from infections in the distribution system.

5. Transport and delivery - A transport system will carry the water to the point of delivery to the customer (CESPT and others). This is an associated project which means that the environmental authorization will be processed with separate EIS’s.

6. Disposal of waste water (brine) – the brine resulting from the reverse osmosis process, that is expected to reach a maximum volume of 4.4 m³/s, will be returned to the sea via a pipeline that will carry it through CFE property down to the existing discharge channel of the power plant, at this point the brine will be mixed (diluted) with CFE cooling effluent (what is left after intake for the desalination process), and then the mixed effluent discharged at the beach, at the same point where CFE has discharged its cooling effluent for close to half a century.

Physical location of the project and location plans

The project location is at the vacant lot immediately adjacent to the south of the CT President Juárez (CFE), itself located in Playas de Rosarito, Baja California. This location is not accidental and it is selection was based on a number of technical and economic advantages that accrue in favor of the project at this site such as: availability of a usable waste stream (CFE cooling discharge) as feed water for the desalination process, possibility of using existing structures avoiding environmental impact and cost of building new structures.

Figure 3 shows a composite of 4 images that places the reader in the approximate location of the project site from the national context, pointing to the north of the peninsula of Baja California, and to the town of Playas de Rosarito.

Figure 4 shows a second composition of 2 images that continue with the sequence in Figure 3, shows Playas de Rosarito, and pinpoints the location of the project site. In the final image CFE property C.T. President Juárez is easily seen and presents the approximate arrangement of the aqueducts and structures that are intended to deliver the intake seawater to the desalination plant and to return the brine to the discharge point.

Plant capacity

The desalination plant capacity has been specified to produce 100 MGD (4.4 m³/s) of potable water. This capacity would be reached through a sequence of successive stages, each of 25 MGD. The average annual production rate is 93 MGD, it is based on maximum availability with 20 production lines, no waiting units. Considered has been given to raise availability to 95% but this requires 1-2 redundant trains.

Equipment will provide a lifetime of 30 years.
Figure 3 Macro location

The composition shown in this paper illustrates the proposed location macro plant NSC WATER.
Figure. 4 Micro-localization

The composition shown in this paper illustrates the location of the proposed plant premises WATER NSC. In yellow the approximate extent of the property of the CT CFE President Juarez, marking the line of the aqueducts raised for the use of thermoelectric complex discharge indicated.
In short, the works required by the project are:

1. Installations and equipment required for the pre-treatment and reverse osmosis desalination process, all to be built at the site that NSC acquired.

2. Installations and equipment necessary to supply the seawater to the desalination process and to discharge the brine in the ocean. This installations and equipment are to be built at CFE property.

**LINKAGE OF PROJECT WITH LAWS AND DEVELOPMENT PLANS**

Documents consulted were:

- National Development Plan 2013 - 2018 (PND)
- Ecological Coastal Corridor Tijuana-Rosarito-Ensenada Regional Program of Urban Development and Tourism (COCOTREN)
- Municipal Urban Development Plan of Playas de Rosarito. 2011-2013
- National Development Plan of the State of Baja California 2008 – 2013

Relevant extracts:

**The 2013-2018 National Development Plan (NDP):**

- Regarding competitive economy and job generation strategy in 4.4.3. "To strengthen national climate change policy and environmental care for the transition to a competitive, sustainable, resilient and low-carbon."

- Regarding the water sector strategy mentioned in 4.4.2 "... Ensure sufficient water of suitable quality for human consumption and ensure food security, development and strengthen the technical and financial capacity of utilities to provide better services."

- Regarding Sustainable Regional Development mentioned in 3.3.2 Desalination axis "Achieving the planning and implementation of projects to desalinate seawater to integrate new sources of supply as a sustainable vision for the benefit of the towns"

**The Municipal Development Plan 2011-2013 Playas de Rosarito, BC (PMDPR):**

- Related to sustainable urban development and quality of life, mentions that "... urban policy and land management, which aim the urban modeling city sustainably, planning and development of infrastructure, services and public works."

**The Plan of the State Ecological Planning (POEBC):**

- Regarding to Resource Water Chapter 2, "... addresses the diagnosis of environmental variables highlighting the problems associated with the current and future availability of water, its treatment and reused."

Given the characteristics of the project it was concluded that its objectives are deeply linked with the guidelines described in the preceding paragraphs, and is useful to underline that the success of this project will result in a substantial increase in the availability of potable water, which will enhance the opportunities for economic and social regional development.

**CHARACTERIZATION AND ENVIRONMENTAL DIAGNOSIS**

The location and extension of the Study Area (SA) was determined in consideration of the following:

- Location of the proposed site.
- Territorial extend of the project influence.
• Regionalization Program established by the Ecological Baja California (POEBC).
• Marine regionalization proposed by Conabio for the waterfront of the project site.

Figure 5 shows UGA 1.2.Pb.3.4.a3, itself comprising the metropolitan area of Playas de Rosarito is presented. It is an urbanized area with essentially uniform characteristics, within which we anticipate being limited the influence of the project on the land area.

The SA Rosarito Beach has two opposite faces considerably, one is derived from its status as a state strategic focus on the availability of energy resources, and the other comes from the tourist capacity. The latter no doubt a result of having an attractive waterfront.

In practice, though Playas de Rosarito is an independent municipality of Tijuana, urbanistically shows that operates as an appendix to the Tijuana metropolitan area, which has passed through a process of accelerated growth for the last 20 years that has led to social problems and a backlog on the development of needed urban facilities, that will take some time to resolve.

Playas de Rosarito in particular is at risks of water erosion associated with the way some slopes have populated. This also presents a landscape in which the natural environment has been eradicated without going through a suburban stage. A considerable fraction of the highlands show continuous settlement, but the paving and urban equipment is poor.

According to the World bioregionalization the proposed development of the project site is located on the east coast of the North Pacific, in the temperate region north Pacific Province 11 Ecoregion 59. This subdivision was determined taking into account homogeneity in species composition of flora and fauna similar environmental conditions such as outcrops, contribution nutrients, freshwater flows, temperature regimes, sediments, currents, bathymetry or shape of the coastline (Spalding et al., 2007).

The Ensenadense Region has the following characteristics: a climate of arid to semi-arid semi hot, dry summers with winter rains. Average annual temperature 12-18 °C, with occurrence of cold fronts. It is an area of scrub, coastal dunes, ocean areas, islands, lagoons, bays, beaches, marshes, cliffs, with contributions by underground freshwater rivers and streams. Dominates the California Current, there occurrence of seasonal upwelling and the presence of high surf. Red tides occur and turbulence processes, concentration,
retention and nutrient enrichment, Ekman transport. Presence of "El Niño" Southern Oscillation (ENSO), only when the phenomenon is very severe. And as for their diversity dominated molluscs, polychaetes, echinoderms, crustaceans, turtles, fish, birds, mammals, plants. In this region there are also some endemic species of fish, invertebrates and plants (Arriaga et al., 2000).

Zooplankton is one of the most important groups within the food chain, the second link in the food chain and because many of the organisms that are present in other higher levels of the food web part of zooplankton in their first life stage (as larvae) and therefore depend on their planktonic stage.

During IMECOCAL cruise numerous surveys of plankton were conducted, on a network of stations from Punta Baja (30° N) to the south of the port of San Carlos (24° N), north of this area is the large eddy cyclonic Southern California. For purposes of this study the data of zooplankton for stations located in the sampling line further north of the study area are presented.

For Cruise 2008, copepods constituted 48% to 60% of the zooplankton community, the euphausiids were the second most abundant group (11% to 17%) in autumn they were overwhelmed by the Chaetognatha (15%). These were the third most abundant taxon in January (7%), while in April and July were the siphonophores (7 and 10% respectively). Most tunicates were abundant salps, with a maximum in January (7%) and a minimum in July (1.5%). The relative abundance of the tilt appendicularians in a narrow range throughout the year (2.6% to 3.8%), while dolioildos were scarce. Ostracods, jellyfish, pteropods and amphipods were regular, which together comprised 5% to 11%. The ichthyoplankton ranged from 0.8% (January-October) to 1.6% (April). The most distinctive invertebrates were barnacle larvae, stomatopods, polychaetes, echinoderms and cephalopods larvae, which included an average of 0.1 to 0.7% of the total abundance (Lavaniegos et al., 2010).

Data from two of the most coastal stations are shown in line 30° N relative to the abundances, which were 108 and 113 ul m-3 (E and E 100.45 100.30 respectively). Table 1 A list of zooplankton groups reported for night station on the northern edge of the sampling, north of the bay of Todos Santos is presented (Lavaniegos et al, 2010). The descending order is given according to the data of abundance.

Unlike primary productivity, zooplankton has been studied for many years and although the samples are not in the area of interest for this work, give an estimate of the organisms that can be present in that place. It is critical to have a detailed study of interannual changes that exist in the structure of the community plantonica ecological, biological and economic importance because it represents an area of high productivity upwelling that occur in the area.

Table 1, Zooplankton Taxa reported for night station 100.45.


Among ichthyofauna studies, is that of Fernández-Escobar and Arenilla-Cuéntara (1987), although the abundance may have varied over the years (as the case of sardine and anchovy), reported as the most representative species of the northwestern part of the peninsula of California sardine (Sardinops sagax), anchovy (Engraulis Mordex), bluefin tuna (Thunnus thynnus), flounder (Paralichthys californicas), the corvina (Cynoscion parvipinnis) and bream (Lepomis megalotis). A comprehensive study of pelagic and benthic fish from the Bay of Todos Santos where there have been a variety of species, both ecological and economic importance, among which are species that are caught

Benthic organisms are of great importance, both ecologically and trade in this area. On the northwest coast of Baja California have been several studies of benthic fauna, given its importance as bioindicators of

---

Table 1, Zooplankton Taxa reported for night station 100.45.


Among ichthyofauna studies, is that of Fernández-Escobar and Arenilla-Cuéntara (1987), although the abundance may have varied over the years (as the case of sardine and anchovy), reported as the most representative species of the northwestern part of the peninsula of California sardine (Sardinops sagax), anchovy (Engraulis Mordex), bluefin tuna (Thunnus thynnus), flounder (Paralichthys californicas), the corvina (Cynoscion parvipinnis) and bream (Lepomis megalotis). A comprehensive study of pelagic and benthic fish from the Bay of Todos Santos where there have been a variety of species, both ecological and economic importance, among which are species that are caught

Benthic organisms are of great importance, both ecologically and trade in this area. On the northwest coast of Baja California have been several studies of benthic fauna, given its importance as bioindicators of
changes or disturbances in the middle. Therefore, benthic communities are considered a reflection of the general oceanographic conditions.

The intertidal zone is the area along the coastline is exposed when the tide rises and falls. Within this area you can differentiate between the supralittoral (splash zone to the line of highest tide), the mesolittoral (from the mean high water mark to the mean low water mark) and finally the infralittoral and sublittoral (zone submerged below the low tide line). Among the studies describing the infauna of intertidal zone of sandy beaches more specifically, the work of López-Uriarte (1994) who studied the composition and abundance of intertidal infauna of two adjacent sandy beaches (Punta Cabras) is found, and the Velasquez-Gonzalez (2003) where the abundance of amphipods Orchestoidea corniculata and O. californica is described in relation to clusters of macroalgae as a suspected factor of spatial heterogeneity in two sandy beaches.

In a near-emitting zone thermoelectric plant in Rosarito, which discharges at 0 m, where the water has a temperature of 8-10 °C higher than the inlet, Serrano-López (2000) reports data faunal associations, dividing the inshore marine area, Midshore and offshore (from the shoreline to 30 m, 30-70 m and 70-200 m, respectively). In the far zone, the presence of polychaeta Mediomastus gender (indicator near issuer’s treatment plant funds) and a gastropod gender Caecum reported. In the middle zone, Mediomastus, Prinospio, Amphiodia (echinoderm, indicator of clean water, first in the affected funds disappear) Parvilucina (clam own funds moderately affected by treatment plants), Dendraster (Sea Biscuit) and Caecum. Finally, in the area close to the beach organisms of the genus Tellina (mollusc), Leitoscoloplos-Chaetozone (polychaetes), Ophelia Dendraster, Diastylopsis (cumaceo) and Mediomastus Caecum reported.

In 1990, the campaign ECOBAC III-0690 (Studies of pollution in Baja California) samples were taken at 42 stations between 31 30’ N and 32 45’ N, within the area 8-10 km wide from waterfront. Within this study, Pérez-Peña (1994) study the sublittoral benthic system and presents data for two stations off the coast of Rosarito, the stations 23 and 24 (41 m and 16 m depth, respectively). The nearshore station presented a smaller number of species but a greater number of organisms (50 sp, 238 individuals), while on the far opposite station (54 sp, 170 individuals) was found. In the near-shore station, the most abundant species of amphipods was two Ampeliscidae family (Ampelisca cristata and Ampelisca agassizi) and generating certain associations with other study given the continued presence of particular species within the top 10 in order of abundance found that the nearshore zone is characterized by the presence of the polychaete Mediomastus sp., Leitoscoloplos puggetenis and Chaetozone setosa (corresponding to a sand substrate type), while the far zone characterized by the presence of only Mediomastus sp. (Corresponding to a type mud substrate) (Pérez-Peña, 1994).

In marine benthic sea urchins play a very important role, being efficient consumers of algae and dams of various organisms such as lobsters, starfish and fish, it is also an economically valuable fisheries in many parts of the world (Andrew et al. 2002). The red sea urchin Strongylocentrotus franciscanus inhabits the subtidal zone with rocky bottoms, commonly associated with community mantles Macrocystis pyrifera, between 3 and 50 m deep. Popotla is one of 26 key locations where red hedgehog is captured in Baja California, but in 2007 a sharp drop of 95 t to 6 t was recorded. The density decreased possibly in response to high fishing intensity as recently operate over 40 fishing equipment (Palleiro-Nayar, 2009). While off the coast of Baja California there are some species of benthic infauna, which have been reported as endemic, and none has been considered by the NOM-059-SEMARNAT-2011

**IDENTIFIED ENVIRONMENTAL IMPACTS**

| Number | 1 |
| Name | PB-03 Issue TSP during movement activities, and terrigenous material warehouse |
| Activities | 1.01 Site Preparation |
| 1.02 Preparation of CT sites in Juárez |
| 1.03 Site preparation at the beach |
| 1.05 Excavations and fills |

**Attribute:** Air Quality

**Cause:** Excavation, grading and packing that involve earthmoving different tasks will be performed

**Effect:** TSP emission occurs, impacting air quality in the surrounding area

**Character:** Negative

**Importance:** Inconsequential

**Magnitude:** Slight

**Temporality:** Temporary

**Corrigibility:** Mitigated

---

**Number:** 2

**Name:** PB-02 Pollutant emissions by heavy machinery that consumes diesel

**Activities**

1.01 Site Preparation
1.02 Preparation of CT sites in Juárez
1.03 Site preparation at the beach
1.05 Excavations and fills
1.06 Civil works

**Attribute:** Air Quality

**Cause:** Many construction activities make use of heavy machinery with diesel combustion engines

**Effect:** Pollutant emission combustion (TSP, SO2, CO, NOx)

**Character:** Negative

**Importance:** Inconsequential

**Magnitude:** Slight

**Temporality:** Temporary

**Corrigibility:** Mitigated

---

**Number:** 3

**Name:** PB-01 Issue TSP activities during transportation of materials and equipment to construction

**Activities**

1.00 Construction of the plant
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Air Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>Constant vehicle traffic on unpaved paving</td>
</tr>
<tr>
<td>Effect</td>
<td>TSP emission occurs, impacting air quality in the surrounding area</td>
</tr>
<tr>
<td>Character</td>
<td>Negative</td>
</tr>
<tr>
<td>Importance</td>
<td>Shortly transcendent</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Slight</td>
</tr>
<tr>
<td>Temporality</td>
<td>Temporary</td>
</tr>
<tr>
<td>Corrigibility</td>
<td>Mitigated</td>
</tr>
</tbody>
</table>

| Number | 4 |
| Name   | PB-04 Pollution discharge to the environment, the wastewater generated by sanitation workers during construction |
| Attribute | 1.00 Construction of the plant |
| Cause   | Water Quality |
| Effect  | Workers during construction will require health services |
| Character | The uncontrolled discharge of wastewater pollutes water and subsoil |
| Importance | Regulated |
| Magnitude | Shortly transcendent |
| Temporality | High |
| Corrigibility | Almost - Permanent |
| Attribute | Preventable |

| Number | 5 |
| Name   | PB-05 Management lubricants and waste during maintenance of heavy equipment used in construction |
| Activities | 1.01 Site preparation |
|           | 1.02 Preparation of sites on the CT P. Juárez |
|           | 1.03 Site preparation at the beach |
|           | 1.05 Excavations and fills |
| Attribute | Soil biochemistry viability |
| Cause    | Maintenance activities of the heavy machinery that are made in the same sites of construction, involving frequent replacement of oil and other hydrocarbons, generating significant volumes of residual hydrocarbons that must be managed responsibly to avoid soil pollution |
contamination

**Effect**
The improper disposal of waste lubricating oils and other hydrocarbons, is a major cause of pollution of soil and groundwater

**Character**
Negative

**Importance**
Significant

**Magnitude**
High

**Temporality**
Temporary

**Corrigibility**
Preventable

---

**Number**
6

**Name**
PB-06 Soil contamination due to the irresponsible disposal of construction waste

**Activities**
1.00 Construction of the plant

**Attribute**
Soil biochemistry viability

**Cause**
Workers, machinery and construction operations generate a variety of waste such as paper, cardboard, plastic, wood, metal, etc., Which if not handled responsibly can be scattered everywhere

**Effect**
The improper disposal of waste, contaminated soil

**Character**
Regulated

**Importance**
Significant

**Magnitude**
Moderate

**Temporality**
Almost - permanent

**Corrigibility**
Preventable

---

**Number**
7

**Name**
E-03 Noise emission during construction

**Activities**
1.01 Site Preparation
1.02 Preparation of CT sites in Juárez
1.03 Site preparation at the beach
1.05 Excavations and fills
1.06 civil works
1.07 electromechanical works
1.08 Enabling and installation of equipment and tanks
**Attribute**  Noise  
**Cause**  Construction machinery and transport materials emit noise  
**Effect**  Noise emission occurs, impacting the surrounding area  
**Character**  Regulated  
**Importance**  Significant  
**Magnitude**  High  
**Temporality**  Temporary  
**Corrigibility**  Mitigated

---

**Number**  8  
**Name**  PB-14  
**Economic income through wages, contracts and procurement for the construction of the system**  
**Activities**  1.00  Construction of the plant  
**Attribute**  Economic stability  
**Cause**  For the construction of the desalination plant requires a substantial number of contractors, and these in turn sufficient workers, equipment and machinery. All this will produce an economic impact on the economy of the region, which in turn may lead to a virtuous circle, generating at every turn, new opportunities to impact personal and social welfare.  
**Effect**  The economic impact resulting from the construction of the plant will bring the generation of high paying jobs through contractors who are responsible for performing the work. Additionally, an outlay occur in a significant number of local companies that provide services or provide goods demanded by builders in charge of the project.  
**Character**  Positive  
**Importance**  Significant  
**Magnitude**  High  
**Temporality**  Temporary  
**Corrigibility**  

---

**Number**  9  
**Name**  C-17  
**Change in land use**  
**Activities**  0.00  Site Selection  
**Attribute**  Land Use  
**Cause**  Currently the site is a vacant lot, the project will result in a change in land use
<table>
<thead>
<tr>
<th>Effect</th>
<th>The site has already been impacted, no loss of natural features. The change in land use become an idle land in an area used to offer a service of public utility.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character</td>
<td>positive</td>
</tr>
<tr>
<td>Importance</td>
<td>significant</td>
</tr>
<tr>
<td>Magnitude</td>
<td>very High</td>
</tr>
<tr>
<td>Temporality</td>
<td>permanent</td>
</tr>
<tr>
<td>Corrigibility</td>
<td>0</td>
</tr>
</tbody>
</table>

| Number | 10 |
| Name | PB-23  Overcrowding during construction |
| Activities | 1.00  Construction of the plant |
| Attribute | Natural hazards |
| Cause | The construction workers require space to park their vehicles, and food services |
| Effect | Without adequate facilities and controls, you may avail himself of the nearby roads to park vehicles, and irregular business installing food service producing overcrowding and inconvenience to neighbors |
| Character | Negative |
| Importance | Significant |
| Magnitude | Very High |
| Temporality | Brief |
| Corrigibility | Preventable |

| Number | 11 |
| Name | PB-24  Altered landscape |
| Activities | 0.00  Site selection |
| Attribute | Aesthetic |
| Cause | Construction of the plant will alter current views from the houses surrounding the vacant lot |
| Effect | The effect of altering the landscape will be different depending on the location of the observer. In the points that have the maximum negative involvement, limited plant obstruct view at present is the marine horizon. Overall, considering the presence of the CT Juárez and now I have not a landscape highly valued, we conclude that the resulting landscape will not be discordant with the current. |
| Character | Negative |
| Importance | Shortly transcendent |
### Activities 1.09 Finishes

**Attribute:** Air Quality

**Cause:** Different coatings and finishes tasks that involve the use of solvents and paint will be made

**Effect:** VOC emissions occur, impacting air quality in the surrounding area

**Character:** negative

**Importance:** significant

**Magnitude:** slight

**Temporality:** temporary

**Corrigibility:** mitigated

---

### Activities 2.00 Operation of the plant

2.18 Kitchen and Cafeteria Services

2.19 Health Services

**Attribute:** Water quality

**Cause:** During plant operation, water for sanitation, the general hygiene of the process areas, transit, offices, etc. Are used., And other general services, which will lead to the generation of waste water shall be discharged municipal sewer system

**Effect:** The discharge of pollutants in waste water may damage to municipal infrastructure by handling, enabling the involvement of the natural environment

**Character:** Regulated

**Importance:** Absolute

**Magnitude:** High

**Temporality:** Temporary
### Number 14

**Name**
- E-06 Noise generated by the maintenance of the plant

**Activities**
- 2.21 Plant Maintenance Workshop

**Attribute**
- Noise

**Cause**
- Part of the equipment used in the maintenance and cleanliness of the plant as well as some manual tasks emit noise

**Effect**
- Noise generation produces distraction, discomfort, and may prevent break due to the inhabitants and users of the surrounding areas

**Character**
- Regulated

**Importance**
- Significant

**Magnitude**
- High

**Temporality**
- Temporary

**Corrigibility**
- Mitigated

### Number 15

**Name**
- PB-20 Possible contamination of soil due to improper disposal of waste generated by the work of operation and maintenance of plant

**Activities**
- 2.01 Screening (Screening)
- 2.06 Filter with cartridges
- 2.07 Reverse osmosis (RO)
- 2.16 Chemical Warehouse
- 2.17 Chemical Laboratory
- 2.18 Kitchen and Cafeteria Services
- 2.19 Health Services
- 2.20 office
- 2.21 Plant Maintenance Workshop

**Attribute**
- Soil biochemistry viability

**Cause**
- During the operation and maintenance operations of a variety of waste such as paper, cardboard, plastic, wood, metal, etc. Is generated.

**Effect**
- Wastes that are not handled properly can contaminate soil
<table>
<thead>
<tr>
<th>Number</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>C-10 Hazardous waste generated by the work of operation and maintenance of plant</td>
</tr>
</tbody>
</table>
| Activities | 2.16 Chemical Warehouse  
                        2.17 Chemical Laboratory  
                        2.21 Plant Maintenance Workshop |
| Attribute | Soil biochemistry viability |
| Cause | During the maintenance and operation of the plant, some hazardous waste is generated |
| Effect | Hazardous wastes that are not handled properly pollute the ground |
| Character | Regulated |
| Importance | Significant |
| Magnitude | Very High |
| Temporality | Almost - permanent |
| Corrigibility | Preventable |

<table>
<thead>
<tr>
<th>Number</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>PB-29 VOC emissions from the use of solvents and paints during application of finishes and coatings maintenance of facilities</td>
</tr>
<tr>
<td>Activities</td>
<td>2.21 Plant Maintenance Workshop</td>
</tr>
<tr>
<td>Attribute</td>
<td>Air quality</td>
</tr>
<tr>
<td>Cause</td>
<td>Since the plant is operational, it will be necessary to periodically perform maintenance on equipment and pipes which involve the use of solvents and paint</td>
</tr>
<tr>
<td>Effect</td>
<td>The use of solvents, varnishes, resins, paints, etc.. Produces VOC emissions and impacting the quality of the air in the surrounding area</td>
</tr>
<tr>
<td>Character</td>
<td>Negative</td>
</tr>
<tr>
<td>Importance</td>
<td>Significant</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Slight</td>
</tr>
</tbody>
</table>
Number: 18
Name: E-05 Noise generated by the operation of the plant
Activities: 2.00 Operation of the plant
Attribute: Noise
Cause: Some plant equipment emit high intensity noise
Effect: Noise generation produces distraction, discomfort, and may prevent break due to the inhabitants and users of the surrounding areas
Character: Regulated
Importance: Significant
Magnitude: High
Temporality: Temporary
Corrigibility: Mitigated

Number: 19
Name: PB-26 Brine discharge
Activities: 2.15 Ocean brine discharge
Attribute: 2.09 Preventive chlorination
Cause: Water quality
Effect: Desalination process will generate a brine that will be discharged to the marine environment
Number: Brine discharge will result in altering the salt concentration of the marine environment at the dispersion zone. To assess this impact a hydrodynamic dispersion study was conducted by widely recognized specialist in this field, Dr. Scott Jenkins Scripps, from the Institute of Oceanographic, at the University of California.

Worst case dilution scenario
The 32 year long records of the boundary condition and variables and the forcing function variables were subjected to a joint probability analysis for the simultaneous recurrence of the combination of these variables for the worst case dilution scenario.
These records contain 11,688 combinations of the variables found in Figures 8-1, between 1980 and 2012. We adopt a commonly used approach in environmental sciences of assessing potential impact in terms of a worst case scenario. We pose this worst case by searching these long-term records for historical events that match a criteria for worst-case.
The criteria for worst case are based on the simultaneous occurrence of the high salinity and...
temperature in the receiving water during periods of low mixing and advection in the local ocean environment. The low mixing/advection conditions arise during periods of benign weather when waves are small and winds and waves are close to stagnation. These worst-case parameters include short period wind waves of only 0.26 m (0.85 ft) heights; a tidal range of only 1.03 ft exciting a current maximum of only 2.7 cm/sec (0.05 kts), and wind speeds of only 0.88 kts.

Following the computer parameter search worst-case dilution criteria, the worst case dilution modeling scenario was posed based on the set of parameters listed below:

1) Intake flow rates = 441 mgd
2) RO Brine discharge rates = 100 mgd
3) Suspended particle size distribution: \( N_0 = 1.14 \times 10^4 \text{ m}^{-3} \); \( \gamma = 2.5 \)
4) Ocean salinity = 33.49 ppt \( \approx 33.5 \text{ ppt} \)
5) End-of-channel combined discharge salinity = 61.19 ppt
6) End-of-channel combined discharge rate = 121 mgd
7) Ocean temperature = 25 \( ^\circ \text{C} \)
8) Combined discharge temperature anomaly \( \Delta T = 10.0 \text{\ } ^\circ \text{C} \)
9) Wave height = 0.26 m (0.85 ft)
10) Wave period = 8 sec
11) Wave direction = 255\(^\circ\)
12) Wind = 0.88 knots
13) Tidal range = 1.03 ft (Syzygian spring/neap cycle)
14) Daily maximum tidal current = 11 cm/sec (0.05 kts)

**Model Calibration:**

The coupled sets of models shown in were calibrated for end-to-end simulations of the temperature field at CFE using field measurements of the spatial temperature decay of the CFE generated thermal plume off Rosarito Beach as ground truth for the calibration. A total of 14 temperature recordings were performed over a three day period in December 2103, captured by an EBE solo logger and the GPS mounted on a wave runner sweeping over a sampling grid in the nearshore waters offshore of the CFE discharge. Temperature at the discharge was between 22.9 and 23.3 \( ^\circ \text{C} \) (variation of 0.4\( ^\circ \text{C} \)).

For all the experiments a rapid decay was observed as the 16\( ^\circ \text{C} \) contour is observed within 500m from the coastline. Concurrent with the temperature measurements, wave and current forcing were measured by an acoustic Doppler current profiler (ADCP) moored in 10m of water depth off shore of the CFE discharge channel for 5 days from December 26\textsuperscript{th} to December 30\textsuperscript{th} 2013.

Using the wave and current forcing data and known CFE discharge rates and discharge temperatures as inputs to the models, free parameters in the models were iteratively adjusted to to minimize the mean-squared error between the predicted and measured surface temperature field of the thermal plume.

To demonstrate the predictive skill of the calibrated SEDXPORT model, we compare the predicted surface temperatures and measured surface temperatures we perform a regression analysis based on 30 points on semi-circles of 50 meters radius and 100 m radius measured from the CFE discharge. In the thermal plume 50 meters from the discharge the coefficient of determination (r-squared) produced by this analysis is \( r^2=0.986 \), and at100 meters from the discharge the coefficient of determination (r-squared) is \( r^2=0.919 \), both of which are an excellent results indicating high predictive skill.
Worst-case dilution scenario

Results are presented in terms of four principle model outputs: 1) salinity of the combined discharge on the sea floor, 2) depth averaged salinity of the combined discharge, 3) dilution factors for the raw concentrate at the sea floor, and 4) depth averaged dilution factors for the raw concentrate in the water column.

Salinity fields are contoured in parts per thousand (ppt) according to the color bar scale at the bottom of each plot. For purposes of comparing scenarios, the salinity scale range spans from 33.5 ppt to 67.0 ppt. Ambient ocean salinity is stated in the caption of each salinity field plot.

Of particular interest in the outcome of each historical extreme scenario will be areas in which the discharge plume elevates the local salinity above 40 ppt and above 35.2 ppt. When salinities rise above 40 ppt, the Locally Relevant Dilution Standard is exceeded for which WET lab testing has found increases in mortality and reductions in reproductive rates in locally relevant marine organisms.

Above 35.2 ppt, the salinity will exceed the 5% over average ambient salinity and exceed the 5% Rule recommendation of SWRCB’ Brine Panel, 1.

The dilution fields are contoured in base-10 log according to the color bar scale at the bottom of each plot, with a scale range that spans from $10^0$ to $10^7$.

We are particularly concerned about the dilution factor of the raw concentrate in the water column at the edge of the Regulatory Mixing Zone of the 5% Rule, measured 100 m in any direction from the mouth of the discharge channel; or alternatively the Zone of Initial Dilution (ZID) measured 300 m in any direction from the mouth of the discharge channel.

In United States waters, the present NPDES permits for the thermal effluent requires a dilution factor of 15 to 1 at the edge of the ZID, and this standard may likely be applied to the hyper-saline discharge of the desalination plant.

The brine dispersion and dilution fields for the worst case surf-zone discharge scenario are shown in Figures 21 – 24 for NSC SWRO = 100 mgd at 67 ppt and CFE heated dilution water discharge = 21 mgd, resulting in a combined discharge of 121 mgd at 61.19 ppt entering the surfzone from the CFE discharge channel.

The potential for re-circulation of brine is based 2 operating intakes, one in the intake channel that accounts for 40% of the source water intake; and the other an offshore intake for the remaining 60% of the source water.

Ocean mixing and advection is based on a significant wave height = 0.26 m; wave period = 8 seconds; wind = 0.88 kts; tidal currents = 11 cm/s; ocean temperature = 25 deg C (El Nino summer conditions).

Graphs

Figure 6 gives the salinity field on the sea floor resulting from the worst case dilution scenario for surfzone discharge. The salinity field is averaged over a 24 hour period. The inner core of the hyper-saline bottom boundary layer is at 45 ppt but covers an area of 2.4 acres of the sub-tidal beach face.

Offshore, the hyper-saline bottom boundary layer follows a southward trajectory and covers about 48 acres of benthic environment with elevated salinity 10 % above ambient ocean conditions.

Maximum bottom salinity at the edge of the ZID is 38.8 ppt, found 300 m offshore to the southwest of the discharge channel.
There is no evidence of any brine recirculation into the intake located inside the intake channel; while seabed salinity is 1.6 ppt above ambient at the site of the offshore intake, or about 4.8% re-circulation to the offshore intake.

Since the brine is heavier than the ambient receiving waters, it is virtually impossible for it
to flow upslope into the intake channel; while it is prone to flowing downslope as a gravity
flow toward the offshore intake.

Depth averaged salinities in Figure 6 are found to be everywhere less than 10% over ambient.

Depth-averaged water column salinities are at most 37.1 ppt inner core of the hyper-saline
bottom boundary layer immediately south of the discharge channel.

Maximum water column salinity at the edge of the ZID is 35.2 ppt, found in the surf zone
300 m to the south of the discharge channel.

Bottom dilution factors for the raw concentrate are shown in Figure 6 for the worst-case
scenario.

Minimum dilution on the sea bed at the edge of the ZID is 6.3 to 1 and dilutions are less
than 15 to 1 on 45 acres of surf zone bottom and offshore seabed.

However, Figure 6 shows that in the water column, dilutions improve to 19.0 to 1 at the
edge of the ZID, comfortably above the 15 to 1 minimum standard.

Therefore, from both a regulatory dilution standards as well as the brine recirculation
potential, the worst-case surfzone dilution scenario is acceptable.

**Long-Term Surfzone Dilution**

The matrix of 7 controlling variables was sequentially fed to the dilution model at common
time steps over the 1980-2012 period record length, producing 11,688 modeled outcomes.
Model output for each individual time step (day) were compressed to records of maximum
salinities along concentric semi-circular contours centered on the shoreline discharge point
that extend offshore on radii of 100 meters (The Regulatory Mixing Zone) and 300 meters
(Zone of Initial Dilution).

Along each concentric search radius, separate 30-yr histograms of the of the variation in
maximum seabed and water column salinity and dilution factor were computed and
displayed graphically as probability density and cumulative to identify long term
persistence of brine plume salinity level for inferring potential biological impact (including
chronic toxicity).

The significance of such results is two-fold 1) brine salinity at sub-lethal levels that cause
chronic toxicity symptoms which are dependent upon the persistence or exposure time of
elevated salinity, and 2) such results can quantify the occurrence probability of lethal
doses.

Both factors are important considerations when assessing whether or not a particular
disposal strategy is fully protective of the marine life.

Figure 7 gives the probability density and cumulative probability of daily mean of
maximum seafloor salinity at 100 m from the CFE discharge (limit of the Regulatory
Mixing Zone under the 5% Rule)

Figure 8 gives the corresponding probabilities at 300 m from the CFE discharge, (limit of
the Zone of Initial Dilution under the present NPDES permit standards from the California
Ocean Plan, Requirement C III-4(b)) as computed by time-stepping the model through the
32 years of controlling variables from Figures 8 – 11.

Hydraulic parameters for this computation are NSC SWRO = 100 mgd at 67 ppt and CFE
heated dilution water discharge = 21 mgd, resulting in a combined discharge of 121 mgd at
61.19 ppt entering the surfzone from the CFE discharge channel; with ambient ocean
salinity = 33.5 ppt.

In Figure 7, the median salinity is 35.2 ppt, consistent with The 5% Rule requirements at
100 m from the point of discharge; and 90% of the 11,688 modeled outcomes were less
than 36 ppt. Maximum salinity at 100 m from the discharge is 39.6 ppt, less than the
Locally Relevant Dilution Standard.
Figure 7, Daily Mean of Maximum Seafloor Salinity (ppm)
Probability density and cumulative probability of daily mean of maximum seafloor salinity at 100 m from the CFE discharge as measured in any direction away from or parallel to the shoreline. NSC SWRO = 100 mgd at 67 ppt and CFE heated dilution water discharge = 21 mgd, resulting in a combined discharge of 121 mgd at 61.19 ppt entering the surfzone from the CFE discharge channel. Ambient ocean salinity = 33.5 ppt.

Figure 8, Daily Mean of Maximum Seafloor Salinity (ppm)
Probability density (red) and cumulative probability (blue) of daily mean of maximum seafloor salinity at 300 m from the CFE discharge as measured in any direction away from or parallel to the shoreline. NSC SWRO = 100 mgd at 67 ppt and CFE heated dilution
water discharge = 21 mgd, resulting in a combined discharge of 121 mgd at 61.19 ppt entering the surfzone from the CFE discharge channel. Ambient ocean salinity = 33.5 ppt

At 300 m from the CFE discharge in Figure 8, (limit of the ZID under NPDES permit standards), the median salinity is 34.3 ppt, and 87% of the 11,688 modeled outcomes were less than 35.2 ppt (less than 5% above ambient salinity). Maximum salinity at 300 m from the discharge is 38.8 ppt. Therefore, the surfzone dilution strategy for the NSC Agua desalination project at CFE satisfies any of the presently permitted or potential future dilution standards for all foreseeable long-term ocean conditions at Rosarito Beach.

<table>
<thead>
<tr>
<th>Character</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance</td>
<td>Absolute</td>
</tr>
<tr>
<td>Magnitude</td>
<td>High</td>
</tr>
<tr>
<td>Temporality</td>
<td>Perdurable</td>
</tr>
<tr>
<td>Corrigibility</td>
<td>Mitigatable</td>
</tr>
</tbody>
</table>

| Number | 20            |
| Name   | PB-30         |
| Activities | 2.00 Operation of the plant |
| Attribute | Resource Availability |
| Cause  | The operation of the desalination plant will make available up to 4.4 m³/s of fresh water for public and industrial use |
| Effect | Practically, under either approach, the most significant for regional development, is limiting the availability of water. There are conditions for industrial development and thereby creating jobs, but both the foundation of industrial parks, such as meeting the demand for public services for families that would meet the demand of industrial personnel, requires the availability of freshwater. Even for the farm, as the region has limited water availability. In this context, the volume of water that will be available this project poses an extremely important benefit to potentiate the possibilities of regional development. |

| Character   | Positive                   |
| Importance  | Absolute                   |
| Magnitude   | Very High                 |
| Temporality | Permanent                 |
| Corrigibility | 0                      |

| Number | 21            |
Name: PB-27
Activities: 2.00 Operation of the plant
Attribute: Performance aquifers
Cause: The operation of the desalination plant will make available up to 4.4 m³/s of fresh water for public and industrial use
Effect: The availability of a volume of freshwater that will be produced by the plant, necessarily unburdened the process of exploitation of aquifers in the region, which will result in it is retrieved and can be used optimally without compromising quality of the resource.
Character: positive
Importance: absolute
Magnitude: very High
Temporality: permanent
Corrigibility: 0

Number: 22
Name: PB-28
Activities: 2.01 Grading
Attribute: aquatic animals
Cause: The large volume of seawater that will be taken for the production of fresh water, dragging means a significant amount of zooplankton biomass
Effect: Zooplankton is the animal part of the plankton, is the secondary link in the pelagic food web, being the link between primary producers and consumers of third order as fish, marine mammals and seabirds. Pumping seawater cause the subtraction of zooplankton species and therefore an affectation of the water column will be a direct function of the volume of water pumped, this will lead to an eventual loss of species such as copepods, euphausiids, larvae fish and gelatinous organisms.
The consequence will be a reduction in food resource for consumers of third order, thus affecting the secondary productivity of the area that could lead to a displacement of bodies outside the zone of possible involvement.
Character: negative
Importance: significant
Magnitude: high
Temporality: lasting
Corrigibility: compensable
<table>
<thead>
<tr>
<th>Name</th>
<th>PB-31</th>
<th>Impact on the phytoplankton community in the area for the water intake for the desalination process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>2.01</td>
<td>Grading (Screening)</td>
</tr>
<tr>
<td>Attribute</td>
<td>aquatic plants</td>
<td></td>
</tr>
<tr>
<td>Cause</td>
<td>The large volume of seawater that will be taken for the production of fresh water, dragging means a significant amount of phytoplankton biomass</td>
<td></td>
</tr>
<tr>
<td>Effect</td>
<td>Phytoplankton organisms are the most important primary producers in the ocean, are microscopic organisms, autotrophs capable of photosynthesis, thus forming the first link in the pelagic food web. Because of their size, are floating in the water column and its movement depends on the masses and streams. Pumping sea water, will have an effect of removal of a mass of phytoplankton of the medium, which is a direct function of the volume of water that is pumped. This means removal of phytoplankton, have a negative effect on the viability of species such as diatoms and dinoflagellates, which means a net reduction in direct productivity secondary to the food web of the area affected.</td>
<td></td>
</tr>
<tr>
<td>Character</td>
<td>negative</td>
<td></td>
</tr>
<tr>
<td>Importance</td>
<td>significant</td>
<td></td>
</tr>
<tr>
<td>Magnitude</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Temporality</td>
<td>lasting</td>
<td></td>
</tr>
<tr>
<td>Corrigibility</td>
<td>compensable</td>
<td></td>
</tr>
</tbody>
</table>

| Number | 24 |
| Name   | PB-32 | Impact on the zooplankton community in the reject water discharge |
| Activities | 2.04 Air flotation (DAF) 2.12 Sand Filter Backwash 2.15 Brine Discharge into the Sea |
| Attribute  | aquatic animals |                                                                                                  |
| Cause      | The discharge of the reject water (brine) to the marine environment, create an area where salinity is higher than the natural environment |
| Effect     | Zooplankton is the animal part of the plankton, is the secondary link in the pelagic food web, being the link between primary producers and consumers of third order as fish, marine mammals and seabirds. An increase in salinity generate osmotic stress in zooplankton organisms which makes their metabolic functions are altered, thus affecting cell growth and development and in extreme cases loss of species by the death of these, as the case of copepods , euphausiids and fish larvae. This could cause a competition between species, which in turn could lead to a condition of replacement of species, in which the most competitive under hypersaline conditions that would proliferate in this medium, as in the case of Artemia salina . This will likely lead to a reduction in biodiversity in the area. The loss of diversity and zooplankton biomass would be reflected in altered secondary productivity, further processes such as circadian vertical migration would possibly be affected or interrupted by |
the rise in salt concentrations and the consequent increase in density, which acts as a physical barrier to such behavior.

| Character  | negative       |
| Importance | absolute       |
| Magnitude  | very High      |
| Temporality| lasting        |
| Corrigibility | compensable  |

| Number | 25 |
| Name   | PB-33 |
| Activities | 2.04 Air flotation (DAF) |
|         | 2.12 Sand Filter Backwash |
|         | 2.15 Brine Discharge into the Sea |
| Attribute | aquatic animals |
| Cause   | The discharge of the reject water (brine) to the marine environment, create an area where salinity is higher than the natural environment |
| Effect  | Benthic organisms are defined as those that live attached to a substrate and can not move or make a displacement is minimal. Inside can be found benthic organisms like gastropods, bivalves, echinoderms (cookies, urchins, and starfish), sea anemones and polychaetes to which environmental indicators are considered. Particulate feed larvae and smaller organisms, some are filter as case or browsers bivalve as gastropods. Are vital because they provide food for other species such as mammals and fish, additionally plays a key role in the carbon cycle and in the case of hedgehogs as an important bridge of trophic cascades. The increase in salinity in the water can cause an osmotic stress on benthic organisms, specifically in communities of urchins and molluscs (they are the most vulnerable), parallel to this may occur an increase in the turbidity of the medium which could further affect more filter feeders like many mollusks. Moreover, depending on the salinity, may be a loss and / or alteration of the substrate for these organisms. Generally increases in salinity can cause pH changes which would affect organisms calcification processes as needed for bivalves. Simultaneously, it could increase mortality of benthic species, leading to species that are resilient to fly alteration may come to dominate the community such as nematodes which can replace the numerically polychaetes. This would lead to a substantial change in the community structure of the site which would affect the flow of carbon and the food web of the site due to the potential loss of diversity. |

| Character  | negative       |
| Importance | absolute       |
| Magnitude  | very High      |
Impact on the pelagic community water discharge rejection

Number 26
Name PB-34
Activities
2.04 Air flotation (DAF)
2.12 Sand Filter Backwash
2.15 Brine Discharge into the Sea

Attribute aquatic animals
Cause The discharge of the reject water (brine) to the marine environment, create an area where salinity is higher than the natural environment
Effect The pelagic community is represented by fish and organisms living in the water column and can perform movements by themselves, constitute the tertiary link in the pelagic food web and serve as food for larger and top predator’s species, like its importance lies in being commercial species.
The increase in salinity, a direct and indirect cause in turn much of the pelagic community effect. As an indirect effect would be that due to the alteration in primary and secondary (planktonic) trophic web would affect the food resource for this community. Particularly for filtering fish and this would lead to the pelagic community of the place see diminished.
Furthermore, because the increase in salinity in the water affects the water balance in fish and causes osmotic stress, there may be a shift to adjacent areas without disturbance which would cause the application to higher trophic levels is minimal in the download area.
While species movement (gobies and flounders), could see altered metabolic functions by osmotic stress, causing alterations in growth rates, skin problems, also a migration or displacement of the pelagic that could eventually cause an alteration of the gene pool (species migrate elsewhere). Eventually cause mortality.

Character Negative
Importance Significant
Magnitude Moderate
Temporality Temporary
Corrigibility Compensable

Impact on the community of marine mammals by the discharge of reject water

Number 27
Name PB-35
Activities
2.04 Air flotation (DAF)
2.12 Sand Filter Backwash
2.15 Brine Discharge into the Sea
Attribute: aquatic animals  
Cause: The discharge of the reject water (brine) to the marine environment, create an area where salinity is higher than the natural environment  
Effect: Marine mammals are large organizations, among which are cetaceans (whales and dolphins), Sirenia (manatees) and pinnipeds (seals and walruses) and some otters. They are considered charismatic species and some are in the red books as endangered species and therefore protected in fishing regulations. They feed on zooplankton as for whales, sea urchins, and fish. Marine mammals in the area, some are species that are in transit from north to south, other species are temporary visitors to the coastal area for feeding or resting depending on the substrate. Because they are, so mobile species is expected to occur no significant effect when encountering a change in salinity. No studies have been reported that affect those communities, because detecting a stress is expected to alter their behavioral habits away or avoiding the dispersion plume of brine.

Character: negative  
Importance: inconsequential  
Magnitude: slight  
Temporality: brief  
Corrigibility: preventable

Number: 28  
Name: PB-36  
Activities:  
2.04 Air flotation (DAF)  
2.12 Sand Filter Backwash  
2.15 Brine Discharge into the Sea  
Attribute: aquatic plants  
Cause: The macroalgae are autotrophic multicellular organisms, which may form large aggregations like forests of Macrocystis need a hard substrate to which anchor and provide a place of refuge and feeding ground for many species of fish, and echinoderms need nutrients for they perform photosynthesis and thus have optimal development are key organisms in the process of capturing CO2 and therefore are key to the carbon cycle. An increase in the salinity of the medium affect the uptake of nutrients of these organisms due to osmotic stress, thus there would be a loss of biomass due to poor leaf development by impaired photosynthesis rates additionally may occur an increase in turbidity which cause a decrease in the uptake of light needed for photosynthesis. If there is, a decrease in leaf development could be presented a decrease in the diversity of macroalgae in the area, which means there is a decrease in competition for space altering in this way some of the ecological relationships as competition for the niche and perhaps could change the macroalgal community in the area.

Character: negative
Importance: shortly transcendent
Magnitude: slight
Temporality: temporal
Corrigibility: compensable

Number: 29
Name: PB-37
Activities: 2.00 Operation of the plant
Attribute: Economic Stability
Cause: Availability of fresh water for use in new urban and industrial projects
Effect: The economic stability of a region requires that the dynamics of growth and development to offset the natural growth of the population and provide expectations of progress for individuals and businesses can occur. Whereas in the region the main obstacle to development is the low availability of water, the project is presented as a major catalyst for development
Character: Positive
Importance: Absolute
Magnitude: very High
Temporality: Permanent

Number: 30
Name: G-09
Activities: 2.00 Operation of the plant
Attribute: Government Revenue
Cause: The operation of the plant is a commercial activity that generates tax obligations
Effect: The operation of the desalination plant will generate taxes to the federal, state and municipal government.
Character: Positive
Importance: Significant
Magnitude: Slight
Temporality: Permanent

Number: 31
Nombre: Recruitement of labor

Actividades: 2.00 Operation of the plant

Atributo: Social welfare

Causa: It derived from the operation of the desalination plant, indicate a significant potential for economic development and thus for the increase in the demand for workers

Efecto: The availability of jobs benefits individuals enable social mobility and the economy in general

Caracter: Positive

Importancia: Significant

Magnitud: Moderate

Temporalidad: Temporary

--

Número: 32

Nombre: Odor from biosolids operations

Actividades: 2.04 Air flotation (DAF)

Atributo: Air Quality

Causa: During the management of marine biosolids could be that these come into degradation under anoxic conditions and in such unpleasant odors which occur depending on the production rate can become perceived distance

Efecto: The odors emitted alter the affected area air quality becoming unpleasant to make public any task

Caracter: Negative

Importancia: Significant

Magnitud: High

Temporalidad: Temporary

Corregibilidad: Quasi-permanent

--

Número: 33

Nombre: Emission of greenhouse gases

Actividades: 2.00 Operation of the plant

Atributo: Air Quality

Causa: The desalination process will require a considerable amount of electric energy to be generated will be necessary to burn natural gas, generating the emission of a large amount of greenhouse gases

Efecto: The emission of pollutants into the atmosphere of greenhouse gases, negatively affects the
quality of the atmosphere and whose presence in the atmosphere contributing to the greenhouse effect

| Character | Negative |
| Importance | Significant |
| Magnitude | High |
| Temporality | Almost - Permanent |
| Corrigibility | Mitigated / Compensable |

**Number**: 34
**Name**: G-16 Substantial increase in electricity demand CFE
**Activities**: 2.00 Operation of the plant
**Attribute**: Public Services
**Cause**: The demand for electrical energy for the operation of the desalination plant of 100 MW
**Effect**: Energy demand generated by the project will cause the programs to increase the supply of electricity to the region should anticipate

| Character | Positive |
| Importance | Absolute |
| Magnitude | High |
| Temporality | Permanent |

**Number**: 35
**Name**: G-14 Chlorination of drinking water
**Activities**: 2.10 Cleaning of Reverse Osmosis Membranes
**Attribute**: Social welfare
**Cause**: Requirement for delivery of water.
**Effect**: Chlorination is the process of disinfecting water by using chlorine or chlorine compounds. The rationale for water disinfection is to reduce the risk of infection from waterborne diseases, through the destruction or inactivation of various pathogens that may be present. Chlorination cause physical, chemical and biochemical changes in the wall of every cell, thus the protective barrier leaving it defenseless destroyed, decreasing its vital functions to take her to death; chlorine does not allow bacteria to grow, reproduce or cause any disease. The benefits of chlorine on the water are many and they are precisely the ones that highlight the use of this product. Chlorine gives the attributes odorless and highly water changes its flavor.

| Character | Positive |
| Importance | Significant |
| Magnitude | High |
### Temporality
- Permanent

<table>
<thead>
<tr>
<th>Number</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>PB-38 Marine discharge biosolids</td>
</tr>
<tr>
<td>Activities</td>
<td>2.04 Air flotation (DAF)</td>
</tr>
<tr>
<td>Attribute</td>
<td>Water Quality</td>
</tr>
<tr>
<td>Cause</td>
<td>The pretreatment process will generate waste marine biosolids to be discharged to the marine environment with brine</td>
</tr>
<tr>
<td>Effect</td>
<td>Download marine biosolids could alter the ability of self-sustaining environmental</td>
</tr>
<tr>
<td>Character</td>
<td>Negative</td>
</tr>
<tr>
<td>Importance</td>
<td>Absolute</td>
</tr>
<tr>
<td>Magnitude</td>
<td>High</td>
</tr>
<tr>
<td>Temporality</td>
<td>Lasting</td>
</tr>
<tr>
<td>Corrigibility</td>
<td>Mitigated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>B-11 Water pollution by industrial discharge and groundwater contaminants</td>
</tr>
<tr>
<td>Activities</td>
<td>2.11 neutralization</td>
</tr>
<tr>
<td>Attribute</td>
<td>Water Quality</td>
</tr>
<tr>
<td>Cause</td>
<td>Discharge of industrial waters without the necessary treatment</td>
</tr>
<tr>
<td>Effect</td>
<td>Environmental pollution, or compromised to the WWTP of town, and infrastructure for the management of sanitary sewer</td>
</tr>
<tr>
<td>Character</td>
<td>Regulated</td>
</tr>
<tr>
<td>Importance</td>
<td>Significant</td>
</tr>
<tr>
<td>Magnitude</td>
<td>very High</td>
</tr>
<tr>
<td>Temporality</td>
<td>Almost - Permanent</td>
</tr>
<tr>
<td>Corrigibility</td>
<td>Preventable</td>
</tr>
</tbody>
</table>

---

**PREVENTION AND MITIGATION OF ENVIRONMENTAL IMPACTS**
Out of the set of identified environmental impacts, the subset of impacts that can only be mitigated, will determine the environmental footprint of the project. Follows a discussion regarding non-preventable impacts:

1. During construction, the following impacts may only be mitigated:
   - Emission of the following air pollutants:
     - VOCs because of use of solvents and paints during application of coatings and finishes
     - TSP during heavy equipment movement activities and terrigenous material warehouse
     - TSP during transport of materials and equipment to construction
     - Combustion gases by the use of heavy machinery that consumes diesel
   
   Regulatory control levels for the emission of these pollutants under expressed conditions has not been clearly defined, but this can be controlled and monitored at the point of generation, and thus ensure that the effect to air quality is minimized to a negligible level, with minimum temporality and very low extension, and/or that they will have no effect in the quality of life in the neighborhood. These impacts will cease when construction of the plant is completed.
   - Noise emission during construction
     Environmental noise must be mitigated to comply with regulations, emission limits for night time will be enforced to contractors at every moment.

2. As a result of project development, the next impact will be inevitable.
   - Altered landscape.
     The proponent is committed to ensure that facilities are designed seeking to incorporate architectural elements, which while have an industrial character, will achieve an aesthetically positive contribution to the local landscape

3. During plant operation, the negative land environmental impacts that can not be prevented are:
   - Noise generated by plant maintenance and operation
     Environmental noise must be mitigated to comply with regulations, night time emission level has been specified for facility design, so it is expected that the plant will operate well under noise emission level compliance.
   - Emission of the COV's by the use of solvents and paints in maintenance
     Use of solvents and paints for facility maintenance will be subject to use only authorized compounds and application will be done in accordance to the manufacturer specifications. Can be asserted that the environmental impact will be limited and the effects will not be registered beyond the property boundary.

4. During operation the following impacts to the marine environment are expected as result of sea water intake for the desalination process:
   - Impact on phytoplankton and zooplankton community
     This impact is intrinsic to the nature of the project, and cannot be eliminated. To desalinate sea water, biotic content in the water will perish. According to the projection of the amount of biomass that will be affected, this will not cause a substantial and measurable change in the primary or secondary productivity in the area. There are plans to periodically evaluate the state of the environment to confirm this.

5. Also during operation the set of impacts to the marine environment resulting from the discharge of brine that will:
Create an area where salinity will be higher than normal possibly affecting:
  o plankton communities
  o benthic communities
  o pelagic communities
Any measurable impact to these communities is not acceptable. Discharge modeling indicates that for most operation and climatic conditions, the extension of the altered areas is relatively small, according to expert criteria, the effect to oceanic communities will not be possible to be measure, given that the size of impact will be too small. The intended effort will be to conduct environmental studies to evaluate if any measurable change can be identified, have a clear view of the state of the marine environment in relation to these communities, so if any change is determined, an early warning will be issued to alert enough if the operation of the plant is threatening. Under this premise, and for the purposes of the remainder of this discussion, it is assumed that these impacts are part of the forecast scenario altered.

**Altered scenario forecast**

Follows description of the scenario resulting from the development of this project:

- For the land environment, the desalination plant will be an industrial friendly facility, an appendix to CFE power plant and PEMEX facilities. Inserted in the urban interface that continues south with tourist facilities. Casual and frequent visitors will barely know of the existence of the desalination plant as its location will make it difficult to be noticed by anyone other than the neighbors whose properties surround the site. Its hidden location, adjacent to CFE is not the only circumstance that difficulties being noticed by visitors and locals, but it is significant with a small number of employees, few movements of freight vehicles, and absence of atmospheric emissions.

- In the marine environment, specifically at the point of the beach at which is projected that brine will contact sea water, the altered scenario will be substantially different in physicochemical terms. The sea typically has a constant salinity that normally ranges around 34,400 ppm ± 1%, the brine mixed in the discharge channel with CFE cooling water, will impact the environment with a flow of between 6.4 and 9.7 m³/s, with a salt concentration of between 39,700 to 57,800 ppm, or 5,300 to 23,400 ppm above the normal concentration of the medium, this will be a shock, catalyzed by wave energy in the intertidal zone, which will quickly produce a turbulent mixing that will lead to an area or stretch of about 80 meters long 7 meters wide, in which the salt concentration will be reduced to values of around 39,000 ppm. At this first segment of the dispersion plume, salinity is high for normal development of the biota in the area. In this regard it must be noted that the strip with high salinity will constantly keep changing its course because of the form of ocean energy, so it is correct to assert that the plume dispersion is a range of strokes and directions with probabilities associated with the current direction pattern, tides and waves. In any case, this range with radius of 80 m from the point of discharge, will result in a probability distribution range of high salt concentration distributions that the environment will face, resulting in some degree of impact to benthic populations. Later in the progress of the plume dispersion, salinity continues to decline, having two circumstances noted, the first is that although salinity continues to be higher than the natural environment, the difference shall be such that, in particular going on for periods in the range of a few hours, subtle impacts are expected to be observed. The second is that, even in the benthos, where mobility of organisms is much lower than in the water column, given the ocean energy that is common in Rosarito Beach, a marked renewal of populations on the surface is expected to happen. In short, near (80 m) the point of discharge is no observable changes in the marine environment are expected to occur. But it will be essential to monitor this situation. To observe the changes, benthic samples with their respective population analysis should be
performed, making it possible to obtain warnings of alterations to populations due to the effect of salinity.

- The third aspect of the altered scenario corresponds to all the effects that will result out of the availability of a new source of fresh water for the region. The new volume of water that the project intends to make available, will alter the possibilities that exist today to achieve the development that new generations are demanding.

In short, this project requires a rigorous environmental management, but its realization will solve a variety of social, economic and water management issues in the region.

**Environmental Monitoring Program**

The environmental management of the project, requires the implementation of three programs or strategies, these are:

- Environmental Protection Program for the Construction Stage (PPAEC)
- Environmental Management Program for Operation Phase (PAAEO)
- Environmental Monitoring Program of the Marine Environment (PMAMM)

A set of specifications for conducting ongoing audits of environmental performance are part of the first two programs, these will be conducted by third parties, and will serve to confirm that management maintains a close engagement with the project environmental objectives.

Regarding the PMAMM, a strict monitoring is essential to ensure that the project conforms to the projected level of environmental impact. Results should be readily available to any public observatory that is interested to track the project behavior.

**Conclusions**

At present there are important projects for the development of industrial parks, and housing complexes, which have failed to obtain a favorable feasibility opinion because of CESPT inability to compromise the water demanded.

Currently the region and large segments of the world economy, are still struggling to leave behind one of the deepest recessions of the past 100 years, the border area of Baja California resented this important economic event in a very painful way. In preparation for the next wave of economic development, it is vital that Baja California is ready to tackle it.

This project aims to solve what is probably the biggest problem that the region faces to provide for the economic development that society demands. For years it was anticipated that the future implied seawater desalination, the future is now in our present, and we must rise to the occasion to committedly act for realization of this project in a way that our environment is properly taken care.