

# Seawater Intrusion SMC – Proposed Strawman Petaluma Valley

Sustainability Indicator	Significant & Unreasonable Condition	Minimum Threshold	Undesirable Result	Measurable Objective
<b>Sea Water Intrusion</b>	Any Seawater intrusion inland of areas of existing brackish groundwater is a significant and unreasonable condition.	Establish the minimum threshold as a 250 mg/L isocontour at, or inland from, the existing 250 mg/L isocontour.	Any exceedance of the minimum threshold chloride isocontour, or any exceedance of the minimum threshold chloride concentrations at a representative monitoring point.	Establish the measurable objective as a 150 mg/L isocontour at the same location as the minimum threshold isocontour.

## Key Points/Considerations

- Available data suggest some seawater intrusion into the Baylands area of Petaluma Valley from San Pablo Bay, however characterizing the distribution and trends related to seawater intrusion is limited by significant data gaps.
- Control of high salinity connate<sup>1</sup> waters is not covered by this SMC.
- Recommended Significant and Unreasonable Condition: *Seawater intrusion inland of areas of existing brackish groundwater related to seawater intrusion is a significant and unreasonable condition.*

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<sup>1</sup> Connate water refers to fluids that were trapped in the pores of sedimentary rocks as they were deposited. These liquids are largely composed of water, but also contain many mineral components as ions in solution, which gives them a saltier or high total dissolved solids composition.

- Recommended Minimum Threshold: *A 250 mg/L chloride isocontour line drawn between the existing 250 mg/L chloride isocontour and active supply wells.*
- Supplement the minimum threshold chloride isocontour with target chloride concentrations in wells along or near the isocontour line.
- Recommended Measurable Objective: *A 150 mg/L chloride isocontour at the same location as the minimum threshold chloride isocontour line.*
- Supplement the measurable objective chloride isocontour with target chloride concentrations in wells along or near the isocontour line.
- Recommended Undesirable Result: *Any exceedance of the minimum threshold chloride isocontour, or any exceedance of the minimum threshold chloride concentrations at a representative monitoring point.*

## Background and Overview

Each GSP must address how groundwater will be managed to address potential seawater intrusion. There is potential seawater intrusion only where basin aquifers are directly connected to saline surface waters such as San Pablo Bay. The Petaluma Valley is connected to San Pablo Bay, and therefore this SMC applies to the Petaluma Valley Basin.

Petaluma Valley currently does not have a monitoring program that regularly maps the extent of seawater intrusion. Currently, no wells within the Baylands area are sampled for seawater intrusion.

## Suggested Approach for Sustainable Management Criteria

### Step 1 - Establish Significant and Unreasonable Conditions

Significant and unreasonable conditions are the qualitative statement of what is undesirable. The GSA should establish what level of seawater intrusion is acceptable and most importantly, where it is acceptable. The GSA may establish that seawater intrusion is acceptable in areas with minimal groundwater pumping, where seawater intrusion may not cause a significant or unreasonable condition.

**Suggested approach:** Seawater intrusion inland of areas of existing brackish groundwater related to seawater intrusion is a significant and unreasonable condition. Existing seawater intrusion is not unreasonable because there are currently few beneficial uses and users in the areas of existing brackish groundwater.

## Step 2 - Establish Metric to be Used

GSP Regulations § 354.28 (c)(3) lays out specific requirements for seawater intrusion minimum thresholds. It states, “The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.”

Additional metrics can be applied to support monitoring of the isocontour, including chloride concentrations at representative monitoring points and groundwater elevation proxies. To establish groundwater elevations as a proxy, the GSA must show adequate evidence of the relationship between groundwater elevation and seawater intrusion.

### Required Chloride Isocontour Criteria

The required metric for defining minimum thresholds and measurable objectives is the location of a chloride isocontour. The GSAs must establish both the location of the isocontour and the chloride concentration of the isocontour. If the minimum threshold is inland of the current location of the isocontour, the GSP sets as policy that some additional seawater intrusion is acceptable. If the isocontour SMC is closer to San Pablo Bay than the current location of the isocontour, the GSA has 20 years to push out the saltwater interface to achieve sustainability.

### Optional Well Chloride Concentration Criteria

An alternative to drawing isocontours annually for comparison with the SMC is to first establish the location of the chloride isocontour, then identify specific wells that define the isocontour as representative monitoring points. Chloride concentrations consistent with the isocontour SMC can be set at the representative monitoring points.

### Optional Groundwater Elevation Proxies

A third possible metric is to establish target groundwater elevations that protect the Subbasin from seawater intrusion. These groundwater elevation proxies can be used as a supplement to the chloride concentration SMC. Groundwater elevation proxies have an advantage over chloride concentrations because they allow the GSA to use groundwater flow models to evaluate projects and management actions without having to simulate density dependent transport.

**Suggested approach:** Use isocontours as the seawater intrusion metric. Supplement the chloride isocontour by defining chloride concentrations at representative monitoring points. These representative monitoring points should exclude wells known to be affected by connate groundwater.

It does not appear possible to include groundwater elevation proxies at this time, as we currently don't have the data for establishing the correlation between sea water intrusion and groundwater levels. Such proxies can be added in future updates of the GSP as more information is developed that may establish a correlation between groundwater levels and sea water intrusion.

### Step 3 - Set Minimum Thresholds and Measurable Objectives

Minimum thresholds are criteria to be achieved in 20 years and maintained for the following 30 years. As minimum thresholds are used to define undesirable results, minimum thresholds are the enforceable criteria in the GSP.

Measurable objectives are quantifiable goals that provide operational flexibility such that minimum thresholds can be achieved and maintained over the 50-year planning horizon. Measurable objectives are typically more difficult to achieve than minimum thresholds.

The secondary maximum contaminant level for chloride is 250 mg/l. Other coastal basins in central California have used either 250 mg/L isocontour or 500 mg/L isocontour to define the minimum threshold.

There are two options for setting a measurable objective isocontour that is consistent with the minimum threshold isocontour. One option is to use the same location as the minimum threshold isocontour with a lower concentration. The second option is to use the same chloride value as the minimum threshold but set at a location closer to the Bay than the minimum threshold isocontour.

Chloride concentrations at representative monitoring points representing minimum threshold and measurable objectives should at least be set along and inland of the associated isocontours with values matching the values for the isocontour.

Suggested approach: Establish the minimum threshold as a 250 mg/L isocontour at, or inland from, the existing 250 mg/L isocontour. For simplicity, establish the measurable objective as a 150 mg/L isocontour at the same location. Set chloride concentrations at representative monitoring points along and inland of the isocontour that match the isocontour values.

Set the definition of an exceedance to account for potential measurement error and to address potential seasonal fluctuations for any wells that are measured more than once per year.

### Step 4 - Define Undesirable Results

Undesirable results are a combination of minimum threshold exceedances. Undesirable results could be based on the length of the isocontour exceeded or the area where observed isocontour exceeds the minimum threshold isocontour. This definition of undesirable results could be associated with the number of representative monitoring points with exceedances.

The most straightforward approach is to define any exceedance of the minimum threshold chloride isocontour, or minimum threshold chloride concentrations at representative monitoring points, as an undesirable result.

**Suggested approach:** An undesirable result occurs based on any exceedance of the minimum threshold chloride isocontour, or any exceedance of the minimum threshold chloride concentrations at a representative monitoring point.

## **Potential Effects of Minimum Threshold on Beneficial Uses and Users**

Agricultural land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Basin's agricultural water users. Preventing additional seawater intrusion from reaching supply wells ensures that a supply of usable groundwater will exist for beneficial agricultural use.

**Urban land uses and users.** The seawater intrusion minimum threshold generally provides positive benefits to the Basin's urban water users. Preventing additional seawater intrusion will help ensure an adequate supply of groundwater for municipal supplies.

**Domestic land uses and users.** The seawater intrusion minimum threshold generally provides positive benefits to the Basin's domestic water users. Preventing additional seawater intrusion will help ensure an adequate supply of groundwater for domestic supplies.

**Ecological land uses and users.** Although the seawater intrusion minimum thresholds do not directly benefit ecological uses, it can be inferred that the seawater intrusion minimum threshold provides generally positive benefits to the Basin's ecological water uses. Preventing additional seawater intrusion will help prevent unwanted high salinity levels from impacting ecological groundwater uses.