CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

INFORMATION SHEET
ON
TENTATIVE ADDENDUM NO. 1 TO ORDER NO. R9-2009-0005

AN ADDENDUM TO INCORPORATE REQUIREMENTS FOR THE DISCHARGE OF BRINE AND CLARIFY EXISTING REQUIREMENTS

RAMONA MUNICIPAL WATER DISTRICT
SAN VICENTE WASTEWATER TREATMENT PLANT
SAN DIEGO COUNTY

I. BACKGROUND

The Ramona Municipal Water District (Recycled Water Agency) proposes to install a brine evaporation pond to treat and store the liquid brine concentrate generated by its reverse osmosis (RO) system at the San Vicente Wastewater Treatment Plant (SVWTP). The discharge of brine to an evaporation pond constitutes a discharge of waste to land; therefore, current waste discharge requirements (WDRs) prescribed in Order No. R9-2009-0005 must be amended to include WDRs for the evaporation pond.

The RO operates at a recovery rate of approximately 95 percent, treating approximately 600,000 gallons per day (gpd) and producing approximately 16,000 gpd of brine. Currently, brine is discharged to a lined pond until it can be trucked off-site, Figure 1.

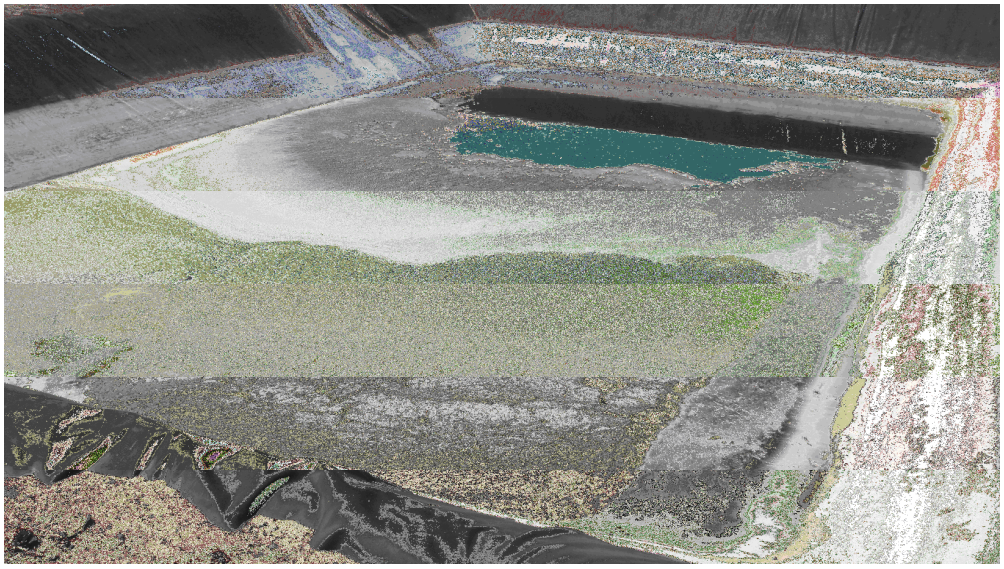

Figure 1. SVWTP brine disposal pond (San Diego Water Board, 2009)

To lower operating costs and provide long-term containment of the brine, the Recycled Water Agency proposes to construct a brine evaporation pond. The evaporation pond will consist of thirteen sections, divided by interior walls with weirs to allow flow to drain down to the next section as the up-stream surface rises. Sections are designed such that section one flows into section two and so on. The pond will be constructed on Recycled Water Agency owned land adjacent to the existing SVWTP and upgradient of Wildcat Canyon Creek.

Brine will utilize the region's high evaporation rates to remove water and allow solids to accumulate in the pond for periodic removal. A total of 2.9 acres of evaporation surface will be utilized to store and evaporate brine. Based on this surface area and the solid waste production from the RO of between 4,600 and 6,130 cubic feet per year, approximately ½ inch of residual will accumulate in the pond annually. (RBF Consulting, 2010)

To ensure proper operation and maintenance of the pond and in lieu of establishing a flowrate discharge prohibition, the tentative Addendum requires sufficient solids removal prior to the rainy season.

The tentative Addendum modifies Monitoring and Reporting Program No. R9-2009-0005 to clarify monitoring points and establish sections to assist the Recycled Water Agency in preparing monitoring reports and to assist future staff in reviewing monitoring reports.

II. BASIS FOR FINDINGS

Findings are determinations of fact supporting the adoption of the tentative Addendum to the Order. As described in the State Board Administrative Procedures Manual, findings consist of: the name of the discharger; a description of the waste discharged, the location of the discharge; and a description of the waste treatment process. Findings must also address the applicable Water Quality Control Plan, including compliance with water quality objectives and beneficial uses of the receiving water, any applicable state water protection policies, California Environmental Quality Act and any public notice and/or public hearing requirements.

Basis for Finding Nos. 1 through 4:

The Report of Waste Discharge identifies the Recycled Water Agency/Discharger, the source of brine waste, the waste containment and treatment unit, and the proposed quantity of brine to be discharged.

Basis for Finding No. 5:

The Report of Waste Discharge describes the type of waste proposed to be discharged and identifies applicable regulations. The discharge of liquid brine

concentrate is exempt from California Code of Regulations (CCR) Title 27 pursuant to section 20090(b) because the discharge complies with the following conditions:

1) *The applicable [Regional Water Quality Control Board] has issued WDRs, reclamation requirements, or waived such issuance*. Adoption of Addendum No. 1 to Order No. R9-2009-0005 by the San Diego Water Board will issue waste discharge requirements for the discharge of brine to the evaporation pond.

2) *The discharge is in compliance with the applicable water quality control plan.* The applicable water quality control plan for the San Diego Region is the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan). The Basin Plan contains beneficial uses and water quality objectives to protect those beneficial uses. To ensure discharges of waste do not exceed water quality objects and impact beneficial uses, Chapter 4, "Implementation" includes discussions of the San Diego Water Board's permitting programs and specific categories of discharges. Applicable to the discharge of brine to an evaporation pond are the Waste Discharge Requirements program and the specific discussions regarding water reclamation and reuse, and discharges of waste to land.

   Waste Discharge Requirements. The Basin Plan states that discharges of wastewater onto land must meet the effluent limitations in the waste discharge requirements prescribed by the San Diego Water Board through the issuances of WDRs. The requirements prescribed in Addendum No. 1 to Order No. R9-2009-0005 provide specifications for the design and operation of the evaporation pond. These specifications are necessary for the discharge of brine to comply with the Basin Plan by effectively prohibiting the discharge to contribute to exceedances of water quality objectives in ground and surface waters.

   Water Reclamation and Reuse. As stated in the Basin Plan, demineralization techniques or source control of total dissolved solids in recycled water may be necessary in some inland areas where groundwaters have been or may be degraded. The SVWTP is located in the inland community of Ramona, California where groundwater is already degraded. The use of demineralized recycled water reduces salt loading to the groundwater basin and promotes water reclamation through increased availability of high quality recycled water for salt sensitive agriculture.

   Discharges of Waste to Land. Pursuant to California Water Code section 13173, brine is not a designated waste because under ambient environmental conditions at the waste management unit, brine stored for evaporative treatment in the proposed evaporation pond could not

be released at concentrations in excess of applicable water quality objectives.

3) *The wastewater does not need to be managed according to Chapter 11, Division 4.5, Title 22 of this code as a hazardous waste.* Brine is not a hazardous waste nor does it need to be managed as a hazardous waste.

Liquid brine concentrate contains constituents in the following concentrations:

Table 1. Brine Waste Constituent Concentrations

Constituent	Concentration	Constituent	Concentration
Ammonium	0	**Nitrate**	1,004
Potassium	374	**Chloride**	3,732
Sodium	3,113	**Fluoride**	7
Magnesium	534	**Boron**	3
Calcium	1,280	**Sulfate**	4,787
Strontium	12	**Silicon dioxide**	193
Iron	2	**Carbon dioxide**	156
pH	7.9 units	**Barium**	1
Hardness	5,404 [unit less]	**Carbon trioxide**	4
TDS	17,642	**Bicarbonate**	2,594

Notes: All concentrations are in mg/L unless noted otherwise.
Constituent concentrations reported by the RO manufacturer. (RBF Consulting, 2009)

Basis for Finding No. 6.a:

The following outline and figure describe the design for the proposed evaporation pond liner system:

i. Minimum 4-inch thick gunite layer (primary layer), with finish surface
ii. Minimum 4-inch thick sand layer (drainage layer)
iii. Polyvinyl chloride membrane (PVC) (containment layer)

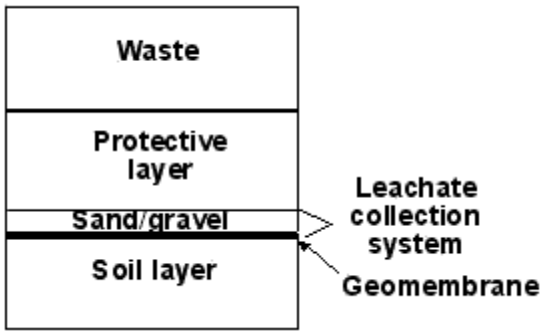

Figure 2. Diagram of Single Liner System (Ohio State University, 2010)

This liner system meets the performance standard of CCR Title 27, section 20330, which states, “Liners shall be designed and constructed to contain the fluid, including landfill gas, waste, and leachate…” Evaporation Pond Facility and Design Specifications ensure protection against water quality impairment. For example, Specification H.7.c requires the subgrade to contain no stones greater than 0.5 inch in diameter, organics, or other deleterious material to prevent tears to the containment layer.

Basis for Finding No. 6.b:

The leachate collection and recovery system (LCRS) is designed in compliance with the prescriptive standards in CCR Title 27 section 20340. The drainage layer, containment layer, and observation ports function as the LCRS. The primary and containment liners will be separated by a minimum of 4 inches of sand. The PVC liner will extend to the edge of the outer edges of the perimeter walls and be sloped towards engineered low points where observation ports will be installed to allow for monitoring of the integrity of the primary layer (Figure 3). Physical evidence of brine accumulated in the observation ports above the containment layer shall be interpreted as a warning that containment of the evaporation pond may be compromised. The observation ports will allow the operator to sample (and remove) any accumulated liquid to determine if the liquid indicates a failure of the primary liner.

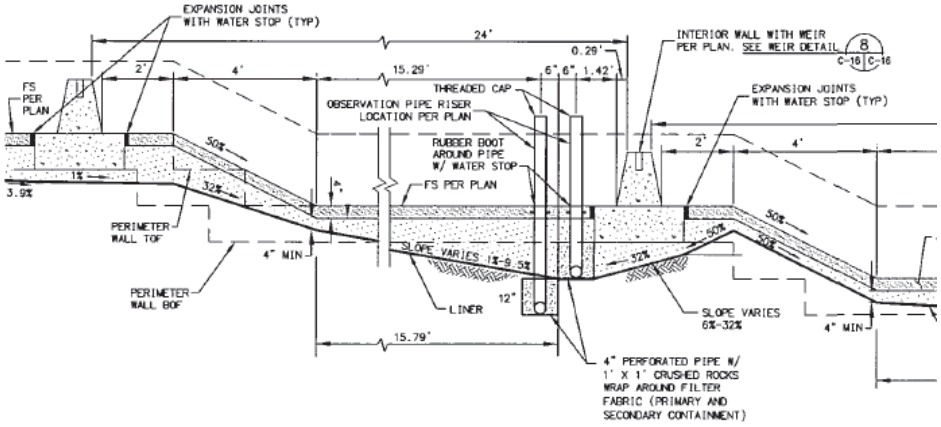

Figure 3. Diagram of Pond Section (RBF Consulting, 2009)

Basis for Finding No. 7:

The pond is comprised of 13 sections constructed with 2 foot tall outer walls and 1.67 foot tall interior walls. Water flow into each section is controlled by weirs. Each weir is 2 feet wide and 1.67 feet high. The weirs are operated to control water height in each section by adding or removing 2 inch high fiberglass reinforced polyester logs.

CCR Title 27 section 20375 prescribes special requirements for surface impoundments, including a requirement for freeboard of two feet or less than two feet if specific conditions are met. Evaporation Pond Facility and Design Specification H.3.b requires a minimum freeboard of 6 inches in pond section 13 at all times. This is permissible because 1) each section is designed to gravity flow to the downgradient section, 2) the pond is required to be operated and maintained in accordance with a water balance plan as part of the Operations Manual required in Evaporation Pond Facility and Design Specification H.3.c, and 3) the Recycled Water Agency will utilize a submersible pump and conduct daily inspections to provide a fail safe mechanism to prevent overflow from the pond.

Similar to design storm requirements for confined animal feeding operations, the Addendum requires marking of the capacity needed to contain a 25-year, 24-hour storm event. This capacity is required to be maintained for emergency storage.

Basis for Finding No. 8:

The San Diego Water Board identified an inconsistency between the required once every five year sampling frequency and the annual average discharge specification.

Basis for Finding No. 9:

The Ramona Municipal Water District produces both secondary and tertiary recycled water at the SVWTP. Secondary and tertiary recycled water share the same treatment process through secondary treatment at which point secondary recycled water is diverted to its designated chlorine contact basin and tertiary recycled water continues through filtration, reverse osmosis, and disinfection (Figure 4).

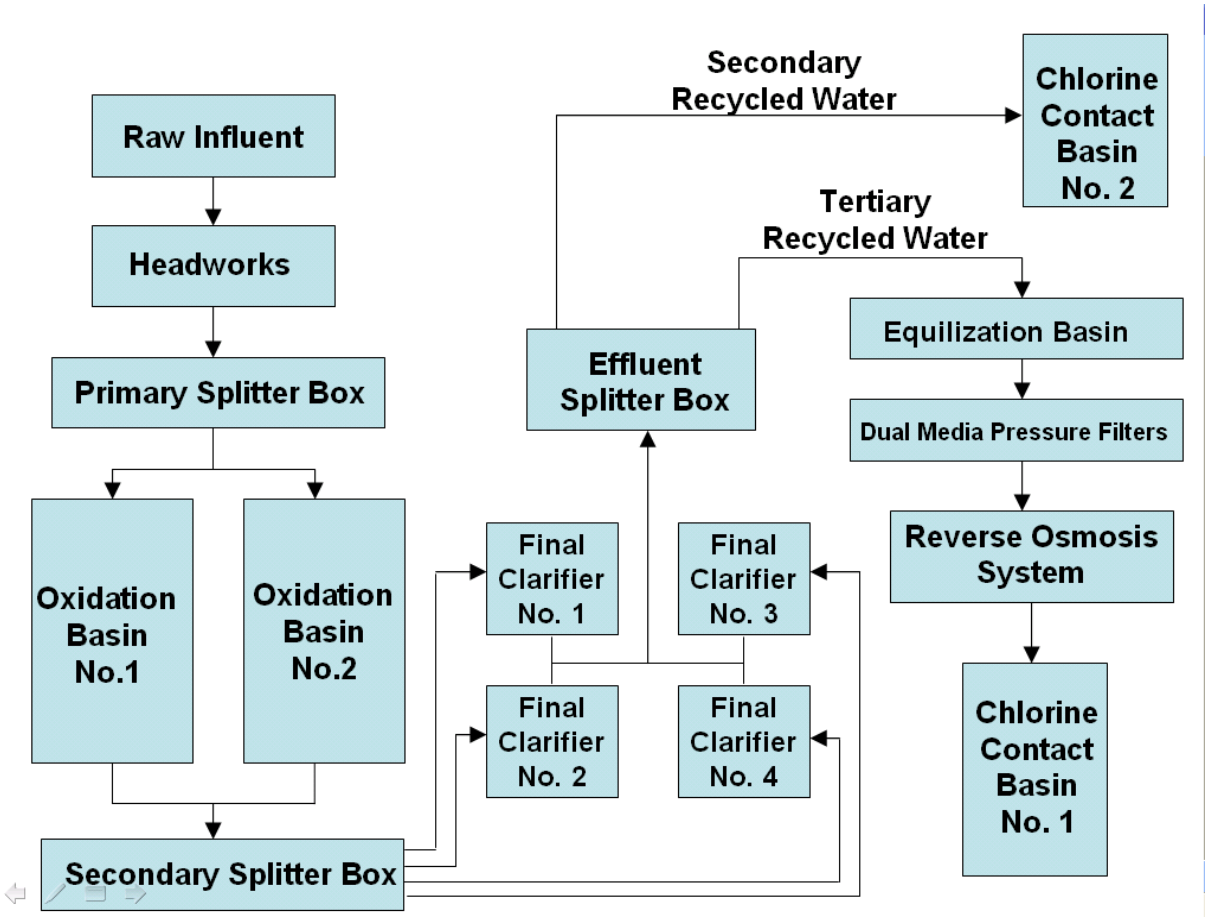

Figure 4. SVWTP Wastewater Treatment Schematic

Secondary recycled water is delivered solely to Spangler Peak Ranch and tertiary recycled water is delivered to both Spangler Peak Ranch and the golf course located in the San Diego Country Estates.
As Monitoring and Reporting Program No. R9-2009-0005 currently reads, both secondary and tertiary recycled water must comply with Discharge Specification B.3.b of Order No. R9-2009-0005 established at 550 milligrams per liter (mg/L); however, secondary recycled water is not treated with reverse osmosis and violates the total dissolved solids (TDS) discharge specification. Secondary recycled water has a TDS concentration of 873 mg/L. Tertiary recycled water has a TDS concentration of 473 mg/L. The Recycled Water Agency produces enough tertiary recycled water to reduce TDS concentrations in the blended effluent to 529 mg/L. (Ramona Municipal Water District, 2010)

The Recycled Water Agency expressed confusion to the San Diego Water Board while trying to implement Monitoring and Reporting Program No. R9-2009-0005 and while assessing compliance. The tentative Addendum, therefore, proposes to clarify that compliance from the SVWTP is based on the blended effluent quality. This is appropriate because both tertiary and secondary recycled water are discharged to the Gower Hydrologic Sub-Area.

For additional clarity, the Addendum inserts compliance sections detailing how the San Diego Water Board will determine compliance with discharge specifications.

Basis for Finding No. 10:

The San Diego Water Board identified the lack of a reporting frequency for potable water supply information.

Basis for Finding No. 11:

The San Diego Water Board identified the applicable regulation pertaining to monthly reporting of water reclamation criteria, specifically reporting of bacteriological results.

Basis for Finding No. 12:

The California Environmental Quality Act is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

Basis for Finding No. 13:

The San Diego Water Board made the draft agenda package available to the public at least 30-days prior to the public hearing via paper copy and via the agency's web page.

Basis for Finding No. 14:

On September 8, 2010, the San Diego Water Board convened a public hearing to collect public input on the Addendum for the proposed evaporation pond.

III. BASIS FOR EVAPORATION POND FACILITY AND DESIGN SPECIFICATIONS

Many of the discharge specifications are taken directly from state regulations. The discharge of brine to an evaporation pond is exempted from CCR Title 27. The regulations contained in CCR Title 27, however, prescribe design and operational requirements for class II surface impoundments and are appropriately applied in the tentative Addendum to the discharge of brine to an evaporation pond. To simplify the information sheet, each specification is listed in the following table with its applicable regulation.

In some instances, a specification may require further explanation. These items are in bold italics in the following table. The discussion for these items will be located after the specification table in the information sheet.

Specification	**Basis**
H.1 Disposal Location	California Water Code section 13243
H.2 Groundwater Separation	CCR Title 27 section 20240(c)
H.3 Operation and Maintenance	
H.3.a Discharge only brine	CCR Title 27 section 20310(b)
H.3.b Freeboard	CCR Title 27 section 20375(a)
H.3.c Operations Manual	CCR Title 27 section 20375(b)
H.3.d Inspections	CCR Title 27 section 20375(f)
H.3.e Removal of solids buildup	No regulatory reference
H.4 Precipitation and Drainage Controls Specifications	
H.4.a Erosion Control	CCR Title 27 section 20365(c)(3)
H.4.b Divert upgradient surface water from pond	CCR Title 27 section 20365(c)(4)
H.4.c Divert runoff via the shortest distance	CCR Title 27 section 20365(c)(2)
H.4.d Prevent ponding	CCR Title 27 section 20365(a)
H.4.e Prevent ponding	CCR Title 27 section 20365(b)
H.5 Leachate Collection and Removal Specifications	
H.5.a Annual LCRS Testing	CCR Title 27 section 20340(d)
H.5.b Leachate Management	CCR Title 27 section 20340(g)
H.5.c Prevent hydraulic head on liner	CCR Title 27 section 20340(c)
H.6 Construction Specifications	
H.6.a Drainage control design capacity	CCR Title 27 section 20365(c)(1)

Specification	Basis
H.6.b Liner materials	CCR Title 27 section 20320(a)
H.6.c Maximum credible earthquake	CCR Title 27 section 20370(a)
H.6.d Containment structures	CCR Title 27 section 20330(a)
H.6.e Pond foundation	CCR Title 27 section 20240(d)
H.7 Linear Specifications	
H.7.a Cutoff walls and grout curtains	CCR Title 27 section 20360
H.7.b Subgrade	Cleanup and Abatement Order No. R9-2006-0016
H.7.c Linear components	No regulatory requirement
H.7.d Linear coverage	CCR Title 27 section 20330(d)
H.8 Certification Report	No regulatory requirement

Additional Information for the Basis of Specification H.3.e

Removing solids buildup in the evaporation pond is necessary to ensure adequate volume in the evaporation pond for precipitation during the upcoming rainy season.

Additional Information for the Basis of Specification H.7.b

The subgrade must consist of a smooth and level surface in order to prevent construction defects to the liner. This will be achieved by limiting the types of material that can be used in the subgrade and the size of rocks that can be part of the subgrade.

An inadequate subgrade that contained large rocks (up to 3-inches), rebar, *etc*. eventually damaged the liner and caused the slope to fail at the Las Pulgas Landfill at Camp Pendleton. This resulted in the issuance of a Cleanup and Abatement Order (see Order R9-2006-0016 and associated Technical Report at http://www.waterboards.ca.gov/sandiego/orders/orders-06.html). Compliance with this Specification will help reduce the probability of liner damage after installation due to underlying materials.

Additional Information for the Basis of Specification H.7.c

This Specification is based upon the authority granted to the San Diego Water Board under Water Code section 13243, and Finding No. 6 of the tentative Addendum.

Additional Information for the Basis of Specification H.8

A certification report is necessary to ensure the evaporation pond is ready and suitable for accepting the brine.

IV. References:

1. San Diego Water Board. 22 July 2009. "San Vicente Wastewater Treatment Plant Facility Inspection Report."

2. RBF Consulting. 17 November 2009. "Report of Waste Discharge – San Vicente WWTP, New Brine Evaporation Ponds."

3. RBF Consulting. 19 January 2010. "Report of Waste Discharge – San Vicente WWTP, New Brine Evaporation Ponds (Revised)."

4. Ramona Municipal Water District. 11 March 2009. "Notice of Intent to Adopt a Mitigated Negative Declaration."

5. San Diego Water Board. 27 July 2009. "Submittal Requirements for Discharge of Reverse Osmosis Concentrate to Evaporation Ponds."

6. State Water Resources Control Board. 1 January 2005. *Porter-Cologne Water Quality Control Act.*

7. Leighton Consulting, Inc. 10 March 2009. "Geotechnical Investigation, Evaporation ponds, San Vicente Wastewater Reclamation Plant, Ramona, San Diego County, California."

8. San Diego Water Board. 11 March 2009. *Order No. R9-2009-0005, Master Reclamation Permit for Ramona Municipal Water District, San Vicente Wastewater Treatment Plant, San Diego County.*

9. Kerry L. Hughes er al., accessed June 21, 2010, *Landfill Types and Liner Systems*, The Ohio State University Extension.

10. Ramona Municipal Water District. 29 April 2010. "2010 first Quarter Monitoring Report for the San Vicente Water Reclamation Plant."