CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

ORDER NO. R7-2010-0032

WASTE DISCHARGE REQUIREMENTS
FOR
TWENTYNINE PALMS WATER DISTRICT, OWNER/OPERATOR FLUORIDE REMOVAL
WATER TREATMENT PLANT
CLASS II SURFACE IMPOUNDMENTS
Twentynine Palms – San Bernardino County

The California Regional Water Quality Control Board, Colorado River Basin Region, finds that:

1. The Twentynine Palms Water District (hereinafter referred to as the Discharger), owns and operates a water treatment facility (Facility) located at 74400 Amboy Road in the city of Twentynine Palms, CA 92277. The project location is shown on Attachment A. The Facility serves the town of Twentynine Palms located in the high desert area of San Bernardino County, California. The Discharger is the sole provider of water to approximately 6,100 service connections in the high desert area, which covers 88 square miles.

2. The Discharger has stated that the high quality groundwater subbasins drawn from in the past are currently over drafted and the Mesquite Springs Aquifer, which is currently being used, is estimated to contain one million acre feet of water. The Mesquite Springs Aquifer contains high quality water with the exception of concentrations of fluoride (typical range from 5 to 8 milligrams per liter mg/l) which has to be reduced tomeet drinking water standards.

3. The Discharger operates a fluoride removal treatment plant (FRTP) that uses three two-vessel, granular activated alumina treatment trains to remove excess fluoride from the water. Each vessel has the capacity to produce one million gallons per day (MGD) for a maximum plant capacity of three (3) MGD. The plant is currently producing approximately one (1) MGD.

4. High fluoride levels found in the existing source water are reduced through the use of granular activated alumina with pH adjustment. Fluoride removal takes place in three parallel treatment trains, each consisting of two ion-exchange treatment vessels - a lead and lag vessel - that operate in series. When the lead vessel reaches saturation, it is taken off-line for regeneration and the lag vessel is placed in the lead position. After a vessel has completed the regeneration cycle, it is placed back in service in the lag vessel position.

5. The regeneration cycle is a twelve-step process that takes about eight hours to complete. The initial flush of regeneration wastewater is routed to a high fluoride wastewater reservoir (HFWR) that allows the suspended fluoride solids to settle out as Calcium Fluoride (CaFl) sludge, which is pumped to a filter press to be dewatered for disposal. Calcium Chloride and acid are added to the HFWR to aid in the settling of the suspended fluoride.

6. The supernatant from the HFWR is then pumped into a low fluoride wastewater reservoir (LFWR) and blended with the remaining regeneration wastewater. Mixing in both reservoirs is provided by three mechanical mixers, one in the HFWR and two in the LFWR, which are controlled by liquid level and mixing time. Acid is added upstream of the LFWR to neutralize the wastewater pH to 8.5.

7. The low fluoride regeneration wastewater from the LFWR is currently used to irrigate atriplex (salt brush). The wastewater from the LFWR is then pumped to two irrigation zones covering approximately 15 acres of atriplex plants.

8. Waste discharge requirements (WDRs) set forth in Order No. 01-187, adopted by the Regional Water Board on November 19, 2001, prescribed requirements for the discharge of waste water to the atriplex irrigation zones. This irrigation practice may not have prevented wastes from reaching and adversely impacting groundwater, which would be a violation of Board Order No. 01-187.

9. The Discharger submitted a revised report of waste discharge (ROWD) on May 28, 2010, describing its plan to abandon the existing atriplex irrigation zones and dispose of the regeneration wastewater in newly constructed, lined, Class II Surface Impoundments.

10. This Order No. R7-2010-0032 is being adopted to regulate the discharge of the regeneration wastewater to the proposed Class II Surface Impoundments, which will be designed to comply with the prescriptive requirements of Title 27 of the California Code of Regulations (27 CCR).

TREATMENT PLANT DESIGN AND OPERATION

11. The fluoride removal treatment plant was designed to allow the removal of one vessel for regeneration per day with the remaining vessels receiving the balance of the plant design flow during regeneration. The existing plant design could generate up to 120,000 gallons per day (gpd) of wastewater when operating at full capacity (3 MGD).

12. Current plant operation regeneration volume logs from June 2007 through July 2008 (August 2007 not included) show a regeneration event occurring every 1 to 5 days with an average volume of approximately 92,000 gallons of wastewater per regeneration event. The average wastewater flow is expected to be approximately 48,700 gpd when the plant is operating at 2 MGD with wastewater flows increasing to 73,000 gpd when the plant is operating at 3 MGD.

13. To accommodate increasing flow conditions, the project will be divided into two phases, Phase 1 and Phase 2. Phase 1 will be designed to accommodate a wastewater design flow of 48,700 gpd. Phase 2 will expand the system to accommodate a wastewater design flow of 73,000 gpd.

14. When the Class II surface impoundments are put into service, it will no longer be necessary to remove fluoride in the HFWR. However, it will be necessary to remove the suspended solids that are created during the backwash cycle. Therefore, backwash flows will be routed to the HFWR tank. The HFWR transfer pumps will remain in service with minor modifications to pump the decant water from the HFWR

directly into a new 10-inch gravity waste line. The existing mixer will also be left in place, but may not be needed on a regular basis. The chemical feed and sludge removal systems will most likely be abandoned after a solids removal plan is determined in final design. The regeneration wastewater from the HFWR will gravity drain directly to the Class II Surface Impoundments.

15. Wastewater will be evaporated in the lined Class II Surface Impoundments and the fluoride will accumulate at the bottom as sludge and will be removed periodically. To prevent damage to the HDPE liner, a one-foot thick layer of soil will be provided above the liner. The soil layer will need to be evaluated on a regular basis to insure that it is thick enough to provide adequate protection to the liner system. When the soil layer becomes less than 6 inches thick, it will be restored to its one-foot thickness.

16. Currently, the fluoride disposal bins are used to remove the dewatered, high fluoride solids collected from the filter frame press. The bins are to remain onsite for use in the fluoride removal process.

SIZING PARAMETERS FOR CLASS II SURFACE IMPOUNDMENTS

17. Sizing of the proposed Class II Surface Impoundments was based on a water balance of the expected inflows and outflows. The water balance was calculated on a monthly basis to capture the seasonal variations in precipitation and evaporation. The water balance calculation equation used is as follows:

    Monthly Volume Change = Wastewater Inflow + Precipitation – Evaporation

18. Phase I of the project consists of two ponds with the following characteristics:

    a. Pond Length (at bottom) – 500 feet
    b. Pond Width (at bottom) – 300 feet
    c. Side Slopes – 1:3 rise / run

19. Projected monthly inflow due to precipitation was estimated using monthly averages of historical data from Twentynine Palms spanning from 1935 to 2008. Precipitation in the Twentynine Palms region follows a seasonal pattern with the highest rainfall rates occurring in both the summer and winter with the month of August having the most rainfall with a monthly average of 0.74 inches. Over the year, Twentynine Palms receives an annual average of 4.31 inches of precipitation. The monthly flow rate into the ponds due to precipitation was calculated as the catchment area at the top of the berm multiplied by the average depth of rainfall in that month.

20. Monthly average evaporation rates for the Twentynine Palms region were estimated using historical reference crop evaporation, or Eto, data. To convert reference crop evaporation rates into meaningful evaporation rates for the ponds, the Eto was converted to pan evaporation rates. To be conservative, the winter period coefficient was assumed to apply throughout the year. Based on the data, evaporation rates in the Twentynine Palms region average approximately 118 inches a year.

21. The surface impoundment system was designed to allow one pond to taken out of service for a maximum of two months per year during Phase 1 and for a maximum of four months a year after completion of Phase II. During the lowest net accumulation months, one impoundment may be taken off-line for maintenance and solids removal. Under Phase I, this period will extend from June through July. Under Phase II, this period will extend from May through August. Solids will be removed from the impoundments using a light-weight, rubber-tired, front end loader and placed in self-draining, roll-away bins.

22. In the event of a liner breach, an impoundment may need to be taken offline. The remaining volume in the damaged pond will need to be emptied into the adjacent pond and the soil layer removed in the drainage area where the leak is detected. The liner will then be inspected for a breach and repaired before the impoundment is placed back in service. Because liner breaches are impossible to predict, the month with the highest predicted flow, the month of March, was used as the design basis for unscheduled maintenance requirements.

23. Pond depth was calculated assuming an emergency shutdown of one pond during Phase I, which would require the remaining pond to receive the entire inflow during the month, and a flow rate equal to the largest net inflow for a period of two months. Based on this worst case scenario, the maximum water depth per pond was determined to be approximately 4 feet. Under normal pond operation, the water depth is not expected to exceed 1.5 feet.

24. Freeboard was determined by the greater of 24 inches or the sum of a 1000-year, 24-hour storm event plus wave run-up from sustained wind. The sum of precipitation and wave run-up are used because they are likely to occur concurrently during a storm event. Design wind speeds for Twentynine Palms is 90 mph (California Building Code 2007). The following equation was used to determine the total wave run-up elevation reached by the surging wave:

    Wave Height (ft) = 1.5 * 0.047 * Wind Speed * √(Pond Length)

    Using this equation, it was estimated that wave heights resulting from 90 mph winds will be approximately 23.5 inches for ponds with a 500 foot length (the proposed length of the Class II Surface Impoundments)

    The precipitation from a 1000-year, 24-hour storm event, as predicted by the National Oceanic Atmospheric Administration (NOAA) (Atlas 14-29 Palms Station #04-9099), is 7.2 inches.

    Therefore, the total amount of freeboard required for each pond is: 23.5 inches + 7.2 inches = 31 inches.

25. A 12-foot wide access road will be provided along the top of the Class II Surface Impoundments and from the existing treatment plant to the proposed pond location. The berm widths at the top of the ponds will actually be 20 feet wide to allow for a 12-foot road width and anchorage of the pond liner systems along each shoulder of the berm.

CLASS II SURFACE IMPOUNDMENTS AND LEACHATE COLLECTION SYSTEM DESIGN

26. The proposed Class II Surface Impoundments will be double liner systems designed in accordance with 27 CCR.

27. 27 CCR construction standards require that all Class II surface impoundments have a single or double liner system that achieves a maximum permeability of $1x10^{-6}$ cm/sec and that double-lined systems must have a blanket-type leachate collection and removal system.

28. The double-lined system provides two layers of synthetic membrane to prevent leakage from the impoundments and a geo-net drainage layer to provide a positive means of leak detection. The system consists of the following components:

    a. Primary Liner – 60 mil high density polyethylene (HDPE) synthetic liner
    b. Drainage Layer – 200 mil geo-net drainage layer
    c. Secondary Liner – 60 mil HDPE synthetic liner

29. The geo-net drainage layer provides a high, horizontal transmissivity (up to 9.66 gal/min/ft), which diverts the liquid that collects between the two layers into a leak detection sump and then into a manhole. Each pond consists of three drainage cells that each discharge into a dedicated sump and manhole. Each pond cell is constructed with a 0.5 percent slope towards its dedicated sump. Leakage collected in the sumps is gravity-piped to concrete manholes through 4-inch PVC pipes.

30. The action leakage rate (ALR) is the allowable leakage from the primary liner system above which contingency actions are triggered. According to Title 40, Code of Federal Regulations (CFR) section 264.222, the ALR is defined as *"…the maximum design flow rate that the leak detection system can remove without the fluid head on the bottom liner exceeding 1 foot"*. The design ALR for the Class II surface impoundments is 1000 gallons per acre per day (gapd).

STORMWATER

31. An existing storm water diversion ditch and soil berm run along the southern border of the treatment plant site and the atriplex irrigation area. The diversion ditch and berm are used to prevent storm water runoff from inundating the water treatment plant area and the atriplex field by diverting flow around the treatment and disposal areas. To accommodate the new Class II Surface Impoundments, the west reaching section of the existing ditch and berm will be demolished and a new section constructed. The new diversion ditch and berm will be built to match the existing design. A four-inch articulating block mat will be installed on the berm for the full length of the new alignment to protect against erosion.

GROUNDWATER MONITORING

32. Three groundwater monitoring wells were installed at the facility in 2007 to evaluate groundwater conditions beneath the site (See Attachment B). All three wells were drilled into first-encountered groundwater to a total depth of 70 feet below ground surface (bgs) and screened from 40 to 70 feet bgs. Data from onsite wells indicate that groundwater occurs at approximately 32 to 36 feet bgs at the facility.

33. Monthly groundwater elevation measurements indicate that the site has two predominant flow directions. Out of 23 groundwater measuring events, 12 events indicated that groundwater flow was towards the southwest and 11 events indicated flow towards the northwest.

34. During any groundwater measuring event, the differences in the water table elevation at the three monitoring wells ranged from 0.5 to 1.7 feet. Therefore, the estimated groundwater gradient is on the order of 0.0015 ft/ft.

35. Water quality data for groundwater samples collected during three sampling events from the three monitoring wells are summarized below:

    a. TDS – 620-6700 mg/l
    b. pH – 7.2-7.9 pH units
    c. Fluoride – 2.2-6.5 mg/l
    d. Sodium – 140-1400 mg/l
    e. Sulfate – 120-3000 mg/l

36. After construction of the Class II Surface Impoundments, a complete groundwater monitoring program will be initiated. The monitoring program will include background and compliance wells. The Discharger proposes to construct additional monitoring wells as needed to adequately characterize the groundwater at the site.

37. Monitoring and Reporting Program No. R7-2010-0032, which is attached to this Board Order and incorporated herein by this reference, is necessary to determine compliance with WDRs and Facility impacts, if any, to receiving water

WASTES AND THEIR CLASSIFICATION

38. The wastewater is from an industrial treatment process and contains no organic chemicals, viruses, bacterial agents, pharmaceutical chemicals, or other constituents associated with municipal wastewater. However, fluoride removed during the treatment process is present in the wastewater.

39. The following chemicals are used during the treatment process. Their purpose and average flow rates in gallons per hour (gph) are as follows:

    a. <u>Sulfuric Acid</u>
        i. Pretreatment - lowers pH for fluoride removal - 0-7 gph.
        ii. Pretreatment – lowers pH for regeneration of treatment media – 0-10 gph.
        iii. Post-treatment – lowers pH of regeneration wastewater – 0-37 gph.

b. Sodium Hydroxide
   i. Pretreatment - raises pH for regeneration of treatment media – 2-5 gph.
   ii. Post-treatment – raises pH of treated water – 0-4 gph.

c. Calcium Chloride
   i. Post-treatment – Adds Calcium ions for precipitation of Calcium Fluoride – 0-158 gph.

BASIN PLAN

40. The Water Quality Control Plan for the Colorado River Basin Region of California (Basin Plan), adopted on November 17, 1993, designates the beneficial uses of ground and surface waters in this Region. The Facility is located in the Dale Hydrologic Unit.

41. The Basin Plan prescribes the following designated beneficial uses of ground water in the Dale Hydrologic Unit:

    a. Municipal Supply (MUN)
    b. Industrial Supply (IND)
    c. Agricultural Supply (AGR)

CALIFORNIA ENVIRONMENTAL QUALITY ACT

42. In accordance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.), Twentynine Palms Water District, acting as lead agency, adopted a Mitigated Negative Declaration (MND) for the District's "Wastewater Disposal Project" (SCH # 2009101040) and filed a Notice of Determination with the San Bernardino County Clerk on November 18, 2009. The Regional Board has considered the Negative Declaration and concluded that compliance with these WDRs will prevent and mitigate any water quality impacts.

PROCEDURAL REQUIREMENTS

43. The Board has notified the Discharger and all known interested agencies and persons of its intent to issue Waste Discharge Requirements for said discharge, and has provided them with an opportunity for a public meeting and an opportunity to submit comments.

44. The Board, in a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED, that Order No.01-187 is rescinded except for enforcement purposes, and that Twentynine Palms Water District and its agents, assigns and successors, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, the Discharger shall comply with the following:

A. Effluent Limitations

1. The 30-day average of discharged wastewater shall not exceed 120,000 gpd.

B. Specifications

2. No changes in type or amount of treatment chemicals added to the process water as described in the findings of this Board Order shall be made without the written approval of the Regional Board's Executive Officer.

3. The treatment or disposal of wastes at this facility shall not cause pollution or nuisance as defined in Sections 13050 of Division 7 of the California Water Code.

4. A minimum depth of freeboard of thirty-one (31) inches shall be maintained at all times in the Class II Surface Impoundments.

5. Each pond shall be double-lined. A leak detection and removal system shall be installed between the liners. The upper liner shall be at least 60 mil high-density polyethylene (HDPE) or equivalent. The lower liner shall be 60 mil high-density polyethylene or equivalent.

6. There shall be no surface flow of wastewater away from the discharge facility.

7. Wastes, including windblown spray, shall be strictly confined to the Class II Surface Impoundments.

8. The Class II Surface Impoundments shall be protected from any washout or erosion and from any inundation which could occur as a result of floods having a predicted frequency of once in 100 years.

9. Solids and settled material shall be disposed of in a manner that will not result in pollution or nuisance as defined by the California Water Code.

C. Prohibitions

10. The direct discharge of any wastewater to any surface water or surface drainage courses is prohibited.

11. Bypass or overflow of untreated or partially treated waste is prohibited.

12. The discharge of waste to land not owned or controlled by the discharger is prohibited.

13. The discharge of wastewater to a location other than the Class II Surface Impoundments, described in Finding Nos. 17-30, above, is prohibited.

14. The disposal of wastes in excess of the design treatment capacity of the system is prohibited.

15. The discharge or deposit of hazardous waste (as defined in 27 CCR) and other wastes that pose a potential threat to water quality at this facility is prohibited.

16. The discharge of designated wastes (as defined in 27 CCR) to other than a waste management unit authorized to receive such waste is prohibited.

17. The discharge of any waste constituents to the unsaturated zone or togroundwater is prohibited.

18. The discharge of solid or liquid waste or leachate to surface waters, surfacewater drainage courses, or groundwater is prohibited.

19. The discharge of wastes that have the potential to reduce or impair the integrityof containment structures is prohibited.

D. Provisions

20. The Discharger shall comply with Monitoring and Reporting Program No. R7-2010-0032 and future revisions thereto, as specified by the Regional Board's Executive Officer.

21. Prior to any change in ownership or management of this operation, the Discharger shall transmit a copy of this Board Order to the succeeding owner/operator, and forward a copy of the transmittal letter to the Regional Board.

22. Prior to any modifications in this facility, which would result in material change in the quality or quantity of discharge, or any material change in the location of the discharge, the Discharger shall report all pertinent information in writing to the Regional Board and obtain revised requirements before any modifications are implemented.

23. The Discharger shall ensure that all site-operating personnel are familiar with the content of this Board Order, and shall maintain a copy of this Board Order at the site.

24. This Board Order does not authorize violation of any federal, state, or local laws or regulations.

25. The Regional Board will review this Board Order periodically and may revise requirements when necessary.

26. The Discharger shall allow the Regional Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:

    a. Enter upon the premises regulated by this Board Order; or the place where records must be kept under this Board Order;

    b. Sample or monitor at reasonable times, for the purpose of assuring compliance with this Board Order or as otherwise authorized by the California Water Code, any substances or parameters at this location.

    c. Inspect at reasonable times: facilities, equipment (including monitoring and control equipment), practices, or operations, regulated or required by this Board Order; and

d. Sample or monitor at reasonable times, for the purpose of assuring compliance with this Board Order, or as otherwise authorized by the California Water Code, any substances or parameters at this location

27. After a significant earthquake event, the Discharger shall:

    a. Immediately notify the Regional Board by phone; and

    b. Within seven (7) days submit to the Regional Board a detailed post-earthquake report describing physical damages to the containment features and groundwater monitoring facilities and a corrective action plan for repairs.

28. The Discharger shall immediately notify the Regional Board of any flooding, slope failure or other change in site conditions that could impair the integrity of the waste containment Facility or of precipitation and drainage control structures. The Discharger shall submit to the Regional Board within 14 days a detailed report describing any physical damage to the cover, surface water diversion systems or groundwater monitoring systems.

29. Prior to commencing construction of the Project, the Discharger shall develop and implement a construction quality assurance (CQA) program in accordance with 27 CCR Section 20324.

30. Upon completion of construction of the Project, the Discharger shall submit a Final Documentation Report, in accordance with 27 CCR Section 20324(d)(1)(C), for review and approval by the Regional Board's Executive Officer.

31. The Discharger shall comply with all of the conditions of this Board Order. Any noncompliance with this Board Order constitutes a violation of the Porter-Cologne Water Quality Control Act and is grounds for enforcement action.

32. This Board Order does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

33. Unless otherwise approved by the Regional Board's Executive Officer, all analyses shall be conducted at a laboratory certified for such analyses by the California Department of Public Health. All analyses shall be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants", published by the United States Environmental Protection Agency.

34. The results of any analysis of samples taken more frequently than required at the locations specified in the Monitoring and Reporting Program shall be reported to the Regional Board.

35. The Discharger shall provide an inventory of all hazardous materials that will be handled at the facility within 60 days of adoption of this Order.

36. The Discharger is the responsible party for these Waste Discharge Requirements and the Monitoring and Reporting Program for the facility. The Discharger shall comply with all conditions of these Waste Discharge Requirements. Violations may result in enforcement actions, including Regional Board Orders or court orders, requiring corrective action or imposing civil monetary liability, or may result in modification or revocation of these Waste Discharge Requirements by the Regional Board.

37. The Discharger shall retain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Board Order, and records of all data used to complete the application for this Board Order. Records shall be maintained for a minimum of five (5) years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board's Executive Officer.

38. Records of monitoring information shall include:

    a. The date, exact place, and time of sampling and measurements.
    b. The individual(s) who performed the sampling or measurements.
    c. The date(s) analyses were performed.
    d. The individual(s) who performed the analysis.
    e. The analytical techniques or methods used.
    f. The result of such analysis.

39. The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), that are installed or used by the Discharger to achieve compliance with conditions of this Board Order.

40. The Discharger shall furnish, under penalty of perjury, technical monitoring program reports, and such reports shall be submitted in accordance with the specifications prepared by the Regional Board's Executive Officer. Such specifications are subject to periodic revisions as may by warranted.

41. The Discharger shall report any noncompliance that may endanger human health or the environment. The Discharger shall immediately report orally to the Regional Water Board Executive Officer and the Office of Emergency Services information of the noncompliance as soon as: (1) the Discharger has knowledge of the discharge, (2) notification is possible, and (3) notification can be provided without substantially impeding cleanup or other emergency measures. During non-business hours, the Discharger shall leave a message on the Regional Water Board office voice recorder. A written report shall be provided within five (5) business days of the time the Discharger is aware of the incident. The written report shall contain a description of the noncompliance and the cause, the period of noncompliance, the anticipated time to achieve full compliance, and steps taken or planned, to reduce, eliminate, and prevent recurrence of the noncompliance. The Discharger shall report all intentional or unintentional spills occurring within the facility or collection system to the Regional Water Board office in accordance with the above time limits.

I, Robert Purdue, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, on September 16, 2010.

Original signed by
Executive Officer

Date