TECHNICAL MEMORANDUM

NPDES Permitting Approach
for Monterey One Water

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Authors: Elaine W. Howe, P.E. (Trussell Technologies, Inc.)
John D. Kenny, P.E. (Trussell Technologies, Inc.)
Brie D. Webber, P.E. (Trussell Technologies, Inc.)
Denise Conners (Larry Walker Associates)
Mitchell Mysliwiec, Ph.D. (Larry Walker Associates)

Reviewers: Rhodes Trussell, Ph.D., P.E., BCEE
Michael Trouchon (Larry Walker Associates)

Subject: Proposed Multiple Dm NPDES Permitting Approach to Address Discharges from Monterey One Water's Pure Water Monterey Project

INTRODUCTION

Monterey One Water (M1W) is permitted to discharge secondary treated wastewater and trucked brine waste to Monterey Bay in accordance with the Waste Discharge Requirements described in their NPDES permit (Order No. R3-2014-0013, NPDES No. CA0048551). The average dry weather discharge is not to exceed 29.6 MGD, which is the average dry weather capacity of M1W's Regional Treatment Plant (RTP). Because the discharge is predominately representative of a single type of waste stream (secondary treated wastewater), only one minimum initial dilution number (D_m) is applied to this discharge. The current D_m is 145 parts seawater to 1 part effluent. This Dm and the numeric water quality objectives (WQOs) in the California Ocean Plan (Ocean Plan) were used to calculate effluent limits for the RTP secondary effluent prior to ocean discharge in order to prevent exceedance of the WQOs (SWRCB, 2015).

M1W is implementing the Pure Water Monterey (PWM) project and has begun construction of an Advanced Water Purification Facility (AWPF) to provide advanced treatment of secondary effluent. The purified recycled water will be injected into the Seaside Groundwater Basin for use as a potable water supply in response to the Cease and Desist Order issued to California American Water Company (CalAm) to stop over-pumping of the Carmel River. Once the AWPF is operational, M1W's effluent quality will be modified to include the concentrate stream from the reverse osmosis (RO) treatment process of the AWPF. The addition of the RO concentrate to the RTP secondary effluent will change the character of the effluent waste stream discharged to the Monterey Bay, and the water quality will be a function of the amount of secondary effluent commingled with the RO concentrate. Additional D_ms will be needed in the NPDES permit to represent the changed effluent quality and the impacts of the discharge to the Monterey Bay.

Secondary effluent from the RTP will be (1) treated through the AWPF to produce purified water for aquifer replenishment, (2) treated at the Salinas Valley Reclamation Project (SVRP)—as currently done—to produce tertiary recycled water for agricultural irrigation, or (3) blended with RO concentrate and discharged to the ocean. The amount of secondary effluent diverted to the outfall will vary throughout the year, with many months having no secondary effluent in the discharge flow. The RO concentrate flow, on the other hand, is anticipated to be relatively constant, ranging from 0.83 MGD to 1.17 MGD, where 1.17 MGD represents the maximum RO concentrate produced when the AWPF is operating at design capacity.

This technical memorandum (TM) discusses justification and implementation of a new NPDES permitting approach for this commingled effluent discharge, where four D_m values will apply to four different types of effluent discharge scenarios—each covering a different range of secondary effluent flows and a constant (maximum) RO concentrate flow. Additionally, this proposed NPDES permitting approach will assess compliance based on a comparison of calculated constituent concentrations at the edge of the zone of initial dilution (C_{ZID}) with each constituent's numeric Ocean Plan WQO.

MODELING APPROACH AND RESULTS

Modeling Tools

The near-field mixing zone model, Visual Plumes, was applied to represent dilution of the effluent plume. Visual Plumes is a USEPA-approved mixing zone model for environmental impact assessment of regulatory mixing zones resulting from continuous point source discharges (Larry Walker Associates, 2017). Visual Plumes version 17 was applied in this study.

The ambient currents in the vicinity of the discharge are determined either through modeling or assumptions. For the calculation of D_m, the ambient current was conservatively assumed to be zero. A zero current velocity assumption is the worst-case condition in the dilution analysis and is consistent with Ocean Plan requirements.

Near-field mixing processes include buoyant jet mixing (including ambient current effects and merging of individual port plumes) and boundary interactions (including density gradient effects). Receiving water depth and stratification, outfall configuration, and discharge flow rate and density are the most important model input parameters. For the M1W submerged, multi-port diffuser, the subprogram UM3 was used for all simulations. UM3 allows for arbitrary alignment of the diffuser structure within the ambient water body and for arbitrary orientation of the individual ports along the diffuser. The use of UM3 allows for the analysis of the current diffuser and any future diffuser modifications for port heights and angles. Using one model will provide comparable results between current and future configurations.

Model results delineate the effluent plume and define the edge of the mixing zone. Dilution calculated by UM3 (S) is the ratio of initial concentration in the effluent to concentration at a given location in the plume, which is the inverse of 'fraction of effluent.' As applied in the Ocean Plan, the dilution credit (D_m) is the parts of seawater per the parts of effluent in the plume and is equal to S - 1.

Ambient Conditions

Monterey Bay is traditionally known for three oceanic seasons: Upwelling from March to September, Oceanic from September to November, and Davidson from November to

March. Conductivity-temperature-depth (CTD) casts were performed by Applied Marine Sciences on a monthly basis from February 2014 to December 2015 at the four locations shown in Figure 1 (Roberts, 2017). The goal was to gather data representative of ocean conditions during this time period. Profiles taken from the four locations showed only slight variations, so the data were averaged and plotted in Figure 1. Seasonal density profiles were then averaged to construct one profile per season for the modeled scenarios as presented in Figure 2. Previous dilution modeling efforts relied on stratification measured at a monitoring buoy located approximately 5 miles north of the discharge. The current model results using more relevant local stratification have slightly higher dilution than previous efforts.

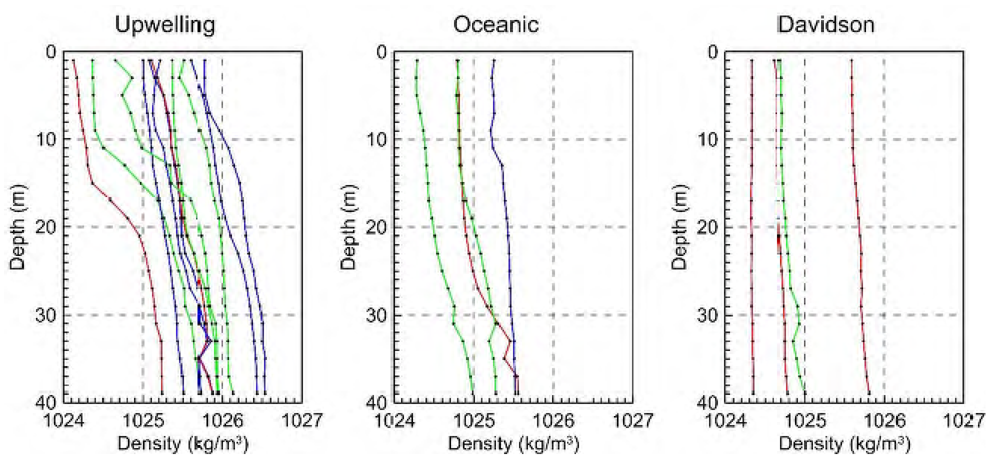

Figure 1. Seasonal density profiles drawn at different monitoring locations (Adapted from Roberts 2017).

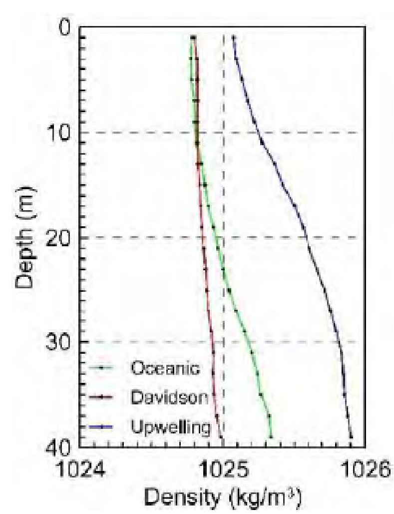

Figure 2. Average density profiles for each of the three seasons.

Ocean current velocity was conservatively assumed to be zero, as the presence of velocity enhances plume dilution. The Ocean Plan requires use of zero ambient current across the discharge structure when estimating minimum initial dilution.

Diffuser Geometry

The M1W outfall is located in Monterey Bay about 9,892 feet from shore. A typical cross-section of the diffuser design is shown in Figure 3. The diffuser design consists of 60-inch internal diameter (ID) and 48-inch ID reinforced concrete pipe with a total length of 1,272 ft. The diffuser has 65 ports in the 60-inch section and 106 ports in the 48-inch section (total of 171 ports). The ports (each 2 inches in diameter) discharge horizontally in an alternate layout on both sides of the diffuser. Currently, 42 ports closest to the shore are closed and 129 ports are open and each is fitted with 4-inch Tideflex "duckbill" check valves (4-inch is the flange size, not the valve opening). For the model, it was assumed that a 6-inch Tideflex "duckbill" check valve is installed at the end-gate. The cross-sectional area of the "duckbill" valve is a function of flowrate going through the valve. The average water depth in the diffuser area is 114.8 feet and the depth of the discharge is set to be 100.7 feet below mean sea level. The ports were modeled as round openings with areas equivalent to the effective area of the "duckbill" valves. Based on this assumption, the actual dilution will be slightly higher than the values computed in 2014 by Flow Science (Flow Science, 2014).

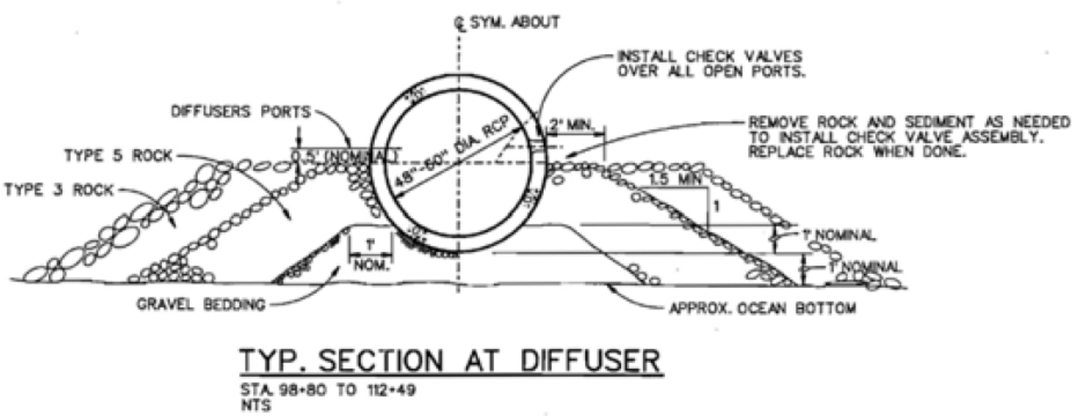

Figure 3. M1W Outfall diffuser cross-section drawing (MRWPCA, 1999).

MODEL RESULTS AND DILUTION CREDITS

The effluent density is less than the surrounding ambient density of the seawater at the discharge level. Therefore, the effluent is positively buoyant and tends to rise towards the surface. Initial dilutions estimated by the Visual Plumes UM3 model for all scenarios and oceanic conditions are presented in Table 1. Scenarios M6, M12, M23, and M34 were selected to define the proposed D_m for set ranges of secondary effluent flow (additional details about the proposed D_m values are included in Section 3). In all scenarios, the Upwelling oceanic condition resulted in the lowest available dilution. Using the Upwelling model results to set the D_m values will ensure conservative initial mixing regardless of the season. The scenarios are highlighted in Table 1 and represent conditions of predominantly RO concentrate flow (M6), low secondary effluent flow (M12), moderate secondary effluent flow (M23), and predominantly secondary effluent flow (M34). These scenarios define the proposed conditions where the D_m applied for NPDES permit limitations would change.

Table 1. Dilution Estimates and Trapped Depth for Modeled Discharge Scenarios

Scenario Number	Total Flow (mgd)	Secondary Effluent (mgd)	Upwelling		Oceanic		Davidson	
			Dm	Trapped Depth (m)	Dm	Trapped Depth (m)	Dm	Trapped Depth (m)
V11	1.17	0.0	515.8	21.6	568.1	26.0	1008.2	Surface
M1	1.20	0.0	511.4	21.6	566.9	25.9	993.7	Surface
M2	1.27	0.0	499.1	21.5	575.8	26.1	958.4	Surface
M3	1.27	0.1	505.5	21.4	557.4	26.0	965.3	Surface
M4	1.37	0.2	494.4	21.2	533.4	26.2	926.9	Surface
M5	1.47	0.3	483.7	21.3	495.3	26.1	892.4	Surface
M6	1.57	0.4	473.4	21.0	487.2	26.0	861.9	Surface
M7	1.67	0.5	463.8	20.8	482.0	21.8	834.5	Surface
M8	1.77	0.6	454.7	20.7	477.9	21.6	809.4	Surface
M9	1.87	0.7	446.2	20.6	472.2	21.6	787.3	Surface
M10	1.97	0.8	438.2	20.5	466.2	21.5	766.6	Surface
M11	2.17	1.0	423.4	20.3	454.6	21.4	730.8	Surface
M12	2.77	1.6	388.3	Surface	418.0	Surface	650.5	Surface
M13	3.17	2.0	371.5	Surface	399.9	Surface	613.8	Surface
V13	4.17	3.0	340.4	Surface	364.4	Surface	552.4	Surface
M14	4.20	3.0	339.3	Surface	363.1	Surface	550.7	Surface
M15	4.27	3.0	336.7	Surface	360.0	Surface	546.5	Surface
M16	4.67	3.5	328.1	Surface	351.0	Surface	533.5	Surface
M17	5.17	4.0	317.5	Surface	340.0	Surface	519.7	Surface
M18	5.67	4.5	308.0	Surface	331.0	Surface	510.7	Surface
M19	6.17	5.0	299.6	Surface	323.6	Surface	506.2	Surface
M20	6.67	5.5	291.3	Surface	317.6	Surface	505.7	Surface
M21	7.17	6.0	283.7	Surface	312.7	Surface	505.4	Surface
M22	8.17	7.0	270.1	Surface	304.2	Surface	498.3	Surface
M23	9.17	8.0	258.7	Surface	295.0	Surface	471.4	Surface
M24	10.17	9.0	248.5	Surface	286.5	Surface	453.8	Surface
M25	11.17	10.0	239.8	Surface	279.9	Surface	436.8	Surface
M26	13.17	12.0	225.0	Surface	265.2	Surface	404.7	Surface
M27	15.17	14.0	213.3	Surface	252.2	Surface	374.9	Surface
M28	19.17	18.0	195.8	Surface	232.7	Surface	333.5	Surface
M29	22.17	21.0	186.2	Surface	222.0	Surface	309.7	Surface
M30	23.17	22.0	183.4	Surface	219.0	Surface	299.8	Surface
M31	23.67	22.5	182.1	Surface	217.4	Surface	298.0	Surface
M32	24.17	23.0	180.8	Surface	216.1	Surface	296.3	Surface
M33	24.57	23.4	179.8	Surface	215.1	Surface	289.1	Surface
M34	29.60	29.6	169.3	Surface	204.9	Surface	263.7	Surface

RECOMMENDED DILUTION NUMBERS FOR THE NPDES PERMIT

Once M1W's AWPF comes on-line, the waste streams discharged to the Monterey Bay will be a blend of RO concentrate (1.17 MGD), trucked brine (intermittent flow, 0.03 MGD historical maximum), and secondary effluent when excess is available for discharge (0 to 9.2 MGD projected on a monthly basis). A compliance assessment found the commingled effluent to be compliant with all numeric WQOs in Table 1 of the Ocean Plan under modeled worst-case discharge conditions (Trussell Technologies, September 2017). Note that the approach used in the assessment could not be applied for some constituents (*i.e.*, acute toxicity, chronic toxicity, and radioactivity[1]). Of the constituents assessed, ammonia was estimated to reach a concentration closest to its WQO. As a result, ammonia was selected as the compliance limiting constituent and the basis for developing dilution credits for the NPDES permit. In other words, if sufficient dilution is credited for ammonia to be in compliance with its WQOs, all other constituents will also be in compliance with their WQOs.

The in-pipe concentration (*i.e.*, in the outfall pipeline) of each constituent is a function of the flow of each waste stream to the outfall. For the purpose of the Ocean Plan compliance assessment, the RO concentrate and trucked brine waste flows (where the trucked waste flows are a minimal component of the discharge) were assumed constant at their highest projected flow rates, while the secondary effluent flow to the outfall was assumed to vary over the year. The projected monthly average secondary effluent flows to the outfall are shown in Table 2. The calculated maximum average dry weather secondary effluent flow that can be discharged to the outfall, based on the permitted RTP average dry weather capacity of 29.6 MGD and the required AWPF influent flow necessary to produce 5.0 MGD of purified water, is 23.4 MGD—substantially higher than what is projected to occur on a monthly average basis.

[1] Calculating flow-weighted averages for toxicity (acute and chronic) and radioactivity (gross beta and gross alpha) is not appropriate based on the nature of the constituents. These constituents were measured individually for the RO concentrate, and these individual concentrations would comply with the Ocean Plan objectives (Trussell Technologies, 2017). Current discharges of the secondary effluent and hauled waste are monitored semiannually for acute toxicity, chronic toxicity, and radioactivity per the existing NPDES permit.

Table 2. Projected Monthly Average Secondary Effluent Flows (MGD) to Ocean Outfall (AWPF Down-Time Not Considered) (Schaaf and Wheeler, 2017)[2]

Type Water Year	J	F	M	A	M	J	J	A	S	O	N	D
Normal, Full Reserve	8.1	5.5	2.2	0.0	0.0	0.0	0.0	0.0	0.0	2.2	5.6	9.2
Normal, Building Drought Reserve	7.6	5.1	1.7	0.0	0.0	0.0	0.0	0.0	0.0	1.7	5.2	8.8
Drought, Starting with Full Reserve	6.5	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.6

[2] The Pure Water Monterey project will include a drought reserve of up to 1,000 acre-ft, which is projected to accumulate at a rate of 200 acre-ft per year during the "building drought reserve" water years.

The water quality of the RO concentrate and secondary effluent waste streams discharged to the outfall are also expected to change throughout the year due to variability in new source water flows diverted to the headworks of the RTP. To assess Ocean Plan compliance over the full range of potential variation in waste stream water quality, the worst-case concentrations of each constituent in the RO concentrate and secondary effluent that could occur at any time of the year were used to determine compliance. These concentrations were then combined with the projected flows in Table 2, through a flow-weighted average, to assess Ocean Plan compliance over the full range of potential variation in waste discharge composition. Considering the constituent estimated to be at a concentration closest to the Ocean Plan WQO, the range of in-pipe ammonia concentrations were then used to estimate the "minimum D_m" needed for compliance with the WQO, using a rearrangement of Equation 1 provided in the 2015 Ocean Plan as shown below.

$$C_e = C_0 + D_m(C_0 - C_s)$$ **Ocean Plan Eqn. 1**

where: C_e = effluent concentration limit - blended concentration in outfall pipe

C_0 = WQO to be met at the edge of the ZID

C_s = background seawater concentration, reported in Table 3 of the Ocean Plan (0 µg/L for ammonia)

D_m = minimum probable initial dilution number

$$D_{mR} = \frac{C_{in-pipe} - C_0}{C_0 - C_s}$$ **Rearrangement of Ocean Plan Eqn. 1**

where: D_{mR} = dilution required for compliance

$C_{in\text{-}pipe}$ = blended concentration in the outfall pipeline (same as C_e)

The minimum D_m required to comply with the Ocean Plan at all secondary effluent flow rates is plotted in Figure 4 (solid red curve). The D_m needed to be at only 80% of the objective is also plotted (solid orange curve), along with the estimated D_m values that were calculated through ocean dilution modeling. It is important to note that (1) all modeled D_m values are well above both the minimum required D_m curve and 80% minimum D_m curve, indicating compliance with WQOs over the entire range of secondary effluent flows, and (2) the proposed four D_m values are all above the 80% minimum D_m curve.

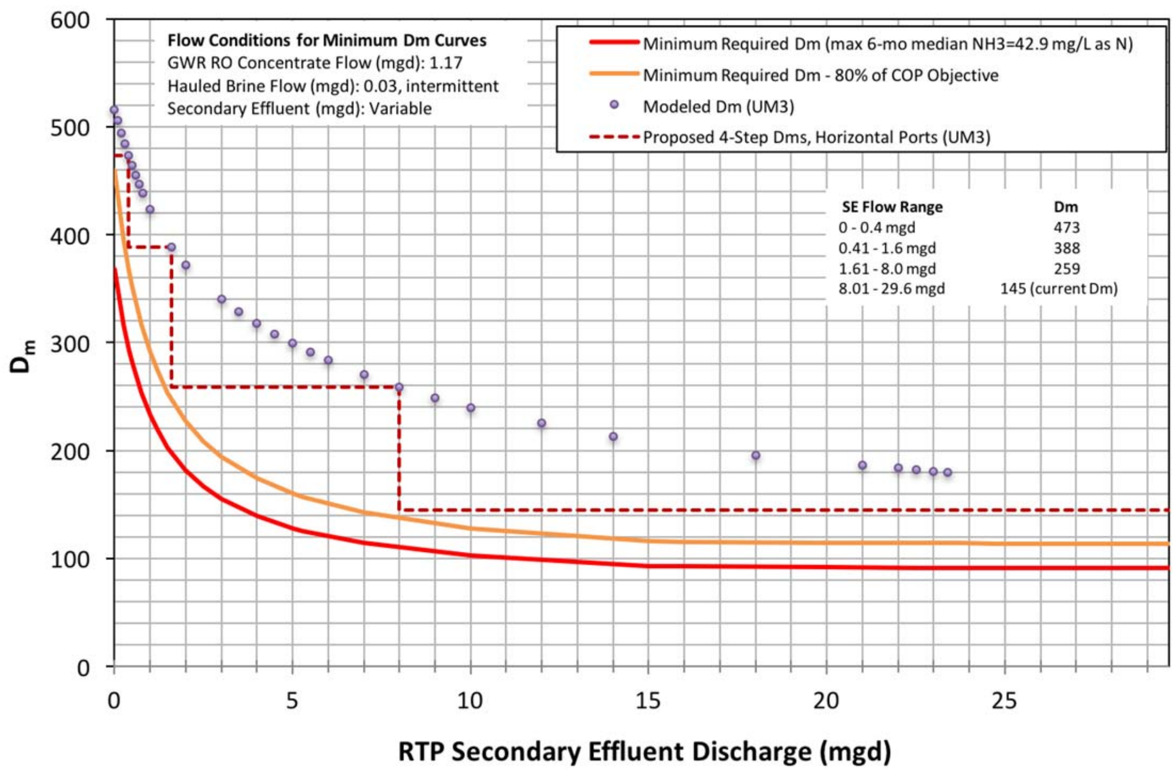

Figure 4. Proposed Four Step Dilution Numbers

Figure 4 also shows the four D_m values proposed for M1W's amended NPDES permit. These D_m values will cover four different secondary effluent flow ranges for the commingled discharge, as summarized in Table 3. The lowest D_m for the "predominately secondary effluent" flow range (i.e., 145) is the D_m in M1W's existing NPDES permit, which is associated with the maximum secondary effluent discharge (average dry weather conditions) through the ocean outfall of 29.6 MGD.

The four proposed D_m values were selected based on modeled dilution numbers for the commingled effluent discharge comprised of a constant RO concentrate flow and constant trucked brine flow. A sensitivity analysis of the relationship between D_m and flow rate was performed for the various discharge types. The greatest D_m sensitivity to flow changes was determined to be from variations in the RTP secondary effluent flow. To simplify the analysis, the flow scenarios used in the compliance analysis conservatively considered the maximum flows for the trucked waste and the RO concentrate because these flows result in the lowest D_m.

To capture the projected variation in secondary effluent flow, ranging from a monthly average of 0 to 9.2 MGD throughout the year, secondary effluent flows from 0 to 29.6 MGD were assessed. As illustrated in Figure 4, the four D_m values proposed for the NPDES permit are the minimum modeled dilutions for the four different types of commingled effluent that will be discharged (Table 3), and are all well above the minimum required D_m curve for ammonia—the compliance limiting constituent.

Table 3 - Proposed Dm Values for NPDES Permit with AWPF RO Concentrate

Secondary Effluent Flow Range (MGD)	Proposed Dm	Discharge Classification
0 – 0.4	473	Predominantly RO concentrate
0.41 – 1.6	388	Low secondary effluent
1.61 – 8.0	259	Moderate secondary effluent
8.01 – 29.6	145	Predominantly secondary effluent

JUSTIFICATION FOR A MULTIPLE D_m NPDES PERMIT

The Ocean Plan requires use of a minimum probable initial dilution "based on observed waste flow characteristics, observed receiving water density structure, and the assumption that no currents, of sufficient strength to influence the initial dilution process, flow across the discharge structure." Discharge of RO concentrate will change the waste flow characteristics significantly (in particular, the density properties that affect near-field mixing processes). In addition, the amount of secondary effluent commingled with the RO concentrate and trucked brine will influence the buoyancy of the plume and the boundary interactions with the ambient receiving water. By assigning multiple D_m values, the commingled effluent is characterized into four types of effluent waste streams that will be permitted for discharge. Representative conditions are therefore applied to each type of effluent waste stream to adequately assess the impacts of these discharges to Monterey Bay.

NPDES REPORTING STRATEGY

Electronic reporting of self-monitoring data for permitted waste discharges began in earnest in 2006. Under the following proposed approach, M1W will continue collecting and analyzing samples of the in-pipe effluent discharge. However, instead of reporting in-pipe constituent concentrations, M1W will calculate constituent concentrations at the edge of the ZID based on measured in-pipe concentrations and the D_m corresponding to the secondary effluent flow rate measured during sampling. To check for compliance, M1W will use the State Water Resources Control Board provided "Limit Tool," as is currently done. However, rather than comparing measured constituent concentrations with effluent limits, the calculated ZID concentrations will be compared with the Ocean Plan numeric WQOs.

To describe this method further, it is proposed that effluent limits in the new NPDES permit equal the Ocean Plan's numeric WQOs for each constituent that has a numeric

WQO. Calculated constituent concentrations at the edge of the ZID will be compared with the Ocean Plan's WQOs after initial dilution (i.e., at the edge of the ZID). Constituent concentrations will be calculated using a rearrangement of Equation 1 from the Ocean Plan as follows:

$$C_{ZID} = \frac{C_{in-pipe}}{(1+D_m)}$$ Eqn. 5-1, when C_s=0

$$C_{ZID} = \frac{(C_{in-pipe}+D_m*C_s)}{1+D_m}$$ Eqn. 5-2, when C_s≠0

where: C_{ZID} = constituent concentration at the edge of the ZID

$C_{in\text{-}pipe}$ = blended discharge concentration

C_s = background concentration in the ocean

For constituents listed in Table 3 of the Ocean Plan that have a defined background concentration (arsenic, copper, mercury, silver and zinc), equation 5-2 would be used to calculate C_{ZID}.

Sample discharge compliance calculations for ammonia—comparing calculated concentrations at the edge of the ZID with daily maximum, instantaneous maximum and 6-month median COP WQOs—are shown for a constant secondary effluent flow (Table 4) and for a variable secondary effluent flow (Table 5). The 6-month median concentration is a moving median of the C_{ZID} concentrations for the grab samples. Because the calculated concentrations at the edge of ZID are already normalized by using the applicable D_m corresponding to secondary effluent flow at sample collection, a 6-month median C_{ZID} can be calculated directly.

Table 4. Example Calculations for Ammonia Concentrations at the Edge of the ZID, Constant Secondary Effluent Flow

INPUT CELLS

A	B	C	D	E	F	G	H	I	J	K
Sampled Parameter	Date	RTP Secondary Effluent Flow (mgd)	Trucked Brine Flow (mgd)	AWTF Concentrate Flow (mgd)	Ocean Plan Limit (µg/L) (Co)	Background Conc. (µg/L) (Cs)	In-Pipe Sampled Result (µg/L)	Associated Dm	Reported C_{ZID} Result (µg/L)	In Compliance?
Ammonia (Instant Max)	1-Sep-16	0.200	0.1	1.17	6,000	0	220,000	473	464	Yes
Ammonia (Daily Max)	1-Sep-16	0.200	0.1	1.17	2,400	0	220,000	473	464	Yes
Ammonia (Instant Max)	6-Oct-16	0.200	0.1	1.17	6,000	0	190,000	473	401	Yes
Ammonia (Daily Max)	6-Oct-16	0.200	0.1	1.17	2,400	0	190,000	473	401	Yes
Ammonia (Instant Max)	3-Nov-16	0.200	0.1	1.17	6,000	0	210,000	473	443	Yes
Ammonia (Daily Max)	3-Nov-16	0.200	0.1	1.17	2,400	0	210,000	473	443	Yes
Ammonia (Instant Max)	1-Dec-16	0.200	0.1	1.17	6,000	0	200,000	473	422	Yes
Ammonia (Daily Max)	1-Dec-16	0.200	0.1	1.17	2,400	0	200,000	473	422	Yes
Ammonia (Instant Max)	5-Jan-17	0.200	0.1	1.17	6,000	0	195,000	473	411	Yes
Ammonia (Daily Max)	5-Jan-17	0.200	0.1	1.17	2,400	0	195,000	473	411	Yes
Ammonia (Instant Max)	2-Feb-17	0.200	0.1	1.17	6,000	0	200,000	473	422	Yes
Ammonia (Daily Max)	2-Feb-17	0.200	0.1	1.17	2,400	0	200,000	473	422	Yes
Ammonia (6-Mo Median)	2-Feb-17	--	--	--	600	0	--	--	422	Yes

Table 5. Example Calculations for Ammonia Concentrations at the Edge of the ZID, Variable Secondary Effluent Flow

INPUT CELLS

A	B	C	D	E	F	G	H	I	J	K
Sampled Parameter	Date	RTP Secondary Effluent Flow (mgd)	Trucked Brine Flow (mgd)	AWTF Concentrate Flow (mgd)	Ocean Plan Limit (µg/L) (Co)	Background Conc. (µg/L) (Cs)	In-Pipe Sampled Result (µg/L)	Associated Dm	Reported C_{ZID} Result (µg/L)	In Compliance?
Ammonia (Instant Max)	1-Sep-16	0.200	0.1	1.17	6,000	0	210,000	473	443	Yes
Ammonia (Daily Max)	1-Sep-16	0.200	0.1	1.17	2,400	0	210,000	473	443	Yes
Ammonia (Instant Max)	6-Oct-16	1.200	0.1	1.17	6,000	0	105,000	388	270	Yes
Ammonia (Daily Max)	6-Oct-16	1.200	0.1	1.17	2,400	0	105,000	388	270	Yes
Ammonia (Instant Max)	3-Nov-16	4.300	0.1	1.17	6,000	0	85,000	259	327	Yes
Ammonia (Daily Max)	3-Nov-16	4.300	0.1	1.17	2,400	0	85,000	259	327	Yes
Ammonia (Instant Max)	1-Dec-16	9.200	0.1	1.17	6,000	0	61,000	145	418	Yes
Ammonia (Daily Max)	1-Dec-16	9.200	0.1	1.17	2,400	0	61,000	145	418	Yes
Ammonia (Instant Max)	5-Jan-17	10.000	0.1	1.17	6,000	0	62,000	145	425	Yes
Ammonia (Daily Max)	5-Jan-17	10.000	0.1	1.17	2,400	0	62,000	145	425	Yes
Ammonia (Instant Max)	2-Feb-17	5.500	0.1	1.17	6,000	0	72,000	259	277	Yes
Ammonia (Daily Max)	2-Feb-17	5.500	0.1	1.17	2,400	0	72,000	259	277	Yes
Ammonia (6-Mo Median)	2-Feb-17	--	--	--	600	0	--	--	372	Yes

Several considerations related to the applicability of this proposed compliance reporting approach are discussed below.

Is this approach of using the Ocean Plan's water quality objectives as the permit effluent limits consistent with Ocean Plan requirements?

The Ocean Plan has the following requirements for implementing Water Quality-Based Effluent Limits (WQBELs) in permits:

1. Effluent limitations must be calculated from Ocean Plan Table 1 WQOs using Ocean Plan Equation 1.
   Response: *As discussed above, the equations used to calculate constituent concentrations at the edge of the ZID are simple rearrangements of Ocean Plan Equation No. 1. The limitations on the discharge (the WQOs) are taken directly from Ocean Plan Table 1.*

2. Effluent limitations must be applied to total effluent (i.e., as discharged, in-pipe).
   Response: *Effluent limitations will be applied to the total effluent. Dilution modeling considered density and velocity of total discharge. Compliance samples will be collected from the commingled effluent discharge, and both the secondary effluent flow and total discharge flow will be monitored and reported. Constituent concentrations at the edge of the ZID will be calculated from the measured "in-pipe" concentration, the secondary effluent flow, and corresponding D_m value.*

3. Effluent limitations must be prescribed for each constituent that shows reasonable potential to exceed WQOs.
   Response: *The effluent limit for each constituent will be the numeric WQO set for each constituent with a WQO in the Ocean Plan. However, rather than an "in-pipe" effluent limit, each constituent will have an effluent limit at the edge of the ZID. A reasonable potential analysis will be conducted to determine which constituents have a reasonable potential to exceed their relevant WQOs.*

4. Compliance must be determined by ensuring WQOs are not exceeded at the edge of the ZID.
   Response: *For each monitoring event, compliance will be based on comparing calculated constituent concentrations at the edge of the ZID with the Ocean Plan WQO. Edge of ZID concentrations will be calculated using Equation 1 from the Ocean Plan, the measured in-pipe constituent concentration, and the applicable D_m based on the flow of secondary effluent in the discharge at the time of sample collection.*

How will an average or median concentration be calculated if samples are collected during different secondary effluent discharge scenarios that have different applicable D_m values?

When the C_{ZID} is calculated, it is already normalized for the secondary effluent flow rate and applicable D_m at the time each individual sample was collected. Therefore, the average or median compliance C_{ZID} concentration is simply the average or median of the monthly (or other frequency) C_{ZID} concentrations. Compliance is still based on comparison of the average or median C_{ZID} with the numeric WQO.

How will it be decided which D_m to use when a composite sample is collected over a 24-hour period and the secondary effluent flow rate varies between the D_m flow ranges?

The composite sample is collected as a flow-weighted composite, meaning that the volume of sample collected at each specific time increment in the 24-hour period is proportioned based on the in-pipe flow rate. Thus, the average secondary effluent flow will be calculated for the 24-hour sampling period and the D_m applicable to the average secondary effluent flow will be used to calculate to C_{ZID}.

How will mass load be calculated, for comparison with the mass-based effluent limitations in the permit?

The mass-based effluent limitation for each constituent with a WQO will be the same as shown in M1W's current NPDES permit (based on the dry weather flow capacity of the RTP of 29.6 MGD).To determine compliance with the mass-based effluent limits, the mass load for each constituent in each sample will be calculated as it is currently done, where:

$$\text{Mass load}\ (\frac{\text{lbs}}{\text{day}}) = C_{in-pipe} * 0.00834 * Q_{discharge}$$

and: $C_{in\text{-}pipe}$ = *µg/L*

$Q_{discharge}$ = *MGD*

Will different Location IDs be required for each D_m?

No. Because the calculated C_{ZID} is already normalized for the appropriate D_m and there is only a single point of compliance assessment for each constituent—the numeric WQO at the ZID—different Location IDs will not be necessary.

Why is the proposed permitting approach based on C_{ZID} preferred over the approach using in-pipe concentration limits?

If in-pipe discharge concentration limits were to be employed, compliance monitoring and reporting would be much more complex. Instead of having one point of comparison for compliance determination (i.e., the Ocean Plan WQOs) there would be four points of comparison—a separate effluent limit associated with each of the four secondary effluent flow ranges, for each constituent. Likely, a separate Location ID would be needed for each D_m (i.e., each secondary effluent flow range), which would mean submitting four sets of data via the California Integrated Water Quality System database (CIWQS)—one for each location—versus the proposed approach which requires only one Location ID.

An additional complexity would be associated with calculating a 6-month median or 30-day average constituent concentration when each individual sample is possibly collected under a different secondary effluent flow range, each having a different applicable Dm. What effluent limit would the average or median discharge concentration be compared against if there were four effluent limits in the permit? One could calculate a flow-weighted D_m and corresponding flow-weighted effluent limit for comparison with the calculated average or median constituent concentration; however, this would increase the complexity of reporting and compliance determination on M1W's side, as well as regulatory compliance checks on the RWQCB's side. Calculating an average or median C_{ZID} concentration, on the other hand, is straight forward because the C_{ZID} concentration has already been normalized for the applicable D_m—and the compliance limit is the same over the entire secondary effluent flow range.

The Federal Standard Provisions for NPDES Permits (Attachment D, Provision V.E) requires the Regional Water Quality Control Board to be notified verbally of a noncompliant discharge event that may endanger health or the environment, within 24 hours of becoming aware of the circumstance. Will M1W be able to quickly check lab results for discharge compliance if they first must calculate the C_{ZID} concentrations for comparison with OP WQOs (i.e., compliance limits)?

Similar to the examples shown in Tables 3 and 4, M1W will have a simple Excel spreadsheet that will determine the applicable D_m, calculate the associated C_{ZID}, and compare the ZID concentration with the permit limit(s). All M1W has to enter into this Excel spreadsheet is (a) the RTP secondary effluent flow corresponding to the time of sample collection and (b) the laboratory measured result from the in-pipe sample. Except for one additional calculation (C_{ZID}), which can be done in the spreadsheet, this is no different from their current data review and reporting procedure. M1W's laboratory and compliance reporting staff will continue their commitment to a quick review of the sampled results so that they are able to adhere to all notification requirements in their NPDES Permit.

Is the proposed permitting approach conservative?

The intent of the Ocean Plan is for each constituent concentration at the edge of the ZID to be below its respective WQO. As shown in Figure 4, each of the four compliance D_m stair-steps is well below the modeled D_m values. Additionally, as shown in Figure 4, the regulatory compliance driver for M1W's waste discharge - ammonia, has estimated C_{ZID} concentrations projected to always be less than 80% of the Ocean Plan WQO. Therefore, this approach is conservative and will ensure compliance with the Ocean Plan WQO over the complete range of secondary effluent flows.

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