Attachment 1
Technical Memorandum: South Bay Salt Ponds Wet Transfer Standard/Salinity Limits

Summary
Discharge permits in the San Francisco Bay Region contain performance-based effluent limitations calculated at three standard deviations higher than the mean (i.e., the 99.87th percentile). This memorandum evaluates the attainability of such performance-based salinity limits for the initial release from salt ponds. To develop salinity limits for the initial release, we a) statistically analyzed data from each pond system over the last six years, and b) evaluated the potential impact to receiving waters. In statistically analyzing salinity values from each pond system, we considered the 99.87th percentile of salinities for the proposed time of discharge, salinities modeled by the Applicants, and salinity trends (due to the finite capacity to remove brines from the system) when performance-based salinities were lower than those modeled. For most pond systems (A14, A16, A19-21, B2, B2C, B6A, B11, and West Bay), we considered the values modeled by the Applicants (U.S. Fish & Wildlife Service and the California Department of Fish & Game) as acceptable for discharge. For pond systems A2W, A3W, A7, and B8A, we believe a lower salinity limit is necessary. This is because a statistical analysis of the data shows that these pond systems can meet lower limits, and/or that these limits are necessary to minimize elevated salinity in the receiving water. As a condition precedent to the transfer of operational and maintenance responsibility from Cargill to the Applicants for ponds transferred in a 'wet' condition, the liquid in such ponds must meet the applicable discharge requirements for the initial discharge of waters from such ponds as set in an Order adopted by the Board. The Board's discharge requirements, or the initial release salinity limits for the transfer of "wet" ponds, or the "Wet Transfer Condition," equals the salinity limits specified in Table 1 below.

Table 1 below summarizes the values modeled by the Applicants, the 99.87th percentile (based on field conversion factors, described in Attachment A), salinity trends, the proposed initial release salinity limit for each pond system, and the time period for the initial release.

Table 1: Transfer Standard and Initial Release Limits

Pond System[1]	Modeled	99.87th Percentile	Trend	Wet Transfer Std/Salinity Limit[3]	Time of Discharge
A2W	65	50	Increasing	60	March-July
A3W	65	46	No Trend	50	March-July
A7	110	73	Increasing	90	March-July
A14[2]	100	83	Increasing	100	March-April
A16	135	80	Increasing	135	March-April
A19-21	135	> 135	NA	135	March-April
B2	65	68	NA	65	March-July
B2C	100	118	NA	100	March-April
B6A	135 (dry)	> 150	NA	65	March-April
B8A	135	>150	NA	65	March-April
B11	65	79	NA	65	March-July
West Bay	135	> 150	NA	135	March-April

[1] To develop performance based limits, Board staff considered data from (a) March and April for Pond Systems A14, A16, A19-21, B2C, B6A, B8A, and West Bay; and (b) March through July for Pond Systems A2W, A3W, A7, B2, and B11.

[2] Salinity data from Pond System A14 did not fit a normal distribution. Since the discharge pond (A14) for this system represents the higher end of salinity levels and fit a normal distribution, Board staff used it to calculate the 99.87th percentile shown in Table 1.

[3] Pursuant to the Phase-Out Agreement, Cargill may transfer these pond systems anytime during year provided the ponds proposed for transfer meet the Wet Transfer Standard values specified in Table 1 (see Table 2 for batch ponds).

In some cases, the modeled values shown in Table 1 (initial discharge limits proposed by the Applicants) are much higher than the proposed limits. This is because the Applicants based their assessment of attainability on year-round salinity data. Since the time-period for the initial discharge will be limited to the spring season to minimize elevating receiving water salinity, we only used salinity data from this relevant time-period in calculating performance-based limits.

As part of the agreement with the Applicants, Cargill is responsible for managing the ponds to be transferred in a wet condition until the liquid in the ponds meet the applicable salinity discharge requirements for initial release of waters from such ponds (also known as the Wet Transfer Condition). In order to satisfy the conditions of the Wet Transfer Standard, the proposed limits in Table 1 must be met (batch ponds are further addressed below).

Transfer Standard for Batch Ponds. As the initial release period will not include batch ponds, the Applicants have not modeled the potential effect on water quality of discharges from these ponds. Under continuous circulation, the Applicants might need to route waters from batch ponds into pond systems that will discharge to the bay or sloughs, but it should be able to do so at a rate that will not significantly affect water quality. To ensure that batch ponds do not approach levels where gypsum (calcium sulfate) could precipitate out, the Applicants need to prevent salinity levels from exceeding 135 ppt. Table 2 below summarizes salinity levels (in parts per thousand) in batch ponds from four different pond systems and proposes a salinity level to serve as the 'Wet Transfer Standard,' since the Applicants do not contemplate an initial release from such ponds.

Table 2: Year-Round Wet Transfer Standard for Batch Ponds

Pond System	Pond Number	Proposal	Year-Round 99.87th(1)	Wet Transfer Std.
A3W	A3N	65	NA	65
A7	A8	110	120	110
A14	A12	100	68	100
A14	A13	100	85	100
A14	A15	100	111	100
B8A	B12	135	>150	135
B8A	B13	135	>150	135
B8A	B14	135	>150	135

[1] Based on data from 1997 through 2002.

Introduction

This memorandum used a technical and water quality based approach to develop salinity limits for the initial release. It also documents that a salinity limit of 44 ppt for the continuous circulation period will not adversely affect water quality. The technical approach involved statistically analyzing salinity values in each pond system to determine performance-based limits and the attainability of these limits by conducting a trend analysis. The water quality based approach evaluated the expected salinity increase in the Bay and sloughs to determine if more stringent salinity limits are needed.

Performance-Based Limits

To calculate salinity levels at extreme percentiles from each pond system (in this case 99th and 99.87th percentiles), it was necessary to fit data to a normal distribution. This was possible for every pond system with the exception of A14. For pond system A14, Board staff used data from the discharge pond only. Table 3 below indicates the transformation performed to fit data to a normal distribution. It also indicates data points that we removed because these points did not appear to be representative of current salinity levels.

Table 3: Transforming Data Sets to a Normal Distribution

Pond System	Transformation	Data Set
A2W	Logarithmic	1997-2002 (March-July)
A3W	Identity	1997-2002 (March-July)
A7	Logarithmic	1997-2002 (March-July)
A14	Identity	1997-2002 (March-April)
A16	Fourth power	1997-2002 (March-April)
B2	Reciprocal Square	1997-2002 (March-July)[1]
B2C	Identity	2000-2002 (March-April)
B6A	Reciprocal	2000-2002 (March-April)
B8A	Reciprocal Cube	2000-2002 (March-April)
B11	Logarithmic	1997-2002 (March-July)[2]

[1] This data set does not include salinity values from ponds 4 and 7 for July 1999, as they do not appear to be representative of levels that the Applicants could discharge during the initial release.

[2] This data set does not include salinity values from 1998, as they do not appear to be representative of levels that the Applicants could discharge during the initial release.

After transforming the data, we were able to calculate the 99th percentile (mean plus 2.326 standard deviations and 99.87th percentile (mean plus 3 standard deviations) for each pond system. Table 4 below shows the values modeled by the Applicants, and the 99th and 99.87th percentiles from each pond system based on the field conversion (see Appendix A).

Table 4: Summary of Discharge Pond Salinities

		Field Conversion Percentile		
Pond System[1]	Modeled	99th	99.87th	Data Set
A2W	65	43	50	March-July
A3W	65	42	46	March-July
A7	110	66	73	March-July
A14[1]	100	79	83	March-April
A16	135	77	80	March-April
B2	65	56	68	March-July
B2C	100	106	118	March-April
B6A	135 (dry)	>150	>150	March-April
B8A	135	>150	>150	March-April
B11	65	65	79	March-July

[1] Salinity data from Pond System A14 did not fit a normal distribution. Since the discharge pond for this system represents the higher end of salinity levels, Board staff used it to calculate the extreme percentiles shown in Table 4.

The basis for using 99th percentile for limits on the initial release is from the State Implementation Policy (SIP) while the basis for using the 99.87th percentile is from previous permits adopted by the Board. The difference depends on whether one is setting final or interim limits. To develop final water quality based effluent limits, Board staff follows guidance outlined in the SIP. The SIP equates the maximum daily effluent limitation with the 99th percentile of required performance. However, in this case, the initial release will occur over an eight-week period, and therefore, is interim in nature. In previous permitting actions, the Board has set interim limits based on the 99.87th percentile. For this reason, this memorandum used the 99.87th percentile in developing limits for the initial release.

Attainability of Performance-Based Limits

In order to evaluate the attainability of performance-based salinity limits set at 99.87th percentile, we performed a trend analysis on pond systems (i.e., Alviso Ponds) where the performance-based values were lower than those modeled by the Applicants. The purpose of the trend analysis was to take into account the finite capacity to remove brines from the system. For ponds in the Alviso System, current salinities are much lower than those proposed by the Applicants, while ponds in the Baumberg system currently contain salinities that are much higher than those proposed. This is because Cargill recently focused its efforts on reducing salinity levels in Alviso Systems. As Cargill shifts its efforts towards reducing salinity levels in Baumberg ponds, it has indicated that salinities in Alviso Ponds will continue to creep higher.

To address salinity creep in Alviso ponds that are exhibiting increasing trends, we are proposing limits that are higher than the 99.87 percentile of data from 1997 through 2002. We based this increase on linear regressions that used data from 2000 through 2003, accounted for seasonality in ponds A7 and A16 by using cosine and sine functions, and time scale plots (shown in Appendix B) of salinity in ponds A2W and A14 (these ponds did not exhibit linear trends). As trend analyses have to be performed on individual ponds, we used the discharge pond from each system because these ponds contain the highest salinity values and represent a worst-case scenario. Table 5 below includes the pond analyzed, regression equation, regression-coefficient (R^2), and standard error.

Table 5: Regression Equations for Ponds A7 and A16

Pond	Regression Equation	R^2	Standard Error
A7	$\ln(A7) = -128.74 + .06518(\text{Date}) - .09821\cos(2\pi * \text{Date}) - .14411\sin(2\pi * \text{Date})$	0.77	0.08845
A16	$(-1/A16) = -20.746 + 0.01030(\text{Date}) - .00542\cos(2\pi * \text{Date}) - .00821\sin(2\pi * \text{Date})$	0.61	0.01222

In order to provide some certainty in the Applicants ability to meet salinity limits for pond systems that are exhibiting increasing trends, we based the limits on the 99th percentile of the expected values for the expected time of discharge. This resulted in a value of 86 ppt for an initial release in July 2004 from pond A7 (~90 ppt) and a value of 131 ppt for an initial release in April 2005 from pond A16 (~135 ppt). This represents an increase of about 15-65% above the 99.87th percentile of data from 1997-2002. For pond systems A2W and A14, we believe the limit should be set at the lower end of the increases documented for pond systems A7 and A16 (~15%) because the trends in these pond systems, while increasing, appear to be doing so at a slower rate (time-scale plots are provided in Appendix A). For pond system A2W, a 15% increase results in a limit of about 60 ppt, while for pond system A14, it results in a limit of about 100 ppt. In the subsections below, we provide the rational for salinity limits in each pond system by also considering potential impacts to water quality. Appendix C documents the magnitude and spatial scale of salinity increases in each receiving water under the initial release and for reference, under the continuous circulation period.

Pond System A2W

Pond system A2W will discharge waters to the Bay. To represent worst-case conditions, the Applicants modeled discharges from this system at 65 ppt. This showed that salinity levels near the discharge would increase by about 3 ppt during the initial release. While a performance-based statistical analysis indicates that the Applicants should be able to meet an effluent limitation of 50 ppt, a trend analysis indicates that salinities are increasing. Therefore, in this system, we believe a salinity limit higher than the performance-based value is appropriate. To address increasing trends, we propose that the salinity limit for initial release be set at 60 ppt. The initial release of waters from pond system A2W must commence between March and July.

Pond System A3W

Pond system A3W will discharge waters to Guadalupe Slough, which does not provide as much mixing as the Bay. To represent worst-case conditions, the Applicants modeled discharges from this system at 65 ppt. This showed that average salinity levels near the discharge would increase by about 16 ppt during the initial release, effectively shifting the salinity gradient a few km upstream, with maximum daily average salinities exceeding 38 ppt in parts of the slough (Appendix C). A performance-based statistical analysis indicates that the Applicants should be able to meet an effluent limitation of 46 ppt (~50 ppt), and a trend analysis does not show that salinities are increasing in this system. Therefore, we propose that the limit for the initial release be set at 50 ppt. The initial release of waters from pond system A3W must commence between March and July.

Pond System A7

Pond system A7 will discharge waters to Alviso Slough. To represent worst-case conditions, the Applicants modeled discharges from this system at 110 ppt. This showed that salinity levels near the discharge would increase by about 20 ppt during the initial release with maximum daily average salinities exceeding 38 ppt in parts of the slough (Appendix C). While a performance-based statistical analysis indicates that the Applicants should be able to meet an effluent limitation of 73 ppt, a trend analysis indicates that salinities are increasing in this system. Therefore, in this system, we believe a salinity limit higher than the performance-based value is appropriate. To address increasing trends and to minimize elevated salinity in the receiving water, we propose that the salinity limit for initial discharge be set at 90 ppt. The initial release of waters from pond system A7 must commence between March and July.

Pond Systems A14 and A16

Pond system A14 will discharge waters to Coyote Creek and pond system A16 will discharge waters to Artesian Slough. We evaluated these two discharges concurrently because of their proximity to one another. To represent worst-case conditions, the Applicants modeled discharges from A14 at 100 ppt and from A16 at 135 ppt. This showed that salinity levels near the discharge would increase by about 14 ppt during the initial release with maximum daily average salinities exceeding 32 ppt in parts of the slough (Appendix C). While a performance-based statistical analysis indicates that the Applicants should be able to meet an effluent limitation of 83 ppt from A14 and 80 ppt from A16, a trend analysis indicates that salinities are increasing in both systems. Therefore, in these systems, we believe that a salinity limit higher than the performance-based value is appropriate. To address increasing trends and to minimize elevated salinity in the receiving water, we propose that the salinity limit for initial discharge from be set at 100 ppt for A14 and 135 ppt for A16. The initial release of waters from pond systems A14 and A16 must commence between March and April.

Island Ponds A19-A21

Pond system A19-A21 will discharge waters to Coyote Creek. To represent worst-case conditions, the Applicants modeled discharges from this system at 135 ppt. This showed that salinity levels near the discharge would increase by about 12 ppt during the initial release with maximum daily average salinities exceeding 30 ppt in parts of the slough (Appendix C). At this time, salinities in Island Ponds are well above 135 ppt, therefore a performance-based statistical analysis on past data would not provide any insight. Since modeling shows that salinity increases should have a minimal effect on receiving water salinity, we believe the limit for the initial release should be set at 135 ppt. The initial release of waters from the Island Ponds must commence between March and April.

Pond System B2

Pond system B2 will discharge waters to the Bay. To represent worst-case conditions, the Applicants modeled discharges from this system at 65 ppt. This showed that salinity levels near the discharge would increase by about 3 ppt during the initial release. As the Applicant has proposed meeting a salinity limit that is lower than the performance-based limits calculated by staff (68 ppt), and modeling shows minimal affects, we believe the limit for the initial release should be set at 65 ppt. The initial release of waters from pond system B2 must commence between March and July.

Pond System B2C

Pond system B2C will discharge waters to Alameda Flood Control Channel. To represent worst-case conditions, the Applicants modeled discharges from this system at 100 ppt. This showed that salinity levels near the discharge would increase by about 14 ppt during the initial release with maximum daily average salinities exceeding 41 ppt in parts of the slough (Appendix C). As the Applicant has proposed meeting a salinity limit that is significantly lower than the performance-based limits calculated by staff (118 ppt), we believe the limit for the initial release should be set at 100 ppt. The initial release of waters from pond system B2C must commence between March and April.

Pond Systems B6A and B8A

Pond systems B6A and B8A will both discharge to Old Alameda Creek. To represent worst-case conditions, the Applicants modeled discharges from B8A at 135 ppt. In this analysis, the Applicants assumed that B6A would not discharge waters during the initial release period (the pond will be transferred “dry” as defined in the transfer Agreement between the Applicant and Cargill). Additionally, the Applicants could not perform three-dimensional modeling on Old Alameda Creek because of its small dimensions, and therefore, used a one-dimensional model (the Corps of Engineers HEC-RAS). This analysis showed that the average salinity in portions of Old Alameda Creek would be about 70 ppt for a week, which would likely result in severe impacts to resident aquatic species, including benthic, invertebrate, and fish communities. The Applicant has proposed to meet a salinity limit for B8A that is lower than the performance-based limits calculated by staff (> 150 ppt); however, the impacts from its proposal are likely to be severe. Therefore, we believe that a lower salinity limit is necessary to minimize water quality impacts. As such, we propose setting the limit for the initial release at 65 ppt. This stringent of a limitation is necessary to reduce impacts to a larger number of species. Using the assumptions provided by the Applicants (40% pond water and 60% creek water at a salinity of 22 ppt), an initial discharge at 65 ppt would result in an average salinity in portions of Old Alameda Creek of about 40 ppt for one week. Recently, the Applicants indicated that pond system B6A might contain salinity levels as high as 65 ppt when if first starts discharging due to small amounts of residual higher salinity waters in the ditches and low points of the “dry” ponds. In our view, the Applicants may discharge salinity levels up to 65 ppt from B6A provided it either (a) staggers the initial release from B6A and B8A so that the different time periods of initial release do not overlap, or (b) meters the flow to ensure that Old Alameda Creek contains at least 60% bay water if the initial release from pond systems B6A and B8A occur at the same time. The initial release of waters from pond systems B6A and B8A must commence between March and April.

Pond System B11

For the initial release, pond system B11 will discharge waters to the Bay. The Applicants propose to a) operate pond 10 of this system as a muted tidal system under the initial release, and b) route waters from pond 10 to 11 for discharge to Mount Eden Creek under the continuous circulation period. The Applicants propose to discharge waters from this system at a maximum salinity of 65 ppt, which should not result in significant increases in Bay salinity. Since the Applicants have proposed meeting a salinity limit that is significantly lower than the performance-based limits calculated by staff (79 ppt), we believe the limit for the initial release should be set at 65 ppt. The initial release of waters from pond system B11 must commence between March and July.

West Bay Ponds

For the initial release, ponds 1 and 4 will discharge to lower Ravenswood Slough, and pond system SF-2 will discharge to the Bay. To represent a worst-case scenario, the Applicants modeled discharges from this system at 135 ppt. In this analysis, the Applicants propose to phase the initial release by discharging surface waters from ponds 1 and 4 to lower Ravenswood slough until salinities in these ponds reach approximately 50 ppt. At this point, the Applicants propose to connect Pond 2 to Pond 1, and Pond 3 to Pond 4 to dilute the salinity levels in Ponds 2 and 3 before releasing waters from these ponds. This analysis showed that maximum daily average salinity levels should increase by about 5 ppt near the discharge point. For the initial release from pond system SF-2, the Applicant predicts a maximum increase in daily average salinity to be 2 to 4 ppt near the discharge point. As the Applicant has proposed meeting a salinity limit that is significantly lower than the performance-based limit calculated by staff (> 150 ppt), and increases in receiving water salinity appear to be minimal, we believe the limit for the initial release should be set at 135 ppt. The initial release of waters from the West Bay Ponds must commence between March and April.

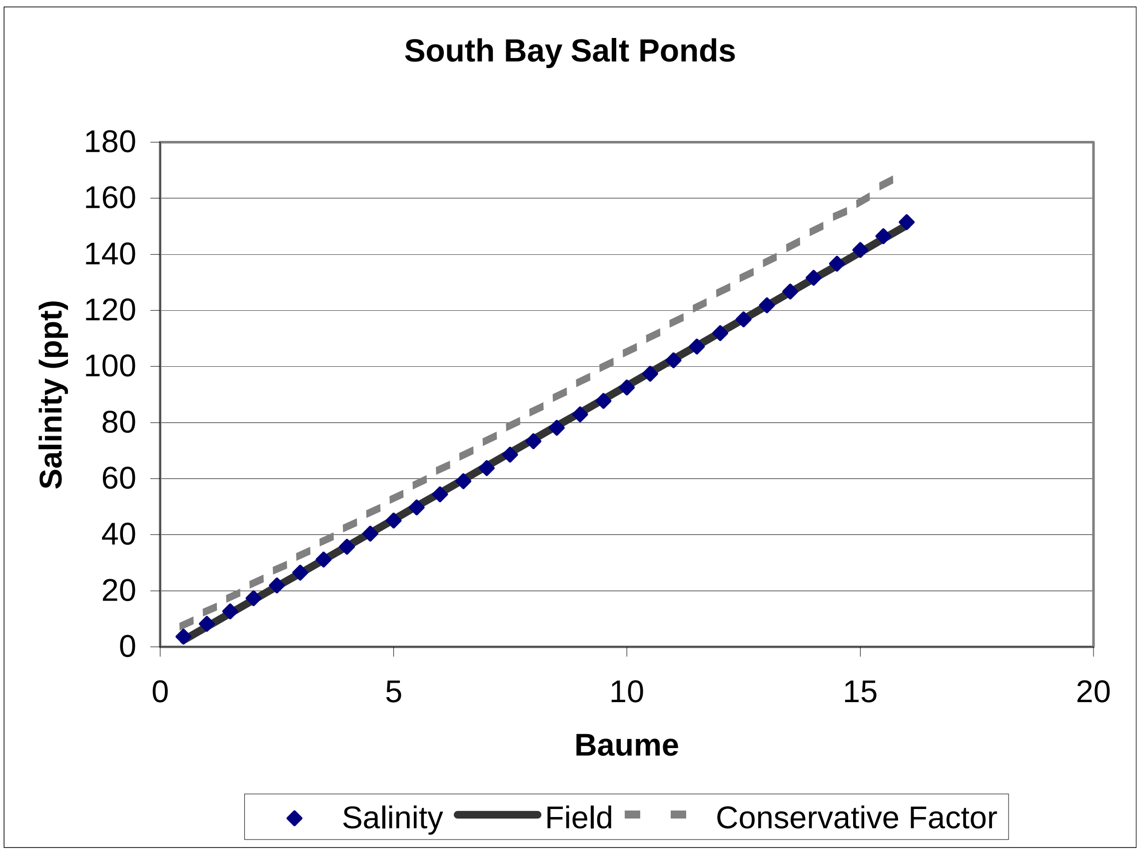
Conclusion

This memorandum includes Wet Transfer Standard values for all ponds (i.e., ponds that will discharge under the initial release scenario and batch ponds). It bases the Wet Transfer Standard and initial release limits on a statistical analysis of data from each pond system (i.e., calculation of extreme values and trends), and potential impacts to receiving waters, as determined by dynamic modeling. For most pond systems (A14, A16, A19-21, B2, B2C, B6A, B11, and West Bay), we consider the values modeled by the Applicants as acceptable for discharge during the time-periods proposed. For pond systems A2W, A3W, A7, and B8A, we believe a lower salinity limit is necessary. This is because a statistical analysis shows that these limits are achievable, and/or modeling results indicate that lower limits are necessary to minimize water quality impacts, given the proposed location of the discharge in sloughs that receive less mixing.

Appendix A: Baume to Salinity Conversion
Appendix B: Time Scale Plots of Pond Salinities
Appendix C: Magnitude and Spatial Scale of Salinity Increases under the Initial Release and the Continuous Circulation Period

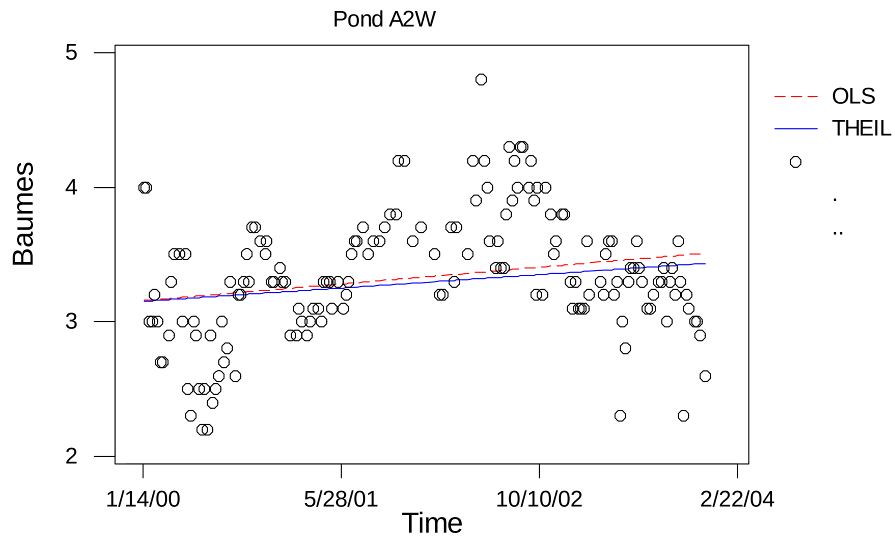
Baume to Salinity Conversion

In order to manage its pond systems, Cargill usually conducts salinity measurements in baumes on a weekly basis. To evaluate the salinity levels proposed by the Applicants for the initial release, we requested that Cargill provide salinity values from each pond system. To address our concerns, Schaaf and Wheeler, the Applicants' technical consultant, provided pond salinities in baumes, a conversion factor to parts per thousand based on field measurements performed by Dr. Steve Hansen (technical consultant to Cargill), and a more conservative conversion factor developed by the Applicants. The plot below shows salinity values measured by Dr. Steve Hansen on the vertical axis and corresponding Baume measurements on the horizontal axis. The best-fit line equation is based on a linear regression, which shows a nearly perfect correlation between field salinity and field Baume measurements ($R^2 = 0.9999$). The Applicants also developed a conservative conversion factor line (dotted) that it based on a sodium chloride equivalent.

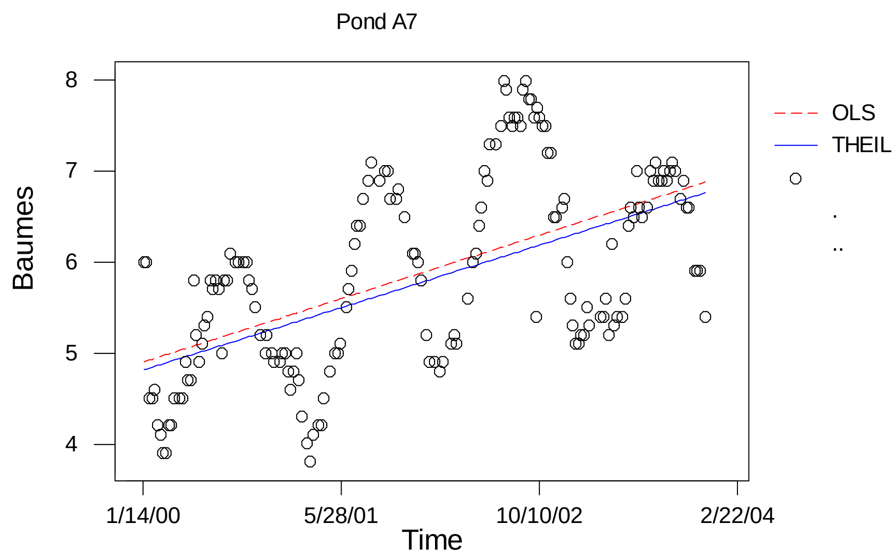


Since the field baume measurements correlate extremely well with the salinity measurements, it is our position that the field conversion factor should be used to determine performance-based salinity limits for the initial discharge.

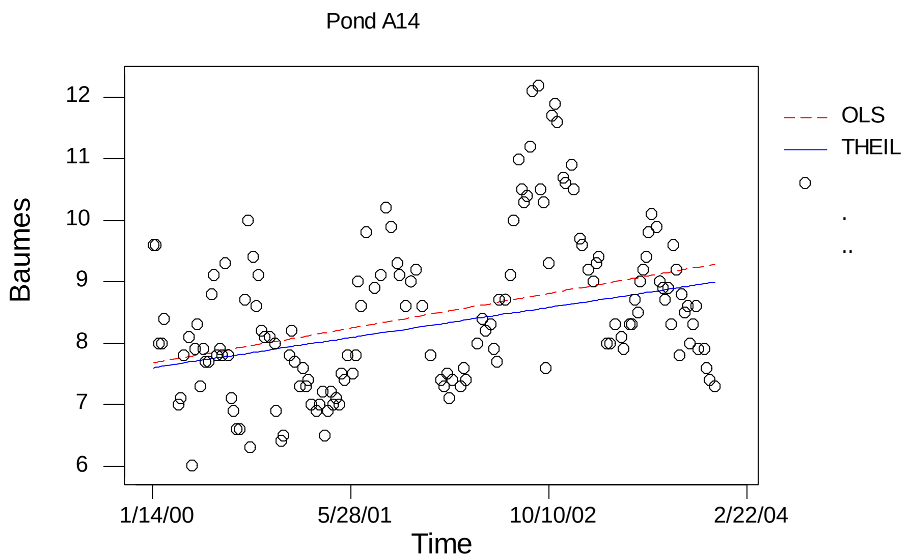
Graph 1: Time Scale Plot of Pond A2W Salinities



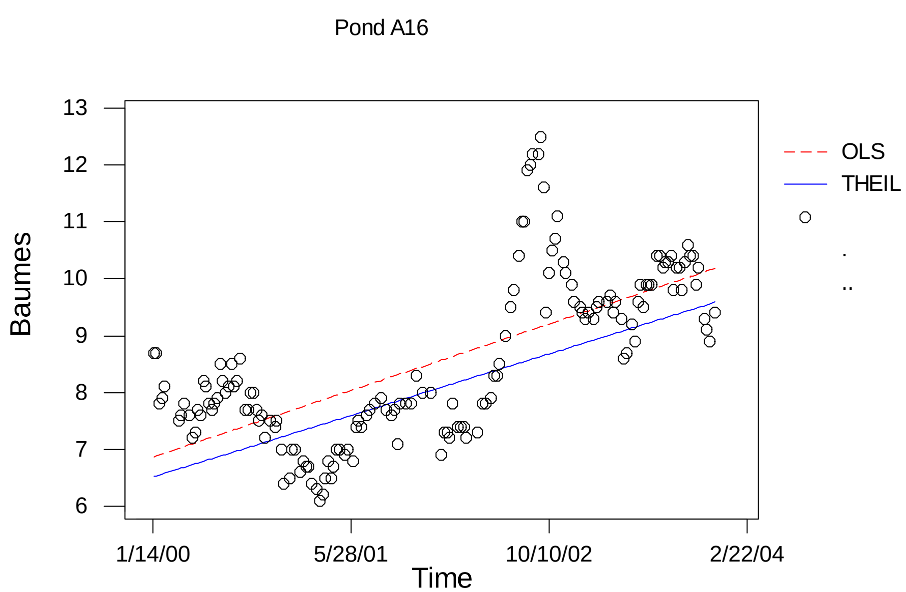
Graph 2: Time Scale Plot of Pond A7 Salinities



Graph 3: Time Scale Plot of Pond A14 Salinities



Graph 4: Time Scale Plot of Pond A16 Salinities



Salinity Increases for the Initial Release and Continuous Circulation Period

Tables 1, 2, and 3 are from the Discharger's Environmental Impact Report (EIR). Table 1 describes the potential effect of salinity levels on aquatic organisms. Tables 2 and 3 summarize the magnitude, duration, and spatial scale of salinity increases. Table 2 summarizes these increases for the initial release period, while Table 3 is for the continuous circulation period.

Table 1. Summary of Potential Salinity Response Characteristics (Summer Conditions)[1]

Class	Salinity Range	Potential Response
Ambient	<33	Benthic species population may vary depending upon species salinity preferences.
Drought	33-35	Chronic exposure: benthic community changes to salinity tolerant species similar to drought years, effects quickly reversed with normal salinity regime. Acute exposure: less of a shift is species composition. In either case, impacts less than significant
Salinity ranges above those encountered in South Bay		
Stage 1	36-38	Chronic exposure: benthic community may lose most sensitive species, impacts considered potentially significant. Acute exposure: less impact on community, impacts considered less than significant.
Stage 2	39-41	Chronic exposure: benthic community may lose larger number of species, impacts considered significant. Acute exposure: less impact on community, impacts considered potentially significant.
Stage 3	41-45	Chronic exposure: community may be limited to most salinity tolerant species, impacts considered significant. Acute exposure: less impact on community but still lose of large number of species, impacts considered significant.
Stage 4	>45	For both chronic and acute exposures, community would be severely reduced. In either case, impacts considered significant.
NOTE: Response criteria based on scant scientific data for local species and therefore must be considered speculative.		

[1] The EIR indicates that the Discharger based the stages on some species that do not inhabit the bay. This is because there is limited information on the tolerance of native species.

Table 2: Modeled Salinity Increases for the Initial Release

			Acres By Salinity Class[1]							
Receiving Water	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**
SF Bay – Alviso										
April Discharge	4-Apr									
Daily Maximum (2-hr)[5]		29,536	27,869	849	316	198	256	48		1.0
Daily Average (24-hr)[6]		29,546	28,775	385	198	168	10	10		0.6
July Discharge	4-Jul									
Daily Maximum (2-hr)[5]		29,536	22,120	5,387	1,384	376	206	63		0.9
Daily Average (24-hr)[6]		29,546	25,108	3,341	603	119	336	40		1.7
SF Bay – Baumberg										
April Discharge	23-Apr									
Daily Maximum (2-hr)[5]		11,868	11,495	304	49	10	5	5		0.1
Daily Average (24-hr)[6]		11,868	11,631	168	49	0	10	10		0.2
July Discharge	4-Jul									
Daily Maximum (2-hr)[5]		11,868	10,885	563	306	99	10	5		0.1
Daily Average (24-hr)[6]		11,868	11,186	385	208	89	0	0		0.7
Coyote Creek										
April Discharge	5-May									
Daily Maximum (2-hr)[5]		1,232	1,212.5	1.7	0.9	0.3	0.2	4.2		0.4
Daily Average (24-hr)[6]		1,232	1,226.4	1.1	0.8	0.0	0.2	3.2		0.3
*Island Ponds***										
Breach		1,236	1,233	3	0	0	0	0		0.0
Alviso Slough										
April Discharge	8-Apr									
Daily Maximum (2-hr)[5]		273	120.5	21.8	73.5	54.2	2.5	0.3		1.0
Daily Average (24-hr)[6]		273	224.7	43.2	4.6	0	0.2	0.0		0.0
July Discharge	16-Jul									
Daily Maximum (2-hr)[5]		273	151.5	19.6	67	28.0	5.6	1.1		2.4
Daily Average (24-hr)[6]		273	271.0	1.5	0.2	0.0	0.0	0.0		0.0
Guadalupe Slough										
April Discharge	22-Apr									
Daily Maximum (2-hr)[5]		376	368.3	4.0	1.7	1.4	0.2	0.2		0.1
Daily Average (24-hr)[6]		376	369.9	3.6	1.7	0.5	0.2	0.0		0.2

			Acres By Salinity Class[1]							
Receiving Water	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**
July Discharge	24-Jul									
Daily Maximum (2-hr)[5]		376	158.3	92.4	121.3	3.3	0.3	0.2		0.1
Daily Average (24-hr)[6]		376	299.5	75.1	1.2	0.0	0.0	0.0		0.0
Alameda FCC										
April Discharge	2-May									
Daily Maximum (2-hr)[5]		254	132.0	15.5	17.9	60.2	28.3	0.2	1 day	11.2
Daily Average (24-hr)[6]		254	187.1	64.7	2.1	0.1	0.0	0.1		0.0
Old Alameda Creek*										
April Discharge										
Daily Maximum (2-hr)[5]		70						70	2 weeks	100
Daily Average (24-hr)[6]		70						70	2 weeks	100
Ravenswood Slough	3-Mar									
Daily Maximum (2-hr)[5]		116	20	58	15	15	4	4		6.9
Daily Average (24-hr)[6]		116	104	8	4	0	0	0		0
All Sloughs (Total)										
April Discharge	varies									
Daily Maximum (2-hr)[5]		2,321	1,853	101	111	131	35	79		4.8
Daily Average (24-hr)[6]		2,321	2,112	121	13	1	1	73		3.4
July Discharge	Varies									
Daily Maximum (2-hr)[5]		2,321	1,674	187	222	107	39	80		5.1
Daily Average (24-hr)[6]		2,321	2,088	150	8	0	0	73		3.3

Notes:

[1] Ambient Conditions = <33ppt salinity; Drought Conditions = 33-35 ppt salinity; Stage 1 = 36-38 ppt salinity; Stage 2 = 36-38 ppt salinity; Stage 3 = 42-45 ppt salinity; Stage 4 = >45 ppt salinity

[2] Date of maximum day of areal impact during IRP.

[3] Duration of period with 10% or more of area within significant category.

[4] Context – Areal extent of significant intensity classes; greater than 10% considered significant.

[5] Daily maximum salinity predicted for approximately 2 hours of maximum day of IRP.

[6] Daily average salinity over 24 hours of maximum day of IRP.

*** Old Alameda Creek was not modeled in the same detail as the other receiving waters.**

Table 3: Modeled Salinity Impacts for Late Summer Conditions during the Continuous Circulation Period

			Acres By Salinity Class[1]							
Receiving Water	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**
SF Bay – Alviso										
Daily Maximum (2-hr)[5]		11,868	11,243	620	5	0	0	0		0
Daily Average (24-hr)[6]		11,868	11,598	270	0	0	0	0		0
SF Bay – Baumberg										
Daily Maximum (2-hr)[5]		29,536	7,386	22,150	20	0	0	0		0
Daily Average (24-hr)[6]		29,536	11,816	17,720	0	0	0	0		0
Coyote Creek										
Daily Maximum (2-hr)[5]		1,232	1,168	61	3.2	0	0	0		0
Daily Average (24-hr)[6]		1,232	1,202	30	0	0	0	0		0
Alviso Slough										
Daily Maximum (2-hr)[5]		273	270	3	0.1	0	0	0		0
Daily Average (24-hr)[6]		273	271	2	0	0	0	0		0
Guadalupe Slough										
Daily Maximum (2-hr)[5]		376	372	4	0.2	0	0	0		0
Daily Average (24-hr)[6]		376	373	3	0	0	0	0		0
Alameda FCC										
Daily Maximum (2-hr)[5]		254	102	152	0.2	0	0	0		0
Daily Average (24-hr)[6]		254	164	80	0	0	0	0		0
Old Alameda Creek*										
Daily Maximum (2-hr)[5]		70	0	70	0.1	0	0	0		0
Daily Average (24-hr)[6]		70	0	70	0	0	0	0		0
Ravenswood Slough										
Daily Maximum (2-hr)[5]		116	0	56	25	25	10	0		8.6
Daily Average (24-hr)[6]		116	0	116	0	0	0	0		0
All Sloughs (Total)										
Daily Maximum (2-hr)[5]		2,341	1,911	346	28.8	25	10	0		0.4
Daily Average (24-hr)[6]		2,341	2,020	301	0	0	0	0		0

Notes:

[1] Ambient Conditions = <33ppt salinity; Drought Conditions = 33-35 ppt salinity; Stage 1 = 36-38 ppt salinity; Stage 2 = 36-38 ppt salinity; Stage 3 = 42-45 ppt salinity; Stage 4 = >45 ppt salinity

[2] Date of maximum day of areal impact during IRP.

[3] Duration of period with 10% or more of area within significant category.

[4] Context – Areal extent of significant intensity classes; greater than 10% considered significant.

[5] Daily maximum salinity predicted for approximately 2 hours of maximum day of IRP.

[6] Daily average salinity over 24 hours of maximum day of IRP.

Attachment 2

Technical Memorandum: South Bay Salt Ponds Translator Study for Nickel and Copper

Summary

The purpose of this memorandum is to show that during the continuous circulation period, the predicted concentrations for copper and nickel associated with the proposed salinity limit will be protective of beneficial uses. This memorandum summarizes the Translator Study (hereafter Study) for nickel and copper conducted by the Applicants for Old Alameda Creek and Alameda Flood Control Channel (AFCC). It also describes a copper translator completed by Board staff for the Regional Monitoring Program (RMP) station at Dumbarton Bridge. Table 1 below summarizes the results of these efforts and shows that the estimated maximum concentration of copper and nickel in Baumberg pond discharges should not exceed site-specific water quality objectives (WQOs) under the continuous circulation period.

Table 1: Converted Site-Specific Objectives[1] for Copper and Nickel

	Dumbarton Bridge		**Old Alameda Creek**		**AFCC**		**Estimated**
Pollutant	**Chronic**	**acute**	**chronic**	**acute**	**chronic**	**acute**	Maximum
Copper	4.6	5.5	7.2	7.1	5.7	6.9	4.3
Nickel	NA	NA	20.3	226	16.3	231	11.8

[1] All values are in μg/L.

Introduction

The values estimated by the Applicants in its Report of Waste Discharge exceeded the WQO for total nickel of 7.1 μg/L from the Basin Plan and the WQO for total copper of 3.7 μg/L (using a default translator to convert from dissolved to total) from the California Toxics Rule (CTR). These WQOs are typical values based on default site conditions and assumptions. However, site-specific conditions such as water temperature, pH, hardness, concentrations of metal binding sites, particulates organic carbon, dissolved organic carbon, and concentrations of other chemicals can greatly impact the chemical toxicity. The purpose of a translator is to adjust these default assumptions for varying site-specific conditions to prevent exceedingly stringent or under protective WQOs.

Translator Study

The intention of the Study was to address potential exceedances in Old Alameda Creek, Mount Eden Creek, and Alameda Flood Control Channel of copper and nickel WQOs under continuous discharges. Since Old Alameda Creek and Mount Eden Creek primarily contain bay water and are hydrologically directly connected, the translator for Old Alameda Creek is applicable to Mount Eden Creek.

To best represent receiving waters under continuous circulation, the Applicants collected samples from Old Alameda Creek, Alameda Flood Control Channel, and from salt ponds with salinities near 44 ppt (the proposed salinity limit); and instructed the contract laboratory (Frontier Geosciences Inc.) to mix these samples with pond waters at a ratio predetermined by hydrologic modeling. Frontier Geosciences analyzed these samples for pH, salinity, total suspended solids, total recoverable and dissolved nickel and copper.

Data Analysis

The two methodologies that are typically used in developing a translator include calculating it (a) directly from the ratio of dissolved to total, and (b) based on the relationship between fraction dissolved and total suspended solids (TSS). The U.S. EPA's *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion*, EPA Publication Number 823-B-96-007 indicates that using the direct calculation is appropriate if the fraction dissolved does not correlate with TSS.

In this case, the Study determined that the fraction of dissolved copper and nickel in Old Alameda Creek and Alameda Flood Control Channel strongly correlate with TSS. Table 2 below provides the logarithmic relationship between fraction dissolved and TSS as well as the coefficient of regression.

Table 2: Correlation of Nickel and Copper with TSS

	Nickel		**Copper**	
Receiving Water	**Regression Equation**	**R^2**	**Regression Equation**	**R^2**
Old Alameda Creek	F_d = -0.221*ln(TSS) +1.313	0.96	F_d = -0.209*ln(TSS) +1.34	0.93
Alameda Flood Control Channel	F_d = -0.208*ln(TSS) +1.258	0.76	F_d = -0.198*ln(TSS) +1.321	0.76

Staff Analysis

In order to calculate site-specific objectives, we had to first ensure that default WQOs were expressed in the dissolved form. Since the CTR expresses WQOs in the dissolved form, we did not have to make any adjustments for copper. However, the nickel WQO is from the Basin Plan and is expressed in the total recoverable form. To convert the nickel WQO from total to dissolved, we used the default CTR conversion factor. This is because the CTR conversion factors are derived under the same laboratory conditions under which the Basin Plan WQOs were developed.

Once we converted WQOs to the dissolved form, we used translators to develop site-specific WQOs. As the Study shows there is a strong correlation between TSS and nickel/copper, we used the regression equations in Table 2 to develop translators for nickel and copper in Old Alameda Creek and Alameda Flood Control Channel. We based the chronic translator on the median of TSS values, and the acute translator on the 10^{th} percentile of TSS values. Table 3 and 4 below show the results of the analysis described above:

Table 3: Translated WQOs for Old Alameda Creek/ Mount Eden Creek

Pollutant	Applicable most stringent WQOs		CTR Conversion Factors		Applicable WQOs basis	Converted dissolved WQOs		Old Alameda Creek-translators		Converted Site-Specific WQOs (total)	
	chronic	acute	Chronic	acute		chronic	Acute	chronic	acute	chronic	acute
Copper	3.1	4.8	NA	NA	CTR, sw	NA	NA	0.43	0.68	7.2	7.1
Nickel	7.1	140	0.99	0.99	BP, sw	7.029	138.6	0.35	0.62	20.3	225.8

Table 4: Translated WQOs for Alameda Flood Control Channel (AFCC)

Pollutant	Applicable most stringent WQOs		CTR Conversion Factors		Applicable WQOs basis	Converted dissolved WQOs		AFCC – translators		Converted Site-Specific WQOs (total)	
	chronic	acute	Chronic	acute		chronic	acute	chronic	acute	chronic	acute
Copper	3.1	4.8	NA	NA	CTR, sw	NA	NA	0.54	0.70	5.7	6.9
Nickel	7.1	140	0.99	0.99	BP, sw	7.029	138.6	0.43	0.60	16.3	231

The converted site-specific WQOs for copper and nickel in Old Alameda Creek and Alameda Flood Control Channel shown in Tables 3 and 4 are greater than the estimated maximum concentration of these two pollutants. As such, the proposed circulation of waters through the Baumberg System to nearby sloughs should not cause an exceedance of site-specific WQOs for nickel and copper.

Copper Translator for Bay Discharges North of Dumbarton Bridge

For discharges north of Dumbarton Bridge, hydrologic modeling indicates that total copper will exceed its translated WQO of 3.7 μg/L. The reason for predicted copper exceedances in bay discharges is the Applicants use of the RMP station at Dumbarton Bridge (copper value of 4.3 μg/L) for estimating metals concentrations under continuous circulation. It turns out that low salinity ponds do not contain copper above the WQO. To address potential exceedances of the translated copper WQO in bay discharges north of Dumbarton Bridge, we further evaluated RMP data to develop a site-specific objective. The RMP data at Dumbarton Bridge did not show a strong correlation with TSS ($R^2 = 0.43$). Therefore, we calculated the translator directly from the fraction dissolved. We based the chronic translator on the median of the fraction dissolved and the acute translator on the 90th percentile. Table 5 below shows the result of this analysis.

Table 5: Translated WQOs for RMP Station at Dumbarton Bridge

Pollutant	Applicable most stringent WQOs		CTR Conversion Factors		Applicable WQOs basis	Converted dissolved WQOs		Dumbarton Bridge translators		Converted Site-Specific WQOs (total)	
	chronic	acute	chronic	acute		chronic	acute	chronic	acute	chronic	acute
Copper	3.1	4.8	NA	NA	CTR, sw	NA	NA	0.68	0.88	4.6	5.5

The converted site-specific WQO for copper at Dumbarton Bridge shown in Table 5 is greater than the estimated maximum concentration of copper from the salt ponds (i.e., 4.3 μg/L). As such, the proposed circulation of waters through the Baumberg System to the bay should not cause an exceedance of site-specific WQO for copper.

Conclusion

Site-specific WQOs for nickel and copper indicate that under the continuous circulation period discharges from Baumberg ponds should not have an adverse impact on receiving waters for these two pollutants.

Attachment 3

Technical Memorandum: South Bay Salt Ponds Dissolved Oxygen and pH Levels

Introduction

This memorandum summarizes the results of dissolved oxygen and pH samples that the Applicants collected in September 2003 from five ponds (i.e., Ponds 2 and 4 in the Baumberg Unit and Ponds A3W, A2E, and A13 in the Alviso Unit). It also places pH and dissolved oxygen values within the context of those typically found in sloughs and in the south bay. The purpose of collecting these data were to determine if dissolved oxygen and pH levels could adversely affect aquatic life mainly from diurnal variations associated with excessive algal growth. The reason algal growth can cause dissolved oxygen and pH levels to vary significantly over the course of a day is because photosynthesis will produce oxygen and consume dissolved carbon dioxide (which behaves similar to carbonic acid) during daylight hours, and respiration will produce dissolved carbon dioxide and consume oxygen during nighttime hours. Therefore, significant algal growth will cause dissolved oxygen and pH levels to peak during the late afternoon and to be at their lowest levels in pre-dawn.

Selection of Ponds

In order to gather dissolved oxygen and pH information that most closely represents discharges during the continuous circulation period; the Applicants collected data from four ponds where the salinity levels ranged from 32 to 43 parts per thousand (ppt). To address discharges from ponds during the phased initial release that would commence in July, the Applicants collected dissolved oxygen and pH information from a fifth pond that contained salinity levels near 63 ppt. As levels of dissolved oxygen and pH can vary considerably in a 24-hour period, the Applicants collected three samples (dawn, midday, and dusk) from each collection point.

Dissolved Oxygen

The data collected by the Applicants shows that dissolved oxygen exhibits a diurnal variation. Because dissolved oxygen levels have the greatest potential to impact water quality in the early morning hours, this memorandum focuses on values collected near dawn. Table 1 below summarizes the number of sample points from each pond, the average salinity level (ppt), and the maximum, average, and minimum dissolved oxygen concentrations (mg/L) near dawn from each pond.

Table 1: Dissolved Oxygen Levels

			Dissolved Oxygen Levels near Dawn		
Ponds	**Sample Points**	**Salinity**	**Maximum**	**Average**	**Minimum**
A2E	10	32.9	9.17	5.83	2.86
A3W	6	40.8	5.47	4.73	4.32
B2	12	39.3	5.93	5.03	3.75
B4	8	42.0	5.39	2.34	0.27
A13	8	63.3	3.40	3.03	2.47

The above table indicates that there is considerable spatial variation in dissolved oxygen levels across each pond and that the Discharger may have trouble meeting the water quality objective for dissolved oxygen of 5.0 mg/L at the point of discharge. It also suggests that the Discharger needs to evaluate the potential for excessive algal growth and potentially low dissolved oxygen levels before commencing with a phased initial release in July of 2004.

pH

The data collected by the Applicants shows that pH does not exhibit a diurnal variation. As such, this memorandum included all values to determine the potential impact from this parameter. Table 2 below summarizes the number of sample points from each pond, the average salinity level, and the maximum, average, and minimum pH values from each pond.

Table 2: pH Levels

			pH		
Ponds	**Sample Points**	**Salinity**	**Maximum**	**Average**	**Minimum**
A2E	10	32.9	10.03	9.86	9.68
A3W	6	40.8	9.68	9.59	9.47
B2	12	39.3	8.27	8.16	8.07
B4	8	42.0	9.04	8.69	8.44
A13	8	63.3	8.57	8.52	8.47

The above table indicates that there is little spatial variation in pH across each pond and that the Discharger would likely have trouble meeting the water quality objective for pH of 6.5 to 8.5 at the discharge point. To minimize the potential for high pH values in the discharge, the Discharger needs to ensure that ponds have adequate flow through. It is also appropriate to consider a receiving water limitation for this parameter due to the impracticalities of chemically controlling pH in salt ponds to meet Basin Plan objectives.

Ambient Dissolved Oxygen and pH Variations

In order to put dissolved oxygen and pH values from the salt ponds within the context of ambient conditions in sloughs and in the south bay, we reviewed information from the South Bay Dischargers Authority Water Quality Monitoring Program Final Technical Report December 1981-November 1986 (hereafter Technical Report). The Technical Report indicates that some areas relatively unaffected by human disturbance, such as Newark Slough, have some low tide excursions below the 5 mg/L dissolved oxygen objective. Available ambient pH data indicate that the Basin Plan objective is consistently met in sloughs and in the south bay. Since pH is expected to normalize along the same line as salinity, we do not believe that it will not be an issue for continuous circulation.

As dissolved oxygen levels in sloughs that are representative of background conditions do not always meet the Basin Plan objective, it is appropriate to consider the frequency and magnitude of these excursions to determine the effect of discharges from salt ponds. Two sloughs that could be included in such an analysis are Faber Tract and Newark Slough. From May through October in 1985 and 1986, these sloughs were sampled twice per month at low tide. Table 3 below describes the average and minimum dissolved oxygen concentrations from Faber Tract and Newark Slough.

Table 3: Dissolved Oxygen at Low Tide in Background Sloughs

Slough	Dissolved Oxygen Average	Minimum	Samples Below 5.0 mg/L
Faber Tract	5.1	3.1	45%
Newark Slough	4.55	1.8	67%

It turns out that these samples represent a worst-case scenario for dissolved oxygen, as the tidal cycle tends to govern dissolved oxygen levels in relatively unaffected sloughs. The Technical Report indicates that dissolved levels increased with incoming tides and decreased to minimum levels with outgoing tides.

As these sloughs indicate that the Basin Plan objective for dissolved oxygen is not always achieved under ambient conditions, one approach for addressing discharges to sloughs would be to allow for some excursions of the Basin Plan objective at the point of discharge provided the Discharger documents that such discharges would not further depress dissolved oxygen levels in sloughs. It is unlikely that this approach would provide any relief for discharges directly to the south bay, as available ambient data does not show that dissolved oxygen levels within the bay are governed by the tidal cycle nor does it show excursions from the Basin Plan objective. To address potential dissolved oxygen excursions for discharges directly to the south bay, the Discharger may need to explore opportunities to operate these ponds as muted tidal systems.

Conclusion

The data set collected by the Applicants indicates that dissolved oxygen and pH levels do not meet Basin Plan objectives at the discharge point from certain ponds. However, it is difficult to collect data that will be fully representative of continuous circulation discharges for these parameters. This is because the amount of algal growth will relate to how quickly bay waters flow through pond systems. Based on our review of the data, we believe that a) the Discharger should ensure it has the ability to increase flow through, install portable aerators, and operate certain ponds as muted tidal systems, and b) waste discharge requirements should include flexibility that allows the Discharger to determine compliance with pH limits in the receiving water and to base dissolved oxygen limits on the Basin Plan or levels in the receiving water.

Attachment 4
<u>Technical Memorandum: South Bay Salt Ponds Sediment Data</u>

Summary

This memorandum concludes that the south bay salt ponds have not accumulated metals in the sediment above ambient levels and to a point where they could cause adverse biological affects. To reach this conclusion, Board staff compared sediment data that the Discharger provided in its Report of Waste Discharge and Initial Stewardship Plan (ISP) with screening criteria.

Screening Criteria

In order to determine if salt ponds have accumulated pollutants beyond background levels and to a point that could cause adverse biological affects, Board staff compared the level of inorganics in salt ponds to several screening criteria. These criterion include ambient inorganic levels in San Francisco Bay contained in a Regional Board staff report entitled *Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments* (hereafter Sediment Report) and a publication by the National Oceanic Atmospheric Administration (NOAA) that established Effects Range-Low (ER-L) and Effects Range-Median (ER-M) toxicity based thresholds.

The Sediment Report summarizes ambient concentrations of chemical compounds found in San Francisco Bay sediments and recommends setting the ambient threshold at the 85^{th} percentile. To relate the potential affects of toxic pollutants, NOAA published effect-ranges. The cutoff points corresponding to the effect ranges are the low (ER-L) and median (ER-M). The Report of Waste Discharge explains that NOAA calculated these values by examining a range of chemical concentrations associated with adverse biological affects. Further, the Report of Waste Discharge explains that the ER-L values represent the lower 10^{th} percentile concentration of the data, and that concentrations near this value should rarely cause adverse biological effects, while the ER-M values represent the 50^{th} percentile of the data and that concentrations above this value are likely to cause adverse biological effects.

Data Collection

The ISP provided sediment data in five summation tables based on the entity that performed sampling. As one of the main concerns with the salt ponds is that mercury might be have accumulated in the Alviso Ponds because of historic mining activities in this watershed, the Discharger focused its sediment sampling efforts in this area. In total, the Discharger collected 31 metal samples from the Alviso Ponds, four from the Baumberg Ponds, and one from the Redwood City Ponds.

Data Evaluation

As mercury is the only pollutant that is expected to differ significantly in the pond systems, Board staff considered two separate data sets for mercury: one from the Alviso Ponds and one from the Baumberg and Redwood City Ponds. To evaluate the remaining inorganics, Board staff considered them as one data set.

Inorganics: In analyzing inorganics (except mercury), Board staff compared the mean of all pond values (if normally distributed) or the median (if nonparametric) to ambient values contained in the Sediment Report and to the ER-L values published by NOAA. Table 1 below summarizes the results of this analysis:

Table 1: Summary of Inorganics in Salt Ponds and Screening Levels

Constituent[1]	Salt Pond Value[2]	**Ambient**	**ER-Low**	Above Ambient and ER-Low?
Arsenic	9.6	15.3	8.2	No
Cadmium	0.36	0.33	1.2	No
Chromium	93	112	81	No
Copper	35.3	68.1	34	No
Lead	28.4	43.2	46.7	No
Nickel	94.9	112	20.9	No
Selenium	0.59	0.64	N/A	No
Silver	0.18	0.58	1	No
Zinc	90.9	158	150	No

[1] Data sets for arsenic, chromium, copper, lead, and zinc fit a normal distribution, whereas data sets for cadmium, nickel, selenium, and silver were nonparametric. Accordingly, the salt pond value for normally distributed parameters is the mean and the salt pond value for nonparametric parameters is the median.
[2] These are mean or median values in mg/kg dry weight based on all data that met quality assurance/quality control requirements in the Discharger's Report of Waste Discharge.

As shown in the Table 1, cadmium is the only constituent that exceeded ambient levels in San Francisco Bay. To determine if the cadmium levels in the salt ponds could pose a threat to wildlife, Board staff compared salt pond values with the ER-L value published by NOAA. Based on this, neither cadmium nor the remaining metals described in Table 1 appear to be at levels of concern. While selenium levels are below ambient, Board staff requested that the Discharger collect additional baseline data for this pollutant because it is bioaccumulative, and it is listed as impairing South San Francisco Bay (Clean Water Act 303(d) list).

There are several constituents below ambient levels, but above the ER-L. These include arsenic, chromium, copper, and nickel. However, there would be little environment benefit in requiring salt pond sediment concentrations to fall below the ER-L if they are already below ambient levels. This is because once the Discharger restores salt ponds to tidal marsh; new substrate will ultimately be composed of sediment from surrounding sources.

Mercury: In analyzing mercury, Board staff evaluated two separate data sets since the Alviso Ponds should contain higher levels than those found elsewhere in the system, due to the historic mining legacy in this watershed. The results of this analysis are summarized in Table 2 below:

Table 2: Summary of Mercury in Salt Ponds and Ambient Levels

Pond Systems	**Salt Pond Value**[1]	**Ambient**[2]	**ER-Low**	**ER-Median**	Above Ambient and ER-Low?
Alviso	0.53	1.1	0.15	0.71	No
Baumberg/Redwood City	0.19	0.43	0.15	0.71	No

[1] The Alviso data set for mercury did not fit a normal distribution and the data set for Baumberg and Redwood City only consisted of five data points. Therefore, in this analysis the median values of mercury are compared to ambient levels. These values are in mg/kg dry weight and are based on all data that met quality assurance/quality control requirements in the Discharger's Report of Waste Discharge.

[2] As historic mining of mercury in the Alviso Pond watershed likely increased mercury values in these ponds, Board staff considered it appropriate to use the median of mercury levels found in the Guadalupe River to be indicative of ambient conditions in this locality. Since the Baumberg and Redwood City ponds should not be affected by mining activities, Board staff compared the mercury levels in these ponds with ambient levels in the Bay.

As shown in Table 2, mercury levels in the Alviso, Baumberg and Redwood City Ponds are below ambient levels. While mercury concentrations are below ambient levels, Board staff requested that the Discharger collect additional baseline data for mercury and methyl mercury so that it would be possible to evaluate the effect of the ISP and subsequent restoration on the availability of mercury to wildlife.

Conclusion

The Discharger has collected enough sediment data to demonstrate that salt ponds have not accumulated metals above ambient levels and to a point where they could have adverse affects on wildlife. To establish more extensive baseline levels for selenium and mercury (including speciation), the Discharger should collect additional sediment samples for these parameters before it initiates discharge.