Staff Report -

Statistical Analysis of Pooled Data From Regionwide Ultraclean Mercury Sampling For Municipal Dischargers

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Executive Summary

The entire San Francisco Bay Estuary is listed as being impaired by mercury, and a Total Maximum Daily Load (TMDL) with waste load allocations (WLAs) for individual point sources is being developed. Until the TMDL and WLAs are developed, mercury loadings into San Francisco Bay from individual point sources need to be held at current levels. Historically, most effluent mercury samples at municipal and industrial dischargers in the Bay Area Region were reported as below detection limits, which reduced the accuracy of mercury load estimates from these sources. In January 2000 municipal and industrial dischargers began using ultraclean sampling methods for mercury, which resulted in a much higher percentage of numerical results, with individual numerical results typically well below the older detection limits.

A number of NPDES permits for large dischargers are due for renewal in 2001. Regional Board staff performed a basic statistical analysis of pooled ultraclean mercury data from selected municipal dischargers, to evaluate the feasibility of developing regionwide interim performance-based mercury effluent limits for municipal dischargers based on ultraclean data that better reflect actual plant performance. Basic statistical analyses were used due to limitations in the underlying data set. Using basic statistical analyses is justified because municipal discharges are estimated to account for three percent (3%) of the current mercury mass loading to San Francisco Bay.

The statistical analysis used pooled data because, when the statistical study was initiated, most individual dischargers only had 12 or 13 ultraclean sample results, too few data points for reliable statistical analysis. In addition, ultraclean data from a cross section of different plants with generally similar processes, totaling approximately 400 total data points, is representative of general plant performance for the treatment categories. Also, pooling the data reduces the likelihood of penalizing plants that have implemented effective control measures and are already performing well, and rewarding other plants which may not have implemented similar measures. Finally, Regionwide effluent limits based on pooled data are more consistent and can be uniformly applied regionwide.

Data were gathered from the Region's Electronic Reporting System database, verified, and the statistical analysis was carried out to evaluate shape of data distribution, identify and evaluate relevance of data subgroups, suggest appropriate data transformations, normal-test untransformed and transformed data, and produce probability plots, whole-population percentile estimates, and confidence intervals on transformed, subgrouped data. The results of preliminary statistical analysis suggested simplified data groupings and prompted re-examination of some of the data. The final statistical analysis used the simplified groupings applied to 398 data points from 24 dischargers, with 285 data points from 18 secondary treatment plants and 113 data points from 7 advanced secondary treatment plants. Percentiles were calculated based on the final data set and treatment subgroups. Regional Board staff propose the following interim regionwide mercury effluent limits, based on the whole-population estimates of the 99.87^{th} percentile of the treatment subgroups, to be taken as monthly averages, for municipal dischargers:

Table 1. Proposed regionwide interim municipal mercury effluent limitations.

Treatment Method	Proposed Limit, ng/L
Secondary Treatment	87
Advanced Secondary Treatment	23
Mixed-regime	87 when operated as secondary 23 when operated as advanced secondary
Secondary with holding ponds	23

Treatment plant mercury performance – and its treatment data distribution – should not change unless a plant changes its treatment technology. Any percentile-based regulatory control point will indicate whether current performance is being maintained in the future. The limits proposed here are based on statistical whole-population estimates of 99.87th percentile performance for municipal dischargers. The 99.87th percentile is useful because it represents an upper limit that should never be exceeded, which simplifies compliance monitoring. Also, it is more conservative than the U.S. EPA guidance suggests (once every 3 years, or approximately the 99.91st percentile).

As long as a plant's treatment technology and performance do not change, the data distribution of its effluent concentration samples should not change, either. Since mass load is a function of flow and concentration, unless flow increases, mass loading should not change. With implementation of mercury pollution prevention measures, reduction of inflow and infiltration, or wastewater reclamation, both effluent concentrations and loads can be expected to reduce and possibly offset flow increases due to growth.

Finally, the actual loadings estimated from the reported flows and concentrations in the ERS database project an annual average mercury mass loading of approximately 13 – 15 kilograms per year. This represents a significant difference from the earlier estimates of maximum possible loading, 45 kilograms per year [Regional Board, 2000, Table 22, Page 103], simply due to refinement of sampling and analytical techniques.

Introduction

Section 303(d) of the Clean Water Act requires each state to identify and list all of its water bodies that are water-quality impaired, and to develop Total Maximum Daily Loads (TMDL's) for each impairing constituent in each impaired water body. The entire San Francisco Bay estuary (the Bay) is currently listed as impaired by mercury, and staff of the San Francisco Bay Regional Water Quality Control Board (the Regional Board) are developing a mercury TMDL for San Francisco Bay. While the TMDL is being developed, the Regional Board intends to hold mercury mass loadings in permitted discharges to current levels.

Estimating current mercury mass loadings by municipal dischargers (publicly owned treatment works – POTW's), and establishing interim performance-based effluent limits (IPBLs) for them was complicated by the relatively high detection limits available for mercury until recently. High detection limits result in a relatively large number of results reported as "non detect" (ND). By letters dated August 4, 1999, and October 22, 1999, the Regional Board required all dischargers with National Pollutant Discharger Elimination System (NPDES) permits within the San Francisco Bay Region to begin sampling for mercury using ultra-clean sampling techniques starting in January 2000. Ultra-clean sampling techniques attain detection limits much lower than previously used methods, typically between 1 and 2 nanograms per liter (ng/L), compared to 200 ng/L. This resulted in fewer ND's (i.e., "<200 ng/L") than previous sampling efforts using the higher detection limits. Most POTW's and industrial dischargers began gathering low-detection-limit data in January 2000. Some of these dischargers – both POTW's and industrial dischargers – use the Region's electronic reporting system (ERS) to report the results of their ongoing monitoring programs, including low-detection-limit mercury data. In other cases, the discharger's data are hand-input into the ERS by Regional Board staff.

Typically, an IPBL is discharger specific, utilizes the last three years data, and is based on enough data points to produce a reasonable statistical estimate of current performance. As noted above, most of the POTW's reporting via the ERS only had about a dozen ultraclean mercury data points at the inception of the statistical study (since risen to about 15 each). That sample size is too small for a reliable statistical analysis for individual POTW's. Staff then considered the possibility of using the more than 400 data points pooled from all the POTW's to see if a "regional" IPBL could be developed that would apply to all the POTW's.

Staff applied a series of statistical tests aimed at answering the following questions:

- Is pooling the ultraclean data from various municipal dischargers statistically valid?
- Should the data be divided into subgroups and, if so, based on which factors?
- Can statistical analysis of pooled data guide development of regionwide IPBLs for mercury from municipal dischargers?

- Would establishing regionwide IPBLs hold all POTWs at current performance and be protective?

Procedures

Data Development and Analysis

In April 2001, staff gathered POTW-derived ultra-clean mercury data that also had associated effluent flow data from the ERS database. The mercury concentration data were originally reported in units of micrograms per liter (µg/L). A microgram is 1,000 nanograms. For ease of viewing, the mercury concentration data were converted to ng/L by multiplying the originally reported value by 1,000.

Next, the raw data (the preliminary data set) were checked for duplicates or blanks, which were removed, and to identify high values that might be outliers. Outliers – as indicated by examining boxplots of the data, see Figures 1 and 2, below - were verified, corrected, or removed based on further inquiries to the reporting dischargers. If an outlier was verified, it remained in the preliminary data set; if it resulted from a transcription or similar clerical error, it was corrected; and if it was associated with problems in the collection or analysis of the samples, it was removed from the preliminary data set. Results reported as below the detection limit (nondetects ND) were retained. This verified preliminary data set is reproduced in Appendix A.

Staff used MiniTab™, Release 13.30 to produce plots and conduct the statistical analysis of the data. The initial statistical analysis was aimed at determining

- if the preliminary data set consisted of one homogeneous data set, or multiple subsets;

- if multiple subsets, then how many and which variable defined the subsets; and

- the distribution of the data set(s).

Preliminary Data Analysis

Staff initially evaluated flow and concentration data. Flow data did not appear to follow any known data distribution and were not considered further in this analysis. Staff then produced and inspected boxplots of concentration data for all dischargers in the preliminary data set, as depicted in Figures 2 and 3, below. A key to the reading the boxplots is shown in Figure 1, below. The boxplots visually present the median, the middle 50 percent of the data (the interquartile range - IQR), the general extent of data, and potential outliers for each of the discharger data sets contained in the preliminary data set, in a format that made comparing their basic qualities easier.

Figure 1. Key to reading boxplots.

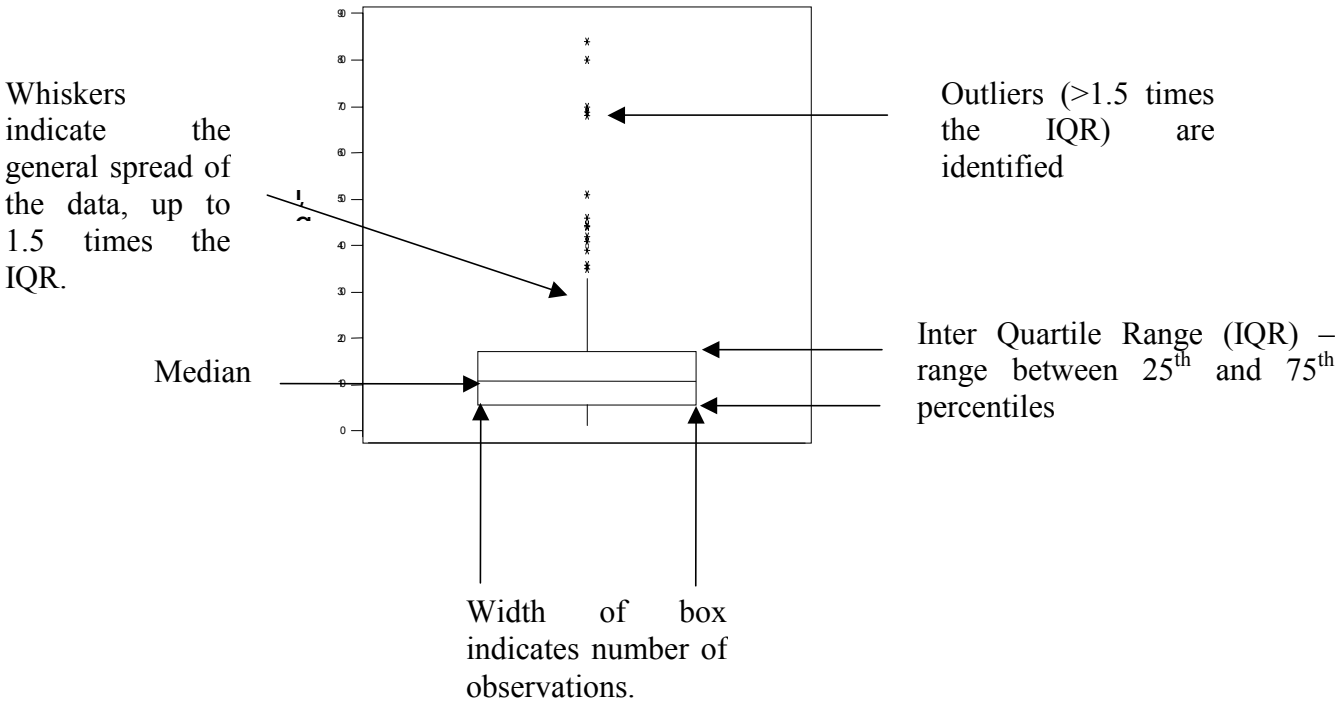
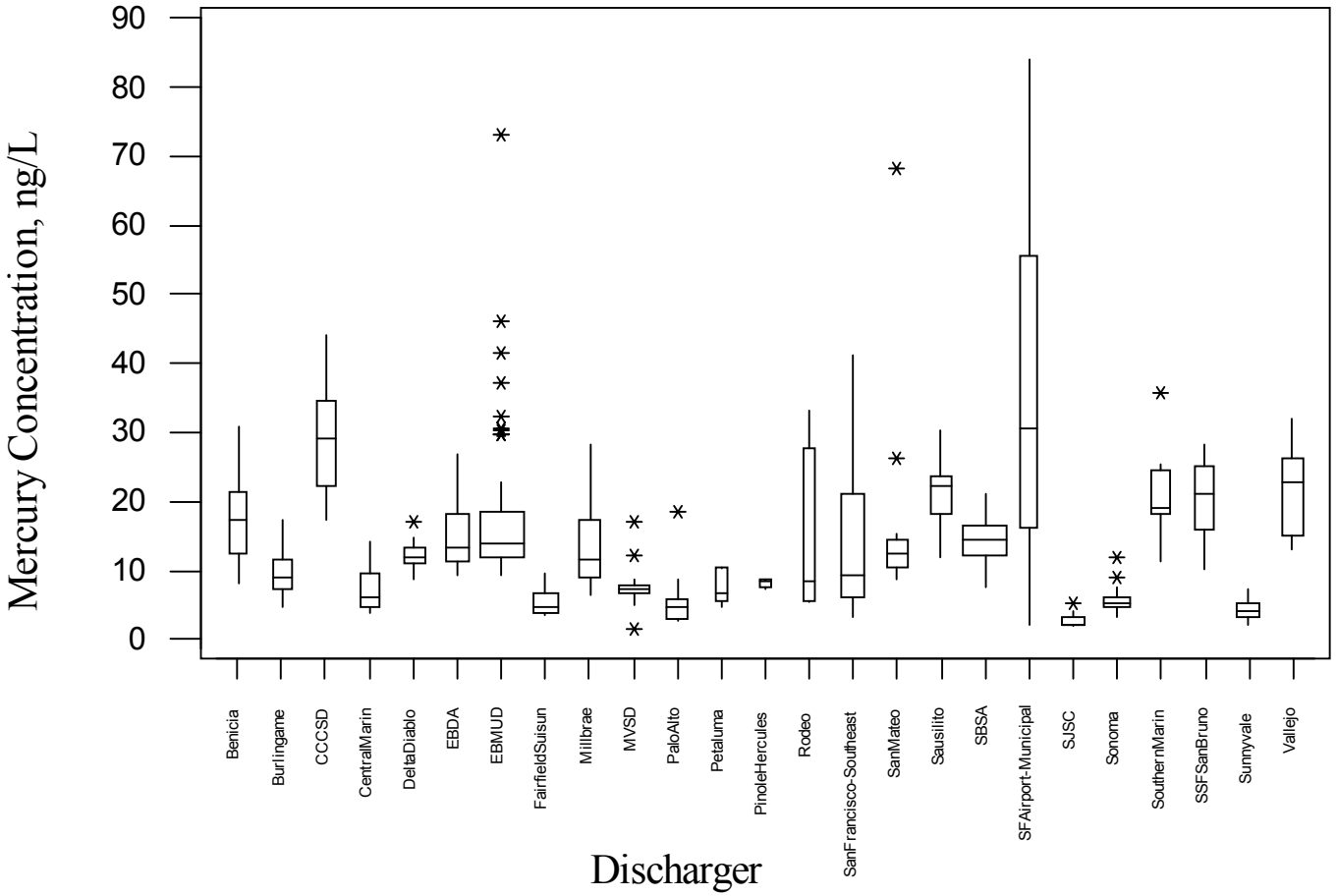


Figure 2. Boxplots of data in preliminary pooled data set, by discharger.



Inspection of the boxplots of all the preliminary pooled data suggested that it would be useful to group the data into subsets. Dischargers were categorized by treatment type, as listed in the Regional Board's 1995 *Water Quality Control Plan, San Francisco Bay Region (Region 2)* (Basin Plan) as amended [Table 4-9, pg. 4-74]. Regional Board staff verified the process classifications by checking the process descriptions contained in the current National Pollutant Discharge Elimination System (NPDES) permit for each discharger in the data set. The initial categories used were:

- full secondary treatment year round, by activated sludge and/or trickling filters;
- secondary treatment with occasional wet weather bypass, and
- advanced secondary treatment by activated sludge and/or trickling filters followed by filtration (later expanded to include secondary treatment consisting of large ponds).

Figure 3. Boxplots of preliminary pooled data set, by treatment type.

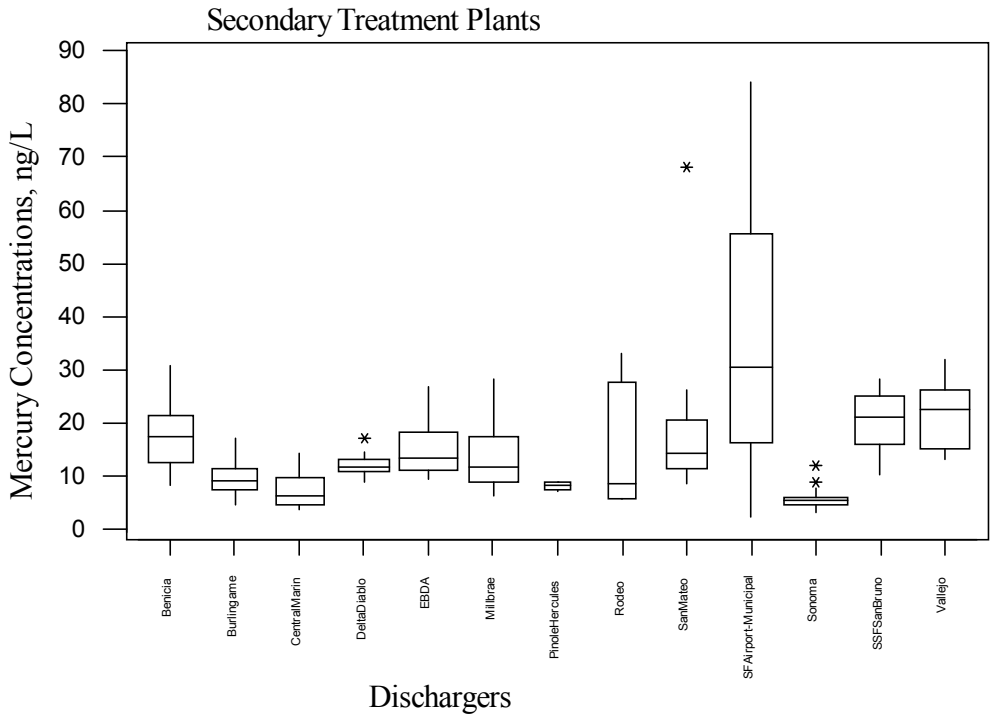
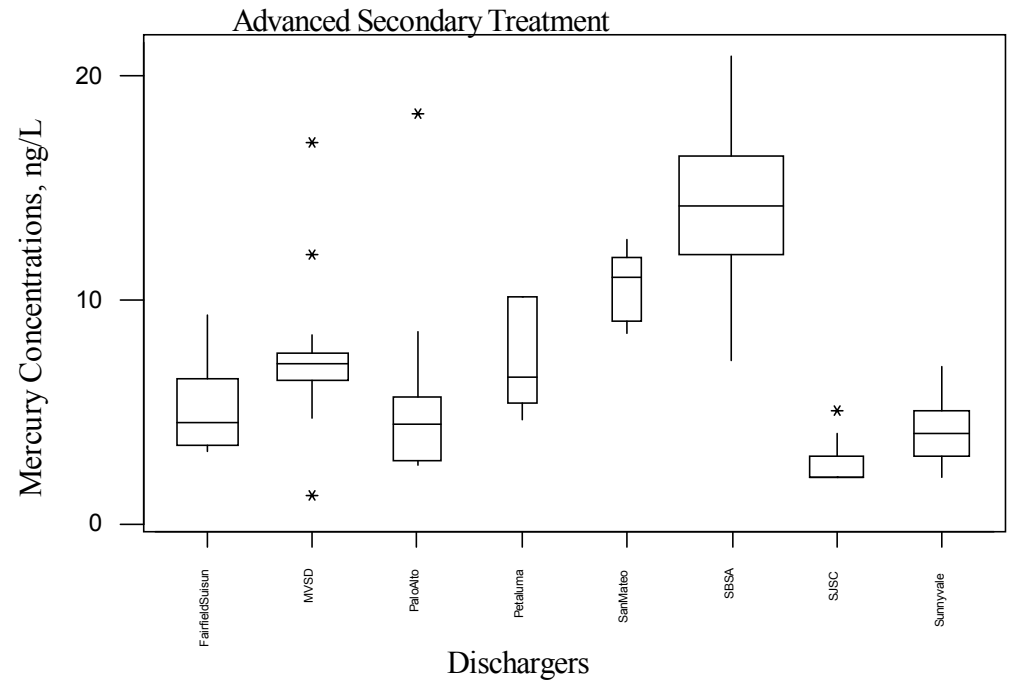
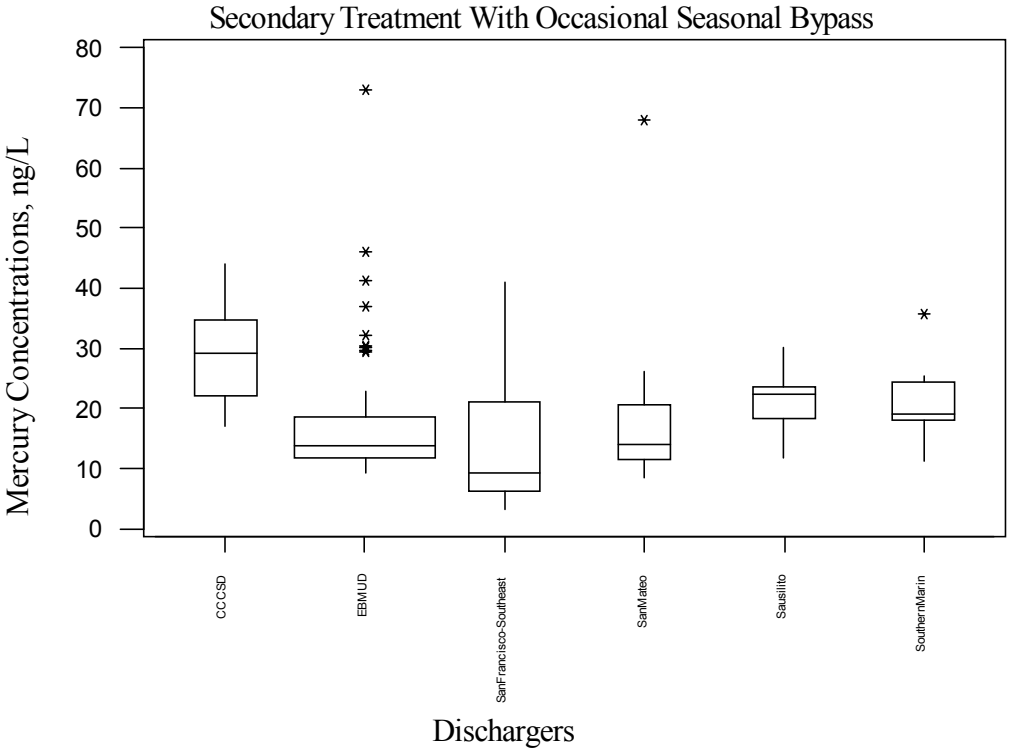


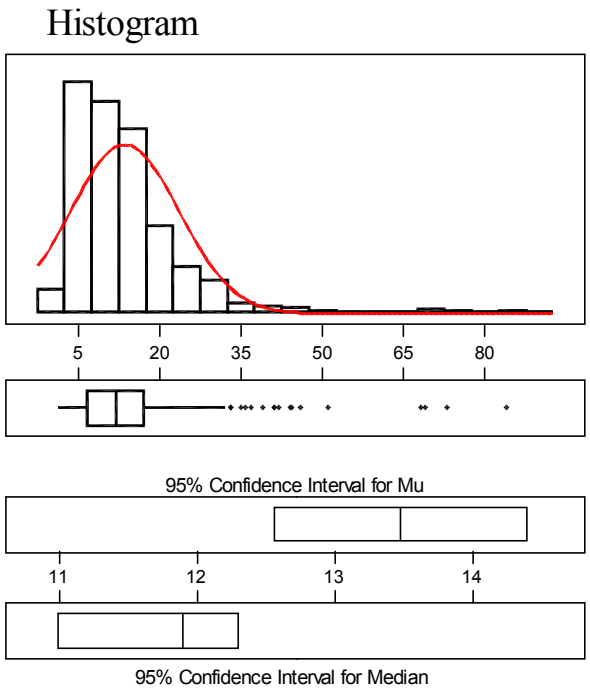
Figure 3. (Continued) Boxplots of preliminary pooled data set, by treatment type.





Before analyzing by subsets, staff examined the descriptive statistics of the preliminary pooled data, as shown in Figure 4, below, to make a preliminary evaluation of the data's distribution.

Figure 4. Descriptive statistics, mercury concentrations, preliminary pooled data set, original units.



Variable:
Mercury Concentration, ng/L

Anderson-Darling Normality Test

A-Squared:	15.064
P-Value:	0.000
Mean	13.4791
StDev	10.0346
Variance	100.693
Skewness	2.54042
Kurtosis	11.3088
N	465
Minimum	1.2000
1st Quartile	6.6500
Median	11.9000
3rd Quartile	17.0000
Maximum	84.0000

95% Confidence Interval for Mu

12.5646	14.3935

95% Confidence Interval for Sigma

9.4284	10.7247

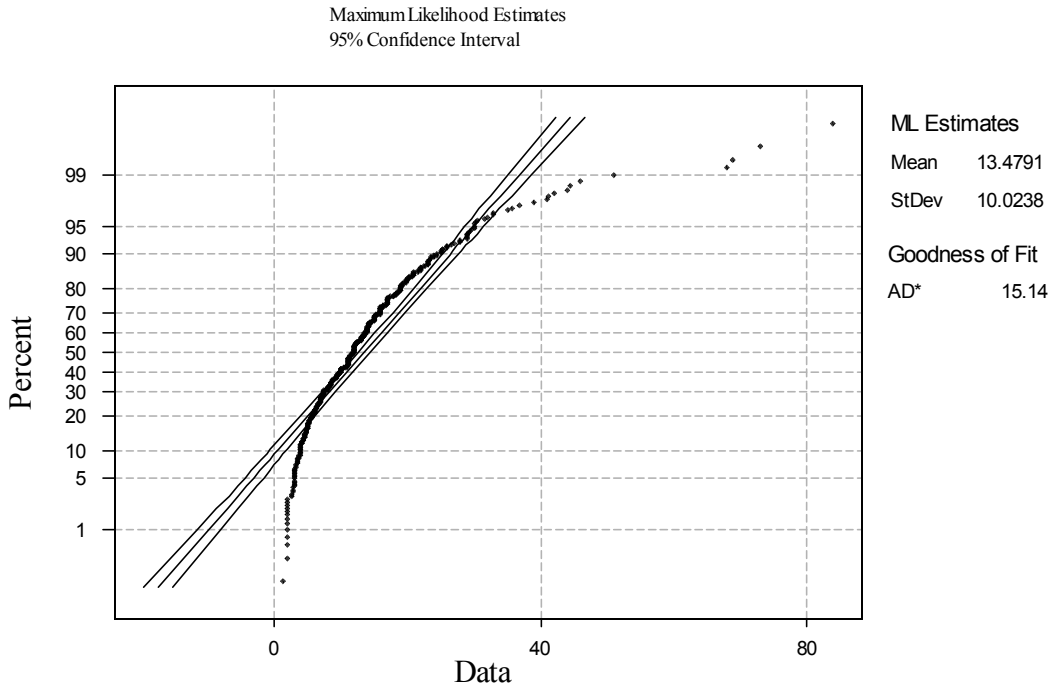
95% Confidence Interval for Median

11.0000	12.3000

The histogram and projected normal curve in Figure 4, above, indicate that concentration data in original units (ng/L) are not normally distributed, which is confirmed by the Anderson-Darling statistic (A-Squared) and the p-value. The Anderson-Darling statistic should generally be less than 1.035 for a normal distribution. The p-value indicates the probability that the data are normally distributed – if the p-value is less than 0.05, then the data cannot be assumed to be normal. The Anderson-Darling statistic is 15.064 and the p-value is estimated as 0.000, which are strong indications that the data in original units are not normally distributed The non-normality of the data was confirmed by inspecting a probability plot of the original pooled data set, as shown in Figure 5, below.

MiniTab™ allows the user to select either the Most Likely Estimate (MLE) or the Least Squares method when calculating the coordinates used to project a probability line. The Most Likely Estimate (MLE) method was selected as being appropriate for this data set.

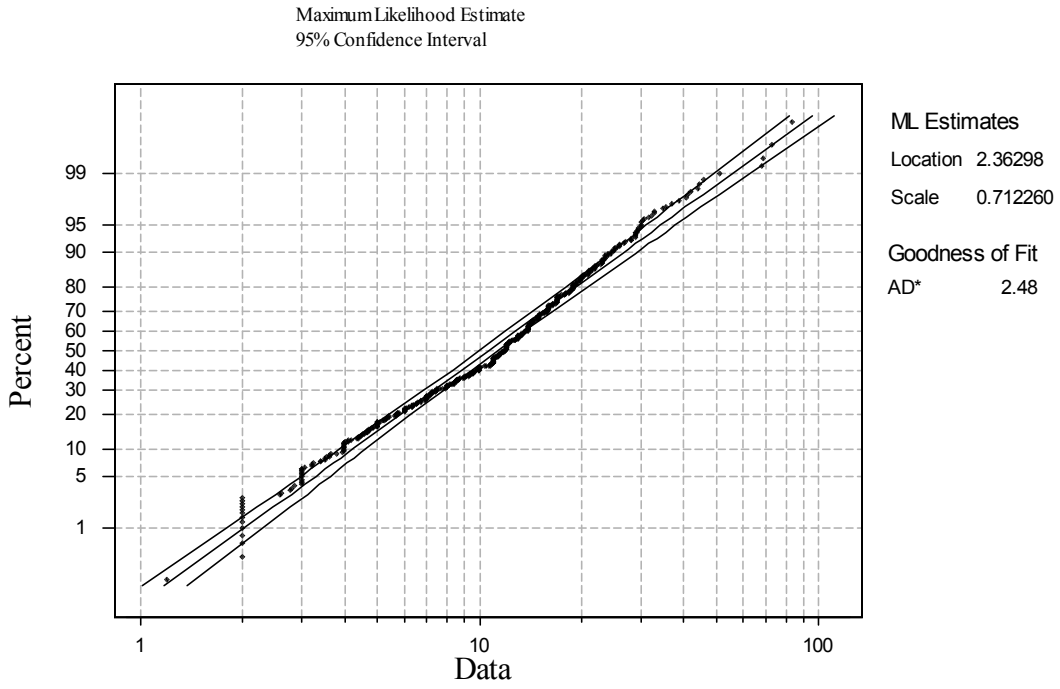
Figure 5. Preliminary probability plot of all data, in original units.



As noted above, an Anderson-Darling statistic above 1.035 strongly indicates that the data are not normally distributed. The Anderson-Darling statistic for the probability plot of the untransformed data is 15.14, a strong indication that the untransformed data are not normally distributed. This is further confirmed visually by the shape of the probability plot, which closely resembles a natural-logarithmic (ln) curve.

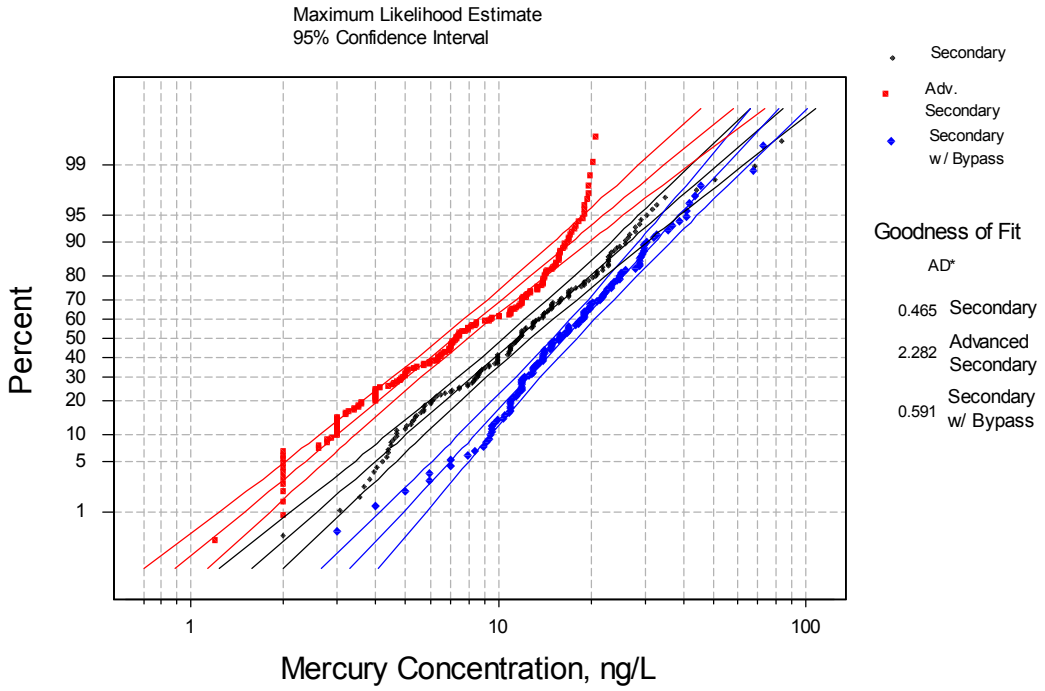
Next, a probability plot of the ln-transformed data (ln-normal probability plot) was produced. This plot is depicted in Figure 6, below. It is much more linear than the probability plot in original units, but the Anderson-Darling statistic is still too high – 2.48 vs. 1.035 – to accept the hypothesis that the ln-transformed data are normally distributed (ln-normal).

Figure 6. Ln-normal probability plot of all preliminary data.



Next, ln-normal probability plots were developed for the data grouped by treatment types as described above as shown in Figure 7, below.

Figure 7. Ln- normal probability plots of mercury concentrations, grouped by treatment type.



The ln-normal probability plots for mercury concentration data grouped by type of treatment appear more linear. The Anderson-Darling statistics for the individual ln-normal probability plots for secondary treatment and secondary treatment with bypass are both well below 1.0385, which indicates that the data are probably ln-normally distributed within each of those groups. The Anderson-Darling statistic for the ln-normal probability plot of the advanced secondary treatment group is still too high to accept the hypothesis that those data are ln-normally distributed. This is confirmed by the shape of the ln-transformed probability plot for that group of data.

Data Reevaluation and Refinement

Based on the preliminary statistical analysis, staff re-evaluated and refined the original classifications. The initial data set was more closely examined to investigate similarities and anomalies suggested by the probability plots of data grouped by type of treatment, and to simplify any proposed effluent limits based on the outcome of the final statistical analysis. The following conclusions were reached:

1. Secondary treatment and secondary treatment with occasional wet weather bypass could be combined. The similarity of their respective ln-transformed probability plots suggested the possibility of simplifying the analysis and IPBL development by recombining the two data subsets. In staff's judgment, this is appropriate because

bypasses only occur intermittently, during wet weather, and are limited in number and duration. This assumption is supported by the final statistical analysis, below.

2. One advanced secondary treatment plant was provisionally removed from the data set because the data from this plant were not similar to either secondary or advanced secondary treatment (see Figure 3, above). Regional Board staff will work with this discharger to determine what is causing this dissimilarity. That plant's mercury concentration data were removed from the data set and were not further considered in this analysis.

3. Another plant operates with filtration during dry weather and without filtration during wet weather months, per its NPDES permit. This plant's mercury concentrations were similar to advanced secondary treatment plants' concentrations when the filtration was being operated, and were similar to the secondary treatment plants' mercury concentrations when the filtration is not operated (see Figure 3, above). Accordingly, this plant's data were split between the secondary and advanced secondary classifications depending on the mode of operation, as determined by comparing the date of the sample to the NPDES permit conditions.

4. Data from one secondary treatment plant that employs large holding ponds were similar to data from advanced secondary treatment plants, and the plant's data were included in the advanced secondary treatment classification.

The final verified and corrected data set contains 398 records, with 8 mercury concentrations reported as nondetected (ND). The ND's represent approximately 2 percent of the preliminary pooled data set, which was not a significant percentage. Therefore, no measures were taken to estimate probable value distributions for the ND concentration data. The final pooled data set is reproduced in Appendix B.

Final Statistical Analysis

The final data set was analyzed again using the MiniTab™ functions described above. First, staff plotted the final data set as boxplots arranged by discharger and grouped by type of treatment, as presented in Figures 8 and 9, below. The histogram of the final pooled concentration data was developed, as shown in Figure 10, below. This histogram is very similar to the histogram for the preliminary pooled data, and indicates that the overall combined data still appear to be ln-normally distributed.

Ln-normal probability plots were developed for the two data subsets: secondary treatment and advanced secondary treatment, as shown in Figure 11, below. The Anderson-Darling goodness of fit statistic for each probability plot is well within the range expected for an ln-normal distribution.

Final Statistical Analysis – Graphical Results

Figure 8. Boxplots of secondary treatment plants in final pooled data set, by discharger.

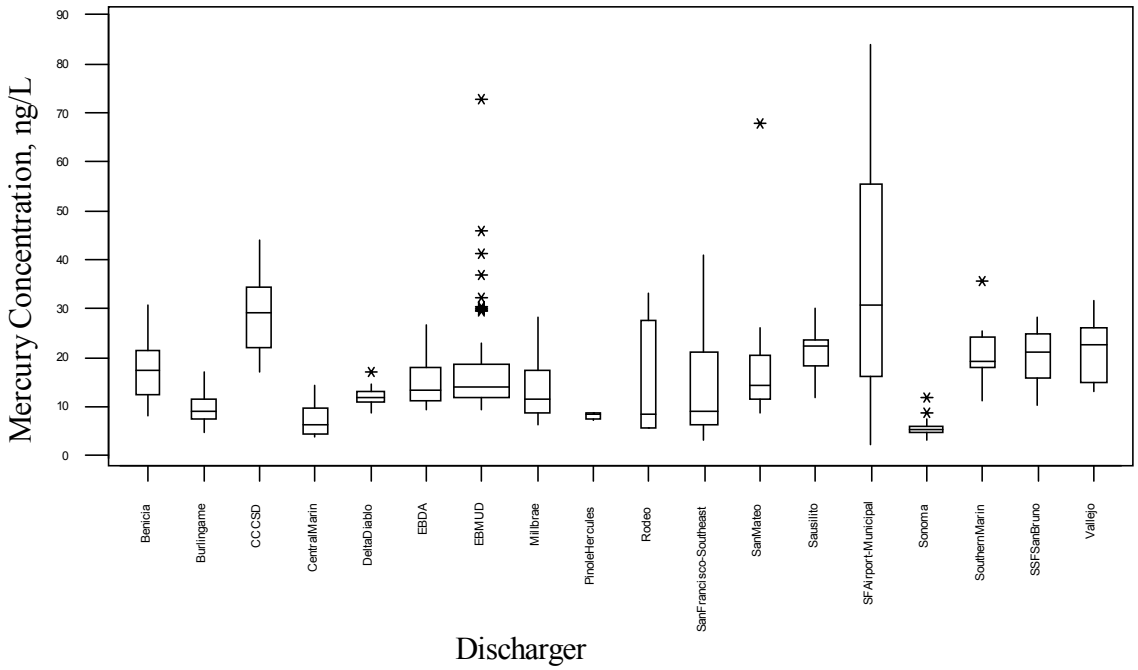


Figure 9. Boxplots of advanced secondary treatment plants in final pooled data set, by discharger.

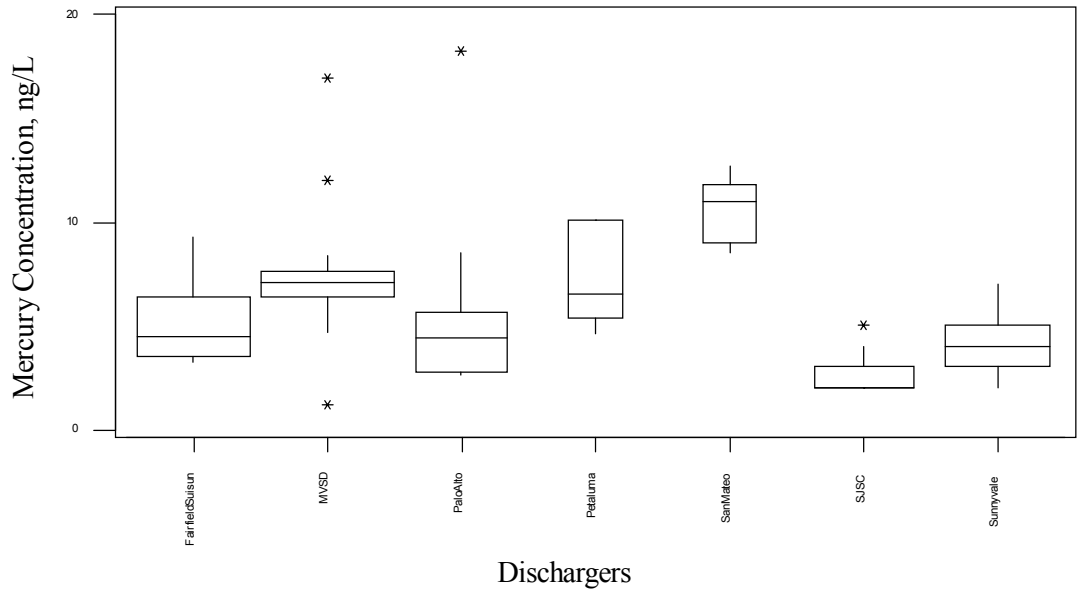


Figure 10. Histogram of final data set, all data.

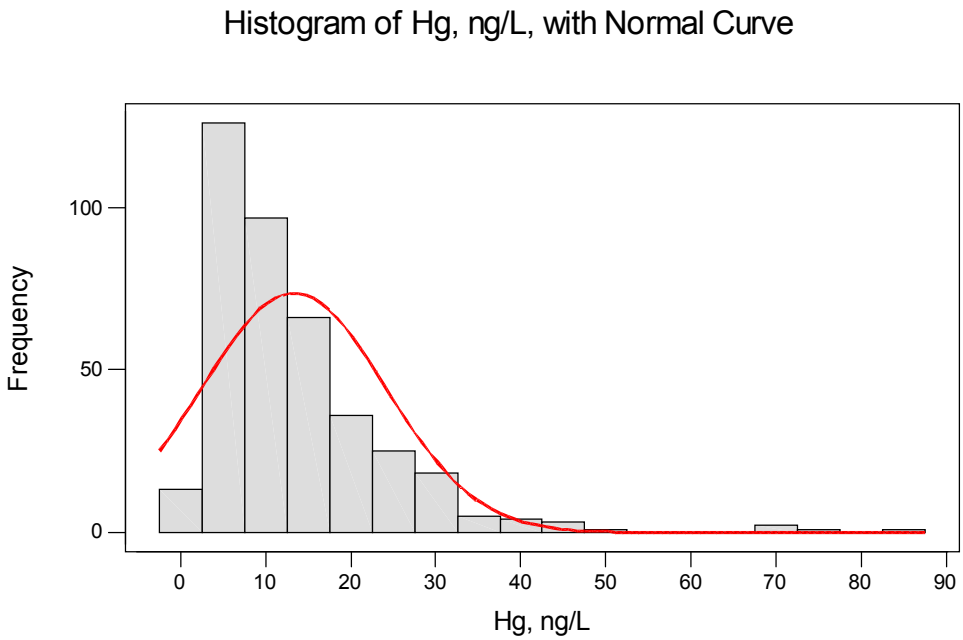
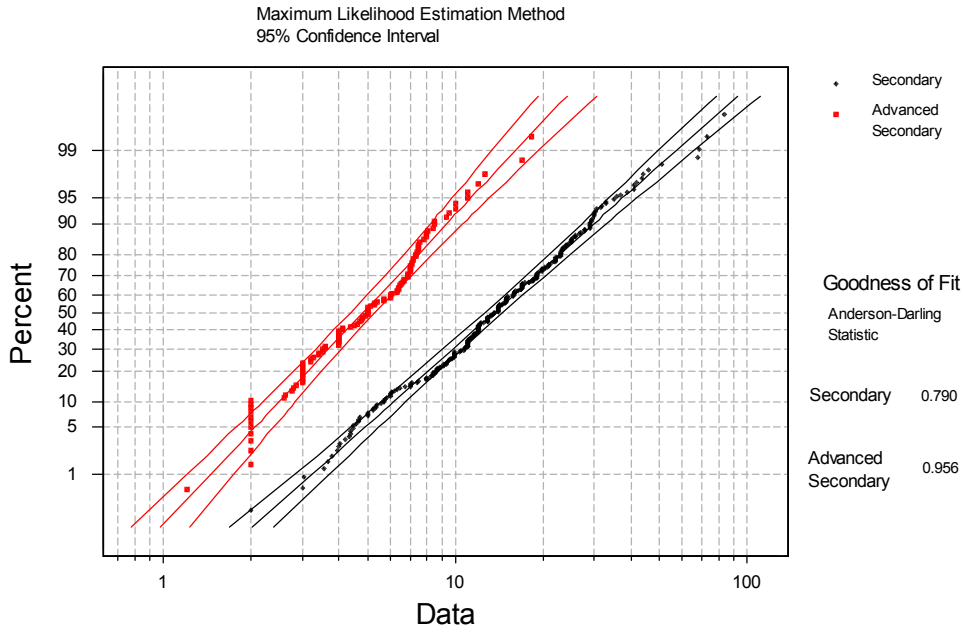


Figure 11. Ln-plotted probability plots of final data, by treatment type.



Applicability of Data Subgroups

As a final check on the suitability of the division of the final data set into two subgroups based on treatment technology, staff used MiniTab™ to run Mood's Median Test on the two subgroup data sets. The results were χ^2 = 123.56, p=0.000, with the medians for secondary and advanced secondary being 13.7 and 5.0, respectively. The χ^2 and p-values indicate that there is sufficient evidence to reject the hypothesis that the two data subsets are similar, as confirmed by the difference in their medians. This confirmed that it was valid to divide the two subgroups by treatment type, and therefore it is appropriate to base the IBPLs on this division.

Percentiles

MiniTab™ computes percentile tables for probability plots it produces. The percentile tables include the percent, the estimated data value (percentile) in original units, and a lower and upper 95 percent confidence limit for each estimated percentile, also in original units. The percentiles and confidence intervals are estimated for the entire population, based on the sample represented by the data set. The assumptions behind this extrapolation are valid as long as the data are a good fit to the distribution chosen for the probability plot. As discussed above, the data, grouped by treatment, appear to be a good fit for an ln-normal distribution.

Confidence intervals of ln-transformed data can be re-exponentiated to produce similar intervals in original units. The re-exponentiated confidence intervals are called *tolerance intervals* to distinguish them from confidence intervals calculated in original units. Therefore, the percentile estimates in Tables 2 and 3, below, include lower and upper 95 percent tolerance limits.

In addition to the standard percentiles, MiniTab™ permits the user to specify additional percentiles for explicit estimation. Staff added the 99.87th percentile for estimation in this analysis, due to its history as a regulatory control point (see Discussion, below).

Precision and Significant Figures

The tables of percentiles for the final data analysis are reproduced as Tables 2 and 3, below. The values in Tables 2 and 3 contain more decimal places (to the 0.0001 ng/L) than would be supported by the original data. This would represent false precision were these results used in the proposed interim limits, since most dischargers report ultraclean mercury data to the nearest nanogram per liter. Therefore, 99.87th percentile values from the tables were rounded to the nearest whole nanogram per liter.

Table 2. Percentiles for secondary treatment.

Percent	Percentile, ng/L	Lower 95% Tolerance Limit, ng/L	Upper 95% Tolerance Limit, ng/L
0.10	2.0104	1.6919	2.389
1.00	3.2238	2.8078	3.701
2.00	3.8156	3.3620	4.330
3.00	4.2462	3.7682	4.785
4.00	4.6018	4.1051	5.159
5.00	4.9130	4.4008	5.485
6.00	5.1944	4.6688	5.779
7.00	5.4543	4.9168	6.051
8.00	5.6980	5.1497	6.305
9.00	5.9292	5.3708	6.546
10.00	6.1502	5.5824	6.776
20.00	8.0725	7.4257	8.776
30.00	9.8216	9.0978	10.603
40.00	11.6133	10.7966	12.492
50.00	13.5825	12.6417	14.593
60.00	15.8855	14.7684	17.087
70.00	18.7835	17.3993	20.278
80.00	22.8532	21.0220	24.844
90.00	29.9962	27.2270	33.047
91.00	31.1144	28.1844	34.349
92.00	32.3765	29.2610	35.824
93.00	33.8235	30.4905	37.521
94.00	35.5160	31.9226	39.514
95.00	37.5500	33.6354	41.920
96.00	40.0890	35.7619	44.940
97.00	43.4469	38.5559	48.958
98.00	48.3500	42.6024	54.873
99.00	57.2252	49.8401	65.704
99.87	87.4044	73.8246	103.482
99.90	91.7666	77.2284	109.042

Table 3. Percentiles for advanced secondary treatment.

Percent	Percentile, ng/L	Lower 95% Tolerance Limit, ng/L	Upper 95% Tolerance Limit, ng/L
0.10	0.9752	0.7755	1.2264
1.00	1.4477	1.2049	1.7395
2.00	1.6669	1.4089	1.9722
3.00	1.8229	1.5554	2.1364
4.00	1.9498	1.6753	2.2693
5.00	2.0595	1.7793	2.3839
6.00	2.1577	1.8726	2.4863
7.00	2.2477	1.9583	2.5799
8.00	2.3314	2.0382	2.6669
9.00	2.4103	2.1135	2.7488
10.00	2.4852	2.1851	2.8266
20.00	3.1202	2.7925	3.4864
30.00	3.6765	3.3210	4.0701
40.00	4.2298	3.8393	4.6601
50.00	4.8220	4.3834	5.3045
60.00	5.4971	4.9896	6.0563
70.00	6.3244	5.7128	7.0015
80.00	7.4520	6.6693	8.3266
90.00	9.3560	8.2262	10.6409
91.00	9.6469	8.4590	11.0016
92.00	9.9732	8.7188	11.4082
93.00	10.3448	9.0129	11.8735
94.00	10.7761	9.3522	12.4168
95.00	11.2900	9.7537	13.0683
96.00	11.9252	10.2462	13.8795
97.00	12.7553	10.8838	14.9487
98.00	13.9489	11.7901	16.5031
99.00	16.0610	13.3673	19.2974
99.87	22.8908	18.2907	28.6477
99.90	23.8427	18.9597	29.9832

Proposed Interim Mercury Effluent Limitations

Based on the statistical analysis of pooled low-detection-limit mercury data for the representative dischargers selected, the following are proposed as interim regionwide mercury effluent limits, taken as monthly averages, for municipal dischargers:

Table 4. Proposed interim performance-based mercury effluent limits.

Type of Treatment	Proposed Interim Mercury Limit, ng/L
Secondary Treatment	87
Advanced secondary Treatment	23
Mixed-regime	87 when operated as secondary 23 when operated as advanced secondary
Secondary with holding ponds	23

Discussion

Validity of Approach

As noted in the Introduction, above, an IPBL is typically discharger specific, utilizes the last three years data, and is based on enough data points to produce a reasonable statistical estimate of current performance. For the reasons outlined in the Introduction, that was not feasible for the ultraclean mercury data generally available for individual POTW's in the Region. The approach outlined in this report appears to be valid for the following reasons:

- Final data subsets appear to be well represented by ln-normal distributions, as shown by the Anderson-Darling goodness of fit statistics in the final statistical analysis.

- Division of the data into subsets by type of treatment appears appropriate, again based on the Anderson-Darling goodness of fit statistics for the two projected probability lines (each subset provides an approximately homogeneous, ln-normally distributed group), and as indicated by the results of the Mood's Median test applied to the two subsets (the two sets are statistically dissimilar).

- The IPBLs are proposed as limits not to be exceeded, based on the 99.87th percentile of actual performance data for each subgroup, which is a standard approach for setting effluent limitations, and is more conservative than the once-every-three-years (approximately 99.91st percentile) frequency suggested by U.S. EPA.

Using pooled data is valid because:

- Only about one year's ultraclean data were available for this statistical analysis, and each discharger's individual data set was too small for reliable statistical analysis.

- one year of ultraclean data from a cross section of different plants with similar processes, with 285 data points for secondary treatment and 113 for advanced secondary treatment is representative of plants' performance in each category.

- pooling the data reduces the likelihood of penalizing plants that have implemented effective control measures and are already performing well as compared to other plants that may not have implemented similar measures (see Protection of Water Quality, below).

- pooling the data results in a more consistent set of interim mercury effluent limits that can be applied uniformly regionwide.

- pre-2000 performance data included a high percentage of non-detects (ND's), and the effluent limits based on those data were typically 210 nanograms per liter, rather than the lower limits proposed in this report.

Percentiles and Regulatory Control Points

The proposed interim performance based effluent limits are based on the 99.87th percentile of the respective data groupings. The 99.87^{th} percentile has historically been used in environmental regulation as an upper limit, as it represents a number that should not be exceeded more than once per 769 samples:

$$Likelihood\ \ of\ of\ exceedence\ = (1 - .9987) = \left(\frac{1}{769}\right).$$

This number is more conservative than the number given in U.S. EPA guidance that effluent limitations will be protective as long as they are not exceeded more than once every three years, which corresponds to approximately the 99.91^{th} percentile, based on

$$Likelihood\ of\ exceedence = \left(\frac{1}{3*365}\right) = \left(\frac{1}{1095}\right) \approx (1 - .9991)$$

Since MiniTab™ estimates percentiles for the entire population, rather than the observed sample, the 99.87^{th} percentile numbers may be greater than the observed data. This is an acceptable regulatory control point because the percentiles (including the 99.87^{th} percentile) and the underlying data distribution from which they are calculated are both products of the underlying treatment technology. Although other data distribution shapes could be imagined that would have similar 99.87^{th} percentile values, the shape of this data distribution should not change as long as treatment processes do not change. Should operational performance degrade, the data distribution would be expected to shift upward, taking the 99.87^{th} percentile of the data up with it. This would produce more frequent violations of the interim effluent limit.

Regulatory controls are sometimes based on other percentiles than the 99.87^{th}; in those cases, the regulatory language envisions a certain number of exceedences. It could be argued that some lower IPBL, perhaps based on a 12-month moving median, or some other, lower percentile should be used instead. The moving median approach would be

valid if applied to individual POTW's, and is premature at this point due to the lack of individual data points. Lower-percentile control points would require additional statistical evaluations by case handlers (and discharger staff) to evaluate compliance by determining the number of exceedences per number of sampling events (2 out of 10 for 80^{th} percentile, for example). Automating this compliance tracking would require reprogramming the ERS to monitor numbers of exceedences for a particular number of sampling events. It is more straightforward to monitor compliance with upper limit controls – the proposed IPBLs are easily interpreted from a compliance perspective and place no additional load on staff or the ERS.

Other possible data groupings

This statistical analysis is based on data groupings by treatment type, subject to the simplifications discussed in the Data Refinement and Reevaluation section, above. Although data groupings by other variables are possible, the data to investigate them are not currently available. This statistical analysis indicates that grouping by treatment type is adequate and appropriate at this time. Other data groupings may be investigated in the future if the data become available.

Performance Reevaluation

The preliminary statistical analysis indicated one treatment plant had mercury concentration data significantly different from plants in either treatment category (see Data Reevaluation and Refinement section, above). This plant recently had its NPDES permit renewed, prior to this statistical analysis, and its NPDES permit includes an IPBL for mercury. Regional Board staff will work with that discharger to identify the cause(s) of this difference, and will determine if its NPDES permit should be reopened to change the mercury IPBL.

Protection of Water Quality

This statistical approach has resulted in IPBLs that are significantly lower than the previous limits – 87 or 23 nanograms per liter versus 210 nanograms per liter for most deepwater discharges – and are still representative of overall plant performance regionwide. It is reasonable to expect that this will result in maintaining the current performance by the POTWs in each of the two groups until the mercury TMDL and its waste load allocations are developed.

Many POTWs have implemented sophisticated pollution prevention measures for mercury (collecting mercury thermometers, collecting fluorescent lamp tubes, and working with medical/dental facilities to insure mercury containing wastes are not discharged to collection systems). However, to date, not all POTWs have implemented these programs since mercury was not a compliance issue in the past. Continued implementation of existing and/or additional mercury pollution prevention measures will be the prerequisite to have an IPBL in lieu of final limit in the permit. The Regional Board staff expects NPDES permits to be one mechanism to ensure all POTW's to implement baseline pollution prevention programs. This is reflected in the positions of

the Bay Area Clean Water Agencies and the Bay Area Pollution Prevention Group. POTW groups have also sponsored SB 633 (Sher), The California Mercury Reduction Act of 2001, which will remove additional sources from the environment. Taken together, all these measures will ensure that current performance of POTW's in the Region is maintained or improved in the interim until the TMDL is developed.

Summary

This statistical analysis provided the following answers to the questions stated in the Introduction, above

- *Is pooling the ultraclean data from various municipal dischargers statistically valid?*

  Pooled data, divided into appropriate subgroups (see next bulleted item) is statistically valid.

- *Should the data be divided into subgroups and, if so, based on which factors?*

  Dividing data into subgroups based on treatment technology produced statistically acceptable results, based on goodness-of-fit tests applied to projected probability plots of the subgrouped data.

- *Can statistical analysis of pooled data guide development of regionwide interim performance-based effluent limits (IPBLs) for mercury from municipal dischargers?*

  The goodness-of-fit statistics for the last round of ln-plotted probability plots indicate that the whole-population percentile estimates calculated for those plots can be used to as the basis for regulatory control points (limits).

- *Would establishing regionwide IPBLs hold all POTWs at current performance and be protective?*

  Explicit mass calculations are outside the scope of this statistical analysis. However, as discussed in the Protection of Water Quality section above, consistently controlling for any percentile from a data distribution will control the entire data distribution. Thus, compliance with the IPBLs proposed in this report would hold POTWs at current performance. To the extent that the IPBLs motivate less-well-performing plants to implement pollution prevention measures and source controls, they should result in improved performance from those plants. Total annual loading can be estimated in future years to see if this holds true. Considering the relatively small contribution of mercury loads from the POTWs to overall mercury loading to the Bay, it is unlikely that TMDL/WLA would require additional load reduction beyond the pollution prevention and source controls that are required by permits.

References Referred To In Conducting This Analysis

1. California Regional Water Quality Control Board, San Francisco Bay Region *San Francisco Bay Basin (Region 2). Water Quality Control Plan*. 1995 and subsequent amendments.

2. California Regional Water Quality Control Board, San Francisco Bay Region, *Watershed Management of Mercury in the San Francisco Bay Estuary: A Total Maximum Daily Load Report to U.S. EPA.* April 1, 2000.

3. Helsel, D.R., and Hirsch, R.M. *Statistical Methods in Water Resources*. 2000.

4. Krebs, C.J. *Ecological Methodology*. 2000.

5. MiniTab Corporation. MiniTab™ Release 13.30 online documentation, 2001.

6. MiniTab Corporation, MiniTab™ Release 13.30, personal communication with MiniTab support technician, May 21, 2001.

Appendix A: Preliminary Verified Data Set

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
Benicia	2	Solano	1/10/00	2.7	30.6
Benicia	2	Solano	2/16/00	4.51	17.4
Benicia	2	Solano	4/4/00	3.29	15
Benicia	2	Solano	5/18/00	3.01	12
Benicia	2	Solano	6/13/00	3.26	17
Benicia	2	Solano	7/12/00	2.82	23
Benicia	2	Solano	8/8/00	2.64	19
Benicia	2	Solano	9/28/00	2.48	22
Benicia	2	Solano	10/18/00	2.76	19
Benicia	2	Solano	11/15/00	2.76	13
Benicia	2	Solano	12/14/00	3.42	11
Benicia	2	Solano	1/25/01	3.55	8
Burlingame	2	San Mateo	1/6/00	3.518	7.48
Burlingame	2	San Mateo	2/2/00	4.413	7.1
Burlingame	2	San Mateo	3/1/00	5.733	8.56
Burlingame	2	San Mateo	4/17/00	4.599	11.3
Burlingame	2	San Mateo	5/5/00	3.758	13.3
Burlingame	2	San Mateo	7/21/00	3.843	17
Burlingame	2	San Mateo	8/8/00	3.499	4.49
Burlingame	2	San Mateo	9/13/00	3.607	11.4
Burlingame	2	San Mateo	10/4/00	4.254	8.27
Burlingame	2	San Mateo	11/6/00	4.005	6.2
Burlingame	2	San Mateo	12/5/00	4.062	10
Burlingame	2	San Mateo	1/6/01	3.79	9.3
CCCSD	2B	Contra Costa	1/5/00	39.7	19
CCCSD	2B	Contra Costa	2/3/00	46.9	ND
CCCSD	2B	Contra Costa	3/2/00	64.9	25
CCCSD	2B	Contra Costa	4/5/00	47.6	17
CCCSD	2B	Contra Costa	5/4/00	43.8	22
CCCSD	2B	Contra Costa	6/12/00	41.3	28
CCCSD	2B	Contra Costa	7/7/00	40.8	29
CCCSD	2B	Contra Costa	8/3/00	41.1	29
CCCSD	2B	Contra Costa	9/7/00	40	29
CCCSD	2B	Contra Costa	10/4/00	39.4	39
CCCSD	2B	Contra Costa	11/3/00	41.2	42
CCCSD	2B	Contra Costa	12/6/00	39.7	22
CCCSD	2B	Contra Costa	1/23/01	41.5	44
CCCSD	2B	Contra Costa	2/8/01	40.2	30
CentralMarin	2	Marin	2/2/00	13.6	6.71
CentralMarin	2	Marin	3/8/00	23.5	14.1
CentralMarin	2	Marin	4/5/00	9.3	9.71
CentralMarin	2	Marin	5/3/00	8.7	8.34
CentralMarin	2	Marin	6/7/00	8.4	6.04
CentralMarin	2	Marin	7/6/00	8.3	4.47
CentralMarin	2	Marin	8/2/00	8.1	3.8
CentralMarin	2	Marin	9/6/00	7.9	4.2
CentralMarin	2	Marin	10/4/00	7.8	3.65
CentralMarin	2	Marin	11/8/00	8.2	12.2
CentralMarin	2	Marin	12/6/00	8.3	9.31
CentralMarin	2	Marin	1/3/01	8.4	5.6
CentralMarin	2	Marin	2/7/01	9.5	5
DeltaDiablo	2	Contra Costa	1/4/00	13.15	10
DeltaDiablo	2	Contra Costa	6/6/00	13.9	8.6

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
DeltaDiablo	2	Contra Costa	6/19/00	13.09	11.6
DeltaDiablo	2	Contra Costa	8/1/00	14.12	12
DeltaDiablo	2	Contra Costa	9/13/00	13.8	ND
DeltaDiablo	2	Contra Costa	9/17/00	13.4	8.66
DeltaDiablo	2	Contra Costa	9/20/00	13.9	10.8
DeltaDiablo	2	Contra Costa	10/4/00	14.4	11
DeltaDiablo	2	Contra Costa	11/1/00	14.3	12.3
DeltaDiablo	2	Contra Costa	11/15/00	13.1	10.7
DeltaDiablo	2	Contra Costa	12/5/00	13.7	14.5
DeltaDiablo	2	Contra Costa	12/19/00	14.4	11
DeltaDiablo	2	Contra Costa	1/3/01	14.3	13
DeltaDiablo	2	Contra Costa	1/16/01	12.4	13
DeltaDiablo	2	Contra Costa	2/5/01	13.3	14
DeltaDiablo	2	Contra Costa	2/20/01	13.6	17
EBDA	2	Alameda	1/5/00	74.31	19.8
EBDA	2	Alameda	1/19/00	79.08	26.7
EBDA	2	Alameda	2/2/00	83.56	18.7
EBDA	2	Alameda	2/16/00	98.52	15
EBDA	2	Alameda	3/1/00	95.89	ND
EBDA	2	Alameda	3/15/00	89.81	9.1
EBDA	2	Alameda	4/5/00	73.18	18
EBDA	2	Alameda	4/19/00	78.46	10
EBDA	2	Alameda	5/3/00	70.57	14
EBDA	2	Alameda	5/17/00	75.51	10
EBDA	2	Alameda	6/7/00	70.96	12
EBDA	2	Alameda	6/21/00	74.65	11
EBDA	2	Alameda	7/5/00	66.54	10
EBDA	2	Alameda	7/19/00	71.89	13.2
EBDA	2	Alameda	8/2/00	73.43	15.8
EBDA	2	Alameda	8/16/00	68.68	11.2
EBDA	2	Alameda	9/5/00	70.52	11.4
EBDA	2	Alameda	10/4/00	70.32	13.6
EBDA	2	Alameda	11/1/00	85.87	11.8
EBDA	2	Alameda	12/6/00	74.3	21
EBMUD	2B	Alameda	12/8/99	68.4	13.2
EBMUD	2B	Alameda	12/21/99	63.7	13.7
EBMUD	2B	Alameda	12/28/99	64.5	18
EBMUD	2B	Alameda	1/9/00	63.2	14.2
EBMUD	2B	Alameda	1/13/00	66.6	18.4
EBMUD	2B	Alameda	1/19/00	80.9	16.9
EBMUD	2B	Alameda	1/26/00	95.1	36.9
EBMUD	2B	Alameda	2/4/00	78.1	11.5
EBMUD	2B	Alameda	2/10/00	114.6	11.6
EBMUD	2B	Alameda	2/15/00	144.3	73
EBMUD	2B	Alameda	2/24/00	130.5	41.2
EBMUD	2B	Alameda	3/5/00	151.1	30.4
EBMUD	2B	Alameda	3/9/00	148.9	32.1
EBMUD	2B	Alameda	3/15/00	81.3	12.2
EBMUD	2B	Alameda	3/19/00	79.1	11
EBMUD	2B	Alameda	3/29/00	72.1	19.9
EBMUD	2B	Alameda	4/5/00	72	29.6
EBMUD	2B	Alameda	4/12/00	82	19.2
EBMUD	2B	Alameda	4/20/00	72	22.7
EBMUD	2B	Alameda	4/27/00	70	14.2
EBMUD	2B	Alameda	5/4/00	66	9.8
EBMUD	2B	Alameda	5/10/00	76	12.6
EBMUD	2B	Alameda	5/14/00	72	14.1
EBMUD	2B	Alameda	5/24/00	69	21.6

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
EBMUD	2B	Alameda	6/1/00	70	9.6
EBMUD	2B	Alameda	6/8/00	70	12.1
EBMUD	2B	Alameda	6/11/00	69	11.2
EBMUD	2B	Alameda	6/21/00	68	29.4
EBMUD	2B	Alameda	6/27/00	69	9.4
EBMUD	2B	Alameda	7/6/00	69	15.8
EBMUD	2B	Alameda	7/12/00	69	14
EBMUD	2B	Alameda	7/20/00	67	9.35
EBMUD	2B	Alameda	7/26/00	71	16.4
EBMUD	2B	Alameda	8/3/00	68	9.16
EBMUD	2B	Alameda	8/9/00	72	9.54
EBMUD	2B	Alameda	8/13/00	64	13.5
EBMUD	2B	Alameda	8/23/00	67	11.9
EBMUD	2B	Alameda	8/24/00	68	10.8
EBMUD	2B	Alameda	8/29/00	68	12.9
EBMUD	2B	Alameda	9/6/00	63	20.3
EBMUD	2B	Alameda	9/13/00	67	10.4
EBMUD	2B	Alameda	9/20/00	65	9.55
EBMUD	2B	Alameda	9/24/00	66	11
EBMUD	2B	Alameda	10/5/00	64	18.3
EBMUD	2B	Alameda	10/15/00	68	14.8
EBMUD	2B	Alameda	10/19/00	65	18.5
EBMUD	2B	Alameda	10/24/00	64	12
EBMUD	2B	Alameda	11/2/00	69	12
EBMUD	2B	Alameda	11/7/00	66	11
EBMUD	2B	Alameda	11/17/00	68	13
EBMUD	2B	Alameda	11/19/00	70	12
EBMUD	2B	Alameda	11/29/00	81	16
EBMUD	2B	Alameda	12/6/00	69	15
EBMUD	2B	Alameda	12/13/00	82	12
EBMUD	2B	Alameda	12/19/00	67	13
EBMUD	2B	Alameda	12/28/00	69	11
EBMUD	2B	Alameda	1/4/01	66	30
EBMUD	2B	Alameda	1/9/01	72	13
EBMUD	2B	Alameda	1/18/01	71	10
EBMUD	2B	Alameda	1/24/01	75	14
EBMUD	2B	Alameda	1/28/01	75	12
EBMUD	2B	Alameda	2/4/01	72	15
EBMUD	2B	Alameda	2/15/01	83	16
EBMUD	2B	Alameda	2/23/01	134	46
EBMUD	2B	Alameda	2/28/01	85	16
FairfieldSuisun	2A	Solano	2/9/00	16.395	6.91
FairfieldSuisun	2A	Solano	2/17/00	29.996	6.35
FairfieldSuisun	2A	Solano	3/8/00	24.595	3.25
FairfieldSuisun	2A	Solano	3/15/00	18.057	4.54
FairfieldSuisun	2A	Solano	4/4/00	16.172	6.6
FairfieldSuisun	2A	Solano	4/11/00	17.167	5.4
FairfieldSuisun	2A	Solano	5/11/00	16.426	3.6
FairfieldSuisun	2A	Solano	5/16/00	15.694	3.4
FairfieldSuisun	2A	Solano	6/14/00	13.633	3.6
FairfieldSuisun	2A	Solano	6/21/00	16.735	9.3
FairfieldSuisun	2A	Solano	7/5/00	12.71	3.5
FairfieldSuisun	2A	Solano	7/13/00	16.335	4.1
FairfieldSuisun	2A	Solano	8/3/00	12.804	5.3
FairfieldSuisun	2A	Solano	8/9/00	14.225	6.3
FairfieldSuisun	2A	Solano	9/6/00	13.072	3.2
FairfieldSuisun	2A	Solano	9/14/00	13.455	6.7
FairfieldSuisun	2A	Solano	11/9/00	10.425	3.4

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
FairfieldSuisun	2A	Solano	11/15/00	16.204	3.5
FairfieldSuisun	2A	Solano	12/9/00	13.936	4.4
FairfieldSuisun	2A	Solano	12/14/00	16.061	3.2
FairfieldSuisun	2A	Solano	1/3/01	14.698	4.8
FairfieldSuisun	2A	Solano	1/10/01	15.626	6.9
Millbrae	2	San Mateo	1/5/00	1.71	20.4
Millbrae	2	San Mateo	2/2/00	2.02	23.2
Millbrae	2	San Mateo	3/8/00	3.52	6.1
Millbrae	2	San Mateo	4/5/00	1.86	14.2
Millbrae	2	San Mateo	5/3/00	1.82	16.1
Millbrae	2	San Mateo	6/7/00	1.88	15.1
Millbrae	2	San Mateo	7/12/00	1.74	10
Millbrae	2	San Mateo	8/2/00	1.76	11
Millbrae	2	San Mateo	9/13/00	1.79	8.9
Millbrae	2	San Mateo	10/11/00	1.76	12
Millbrae	2	San Mateo	11/14/00	1.66	8.4
Millbrae	2	San Mateo	12/13/00	1.79	6.3
Millbrae	2	San Mateo	1/17/01	1.77	8.8
Millbrae	2	San Mateo	2/21/01	3.43	28
MVSD	2A	Contra Costa	2/9/00	1.854	8
MVSD	2A	Contra Costa	8/2/00	1.769	4.7
MVSD	2A	Contra Costa	8/9/00	1.778	5.3
MVSD	2A	Contra Costa	8/16/00	1.736	4.9
MVSD	2A	Contra Costa	8/22/00	1.738	1.2
MVSD	2A	Contra Costa	9/13/00	1.747	8.4
MVSD	2A	Contra Costa	10/4/00	1.674	6.4
MVSD	2A	Contra Costa	10/11/00	1.693	6.4
MVSD	2A	Contra Costa	10/18/00	1.75	7.4
MVSD	2A	Contra Costa	10/23/00	1.723	7.5
MVSD	2A	Contra Costa	11/2/00	1.732	17
MVSD	2A	Contra Costa	11/9/00	1.781	12
MVSD	2A	Contra Costa	11/17/00	1.824	8
MVSD	2A	Contra Costa	11/30/00	1.838	7
MVSD	2A	Contra Costa	12/4/00	1.731	8.1
MVSD	2A	Contra Costa	12/6/00	1.738	7
MVSD	2A	Contra Costa	12/11/00	1.811	7.3
MVSD	2A	Contra Costa	12/12/00	1.762	6.5
MVSD	2A	Contra Costa	12/18/00	1.822	7.6
MVSD	2A	Contra Costa	12/19/00	1.756	6.9
MVSD	2A	Contra Costa	12/27/00	1.777	7.5
MVSD	2A	Contra Costa	12/28/00	1.774	7.2
MVSD	2A	Contra Costa	1/2/01	1.776	7.3
MVSD	2A	Contra Costa	1/3/01	1.79	7.8
MVSD	2A	Contra Costa	1/9/01	1.814	7.1
MVSD	2A	Contra Costa	1/10/01	2.66	7
MVSD	2A	Contra Costa	1/16/01	1.818	6.7
MVSD	2A	Contra Costa	1/17/01	1.761	7.1
MVSD	2A	Contra Costa	1/24/01	1.83	7.5
MVSD	2A	Contra Costa	1/30/01	1.779	5.7
MVSD	2A	Contra Costa	1/31/01	1.779	5.7
PaloAlto	2A	Santa Clara	1/12/00	25.94357	4
PaloAlto	2A	Santa Clara	2/9/00	27.85798	5.11
PaloAlto	2A	Santa Clara	3/8/00	39.28131	2.85
PaloAlto	2A	Santa Clara	4/12/00	28.8104	2.59
PaloAlto	2A	Santa Clara	5/10/00	27.2606	2.61
PaloAlto	2A	Santa Clara	6/7/00	20.23016	2.78
PaloAlto	2A	Santa Clara	7/12/00	26.43544	4.1
PaloAlto	2A	Santa Clara	8/9/00	26.27452	2.77

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
PaloAlto	2A	Santa Clara	9/13/00	27.38244	4.84
PaloAlto	2A	Santa Clara	10/18/00	26.37206	18.3
PaloAlto	2A	Santa Clara	11/15/00	26.51216	8.52
PaloAlto	2A	Santa Clara	12/6/00	24.23864	7.16
PaloAlto	2A	Santa Clara	1/9/01	25.69047	4.76
PaloAlto	2A	Santa Clara	2/6/01	27.86786	5.02
Petaluma	2A	Sonoma	1/1/00	0	6.54
Petaluma	2A	Sonoma	2/1/00	6.37	10.1
Petaluma	2A	Sonoma	3/1/00	8.557	10.1
Petaluma	2A	Sonoma	11/17/00	5.24	4.6
Petaluma	2A	Sonoma	1/12/01	8.75	6.1
PinoleHercules	2	Contra Costa	3/8/00	4.63	7.97
PinoleHercules	2	Contra Costa	6/7/00	2.11	8.4
PinoleHercules	2	Contra Costa	9/11/00	2.06	8.6
PinoleHercules	2	Contra Costa	12/11/00	2.52	7
Rodeo	2	Contra Costa	3/6/00	1.56	10.8
Rodeo	2	Contra Costa	6/5/00	0.86	5.4
Rodeo	2	Contra Costa	9/6/00	0.761	33
Rodeo	2	Contra Costa	12/5/00	0.702	5.7
SanFrancisco-Southeast	2B	San Francisco	9/1/00	79.2	33
SanFrancisco-Southeast	2B	San Francisco	9/3/00	60.4	29
SanFrancisco-Southeast	2B	San Francisco	9/20/00	75.9	41
SanFrancisco-Southeast	2B	San Francisco	9/28/00	64.1	25
SanFrancisco-Southeast	2B	San Francisco	11/3/00	64.2	7
SanFrancisco-Southeast	2B	San Francisco	11/9/00	66.8	17
SanFrancisco-Southeast	2B	San Francisco	11/17/00	67.9	5
SanFrancisco-Southeast	2B	San Francisco	11/21/00	97.4	11
SanFrancisco-Southeast	2B	San Francisco	12/2/00	66.9	3
SanFrancisco-Southeast	2B	San Francisco	12/16/00	68.4	4
SanFrancisco-Southeast	2B	San Francisco	12/23/00	67.5	7
SanFrancisco-Southeast	2B	San Francisco	1/7/01	62	6
SanFrancisco-Southeast	2B	San Francisco	1/14/01	62.9	9
SanFrancisco-Southeast	2B	San Francisco	1/21/01	64.2	8
SanFrancisco-Southeast	2B	San Francisco	2/5/01	64.1	6
SanFrancisco-Southeast	2B	San Francisco	2/12/01	114.1	14
SanFrancisco-Southeast	2B	San Francisco	2/26/01	84.8	15
SanMateo	2B	San Mateo	1/4/00	11.18	68
SanMateo	2B	San Mateo	2/8/00	12.95	26
SanMateo	2B	San Mateo	3/7/00	20.5	14
SanMateo	2B	San Mateo	4/2/00	14.24	15
SanMateo	2A	San Mateo	5/6/00	12.67	11
SanMateo	2A	San Mateo	6/6/00	12.22	9.5
SanMateo	2A	San Mateo	7/5/00	11.71	8.5
SanMateo	2A	San Mateo	8/7/00	11.74	11
SanMateo	2A	San Mateo	9/12/00	11.41	12.7
SanMateo	2B	San Mateo	10/3/00	11.66	8.4
SanMateo	2B	San Mateo	11/7/00	12.12	13.5
SanMateo	2B	San Mateo	12/5/00	11.76	10.5
SanMateo	2B	San Mateo	1/7/01	13.38	12
SanMateo	2B	San Mateo	2/7/01	11.76	14
Sausilito	2B	Marin	1/2/00	1.598	22.4
Sausilito	2B	Marin	2/2/00	1.369	21
Sausilito	2B	Marin	3/1/00	2.114	16.8
Sausilito	2B	Marin	4/3/00	1.305	21.5
Sausilito	2B	Marin	5/4/00	1.393	15.2
Sausilito	2B	Marin	6/5/00	1.44	25.3
Sausilito	2B	Marin	7/11/00	1.387	30
Sausilito	2B	Marin	8/3/00	1.296	11.7

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
Sausilito	2B	Marin	9/6/00	1.178	19.5
Sausilito	2B	Marin	10/3/00	1.286	22.1
Sausilito	2B	Marin	12/10/00	1.517	23.4
Sausilito	2B	Marin	1/1/01	1.385	23.5
Sausilito	2B	Marin	2/1/01	1.385	23.5
SBSA	2A	San Mateo	1/1/00	16.8	12.7
SBSA	2A	San Mateo	1/7/00	17.9	17.2
SBSA	2A	San Mateo	1/11/00	18.7	17.3
SBSA	2A	San Mateo	1/13/00	18.1	14.3
SBSA	2A	San Mateo	1/19/00	21	11.7
SBSA	2A	San Mateo	1/25/00	37.6	9.6
SBSA	2A	San Mateo	2/3/00	21.87	12
SBSA	2A	San Mateo	2/6/00	21.31	11.1
SBSA	2A	San Mateo	2/12/00	33.46	14.4
SBSA	2A	San Mateo	2/18/00	24.26	14
SBSA	2A	San Mateo	2/25/00	26.39	14
SBSA	2A	San Mateo	3/1/00	26.92	14.1
SBSA	2A	San Mateo	3/7/00	24.73	15.5
SBSA	2A	San Mateo	3/14/00	23.16	13.5
SBSA	2A	San Mateo	3/20/00	21.89	18.8
SBSA	2A	San Mateo	3/25/00	20.24	16.3
SBSA	2A	San Mateo	3/27/00	20.57	19.8
SBSA	2A	San Mateo	4/5/00	19.93	17.9
SBSA	2A	San Mateo	4/12/00	20.29	16.4
SBSA	2A	San Mateo	4/18/00	20.62	14.2
SBSA	2A	San Mateo	4/24/00	20.23	14
SBSA	2A	San Mateo	5/1/00	19.4	19.9
SBSA	2A	San Mateo	5/6/00	19.16	16
SBSA	2A	San Mateo	5/12/00	19.46	14.2
SBSA	2A	San Mateo	5/18/00	19.61	15.8
SBSA	2A	San Mateo	5/23/00	19.56	13.4
SBSA	2A	San Mateo	5/30/00	19.94	15
SBSA	2A	San Mateo	6/5/00	20.13	16.9
SBSA	2A	San Mateo	6/12/00	19.69	12.1
SBSA	2A	San Mateo	6/17/00	18.73	12
SBSA	2A	San Mateo	6/23/00	19.05	16.4
SBSA	2A	San Mateo	6/25/00	19.36	15.8
SBSA	2A	San Mateo	7/5/00	19.99	19
SBSA	2A	San Mateo	7/11/00	19.16	19.2
SBSA	2A	San Mateo	7/17/00	19.43	12.5
SBSA	2A	San Mateo	7/25/00	19.05	15.5
SBSA	2A	San Mateo	7/29/00	18.47	16.8
SBSA	2A	San Mateo	8/4/00	18.76	17.8
SBSA	2A	San Mateo	8/10/00	18.2	11.9
SBSA	2A	San Mateo	8/16/00	17.68	12
SBSA	2A	San Mateo	8/22/00	18.63	19.2
SBSA	2A	San Mateo	8/27/00	17.82	7.99
SBSA	2A	San Mateo	9/4/00	18.47	11.8
SBSA	2A	San Mateo	9/9/00	18.45	14
SBSA	2A	San Mateo	9/15/00	18.3	13.8
SBSA	2A	San Mateo	9/20/00	18.58	11
SBSA	2A	San Mateo	9/26/00	18.68	12.3
SBSA	2A	San Mateo	10/3/00	18.07	11.4
SBSA	2A	San Mateo	10/9/00	18.28	12.4
SBSA	2A	San Mateo	10/15/00	18.2	10.9
SBSA	2A	San Mateo	10/21/00	18.42	13.4
SBSA	2A	San Mateo	10/27/00	22.33	11.3
SBSA	2A	San Mateo	11/3/00	19.38	20.9

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
SBSA	2A	San Mateo	11/8/00	19.21	19.5
SBSA	2A	San Mateo	11/14/00	18.91	20.3
SBSA	2A	San Mateo	11/20/00	18.86	19.8
SBSA	2A	San Mateo	11/26/00	18.25	15.1
SBSA	2A	San Mateo	12/2/00	18.43	15.8
SBSA	2A	San Mateo	12/8/00	18.4	15.8
SBSA	2A	San Mateo	12/14/00	19.49	15.3
SBSA	2A	San Mateo	12/20/00	18.68	13.4
SBSA	2A	San Mateo	12/26/00	17.55	11
SBSA	2A	San Mateo	1/1/01	17.19	9.07
SBSA	2A	San Mateo	1/11/01	30.47	7.28
SBSA	2A	San Mateo	1/13/01	20.69	8.19
SBSA	2A	San Mateo	1/19/01	18.58	14.3
SBSA	2A	San Mateo	1/25/01	25.42	16
SFAirport-Municipal	2	San Mateo	1/3/00	0.89	69
SFAirport-Municipal	2	San Mateo	2/22/00	1.42	84
SFAirport-Municipal	2	San Mateo	4/10/00	0.83	35
SFAirport-Municipal	2	San Mateo	5/8/00	1.04	51
SFAirport-Municipal	2	San Mateo	6/5/00	0.87	24
SFAirport-Municipal	2	San Mateo	7/10/00	0.97	44.4
SFAirport-Municipal	2	San Mateo	8/7/00	1.08	17
SFAirport-Municipal	2	San Mateo	9/11/00	0.9	13
SFAirport-Municipal	2	San Mateo	11/13/00	0.79	26
SFAirport-Municipal	2	San Mateo	12/11/00	0.85	2
SJSC	2A	Santa Clara	1/20/00	127.5	5
SJSC	2A	Santa Clara	2/9/00	128.2	3
SJSC	2A	Santa Clara	3/22/00	131	3
SJSC	2A	Santa Clara	4/6/00	127.4	3
SJSC	2A	Santa Clara	5/2/00	126.9	2
SJSC	2A	Santa Clara	6/8/00	128	3
SJSC	2A	Santa Clara	7/19/00	118.1	2
SJSC	2A	Santa Clara	7/20/00	118.4	2
SJSC	2A	Santa Clara	8/17/00	116.6	2
SJSC	2A	Santa Clara	9/6/00	118.4	4
SJSC	2A	Santa Clara	9/7/00	118.3	3
SJSC	2A	Santa Clara	10/3/00	118.2	2
SJSC	2A	Santa Clara	10/4/00	119.1	2
SJSC	2A	Santa Clara	11/14/00	125	2
SJSC	2A	Santa Clara	11/15/00	123.6	2
SJSC	2A	Santa Clara	12/7/00	120.2	4
SJSC	2A	Santa Clara	1/17/01	120.3	2
Sonoma	2	Sonoma	1/1/00	3.174	4.38
Sonoma	2	Sonoma	1/10/00	3.066	5.02
Sonoma	2	Sonoma	1/18/00	5.785	5.37
Sonoma	2	Sonoma	1/24/00	5.785	5.24
Sonoma	2	Sonoma	1/31/00	5.111	5.8
Sonoma	2	Sonoma	2/7/00	4.213	7.44
Sonoma	2	Sonoma	2/14/00	10.789	11.7
Sonoma	2	Sonoma	2/22/00	8.108	8.65
Sonoma	2	Sonoma	2/28/00	9.086	4.66
Sonoma	2	Sonoma	3/6/00	6.791	6.01
Sonoma	2	Sonoma	3/13/00	5.423	6.5
Sonoma	2	Sonoma	3/20/00	4.584	3.55
Sonoma	2	Sonoma	3/27/00	3.608	4.58
Sonoma	2	Sonoma	4/3/00	3.011	5.72
Sonoma	2	Sonoma	4/10/00	3.449	4.67
Sonoma	2	Sonoma	4/17/00	7.658	5.75
Sonoma	2	Sonoma	4/24/00	3.469	4.04

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
Sonoma	2	Sonoma	5/1/00	3.295	5.22
Sonoma	2	Sonoma	5/8/00	3.858	4.39
Sonoma	2	Sonoma	5/15/00	4.604	3.95
Sonoma	2	Sonoma	12/4/00	2.786	5.33
Sonoma	2	Sonoma	12/11/00	3.365	3.04
Sonoma	2	Sonoma	12/18/00	3.157	4.7
Sonoma	2	Sonoma	12/26/00	2.724	4.36
SouthernMarin	2B	Marin	1/27/00	4.14	24.5
SouthernMarin	2B	Marin	3/16/00	3.22	35.7
SouthernMarin	2B	Marin	4/5/00	2.37	18.8
SouthernMarin	2B	Marin	5/2/00	2.64	25.2
SouthernMarin	2B	Marin	6/9/00	2.51	11
SouthernMarin	2B	Marin	7/13/00	2.41	19
SouthernMarin	2B	Marin	8/3/00	2.46	19
SouthernMarin	2B	Marin	9/6/00	2.4	16
SouthernMarin	2B	Marin	10/18/00	2.44	19
SouthernMarin	2B	Marin	11/5/00	2.85	17
SouthernMarin	2B	Marin	12/20/00	2.85	20
SouthernMarin	2B	Marin	1/3/01	2.52	24
SouthernMarin	2B	Marin	2/14/01	3.67	20
SSFSanBruno	2	San Mateo	1/1/00	8.31	27
SSFSanBruno	2	San Mateo	2/2/00	10.3	21
SSFSanBruno	2	San Mateo	3/7/00	13.01	28
SSFSanBruno	2	San Mateo	4/4/00	9.91	21
SSFSanBruno	2	San Mateo	5/2/00	9.94	23
SSFSanBruno	2	San Mateo	6/1/00	10.02	10
SSFSanBruno	2	San Mateo	7/6/00	10.12	16
SSFSanBruno	2	San Mateo	8/3/00	10.12	17
SSFSanBruno	2	San Mateo	9/6/00	10.07	23
SSFSanBruno	2	San Mateo	10/3/00	9.98	12
SSFSanBruno	2	San Mateo	11/3/00	10.13	15
SSFSanBruno	2	San Mateo	12/13/00	10.28	24.4
SSFSanBruno	2	San Mateo	1/10/01	17.56	26
SSFSanBruno	2	San Mateo	2/1/01	9.84	19
Vallejo	2	Solano	1/4/00	11.3	29.1
Vallejo	2	Solano	1/24/00	27.69	31.7
Vallejo	2	Solano	2/1/00	13.8	23.4
Vallejo	2	Solano	2/11/00	3.2	29.3
Vallejo	2	Solano	3/1/00	20.3	12.9
Vallejo	2	Solano	3/5/00	3.03	14.7
Vallejo	2	Solano	4/3/00	12.6	20.8
Vallejo	2	Solano	5/2/00	13.6	15
Vallejo	2	Solano	6/13/00	12.8	16
Vallejo	2	Solano	7/11/00	12	23
Vallejo	2	Solano	8/10/00	11.4	14
Vallejo	2	Solano	9/13/00	12.3	23
Vallejo	2	Solano	10/4/00	11.2	25
Vallejo	2	Solano	11/8/00	10.2	22
Sunnyvale	2A	Santa Clara	1/11/00	15.9	6
Sunnyvale	2A	Santa Clara	1/23/00	17.68	5
Sunnyvale	2A	Santa Clara	2/9/00	22.79	ND
Sunnyvale	2A	Santa Clara	2/24/00	23.26	ND
Sunnyvale	2A	Santa Clara	3/8/00	19.79	5
Sunnyvale	2A	Santa Clara	3/26/00	18.09	4
Sunnyvale	2A	Santa Clara	4/13/00	13.1	5
Sunnyvale	2A	Santa Clara	4/18/00	13.84	4
Sunnyvale	2A	Santa Clara	5/11/00	11.96	3
Sunnyvale	2A	Santa Clara	5/25/00	13.53	ND

Discharger	Trtmnt	County	Date	Q, mgd	Hg, ng/L
Sunnyvale	2A	Santa Clara	6/14/00	13.27	4
Sunnyvale	2A	Santa Clara	6/27/00	7.05	ND
Sunnyvale	2A	Santa Clara	7/18/00	15.74	ND
Sunnyvale	2A	Santa Clara	7/25/00	17.02	7
Sunnyvale	2A	Santa Clara	8/8/00	11.98	2
Sunnyvale	2A	Santa Clara	8/15/00	9.17	3
Sunnyvale	2A	Santa Clara	9/20/00	9.76	3
Sunnyvale	2A	Santa Clara	9/26/00	7.37	4
Sunnyvale	2A	Santa Clara	10/12/00	15.97	4
Sunnyvale	2A	Santa Clara	10/25/00	13.76	3
Sunnyvale	2A	Santa Clara	11/5/00	13.59	3
Sunnyvale	2A	Santa Clara	11/20/00	16.6	4
Sunnyvale	2A	Santa Clara	12/13/00	12.96	2
Sunnyvale	2A	Santa Clara	12/19/00	13.56	6

Appendix B: Final Verified Data Set

Discharger	Treatment	County	Date	Q, mgd	C_Ng/L
Benicia	2	Solano	1/10/00	2.7	30.6
Benicia	2	Solano	2/16/00	4.5	17.4
Benicia	2	Solano	4/4/00	3.3	15
Benicia	2	Solano	5/18/00	3.0	12
Benicia	2	Solano	6/13/00	3.3	17
Benicia	2	Solano	7/12/00	2.8	23
Benicia	2	Solano	8/8/00	2.6	19
Benicia	2	Solano	9/28/00	2.5	22
Benicia	2	Solano	10/18/00	2.8	19
Benicia	2	Solano	11/15/00	2.8	13
Benicia	2	Solano	12/14/00	3.4	11
Benicia	2	Solano	1/25/01	3.6	8
Burlingame	2	San Mateo	1/6/00	3.5	7.48
Burlingame	2	San Mateo	2/2/00	4.4	7.1
Burlingame	2	San Mateo	3/1/00	5.7	8.56
Burlingame	2	San Mateo	4/17/00	4.6	11.3
Burlingame	2	San Mateo	5/5/00	3.8	13.3
Burlingame	2	San Mateo	7/21/00	3.8	17
Burlingame	2	San Mateo	8/8/00	3.5	4.49
Burlingame	2	San Mateo	9/13/00	3.6	11.4
Burlingame	2	San Mateo	10/4/00	4.3	8.27
Burlingame	2	San Mateo	11/6/00	4.0	6.2
Burlingame	2	San Mateo	12/5/00	4.1	10
Burlingame	2	San Mateo	1/6/01	3.8	9.3
CCCSD	2	Contra Costa	1/5/00	39.7	19
CCCSD	2	Contra Costa	2/3/00	46.9	<16
CCCSD	2	Contra Costa	3/2/00	64.9	25
CCCSD	2	Contra Costa	4/5/00	47.6	17
CCCSD	2	Contra Costa	5/4/00	43.8	22
CCCSD	2	Contra Costa	6/12/00	41.3	28
CCCSD	2	Contra Costa	7/7/00	40.8	29
CCCSD	2	Contra Costa	8/3/00	41.1	29
CCCSD	2	Contra Costa	9/7/00	40.0	29
CCCSD	2	Contra Costa	10/4/00	39.4	39
CCCSD	2	Contra Costa	11/3/00	41.2	42
CCCSD	2	Contra Costa	12/6/00	39.7	22
CCCSD	2	Contra Costa	1/23/01	41.5	44
CCCSD	2	Contra Costa	2/8/01	40.2	30
CentralMarin	2	Marin	2/2/00	13.6	6.71
CentralMarin	2	Marin	3/8/00	23.5	14.1
CentralMarin	2	Marin	4/5/00	9.3	9.71
CentralMarin	2	Marin	5/3/00	8.7	8.34
CentralMarin	2	Marin	6/7/00	8.4	6.04
CentralMarin	2	Marin	7/6/00	8.3	4.47
CentralMarin	2	Marin	8/2/00	8.1	3.8
CentralMarin	2	Marin	9/6/00	7.9	4.2
CentralMarin	2	Marin	10/4/00	7.8	3.65
CentralMarin	2	Marin	11/8/00	8.2	12.2

CentralMarin	2	Marin	12/6/00	8.3	9.31
CentralMarin	2	Marin	1/3/01	8.4	5.6
CentralMarin	2	Marin	2/7/01	9.5	5
DeltaDiablo	2	Contra Costa	1/4/00	13.2	10
DeltaDiablo	2	Contra Costa	6/6/00	13.9	8.6
DeltaDiablo	2	Contra Costa	6/19/00	13.1	11.6
DeltaDiablo	2	Contra Costa	8/1/00	14.1	12
DeltaDiablo	2	Contra Costa	9/13/00	13.8	<16.5
DeltaDiablo	2	Contra Costa	9/17/00	13.4	8.66
DeltaDiablo	2	Contra Costa	9/20/00	13.9	10.8
DeltaDiablo	2	Contra Costa	10/4/00	14.4	11
DeltaDiablo	2	Contra Costa	11/1/00	14.3	12.3
DeltaDiablo	2	Contra Costa	11/15/00	13.1	10.7
DeltaDiablo	2	Contra Costa	12/5/00	13.7	14.5
DeltaDiablo	2	Contra Costa	12/19/00	14.4	11
DeltaDiablo	2	Contra Costa	1/3/01	14.3	13
DeltaDiablo	2	Contra Costa	1/16/01	12.4	13
DeltaDiablo	2	Contra Costa	2/5/01	13.3	14
DeltaDiablo	2	Contra Costa	2/20/01	13.6	17
EBDA	2	Alameda	1/5/00	74.3	19.8
EBDA	2	Alameda	1/19/00	79.1	26.7
EBDA	2	Alameda	2/2/00	83.6	18.7
EBDA	2	Alameda	2/16/00	98.5	15
EBDA	2	Alameda	3/1/00	95.9	<13.8
EBDA	2	Alameda	3/15/00	89.8	9.1
EBDA	2	Alameda	4/5/00	73.2	18
EBDA	2	Alameda	4/19/00	78.5	10
EBDA	2	Alameda	5/3/00	70.6	14
EBDA	2	Alameda	5/17/00	75.5	10
EBDA	2	Alameda	6/7/00	71.0	12
EBDA	2	Alameda	6/21/00	74.7	11
EBDA	2	Alameda	7/5/00	66.5	10
EBDA	2	Alameda	7/19/00	71.9	13.2
EBDA	2	Alameda	8/2/00	73.4	15.8
EBDA	2	Alameda	8/16/00	68.7	11.2
EBDA	2	Alameda	9/5/00	70.5	11.4
EBDA	2	Alameda	10/4/00	70.3	13.6
EBDA	2	Alameda	11/1/00	85.9	11.8
EBDA	2	Alameda	12/6/00	74.3	21
EBMUD	2	Alameda	12/8/99	68.4	13.2
EBMUD	2	Alameda	12/21/99	63.7	13.7
EBMUD	2	Alameda	12/28/99	64.5	18
EBMUD	2	Alameda	1/9/00	63.2	<20
EBMUD	2	Alameda	1/13/00	66.6	<20
EBMUD	2	Alameda	1/19/00	80.9	<20
EBMUD	2	Alameda	1/26/00	95.1	31
EBMUD	2	Alameda	2/4/00	78.1	<20
EBMUD	2	Alameda	2/10/00	114.6	<20
EBMUD	2	Alameda	2/15/00	144.3	70
EBMUD	2	Alameda	2/24/00	130.5	31
EBMUD	2	Alameda	3/5/00	151.1	30
EBMUD	2	Alameda	3/9/00	148.9	30

EBMUD	2	Alameda	3/15/00	81.3	<20
EBMUD	2	Alameda	3/19/00	79.1	<20
EBMUD	2	Alameda	3/29/00	72.1	<20
EBMUD	2	Alameda	4/5/00	72.0	<20
EBMUD	2	Alameda	4/12/00	82.0	<20
EBMUD	2	Alameda	4/20/00	72.0	23
EBMUD	2	Alameda	4/27/00	70.0	20
EBMUD	2	Alameda	5/4/00	66.0	80
EBMUD	2	Alameda	5/10/00	76.0	<20
EBMUD	2	Alameda	5/14/00	72.0	<20
EBMUD	2	Alameda	5/24/00	69.0	26
EBMUD	2	Alameda	6/1/00	70.0	<20
EBMUD	2	Alameda	6/8/00	70.0	<20
EBMUD	2	Alameda	6/11/00	69.0	<20
EBMUD	2	Alameda	6/21/00	68.0	<20
EBMUD	2	Alameda	6/27/00	69.0	<20
EBMUD	2	Alameda	7/6/00	69.0	15.8
EBMUD	2	Alameda	7/12/00	69.0	14
EBMUD	2	Alameda	7/20/00	67.0	9.35
EBMUD	2	Alameda	7/26/00	71.0	16.4
EBMUD	2	Alameda	8/3/00	68.0	9.16
EBMUD	2	Alameda	8/9/00	72.0	9.54
EBMUD	2	Alameda	8/13/00	64.0	13.5
EBMUD	2	Alameda	8/23/00	67.0	11.9
EBMUD	2	Alameda	8/24/00	68.0	10.8
EBMUD	2	Alameda	8/29/00	68.0	12.9
EBMUD	2	Alameda	9/6/00	63.0	20.3
EBMUD	2	Alameda	9/13/00	67.0	10.4
EBMUD	2	Alameda	9/20/00	65.0	9.55
EBMUD	2	Alameda	9/24/00	66.0	11
EBMUD	2	Alameda	10/5/00	64.0	18.3
EBMUD	2	Alameda	10/15/00	68.0	14.8
EBMUD	2	Alameda	10/19/00	65.0	18.5
EBMUD	2	Alameda	10/24/00	64.0	12
EBMUD	2	Alameda	11/2/00	69.0	12
EBMUD	2	Alameda	11/7/00	66.0	11
EBMUD	2	Alameda	11/17/00	68.0	13
EBMUD	2	Alameda	11/19/00	70.0	12
EBMUD	2	Alameda	11/29/00	81.0	16
EBMUD	2	Alameda	12/6/00	69.0	15
EBMUD	2	Alameda	12/13/00	82.0	12
EBMUD	2	Alameda	12/19/00	67.0	13
EBMUD	2	Alameda	12/28/00	69.0	11
EBMUD	2	Alameda	1/4/01	66.0	30
EBMUD	2	Alameda	1/9/01	72.0	13
EBMUD	2	Alameda	1/18/01	71.0	10
EBMUD	2	Alameda	1/24/01	75.0	14
EBMUD	2	Alameda	1/28/01	75.0	12
EBMUD	2	Alameda	2/4/01	72.0	15
EBMUD	2	Alameda	2/15/01	83.0	16
EBMUD	2	Alameda	2/23/01	134.0	46
EBMUD	2	Alameda	2/28/01	85.0	16

FairfieldSuisun	2A	Solano	2/9/00	16.4	6.91
FairfieldSuisun	2A	Solano	2/17/00	30.0	6.35
FairfieldSuisun	2A	Solano	3/8/00	24.6	3.25
FairfieldSuisun	2A	Solano	3/15/00	18.1	4.54
FairfieldSuisun	2A	Solano	4/4/00	16.2	6.6
FairfieldSuisun	2A	Solano	4/11/00	17.2	5.4
FairfieldSuisun	2A	Solano	5/11/00	16.4	3.6
FairfieldSuisun	2A	Solano	5/16/00	15.7	3.4
FairfieldSuisun	2A	Solano	6/14/00	13.6	3.6
FairfieldSuisun	2A	Solano	6/21/00	16.7	9.3
FairfieldSuisun	2A	Solano	7/5/00	12.7	3.5
FairfieldSuisun	2A	Solano	7/13/00	16.3	4.1
FairfieldSuisun	2A	Solano	8/3/00	12.8	5.3
FairfieldSuisun	2A	Solano	8/9/00	14.2	6.3
FairfieldSuisun	2A	Solano	9/6/00	13.1	3.2
FairfieldSuisun	2A	Solano	9/14/00	13.5	6.7
FairfieldSuisun	2A	Solano	11/9/00	10.4	3.4
FairfieldSuisun	2A	Solano	11/15/00	16.2	3.5
FairfieldSuisun	2A	Solano	12/9/00	13.9	4.4
FairfieldSuisun	2A	Solano	12/14/00	16.1	3.2
FairfieldSuisun	2A	Solano	1/3/01	14.7	4.8
FairfieldSuisun	2A	Solano	1/10/01	15.6	6.9
Millbrae	2	San Mateo	1/5/00	1.7	20.4
Millbrae	2	San Mateo	2/2/00	2.0	23.2
Millbrae	2	San Mateo	3/8/00	3.5	6.1
Millbrae	2	San Mateo	4/5/00	1.9	14.2
Millbrae	2	San Mateo	5/3/00	1.8	16.1
Millbrae	2	San Mateo	6/7/00	1.9	15.1
Millbrae	2	San Mateo	7/12/00	1.7	10
Millbrae	2	San Mateo	8/2/00	1.8	11
Millbrae	2	San Mateo	9/13/00	1.8	8.9
Millbrae	2	San Mateo	10/11/00	1.8	12
Millbrae	2	San Mateo	11/14/00	1.7	8.4
Millbrae	2	San Mateo	12/13/00	1.8	6.3
Millbrae	2	San Mateo	1/17/01	1.8	8.8
Millbrae	2	San Mateo	2/21/01	3.4	28
MVSD	2	Contra Costa	2/9/00	1.9	8
MVSD	2	Contra Costa	8/2/00	1.8	4.7
MVSD	2	Contra Costa	8/9/00	1.8	5.3
MVSD	2	Contra Costa	8/16/00	1.7	4.9
MVSD	2	Contra Costa	8/22/00	1.7	1.2
MVSD	2	Contra Costa	9/13/00	1.7	8.4
MVSD	2	Contra Costa	10/4/00	1.7	6.4
MVSD	2	Contra Costa	10/11/00	1.7	6.4
MVSD	2	Contra Costa	10/18/00	1.8	7.4
MVSD	2	Contra Costa	10/23/00	1.7	7.5
MVSD	2	Contra Costa	11/2/00	1.7	17
MVSD	2	Contra Costa	11/9/00	1.8	12
MVSD	2	Contra Costa	11/17/00	1.8	8
MVSD	2	Contra Costa	11/30/00	1.8	7
MVSD	2	Contra Costa	12/4/00	1.7	8.1
MVSD	2	Contra Costa	12/6/00	1.7	7

MVSD	2	Contra Costa	12/11/00	1.8	7.3
MVSD	2	Contra Costa	12/12/00	1.8	6.5
MVSD	2	Contra Costa	12/18/00	1.8	7.6
MVSD	2	Contra Costa	12/19/00	1.8	6.9
MVSD	2	Contra Costa	12/27/00	1.8	7.5
MVSD	2	Contra Costa	12/28/00	1.8	7.2
MVSD	2	Contra Costa	1/2/01	1.8	7.3
MVSD	2	Contra Costa	1/3/01	1.8	7.8
MVSD	2	Contra Costa	1/9/01	1.8	7.1
MVSD	2	Contra Costa	1/10/01	2.7	7
MVSD	2	Contra Costa	1/16/01	1.8	6.7
MVSD	2	Contra Costa	1/17/01	1.8	7.1
MVSD	2	Contra Costa	1/24/01	1.8	7.5
MVSD	2	Contra Costa	1/30/01	1.8	5.7
MVSD	2	Contra Costa	1/31/01	1.8	5.7
PaloAlto	2A	Santa Clara	1/12/00	25.9	4
PaloAlto	2A	Santa Clara	2/9/00	27.9	5.11
PaloAlto	2A	Santa Clara	3/8/00	39.3	2.85
PaloAlto	2A	Santa Clara	4/12/00	28.8	2.59
PaloAlto	2A	Santa Clara	5/10/00	27.3	2.61
PaloAlto	2A	Santa Clara	6/7/00	20.2	2.78
PaloAlto	2A	Santa Clara	7/12/00	26.4	4.1
PaloAlto	2A	Santa Clara	8/9/00	26.3	2.77
PaloAlto	2A	Santa Clara	9/13/00	27.4	4.84
PaloAlto	2A	Santa Clara	10/18/00	26.4	18.3
PaloAlto	2A	Santa Clara	11/15/00	26.5	8.52
PaloAlto	2A	Santa Clara	12/6/00	24.2	7.16
PaloAlto	2A	Santa Clara	1/9/01	25.7	4.76
PaloAlto	2A	Santa Clara	2/6/01	27.9	5.02
Petaluma	2A	Sonoma	1/1/00	-	6.54
Petaluma	2A	Sonoma	2/1/00	6.4	10.1
Petaluma	2A	Sonoma	3/1/00	8.6	10.1
Petaluma	2A	Sonoma	11/17/00	5.2	4.6
Petaluma	2A	Sonoma	1/12/01	8.8	6.1
PinoleHercules	2	Contra Costa	3/8/00	4.6	7.97
PinoleHercules	2	Contra Costa	6/7/00	2.1	8.4
PinoleHercules	2	Contra Costa	9/11/00	2.1	8.6
PinoleHercules	2	Contra Costa	12/11/00	2.5	7
Rodeo	2	Contra Costa	3/6/00	1.6	10.8
Rodeo	2	Contra Costa	6/5/00	0.9	5.4
Rodeo	2	Contra Costa	9/6/00	0.8	33
Rodeo	2	Contra Costa	12/5/00	0.7	5.7
SanFrancisco-Southeast	2	San Francisco	9/1/00	79.2	33
SanFrancisco-Southeast	2	San Francisco	9/3/00	60.4	29
SanFrancisco-Southeast	2	San Francisco	9/20/00	75.9	41
SanFrancisco-Southeast	2	San Francisco	9/28/00	64.1	25
SanFrancisco-Southeast	2	San Francisco	11/3/00	64.2	7
SanFrancisco-Southeast	2	San Francisco	11/9/00	66.8	17
SanFrancisco-Southeast	2	San Francisco	11/17/00	67.9	5
SanFrancisco-Southeast	2	San Francisco	11/21/00	97.4	11
SanFrancisco-Southeast	2	San Francisco	12/2/00	66.9	3
SanFrancisco-Southeast	2	San Francisco	12/16/00	68.4	4

SanFrancisco-Southeast	2	San Francisco	12/23/00	67.5	7
SanFrancisco-Southeast	2	San Francisco	1/7/01	62.0	6
SanFrancisco-Southeast	2	San Francisco	1/14/01	62.9	9
SanFrancisco-Southeast	2	San Francisco	1/21/01	64.2	8
SanFrancisco-Southeast	2	San Francisco	2/5/01	64.1	6
SanFrancisco-Southeast	2	San Francisco	2/12/01	114.1	14
SanFrancisco-Southeast	2	San Francisco	2/26/01	84.8	15
SanMateo	2	San Mateo	1/4/00	11.2	68
SanMateo	2	San Mateo	2/8/00	13.0	26
SanMateo	2	San Mateo	3/7/00	20.5	14
SanMateo	2	San Mateo	4/2/00	14.2	15
SanMateo	2A	San Mateo	5/6/00	12.7	11
SanMateo	2A	San Mateo	6/6/00	12.2	9.5
SanMateo	2A	San Mateo	7/5/00	11.7	8.5
SanMateo	2A	San Mateo	8/7/00	11.7	11
SanMateo	2A	San Mateo	9/12/00	11.4	12.7
SanMateo	2	San Mateo	10/3/00	11.7	8.4
SanMateo	2	San Mateo	11/7/00	12.1	13.5
SanMateo	2	San Mateo	12/5/00	11.8	10.5
SanMateo	2	San Mateo	1/7/01	13.4	12
SanMateo	2	San Mateo	2/7/01	11.8	14
Sausilito	2	Marin	1/2/00	1.6	22.4
Sausilito	2	Marin	2/2/00	1.4	21
Sausilito	2	Marin	3/1/00	2.1	16.8
Sausilito	2	Marin	4/3/00	1.3	21.5
Sausilito	2	Marin	5/4/00	1.4	15.2
Sausilito	2	Marin	6/5/00	1.4	25.3
Sausilito	2	Marin	7/11/00	1.4	30
Sausilito	2	Marin	8/3/00	1.3	11.7
Sausilito	2	Marin	9/6/00	1.2	19.5
Sausilito	2	Marin	10/3/00	1.3	22.1
Sausilito	2	Marin	12/10/00	1.5	23.4
Sausilito	2	Marin	1/1/01	1.4	23.5
Sausilito	2	Marin	2/1/01	1.4	23.5
SFAirport-Municipal	2	San Mateo	1/3/00	0.9	69
SFAirport-Municipal	2	San Mateo	2/22/00	1.4	84
SFAirport-Municipal	2	San Mateo	4/10/00	0.8	35
SFAirport-Municipal	2	San Mateo	5/8/00	1.0	51
SFAirport-Municipal	2	San Mateo	6/5/00	0.9	24
SFAirport-Municipal	2	San Mateo	7/10/00	1.0	44.4
SFAirport-Municipal	2	San Mateo	8/7/00	1.1	17
SFAirport-Municipal	2	San Mateo	9/11/00	0.9	13
SFAirport-Municipal	2	San Mateo	11/13/00	0.8	26
SFAirport-Municipal	2	San Mateo	12/11/00	0.9	2
SJSC	2A	Santa Clara	1/20/00	127.5	5
SJSC	2A	Santa Clara	2/9/00	128.2	3
SJSC	2A	Santa Clara	3/22/00	131.0	3
SJSC	2A	Santa Clara	4/6/00	127.4	3
SJSC	2A	Santa Clara	5/2/00	126.9	2
SJSC	2A	Santa Clara	6/8/00	128.0	3
SJSC	2A	Santa Clara	7/19/00	118.1	2
SJSC	2A	Santa Clara	7/20/00	118.4	2

SJSC	2A	Santa Clara	8/17/00	116.6	2
SJSC	2A	Santa Clara	9/6/00	118.4	4
SJSC	2A	Santa Clara	9/7/00	118.3	3
SJSC	2A	Santa Clara	10/3/00	118.2	2
SJSC	2A	Santa Clara	10/4/00	119.1	2
SJSC	2A	Santa Clara	11/14/00	125.0	2
SJSC	2A	Santa Clara	11/15/00	123.6	2
SJSC	2A	Santa Clara	12/7/00	120.2	4
SJSC	2A	Santa Clara	1/17/01	120.3	2
Sonoma	2	Sonoma	1/1/00	3.2	4.38
Sonoma	2	Sonoma	1/10/00	3.1	5.02
Sonoma	2	Sonoma	1/18/00	5.8	5.37
Sonoma	2	Sonoma	1/24/00	5.8	5.24
Sonoma	2	Sonoma	1/31/00	5.1	5.8
Sonoma	2	Sonoma	2/7/00	4.2	7.44
Sonoma	2	Sonoma	2/14/00	10.8	11.7
Sonoma	2	Sonoma	2/22/00	8.1	8.65
Sonoma	2	Sonoma	2/28/00	9.1	4.66
Sonoma	2	Sonoma	3/6/00	6.8	6.01
Sonoma	2	Sonoma	3/13/00	5.4	6.5
Sonoma	2	Sonoma	3/20/00	4.6	3.55
Sonoma	2	Sonoma	3/27/00	3.6	4.58
Sonoma	2	Sonoma	4/3/00	3.0	5.72
Sonoma	2	Sonoma	4/10/00	3.4	4.67
Sonoma	2	Sonoma	4/17/00	7.7	5.75
Sonoma	2	Sonoma	4/24/00	3.5	4.04
Sonoma	2	Sonoma	5/1/00	3.3	5.22
Sonoma	2	Sonoma	5/8/00	3.9	4.39
Sonoma	2	Sonoma	5/15/00	4.6	3.95
Sonoma	2	Sonoma	12/4/00	2.8	5.33
Sonoma	2	Sonoma	12/11/00	3.4	3.04
Sonoma	2	Sonoma	12/18/00	3.2	4.7
Sonoma	2	Sonoma	12/26/00	2.7	4.36
SouthernMarin	2	Marin	1/27/00	4.1	24.5
SouthernMarin	2	Marin	3/16/00	3.2	35.7
SouthernMarin	2	Marin	4/5/00	2.4	18.8
SouthernMarin	2	Marin	5/2/00	2.6	25.2
SouthernMarin	2	Marin	6/9/00	2.5	11
SouthernMarin	2	Marin	7/13/00	2.4	19
SouthernMarin	2	Marin	8/3/00	2.5	19
SouthernMarin	2	Marin	9/6/00	2.4	16
SouthernMarin	2	Marin	10/18/00	2.4	19
SouthernMarin	2	Marin	11/5/00	2.9	17
SouthernMarin	2	Marin	12/20/00	2.9	20
SouthernMarin	2	Marin	1/3/01	2.5	24
SouthernMarin	2	Marin	2/14/01	3.7	20
SSFSanBruno	2	San Mateo	1/1/00	8.3	27
SSFSanBruno	2	San Mateo	2/2/00	10.3	21
SSFSanBruno	2	San Mateo	3/7/00	13.0	28
SSFSanBruno	2	San Mateo	4/4/00	9.9	21
SSFSanBruno	2	San Mateo	5/2/00	9.9	23
SSFSanBruno	2	San Mateo	6/1/00	10.0	10

SSFSanBruno	2	San Mateo	7/6/00	10.1	16
SSFSanBruno	2	San Mateo	8/3/00	10.1	17
SSFSanBruno	2	San Mateo	9/6/00	10.1	23
SSFSanBruno	2	San Mateo	10/3/00	10.0	12
SSFSanBruno	2	San Mateo	11/3/00	10.1	15
SSFSanBruno	2	San Mateo	12/13/00	10.3	24.4
SSFSanBruno	2	San Mateo	1/10/01	17.6	26
SSFSanBruno	2	San Mateo	2/1/01	9.8	19
Sunnyvale	2A	Santa Clara	1/11/00	15.9	6
Sunnyvale	2A	Santa Clara	1/23/00	17.7	5
Sunnyvale	2A	Santa Clara	2/9/00	22.8	<4
Sunnyvale	2A	Santa Clara	2/24/00	23.3	<3
Sunnyvale	2A	Santa Clara	3/8/00	19.8	5
Sunnyvale	2A	Santa Clara	3/26/00	18.1	4
Sunnyvale	2A	Santa Clara	4/13/00	13.1	5
Sunnyvale	2A	Santa Clara	4/18/00	13.8	4
Sunnyvale	2A	Santa Clara	5/11/00	12.0	3
Sunnyvale	2A	Santa Clara	5/25/00	13.5	<2
Sunnyvale	2A	Santa Clara	6/14/00	13.3	4
Sunnyvale	2A	Santa Clara	6/27/00	7.1	<2
Sunnyvale	2A	Santa Clara	7/18/00	15.7	<3
Sunnyvale	2A	Santa Clara	7/25/00	17.0	7
Sunnyvale	2A	Santa Clara	8/8/00	12.0	2
Sunnyvale	2A	Santa Clara	8/15/00	9.2	3
Sunnyvale	2A	Santa Clara	9/20/00	9.8	3
Sunnyvale	2A	Santa Clara	9/26/00	7.4	4
Sunnyvale	2A	Santa Clara	10/12/00	16.0	4
Sunnyvale	2A	Santa Clara	10/25/00	13.8	3
Sunnyvale	2A	Santa Clara	11/5/00	13.6	3
Sunnyvale	2A	Santa Clara	11/20/00	16.6	4
Sunnyvale	2A	Santa Clara	12/13/00	13.0	2
Sunnyvale	2A	Santa Clara	12/19/00	13.6	6
Vallejo	2	Solano	1/4/00	11.3	29.1
Vallejo	2	Solano	1/24/00	27.7	31.7
Vallejo	2	Solano	2/1/00	13.8	23.4
Vallejo	2	Solano	2/11/00	3.2	29.3
Vallejo	2	Solano	3/1/00	20.3	12.9
Vallejo	2	Solano	3/5/00	3.0	14.7
Vallejo	2	Solano	4/3/00	12.6	20.8
Vallejo	2	Solano	5/2/00	13.6	15
Vallejo	2	Solano	6/13/00	12.8	16
Vallejo	2	Solano	7/11/00	12.0	23
Vallejo	2	Solano	8/10/00	11.4	14
Vallejo	2	Solano	9/13/00	12.3	23
Vallejo	2	Solano	10/4/00	11.2	25
Vallejo	2	Solano	11/8/00	10.2	22