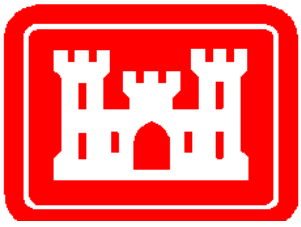
ANNUAL WATER QUALITY REPORT

Water Year 2002



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January 2003

Preface to the 2002 Water Quality Report

As may be noted by readers of prior annual Water Quality Reports for the Sacramento District there has been a change of authorship this year. Victor Chan, author of prior year's reports, has transferred to the San Francisco District of the U.S. Army Corps of Engineers. This year's report is the product of John Headlee, P.E. and John J. Baum, both Environmental Engineers. With this change in authorship there are probable changes in perspective, Mr. Headlee having performed environmental engineering and water quality tasks in the context of navigational and construction dredging projects for several years and Mr. Baum having been in the Corps' rotational assignment program, but having recently received a Master of Science Degree in Environmental Engineering and formerly working in the field of limnology. Overall it is the hope of the authors that this perspective will be additive and that the reader will also find new perspectives and information in this work.

Some notable changes in this year's report include the manner of presentation of the metals data resulting from the water sampling program, the inclusion of more commentary on parameters other than just the metals, and a compilation of historic Secchi disk depths as a method of classification and lake health indicator.

The metals concentration data for the last five years had been presented as bar graphs at numerous different locations within any lake and at one downstream location. In the past the length of the bar was made to represent the either the "non-detect" concentration, a measure of the labs ability to measure, or the concentration if it were above the "non-detect" level. This is not representative of the concentration of metals within the lakes in the case of the non-detect value because a non-detect value means that there was no indication of the presence of the chemical. Representing a metal as being present at a concentration equal to the "non-detect" level is certainly conservative, but could lead to the indication of trends that do not exist in the instance where labs changed and the detection limit increased. Upon further enquiry it was found that the "non-detect" level was actually what should have been called the "practical quantitation limit" (PQL) for the lab, a level that is several to many times higher than the non-detect level so the past display of concentrations was doubly conservative and not representative of the state of knowledge concerning the water concentrations since the concentrations were not known, but certainly, if present, were below the plotted levels.

As a result of the discoveries above it was decided that as before where there were detections of metals above the PQL they would be plotted at the determined concentration, however, for levels below the PQL the unknown values would be plotted either as: 1) Their indicated value if a "flagged " value was presented by the lab indicating that even though there was no detection above the PQL, there were indications that the concentrations was "closing in from below" on the PQL value or 2) as a marker in the form of a very short yet visible bar to indicate that the metal was analyzed for, but it was either totally not found to present (non-detect) or that if there were indications that it might be present the concentration was indicated to be less than 50% of the PQL. The term "indicated" is used on purpose because as the concentration falls further and further below the PQL from the 50% level the probability that the quantity indicated is correct fades to insignificance.

The compilation of historical Secchi Disc depths (SD) was a first step toward using archived data to identify long-term trends within the lakes. Each lake has now been classified according to its historical average SD value and any newly acquired data can be interpreted more accurately.

I. Introduction

A. Requirements - This report follows the requirements of Engineering Regulation 1110-2-8154, entitled "Water Quality and Environmental Management for Corps Civil Works Projects". This USACE's regulation requires a summary of the water quality management programs for the past fiscal year, and requires the following items be addressed in this report:

(1) Description of the goals and objectives of the water quality management program.

(2) Progress made toward meeting those goals and objectives.

(3) Activities that are planned for out years.

(4) Changes in technical capabilities in the district office.

(5) Relationship between water quality and water control management activities.

(6) Pertinent division regulations.

(7) Laboratory facilities.

(8) Data management system.

(9) Training needs.

(10) A discussion of research and development needs.

(11) Special studies completed or required.

(12) Water quality coordination with other agencies.

(13) Scheduling for detailed project evaluations.

(14) Problems encountered with contracted work.

(15) Hindrances to meeting goals & objectives & proposed solutions

(16) Special assistance from other Corps elements or research facilities.

(17) A project-by-project summary of water quality conditions.

(18) Problems encountered and how addressed at each project.

(19) Opportunities identified and how addressed.

(20) Innovative techniques utilized to improve water quality.

(21) Regulatory changes

(22) Data or R&D activity with Corps wide applicablility

B. Goals and Objectives

The goals and objectives of the water quality management program are to ensure that the US Army Corps of Engineers' projects in the planning, design, construction, and operation phases do not degrade water quality and that the beneficial uses of the water near the project site can be maintained. As announced this year, this includes consideration of cumulative impacts and unintended consequences. Progress toward the goal is achieved by having a water quality engineer participating in the Civil Works Process beginning with the Reconnaissance phase all the way to the Construction phase. Critical involvement is in the intermediate phases when the feasibility studies and engineering work are being accomplished. A water quality engineer ensures that the Civil Work Process includes the application of monitoring programs, best management practices, the utilization of analytical techniques, and the installation of mitigation devices where needed.

Other goals and objectives for the existing 12 lakes in the annual lake monitoring program are to establish the baseline water quality conditions, to detect the entrance of undesirable nutrient and toxic loads, monitor for any adverse trends, and to ensure that the water quality remains satisfactory to support the beneficial uses assigned to the lake and the downstream water from the lake.

C. Progress Made Toward Meeting The Goals and Objectives

During a typical US Army Corps of Engineers project's planning phase, a water quality engineer will be involved in negotiating or reviewing the state regulatory requirements such as the Waste Discharge Requirements (WDR) issued by the applicable California Regional Water Quality Control Board. If the regulatory requirements have already been established, the water quality engineer would issue a written or verbal report evaluating the regulatory requirements and make recommendations to the Project Manager on specific steps necessary to ensure implementation and compliance. Some of these recommendations may include environmental engineering to ensure water quality. Prior to entering the construction phase of a project, the water quality engineer can work with project managers to ensure that storm water pollution prevention measures that are needed for a project have been anticipated. During construction the water quality engineer performs follow up to validate that the anticipated storm water pollution prevention measures are operating adequately and implemented properly. Additionally, during the construction phase of any in water work the water quality engineer verifies that adequate water sampling is performed.

Ecosystem restoration projects are becoming more common and more important in the future of US Army Corps of Engineers. This is somewhat of a shift from the original objective of protecting the environment. The new objective is now restoring the environment that has been degraded by prior human activities. Now the District's Planning Department solicits the views of a District water quality engineer to provide technical insight in the planning and design of ecosystem restoration projects during the reconnaissance and feasibility stages. An example of this is the Feasibility Study for the Steamboat Springs (Sparks, NV) restoration project which may have started with wetland creation as an objective, but was steered away from that objective to strictly riparian habitat creation because of the mercury content of the stream's waters and the potential for transformation of that mercury into a bio-available form by wetlands.

For the Lake Monitoring Program, the baseline data has been established so this program is progressing to address more site specific ecosystem problems such as MTBE and mercury in fish that have been

found on certain lakes. Additionally, the baseline data collected is being compiled to more accurately look at long term heath trends within the lakes.

D. Activities Planned For The Out-years

All of current programs are expected to continue. The current plan for the existing annual lake water quality monitoring program is to start tailoring the program to address site-specific conditions. More monitoring may be performed on lakes that are experiencing problems while other lakes with no apparent problems will have a reduced monitoring program. The lake monitoring program is now focusing on the potential bioaccumulation of mercury in fish tissue and sample points where other lake parameters were higher than expected. Addtionally work will be done to incorporate archived data in order to observe long term trends in the lakes that may not be apparent when examined year to year.

The report for the data collected from the Sacramento Deep Water Ship Channel pre-deepening salinity monitoring program in the mid 1990's is going to be finished so that it is available for comparison to post-deepening data.

The jet aerators in the Stockton Deep Water Ship Channel (DWSC) are expected to continue to be utilized during the fall salmon run, but consideration is also being given to using the aerators at other times in mitigation for deepening near the berths of the Port's new "West Complex" previously known as Rough & Ready Island. During the year a ship collided with the dock that supported the walkway to the aerators, but left the aerators relatively unscathed. They have been restored and are operable.

Of course in the first instance the aerators were put in place in mitigation of the presumed oxygen demand created by deepening the Stockton DWSC from 30' to 35'. The Port of Stockton and portions of the DWSC have been declared an impaired body of water under § 303(d) of the Clean Water Act based on low levels of dissolved oxygen (DO). As a result a Total Maximum (oxygen load) Daily Load (TMDL) is in the process of being prepared for this reach. It has been found that any one of three factors , if eliminated, would resolve the DO impairment: 1) Flows below approximately 2000 cfs. 2) The existence of a deepened port and 3) Biologic loads from several sources including, those from upstream, those from the Stockton treatment plant and/or from Stockton stormwater. There have been occurrences of DO in the region of 1 mg/liter this year as compared to the desired 5 mg/liter. The eventual form of the TMDL will be more clear by July 2003 when it is due to be presented to the U.S. EPA. It is likely to include a so called phased approach in which immediate measures such as aeration are tried while the influence of other factors and other measures to be taken are being determined. In response to long standing requests, the Corps has become involved in this process.

A review of the last year's Water Quality Report reveals, from the perspective of one involved in the qualitative change in the WDR for navigational dredging that was wrought in that time frame, a light treatment of the subject. Some of the recent events mentioned below occurred slightly after FY 2002 ended and hence are treated here in the out year section, albeit the requirements below will express themselves within only the next few months during the 2003 summer dredging season. Beginning at the beginning; in 1999 the Central Valley Regional Water Quality Control Board (CVRWQCB) received Cal-Fed funding to completely overhaul the dredging WDR's. This task was undertaken with a vengeance. For the five months preceding the hearing on whether the new WDR should be imposed by the CVRWQCB over the Corps' objections, little other than commenting on the stringency of the WDR was done by the water quality engineer involved in navigational dredging. At the hearing on May 11, 2001 the CVRWQCB imposed the WDR as it was over the Corps' objection. A precautionary appeal was filed. The period for bringing the appeal runs this May 11, 2003. At the hearing CVRWCQB representatives stated on the record that in applying the WDR that both attenuation of contaminants and mixing with waters having sufficient assimilative capacity would be allowed. It was

not until this reporting period (FY2002) that it became clear what the CVRWQCB's interpretation of such allowances were. Suffice it to say the Corps' now finds itself saddled with more restrictive requirements than it anticipated at the time the WDR was imposed with the possibility that no mixing being allowed in receiving waters for bio-accumulative metals such as mercury.

This is a potentially significant limitation since in high water years or in construction dredging it is necessary to discharge effluent at some sites and the concentration exceeds the current criterion of 50 parts-per-trillion imposed by the WDR. Thus some out-year activity, perhaps in FY 2003 will have to be undertaken to either get relief from this criterion or to mitigate its effects, that being the prevention of the discharge of effluent from dredging sites. The latter would entail either increasing the size of dredge ponds or dredging at very low rates, both of which would increase the unit costs of removing dredged material from channels.

Further during the Cal-Fed grant period mentioned above CVRWQCB produced a Delta Dredged Material Re-use Strategy (DDRS) which delves deeply into the area of restrictions on re-use of dredged materials. Re-use of dredged materials is beneficial to all concerned; it empties the dredged materials ponds so that they can be used again avoiding expense, it provides a benefit to the environment in providing a convenient source of material to build wetlands, in shore (barrier) islands, and to reduce the depth of flooded islands so that wetland habitat can be established. It has been used as reinforcement material for levees thereby lessening the probability of a levee failure that could draw saltwater into the delta. It has been used for fill and as sand for concrete and can be a source of revenue to either lessen the cost of dredging or benefit the construction of better waterways. It is planned to be used in Old Mormon Slough, an upstream branch near the Port of Stockton, for capping contaminated sediments off shore of a former wood treatment plant. Tests of the Corps' dredged materials show that it is freer of metals contamination than materials supplied by large scale materials operations and is, of course, convenient to transport to water related construction projects.

Even though the CVRWQCB expresses its own doubt about whether it has jurisdiction to regulate sediments, other than those that might have an impact on groundwater through leaching, it has propounded the DDRS in June 2002, and gave notice of the preparation of an Environmental Impact Report at the same time. The DDRS *per se* purports to deal only with dredging projects of under 100,000 cubic yards, yet the Corps has been told that it is the intent that some day a DDRS like instrument will become first a Regional Management Program Plan (RMPP) for dredged material and then after having gone through the approval process be written into the San Joaquin-Sacramento Basin Plans when it will become "law." The intent of the DDRS at the outset was to provide persons with a guidebook on how to get approval of smaller dredging projects. It evolved however into a document that places some restrictions on as much as 90+% of the re-use of dredged material. It is wondered if the DDRS might not have a restrictive effect on the beneficial re-use of dredge material, one that does not exist on materials that just happened to be obtained from a sand and gravel company instead of from a body of water. The restrictive effect of the DDRS results from its means of arriving at sediments standards, that being basically that five different sets of criteria were considered and the most stringent picked. Because the Corps does have dredging projects in the size range covered by the DDRS (e.g. Folsom Reservoir construction dredging) and because it is the announced objective of the CVRWQCB to eventually expand the reach of a DDRS like document to the Basin Plan which applies to everything, it would behoove the Corps to become involved in out years in the crafting of this document. To this point in time, much like with the navigational dredging WDR, the Corps' pleas for rational regulation have been unheard.

As referred to above TMDL's have become an issue for the Corps. For instance one of the remedies the CVRWQCB has mentioned to alleviate low DO at the Port of Stockton is to deny any dredging permits so that it will eventually fill back in making it more shallow and reducing the retention time in

the port. This directly affects the Corps' mission of keeping the channel open. Thus, there may be out year activity on this subject, perhaps not just at the Port, but also in regard to water control as water quality and water control become more closely linked. The final implementing regulation for TMDL's is due in March 2003 so it is not yet known what form that regulation will take, but it is certain that the subject will not just "go away" and, therefore, there are likely to be out year activities associated with TMDL's.

Finally, also in March 2003, all construction sites one acre or more in size will have to obtain National Pollution Discharge Elimination System (NDPES) stormwater permits. Victor Chan before transferring set up a program and published a work instruction for obtaining such permits. What has been observed in the five months since Victor's transfer is that there is still some confusion about the applicability of the NPDES permits and the process for obtaining them. For example, questions have been received on whether a series of less five acre (old limit that required a permit) bank protection segments of a project which totaled more than five acres needed a permit (Yes.). Plans and Specifications for projects have been reviewed in which the contractor is required to prepare Storm Water Pollution Prevention Plan (SWPPP), but drops the subject at that point without requiring them to either file an Notice of Intent to do their grading or pay the fees. This will involve out year efforts to make sure these defects are cured and to instruct job inspectors regarding the basic tenet of a SWPPP which is a commitment on the part of the contractor to implement it in the field, make modifications if the measures in the SWPPP prove inadequate, keep records of changes, make an annual report stating that they are still following the plan and testing if there is a release of a non-visible pollutant

On a related note the reader is referred to the section below on required research and development which would occur in out years, but not necessarily that far in the future.

Two of the most notable out-year activities are the deepening of both the Stockton and Sacramento DWSC's. the Stockton DWSC was deepened in the 1980's from 30 to 35 feet and, as mentioned above, the Corps agreed to install aeration as mitigation for the worsening effect on DO at the Port of Stockton. Further the Sacramento DWSC began deepening in the mid 1990's but proceeded only nine miles from the Port out of a total of thirty some miles before being brought to a halt by funding issues. Of course the depth of the channels is a big issue because it significantly affects the amount of cargo that can be put aboard each vessel and hence the shipping cost, since the remainder of ship operation costs remain relatively fixed even with a bigger load. In December of 2001 both the Ports of Stockton and Sacramento asked the Sacramento District, District Engineer that their deepening projects be managed by the San Francisco District that had recent experience with two deepening projects for the Port of Oakland and otherwise had a more facilitative outlook regarding their projects. Both these projects are conducting modeling studies on the subject of any adverse salinity intrusion effects of deepening and in, addition, the Port of Stockton is considering the effects of deepening form 35 to 40 feet on DO. These efforts are at their beginning as affects the Sacramento District, but it is certain that there will be out year activities if not within the Sacramento District, at least within the geographic boundaries of the District concerning these two deepening projects.

E. Changes In Technical Capabilities In The District Office

As referred to in the preface to this report during the year Victor Chan transferred to the San Francisco District leaving a vacancy and reducing the water quality staff to one. Since that time, also as mentioned above, John J. Baum has been assigned to the open position and his participation in this report has been noted. It is anticipated that the vacant position will be filled in the next year. As was mentioned in last year's report District knowledge is expanding on ecosystem restoration and methly-mercury issues due to project experience and training. Newer employees, more recently graduated

from universities that have curricula that include water quality courses are expected to maintain water quality technical capability. As more and more real time water quality data and information goes on line, the Internet is becoming an important source of information. The uploading of this Annual Water Quality Report on Sacramento District's web page also facilitates the sharing of water quality information. There has been an enquiry from U.C. Davis already as to when this year's report is due to be posted.

F. Relationship Between Water Quality And Water Control Management Activities

The Water Quality activity is located within Environmental Engineering Branch, while the Water Control Management activity is located within Civil Design Branch. Personal communications with the Water Control activity indicates that water control for the sake of water quality is not yet coming to the fore as far as the Corps is concerned because other than for purposes of flood control the Corps does not "own" the water and, therefore, makes whatever releases it makes other than during flood events, only at the behest of the "owners" of the water. Further Corps dams, other than Warm Springs Dam at Lake Sonoma, are not equipped with variable height shutters to regulate water withdrawal height and hence temperature. At Warm Springs there are shutters and the outflow from the dam is operated in such a way the temperature and DO are adequate for the rearing of the downstream fishery.

With the advent of TMDL's based on such water qualities as DO, it is expected that the linkage between water quality and water control (quantity) will become greater in the future. Temperature modifications are being made to more than one dam and the Corps has been advised that dam operators are being asked to consider releases to alleviate, for instance, the Stockton DO concern. Due to the lack of any control other than flood control it may be that the owners of the water in Corps dams are receiving such requests also, but may not be making it known to the Corps that called for releases are for water quality purposes.

G. Pertinent Division Regulations

There are no pertinent South Pacific Division Regulations at this time. As mentioned above Sacramento District published its NPDES work instruction on its web site. As in last year's report it is noted that previously unregulated Municipal Separate Storm Sewer Systems (MS4) located within urban areas will be regulated by the Phase II NPDES program by March 2003 which requires the development of a Stormwater Management Plan.

H. Laboratory Facilities

Private commercial laboratories are utilized to perform the lab analyses. The chemistry laboratory selected has to be State-certified in the parameters being analyzed. The current chemical laboratory is Cal-Test Lab located in Napa, California and this laboratory will be audited in 2003 by USACE personnel. An algalogist at the University of California at Davis does the biological analysis (phytoplankton) analyses. Multiple year laboratory and service contracts are now being set up to reduce the administrative effort involved in contracting.

In the navigational dredging program an error was detected by the Corps in the results pertaining to the 2001 Sacramento dredging. A supplement immediately correcting the error was sent to the CVRWQCB. The reason it is brought up in this year's report is that the last correction for the values

was just received near the end of FY2002! This occurrence obviously gave rise to the subject of a Quality Assurance Program Plan (QAPP) for the civil works projects in general including dredging. The concern is that the errors in 2001 dredging resulted from human error and no plan has been yet devised that will prevent human error i.e. the error in question arose when a new instrument was not interfaced properly to the spreadsheet program that displays the results. It was found that the labs QA simply did not catch this problem. It was noticed when Corps' personnel noticed that metals concentrations went down when they should have gone up. The result was then examined by the lab and found to be incorrect, but the lab didn't catch it at all. The solution thus far has been to change laboratories and require electronic checking of electronically delivered results that will not allow one to ignore or miss, for instance, incorrect recovery percentages District staff continues to try to find a set of QAPP provisions that would have prevented the interfacing error. Various QAPP models are available including the recently completed SWAMP QAPP that will henceforth be used in State of California sampling and analysis projects.

I. Data Management System

Currently data is filed in files that are designated for either the water quality reports such as this report that contain mostly lake water quality data or for navigational dredging. Additionally for years up to 2000 the California Department of Fish and Game constructed a Microsoft Access database called DREDGE that contained all Sacramento results since about the late 1980's, sediment results of other agencies and for other projects and even a set or two of San Francisco District sediment data from near the district boundary at Antioch California. As above, analytical chemistry data is now being delivered electronically which might facilitate its being databased. Currently with the QA Level III packages being required of the labs, the papers associated with each DWSC exceed 500 pages each which before long will create a storage and access problem unless reduced to electronic form.

The Engineering Regulation cited at the outset states that the District must use automated information systems appropriate to its needs and that for public accessibility the EPA's national data storage and retrieval (STORET) system should be used. This has proved to be an elusive goal for not only this District, but for other agencies which all state, as we do, that some day the data should migrate to STORET. Frankly this writer has been so busy taking care of concerns brought about by the regulatory upheaval that this task has not been looked into other than finding out that there is and "old" and a "new" STORET that may not talk to each other. However from last year's report it is known that STORET training classes continue to be taught, therefore, the program must still be viable in one of its forms. It would be a shame for the DREDGE database to continue to fall out of date as it has for the last two years. Linking the database to a GIS display program, perhaps like Waterway's Experiment Station's DMSMART program that is an Oracle database linked to ArcView is a possibility. The overall objective is to accumulate enough dredging sediment data to demonstrate that it is not that variable from year to year thereby allowing dredging to proceed without being preceded by sampling, and analytical testing. In turn the objective of doing this is to speed up the time when dredging can be done so that the DWSC's will be at full depth for the maximum period of time before the dredging cycle begins all over again the next year.

J. Training Obtained

As was stated in the preface John J Baum is a recent graduate from the University of California at Davis with applicable course work in water quality and is therefore reasonably trained for the tasks at hand.

During this period John Headlee took courses in Dredging Fundamentals, Streambed Macroinvertebrate Surveys as an indicator of stream ecological health, a graduate level statistics course and continued to take courses in TMDL's and monitoring.

K. Training Needs

District personnel are obtaining the training as needed or learning on their own. Training includes environmental effects of dredging, water quality mathematical modeling of rivers and lakes, biology, and, as above, statistics. Funding is provided by either project funds (with project the manager's approval) or overhead funds (with branch head's approval). The latter is somewhat restricted this year with $200,000 being spread over 267 persons. One new program is a cooperative undertaking with the graduate school at California State University, Sacramento wherein Corps personnel are provided, tuition, books and transportation to take pertinent courses. This year courses in statistics, partitioning of contaminants between earth, water and air phases, geographical information systems (GIS) and water chemistry are being taken by Corp employees. Whether Corps employees will be partially compensated for their class time is currently being discussed.

There are several ecosystem restoration projects that are now in the reconnaissance and planning phase in Sacramento District and ecosystem restoration is expected to be a growing field. The interconnection of water quality, aquatic life, endangered land species, plant systems, and the general localized ecosystem requires more specialized training beyond water quality in order to ensure that the District's projects will be beneficial and cost effective. Fortunately a UC Berkeley Extension Certificate in Ecosystem Restoration is now available and participation in some of the courses is being considered. Due to the current budget constraints, it is likely that all the training that could be put to use now will have to be conducted over a 2 or 3 year period to spread out the cost. Other training needs are GIS and STORET, as previously discussed. Because of the watershed approach that is both current Corps policy and coming to the fore in such areas as TMDLS, GIS is also expected to be a growing field. Watershed programs frequently use geo-spatial information such as slopes and soils and crop types, therefore GIS becomes involved. The writer is attempting to learn the U.S. EPA program BASINS which is for watershed and surface water quality projections. It is programmed as an application of the ArcView GIS program. If self instruction does not work and TMDL's become an issue, formal training may have to be sought.

L. Research and Development Needs

As detailed in last year's report the District needs to know more about the process by which mercury is methylated (made bio-available) in wetlands. As mentioned above some projects located where mercury is present (much of northern California) are being modified to not incorporate wetlands because of the fear of methylating more mercury than the system that is currently in place. It was learned that a portion of one of Cal-Feds projects (Bear Creek) was halted for this reason.

Since as has been set forth above dredging may be restricted by the fact that mixing zones may no longer be allowed for persistent bio-accumulative contaminants it may become necessary to find a way to remove it from dredge effluent or, God forbid, after an emergency dredge project when mercury is found in the dredged materials. Last year's report suggested ionic separation and a presentation was had during the year for electrokinetic separation (even though Mercury is not a compound that ionizes). It is expected however, that if separation is required it will involve filtering or settling (perhaps by flocculation?) of suspended particles out of the dredge effluent, an expensive process which has unwanted consequences, i.e. the sludge would have to be disposed of or the dredge materials would be "jellified" and would not drain. In order to avoid this it is thought that perhaps the mercury criteria of

50 parts-per-trillion should be attacked because it is inappropriate. In this case it possible that an in-district analysis by our toxicologists of how the criterion was arrived at would perhaps indicate if there were anywhere to go with along this line.

Finally, there is an R&D need that is perhaps notable by having been overcome by events (OBE). For the longest time the District which had until now placed all of its dredged material "upland" i.e. out of the water had been waiting for the issuance of the "Upland Testing Manual" corresponding to the Inland and Open Ocean manuals. However in conversation with the operative parties at Waterways Experiment Station (WES) it has been learned that they intended to incorporate groundwater dilution in their dredge pond model an effect that the CVRWQCB has denied the District. The District had to go it alone with attenuation in the basement soils above the water table in an approach known as the cation exchange developed by the now departed Victor Chan. Given the increased stringency of the WDR it is likely however that either new methods for testing for leaching of metals out of dredged material or the presence/bio-availability of metals in dredge effluent will need to take place. The District has generally depended on outside agencies such as the US EPA , WES, the scientific community and universities which are better organized for R&D research. As above the web has become an important source of reference material and data.

M. Special Studies Completed or Required

Cation Exchange Attenuation - During this reporting period the District completed three studies of attenuation of metals in the basement materials under its dredge ponds. These studies were in the first instance required by the WDR and submitted when due exactly one year ago. After a long hiatus the district was contacted by the CVRWQCB and informed that it would not allowed to use attenuation in the soils laterally under the site to the receiving waters and that the water had to meet a special set of somewhat relaxed groundwater criteria not contained in the WDR, but in the DDRS before it ever reached grounwater. This required that the amount and character of the soils under each site be determined. Surprisingly there was from 10-13 feet of vadose zone and in places its was highly organic, the type of soil that has the highest cation exchange capacity. The above mentioned cation exchange capacity was then calculated and two supplemental reports were submitted showing that metals would be attenuated for the foreseeable future (one decade) by the soils under the ponds. It was not until the very end of this dredging season, actually just a bit into FY2003, that there were indications from the CVRWQCB that mixing zones for bio-accumulative metals might not be allowed.

As above, the Distirct is contemplating a literature search into the exact basis for the mercury criterion.

Bioaccumulation of Mercury - Results from United States Geological Survey (USGS) studies of fish mercury levels have increased public concern over contamination at Englebright Lake. Although USGS fish tissue concentrations were high enough to warrant additional monitoring (California Office of Environmental Health Hazard Assessment limit of 0.3 ppm), none of their results was above the FDA's level of 1 ppm for a fish advisory. The USGS studies initiated a public news agency to test fish for mercury accumulation. Analysis of fish caught by the news agency resulted in a concentration of 1.2 ppm, which is above the FDA advisory limit. While the limited USACE fish tissue results have not indicated the need for a fish advisory, additional data is needed to verify the status of mercury in lake fish. Fish tissue analysis must focus on those species that are most likely to bioaccumulate mercury. An expanded fish monitoring program is recommended for Englebright Lake and all other lakes of concern.

Total Sediment Values - as is outlined in the reports for the individual lakes, Eastman Lake is currently displaying a three year trend toward higher and higher total sediment in the inflow and in the lake. An investigation of the circumstances of this trend is in order because of the potential effects on the lake.

N. Water Quality Coordination With Other Agencies

The District maintained contact with the following agencies on water quality-related projects: 1. CalFed At times there is a Corps employee that is detailed to this organization. 2. [San Joaquin/Sacramento] Delta Protection Commission, this is the organization under whose auspices the DDRS was produced by Cal-Fed and the California Department of Fish & Game. 3. U.S. Bureau of Reclamation, for the Folsom Dam modifications. The Bureau has operational control of Folsom Dam and Reservoir and wanted to be assured that water quality was being preserved during the construction of this project. 4. CVRWQCB this is the state agency which grants dredging permits and imposes conditions on them ans which is snow in charge of the Port of Stockton DO TMDL. 5. Moss Landing Marine Laboratory, a state funded laboratory that is doing a good deal of work in mercury and put on a seminar on methylation and supplied mercury data in the delta. 6. U.S.G.S. through its facility on the California State University Sacramento campus provided information concerning the efficacy of one dimensional models for determining probable salinity levels in the DWSC's after deepening and would likely weigh in with its circulations studies in Suisun Bay which is just downstream of the deepening projects. 7. California Water Environmental Modeling Forum (nee Bay-Delta Modeling Forum), provides workshops on various topics having to do with models and water quality and convenes an annual meeting and seminar that deals with water quality related topics. 8. Lahontan Regional Water Quality Board concerning the Lake Tahoe Restoration Project of which there will be more mention later. 9. Naval Weapons Station Concord, there was contact concerning phase I characterization of some of their sites. 10. US. EPA Region IX & DMMO (Dredge Material Management Office) both concerning the roll out of Long Term Management Strategy for sediments in the SF Bay area and (Reg. I) briefly concerning the DDRS. 11 National Parks Services (Department of Interior) – concerning NPDES stormwater permits.

O. Scheduling For Detailed Project Evaluations

Every year there is a dredging season that begins with condition soundings taking place at the beginning of April. Dredging generally takes place in a window that is from July 1 to November 30th. The Sacramento Deepening Project wants to conduct sediment sampling during roughly this same time period. The construction dredging for Folsom Mods is now proposed to happen during the summer months of calendar year 2003. Any appeal of the WDR would have to take place before May 11, 2003.

P. Problems Encountered With Contracted Work

As mentioned above a lab produced incorrect results for the Sacramento DWSC. The solution was to immediately correct the results given to the CVRWQCB. Another lab was retained to do the analysis work this year.

Q. Special Assistance From Other Corps Elements Or Research Facilities

Assistance has been obtained from Waterways Experiment Station on dredging activities.

R. Project-By-Project Summary of Water Quality Conditions

As in last year's report the lake water quality is commented in section II

S. Problems Encountered And How Addressed At Each Project

As indicate in last year's report compliance with ever more stringent regulation of dredged material and stormwater is causing changes. Thus far the challenges have been met by more careful analysis of effects such as the reports for attenuation of metals mentioned above. Stormwater regulations are being met by the publication of the Stormwater Work Instruction and compliance with SWPPP's. The result of more stringent regulation is higher unit costs for excavation to include dredging and also lesser impacts on the environment. The District's water quality engineers are becoming more involved in projects as water quality concerns become more of a driver.

The goal announced last year of publishing the sediment analysis results has not been attained at the Corps although prior years data have been put in the DREDGE database by the California Department of Fish & Game. Several enquiries have been made about potential host for the DREDGE database, but none are known to have accepted this challenge.

T. Opportunities Identified And How Addressed

During this year there has been outreach to the National Park Services (NPS) and the Naval Weapons Station, Concord. The Station's Commander has requested technical assistance from Sacramento District due to the limited technical staff in Concord. Both the Corps and the customer organizations would benefit because this would expand work at Sacramento District while the smaller federal facilities would avoid hiring and training new employees. In order for this benefit to occur, it would be necessary to either shift district staff assignments or fill the position left vacant by the transfer of the primary proponent of this work.

U. Innovative Techniques Utilized to Improve Water Quality

Two innovative techniques are currently being utilized by the District, as follows:

Jet Aeration System - Sixteen jet aeration nozzles mounted on two underwater manifolds are continuing to be utilized to input dissolved oxygen into the San Joaquin River at the Port of Stockton during the fall salmon run. At the recent National TMDL Science and Policy Conference, the firm hired by the Savannah District mentioned the fact that Sacramento District's aerator was the only aerator application employed to mitigate for dredging that they were aware of. Further they are considering this as mitigation for the Savannah Deepening Project. The consultant for the Port of Stockton has conducted tests of pure oxygen injection for this purpose and it is understood that the Port is interested in operating the aerator installed by the Corps for longer periods of time also for mitigation.

Cation Exchange Attenuation – Acceptance this year of cation exchange as a means of showing leached metal attenuation in the soils beneath the dredging ponds by the CVRWQCB is, if not a first, certainly new to this District. This suggests that when the user designated attenuation factor is put into the spreadsheet referred to in the Upland Testing Manual[1], one manner of determining attenuation would be using the cation-exchange-capacity (CEC) that is determined by a suitable laboratory such as an agricultural fertility lab or golf course lab. If this is done care should be exercised that cation exchange is not also accounted for in arriving at partitioning coefficients.

[1] Technical report ERDC/ELK TR-03-1, *Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual*, U.S. Army Corps of Engineers Engineering Research & Development Center (ERDC), January 2003. Spreadsheet referred to at p.6-9, § 6.3.1.

V. Action Items for the Lake Monitoring Program for 2003.

Feedback from the Park Rangers will be requested to determine if there are any site specific water quality issues that should be addressed in future Lake Monitoring Reports. A Field Sampling Plan and a Quality Assurance Project Plan need to be developed. The Quality Assurance Project Plan will address the need for field blind duplicates. Fish tissue analyses will continue for several lakes, to check for mercury content. MTBE monitoring will also continue for several lakes.

W. Regulatory Changes

Much has already been said above about the regulatory changes in the areas of upland dredged material placement and stormwater permitting. At this time the germ of the new regulations has been planted and, with time, it is an announced objective that these standards become part of the "law" of water, the Basin Plan. Since the criteria in these ideas will affect the re-use of dredged material and the degree to which environmental and commercial good can be made of these materials it behooves the District to be engaged with the process of rule making.

Although the degree to which water control (quantity) and water quality currently have merged is not particularly within this writer's ken at this time it is suspected that there will be a further movement in that direction. This has already surfaced as is indicated by the fact that the U. S. Bureau of Reclamation is being asked to consider additional releases at a point far upstream because that seems to clear the DO deficit at the Port of Stockton, California. This same concern is the subject of a TMDL which may well give rise to allocations by mid 2003. More and more impairing constituents are being identified , e.g. pathogens or "unknown toxicity" which inevitably give rise to TMDL's and allocations. All of these challenges will be expressing themselves as the practice of water quality management evolves. One of the aspects of this evolution will be thinking and analysis at a watershed scale and stakeholder group solutions to these concerns.

X. Data or R&D Activity with Corps Wide Applicability

Although strictly within the area of applied science, the Sacramento District's technique of calculating cation exchange capacity in relation to attenuation of metals in soils might be useful in other districts where regulators do not allow dilution of metals with groundwater or even in those where they do, but it is difficult to meet the surface water criteria once the leachate has traveled that far. This is in the context of any impoundment where relatively contaminated water is stored and ground or surface waters are to be protected.

Another effort that is under development is the production of a sediments database in Microsoft Access. Applications of the data themselves is not apparent to this writer, but perhaps the database architecture might be.

II. Projects in the Planning, Design, and Construction Phases

In recognition of the fact that most if not all Corps projects that deal with water side construction have an effect on water quality, a selection of projects and their effect on water quality is setforth at this point. This selection is by no means exhaustive and was based more on ready access to the information than any other factor.

Napa River
Flood Project
Napa, CA — Completed the first phase of a petroleum contaminated soil cleanup project as part of the overall flood protection project. Sheetpiles were used to contain and allow the excavation of petroleum products that would have leaked into the river. A silt curtain and oil sorbing buoys were placed in the water to contain any impacts from in water work. Tidally timed sampling was performed throughout the project. The second phase of the contaminated soil cleanup project will begin in spring 2003.

Cherokee Canal
Oroville, CA — Completed sediment budget and transport study in preparation for feasibility study and possibly design of low drop grade control structures in order to match sediment transport of upstream portions of stream to downstream canal portions thereby avoiding accumulations of tens of thousands of cubic yards of sediment yearly. Source water of stream is partly in area of historic gold mining with potential for involvement of mercury.

Galindo Creek
Walnut Creek, CA — Placement of a retention basin for peak flood flow alleviation. Importance to water quality is in leveling off all but strongest flows thereby affecting sediment transport.

Lake Natoma
Restoration of
Backwater
Folsom CA — Reconnaissance study of portions of a creek that is tributary to Lake Natoma, a manmade regulation lake downstream of Folsom Dam and Lake Folsom. Unfortunate flow restriction by culverts under major freeway have given rise to backwater in which nitrogen fixing algae *Nostoc* flourished after removal of water hyacinth by sponsor. Restoring freer water interchange between lake and backwater and creating condition calculated to inhibit the methylation of mercury from local gold dredge tailings through which creek flows are water quality effects.

Glenn–Colusa Irrigation District
Montgomery Island
River Mile 205.5
Glenn-Tehama County Line
3mi. NW of Hamilton City, CA

The recently completed gradient control structure on the Sacramento River had left areas that were previously riparian habitat that had been disturbed by construction activities. In addition there was the potential for erosion from the freshly graded shore side portion of the construction site into the Sacramento River. This project placed soil onto and infiltrating into the rockwork, then covered it with gravel to cobble sized rocks to lessen stormwater erosion and planted willow cuttings on the area in order to both restore the riparian habitat and stabilize the soil.

Upper Jordan River
Aquatic ecosystem restoration
Salt Lake City County, UT

By installing a benched bank, amongst other alternatives, this project would promote riparian natural habitat and tree over hang thereby reducing water temperatures and sediment loads which will promote higher dissolved oxygen levels. Other benefits of controlling sediment transport by bank protection and channel depth control structures are increased macroenvertebrate populations capable of supporting larger fish populations.

Capping Bottom of Old Mormon Slough
McCormick Baxter Superfund Site
Dredged Material Re-use
City of Stockton CA

Capping of sediments found to be a human health risk on the bottom of Old Mormon Slough is planned for the summer of 2003. Placement of approximately 43,000 C. Y. of dredged material from the Corps' Rio Vista, California Dredged Material Confinement Area in a two foot deep layer will prevent exposure. The dredged material is highly inorganic (98% sand) and was found to compare favorably to other commercially available materials with the additional advantage of being transportable by water to the site. For the present a berm is being built around the land-side exposure of the McCormick-Baxter superfund site to Old Mormon Slough and the banks have been stabilized with rip-rap to prevent re-contamination from the land-side. McCormick-Baxter was a former wood preserving concern located in the City of Stockton, California in the vicinity of the Port of Stockton.

Lake Tahoe Restoration

The lake's clarity, as measured by Secchi disk depths, has been declining by one foot per year for the past 30 years. Far back in time there was almost complete logging of the slopes at the lake. More recently there has been development, increased numbers of visitors and the conversion of a wetland to a marina. These occurrences affect the nutrient load on the lake giving rise to the growth of algae which lessens the lake's clarity. In 1997 President Clinton and Vice President Gore visited the lake and set in motion a Lake Tahoe Federal Interagency Partnership to address water clarity. As last year's report indicated the Corps was to become involved in this initiative. The Corps is now working or has completed four tasks: 1) Analysis of groundwater as a source of nitrogen and phosphorus nutrients. Available data will be used in a model to determine groundwater/surface water interchange then remedial measures will be developed to reduce nutrient loading. This study is currently underway and will be completed in the summer of 2003. 2) Sewer line risk evaluation. A tool kit of Best Management Practices (BMP's) will be developed that will reduce the risk of the release of nutrients and other pollutants from wastewater facilities around Lake Tahoe. The draft of this report is currently being reviewed and concludes that less than 1% of the nutrient loading is due to sewer line exfiltration. 3) A small study was made of the state of urban stormwater management in the Lake Tahoe Basin. This task has been completed. The report concluded that there was no comprehensive stormwater plan for the Lake Tahoe Basin. Recommendations were made for tasks to be done to prepare a such a plan. 4) A statistical and site analysis of Tahoe Basin stream erosion will be conducted the result of which will be numbers for the erosive

contribution of sediments to the lake. This study will be completed in the summer of 2003.

III. Annual Lake Water Quality Monitoring Program

A. Parameters Being Monitored - The District samples the 12 lakes in two sampling events, spring and late summer. The spring monitoring reflects the lake condition after it has received the bulk of the incoming nutrients, organic loads, and other contaminants that may have washed off of the watershed. Spring monitoring is done to examine lake dynamics prior to the arrival of warm summer conditions. The summer monitoring reflects the impact of warm weather conditions on the lakes. Some of the changes created by summer weather conditions are low dissolved oxygen levels that limit fish survival, undesirable phytoplankton blooms, accelerated organic decay toward the lake's bottom, shifts in lake pH, and increased impacts from recreational use.

B. **QA/QC Techniques** - The District is in the process of incorporating more QA/QC techniques into the annual lake monitoring program, so that the methodology is comparable to the USGS's NAWQS program or California's SWAMP program. This will then allow a multitude of agencies to share their data in the future with a feeling of confidence in support of better decisions affecting water quality. QA/QC techniques are built around a Field Sampling Plan and a Quality Assurance Project Plan. The primary analytical laboratory for lake water quality is Cal Test located in Napa California. A formal audit on this laboratory will be conducted by US Army Corps personnel in

2003 to verify compliance with the QA/QC requirements of the state of California certification program.

Field Sampling Plan - The U.S. Bureau of Reclamation does the field sampling for the District. In their work they follow several protocols on field sampling, as follows:

(a) USGS Field Guide for Collecting Stream Quality Samples. This consists of a USGS ring binder entitled "Guide for Collection, Treatment, and Analysis of Water Samples, Western Region Field Manual, Sept. 1990.

(b) California DWR, State Water Project Water Quality Field Manual, 1991

(c) USEPA sampling protocols

The District is currently starting work on developing their own QAPP which will incorporate the above by references but also take into account special needs of the District's program, such as the phytoplankton sampling program and field calibration techniques.

C. Changes for the Lake Monitoring Report for 2002

Historically, each water quality report was compared with the year or two preceding it as a reference for trends and overall lake health. This year Secchi disc depth data was compiled for thirty years in order to look for long-term trends. Additionally, the concentration of metals in lake water samples is now displayed showing additional historical values. Compiling, integrating, and analyzing the historical data for trends is an ongoing process that will continue over the next year.

The format of the 2002 Lake Monitoring report has changed slightly in order to reflect its more historic perspective. This year each lake's report will include a description of the lake and restate concerns from the previous years water quality report in addition to the standard information provided.

D. **Lake Annual Water Quality Reports for 2002** - The following lakes have had reports written for them. These reports only contain the highlights or summaries of the complete laboratory analytical results and raw field data. The complete report for each lake is available on the web and contains such additional information as tabular results and graphs. For any questions not addressed in the reports, please contact John Baum at John.J.Baum@usace.army.mil.

1. Black Butte Lake
2. Eastman Lake
3. Englebright Lake
4. Hensley Lake
5. Isabella Lake
6. Kaweah Lake
7. Martis Creek Lake
8. Mendocino Lake
9. New Hogan Lake
10. Pine Flat Lake
11. Sonoma Lake
12. Success Lake