**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF September 25 - 26, 2014
Prepared on August 12, 2014

ITEM NUMBER: **20**

SUBJECT: **Healthy Watersheds Assessment and Web-based Report Card**

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THIS ACTION: **Board Discussion/Information**

SUMMARY

Central Coast Water Board staff has been working for the past several years towards implementation of our Vision of "Healthy Watersheds." As part of this effort we established three measureable goals, related to healthy aquatic habitat, clean groundwater, and proper land management. To support the assessment of these goals, Central Coast Ambient Monitoring Program (CCAMP) staff has been assessing the conditions of our watersheds and developing new web-based tools that allow users to quickly understand if, where and why our streams are healthy, and if they are not healthy, why not. Staff is synthesizing data from multiple sources to express measures of health. This project is garnering attention at state and national levels because it provides a unique new way to view complex data in a user-friendly environment.

DISCUSSION

There are two primary components to the CCAMP web tools. The first is the Data Navigator. This has been the primary data viewing tool we have used in our Region since 2005, but we have made a number of improvements to it, including a new and more robust scoring approach and additional statistical tools for data interpretation. The second is the Healthy Watersheds Report Card. This website displays general health assessments of the watersheds in the region for each of the three Vision goals, and allows the user to drill in to the assessment for more details about sources and causes of problems.

We have presented this work in several different forums to share ideas and gather comments about potential improvements. We are also interested in finding partners that may be willing to support and help institutionalize the website for the future. Two interested potential partners include the State Water Resource Control Board's California Environmental Data Exchange Network (CEDEN) and the Central Coast Water Resources Center (www.ccwater.org), a new non-profit in the Monterey area. Many of the presentations we have given on this work have been solicited by the sponsoring entity. Several other states have also expressed interest in the tools (Arizona, Oregon, Delaware). Staff has presented the new tools in the following forums:

- California Healthy Watersheds Partnership meeting, 1/16/14
- State Water Resources Control Board (State Board) staff, 4/25/2014 and 8/7/2014, including staff from Surface Water Ambient Monitoring Program (SWAMP), California

Data Exchange Network (CEDEN), Integrated Report Unit, Department of Information Technology and others
- National Water Quality Monitoring Conference (Cincinnati, OH), 5/1/2014
- Central Coast Water Board staff meeting, 5/6/2014
- Headwaters to Oceans Conference (San Diego), 5/27/2014
- U.S. Environmental Protection Agency (EPA) Water Quality Assessment Framework interstate working group, 6/3/2014
- Surface Water Ambient Monitoring Program Roundtable, 6/10/2014
- U.S. EPA Healthy Watersheds staff, 6/20/2014
- Central Coast Water Resources Center, 7/9/2014
- California Water Quality Monitoring Council, 9/3/2014
- Southern California Stormwater Coalition, (planned for 10/2014)

Scoring the data
A key component of the functionality of both websites is the scoring approach that enables report card style (A – F) categories to be assigned to each parameter scored. The scoring approach is very similar to that employed in Canada for the Canadian Water Quality Index. The Canadian approach assesses how "bad" a site is (how far above the threshold(s) it scores), but does not assess how "good" it is (i.e. how far below the threshold(s) it scores). We have modified the scoring to also characterize degrees of good. We have also added flexibility in terms of sample count requirements, number of parameters scored, and several other features. We have prepared a methods manual which includes a description of the scoring approach and other technical components of the project. The manual will be peer reviewed through the SWAMP program, and we will submit a paper describing the methods for publication in a peer reviewed journal.

The scoring approach requires that thresholds be selected for each parameter evaluated. Thresholds are specific for beneficial use and matrix (e.g. sediment, tissue, water). Various agencies, such as the U.S. EPA and U.S. Geological Survey, update and make new regulatory and guideline thresholds available periodically. Therefore, we have developed an automated selection process that compiles thresholds from multiple sources and employs software to select the most applicable value, based on algorithms developed primarily by Jon Marshack, State Water Board staff and author of the Water Quality Goals database. The thresholds and selection algorithms have been reviewed by an external group of scientists.

CCAMP Data Navigator
The CCAMP Data Navigator is an improved version of the data viewing tool that has been accessible on our website for a number of years. The Data Navigator provides access to bar charts, graphs, maps, and various statistical assessments of data for the various analytes measured by our monitoring program and others (including the Cooperative Monitoring Program for Agriculture). Maps show sites that are color scored for the analyte of interest, and sites are "clickable" to navigate to the associated data. The data being viewed on the screen can now be downloaded in Excel formatted tables.

Staff for the State Board's California Environmental Data Exchange Network is particularly interested in acquiring the Data Navigator to display water quality data and conditions in all watersheds of the state. In addition, the Moss Landing Regional Data Center now has working versions of the Data Navigator for each of the State Board's nine Regions, pulling data directly from the SWAMP data warehouse. These websites support the Regional Data Center's web-based data upload and checking tool, also originally a CCAMP product.

Screen shots from the data navigator are shown in Figures 1 and 2. Figure 1 shows average total ammonia concentrations at sites in the Region's hydrologic units, with the map zoomed in to the Monterey area. Figure 2 shows change analysis at a single site on San Simeon Creek, where upstream effluent disposal has dramatically increased creek nitrate concentrations in the last decade.

Healthy Watersheds Report Card

Central Coast Water Board staff developed the Healthy Watersheds Report Card as a way for our Region to assess progress towards our goals of "Healthy Watersheds". Health is assessed using a multi-metric approach, where scores for parameters are combined into indices of health. Site level data is extended upstream to assign scores to reaches. Areas that are unsampled are evaluated using a modeled approach based on the State's recently completed "Healthy Watersheds" assessment. This assessment approach will allow us to understand what percent of our various watersheds are healthy, where they are and are not healthy, and, if not healthy, what is causing the problem and what are the trends. Figure 3 shows a screen shot of the report card for San Simeon Creek below the wastewater disposal field. It shows the health scores for aquatic life and human health indices, their component sub-indices, as well as the parameter details for the "conventional analytes" sub-index (e.g., oxygen, temperature, ammonia).

The Healthy Watersheds report card approach is of particular interest to the State's Healthy Streams Workgroup, charged with developing public access to state-wide data describing conditions of streams. The Healthy Streams Workgroup has created the "Healthy Streams" web portal for the California Water Quality Monitoring Council's "My Water Quality" website (http://www.mywaterquality.ca.gov), which provides the public with information about the conditions of water in California. Our work was presented to the Council on September 3rd (after the writing of this report); staff will include a summary of that interaction at the September 25th Board presentation.

The Healthy Watersheds Report Card is scheduled to be beta-tested by Central Coast Water Board staff this fall, with its first release to the public planned for the end of the year. The first release will include surface water data only, scored for Human Health and Aquatic Life goals. Future releases in the coming year will include assessment of groundwater data from Geotracker, land management and watershed condition data from various sources.

Peer Review
This project will be peer reviewed in several ways. Central Coast Water Board staff have and will continue beta-testing various website elements as they reach completion. We have already received external peer review of the thresholds selected to indicate "health." This review was led by Dr. John Hunt of U. C. Davis, who solicited and addressed comments from Dr. Jon Marshack (State Water Resources Control Board staff and author of Water Quality Goals database), Dr. Brock Bernstein (Environmental Consultant and author of a report card approach for San Diego Region), Brian Anderson (Granite Canyon toxicologist), Rusty Fairey (Moss Landing Marine Labs sediment objectives expertise) and Nan Singhasemanon (California Department of Pesticide Regulation pesticide expertise). The methods manual will be submitted this fall to the SWAMP program to take advantage of the program's established external scientific peer review process.   Several components of the methods manual will be further developed for publication in scientific journals, which will insure peer review.

Next Steps and Project Schedule
This project will reach key milestones in the next six months. The first phase of the project has been completed: public release of the new CCAMP Data Navigator. These are the following immediate next steps:

- October, 2014- Submit the methods manual for SWAMP peer review.
- November, 2014- Beta-test the Healthy Watersheds
- December, 2014- Release the first phase of the Healthy Watersheds website.

Staff will continue dialogue with potential partners to assess how best to proceed with institutionalizing this software for the future.
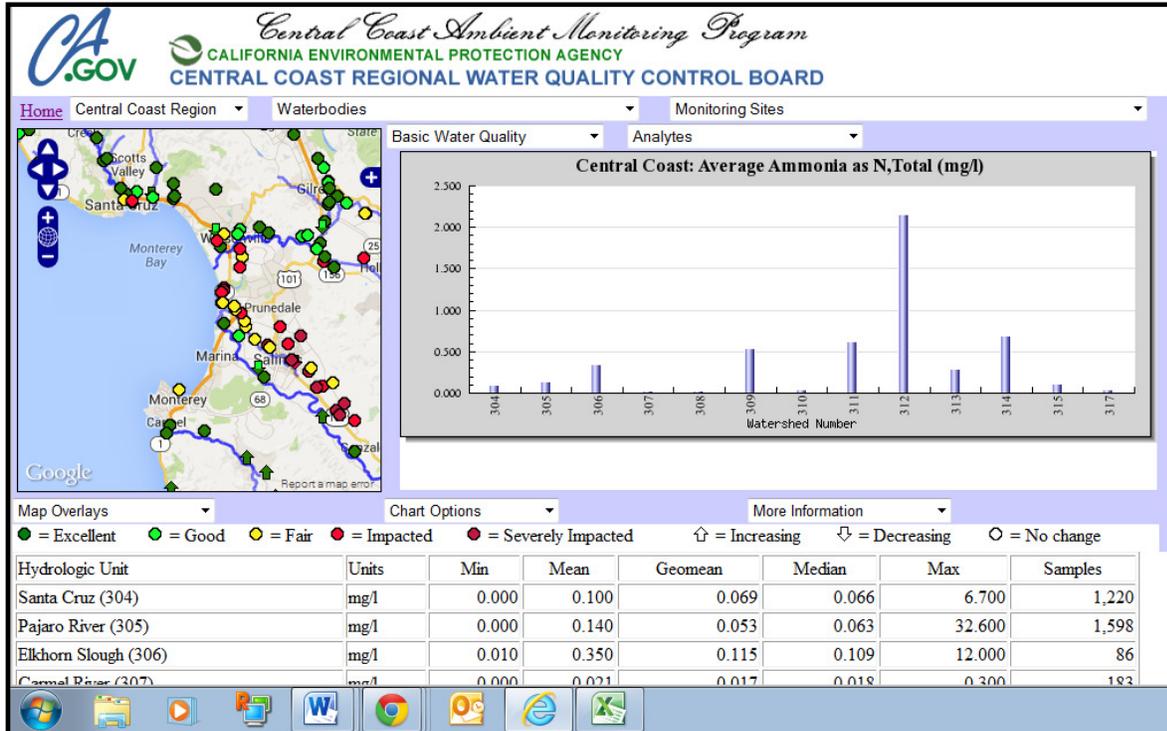
Figure 1. CCAMP Data Navigator, showing an evaluation of total ammonia at sites in the Monterey area.
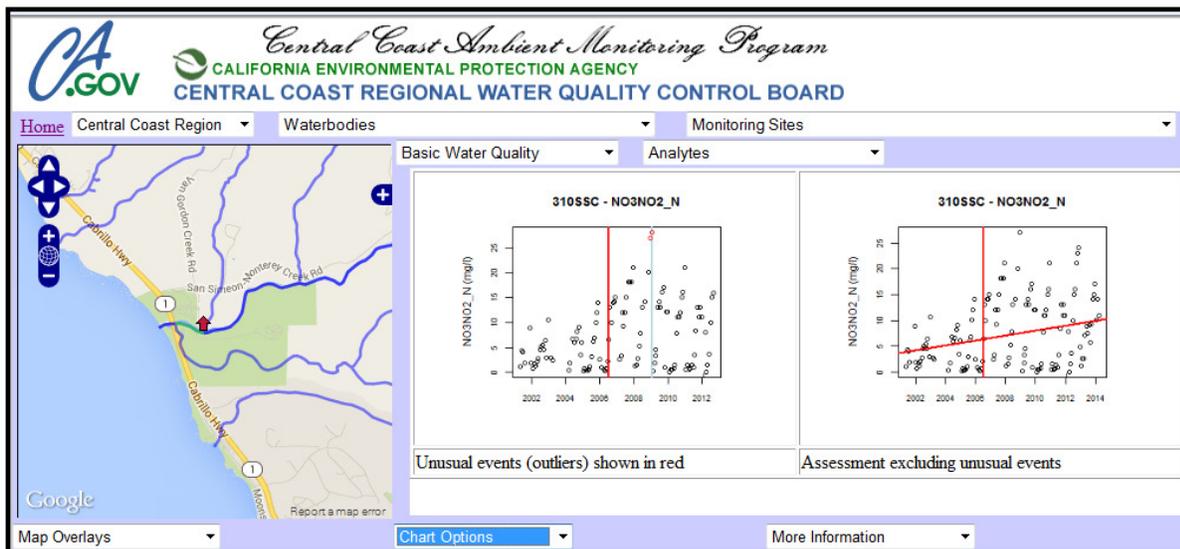

Figure 2. New website enhancements to the CCAMP Data Navigator test for both linear change and significant change points in time. This screen shot shows nitrate concentrations at San Simeon Creek in San Luis Obispo County.

(310SSC)	Watersheds					Waterbodies		Sites		
* Analyte	Units	Matrix	Min	Mean	Max	# Samples	Grade	Score	Threshold
● Oxygen,Dissolved-departure	mg/l	water	0	1.9	5.54	388	F	32	0.5
● Water Temperature-departure	degrees c	water	0	0	0	388	A	100	3
● Ammonia as N,Unionized	mg/l	water	0	0.0006	0.01	100	A	99	0.025
● Ammonia as N,Total	mg/l	water	0.01	0.04	0.41	117	A	96	0.49
● Nitrate,Nitrite as N	mg/l	water	0.05	7.15	28.1	117	F	16	1
● OrthoPhosphate as P	mg/l	water	0.01	0.58	1.4	119	F	23	0.13
● pH departure	-log[h+]	water	0	0.002	0.35	387	A	99	0.1
● Suspended Solids,Total	mg/l	water	0.5	31.2	2210	231	A	96	30
● Turbidity	ntu	water	0	39.6	3000	124	A	94	25

Sturgeon Generals Warning: this web app is a very rough work in progress version.
Grades: ● = A+ Outstanding ● = A Excellent ● = B Good ● = C Fair ● = D Impacted ● = F Severely Impacted

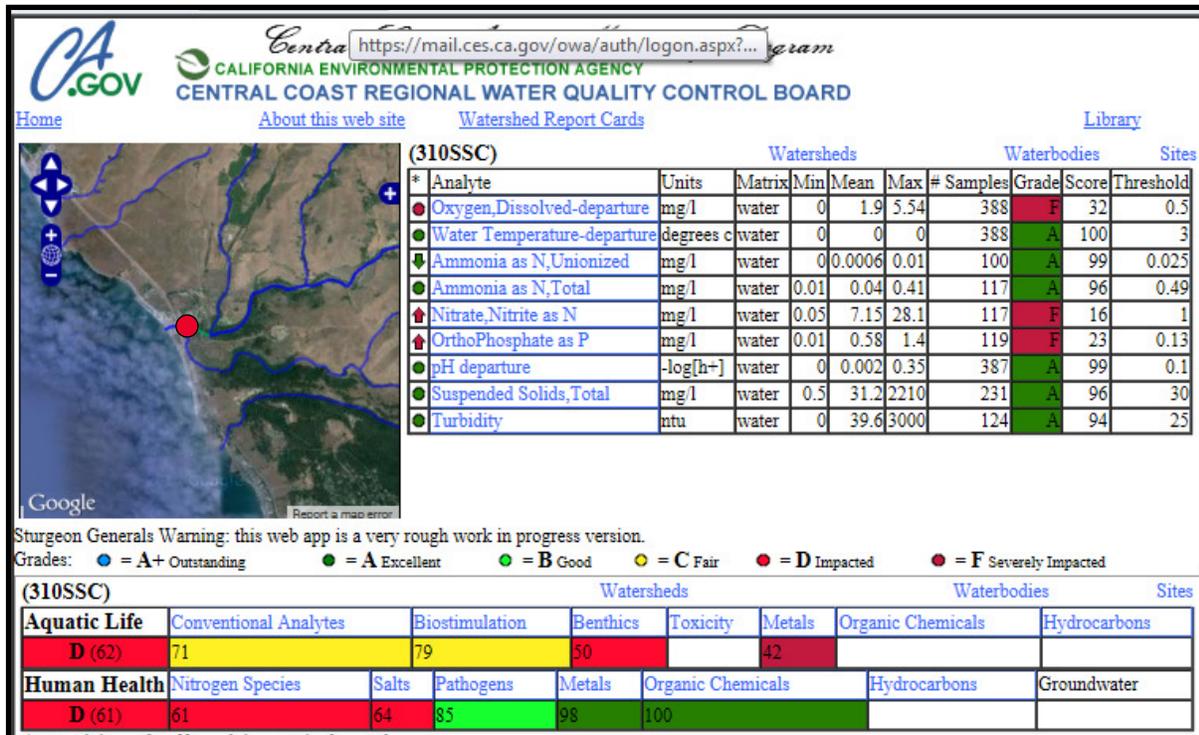| (310SSC)		Watersheds					Waterbodies		Sites
Aquatic Life	Conventional Analytes		Biostimulation		Benthics	Toxicity	Metals	Organic Chemicals	Hydrocarbons
D (62)	71		79		50		42		
Human Health	Nitrogen Species	Salts	Pathogens	Metals	Organic Chemicals		Hydrocarbons		Groundwater
D (61)	61	64	85	98	100				

Figure 3. Healthy Watersheds report card for San Simeon Creek (San Luis Obispo County) below wastewater discharge area. The creek has very high nitrate and ortho-phosphate levels, and related eutrophic conditions. Mercury is also elevated in this watershed due to past mining activities.