East San Joaquin Water Quality Coalition Proposed Monitoring Sites: Site Description and Sampling Strategy

East San Joaquin Water Quality Coalition

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Michael Johnson
Parry Klassen

COALITION SETTING – IRRIGATED AGRICULTURE AND GEOGRAPHIC COVERAGE

The ESJWQC region consists essentially of three subregions (hereafter referred to as Subregion 1, Subregion 2, and Subregion 3 corresponding to 1, 2, and 3 as follows); 1) the region to the east of the major urban centers that sit along Highway 99, 2) the region to the west of that same urban corridor, and 3) the region at the southern end of the coalition region that is largely Madera County. The first region corresponds to the Little Johns Creek, Dry-Tuolumne, Dry-Merced, and Fahrens Creek subwatersheds, and portions of the opt-out irrigation districts as outlined in the WER submitted on April 1, 2004. The second region corresponds to the San Joaquin Flats and the remaining area of the opt-out irrigation districts, and the third region is essentially Madera County who joined the coalition after the April 1 submission.

In addition to discussions with various entities in the Coalition region, we used two software programs, Terrain Navigator Pro and ArcGIS, to locate as many drains as possible. Terrain Navigator Pro is a proprietary software program that maintains all current USGS topographic maps. The GIS maps are available for downloading through the California Spatial Information Library (http://gis.ca.gov/data.epl) and are placed into the proprietary ArcGIS software package.

In the absence of a definition of "intermediate" we attempted to find every drain listed on the maps. At this point, we have located as many as we can, but there are undoubtedly agricultural drains remaining the area that we will discover over time. There are numerous irrigation water delivery canals and laterals, and these can convey storm water during winter rains when rainfall amounts are sufficiently high. In Subregion 1, there are few dedicated agricultural drains, at least as can be detected by two mapping programs. Soils in this region tend to be sandy resulting in high infiltration and low return. There are large amounts of deciduous orchards, primarily almonds, vineyards, and irrigated pasture. In Subregion 2, soils tend to have higher clay content and there are several drains located throughout the region. Irrigated agriculture is a mix of field crops and vineyards. Farther south in Madera County, irrigated agriculture tends to be dominated by field crops with lesser amounts of vineyards and deciduous crops.

SITE SELECTION STRATEGY

The site selection strategy of the ESJWQC is based on three underlying objectives. The first objective of the ESJWQC is to achieve the characterization of discharge from irrigated agricultural lands as specified in the Conditional Waiver. The second objective is to maximize the geographic coverage of the characterization over the coalition region. The final objective is to be able to demonstrate improvement in water quality after implementation of BMPs in the Coalition region. To achieve these three objectives, the ESJWQC proposes a two tiered sampling approach. This approach includes a core set of monitoring stations that are sampled yearly over the life of the monitoring program, and a second set of monitoring stations that are rotated among the remaining candidate sites over time. The proposed rotation schedule is 2 years. The core, non-rotating sites will allow us to monitor water quality improvement due to the implementation of BMPs and

the rotating sites will allow us to characterize as much of the discharge from irrigated agriculture as possible and in the process cover as much of the Coalition region as possible.

Characterizing irrigated agriculture is becoming more difficult in the San Joaquin Valley as the urban centers expand. In addition, dairy operations dot the landscape and can discharge to surface waters. No GIS coverage of dairies is available through the CaSIL and the only nonproprietary information on the location of dairies is through the DWR land use database. The California Department of Food and Agriculture does maintain a geospatial database of dairies and their size and we will attempt to obtain that information. When we proposed previous candidate lists of sites for monitoring, we attempted to eliminate all surface waters that would receive urban storm water runoff or runoff from dairies. This restricted our site list and consequently, the expanded list proposed below contains sites that may receive discharge from dairies, but does not contain surface waters that receive urban storm water or runoff discharge from POTWs.

As stated in the Conditional Waiver regulations, the method to demonstrate improvement in water quality is through statistical analysis of water quality data. However, as is well known, there are numerous complicating covariates in any analysis such as antecedent conditions (e.g., average temperature over the preceding weeks, irrigation management and history), soil moisture, rainfall amount and timing, the timing of pesticide applications relative to storm events or irrigation, and location of the applications relative to the drains. The traditional method of statistical analysis for examining changes in water quality after implementation of a BMP at a specific location is Before-After-Control-Impact (BACI). This method assumes that the treatment (BMP) is implemented at a specific location and the statistical test relies on comparison of water quality measurements above and below that site at times before and after the implementation of the treatment. The relative difference in the before and after measurements of water quality above and below the site of the treatment is the basis for the statistical test, the assumption being that after the treatment is implemented, the difference in water quality below the treatment should be much greater than the difference in water quality above the treatment. Unfortunately, if BMPs are implemented across the entire watershed and only a single measure of water quality is obtained on the surface water body, no estimate of improvement can be made using the BACI design and any demonstration of improvement would rely on numerous years of data collection and long time series of data. Consequently, a core set of monitoring sites will be required to develop the time series of data sufficient to perform these analyses.

CORE SITES

The ESJWQC proposes the following core sites: Dry Creek @ Willsford Road, Merced River @ Santa Fe, Highline Canal @ Lombardy Ave (dormant season only), Duck Slough @ Gurr Road, Ash Slough @ Avenue 21, Prairie Flower Drain @ Crows Landing Road, and Cottonwood Creek @ Road 20. The general rationale for these sites is that they represent irrigated agriculture from the northern to the southern edges and from the western to the eastern edges of the Coalition region. These sites represent natural water

bodies and engineered drains and cover all of the major types of agriculture present in the Coalition region.

Dry Creek @ Willsford Road (13,655 acres) – This site is in the northern part of the Coalition region and drains a combination of field crops, deciduous nuts, and vineyards. Dry Creek drains into the Tuolumne River in Modesto and this site represents the closest accessible location to Modesto that collects agricultural drainage. There appear to be dairies upstream and the town of Waterford may provide some urban signal but the site appears to be sufficiently far from Waterford to be used as a core site.

Merced River @ Santa Fe (26,084 acres) – This site was sampled during the summer of 2004 and although we could not detect the source of toxicity and it was not persistent, some toxicity was observed. Upstream agriculture includes some field crops in the immediate vicinity of the river and deciduous nuts, primarily almonds. This site integrates the signal from a relatively large area and will be one of the locations we use to measure improvement in water quality with upstream BMP implementation.

Highline Canal @ Lombardy Road (3,332 acres) – This site is proposed as a core site for the dormant season only. During the irrigation season, the canal may carry agricultural return water, but the signal is expected to be diluted out due to the clean irrigation water delivered in the canal. Dairies are present upstream and the Mustang Creek, a major tributary during the dormant season, passes immediately to the southeast of the Turlock Airport. However, it is anticipated that these will not distort the agriculture signal. The main agricultural crop upstream is deciduous nuts.

Duck Slough @ Gurr Road (9,885 acres) – This site is currently monitored and is proposed to be a core site. Located west of Merced, the site drains field crops immediately upstream and deciduous nuts farther upstream. In addition, there is irrigated pasture upstream.

Ash Slough @ Avenue 21 (49,114 acres) – This site was used as a monitoring station during the 2004 irrigation season, although lack of flow did not allow samples to be collected. Agriculture upstream includes vineyards, field crops, and deciduous nuts. Ash Creek flows just north of Chowchilla but there appears to be a buffer of agricultural land between Ash Slough and Chowchilla. As is true with most sites, there are dairies located upstream.

Prairie Flower Drain @ Crows Landing Road (2,486 acres) – Several drains exist in the western portion of the Coalition region and we are proposing Prairie Flower Drain as a core monitoring site. Relative to other drains in this part of the Coalition region, Prairie Flower Drain is longer and appears to drain a larger number of parcels of irrigated agriculture. Dairies and feedlots are ubiquitous in this part of the Coalition region and this drain may receive runoff from several dairies immediately upstream. Upstream agriculture is field crops.

Cottonwood Creek @ Road 20 (164,633 acres) – This site is at the very southern edge of the Coalition region in Madera County and the creek drains into the Eastside Bypass. The immediate upstream agriculture is vineyards and there are deciduous nuts farther to the east. Unlike other sites, there are few dairies on Cottonwood Creek.

In addition to these core sites, the Coalition proposes to monitor the additional rotating sites as outlined in Table 1. The rationale for the selection of these sites include broadening the geographic coverage, adding sites relatively close to core sites to partition loads among subwatersheds, or adding sites along the same water body to determine relative loading of constituents from upstream to downstream. All of these sampling strategies will allow the Coalition to better characterize discharge from irrigated agriculture and monitor the effectiveness of BMP implementation.

As mentioned above, there may be drains that will be found during the next several months as we examine more closely the coalition region. If more drains are found, they will be reported and worked into the monitoring schedule during the next several years. In addition, the Coalition will develop an inventory of crops by fields, BMPs used on those crops, and the location of any field drains that can be identified. Pesticide use will be obtained from Pesticide Use Reports from the County Agricultural Commissioner and placed into the GIS as quickly as possible.

Table 1. Rotating monitoring sites for 2005-06 and rationale for each site. These sites are monitored in addition to the sites proposed above as the core sites.

2005-06	Rationale	Watershed Size in Acres	Crops in Watershed
Lone Willow Slough @ Madera Ave	Geographic coverage, expand crop type in subregion	9,922	Field crops, vineyards
Duck Slough @ Pioneer Road	Upstream load partitioning	6,845	Orchards (almonds, peaches), field crops
Jones Drain @ Oakdale Road	Subwatershed (Merced River) load partitioning	2,377	Orchards, vineyards
Hilmar Drain @ Central Ave	Additional drain	684	Field crops, orchards
Highline Canal @ Highway 99 (dormant season)	Downstream load partitioning (Merced River)	3,203	Orchards (almonds, peaches), field crops
Bear Creek @ Kibby Road	Geographic coverage	6,532	Orchards (almonds, peaches), field crops

Table 2. Rotating monitoring sites for 2007-08 and rationale for each site. These sites are monitored in addition to the sites proposed above as the core sites.

2007-08	Rationale	Watershed Size in Acres	Crops in Watershed
Dry Creek @ Road 18	Geographic coverage	18,534	Vineyards, orchards
Owens Creek @ Kibby Road	Geographic coverage	5,528	Field crops, orchards
Silva Drain @ Meadow Drive	Subwatershed (Merced River) load partitioning	461	Orchards (almonds), field crops
Mustang Creek @ East Ave*	Subwatershed (Merced River) load partitioning	8,801	Orchards
Mattos Drain @ Range Road	Additional drain	1,802	Field crops
Black Rascal Creek @ Kibby road	Geographic coverage	2,,891	Field crops, orchards

*If the ESJWQC Proposition 40/50 proposal is funded, this site will be added in 2006 and maintained through 2007. Other sites will be shifted to other years after discussion with Regional Board Staff.

Table 3. Rotating monitoring sites for 2009-10 and rationale for each site. These sites are monitored in addition to the sites proposed above as the core sites.

2009-10	Rationale	Watershed Size in Acres	Crops in Watershed
Berenda Slough @ Dairyland Road	Geographic coverage	42,130	Field crops, orchards, vineyards
Mariposa Creek @ Simonson Way	Geographic coverage	526	Orchards
Deane Drain @ Gurr Road	Additional drain	4,,887	Field crops
Cavill Drain @ McGee Road	Additional drain	14,131	Field crops
Dutchman Creek @ Highway 99	Geographic coverage	9,213	Field crops, orchards
Cottonwood Creek @ Sixmile road	Geographic coverage	780	Field crops
Hatch Drain @ Monte Vista Ave	Additional drain	1,557	Field crops, orchards

Table 4. Rotating monitoring sites for 2011-128 and rationale for each site. These sites are monitored in addition to the sites proposed above as the core sites.

2011-2012	Rationale	Watershed Size in Acres	Crops in Watershed
Berenda Creek @ Road 19	Geographic coverage	20,845	Vineyards, orchards
Deadman Creek @ Highway 59	Geographic coverage	26,610	Field crops
Livingston Drain @ Robin Ave	Additional drain	2,874	Orchards
Western States Drain @ Central Ave	Additional drain	3,866	Field crops, orchards
Westport Drain @ Vivian Road	Additional drain	1,766	Field crops, orchards, vineyards