City of Dixon WWTF: Site Specific Boron Objective Study

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Sign-off Sheet

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Certification Statement

On behalf of the City of Dixon this Report is submitted to the Regional Board in conformance with the Requirements of CDO R5-2008-0136, Order No. 9, as modified by the January 30, 2013 letter from Pamela Creedon.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

1.0 Introduction

The City of Dixon Wastewater Treatment Facility (WWTF) treats municipal wastewater produced in the City of Dixon in Solano County, CA. The potable water supply for the City is comprised of groundwater that is generally considered mineral rich and hard, resulting in widespread use of water softeners. The natural occurring and softener salts in the City's potable water, as well as salt additions attributed to public use (e.g. detergents, use of toilets, etc.) are currently concentrated in the City's wastewater due to the significant evaporative losses associated with the current pond treatment method. This has historically resulted in the potential for salinity related impacts to the local groundwater from the land discharge disposal of the effluent from the WWTF.

The WWTF is located south of the City of Dixon in a largely agricultural area, and disposes of its wastewater through discharge to slow rate evaporation and percolation basins. Historically, they have also used the WWTF effluent for irrigation; however, irrigation with effluent has ceased due to the significant increase in salinity of percolated water associated with that practice. The City has also instituted an effective salinity source control program, including a residential softener removal incentive program, which measurably lessened the chloride load to the WWTF. Although *salt* loads are relatively unaffected by the historic, current, and proposed future treatment and disposal operations, the *salinity* load will be dramatically lessened (i.e. halved) by best practicable treatment and control (BPTC) improvements that replace the treatment ponds with activated sludge treatment intended to target the dominant driver, or source, of effluent salinity: *evaporative losses of water that leave the salt mass behind*. This is the basis for the City of Dixon WWTF Improvements Project (Project), which is to be constructed in 2015 and 2016.

The City has also completed analyzing data from an expanded monitoring well network in the vicinity of the WWTF and has characterized the local first recoverable groundwater background water quality . This data has been submitted to the Regional Board in monitoring reports and the Project's Report of Waste Discharge (RWD) technical support documents (TSD). This information is expected to support site specific WWTF effluent discharge limits up to the background levels for constituents of concern with background values above the default water quality objectives. However, for constituents with background water quality better than the default water quality objective, the default objective may apply to limit discharges to less than can be achieved with BPTC, unless additional information would justify raising the default objective due to site specific circumstances.

The constituents of concern for the City of Dixon WWTF are TDS, sodium, chloride, and boron with respect to their effect on the agricultural beneficial use of the groundwater resources. A summary of the relevant water quality for these constituents in effluent discharged to groundwater from the WWTF Project is presented in the following table:

Table 1 Agricultural Use Protection - Constituents of Concern (mg/L)

	Potable Water	Raw Wastewater	Proposed Project Discharge to Groundwater (average annual)
TDS	380	640	<800
Sodium	50	150	<190
Chloride	15	120	<150
Boron	0.5	0.8	<1.0

The receiving water of concern is the shallow groundwater, including its potential to affect the deeper production aquifer, and the beneficial use of agricultural irrigation provides the most stringent default water quality objectives for salinity related constituents. For all of the above constituents of concern except boron, the background water quality provides a basis for a site-specific discharge limit that is expected to be attainable through BPTC Project implementation. For boron there is a need to justify a higher limit than the default agricultural use water quality objective to ensure long-term compliance with a site specific discharge limit. *The purpose of this Report is to provide information to support a determination of such a site specific boron objective in the vicinity of the WWTF's discharge.*

> *Note: An addendum to this Report with similar site specific objective rationale but addressing TDS, chloride, and sodium will also be filed with the Regional Board as a TSD to the RWD.*

The rationale for considering relaxing the default value on a site specific basis is because this region, as well as the entire west side of the Central Valley, is known to have naturally elevated boron levels in the water resources, and crops that are commercially grown would be expected to generally be more tolerant of boron, and the farm management practices utilized will also be attuned these local conditions. Therefore, the analysis of the effect of boron locally will be based on *established local crops, and management practices, that may be affected by the WWTF discharge*, instead of relying on the hypothetical most sensitive crop anywhere/anytime value, which may not be manageable with existing local water resources.

The CV_SALTS stakeholder process has proposed setting a commercial use threshold of 5% for such assessments (i.e.; the agricultural use will be adequately protected if 95% of the commercially grown crops in a management region are protected). In addition CV_SALTS has proposed that if for the selected commercial crops the yield is protected to a 95% level (rather than the default 100% level) then agricultural use is adequately protected. These 95% thresholds are used in this Report where applicable as the basis for protecting the general agriculture use of the local groundwater resource.

2.0 Site Specific Factors

The primary study site is shown in Figure 1 and comprises approximately 5,400 acres of land within one (1) mile of the City of Dixon's WWTF, as recommended by Regional Board staff. Since the effluent is discharged to land and ultimately the shallow groundwater, it is anticipated that its ultimate use will be down gradient and to the Southeast of the WWTF; however, due to complexities of subsurface water flow and the surface water conveyance utilities, that may convey water in part derived from the downgradient portions of the local aquifer, the specific area of use potentially affected by the WWTF discharge cannot be precisely delineated. To reasonably address potential impacts beyond the (1 mile radius) study site, crops of regional importance (e.g. Dixon Resource Conservation District (DRCD) listed "Million Dollar Crops") grown down gradient of the WWTF were also evaluated. Crops grown in the study area are summarized in Table 2.

Table 2 Crops Grown in the Study Area

Crop	Area of Survey (%)			DRCD
	DWR 1994	DWR 2003	City Staff 2013	$Million Crop
Alfalfa	22.0%	41.0%	35.50%	Y
Almonds	--	0.9%	1.70%	N
Beans	9.4%	4.4%	--	Y
Corn	15.4%	5.7%	18.40%	Y
Grapes	--	--	2.30%	Y
Melons, squash, cucumbers	--	2.2%	--	N
Mixed Pasture	5.6%	6.5%	20.90%	Y
Pears	--	--	--	Y
Prunes	--	--	--	Y
Safflower	--	--	--	Y
Small Grain	31.2%	23.1%	--	N
Sudan	--	14.3%	5.90%	Y
Sugar Beets	9.1%	--	--	N
Sunflowers	2.4%	0.9%	15.10%	N
Tomatoes	10.2%	0.5%	14.60%	Y
Walnuts	--	--	--	Y
Wheat	1.6%	16.7%	12.30%	Y

Figure 1 Dixon WWTF and Site Specific Boron Objective Study Area

2.1 AGRICULTURAL PRACTICES

Agriculture in the study area has remained relatively consistent over the past 20 years based on a review of California Department of Water Resource (DWR) Land Use Surveys, conducted in 1994 and 2003, and a recent survey conducted by City staff in 2013. Irrigation is primarily gravity fed (e.g. flood, furrow, etc.) using surface water (of varying quality, i.e. including varying amounts of tailwaters from upgradient farms) and/or ground water. Alfalfa and irrigated pasture are grown on more than 25 percent of the study area, and the acreage devoted to these continuous crops has increased over time. Small grains, including wheat, are also grown on substantial acreage throughout the study area. Generally, small grains are grown in a rotation with field (e.g. corn, sunflower) or truck (e.g. tomatoes) crops, allowing for two crops to be grown in a year. Table 2 presents changes in cropping patterns over time and relative significance of specific crops grown in the study area. Due to the use of rotations, the acreage from some fields is included in two separate crops causing the total percentage of all crops to exceed 100 percent; additionally, the survey conducted by City Staff included potential future crops that may be grown on a field (based on discussions with farmers), resulting in three or more crops being grown on the same acreage.

2.2 LIMITING CROPS

The relative boron tolerance of crops grown, planned to be grown, or historically grown in the area on greater than five percent of the study area are presented in Table 3. Yield responses to boron have only been developed for a few crops, while thresholds, representing the concentration above which the crop exhibits signs of boron toxicity (not necessarily decline in yield), have been developed based largely on vegetative growth observations. Generally, orchard and vineyard crops which are relatively sensitive to boron are not grown on significant acreage in the study area or down gradient of the WWTP. The most limiting local crops based on sensitivity to boron are wheat, sunflowers, and beans. Beans were not identified as a potential crop in the City's survey, and the most recent 2003 DWR survey reported that all beans were irrigated with a surface water supply. This suggests that bean cultivation utilizing groundwater supplied irrigation may not be commercially viable in the area. This may be due to groundwater quality, including factors other than boron, or other economic factors that have not been considered.

Table 3 Boron Tolerance of Commercial Crops Grown in the Study Area

Crop	Relative Tolerance [(a)]	Minimum Toxicity Threshold [(b)] (mg/L)	Minimum 95% yield Threshold [(c)] (mg/L)
Sunflowers	sensitive	0.75 to 1	NA
Wheat	sensitive	0.75 to 1	2.3
Beans	sensitive	0.75 to 1	NA
Mixed Pasture	moderately tolerant	2 to 4	NA
Corn	moderately tolerant	2 to 4	NA
Small Grain (excluding Wheat)	moderately tolerant	2 to 4	NA
Alfalfa	tolerant	4 to 6	NA
Sugar Beets	tolerant	4.9	6.1
Tomatoes	tolerant	5.7	7.2
Sudan	very tolerant	7.4	8.5

(a) Tolerance data adapted from E.V. Maas, 1990.
(b) Soil solution, first signs of toxicity noted, not necessarily affecting yield.
(c) Soil solution, for crops with yield response curves.

2.3 BORON BUILDUP MODELING

A relatively simple steady state salinity model based on plant uptake, referred to as “40-30-20-10” (Rhodes and Merril, 1976), was used to calculate boron buildup in the soil solution. This model calculates the salt concentration in quarter fractions of the root zone, and the linear average of these concentrations is recommended to represent soil salinity under infrequent irrigations. Since crop types on a specific field in the study area vary from season to season and annually due to variations in economic, climatic, and crop and soil health considerations, the model was based on an annual time step using average conditions. Average monthly climatic data from the Dixon CIMIS station and Vacaville NOAA COOP station were used in the model to calculate crop irrigation requirements accounting for rainfall. A bare soil evaporation value of 0.7 inches per month, consistent with DWR data for the Central Valley, was applied to rainfall occurring outside of the growing season; however, non-growing season rainfall was never reduced below zero by bare soil evaporation. The amount of rainfall exceeding the non-growing season bare soil evaporation was added to all rainfall during the growing season to calculate effective precipitation (i.e. the amount used by the crop). Two different leaching requirements, 15 and 25 percent, were applied to the model to calculate the irrigation water requirement. The results of the modeling are discussed below and presented in Table 4. The site specific effect of irrigation water quality on soil solution boron concentrations is presented graphically in Figure 2.

Table 4 Crop Specific Irrigation Water Requirements and Modeled Boron Concentrations Protective of Crop Yields.

Crop	LR [(a)]	Irrig.[(b)] Water (in)	ETc [(c)] (in)	Eff. Prec. [(d)] (in)	Limiting Boron Concentration (mg/L)			
					Irrig.	Prec+Irrig [(e)]	Soil Sol	Basis
Wheat	57	0.0	9.9	22.87	NA	~0	~0	Avg. Rainfall
Beans	25	5.0	17.7	18.62	1.53	0.32	0.75	100 % Yield
Beans	15	2.2	17.7	18.62	2.23	0.23	0.75	100 % Yield
Sunflower	25	9.7	24.5	19.20	1.83	0.24	1.75	95 % Yield
Sunflower	15	13.5	24.5	19.20	1.65	0.75	1.75	95 % Yield
Wheat/Beans	25	12.3	27.6	24.55	1.51	0.5	1.17	beans 95 % yield
Wheat/Beans	15	7.9	27.6	24.55	1.51	0.37	1.17	beans 95 % yield
Wheat/Beans	25	12.3	27.6	24.55	1.81	0.60	1.4	snap beans 95 % yield
Wheat/Beans	15	7.9	27.6	24.55	**1.80**	0.44	1.4	snap beans 95 % yield

(a) LR is the leaching requirement, percentage of water applied above crop requirement to control soil salinity.
(b) Irrig. is the amount of irrigation water (surface and/or groundwater) applied.
(c) ETc is the crop requirement for water based on reference evapotranspiration (ETo) adjusted for crop properties.
(d) Eff. Prec. is the effective precipitation, or the amount of precipitation that is used by the crop. This includes all precipitation falling during the growing season and a portion of precipitation falling outside of the growing season adjusted for evaporation from the soil surface.
(e) Prec+Irrig represents all water (irrigation and effective precipitation) applied to the crop.

2.3.1 Wheat

Wheat is grown during the rainy season, and is often cultivated as a “dry land” (i.e. no irrigation) crop in the area. Average rainfall during the growing season is more than twice the amount needed to grow this wheat crop; therefore irrigation supply quality would not impact soil boron under typical local wheat production practices.

2.3.2 Beans

Beans are cultivated during the dry season; however, their irrigation requirement can be met by effective precipitation during the non-growing season. When a leaching requirement (LR) of 15 or 25 percent is applied, supplemental irrigation is required. At the minimum soil solution threshold for beans of 0.75 mg/L, an irrigation water supply with a boron concentration of 1.5 to 2.2 mg/L with 25 and 15 percent LR, respectively, is protective of beans at the 100 percent yield level. At a soil solution value of 1.4 mg/L, and LR of 25%, irrigation water can be up to 2.85 mg/L, which would be protective of 95% yield with a yield response assumption as discussed in the following pages.

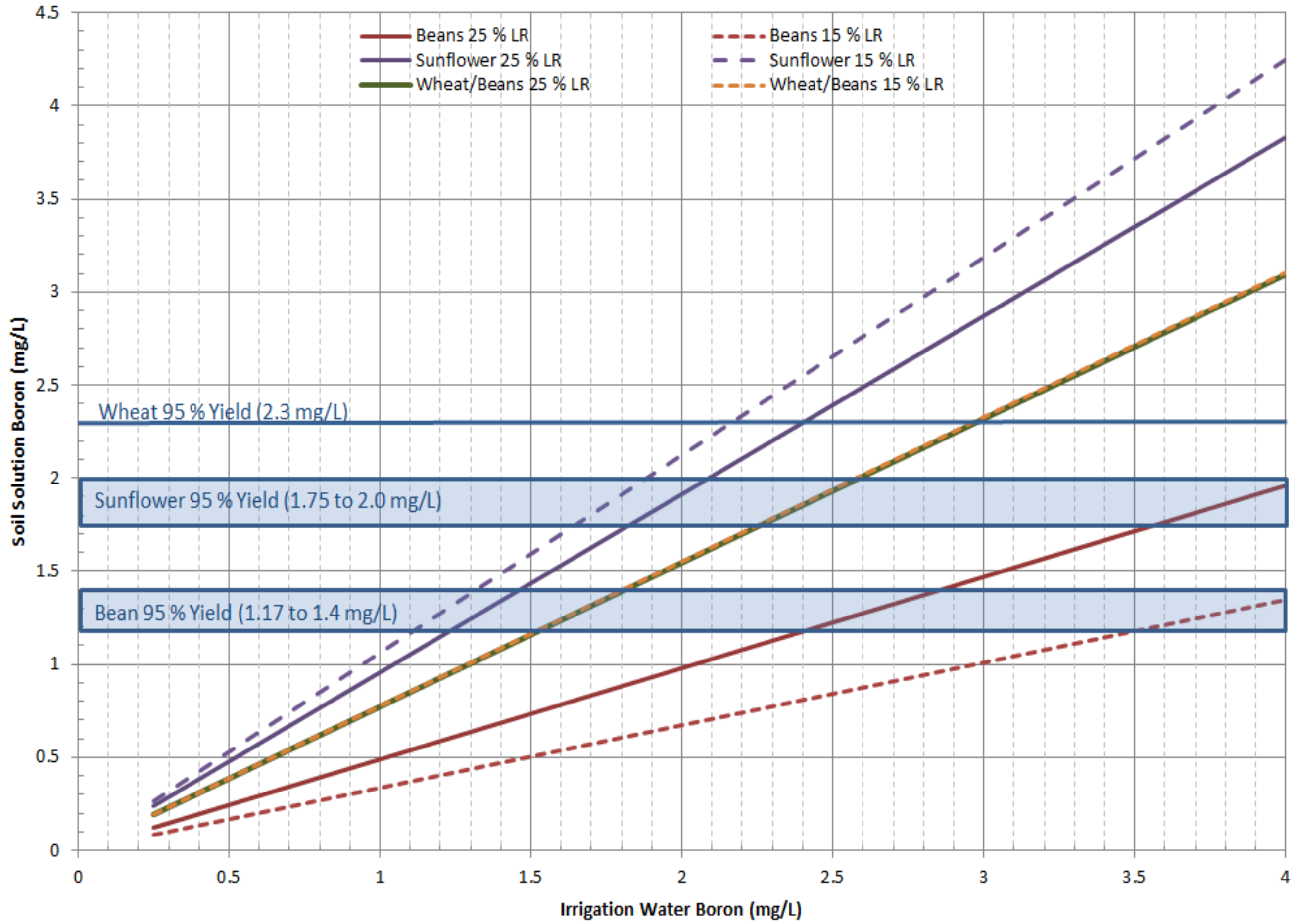

Figure 2 Site Specific Soil Solution Boron Concentrations Relative to Irrigation Water Quality, Crop Practices, and Crop Yield Thresholds.

2.3.3 Sunflower

Similar to beans, sunflowers are cultivated during the dry season, but effective precipitation does not fulfill the irrigation requirement. At the minimum soil solution threshold for sunflowers of 0.75 mg/L, an irrigation water supply with a boron concentration of 0.7 to 0.8 mg/L with 15 and 25 percent LR, respectively, is protective of the 100 percent yield level. Unfortunately, no yield response curve has been developed for sunflower. In addition, there appears to be genetic variation in sunflower cultivars that leads to variable tolerance to boron, with native sunflowers being moderately tolerant (2 to 4 mg/L threshold). Assuming that sunflower yield responds similar to other seed and grain crops, adding 1 mg/L boron to the threshold would reduce yield by less than 5 percent; therefore, a soil solution boron concentration of 1.75 mg/L is anticipated to be protective of the 95 percent yield for sunflowers. This 95 percent yield threshold can be achieved with an irrigation water supply boron concentration of 1.6 or 1.8 mg/L at a 15 or 25 percent LR, respectively.

2.3.4 Crop Rotations

Growing two crops a year is common in the area, with small grains including wheat being grown with a summer field crop reported by DWR on 10 to 15 percent of the acreage. The field crops used in these rotations included beans, corn, Sudan grass, and sugar beets. Of these rotations, wheat followed by beans would be the most sensitive to boron buildup. Legumes appear to have a steeper decline in yield per incremental increase than other crops; snap beans and cowpeas are reported to have a 12 percent decline in yield for each mg/L increase in boron concentration over the threshold concentration. The yield response for snap beans indicates that a soil solution boron concentration of 1.4 mg/L is protective of the 95 percent yield, and snap bean threshold of 1 mg/L, is at the high range of the bean threshold (0.75 to 1 mg/L). A conservative estimate of the boron concentration protective of the 95 percent level of beans is 1.17 mg/L, based on applying the legume yield slope decline to the minimum threshold for beans. This 95 percent threshold for a wheat bean rotation can be achieved using an irrigation water supply with a boron concentration 1.5 mg/L at both 15 and 25 percent LR. *Increasing the irrigation water supply boron concentration to 1.8 mg/L is protective of 95 percent yield of snap beans and wheat rotation at both LR, and weighing all factors this value is proposed as an appropriate site specific objective (SSO) for boron.*

2.4 SOIL CONDITIONS

The fate of boron in soils is a complex process affected by soil pH, texture, mineralogy, and organic matter content. Generally, the majority of boron in the soil is adsorbed to the solid phase and only a small quantity of the total boron remains in the soil solution where it is available to plants. The boron adsorption capacity of the soil creates a buffer that maintains soil solution boron concentrations near steady, and this buffer capacity results in marginal increases in soil solution boron concentration after significant and prolonged additions of boron to the soil.

Soils in the vicinity of the WWTP are predominantly fine textured (clay loam and clay) with near neutral pH and appreciable organic matter build up at the surface. Near neutral clay loam and clay soils from California have been reported to have boron adsorption capacities of 25 to 30 mg/kg (Gupta et. al, 1985). This means that an acre of these soils could adsorb at least 100 lbs of boron in the surface foot. However, only 4 lbs of boron adsorbed to this same acre foot of soil would result in a soil solution boron concentration of 0.7 mg/L. If the maximum rate of irrigation (12.3 inches) and maximum irrigation water boron concentration (1.8 mg/L) from the boron buildup modeling were applied to an acre of this soil, and all boron remained in the surface foot of soil, it would take over 11 years to apply 4 lbs of boron and achieve the equilibrium 0.7 mg/L soil solution boron concentration. This suggests the boron buildup modeling is highly conservative, and irrigation supplies with higher boron concentrations could be protective of the agriculture beneficial use.

Other soil conditions that affect agriculture production include soil salinity and sodicity (sodium content). The majority of soils mapped at the site have the potential to be salt affected, with soil salinity (ECe) reported in the range of 0 to 2 mmohs/cm in at least one soil horizon (NRCS, 1977). Additionally, two soil series, the Antioch and the Capay, have elevated sodium contents with sodium adsorption ratios reported as high as 20 and 10, respectively (NRCS, 1977). Soils in the area require salinity management regardless of irrigation water quality, and depending on past management, some soils may not support the maximum yields of salt sensitive crops without substantial soil reclamation programs. Farmers in the region routinely apply gypsum to control sodium build up, and use crop rotation to control soil salinity. The extensive drainage network constructed in the area and use of higher quality surface water supplies, where available, has likely ameliorated soil salinity conditions in much of the study area.

3.0 Water Quality Objective

Utilizing the same model employed by Ayers and Westcott (1976) to determine salinity related agriculture water quality objectives in the FAO Irrigation and Drainage Paper 29, a water quality objective for boron was calculated based on local climate and cropping conditions. The fate of boron in soils and its effects on crops is complex and variable, especially in contrast to soil salinity which is generally related to mass of salts and osmotic stress on plants. Thus, it is anticipated that water quality objectives determined from this simplified model are highly conservative and offer a high level of protection of the agriculture beneficial use.

3.1 AVERAGING PERIOD

The application of a water quality objective should address averaging periods based largely on the potential impact to the beneficial use. Unlike salinity where crop physiology is affected by osmotic stress, there is limited knowledge on boron's role in plant nutrition as well as on the mechanisms responsible for boron toxicity. However, in general, the deleterious effects of boron toxicity require several years to become pronounced and are often observed in the later stages of crop growth. Furthermore, soils have a robust feedback system to buffer, or ameliorate, the concentration of boron in the soil solution, and numerous years of application of boron at the concentrations found in the regional groundwater would be necessary to increase soil boron to sensitive crop threshold levels. Therefore, seasonal or growth stage specific water quality objectives are not warranted, and an annual average based water quality objective is proposed.

The above factors alone warrant long term averaging periods when translating the boron water quality objective to the WWTF discharge limits, which are further supported by the nature of the WWTF discharge, including the lack of a seasonal source of boron. The land discharge of the effluent also results in a significant time delay prior to the effluent mixing with the groundwater resource, and the movement of said effluent mixed with local groundwater to a point of potential reuse results in another significant time delay. This residence time (likely measured in years or decades) allows boron concentrations in effluent to be equalized in its effect on the groundwater resource. Thus, the averaging period for boron effluent limits applied to the WWTF land discharge may be relatively long (i.e. measured in years/decade), and be consistent a water quality objective based on an annual averaging period for applied irrigation water, which is what is proposed with the values used in the boron buildup model.

3.2 PRACTICALITY

Other areas in California are known to have elevated boron concentrations in water supplies and continue to have productive agriculture. One of these areas is just north and east of the study area, in Yolo County, where surface water draining from Clear Lake and throughout the Cache Creek watershed is known to have elevated boron concentrations. The soils found in Yolo County are similar to soils found in the study area, and the climate is relatively similar with a moderate decline in total annual precipitation in Yolo County. Therefore, salinity related stresses, including that due to boron, are anticipated to be higher in Yolo County than in the Dixon/Solano County study area.

The Yolo County Flood Control and Water Conservation District (YCFCWD) reported the long term average boron concentration for its irrigation supply (Cache Creek at the Capay Dam) was 1.7 mg/L and average boron concentrations of groundwater in Yolo County range from 0.6 to 6.6 mg/L (YCFCWD, 2007). The most recent DWR land use survey of Yolo County conducted in 2008 indicates a small proportion of acreage devoted to beans, and there are no specific wheat followed by bean rotations. It should be noted that land used to cultivate small grains crops were mostly undifferentiated in the survey, and wheat was not specifically reported in the survey. Small grain crops followed by a field crop were noted for approximately 2,700 acres and irrigation supply was reported as surface water, groundwater, or both. In these rotations, sunflower was the most sensitive crop specified.

This indicates that in practice a suitable yield from a sunflower crop can be obtained from an irrigation water supply with a 1.7 mg/L boron concentration, which is intermediary between the values modeled for sunflower in the Dixon/Solano County study area (1.65 and 1.8 mg/L). Additionally, this practical sunflower yield is obtained at higher soil boron concentrations than modeled in the Dixon study area due to less supplemental water from precipitation and the additional irrigation demand of a second crop in Yolo County. Therefore, the water quality objectives derived in this report are very conservative, and it appears objectives modeled using the higher end of the presented threshold range are protective. For instance, the bean threshold range is 0.75 to 1 mg/L which corresponds to 95 % yield soil solution concentrations of 1.17 to 1.4 mg/L, and *applying the higher end of this range to the model results in an irrigation water quality objective of 1.8 mg/L, which is likely protective of the agricultural use, and is the value proposed for a reasonable site specific objective.*

4.0 Conclusion

An agricultural use site specific boron objective study was conducted for the area within 1 mile of the City of Dixon's WWTF. Available crop surveys for the area for the past 20 years were used to identify specific and significant commercially viable crops grown in the area. The relative boron sensitivity of crops identified from the surveys, as well as regionally important crops, was used to determine the most limiting crops potentially grown in the area. The most limiting boron sensitive crops were beans, sunflowers, and wheat. The most sensitive potentially irrigated cropping practice is found to be a rotation of wheat followed by beans.

A simple salinity model based on water uptake was used to calculate soil boron concentrations from irrigation water boron concentrations and accounting for average local precipitation and evapotranspiration conditions. Since the fate of boron in the soil is very complex, the modeled values do not take into account the likely substantial boron adsorption capacity of the areas soils, and are therefore conservative. Based on this model, irrigation water with an annual average quality of 1.5 to 1.8 mg/L boron is protective of the 95 percent yield of beans, in a wheat followed by beans rotation, with a 15 to 25 percent leaching requirement.

Actual crop practices, where irrigation water is known to be relatively high in boron, were compared to values calculated from the model. In Yolo County, water supplied from the YCFCWD averages 1.7 mg/L boron and is applied to similar soils as found in the Dixon area to irrigate similar crops. Based on differences in the crop data reported for the DWR crop surveys, sunflowers provided the most direct correlation of crop practices between the surveys for each county. In Yolo County, acceptable yields of sunflowers are apparently obtained using this high boron irrigation water. This is consistent with the irrigation water quality, of 1.65 to 1.8 mg/L, calculated in the model to protect the 95 percent yield of sunflowers near the Dixon WWTF. However, when the drier conditions in Yolo County and increased irrigation water requirement necessary to grow sunflowers in rotation with small grains are considered, the model is likely highly conservative as applied in the Dixon study area.

Therefore, the recommended site specific boron objective of 1.8 mg/L, applied as an annual average, is found to be reasonably protective of local commercial agricultural uses in the study area. This is based on a conservative standard utilizing the upper level of the threshold for beans and applying a 95% yield criteria (per CV_SALTS) under normal (average) climate year conditions.

The City thanks the DRCD for supplying information on the crops and farm management practices in the study area. The City has shared its preliminary findings with the DRCD but the DRCD has not necessarily endorsed the recommendations in this report, due in part to the many other factors that are a part of commercial farm management that may affect determining the optimum site specific objective for boron, or other constituents of concern. Many of these factors are beyond the ability of the City to control or even reasonably quantify for use in the models utilized in this study. This study is limited to evaluating the potential effect of water supply quality on crop yield, not considering other constraints that may be important to AGR users, such as their ability to economically meet their own discharge limits to surface and groundwaters.

The City fully intends to continue to support the commercial viability of AGR users of the local groundwater resource and is investing in a BPTC project that will significantly improve the quality of its discharge that may affect that resource. By providing information that supports raising the local boron AGR objective to 1.8 mg/l on an annual basis, the City understands the local AGR community may subsequently provide information to the Regional Board that may justify a higher or lower value based on factors beyond those considered in this Study. At a minimum, the City expects to support the local AGR community if they request any refinements to the proposed site specific water quality objectives in such context, and that are reliably attainable with BPTC processes applied to the WWTF discharge.

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