ATTACHMENT 1:

Supplemental Information Regarding City of Turlock's Application

3. Project Description

The City of Turlock (Turlock) proposes to appropriate up to 13,393.39 acre-feet per year (AFY) of San Joaquin River flows under Water Code section 1485 in a quantity equal to its discharges of tertiary treated wastewater into the river. The place of use for this water would be Del Puerto Water District's (DPWD) service area (*see* **Attachments 5 & 6**), where it would be used for agricultural irrigation. Turlock's requested appropriation includes (i) 10,000 AFY of existing flows—the quantity currently available because it is already being discharged to the San Joaquin River; plus (ii) future increases in river flows attributable to increased discharges that will occur with near-term population growth. Together, these flows total 13,393.39 AFY. (All quantities account for evapotranspiration and seepage losses between Turlock's point of discharge and the point of diversion, as calculated in **Attachment 3**.)

Turlock proposes to utilize existing facilities and points of diversion/rediversion to effect its appropriation. Water appropriated under this permit would be diverted at the Patterson Irrigation District's (PID) intake facility on the San Joaquin River and conveyed through PID's Main Canal to the Delta-Mendota Canal (DMC), for ultimate delivery to and use within DPWD's service area. Neither Turlock nor PID proposes to increase or exceed PID's total authorized diversion rate of 195 cubic-feet per second (cfs). The project assumes six percent (6%) conveyance losses through PID's Main Canal and five percent (5%) conveyance losses through the DMC.

Upon securing a permit under Water Code section 1485, Turlock would enter into an agreement to sell water available under that permit to DPWD. DPWD would enter into an agreement with PID to divert water through PID's existing facilities located between the San Joaquin River and the DMC. Diverted water would be conveyed through PID's distribution system and through PID's existing connection to the DMC. DPWD would enter into a multi-year Warren Act contract with the U.S. Bureau of Reclamation for the conveyance, storage and delivery of non-project water using the DMC and the San Luis Reservoir.

4. Purpose of Use, Diversion/Storage Amount and Season

Turlock proposes to appropriate the permit water for irrigation on a maximum of 43,259 acres within DPWD's service area. DPWD diverts for irrigation year-round; its proposed diversion season is January 1 to December 31.

San Joaquin River flows are available for appropriation because of Turlock's discharges of tertiary treated wastewater into the San Joaquin River. Currently, Turlock treats approximately 10 million gallons per day (mgd), the majority of which is discharged into the San Joaquin River. (Up to 2.0 mgd are delivered to the Turlock Irrigation District for use as cooling water in an existing cogeneration facility as previously approved by the Division of Water Rights pursuant to Order dated July 18, 2007, In the Matter of Wastewater Petition WW-46, and a small amount is used for landscape irrigation at the City of Turlock's Pedretti Park; wastewater for the latter use is received by the City of Turlock from the City of Ceres.) Turlock's discharges to the River are projected to increase gradually as population and water use within Turlock increase. Thus, the

quantity available for appropriation will also gradually increase with the quantity being discharged. Turlock therefore proposes to regulate its diversions such that the 15-day average of its diversions is equal to the 15-day average of its discharges.

DPWD's multi-year Warren Act contract would include the right to store Turlock's discharged waste water in San Luis Reservoir. Although DPWD does not anticipate the need to access storage capabilities in San Luis Reservoir, if storage were necessary it would likely be during the months of December, January or February. These are months when demands within DPWD are at a minimum, particularly if they coincide with a time of above-average rainfall.

6. Water Availability

California Water Code section 1485 authorizes Turlock to appropriate San Joaquin River flows that it has made available by virtue of its discharges of tertiary treated wastewater. Section 1485 provides:

> Any municipality, governmental agency, or political subdivision operating waste disposal plants producing disposal water meeting the requirements of the appropriate regional board, and disposing of said water in the San Joaquin River may file an application for a permit to appropriate an equal amount of water, less diminution by seepage, evaporation, transpiration or other natural causes between the point of discharge and the point of recovery, downstream from said disposal plant and out of the San Joaquin River or the Sacramento-San Joaquin Delta. A permit to appropriate such amount of water may be granted by the board upon such terms and conditions as in the board's judgment are necessary for the protection of the rights of others. Water so appropriated may be sold or utilized for any beneficial purpose. The right to the use of water granted by this section shall not include water flowing in underground streams.
>
> The Legislature finds and declares that the problems incident to the full utilization of the waters of the San Joaquin River and the Sacramento-San Joaquin Delta into which it flows, are unique and that a general law cannot be made applicable thereto.

As explained more fully in the technical analysis in **Attachment 2**, the water Turlock seeks to appropriate is available for appropriation because its discharges of tertiary treated wastewater contribute new flows that otherwise would not have reached the San Joaquin River. Although the San Joaquin River is listed as a Fully Appropriated Stream (*see* Exhibit A to Order WR 98-08, pp. 11, 22, hereinafter "FAS Order"), the FAS Order authorizes the SWRCB to accept "applications to appropriate water made available through actions to develop or salvage water." FAS Order, p. 16. As explained below, this water right application is consistent with the terms of the FAS Order because it demonstrates that Turlock's activities make water available for appropriation without infringing on prior rights.

The municipal water supply that ultimately becomes Turlock's treated wastewater discharge originates in the Turlock Groundwater Basin. Turlock's wells draw from a confined aquifer that is located beneath the Corcoran Clay—a layer that separates the unconfined aquifer from the

confined aquifer in this portion of the Basin. The Corcoran Clay effectively limits the extent to which water can move vertically upward and join the San Joaquin River.

The historical development of groundwater pumping in the Central Valley also has shifted hydraulic gradients such that groundwater being pumped by Turlock flows downward and away from the San Joaquin River. Groundwater pumping below the Corcoran Clay has increased significantly over time, as has infiltration due to irrigation above the Corcoran Clay. These two effects have caused groundwater to flow laterally and downward away from the San Joaquin River banks. Additionally, as shown in Figure 5 in **Attachment 2**, long-term, concentrated groundwater pumping to the East of Turlock has resulted in a cone of depression. This effect causes groundwater under much of Turlock to flow generally eastward, away from the San Joaquin River.

Therefore, the groundwater pumped by Turlock—which ultimately becomes recycled water—would not reach the San Joaquin River absent Turlock's discharges into the San Joaquin River. Turlock's recycled water discharges represent "new water" to the river system.

As shown in **Attachment 3**, there would be minimal diminution in San Joaquin River flows between Turlock's point of discharge and PID's point of diversion—an average of 0.63%. Thus, under Water Code section 1485, a quantity of San Joaquin River flows equivalent to 99.37% of Turlock's wastewater discharges is available for appropriation by Turlock.

8. Project Schedule

All necessary facilities for the proposed project have already been built. The City began discharging treated wastewater in 2006, and it is currently discharging approximately 10,000 AFY into the San Joaquin River. However, those discharges are expected to increase to more than 13,393.39 AFY as the city's population and water use increase within the next six years. Turlock proposes to monitor its discharges and periodically increase its diversions to match those discharges, up to an annual maximum of 13,393.39 AFY. Turlock therefore requests fifteen years to put all 13,393.39 AFY to full beneficial use under the requested permit.

9. Justification of Amounts Requested

a. DPWD's Need for Supplemental Water Supplies:

A quantity of San Joaquin River flows equal to Turlock's discharges of tertiary treated wastewater, less seepage and evapotranspiration losses, is available for appropriation by Turlock. Turlock proposes to sell this water to DPWD in order to meet DPWD's urgent need for a supplemental water supply.

Currently, DPWD's primary source of water is through a contract with the U.S. Bureau of Reclamation for the delivery of up to 140,210 AFY of Central Valley Project (CVP) water annually. Since the early 1990s, DPWD has experienced reductions in its CVP entitlements due to drought conditions and regulatory restrictions imposed on CVP operations. In 2009, due to hydrologic conditions as well as increased Delta pumping restrictions, DPWD received only 10 percent (approximately 14,000 AF) of its CVP contract amount. While the District's supply was 80 percent in 2012, in 2013 DPWD has only received 20 percent (approximately 28,000 AF) of

its CVP contract amount. On average, DPWD has received about 36 percent (51,000 AF) of its CVP contract amount over the last seven years.

So far, DPWD has made up the difference between its CVP supply and its total demand for water by purchasing additional supplies when available, with additional groundwater pumping, and by fallowing farmland. The water shortages and the lack of water supply reliability that DPWD has experienced have resulted in economic hardships for DPWD and its growers. In 2009, approximately 11,000 acres of lands were fallowed, representing almost 25 percent of the District's productive farmland. Furthermore, in the future it is expected that Delta exports and surface water supplies will become even less reliable due to the impacts of climate change and regulations to maintain the Delta ecosystem. In light of this persistent deficit in DPWD's water supplies, Turlock is proposing to appropriate and sell to DPWD one hundred percent of the San Joaquin River flows made available by Turlock's recycled water discharges.

10. Diversion and Distribution Method

a. Irrigation

Turlock proposes to wheel the permit water through PID's point of diversion and distribution system in order to convey it to the DMC at the point of rediversion, and ultimately to DPWD's service area. A map showing the point of diversion and point of rediversion is appended to this application as **Attachment 4**. The quantity of water diverted for delivery to DPWD would represent only a portion—up to 18.5 cfs—of PID's total diversion capacity of 195 cfs.

PID completed construction of a new 195 cfs, National Marine Fisheries Service-approved fish screen and diversion pump station at its San Joaquin River diversion facility in 2011. The pump station is outfitted with stainless steel, high-profile bar screens rated to prevent entrainment and impingement of steelhead and Chinook salmon in the San Joaquin River. This pump station conveys water into PID's main canal lift system.

The PID Main Canal lift system includes approximately four miles of concrete-lined open channel, and 5 additional pump stations (excluding the San Joaquin River fish screen) capable of moving water into 5 separate canal lift segments. The pump stations range in capacity from 195 cfs to 40 cfs and include 35 electrically driven pumps ranging in size up to 350 horsepower. The Main Canal system is automated, with each pump station relying on downstream level control to maintain water levels in each canal segment, which prevents and limits operational spills. It is estimated that PID's pumping efficiency is approximately 80-percent.

At the end of its Main Canal, PID maintains existing intertie facilities capable of conveying approximately 40 cfs to the DMC through approximately 2.2 miles of buried PVC pipeline. PID's existing discharge facility into the DMC from its Main Canal is located at DMC milepost 42.53L.

b. Storage

DPWD does not anticipate needing to store any of the water requested under this application. DPWD delivers water to its growers year-round, and its growers likely would consume the entire quantity delivered pursuant to this permit on a real-time basis. Further, as a CVP contractor, DPWD has complete authority to designate when its water use represents CVP water and when it represents other water supplies. Because DPWD is not penalized for not using its CVP contract supply, DPWD intends to always use its permit water supply first, followed by its CVP contract

supply. However, in the unlikely event that DPWD would need to store the permit water, its Warren Act contract with the U.S. Bureau of Reclamation will provide for storage rights in the San Luis Reservoir. Therefore, Turlock is requesting that this permit authorize the storage of up to the full quantity of water available under the permit.

DPWD's Warren Act contract provides that storage of non-CVP water is always available to DPWD for an additional rate component so long as the federal share of the San Luis Reservoir is not full. (In recent years, the federal share has almost never been full.) In the highly unlikely event that DPWD is unable to utilize all permit water and storage is unavailable in the San Luis Reservoir, the Warren Act contract provides that the U.S. Bureau of Reclamation would re-categorize the permit water as a "donation to the United States."

11. Conservation and Monitoring

a. Methods to Conserve Water

PID's Main Canal is lined with concrete, greatly reducing potential seepage losses. Through testing and flow measurement, the physical losses associated with wheeling of the permit water directly from PID's diversion facility to the DMC and which would be imposed by PID are approximately six percent (6%). PID's Main Canal system is automated, with each pump station relying on downstream level control to maintain water levels in each canal segment, which prevents and limits operational spills. DPWD and the Bureau of Reclamation will impose conveyance losses of five percept (5%) between the point of rediversion and DPWD's facilities on the DMC. With respect to conservation measures where the water is to be applied, DPWD's growers continually strive to conserve supplies, primarily through the use of high efficiency irrigation practices on a major portion of its cultivated lands, as indicated in the matrix in section 9.a, above. DPWD growers will continue to implement these efficiency measures with the addition of permit water to supplement their water supplies.

b. Methods to Monitor Diversion Rate

Turlock's wastewater treatment facility has an approved flow measuring device (meter) that precisely measures its effluent as it leaves the facility. This meter allows Turlock to precisely and accurately measure the volume of wastewater being discharged. PID will monitor the diversion rate on a real-time basis as diversions are scheduled at its San Joaquin River fish screen and diversion facility, newly installed in 2011. Corresponding discharges into the DMC will be monitored by Bureau of Reclamation meters along the DMC, which are operated and maintained by the San-Luis & Delta-Mendota Water Authority. The supplies will then be measured upon re-delivery to DPWD lands, also through Bureau of Reclamation-owned meters operated and maintained by the San-Luis & Delta Mendota Water Authority.

12. Right of Access

All necessary entitlements and rights of access would be obtained through a series of agreements with participating agencies. Specifically, DPWD would contract with PID for the use of its diversion and distribution facilities to convey the permit water to the DMC. DPWD would execute a Warren Act contract by which the U.S. Bureau of Reclamation would consent to the

delivery of the (non-CVP) permit water through the DMC. Finally, Turlock and DPWD would execute an agreement by which DPWD would consent to the delivery and use of the permit water within its service area. By these agreements, Turlock and DPWD would obtain all necessary rights of access for the project.

13. Existing Water Rights and Related Filings

c. Related Applications, Registrations, Permits, or Licenses for Proposed Place of Use, Point of Diversion:

PID claims a pre-1914 appropriative water right that utilizes the same point of diversion as the proposed project. Statement Number S009320 contains the most recent information regarding this water right.

18. Environmental Document

Because the proposed project involves the use of the DMC—a U.S. Bureau of Reclamation facility—the project is subject to both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The City of Turlock is serving as lead agency for the proposed project under CEQA, and the Bureau of Reclamation is serving as the lead agency under NEPA. As a state agency with approval authority over the project, the SWRCB is a responsible agency for the proposed project under CEQA. Turlock intends to rely on an Initial Study-Negative Declaration/Environmental Assessment (IS-ND/EA) for this project. Consistent with SWRCB requirements, Turlock will submit to the Division of Water Rights the final IS-ND/EA, Notice of Determination, and proof of payment of the State Clearinghouse filing fee when those documents are prepared.

20. Archaeology

The proposed project would not involve the construction of any new facilities. Therefore, no impacts to archaeological resources are anticipated.

Memorandum

RMC Water and Environment

Subject: **Turlock Groundwater Basin**

Prepared For: Andrew Derringer

Prepared by: Ryan Alameda

Reviewed by Jim Blanke and Lyndel Melton

Date: September 13, 2013

Background

The City of Turlock (Turlock or City) is proposing to secure a right to its recycled water for the purpose of enabling delivery of recycled water to the Del Puerto Water District (DPWD or District) via a wheeling agreement with Patterson Irrigation District. The City of Turlock currently discharges its treated wastewater to the Turlock Irrigation District owned Harding Drain. The Harding Drain discharges into the San Joaquin River at a point approximately 4 miles upstream of the West Main Street crossing of the San Joaquin River, which is immediately upstream of the Patterson Irrigation District's (PID) licensed fish screen intake. The City is in the process of installing the Harding Drain Bypass Pipeline which will be used to convey the treated wastewater directly to the San Joaquin River and remove its discharge from the Harding Drain.

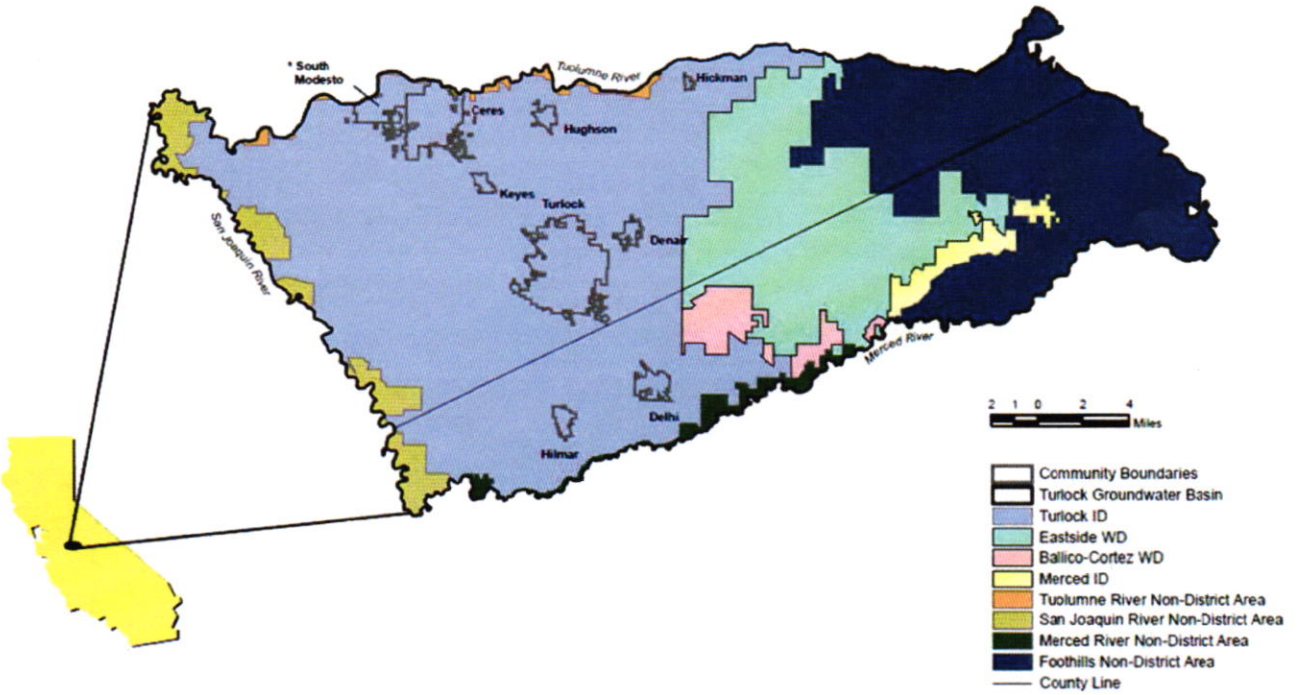
Turlock derives its municipal water supply from the Turlock Groundwater Basin. Turlock's wells are located in the confined aquifer that is located beneath the Corcoran Clay layer which separates the unconfined aquifer from the confined aquifer in this portion of the Basin. Although shallow groundwater is available, the quality and reliability of the groundwater from the aquifer above the Corcoran Clay layer is not adequate to meet Turlock's municipal water supply needs.

The objective of the delivery of recycled water to DPWD is to provide an incremental water supply to the District to supplement the District's primary supply which is Central Valley Project (CVP) water. DPWD has a contract with the Bureau of Reclamation (Reclamation) for 142,000 AFY of CVP water. This CVP supply has become increasingly more variable and less reliable as a result of increased hydrologic variability and increased regulatory constraints. Over the last five years, this supply has averaged approximately 42,000 AFY, leaving land owners within DPWD short of the water supplies necessary to meet their needs. Historically, DPWD has attempted to purchase available supplies in years when CVP supplies are not adequate to meet its land owners' needs. However, these supplies are often very costly and often inadequately available to meet the full needs of the land owners within DPWD. Consequently, many land owners within DPWD have turned to groundwater pumping to meet their incremental water supply needs.

Turlock Groundwater Basin

The Turlock Groundwater Basin (Basin) covers an area of approximately 347,000 acres, with irrigated crops (245,000 acres), native vegetation (69,000 acres), and urban development (20,000 acres) as the predominant land uses. Figure 1 below displays the Basin location and boundaries.

Figure 1. Turlock Groundwater Basin Location and Boundaries

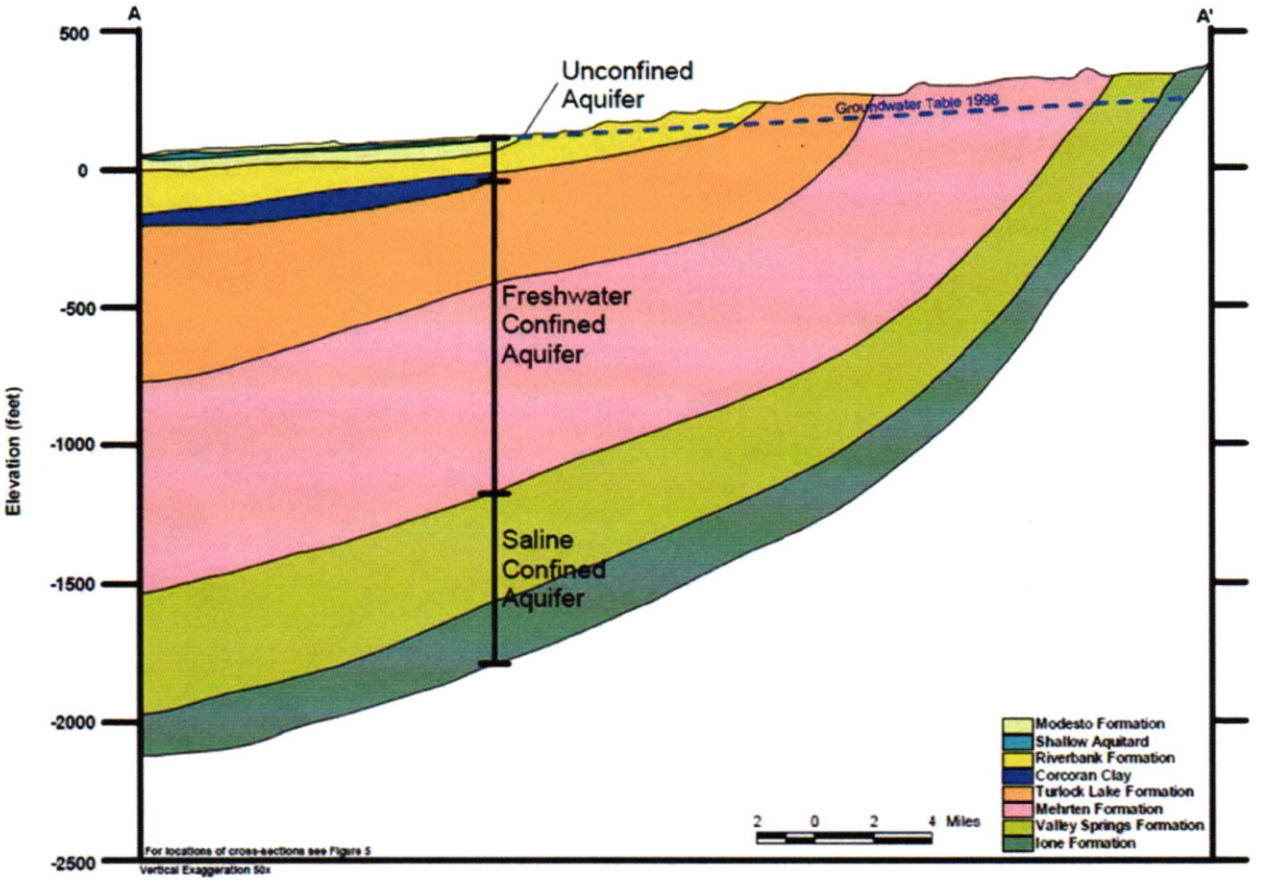


Source: Turlock Groundwater Basin Association, 2008, Turlock Groundwater Basin- Groundwater Management Plan

Basin Hydrogeology

The Basin consists of either consolidated or unconsolidated sedimentary deposits. The consolidated deposits include the Ione Formation, the Valley Springs Formation, and the Mehrten Formation. The Ione and Valley Springs formations typically contain saline water of marine origin. These consolidated deposits are found at shallower depths in the eastern portion of the Subbasin and generally yield small quantities of water to wells. The Mehrten Formation, however, yields greater quantities of water and is an important water source for the eastern portion of the Turlock Subbasin. The Mehrten Formation forms the confined aquifer from which Turlock obtains its municipal water supplies. See Figure 2 below for a cross section of the basin.

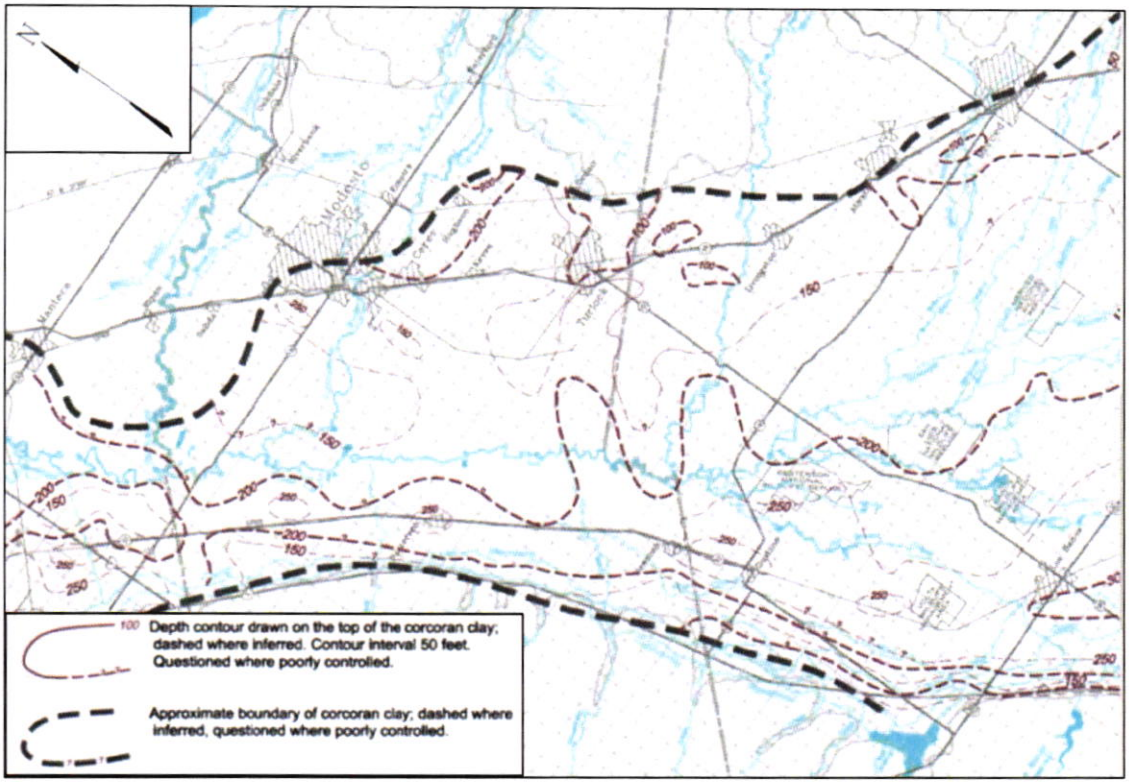
Figure 2. Turlock Groundwater Basin Cross Section



Source: Turlock Groundwater Basin Association, 2008, Turlock Groundwater Basin- Groundwater Management Plan

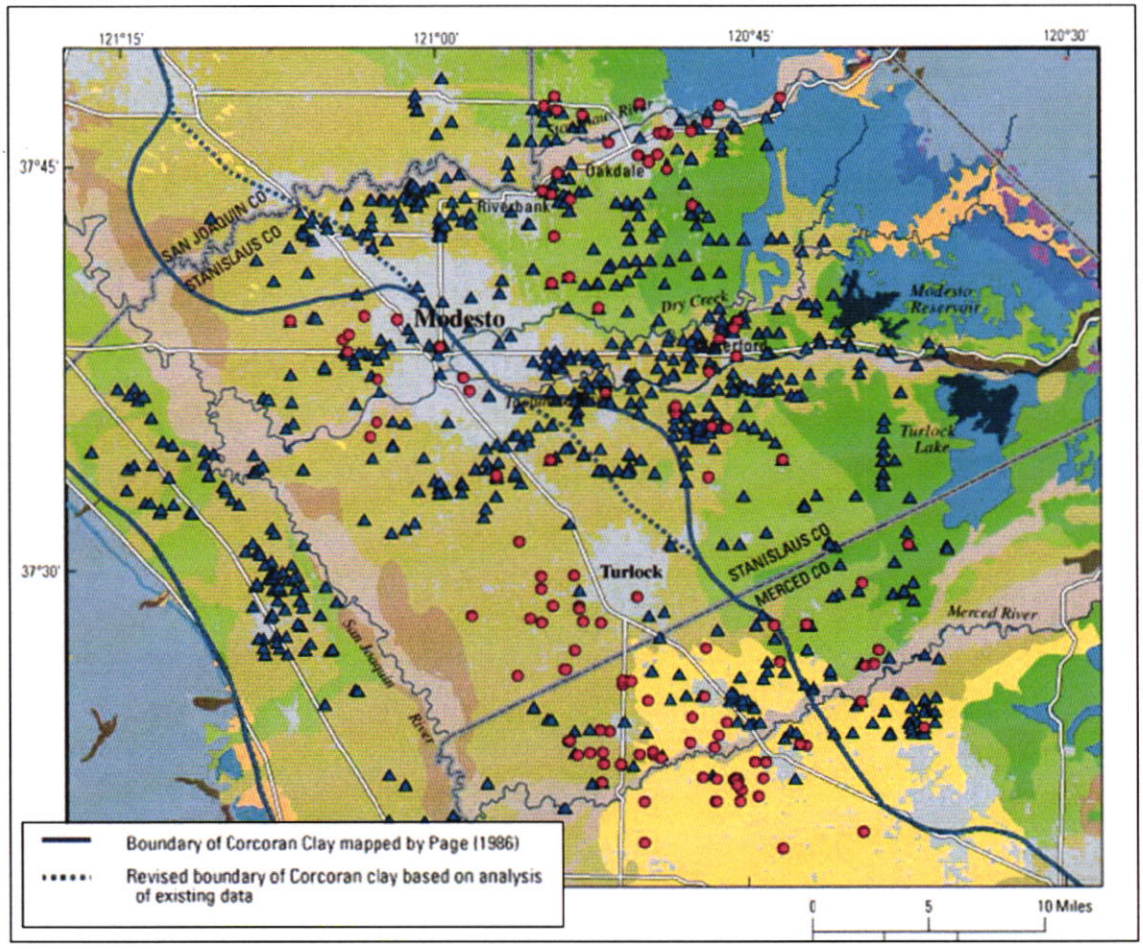
The Corcoran Clay aquitard occurs in the western portion of the Basin within the Turlock Lake hydrogeologic unit. The Corcoran Clay layer is a low-permeability, areally extensive, lacustrine deposit that ranges in thickness from 10 to 80 feet and is typically found at depths ranging between 50 to 250 feet. This continuous clay layer separates groundwater in the Basin into an upper, unconfined aquifer and a lower, confined aquifer. The unconfined aquifer is used for both private domestic supply and agricultural supply in the western part of the Basin. The confined aquifer, which is in the Mehrten Formation and is contained under pressure by the Corcoran Clay, is approximately 1,300 feet thick and starts around a depth of 200 feet. This confined aquifer provides extensive municipal supply for Turlock and agricultural supplies to the Basin. Figure 3 below illustrates the extent of the Corcoran clay in the vicinity of the Turlock area. A study conducted in 2004 adjusted the eastern boundary of the Corcoran Clay layer. This adjustment can be seen in Figure 4; no change was made to the western boundary seen in Figure 3.

Figure 3. Corcoran Clay Boundaries



Source: http://www.water.ca.gov/pubs/groundwater/depth_to_top_of_corcoran_clay_map__1981/depth_to_the_top_of_corcoran_clay-1981.pdf

Figure 4. Updated Eastern Boundary of the Corcoran Clay Layer



Source: Burow, K.R., Shelton, J.L., Hevesi, J.A., and Weissmann, G.S., 2004, Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2004-5232, 54 p

Movement of Groundwater

In 2009 the U.S. Geological Survey (USGS) published a paper titled *Groundwater Availability of the Central Valley Aquifer, California* (Professional Paper 1766). The purpose of the paper was to provide information on the USGS's assessment of groundwater availability of the Central Valley aquifers including the following topics:

1. The present status of groundwater resources and
2. How the groundwater resources have changed over time.

The conclusions of the 2009 USGS publication indicate that during predevelopment (before groundwater pumping), groundwater was primarily recharged at the upper parts of the alluvial fans in the eastern part of the basin where the major streams enter the valley. In the lower parts of the alluvial fans, ground water moved generally westward and toward the San Joaquin River from both sides, and artesian conditions in the western part of the basin reflected the upward movement from the confined aquifer to the unconfined aquifer in the center of the basin/the San Joaquin River.

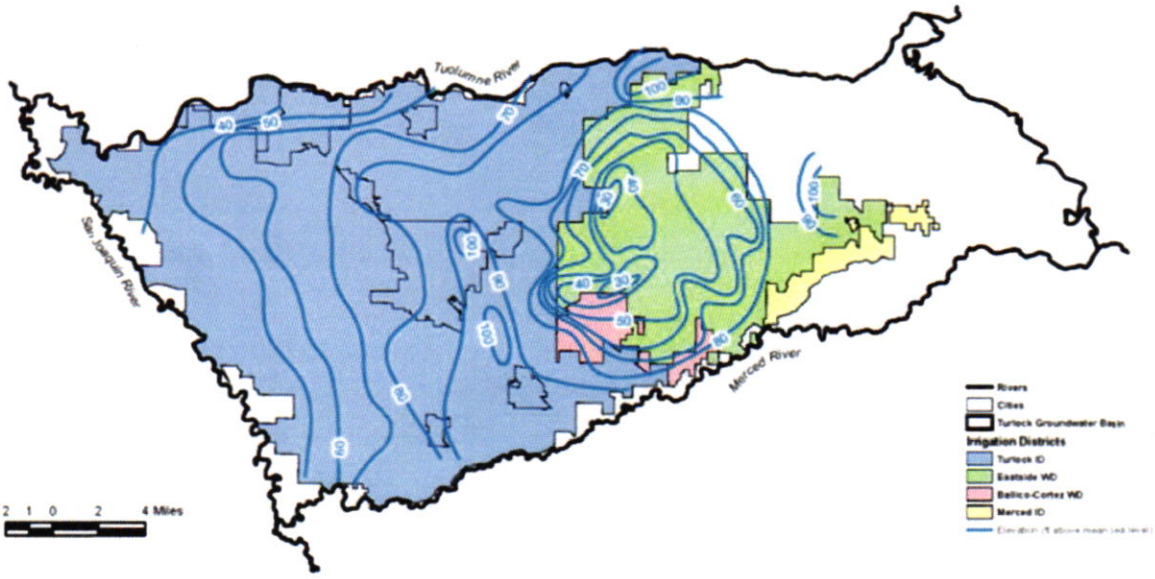
Since the development of groundwater pumping in the basin, the combination of the magnitude of the pumping from the confined aquifer (below the Corcoran Clay) and increased recharge to the water table

(from the percolating of excess irrigation water) reversed the vertical hydraulic gradient over much of the San Joaquin Valley. Further, the 2009 USGS report states "As a result, much of the water in the upper parts of the aquifer system that flowed laterally toward the San Joaquin River under predevelopment conditions began to leak downward through the confining beds into the confined part of the aquifer system."

The primary source of recharge has been percolating excess irrigation water, and the primary means of groundwater discharge has been extensive pumping of ground water from the confined aquifer. These forms of recharge and discharge provide a significant component of vertical flow in the system. In the western part of the Basin, groundwater movement is downward to the confined aquifer from the overlying unconfined aquifer through the Corcoran Clay.

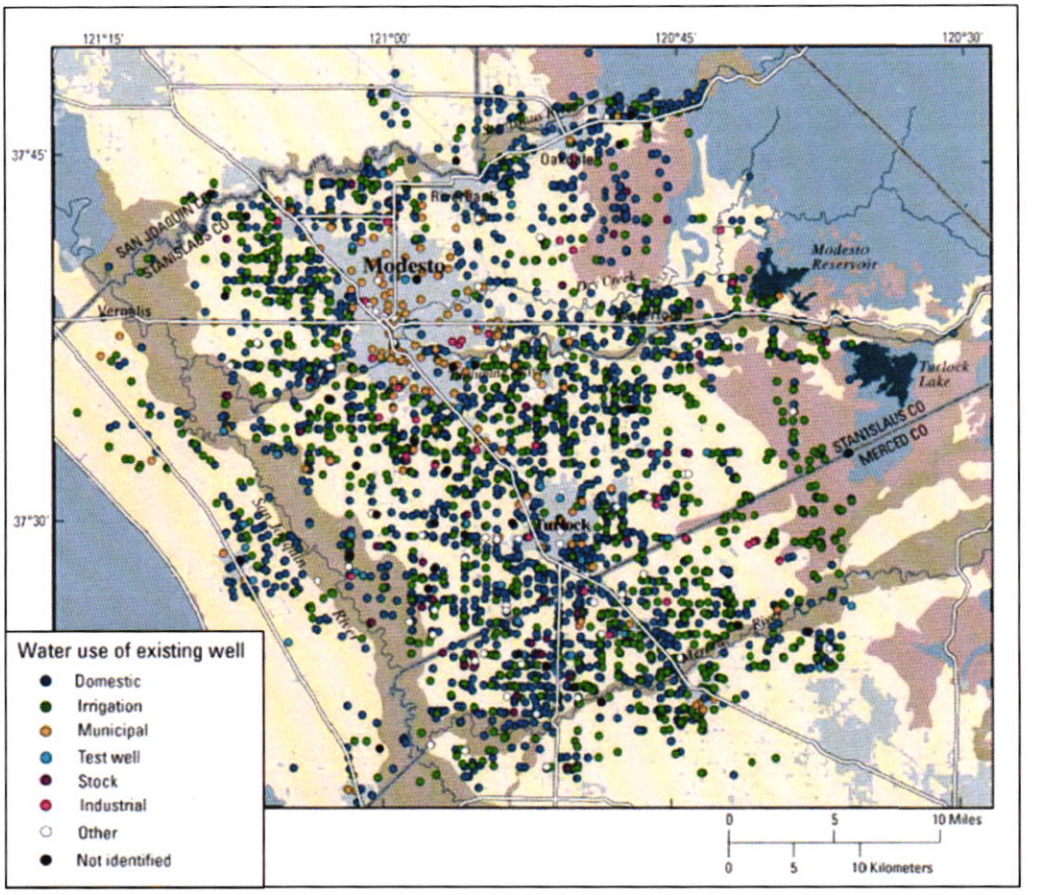
Additionally, the area surrounding Turlock is dominated by irrigated cropland. Figure 6 illustrates the extent of the groundwater wells in the area. The 2009 USGS report states "Water generally moves from irrigated areas toward pumping-induced broad head depressions in agricultural areas or toward cones of depression at urban pumping centers." Thus, according to the 2009 USGS report, groundwater movement is generally not toward the San Joaquin River, but is toward pumping depressions such as the depression in the eastern portion of the basin where the majority of groundwater pumping for agriculture is occurring. Figure 5 illustrates the depression in the groundwater elevation east of the City of Turlock due to groundwater pumping. It is this type of pumping depression the USGS is referring to in their 2009 report.

Figure 5. Measured Groundwater Elevations



Source: Turlock Groundwater Basin Association, 2008, Turlock Groundwater Basin- Groundwater Management Plan

Figure 6. Groundwater Wells in the Turlock and Modesto Area



Source: Burow, K.R., Shelton, J.L., Hevesi, J.A., and Weissmann, G.S., 2004, Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2004-5232, 54 p.

Conclusions

Based on the information and analysis above, the following conclusions can be deduced:

1. Due to the presence of the Corcoran Clay layer in the area where Turlock's groundwater pumping occurs (as seen in Figure 3), the migration of such water toward the surface will be limited.
2. As documented by the USGS, groundwater movement in the western portion of the groundwater basin is vertically [laterally?] downward from the unconfined aquifer toward the confined aquifer. As previously stated, all of the City of Turlock municipal water supply pumping occurs below the Corcoran Clay layer in the confined aquifer.
3. The groundwater conditions in and around the City of Turlock are such that water not pumped by the City of Turlock would stay within the groundwater system until pumped by other uses. If the City of Turlock were to cease groundwater pumping, the groundwater that was not pumped would likely migrate toward other groundwater pumping wells (as seen in Figure 5), and not vertically toward surface water courses specifically the San Joaquin River.

References:

1. Turlock Groundwater Basin Association, 2008, Turlock Groundwater Basin- Groundwater Management Plan
2. Burow, K.R., Shelton, J.L., Hevesi, J.A., and Weissmann, G.S., 2004, Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2004-5232, 54 p.
3. Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766

Technical Memorandum

RMC Water and Environment

Subject: **Estimation of Losses of Recycled Water Discharged to San Joaquin River**

Prepared For: City of Turlock

Prepared by: Reza Namvar

Reviewed by: Ali Taghavi, Lyndel Melton, Ryan Alameda

Date: October 7, 2013

Reference: 0598-001 City of Turlock

1 Purpose

The City of Turlock and Del Puerto Water District (DPWD) propose to transfer up to 13,400 acre-feet per year (AFY) of water from Turlock to DPWD. The transfer would include 10,000 AFY of existing flows, which are currently discharged to the San Joaquin River, plus future flows up to a total of 13,400 AFY. The City of Turlock proposes to continue this discharge, but to have 15 cfs of water diverted from the San Joaquin River approximately 3.6 miles downstream of the recycled water discharge point at the existing diversion facility operated by the Patterson Irrigation District (PID). The diverted water would be conveyed to the Delta-Mendota Canal (DMC) for use by Del Puerto Water District (DPWD). For the purposes of this evaluation we have assumed 11 mgd (12,330 AFY) is discharged to the San Joaquin River.

The purpose of this Technical Memorandum (TM) is to estimate the quantity of losses of recycled water after it is discharged to the San Joaquin River and thus the quantity of remaining SJR water available for diversion at the PID diversion facility.

2 Assumptions

It is assumed that the recycled water discharged in the San Joaquin River is fully mixed with the river streamflows and the percentage of losses applied to the recycled water is the same as that applied to the San Joaquin river flows.

It is also assumed that the losses of San Joaquin River flows from the recycled water discharge point to PID diversion point consists of the following losses:

- Seepage to groundwater
- Evaporation from open water surface of the San Joaquin River
- Evapotranspiration (ET) of phreatophytes along the San Joaquin River

3 Methodology for Estimating Losses

The losses were estimated on a monthly basis from January 2000 to September 2009. This ten-year period was selected based on availability of data for Turlock plant discharge. Losses from San Joaquin River between the Turlock recycled water discharge point and the PID pump station were estimated based on the methodology described in the following sections.

3.1 Seepage to Groundwater

The latest version[1] of the California Department of Water Resources' (DWR) Central Valley surface water and groundwater model (C2VSIM) was used to estimate the San Joaquin River seepage losses. C2VSIM simulates the San Joaquin River flows from the Friant Dam to the San Francisco Bay-Delta. Stream reach 38 of C2VSIM covers a 22-mile segment of the San Joaquin River that includes the segment between the City of Turlock discharge and Patterson Irrigation District diversion. C2VSIM simulated monthly seepage losses for this segment of the river were divided by the monthly streamflows to obtain the percentage of seepage losses attributable to the Turlock discharge.

C2VSIM stream reach 22 is mostly a gaining stream and has limited seepage losses. This is due to the fact that groundwater levels in the vicinity of the project area are close to the ground surface[2] and mostly result in the San Joaquin River gaining from the groundwater.

For the months that the San Joaquin River is gaining from groundwater, it is assumed that the recycled water losses would be zero and no gains were assigned to the recycled water. For the months that San Joaquin River was losing flow to the groundwater basin through seepage/recharge, the percentage of streamflow loss to seepage was proportionately applied to the recycled water losses.

3.2 Evaporation from Open Water Surface

The water surface area of the San Joaquin River between the discharge point and the diversion point is estimated to be approximately 132 acres. The evaporation losses from the surface of the river can be estimated by multiplying the Class A Pan evaporation data by a coefficient. These coefficients have been computed for a number of water bodies[3] and tend to range in value from 0.65 to 0.85. A conservative coefficient of 0.85 was used for estimating the evaporation losses from the San Joaquin River. Monthly Class A Pan evaporation data from 2000 to 2009 was obtained from CIMIS (California Irrigation Management Information System) Station 80[4]. Similar to seepage estimation, the percentage of San Joaquin River evaporation losses was applied to the recycled water evaporation losses.

3.3 Evapotranspiration (ET) of Phreatophytes

There are approximately 466 acres of riparian vegetation in the form of phreatophytes along the San Joaquin River between the Turlock discharge point and PID diversion point. ET rates of 30 in/yr to 114 in/yr with average rates of 55 to 60 in/yr have been reported for phreatophyte ET in the western United States[5,6,7].

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[1] Run number C2VSIM_FG_R374b of September 2013

[2] The high groundwater in the vicinity of the project area could be observed in groundwater elevation data of DWR monitoring wells number 06S08E01J001M and 05S09E17K001M. http://www.water.ca.gov/iwris/
Or http://www.water.ca.gov/waterdatalibrary/

[3] Kohler, M.A., T.J. Nordenson, and W.E. Fox. Evaporation from Pans and Lakes. Research Paper No. 38. Weather Bureau, U.S. Department of Commerce. May 1955.

[4] CIMIS station #80, Department of Water Resources, San Joaquin District, Agroclimatic Data, California State University, Fresno. www.water.ca.gov/landwateruse/annual data/agroclimatic/#agroclimatic

[5] Loheide, S.P., J.J. Butler, S.M. Gorelick. 2005. Estimation of groundwater consumption by phreatophytes using diurnal water table fluctuations: A saturated-unsaturated flow assessment. Water Resources Research, v. 41. 2005WR003942.

[6] Eddy, T.A. 1991. Phreatophyte survey and water-use estimates for nine river systems in Kansas. Proceedings of the the 14th annual north American Prairie Conference.

[7] Ritzi, R.W., H. Bouwer, and S. Sorosshian. 1985. Water resources conservation by reducing phyratophyte transpiration. First North American Riparian Conference, Riparian Ecosystems and Their Management: Reconciling Conflicting Uses, April 16-18, 1985, Tucson, Arizona.

For the purposes of this analysis, the phreatophytes ET is estimated as the product of the Class A Pan evaporation rate and the phreatophyte ET coefficient. Monthly Class A Pan evaporation data from 2000 to 2009 of CIMIS Station 80 was used for ET calculations. The average annual rainfall and Class A Pan evaporation from 2000 to 2009 of the CIMIS Station 80 were 12 and 71 inches, respectively. Therefore, the phreatophyte ET coefficient is calculated as the ratio of maximum reported ET rate to the effective Class A Pan evaporation rate (114 in/ (71-12) in = 1.93). This ratio tends to be very conservative and used for this analysis to provide a basis for calculating phreatophyte ET. Similar to seepage estimation, the percentage of San Joaquin River ET losses was applied to the recycled water flows from Turlock.

4 Results

The recycled water losses between the discharge and diversion points were estimated based on monthly San Joaquin River streamflow losses from 2000 to 2009. The quantity of monthly loss in acre-feet is shown in **Figure 1. Figure 2** presents monthly losses as percentage of total recycled water discharged. The average annual loss of Turlock's discharged recycled water was 78 AF per year from 2000 to 2009 (**Table 1**). The range of average monthly total loss of discharged recycled water is approximately 0.16% to 1.82%.

Figure 1 – Estimated average monthly losses (AF) for Turlock recycled water discharged to San Joaquin River between point of discharge and PID pump station

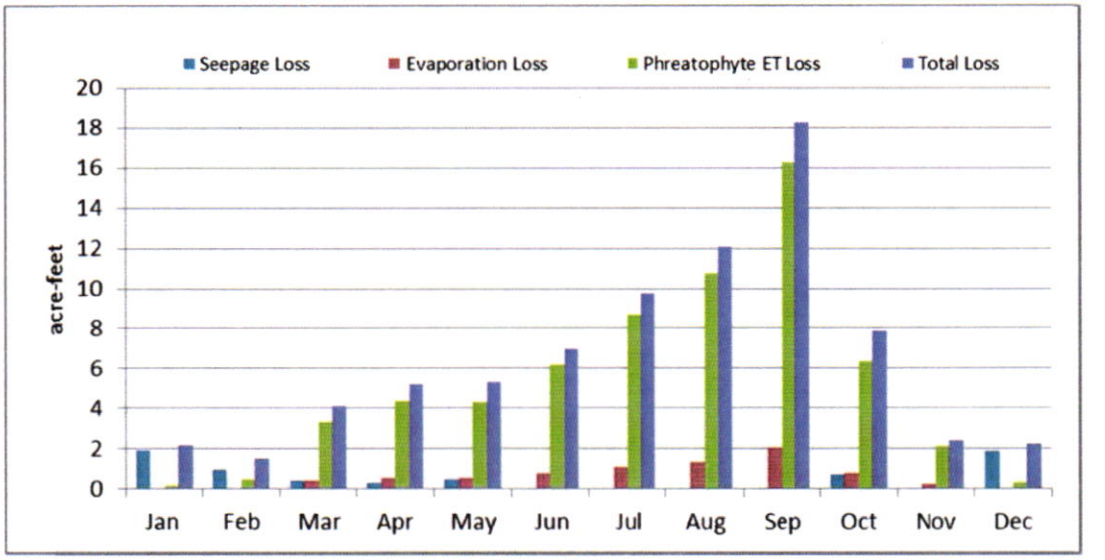

Figure 2 – Estimated average monthly losses (%) for Turlock recycled water discharged to San Joaquin River between point of discharge and PID pump station

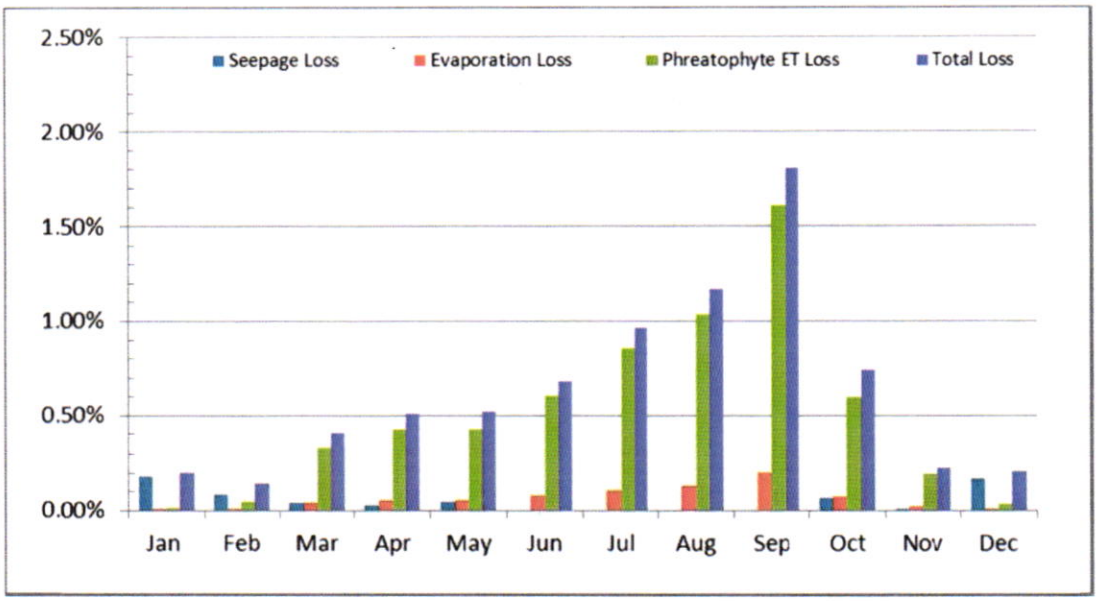

Table 1 – Estimated average monthly losses (AF) for Turlock recycled water discharged to San Joaquin River between point of discharge and PID pump station

Month	Turlock Recycled Water Discharge (AF)	Seepage Loss (AF)	Evaporation Loss (AF)	Phreatophyte ET Loss (AF)	Total Loss (AF)	Total Loss %	Turlock Water Available at PID Intake (AF)
Jan	1,054	1.9	0.0	0.2	2.2	0.20%	1,052
Feb	954	1.0	0.1	0.5	1.5	0.16%	953
Mar	1,021	0.4	0.4	3.3	4.1	0.40%	1,017
Apr	1,011	0.3	0.5	4.4	5.2	0.52%	1,006
May	1,034	0.5	0.5	4.3	5.3	0.52%	1,029
Jun	1,006	0.0	0.8	6.2	7.0	0.69%	999
Jul	1,024	0.0	1.1	8.7	9.7	0.95%	1,015
Aug	1,049	0.0	1.3	10.7	12.1	1.15%	1,037
Sep	1,002	0.0	2.0	16.2	18.3	1.82%	983
Oct	1,081	0.7	0.8	6.4	7.9	0.73%	1,073
Nov	1,026	0.1	0.3	2.1	2.4	0.23%	1,024
Dec	1,066	1.9	0.0	0.3	2.2	0.21%	1,064
Average Annual (AF)	**12,330**	**7**	**8**	**63**	**78**	**0.63%**	**12,252**

ATTACHMENT 5

Water Right Application - City of Turlock
Section-Township-Range-APN Data for DPWD Place of Use

Section	Township	Range	APN
1	6S	7E	25-06-33
1	6S	7E	25-06-34
1	6S	7E	25-06-58
1	6S	7E	25-06-59
1	5S	6E	21-07-08
1	5S	6E	21-07-09
1	5S	6E	21-07-13
1	6S	7E	25-06-26
1	6S	7E	25-06-29
1	6S	7E	25-06-60
1	6S	7E	25-06-42
1	5S	6E	21-07-03por
1	5S	6E	21-07-14
10	8S	8E	69-07-49
10	8S	8E	69-07-55
10	8S	8E	28-08-08
10	9S	8E	69-19-68por
10	8S	8E	69-07-50
10	4S	6E	16-33-13
10	7S	8E	26-14-34
10	7S	8E	26-14-15
10	7S	8E	26-14-18
10	7S	8E	26-14-33
10	7S	8E	26-14-37
10	5S	7E	21-16-27
10	5S	7E	21-16-26
11	9S	8E	69-19-31
11	9S	8E	69-19-38
11	9S	8E	69-19-47
11	8S	8E	69-27-01
11	8S	8E	69-27-02
11	9S	8E	69-19-32por
11	9S	8E	69-19-32por
11	9S	8E	69-19-32por
12	9S	8E	69-19-35
12	9S	8E	69-19-36
12	9S	8E	69-19-65
12	9S	8E	69-19-33
12	9S	8E	69-19-60
12	9S	8E	69-19-61por
12	9S	8E	69-19-37
12	9S	8E	69-19-34
12	6S	7E	25-06-61
12	6S	7E	25-06-41
12	6S	7E	25-06-43
12	6S	7E	25-06-45
12	6S	7E	25-06-63
12	6S	7E	25-06-62
12	9S	8E	69-19-61por
12	6S	7E	25-06-36

ATTACHMENT 5

Section	Township	Range	APN
13	8S	8E	69-14-07
13	9S	8E	69-22-40
13	9S	8E	69-22-43
13	9S	8E	69-22-24
13	9S	8E	69-22-26
13	9S	8E	69-22-56
13	9S	8E	69-22-57
13	9S	8E	69-22-58
13	9S	8E	69-22-28
13	9S	8E	69-22-46
13	9S	8E	69-22-27
13	6S	7E	25-12-13
13	6S	7E	25-12-25
13	9S	8E	69-22-41
13	9S	8E	69-22-71
13	9S	8E	69-22-72
13	9S	8E	69-22-73
13	9S	8E	69-22-74
14	9S	8E	69-22-66
14	9S	8E	69-22-67
14	9S	8E	69-22-48
14	9S	8E	69-22-49
14	9S	8E	69-22-44
14	6S	7E	25-12-33por
14	3S	5E	253-24-08
14	4S	6E	16-13-23
15	5S	7E	21-19-19
15	5S	7E	21-19-20
15	5S	7E	21-19-09
15	8S	8E	69-11-56
15	5S	7E	21-19-06
15	5S	7E	21-19-12
15	5S	7E	21-19-07
15	7S	8E	26-20-16
15	7S	8E	26-20-17
15	8S	8E	69-11-66
15	8S	8E	69-11-72
15	3S	5E	253-20-08
15	3S	5E	253-20-20
15	3S	5E	253-20-16
15	3S	5E	253-20-06
15	3S	5E	253-20-19
15	7S	8E	26-20-35
15	7S	8E	26-20-33
15	4S	6E	16-13-01
15	5S	7E	21-19-14
15	5S	7E	21-19-15
15	5S	7E	21-19-18
15	5S	7E	21-19-21
15	8S	8E	69-11-02
15	8S	8E	69-11-03
15	8S	8E	69-11-61
15	4S	6E	16-13-31

ATTACHMENT 5

Section	Township	Range	APN
15	3S	5E	253-20-07
15	3S	5E	253-20-11
15	5S	7E	21-19-11
15	5S	7E	21-19-25
15	4S	6E	16-13-65
15	8S	8E	69-26-06
15	5S	7E	21-19-17
15	4S	6E	16-13-30
15	3S	5E	253-20-15
15	3S	5E	253-20-17
15	3S	5E	253-20-18
15	3S	5E	253-20-12
15	3S	5E	253-20-13
15	3S	5E	253-20-14
15	7S	8E	26-20-34
15	4S	6E	16-13-66
15	4S	6E	16-13-81
15	8S	8E	69-11-73
15	8S	8E	69-11-74
15	4S	6E	16-13-80
15	8S	8E	69-11-36
16	8S	8E	69-10-19
16	6S	8E	27-03-61
16	8S	8E	69-10-23
16	5S	7E	21-19-01
16	5S	7E	21-19-02
16	7S	8E	26-19-87
16	7S	8E	26-19-84
16	7S	8E	26-19-89
16	5S	7E	21-19-32
16	5S	7E	21-19-27por
16	5S	7E	21-19-28
16	8S	8E	28-15-24
16	8S	8E	69-26-10
16	4S	6E	16-16-23
16	7S	8E	26-19-12
16	6S	8E	27-03-81
16	6S	8E	27-03-10
16	7S	8E	26-19-88
16	4S	6E	16-16-01
16	4S	6E	16-16-02
16	4S	6E	16-16-09
16	4S	6E	16-16-31
16	4S	6E	16-16-32
16	8S	8E	28-15-26
16	7S	8E	26-19-71
16	7S	8E	26-19-79
16	6S	8E	27-03-60por
16	6S	8E	27-03-60por
16	4S	6E	16-16-07
16	5S	7E	21-19-27por
16	8S	8E	28-15-09
16	8S	8E	28-15-11

ATTACHMENT 5

Section	Township	Range	APN
16	8S	8E	28-15-17
16	8S	8E	28-15-15
16	8S	8E	28-15-23
16	8S	8E	28-15-14
16	8S	8E	28-15-20
16	5S	7E	21-19-31
16	5S	7E	21-19-30
16	5S	7E	21-19-29
16	4S	6E	16-16-33
16	6S	8E	27-03-82
16	6S	8E	27-03-83
16	6S	8E	27-03-84
16	6S	8E	27-03-85
17	5S	7E	21-18-05
17	5S	7E	21-18-06
17	7S	8E	26-19-38
17	7S	8E	26-19-52
17	7S	8E	26-19-62
17	8S	8E	28-15-25
17	7S	8E	26-19-27por
17	5S	7E	21-18-07
17	6S	8E	27-03-75
17	6S	8E	27-03-76
17	6S	8E	27-03-77
17	4S	6E	16-16-15
17	4S	6E	16-16-25
17	4S	6E	16-16-30
17	4S	6E	265-26-02por
17	4S	6E	265-26-03
17	4S	6E	265-26-05
17	4S	6E	265-26-07
17	7S	8E	26-19-34
17	7S	8E	26-19-35
17	7S	8E	26-19-37
17	7S	8E	26-19-54
17	7S	8E	26-19-53
17	4S	6E	265-26-04
17	7S	8E	26-19-27por
17	6S	8E	27-03-78
17	6S	8E	27-03-79
17	6S	8E	27-03-74por
18	7S	8E	26-19-40
18	9S	9E	70-06-46
18	6S	8E	27-03-02
18	6S	8E	27-03-03
18	6S	8E	27-03-05
18	6S	8E	27-03-07
18	6S	8E	27-03-08
18	7S	8E	26-19-43
18	7S	8E	26-19-01
18	7S	8E	26-19-63
18	6S	8E	27-03-35por
18	9S	9E	70-06-47

ATTACHMENT 5

Section	Township	Range	APN
18	9S	9E	70-06-48
19	6S	8E	27-03-12
19	6S	8E	27-03-67
19	7S	8E	26-19-29por
19	9S	9E	70-07-34
19	6S	8E	27-33-01
19	7S	8E	26-19-46por
19	6S	8E	27-33-03
19	6S	8E	27-33-12por
19	6S	8E	27-33-04
19	6S	8E	27-33-07
2	9S	8E	69-19-51
2	9S	8E	69-19-70
2	6S	7E	25-06-03
2	8S	8E	69-07-05
2	8S	8E	69-07-01
2	9S	8E	69-19-75
2	6S	7E	25-06-22
2	9S	8E	69-19-71
2	9S	8E	69-19-72
2	9S	8E	69-19-74
2	9S	8E	69-19-76
2	9S	8E	69-19-77
20	6S	8E	27-03-13
20	6S	8E	27-03-17
20	6S	8E	27-03-21
20	8S	8E	69-10-28
20	7S	8E	26-19-50por
20	6S	8E	27-03-74por
20	6S	8E	27-03-80
21	6S	8E	27-03-19
21	8S	8E	69-10-12 por
21	8S	8E	69-10-13por
21	8S	8E	69-10-30por
21	8S	8E	69-10-31
21	7S	8E	26-19-25
21	7S	8E	26-19-70
21	5S	7E	21-22-25
21	5S	7E	21-22-27
21	5S	7E	21-22-28
21	5S	7E	21-22-30
21	5S	7E	21-22-31
21	7S	8E	26-19-69
21	6S	8E	27-03-72
21	6S	8E	27-03-30
21	6S	8E	27-03-59
21	6S	8E	27-03-64
21	6S	8E	27-03-65
21	6S	8E	27-03-71
21	7S	8E	26-19-68
21	4S	6E	16-16-21
21	8S	8E	69-10-30por
21	6S	8E	27-03-73

ATTACHMENT 5

Section	Township	Range	APN
21	6S	8E	27-03-27
21	6S	8E	27-03-28
21	8S	8E	69-10-12por
21	8S	8E	69-10-13por
22	8S	8E	69-11-58
22	8S	8E	69-11-59
22	8S	8E	69-11-45por
22	8S	8E	69-11-40
22	8S	8E	69-11-41
22	7S	8E	26-20-28
22	7S	8E	26-20-27
22	7S	8E	26-20-25
22	7S	8E	26-20-32
22	7S	8E	26-20-31
22	7S	8E	26-20-24
22	4S	6E	16-13-27
22	6S	8E	27-04-13
22	6S	8E	27-04-36
22	6S	8E	27-04-44
22	6S	8E	27-11-13
22	5S	7E	21-22-33
22	5S	7E	21-22-44por
22	5S	7E	21-22-44por
22	5S	7E	21-22-24
22	4S	6E	16-13-26
22	4S	6E	16-13-34
22	4S	6E	16-13-49
22	4S	6E	16-13-50
22	4S	6E	16-13-51
22	7S	8E	26-20-29
22	7S	8E	26-20-21por
22	8S	8E	69-11-45por
22	6S	8E	27-11-16
22	6S	8E	27-11-15
22	4S	6E	16-13-32
22	8S	8E	69-11-65
22	8S	8E	69-11-64
22	5S	7E	21-22-34
22	5S	7E	21-22-35
22	5S	7E	21-22-36
22	5S	7E	21-22-37
22	5S	7E	21-22-38
22	5S	7E	21-22-39
22	5S	7E	21-22-40
22	5S	7E	21-22-41
22	5S	7E	21-22-42
22	5S	7E	21-22-43
22	5S	7E	21-22-45
22	5S	7E	21-22-46
22	4S	6E	16-13-40
22	4S	6E	16-13-36
22	3S	5E	253-19-21
22	3S	5E	253-19-22

ATTACHMENT 5

Section	Township	Range	APN
22	3S	5E	253-19-20
22	3S	5E	253-19-17
22	3S	5E	253-19-19
22	3S	5E	253-19-18 por
22	3S	5E	253-19-18 por
22	3S	5E	253-19-16
22	3S	5E	253-19-14
22	3S	5E	253-19-12
22	3S	5E	253-19-13
22	3S	5E	253-19-15
23	8S	8E	69-11-21
23	8S	8E	69-11-63
23	4S	6E	16-13-71
23	9S	8E	69-22-65
23	5S	7E	21-23-01
23	3S	5E	253-25-07
23	3S	5E	253-25-26
23	9S	8E	69-22-36por
23	5S	7E	21-23-02
23	4S	6E	16-13-25
23	3S	5E	253-25-27
23	3S	5E	253-25-28
23	3S	5E	253-25-29
23	3S	5E	253-25-30
23	3S	5E	253-25-16
23	3S	5E	253-25-17
23	3S	5E	253-25-18
23	3S	5E	253-25-22
23	3S	5E	253-25-23
23	3S	5E	253-25-24
23	3S	5E	253-25-25
23	4S	6E	16-13-72
23	4S	6E	16-13-73
23	4S	6E	16-13-74
24	8S	8E	69-15-11
24	4S	6E	16-13-42
24	9S	8E	69-22-60
24	9S	8E	69-22-68
24	3S	5E	253-25-04
24	3S	5E	253-25-34
24	3S	5E	253-25-32
24	3S	5E	253-25-36
24	9S	8E	69-22-62
24	9S	8E	69-22-14por
24	9S	8E	69-22-23
24	9S	8E	69-22-52
24	9S	8E	69-22-53
24	6S	7E	25-12-17
24	6S	7E	25-12-31por
24	9S	8E	69-22-61
24	3S	5E	253-25-33
24	9S	8E	69-22-59
24	9S	8E	69-22-55

ATTACHMENT 5

Section	Township	Range	APN
24	9S	8E	69-22-54
24	3S	5E	253-25-35
24	3S	5E	253-25-14
24	3S	5E	253-25-31
24	3S	5E	253-25-20
24	9S	8E	69-22-69
24	9S	8E	69-22-70
24	6S	7E	25-12-16
24	8S	8E	69-15-12
25	4S	6E	16-37-03
25	4S	6E	16-37-04
25	4S	6E	16-37-42
25	4S	6E	16-37-43
25	4S	6E	16-37-05
25	4S	6E	16-37-07
25	4S	6E	16-37-08
25	4S	6E	16-37-06
25	4S	6E	16-37-31
25	4S	6E	16-37-32
25	4S	6E	16-37-33
25	9S	8E	69-24-16
25	9S	8E	69-24-30
25	3S	5E	253-29-02
25	3S	5E	253-29-09
25	9S	8E	69-24-32
25	3S	5E	253-29-06
25	3S	5E	253-29-10
26	7S	8E	26-25-40por
26	4S	6E	16-36-21
26	4S	6E	16-36-05
26	4S	6E	16-36-07
26	7S	8E	26-25-05
26	4S	6E	16-36-03
26	4S	6E	16-36-04
26	5S	7E	21-26-03
26	5S	7E	21-85-10
26	5S	7E	21-26-19
26	4S	6E	16-36-01
26	4S	6E	16-36-02
26	9S	8E	69-24-31
26	5S	7E	21-26-43
26	5S	7E	21-26-17
26	5S	7E	21-85-11
26	5S	7E	21-85-12
26	5S	7E	21-26-45
26	5S	7E	21-28-XX
26	4S	6E	16-36-22
26	4S	6E	16-36-24
26	4S	6E	16-36-25
26	4S	6E	16-36-29
26	4S	6E	16-36-30
27	6S	8E	27-16-06
27	6S	8E	27-18-53

ATTACHMENT 5

Section	Township	Range	APN
27	8S	8E	69-17-02por
27	7S	8E	26-25-48
27	7S	8E	26-25-47
27	8S	8E	69-17-46
27	8S	8E	69-17-47
27	8S	8E	69-17-49
27	5S	7E	21-25-20
27	6S	8E	27-18-15
27	5S	8E	21-25-26
27	5S	7E	21-25-28
27	7S	8E	26-25-04
27	7S	8E	26-25-07
27	7S	8E	26-25-50
27	5S	7E	21-25-19
27	4S	6E	16-35-02
27	6S	8E	27-18-54
27	8S	8E	69-17-02por
27	7S	8E	26-25-46
27	5S	7E	21-25-27
27	5S	7E	21-25-24
27	4S	6E	16-35-01
27	5S	7E	21-25-29
28	7S	8E	26-24-24por
28	6S	8E	27-17-69
28	6S	8E	27-17-71
28	6S	8E	27-17-54
28	8S	8E	69-16-10
28	8S	8E	69-16-11
28	6S	8E	27-17-70
28	7S	8E	26-24-19por
28	6S	8E	27-17-24
28	6S	8E	27-17-30
28	7S	8E	26-24-24por
28	6S	8E	27-17-09
28	7S	8E	26-24-04
28	6S	8E	27-17-10
28	6S	8E	27-17-68
28	6S	8E	27-17-67
28	7S	8E	26-24-19por
28	6S	8E	27-17-11
29	6S	8E	27-17-65
29	6S	8E	27-17-61
29	6S	8E	27-17-73
29	6S	8E	27-17-03
29	6S	8E	27-17-07por
29	6S	8E	27-17-72
29	6S	8E	27-17-74
29	6S	8E	27-17-07por
3	9S	8E	69-18-08por
3	9S	8E	69-19-40
3	9S	8E	69-19-59
3	8S	8E	28-08-03
3	8S	8E	28-08-01

ATTACHMENT 5

Section	Township	Range	APN
3	8S	8E	28-08-02
3	8S	8E	28-08-06
3	7S	8E	26-14-82
3	7S	8E	26-14-22
3	7S	8E	26-14-23
3	4S	6E	265-01-12
3	4S	6E	16-04-02
3	4S	6E	265-01-06
3	4S	6E	265-01-14
3	4S	6E	265-01-13
3	7S	8E	26-14-81
3	7S	8E	26-14-80
30	9S	9E	70-10-32por
30	3S	6E	255-06-21
30	3S	6E	255-06-38
30	3S	6E	255-06-43
30	3S	6E	255-06-47
30	3S	6E	255-06-48
30	9S	9E	70-10-19
30	9S	9E	70-10-20
30	4S	7E	16-19-30
30	4S	7E	16-19-01
30	4S	7E	16-19-54por
30	6S	8E	27-17-66
30	3S	6E	255-06-39
30	9S	9E	70-10-23
30	9S	9E	70-10-33
30	3S	6E	255-06-12
30	3S	6E	255-06-14
30	9S	9E	70-10-16
30	9S	9E	70-10-25
30	9S	9E	70-10-28por
30	3S	6E	255-06-44
30	3S	6E	255-06-45
30	3S	6E	255-06-46
30	3S	6E	255-06-40
30	3S	6E	255-06-41
30	3S	6E	255-06-42
30	9S	9E	70-10-34
30	4S	7E	16-19-29
30	4S	7E	16-19-54por
31	4S	7E	16-19-37
31	6S	8E	27-17-36
31	6S	8E	27-17-80por
31	6S	8E	27-17-63por
31	9S	9E	70-23-01
31	4S	7E	16-19-32
31	4S	7E	16-19-40
31	4S	7E	16-19-44
31	4S	7E	16-19-36
31	4S	7E	16-19-45
31	3S	6E	255-07-02
31	3S	6E	255-07-03

ATTACHMENT 5

Section	Township	Range	APN
31	3S	6E	255-07-08
31	3S	6E	255-07-13
31	3S	6E	255-07-14
31	3S	6E	255-07-15
31	3S	6E	255-07-16
31	3S	6E	255-07-17
31	3S	6E	255-07-18
31	3S	6E	255-07-01por
31	3S	6E	255-07-12
31	6S	8E	27-17-83por
31	3S	6E	255-07-01por
32	6S	8E	27-17-45
32	6S	8E	27-17-21
32	3S	6E	255-08-01
32	6S	8E	27-17-62
32	6S	8E	27-17-12por
32	6S	8E	27-17-31
32	3S	6E	255-08-04
32	3S	6E	255-08-05
32	3S	6E	255-08-06
32	3S	6E	255-08-07
32	3S	6E	255-08-12
32	3S	6E	255-08-08
32	6S	8E	27-17-55
32	3S	6E	255-08-09
32	3S	6E	255-08-10
32	3S	6E	255-08-11
32	3S	6E	255-08-13
32	6S	8E	27-17-12por
33	7S	8E	26-24-33por
33	6S	8E	27-17-22
33	3S	6E	255-17-19
33	3S	6E	255-17-07
33	7S	8E	26-24-14
33	7S	8E	26-24-16
33	7S	8E	26-24-33por
33	6S	8E	27-17-13por
33	6S	8E	27-17-14
33	6S	8E	27-17-16
33	6S	8E	27-17-20
33	6S	8E	27-17-23
33	6S	8E	27-17-56por
33	6S	8E	27-17-57
33	7S	8E	26-24-13
33	7S	8E	26-24-09
33	6S	8E	27-17-13por
33	6S	8E	27-17-56por
33	7S	8E	26-24-10
33	3S	6E	255-17-13
33	3S	6E	255-17-20
33	3S	6E	255-17-21
33	3S	6E	255-17-22
34	7S	8E	26-25-11

ATTACHMENT 5

Section	Township	Range	APN
34	7S	8E	26-25-13
34	6S	8E	27-18-39
34	6S	8E	27-18-40
34	8S	8E	69-17-51por
34	8S	8E	69-17-51por
34	6S	8E	27-18-41
34	8S	8E	69-17-82
35	8S	8E	69-29-03
35	8S	8E	69-29-11
35	8S	8E	69-29-26
35	8S	8E	69-29-27
35	8S	8E	69-29-28
35	5S	7E	21-91-11
35	5S	7E	21-91-14
35	4S	6E	16-36-12
35	4S	6E	16-36-27
35	8S	8E	69-29-09
35	8S	8E	69-29-01
35	5S	7E	21-91-08
35	5S	7E	21-91-09por
35	5S	7E	21-91-12por
35	5S	7E	21-91-04
35	5S	7E	21-91-09por
35	4S	6E	16-36-28
35	5S	7E	21-91-12por
35	5S	7E	21-91-07
35	5S	7E	21-91-06
35	5S	7E	21-91-05
35	5S	7E	21-91-10
35	4S	6E	16-36-14
35	4S	6E	16-36-15
35	4S	6E	16-36-16
35	4S	6E	16-36-17
35	8S	8E	69-29-25
36	4S	6E	16-37-38
36	4S	6E	16-37-37
36	4S	6E	16-37-12
36	3S	5E	253-28-06
36	4S	6E	16-37-40
36	5S	7E	21-27-27
36	9S	8E	69-24-27
36	4S	6E	16-42-26
36	5S	7E	21-27-26
36	4S	6E	16-37-39
36	4S	6E	16-42-01
36	5S	7E	21-27-49
36	4S	6E	16-37-41
36	3S	5E	253-28-07
36	5S	7E	21-27-50
36	5S	7E	21-27-15
4	4S	6E	265-01-15
4	7S	8E	26-13-04por
4	7S	8E	26-13-05

ATTACHMENT 5

Section	Township	Range	APN
4	7S	8E	26-13-44por
4	7S	8E	26-13-45
4	8S	8E	28-28-07
4	8S	8E	28-28-23
4	8S	8E	28-28-25por
4	8S	8E	28-28-26
4	8S	8E	28-28-01
4	8S	8E	28-28-02
4	4S	6E	16-03-01
4	4S	6E	265-01-07por
4	4S	6E	265-01-03
4	4S	6E	265-01-17
4	4S	6E	265-01-18
4	4S	6E	265-01-07por
4	7S	8E	26-13-04por
4	4S	6E	265-01-01por
4	4S	6E	265-01-16
4	4S	6E	265-01-02
4	4S	6E	265-01-01por
4	7S	8E	26-13-44por
5	5S	7E	21-13-06
5	5S	7E	21-13-25
5	4S	6E	265-09-03
5	7S	8E	26-13-03
5	7S	8E	26-13-41por
5	5S	7E	21-13-10
5	7S	8E	26-13-47
5	5S	7E	21-13-13
5	7S	8E	26-13-29
5	7S	8E	26-13-49
5	5S	7E	21-13-12
5	6S	8E	27-01-46
5	6S	8E	27-01-30
5	6S	8E	27-01-32
5	6S	8E	27-01-42
5	6S	8E	27-01-43
5	4S	6E	265-09-02
5	4S	6E	265-09-04
5	4S	6E	265-09-05
5	4S	6E	265-09-06
5	4S	6E	265-09-01por
5	4S	6E	265-09-01por
5	6S	8E	27-01-45
5	6S	8E	27-01-44
5	7S	8E	26-13-48
5	4S	6E	265-09-08
5	5S	7E	21-13-26
5	5S	7E	21-13-27
5	5S	7E	21-13-28
5	5S	7E	21-13-29
5	4S	6E	265-09-09
5	4S	6E	265-09-10
5	7S	8E	26-13-41por

ATTACHMENT 5

Section	Township	Range	APN
5	4S	6E	265-09-01por
6	5S	7E	21-13-18
6	4S	6E	265-08-13por
6	4S	6E	265-08-14
6	6S	8E	27-01-51
6	6S	8E	27-01-18
6	6S	8E	27-01-19
6	5S	7E	21-13-01
6	5S	7E	21-13-20
6	7S	8E	26-13-43por
6	4S	6E	265-08-04
6	5S	7E	21-13-02
6	5S	7E	21-13-16por
6	6S	8E	27-01-21
6	6S	8E	27-01-22
6	4S	6E	265-08-15por
6	4S	6E	265-08-13por
6	6S	8E	27-01-53por
6	6S	8E	27-01-53por
6	4S	6E	265-08-11
6	4S	6E	265-08-12
6	6S	8E	27-01-52
6	4S	6E	265-08-16
6	4S	6E	265-08-02
6	5S	7E	21-13-16por
6	4S	6E	265-08-15por
6	4S	6E	265-08-13por
6	5S	7E	21-13-22
6	6S	8E	27-01-49
6	4S	6E	265-08-05
6	4S	6E	265-08-06
7	5S	7E	21-15-02
7	5S	7E	21-15-23
7	7S	8E	26-13-54
7	6S	8E	27-01-14
7	6S	8E	27-01-26
7	6S	8E	27-01-47
7	4S	6E	265-12-14
7	4S	6E	265-12-15
7	6S	8E	27-01-48
7	4S	6E	265-12-06
7	4S	6E	265-12-13
7	4S	6E	265-12-08
7	4S	6E	265-12-16
7	5S	7E	21-15-24
7	5S	7E	21-15-25
7	5S	7E	21-15-26
8	5S	7E	21-15-09
8	5S	7E	21-15-08
8	5S	7E	21-15-10
8	4S	6E	265-11-07
8	7S	8E	26-13-59
8	7S	8E	26-13-33por

ATTACHMENT 5

Section	Township	Range	APN
8	7S	8E	26-13-34por
8	7S	8E	26-13-36
8	4S	6E	265-11-12por
8	5S	7E	21-15-11
8	5S	7E	21-15-12
8	5S	7E	21-15-20
8	6S	8E	27-01-57
8	6S	8E	27-01-15
8	4S	6E	16-03-06
8	4S	6E	265-11-02
8	4S	6E	265-11-03
8	4S	6E	265-11-06
8	6S	8E	27-01-25
8	5S	7E	21-15-17
8	5S	7E	21-15-22
8	7S	8E	26-13-55
8	4S	6E	265-11-09
8	4S	6E	265-11-10
8	4S	6E	265-11-11por
8	5S	7E	21-15-21
8	5S	7E	21-15-16
9	5S	7E	21-16-01
9	4S	6E	265-01-10
9	8S	8E	28-28-09
9	8S	8E	28-28-11
9	8S	8E	28-28-17
9	7S	8E	26-13-51
9	5S	7E	21-16-16
9	5S	7E	21-16-17
9	7S	8E	26-13-17
9	4S	6E	16-03-02
9	4S	6E	265-01-08
9	7S	8E	26-13-16
9	7S	8E	26-13-25
9	7S	8E	26-13-26
9	4S	6E	16-03-13
9	4S	6E	265-01-22
9	7S	8E	26-13-50
9	4S	6E	16-03-05
9	4S	6E	16-03-04
9	4S	6E	16-03-10
9	6S	8E	27-01-58
9	6S	8E	27-01-59
9	4S	6E	265-01-21
9	7S	8E	26-13-58
9	4S	6E	16-03-14
9	4S	6E	16-03-11
9	4S	6E	16-03-12