Glenn-Colusa Irrigation District

History

GCID (or the District) claims a water right, under pre-1914 postings, to divert water from the natural flow of the Sacramento River. The water right dates back to 1883, when Will S. Green posted notices for the appropriation and diversion of irrigation water on the west bank of the Sacramento River, at the upstream end of the Oxbow Channel near the current diversion at the main pump station. GCID also has adjudicated pre-1914 water rights under the Angle Decree, issued in 1930 by the Federal District Court, Northern District of California, to divert water from the natural flow of Stony Creek, a tributary to the Sacramento River.

GCID entered into a negotiated agreement with Reclamation in 1964, quantifying the amount of water GCID could divert from the Sacramento River. The resulting negotiated agreement recognized GCID's annual entitlement of a Base Supply of 720,000 ac-ft/yr of flows from the Sacramento River and also provided for a 105,000 ac-ft allocation of Project Supply, resulting in a total contract entitlement of 825,000 ac-ft/yr. The 825,000 ac-ft/yr entitlement recognized under contract for GCID is inclusive of their entitlement recognized under their Angle Decree rights, which, on average, yield about 15,000 to 18,000 ac-ft/yr. The schedule of monthly diversions of the Contract Total, Base Supply, and Project Supply are identified in Table 2-9 to the Settlement Contract.

TABLE 2-9
Schedule of Monthly Water Diversions – GCID
Sacramento Valley Regional Water Management Plan

Month	Base Supply (ac-ft)	Project Water (ac-ft)	Contract Total (ac-ft)
April	100,000	0	100,000
May	140,000	0	140,000
June	150,000	0	150,000
July	130,000	55,000	185,000
August	90,000	50,000	140,000
September	65,000	0	65,000
October	45,000	0	45,000
Total	**720,000**	**105,000**	**825,0000**

Notes:

Contract No. 14-06-200-855A-R-1

Points of Diversion: 154.7R, 154.8R

Service Area and Distribution System

GCID is located in the central portion of the Sacramento Valley on the west side of the Sacramento River and is the largest irrigation district in the Sacramento Valley, encompassing approximately 175,000 acres. The service area extends from northeastern Glenn County near Hamilton City to south of Williams in Colusa County. District boundaries also encompass the communities of Willows and Maxwell. GCID does not currently supply M&I

water to any of the regions that overlie its service area. Rice is the predominant crop, accounting for approximately 85 percent of the District's irrigated acreage. Other important crops include tomatoes, orchards, vineseeds, cotton, alfalfa, and irrigated pasture.

Water Supply

Surface Water. GCID holds both pre- and post-1914 appropriative water rights to divert water from the natural flow of the Sacramento River. GCID also has adjudicated pre-1914 water rights under the Angle Decree, issued in 1930 by the Federal District Court, Northern District of California, to divert water from the natural flow of Stony Creek, a tributary to the Sacramento River. In addition, as the successor in interest to Central Canal and Irrigation Company, GCID may have, under a May 9, 1906 Act of Congress, "the right to divert, at all seasons of the year, from the Sacramento River...an amount of water which...shall not exceed nine hundred cubic feet per second, to be used for irrigating the lands of the Sacramento Valley, on the west side of the Sacramento River..." (Public Law 151, Ch. 439). These water rights are shown in Table 2-10 with associated dates and quantities.

TABLE 2-10
GCID: Water Rights
Sacramento Valley Regional Water Management Plan

	Water Rights[a,b]				
Source	**Application[c] (Priority Date)[d]**	**Permit (Date)**	**License (Date)**	**Diversion Season**	**Maximum Quantity[e] (cfs)**
Sacramento River	A000018 (3/3/15)	000029 (10/20/15)	002871 (5/14/47)	Mar 1 to Nov 1	110 cfs
Sacramento River	A001554 (12/3/19)	000796 (12/14/20)	007208 (3/20/65)	Apr 15 to Oct 1	83.27 cfs
Sacramento River	A001624 (1/14/20)	000797 (12/14/20)	007209 (3/30/65)	Apr 15 to Nov 1	32.0 cfs
Hunters Creek	A008688 (5/28/36)	004795 (8/17/36)	005387 (1/14/59)	Apr 15 to Oct 1	2 cfs
Stone Corral Creek	A012125 (10/8/47)	008272 (12/20/50)	004340 (4/24/56)	Apr 20 to Sep 30	11 cfs
Unnamed Stream Tributary to Funks Creek	A023005 (3/12/68)	015687 (9/10/68)	010635 (4/23/76)	Primary: Apr 1 to Jun 30 Secondary: Sep 1 to Dec 31	2 cfs 415 ac-ft/yr
Sacramento River	A030838 (2/19/1999)	21101 (5/16/2001)	Pending	Nov 1 to Mar 31	1,200 cfs 182,900 ac-ft/yr
Sacramento River	S007367 (N/A)	N/A	N/A	Apr 1 to Oct 31	2,700 cfs
Colusa Basin Drain	S007368 (N/A)	N/A	N/A	Apr 1 to Aug 31	134 cfs

[a]Source – SWRCB; Division of Water Rights (www.waterrights.ca.gov).

[b]N/A – Priority Dates and License/Permit Information are not applicable for some types of water rights.

[c]The type of water right is indicated by the first letter in the Application reference, as follows:
A – Appropriative right
J – Adjudication
S – Statement of Water Diversion and Use
Z – Section 12 filings

[d]The Priority Date is the basis for defining the seniority of the water right, and is based on the application date.

[e]The amount of water diverted under the water right will be in accordance with the principles of reasonable and beneficial use.

The GCID surface water supply entitlement is currently addressed in a contract entered into with Reclamation in 1964, Contract No. 14-06-200-0855A (Contract No. 0855A). This contract provides for an agreement between GCID and the United States on the diversion of water

from both the Sacramento River and Stony Creek from April 1 through October 31 of each year. This contract will remain in effect until March 31, 2006.

Pursuant to provisions of the contract, Reclamation can require GCID to divert from the Sacramento River water quantities equal to and in lieu of its entitlement under the Angle Decree. Such water, along with Sacramento River water, is made available to GCID under Contract No. 0855A for diversion at its main pump station. In 1998, GCID executed a new agreement with Reclamation (Agreement No. 1425-98-FC-20-17620) for the conveyance of wildlife refuge water and other related purposes. Under the terms of this separate wheeling agreement with Reclamation, GCID can request to receive a portion of its entitlement water via two points on interconnections with the Tehama-Colusa Canal: the Cross-Tie, a 48-inch diameter pipe at Canal Mile 56, and the Inter-Tie, a 1,000-csf flume, at Canal Mile 37. The use of the Tehama-Colusa Canal for delivery of entitlement water is subject to available capacity as determined by Reclamation, in accordance with the terms and conditions of the wheeling agreement. However, GCID has agreed to pay TCCA the O&M costs associated with wheeling a minimum of 20,000 ac-ft annually of Sacramento River water to GCID from the TC Canal whether GCID uses the water or not. This water is typically acquired during rice season flood up after May 15 when the gates are put in at the Red Bluff Diversion Dam.

Contract No. 0855A provides for a maximum total of 825,000 ac-ft/yr, of which 720,000 ac-ft is considered to be Base Supply and 105,000 ac-ft is CVP water (Project Supply). The contract also provides that additional Project Supply can be purchased if surplus water is available. Water from Stony Creek and water diverted from the Sacramento River at the main pump station is accounted for as water diverted under Contract No. 0855A. For purposes of the contract, it was determined that GCID's Angle Decree rights yielded, on a long-term average, about 15,000 ac-ft/yr. This yield was included in the 720,000 ac-ft of Base Supply entitlement recognized under Contract No. 855A.

The contract specifies the total quantity of water that may be diverted each month during the period April through October each year. The monthly Base Supply ranges from a minimum of 45,000 ac-ft in October to a maximum of 150,000 ac-ft in June. CVP Supply water is available during the months of July and August, with entitlements of 55,000 and 50,000 ac-ft, respectively. The contract identifies July and August as the critical months. For the critical months, the total Base Supply is 220,000 ac-ft and the total Project Supply is 105,000 ac-ft, as shown in Table 2-11. The monthly distribution of the Base and Project Supply is shown on Figure 2-11.

TABLE 2-11
GCID: Settlement Contract Supply
Sacramento Valley Regional Water Management Plan

	Base Supply (ac-ft)	Project Supply (ac-ft)
Critical Months	220,000	105,000
Non-critical Months	500,000	0
Total Annual	**720,000**	**105,000**

Settlement Contract Historical Diversions. Historically, GCID has used all of its Base Supply and diverted a majority of its Project Supply. In 1981 and 1984, GCID purchased additional

CVP water above the 105,000 ac-ft amount provided for in the contract. During the critical months, GCID diverted CVP water every year from 1964 to 1997, as shown on Figure 2-12. Furthermore, during the 1980s and early 1990s, GCID used nearly all their entitlement water (Base and Project Supply) during the critical months.

Since GCID's peak demand generally occurs in the spring, it often coincides with the peak out-migration of juvenile salmon. Four runs of Chinook salmon (fall, late fall, winter, and spring) inhabit the Sacramento River. In general, all four runs have declined over the past 25 years. One reason for the decline was the lack of fish screens or, in the case of GCID, poor performance of an existing 20-year–old drum screen.

The District's diversion was identified as a significant impediment to the downstream migration of juvenile salmon as the lower water surface elevations contributed to unacceptable fish losses at the existing drum screen facility. Following the state and federal listing of the winter-run Chinook salmon as endangered through the Endangered Species Act, pumping restrictions were imposed on GCID by a court-ordered injunction in the early 1990s, preventing the District from diverting its full water entitlement until a long-term solution was implemented.

In addition to pumping restrictions from the injunction, 3 years were classified as critical years, and contract supplies were reduced to 75 percent of contract entitlements. The District managed several programs to supplement these reduced supplies, including a water reuse program, water conservation program, and groundwater conjunctive water management program which contributed up to an estimated 63,000 ac-ft in 1994 in response to reductions in surface water supply.

To address the fisheries issue, an interim flat-plate screen was installed in front of the existing 480 foot long drum screens in August 1993. In 2001, GCID completed the improvement and enlargement of the fish screen facility at the main pump station located near Hamilton City. Once these improvements were completed, the District was able to divert its full entitlement.

Figure 2-13 shows the historical monthly average diversions for the following three periods:

- 1964 to 1991: Long-term period of record from beginning of recording period to just prior to the listing of winter-run Chinook salmon as an endangered species in 1992.
- 1979 to 1982: A period of near normal hydrologic and water use conditions.
- 1992 to 1997: The period following the listing of the winter-run Chinook salmon to present.

The following observations are noted:

- The distribution of the monthly average diversions for the three periods is similar.
- The average monthly diversions for the recent period (1992 to 1997) are about 75 percent of those observed for the 1964 to 1991 and 1979 to 1982 periods. The recent decline in diversions correlates with restrictions from the listing of the winter-run Chinook salmon and drought periods. This required GCID to reuse greater quantities of water, reducing tailwater leaving the District.

- On average, GCID diverts at or above their contract amounts in May and June, except during the recent period. This is because of increased high cultural practice demands for rice during the month of May. (As previously stated, the District is permitted to shift contract supply allocations between non-critical months.)
- During the 1992-1997 period of record, diversions in May and June show the greatest decline relative to the other two period averages. This decline is attributed to strict conservation practices implemented and monitored by the District and the ESA-imposed pumping restrictions (which have since been lifted).

Non-contract Period (November – March). Contract No. 0855A does not limit GCID from diverting water for beneficial use during the months of November through March, to the extent authorized under California law. GCID has recently obtained a water right permit for non-contract-period diversions in the amount of 182,900 ac-ft (up to 1,200 cfs), as shown in Table 2-10. Although some pre-irrigation occurs within the District, non-contract-period diversions are predominantly used for rice straw decomposition and waterfowl habitat. In response to increasingly stringent limitations on rice burning, many of the District's land-owners flood a portion of their fields to clear their land of leftover rice straw by allowing the rice stubble to decompose. Approximately 54,000 acres were flooded in 2004 with expectation that this acreage number will increase in the future.

GCID has an agreement with Reclamation to convey water to approximately 20,000 acres of wildlife refuges year-round. GCID is strictly a water conveyor for Reclamation in this agreement and is paid on an ac-ft basis. The water delivered to the refuges by GCID is not counted toward GCID's water right entitlement. Approximately, 60,000 to 80,000 ac-ft/yr of supply is conveyed by GCID to the refuges. However, the District must be prepared, if necessary, to convey up to 105,000 ac-ft to meet Level 4 requirements. In addition, as noted above, GCID may hold a right to divert up to 900 cfs from the Sacramento River during "all seasons of the year," pursuant to the May 9, 1906 Act of Congress (Pub. L. No. 151, Ch. 2439).

As discussed above, GCID has entitlements to water from Stony Creek, which can be diverted from Stony Creek, or equivalent quantities can be diverted from the Sacramento River. The GCID service area is relatively large and contains a number of small tributaries to the Sacramento River. GCID holds water rights to pump from Hunters Creek, Funks Creek, and Colusa Basin Drain, as shown in Table 2-10.

Groundwater. The GCID boundary lies within the Sacramento Groundwater Basin. The area is located on alluvium and flood basin sediments, as well as alluvial fan deposits. Flood basin sediments are deposited in low-energy environments; therefore, they typically exhibit low permeabilities. Alluvial fan sediments are deposited in higher energy, continental environments. Because they are coarser grained, alluvial fan deposits generally have high permeabilities. These recent sediments are underlain by older deposits of the Tehama and Tuscan Formations (Department, 1978).

In the northern portion of GCID, the Tehama Formation contains extensive deposits of interbedded gravel from the ancestral Stony Creek (the Stony Creek Member). The Stony Creek Member of the Tehama Formation is typically very productive, yielding large quantities of water to wells. In the south-central portion of GCID, between Willows and

Williams, the Tehama Formation is predominately clayey, and wells in this area are generally less productive than those in the northern portion of GCID (Department, 1978).

The Tuscan Formation is an important water-bearing unit in the northeastern portion of the Sacramento Valley (Department, 2003a). In the Colusa Sub-basin, the Tuscan Formation interfingers with the Tehama Formation at depths of 300 to 1,000 feet bgs. Coarse-grained deposits within the Tuscan Formation can provide high well yields; however, the unit is generally too deep to be tapped by wells west of Chico (Department, 1978).

Groundwater quality in the Sacramento Groundwater Basin is generally good and is sufficient for agricultural, domestic, and M&I uses. The total depth of freshwater aquifer in the GCID area is estimated as 900 to 1,500 feet bgs. The freshwater is underlain by saline water found in older marine units

In the northern portion of GCID, between the towns of Artois and Glenn, groundwater movement is generally to the southeast, toward the Sacramento River, at a gradient of between 4 and 15 feet per mile (Department, 2003a). In the middle of GCID, near the Town of Maxwell, the flow changes to a more easterly direction with a gradient of approximately 4 to 10 feet per mile. At the southern end of GCID, near the town of Williams, groundwater flows east to slightly northeast, toward the Sacramento River, with the gradient ranging from 7 to 10 feet per mile. The steeper gradients exist at the southwest and northwest edges of GCID. Groundwater throughout the Sacramento Groundwater Basin, and therefore within GCID, occurs in a broad alluvial basin and is therefore not confined to any well-defined subsurface stream channels.

Groundwater use within GCID is generally limited because of the availability of surface water supplies and is driven primarily by climatic conditions. GCID manages and operates a voluntary groundwater conjunctive water management program to increase capacity when water supply does not meet demand. Up to 100 landowners have participated in the groundwater program, representing a combined capacity of approximately 500 cfs. Pumping ranges from 20,000 ac-ft/year during years of high surface water supply to as much as 77,000 ac-ft in critically dry years. Seasonal fluctuations in groundwater levels are generally less than 10 feet, but can be up to 30 feet in drought years. Historical trends show that groundwater levels in the GCID area are generally stable over the long term, although short-term fluctuations in groundwater levels are observed that can be correlated with precipitation trends. GCID implemented a conjunctive water management project pilot study where up to 65,000 ac-ft of groundwater was pumped from private wells during the 1994 irrigation season.

Other Water Supplies. An aggressive recapture program, which captures both subsurface flows (from system leakage and deep percolation recovered by open surface drains) and tailwater runoff from cultivated fields from within GCID's service area, is a part of GCID's overall water management program. GCID recaptures this water with both gravity and pump systems. This captured water is delivered to either laterals or the main canal for reuse. Currently, GCID recycles approximately 155,000 ac-ft annually. Relatively small quantities of tailwater are available to GCID from areas outside of the District's boundaries.

Continued reuse and recycling efforts are expected to be influenced by an increasing need to manage salinity and other constituents that affect crop productivity and sustainability. The

District has established a program that encompasses the entire District to monitor soil and water salinity and test for electrical conductivity and pH.

Much of GCID's surplus water is captured for use by downstream districts such as the PID, PCGID, and MID. GCID is one of the irrigation districts that signed the Five-Party Agreement of June 2, 1956. This agreement represents a cooperative effort by GCID, PID, PCGID, MID, and two entities that have since dissolved (Compton-Delevan Irrigation District and Jaciento Irrigation District) to share O&M of the drains within their respective service areas and to share the right to recirculate the water in those drains. In addition, Colusa Basin Drain Mutual Water Company members (57,000 acres, gross) rely on tailwater from GCID and other upstream water users.

GCID adopted a Water Transfer Policy in 1995. This policy identifies agricultural water users within the Sacramento Valley as the highest priority, and environmental purposes as the second highest priority for future water transfers. An in-basin water transfer program was introduced in 1997 that provides for up to 20,000 ac-ft to be transferred to neighboring lands in full water supply years.

Water Use

District Water Requirements. Land use within GCID's service area is primarily rice, due to the presence of fine-textured and poorly drained soils within the majority of the District. Other key crops include alfalfa, tomatoes, and cotton. Rice accounts for approximately 80 to 85 percent of the District's irrigated acreage on an annual basis (Department, Northern District). Water requirements are typically highest during the summer months (July and August) due to the requirements of rice and the area's hot, dry climate. Cultural practice water needs for rice are greatest early in the growing season associated with the flooding up of previously dry rice fields. Although surface water is the primary source of irrigation water, groundwater is used in drought years on an individual grower basis, as well as per agreements with the District.

Annual cropping patterns have remained fairly constant over the last few decades, other than in response to farm programs in the early 1980s. Associated water requirement needs and associated diversions have therefore been more a function of water-year type and climate than changes in cropping.

Figure 2-14 summarizes irrigated acreage by crop, on-field water requirements, and TDRs.

Table 2-12 shows current (1995 normalized estimates) irrigated acreage estimates for the primary crops grown within the District service area, as well as projections for 2020. The variation around these estimates (± percentage figures) was provided by the District to account for typical variations in particular crop acreage (primarily due to year type), as well as anticipated future variation.

In response to increasingly stringent limitations on burning, many of the District's landowners flood a portion of their fields to clear their land of leftover rice straw by allowing the rice stubble to decompose. GCID estimates that approximately 54,000 acres were flooded in 2004, a trend that is expected to continue or increase, assuming other options (including the sale of stubble for ethanol production) are not determined to be more economically feasible.

TABLE 2-12
GCID Irrigated Acreage – 1995 and 2020 Estimates
Sacramento Valley Regional Water Management Plan

Crop	1995[a]	2020[b]
Rice	99,300 (± 10%)[c]	99,100 (± 10%)[c]
Grain	5,500 (± 10%)[c]	5,000 (± 10%)[c]
Alfalfa	4,300 (± 50%)[c]	4,500 (± 50%)[c]
Pasture	4,100 (± 20%)[c]	3,300 (± 20%)[c]
Tomatoes	3,800 (± 40%)[c]	6,400 (± 40%)[c]
Other Crops	13,200 (± 10%)[c]	18,500 (± 10%)[c]
Total Irrigated Acreage	**130,200 (± 10%)[c,d]**	**136,800 (± 10%)[c,d]**

[a]Values are estimates derived from field data that have been normalized (data has been modified to simulate a condition where hydrology and climate are assumed to be normal, i.e., drought or wet condition assumed not to occur). Source: Department, Northern District.

[b]Values are future projections that incorporate current and historical trends, as well as anticipated local and regional development and economic trends in the year 2020. Source: Department, Northern District.

[c]Percentages obtained from GCID.

[d]Includes 200 double-cropped acres for 1995, and 3,700 double-cropped acres for 2020.

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This practice provides additional winter habitat for waterfowl above that which has been available within the Sacramento Valley since the development of agriculture.

Future irrigation-season cropping patterns and associated water requirements are anticipated to remain relatively the same as current conditions.

Urban. Although GCID overlays the agricultural communities of Willows, Maxwell, and Williams, the District currently does not serve these or other major M&I users. The District has been involved in water transfer programs with municipalities in the past where growers within GCID are given incentives to pump groundwater so that Sacramento River surface water can in turn be transferred to eligible candidates. Future transfers will be dependent on water availability and overall economics. M&I water demand within the vicinity of the District is anticipated to increase only slightly, with additional annual water requirements in the year 2020 expected to increase by less than 10,000 ac-ft compared to 1995 estimated levels (Department, Northern District). This water (in addition to current demands) is assumed to be groundwater. Although lands that are incorporated within a municipality are currently uncoupled from the District, GCID could serve at least a portion of the current and/or future M&I water requirement given a mutual agreement.

Environmental. GCID conveys water to three National Wildlife Refuges (Sacramento, Delevan, and Colusa), encompassing approximately 22,500 acres. Level 4 (total quantity of water identified for each refuge to optimize management by the year 2002 identified by the Central Valley Project Improvement Act) water requirements for these three refuges total 105,000 ac-ft. The District has recently upgraded its water system to better supply the refuges and provide year-round service. Additionally, the District serves approximately 700 acres of privately owned duck clubs. Approximately 8,350 acres of riparian vegetation are estimated to be incidentally supplied by irrigation, including vegetation directly adjacent to delivery laterals or influenced by leakage from the delivery system. Such vegetation includes elderberry shrubs, which provide habitat for the federally listed valley elderberry longhorn beetle, and habitat used by the giant garter snake.

As previously described, approximately 54,000 acres of rice stubble were flooded in 2004, with associated winter habitat benefits to migratory waterfowl that use the area as part of the Pacific Flyway. The flooding of rice fields in the spring and summer provides wetlands habitat during these periods for waterfowl and terrestrial species. Rice fields that are not flooded also provide habitat for waterfowl and upland birds as resting areas.

Groundwater Recharge. Intentional groundwater recharge is not currently practiced in the District. Incidental groundwater recharge occurs routinely from groundwater percolation resulting from conveyance losses and irrigation application practices.

Topography and Soils. The District's topography consists of nearly level to gently sloping terrain. Because the District is relatively flat, the impact of the area's terrain on District water management practices is negligible.

Soil associations for the Glenn County area and soil profile characteristics for the Colusa County area of the District are listed below. The total acreage for the individual soil associations and soil profiles within the District is shown in the General Soils Map and Profile Characteristic Map provided in the NRCS Soil Survey for Glenn and Colusa Counties.

Soil associations in the Glenn County area of GCID are as follows (Appendix C):

- Arbuckle-Kimball-Hillgate: Sandy loam, well-drained, moderately permeable to very slowly permeable soils on low terraces.
- Tehama-Plaza: Silt loam, deep, well-drained to somewhat poorly drained soils mainly on alluvial fans.
- Myers-Hillgate: Clay loam well-drained, slowly and very slowly permeable soils mainly on alluvial fans.
- Willows-Capay: Clay, somewhat poorly drained and poorly drained, fine-textured soils.
- Willows-Plaza-Castro: Clay loam, somewhat poorly drained and poorly drained, medium- to fine-textured soils.
- Wyo-Jacinto: Sandy loam, well-drained to somewhat excessively drained, medium-textured and moderately coarse-textured soils on young alluvial fans or on wind-deposited material.
- Cortina-Orland: Gravely sandy loam, shallow to deep, well-drained to excessively drained soils on recent alluvial fans and on floodplains.

Soil profile characteristics in the Colusa County area of GCID are as follows (Appendix C):

- Young alluvial fan and basin soils with moderately compacted subsoils.
- Older alluvial fan and basin soils with moderately compacted subsoils.
- Older plain or terrace soils with dense clay subsoils.
- Upland soils formed in place from the underlying softly consolidated sedimentary materials.

Transfers and Exchanges. GCID makes conserved water available for its annual in-basin base supply transfer program and to Colusa Drain Mutual Water Company. GCID manages a fallowing program whereby landowners forego their use of water to grow crop and makes the foregone surface water available to State Water Contractors.

Other Uses. No other significant water uses other than those discussed above occur within GCID.

District Facilities

GCID's main facilities within its service area include a 3,000-cfs pumping plant and fish screen structure, a 65-mile main canal, and approximately 900 miles of lateral canals and drains that serve its approximately 175,000-acre service area (Figure 2-15). The pump station is situated on an oxbow off the main stem of the Sacramento River. Waterflow passes through a 1,100-ft fish screen structure where a portion of it is pumped into GCID's main irrigation canal. The remaining flow in the oxbow passes by the screens and then back into the main stem of the Sacramento River. The construction of a large siphon at Stony Creek in 1998, and various other siphons and cross-drainage structures in 1999/2000, has eliminated the need for a seasonal dam in Stony Creek and allows for winter deliveries.

Diversion Facilities. GCID's primary diversion supply facility is the Hamilton City Pump Station located on the Sacramento River. The existing pump station was constructed in 1984. In 2001, GCID, completed the improvement and enlargement of the fish screen, including the construction of a gradient control facility along a segment of the main stem of the Sacramento River, and a water control structure for the Oxbow Channel where the pump station is located. The District has historically diverted from Stony Creek via a seasonal gravel dam. This diversion is no longer used following the construction of the Stony Creek Siphon, which conveys main canal flows under the Stony Creek Channel. GCID now receives its Stony Creek water supply through diversion from the Sacramento River or via Reclamation's Tehama-Colusa Canal facilities. GCID can convey refuge water and some of the Settlement Contract water through TCCA via two points of interconnection with the GCID Main Canal: the Inter-Tie, a 1,000-cfs flume, near the Glenn and Colusa County boundary line (Main Canal Mile Post 37); and the Cross-Tie, a 48-inch-diameter pipe, west of Williams (at Main Canal Mile Post 56).

Table 2-13 summarizes GCID's surface water supply facilities. See Figure 2-15 for a map of GCID's major conveyance facilities.

TABLE 2-13
GCID Surface Water Supply Facilities
Sacramento Valley Regional Water Management Plan

Facility Name	Water Source	Pump/Gravity	Capacity (cfs)	Average Historical Diversion (ac-ft/yr)
Hamilton City Pump Station (Mile 1.4)	Sacramento River	Pump	3,000	659,900
Tehama-Colusa Canal Intertie (Mile 37.2)	Tehama-Colusa Canal	Gravity	1,000	25,400
Tehama-Colusa Canal Crosstie (Lateral 56-1G)	Tehama-Colusa Canal	Gravity	130	23,400

Conveyance System. GCID has approximately 65 miles of main canal and 900 miles of laterals canals and drains. The main canal is the primary conveyance facility for the District. The main canal generally runs along the west side of the District and supplies the various laterals for delivery to field turnouts. Several main canal major improvements have been made recently, including upgrades being constructed this year. These include the installation of new cross-drainage structures and the replacement of existing drainage and control structures. These improvements allow year-round operation of the main canal for Supplying the wildlife refuge complex lands. Table 2-14 summarizes GCID's main canal and irrigation lateral features. GCID does not currently have any lined canals. Estimation of the leakage losses from the GCID main canal indicates that losses are minimal due to the low permeability of the clay soils that are common in the area. A relatively minor quantity of water could be saved by lining some portion of the main canal, but the preliminary analysis shows this to be a prohibitively expensive water management option. Most seepage from District canals returns to surface drains adjacent to the canals, or recharges the underlying groundwater basin, making net regional water savings from canal lining minimal.

TABLE 2-14
GCID Canals and Laterals
Sacramento Valley Regional Water Management Plan

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
GCID Main Canal	Hamilton City Pump Station	3,000	No	NA	13
River Branch Canal (Lateral 12-4)	GCID Main Canal at MCM 12.8/12.9	200	No	Lower part of PCGID	15
Bondurant Slough (Drain A) (Laterals 17-1 and 17-2)	GCID Main Canal (48-inch Sluice Gate)	200	No	Colusa Basin Drain	12
Quint Canal (Lateral 21-2)	GCID Main Canal	100	No	Colusa Basin Drain (20-47 Drain)	12
Willow Creek (Drain B)	GCID Main Canal	100	No	Quint Canal	12
Lateral 25-1	GCID Main Canal	50	No	Western Canal	12
Lateral 26-2	GCID Main Canal	130	No	Sacramento National Wildlife Refuge	10
Lateral 35-1	GCID Main Canal	30	No	Sacramento National Wildlife Refuge	10
Hunter Creek (Drain D) (aka Willits Slough)	GCID Main Canal (Sluice Gate at MCM 40.3)	75	No	Logan Creek and Colusa Basin Drain, MID	10 (clay)
Lateral 41-1	GCID Main Canal	80	No	Delevan National Wildlife Refuge, MID	10 (clay)
Stone Corral Creek (Drain E)	GCID Main Canal	50	No	Delevan, Maxwell, and Colusa Basin Drain	<10
Lateral 45-1 (Drain F3 System)	GCID Main Canal	43	No	Kulh Weir-MID	11
Lateral 48-1 (Lurline Creek System)	GCID Main Canal	100 (Lurline Creek)	No	CDMWC and MID	12

TABLE 2-14
GCID Canals and Laterals
Sacramento Valley Regional Water Management Plan

Facility Name	Source Facility	Capacity (cfs)	Lined	End Spill Location	Percent Leakage Loss Estimate
Lateral 49-2 (Lurline Creek System)	GCID Main Canal	100 (Lurline Creek)	No	CDMWC and MID	12
Lateral 51-1 (Freshwater Creek System	GCID Main Canal	50	No	CDMWC Colusa Drain	12
Salt Creek System (including Spring Creek)	GCID Main Canal	50	No	Joins Freshwater Creek and goes into Colusa Drain (Davis Weir)	10 (can gain water)
Lateral 64-1 (at M.P. 64.95)	GCID Main Canal	80	No	Colusa National Wildlife Refuge	10
Lateral 56-1	Tehama-Colusa Canal Crosstie	130	No	Spring Creek/Salt Creek System	10

Notes:
NA = not applicable
CDMWC = Colusa Drain Mutual Water Company

GCID has been modernizing its facilities to create a canal system with automated control and monitoring, including motor-operated radial and slide gates, water-level and flow measurement at key points in the system, and integrated SCADA to match supplies and demands throughout the system. The District also has an ongoing program to increase the coverage of the SCADA system and to automate remaining major flow control structures. Only five major control structures on the main canal require replacement and modernization. The District's operational spills are minimal based on the standard performance and requirements of an open-channel distribution systems, and it is not likely that significant reductions in the quantity of operational spills can be achieved.

Storage Facilities. GCID currently has no significant storage facilities. The Department is currently studying the feasibility of constructing the Sites Reservoir west of the Town of Maxwell. There is potential benefit to the reintroduction of water from Sites Reservoir, through the District's Main Canal, to the Colusa Basin Drain and then to the Sacramento River. For example the water from Sites Reservoir could be blended with drain flow from the District to improve water quality released to the downstream system. In addition from the regulating reservoir could be pumped back upstream, check by check, in the Main Canal and diverted to Sites Reservoir.

The Stony Creek Fan Partnership, a partnership between GCID and its neighbors, Orland Unit Water Users Association, and Orland-Artois Water District, is funded through the Department Storage Investigations Program to examine the potential for groundwater production and recharge within a gravely strata located in Glenn County, the Stony Creek Fan. GCID's Conjunctive Use Program is being developed in conjunction with the Stony Creek Fan Program and builds upon data obtain through this investigation and the Sacramento Valley Water Management Program.

Spill Recovery. An aggressive recapture program, which includes groundwater seepage and tailwater runoff from cultivated fields, is part of the District's overall water management program. GCID has a network of unlined drainage ditches for conveying irrigation return flows and regional surface runoff. The drainage ditches generally empty into regional sloughs and creeks, which in turn drain into the Colusa Basin Drain. The District operates 19 drain recapture pump stations to divert for reuse. These pump stations have a total combined capacity of 912 cfs, and recapture an average of 76,000 ac-ft/season. The District also has 18 gravity surface diversions for recapturing, which recapture an average of 77,000 ac-ft/season. These facilities are not shown on Figure 2-15.

District Operating Rules and Regulations

GCID was formed under Chapter 11 of the California Water Code. As such, the District is subject to the rules and regulations of this code including governing its actions through an elected Board of Directors and is required to keep a minimum amount in financial reserves.

Water rotation, apportionment, and shortage allocation:

> According to Rule 13 of GCID Rules and Regulations: *All consumer requests for water must be received at the District's office, or by the responsible water operations worker, at least three days before the water is needed by the consumer.*
>
> According to Rule 14 of GCID Rules and Regulations: *In the event of water shortage or water delivery constraints, the District will endeavor to equitably apportion the available District water to the District land entitled thereto.*
>
> *In years in which the Board concludes that the District's water supply will be inadequate to serve all lands entitled to service from the District, the District will estimate the total water supply available for the irrigation season, and after deducting estimated canal losses, apportion the balance to each District landowner in accordance with California Water Code section 22250 and 22251. To accomplish this apportionment, the District will accept primary applications for acreages of crops for which the landowner's apportioned water share will bring appurtenant crops to maturity. All additional acreage applied for will be placed on a secondary application list. On expiration of the time to submit primary water applications, if the total estimated water required to serve the primary application is less than the total estimated water available, the excess shall be equitably allocated to secondary applications at the discretion of the Board.*

Use of drainage waters:

> According to Rule 14 of GCID Rules and Regulations: *District landowner(s) are advised that drain water in the District is considered water supplied by the District, and any such water recaptured by the landowner(s) or user(s) may not be used to increase irrigated acreage.*

Policies for wasteful use of water:

> According to Rule 16 of GCID Rules and Regulations: *If, in the opinion of the General Manager, a consumer is wasting water, either willfully, carelessly,*

negligently or on account of defective private conduits, the District may refuse the delivery of water until the wasteful conditions are remedied, or the District may reduce the water inflow into the consumer's fields to a flow that would be reasonable if such wasteful conditions were remedied. Wasteful water use practices include, but are not limited to, (1) using water on roads, vacant land, or land previously irrigated, (2) flooding any portions of a consumer's land to an unreasonable depth or using an unreasonable amount of water in order to irrigate other portions of such land, (3) using water on land that has been improperly prepared for the economical use of water, and (4) allowing an unnecessary amount of water to escape from any tailgate.

The District reserves the right to refuse delivery of water when, in the opinion of the District Manager, the proposed use, or method of use, will require excessive quantities of water which constitute waste.

Water Measurement, Pricing, and Billing

Main canal flows are measured using meters at key points, including a new acoustic measuring device at the recently constructed Stony Creek siphon. Main laterals and sub-laterals that serve field turnouts are metered. The District drain pumps and the single District groundwater well are metered. Turnouts to fields are measured and totalized by service area using the measurements for the service lateral that serves each area. Lateral spills are measured and totalized using lateral stage measurement and weir equations. Drain outflows from the District are measured and recorded using a combination of weirs and meters.

GCID does not currently meter individual field turnouts, with the exception of several test plots that are used to provide detailed quantitative data for use in monitoring efforts to improve farm-level water management. GCID does, however, measure flow rates at turnouts using canal stage and head-discharge relationships for orifices and gates. Total deliveries per service lateral are recorded. The average on-farm efficiency for the District is approximately 65 percent, which is near the practical upper limit of around 70 percent. Farm-level measuring in combination with incentive pricing and on-farm improvements may potentially increase the average on-farm efficiency and provide a quantity of conserved water.

GCID also participates in an effort to support improved water management in the Sacramento Valley on a broader scale, the *Sub-basin-level Water Measurement Study* was proposed by the SRSCs and subsequently funded through CALFED. Given the BWMP's recommendation that sub-basin management be further explored, this water measurement study focuses on increasing the water measurement level of accuracy at a sub-basin level. This ongoing study is a preliminary investigation of potential measurement locations, facilities, and associated implementation issues to allow for water measurement in the five Sacramento Valley sub-basins addressed in the BWMP.