4.0 RELIABILITY PLANNING

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable.

10631 (c) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.

10631 (c) Provide data for each of the following: (1) An average water year, (2) A single dry water year, (3) Multiple dry water years.

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplied:

(a) Stages of action to be undertaken by the urban water supplier in response to water supply, and an outline of specific water supply conditions which are applicable to each stage.

(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply

(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(d) Additional mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(f) Penalties or charges for excessive use, where applicable.

(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed

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measures to overcome those impacts, such as the development of reserves and rate adjustments.

(h) A draft water shortage contingency resolution or ordinance.

(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

4.1 Water Supply Reliability

Two aspects of supply reliability are considered for both near-term needs (present to 2015) and long term needs (beyond 2015). The first relates to emergency reliability needs and is primarily a function of the availability and adequacy of supply facilities. The second aspect is climate-related, and involves the availability of water during mild or severe drought periods.

4.1.1 STANDBY PRODUCTION

The City's standby production was described in the previous chapter and standby production capacity is required for system reliability. Under normal operating conditions, it is possible that one or two of the City's wells can be out of service during maximum day demand conditions due to equipment malfunction, servicing, or water quality concerns.

The California Department of Health Services (DHS) criteria recommends counting the capacity of the largest well as out of service. To mitigate the potential impact of lost production capabilities, the City should thus have wells with a capacity of 6.07 million gallons per day (MGD), the City's largest producing well's capacity, in surplus of the maximum day demand requirements.

The City's current MDD is approximately 9.47 MGD during the blistering months of May through August during which the pumps are operating 69.8% of a day. The City has recently (2006) increased water supply and storage facilities to include redundancy provisions for standby production and source reliability.

4.1.2 CLIMATE-RELATED RELIABILITY CONCERNS

Not all hydrologic dry years lead to water supply shortages and groundwater overdraft. The annual quantity of groundwater available to the City will not vary significantly in relation to wet or dry years. However, the groundwater elevations to surface do change in correlation to wet and dry years. During extended drought periods, groundwater levels generally decline, and will require more aggressive demand management practices. The reliability of the City's water supply, however, remains constant despite seasonal or climatic changes.

In terms of water supply reliability, the City's system reliability is such that alternative source consideration and water shortage contingency planning has not thus far been required (see Chapter 8 of this UWMP). Water conservation demand regulations are, however, incorporated in a City ordinance (Appendix H) and discussed in Chapter 7 of this report.

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The City of Corcoran has never suffered a severe water shortage due to groundwater deficiency. The nature of the groundwater supply is such that a sudden shortage is extremely unlikely. Any shortage that may be experienced will be due to failure to plan for increased demand due to population and industrial growth, or from catastrophic well or equipment failure.
The City did experience a potential unsafe water conditions in the May of 2006 when well 4A collapsed and the City was force to supply bottle water to their residents. The residents were asked to turn off their taps after the collapsed well started spreading sand throughout the City's water infrastructure. After flushing out as much sand as the City could, the preliminary test results showed the well water was safe to drink, but state law required that a second test be performed before they're allowed consume the tap water. The City handed out an excess of $100,000 of bottled water to its residence during this contamination period.

The effects of droughts in the past have forced the City to modify their wells due to falling groundwater levels, but the overall effect has not been detrimental to the City's water supply.

4.2 Groundwater Quality Reliability Concerns

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631 and the manner in which water quality affects management strategies and supply reliability.

4.2.1 LOCAL GROUNDWATER QUALITY

The United States Environmental Protection Agency (EPA) is currently considering implementing several new or revised drinking water standards. The Ground Water Rule (GWR) contains measures to establish multiple barriers to further protect against bacteria and viruses in drinking water from the groundwater sources. The GWR will specify when corrective action (including disinfection) is required to further protect consumers serviced by groundwater systems from bacteria and viruses. The City is faced with two water quality conditions that are the result of the natural deposition that formed the valley fill, arsenic and hydrogen sulfide. Each successive layer of material deposited on the valley floor carried with it a portion of the minerals that are present in the surrounding mountains and these became a part of the geology of the Valley.

Many of these minerals contribute to the quality of the soils and to the quality of the groundwater. Most of the minerals are in concentrations that do not affect the suitability of the water for domestic use. Arsenic however, is concentrated in water-bearing strata in the Corcoran area in sufficient quantity that water for domestic consumption must be treated, blended or otherwise modified in the foreseeable future in order to meet new and more restrictive water quality standards.

Plants in deltaic and lacustrine environments in the ancient San Joaquin Valley utilized the mineral-rich water and bioaccumulated arsenic in plant tissue. Over time, the accumulation of dead vegetative material in which the arsenic had bioaccumulated formed interbedded layers within the finer grained deposits.

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These fine-grained deposits (usually silts and clays) became enriched in arsenic and were eventually buried. Chemical analyses of well samples report soluble arsenic concentrations of 16 to 25 µg (in wells located in the well field north of the community) and lesser amounts, 3 to 15 µg/l in wells drilled within the community.

The majority of the City's municipal wells are completed in aquifers that have a moderately reducing chemical environment which enables the presence of arsenic, iron oxides and sulfate-reducing bacteria. The bacteria utilize subsurface organic matter, and cause the release of hydrogen sulfide gas, H_2S, creating a mild "rotten egg" odor. In addition, it is possible that the mixing of H_2S and soluble iron form ferrous monosulfide, which can create an "iced tea" colored water.

Water from the three active wells in the well field north of the community, although higher in arsenic, does not have color or excessive sulfide problems. Wells drilled in the community have lower arsenic levels but must be carefully developed (in terms of which aquifer levels are utilized) to avoid color and sulfide taste or odor problems.

4.2.1 ARSENIC TREATMENT

In 1996, the EPA set out to reduce the arsenic levels in the nation's drinking water and established the Safe Drinking Act. In 2001, after nearly a year of research and review, the EPA established a new standard for drinking water that was 10 ppb. Quad Knopf was contracted by the City of Corcoran to design a new water treatment plant capable of reducing the arsenic levels in the water from the mid-20's to 5 ppb or less. This included the civil, structural, architectural and process design of the filters, pump stations, sewage lift stations, new wells, well modifications, operation's building, grading, drainage and general site work. Quad Knopf also performed all of the construction management services for the plant as well as performed all of the system tests once the plant became operational. Figure 4-1 give you an idea about the levels of arsenic at each well prior to the installment of the treatment plant.

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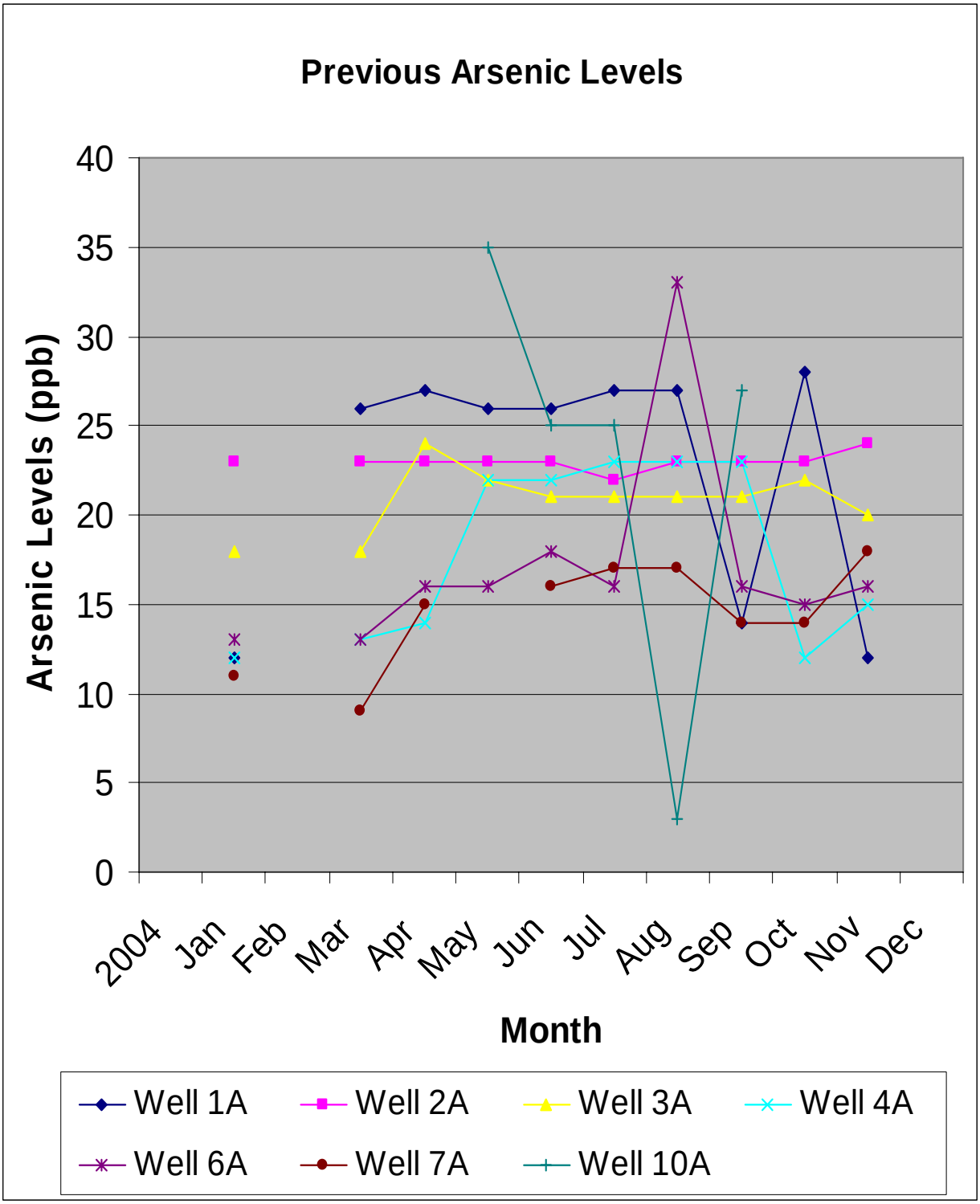
Figure 4-1


Previous Arsenic Levels
Arsenic Levels (ppb)
40
35
30
25
20
15
10
5
0
2004
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Well 1A
Well 2A
Well 3A
Well 4A
Well 6A
Well 7A
Well 10A

Carollo Engineers and Tonka Water Treatment Systems worked with Quad Knopf to help complete the treatment plant. Carollo Engineers developed the process design system for the plant as well as the programming for the plant's computer systems. Tonka Water designed and manufactured the pressure filter system, which is responsible for actual filtration of the City's water supply.

The arsenic treatment plant for the City of Corcoran is a state of the art plant that is unlike any other constructed on the west coast. Whereas most arsenic removal water treatment systems treat the water supply at the individual wellheads, this plant has the capability to treat the combined water from all of the City's nine wells in one location, making it a landmark accomplishment for the Central Valley.

The treatment plant itself utilizes a unique water chemistry technology to filter the water. Adding chlorine to the raw water coming from the wells oxidizes naturally occurring arsenic. When ferric chloride (iron) is injected into the water the oxidized arsenic will bind to the ferric and form a flock. The formation of this flock creates large enough particles that can be filtered out of the water in the pressure filters. The water treatment plant also includes one 0.5-MG raw water blend tank, a 2 MG finish water reservoir, two backwash reclaim tanks, a chemical storage and injection system, six 2,500-gpm filter feed pumps, two 1,700-gpm booster pumps, one 3,150-gpm backwash pump, a 3,320- square-foot operations building and a wastewater pump station. Figure 4-2 illustrates results of arsenic present in the treated water.

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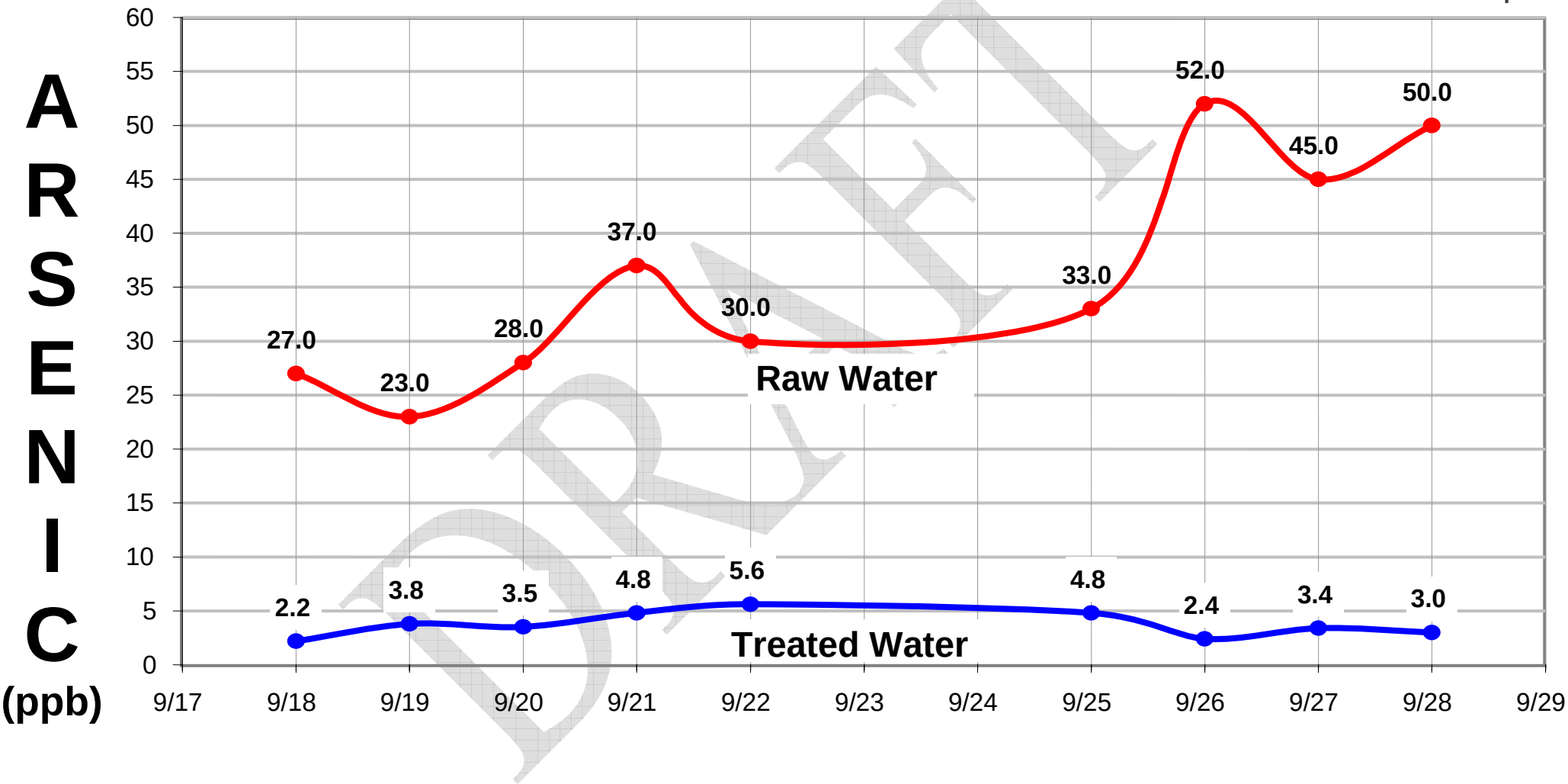
Quad Knopf



Date – Year 2006

Quad Knopf

The social benefits of the project for the City of Corcoran are highlighted by the development of a clean and safe drinking water supply. Not only was this the primary goal of Quad Knopf in the design of the plant, but the goal of cleaner and safer drinking water for the City residents was a primary concern for the City itself. With a goal of lowering arsenic levels below 5 ppb, the City will more than exceed the federal standards for drinking water. The design and construction of the water treatment plant posed several challenges for the Quad Knopf team; in particular was the complexity of the project schedule. The project itself presented a very compressed time schedule, due to the pending implementation of the EPA arsenic standards. The construction of the plant began in October in 2005 and on May 31st of 2006 the plant had begun to process raw water from the City's wells. The new water treatment is located at the site of the previous treatment facility.

4.3 Catastrophic Interruption Concerns

Such concerns have been identified by the Water Code (Section 1063(c) as involving regional power outages, earthquakes or other disasters.

The availability of diesel power on one of the system's largest wells, portable emergency generation availability for one of the in-town wells, and backup power for 3.5 million gallons of the system's 4.5 million gallon storage capacity mitigates the potential impact of such catastrophic emergencies. The City is planning the addition of emergency generator hookup capabilities to additional in-town wells and storage reservoir pumps.

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