There are three major groundwater types in the study area:

- Magnesium calcium bicarbonate or calcium magnesium bicarbonate.
- Magnesium sodium bicarbonate or sodium magnesium bicarbonate.
- Sodium calcium bicarbonate or calcium sodium bicarbonate.

All three water types closely resemble the chemistry of surface water in the Sacramento, Feather, Yuba, and Bear rivers near the study area, which is typically calcium magnesium bicarbonate. The observed groundwater is somewhat enriched in total dissolved solids (about 150-400 mg/L versus 50-90 mg/L for surface water) possibly due to both natural processes and agricultural activities.

A fourth study area groundwater type is sodium bicarbonate. A small area of sodium bicarbonate water exists near Sacramento International Airport. All of these wells are deeper than 500 feet. Additionally, throughout the study area are sodium bicarbonate water at depths greater than 400 feet (not shown on Figure 34).The presence of this type water at depth supports the idea of cation exchange processes being a major factor in the observed groundwater chemistry. A few shallow wells (<200 feet deep) along the Sacramento River have a sodium bicarbonate water type. Not enough data exist to explain the water chemistry there, but it could be related to deeper water moving up along a fault.

Anomalous water types are noted on Figure 34. The sodium chloride sulfate and sodium chloride bicarbonate water near Lincoln and Pleasant Grove Creek are found in wells completed in areas where the Ione Formation occurs in the shallow subsurface. Ione Formation sediments are marine in origin, and groundwater derived from them commonly has elevated sodium, chloride, and sulfate.

Near Wheatland is an area with significant percentages of chloride and sulfate in shallow wells (less than 200 feet deep). The source of this anomalous water is unknown. Redwine (1972) and Almgren (1984) suggest that marine sediments deposited in the submarine Markley Canyon crop out near Wheatland; this could explain the observed groundwater chemistry.

Chloride is the predominant anion in three wells along the Sacramento River between the confluence of the Feather and Bear rivers on the north and Verona on the south. Chloride concentrations are elevated (>100 mg/L) just west of the Sacramento River in Yolo County (Evenson 1985). The water types could be related to groundwater flow from Yolo County under the Sacramento River. The presence of this groundwater could also be related to possible subsurface faulting in the western study area.

ing water are related to health issues, and secondary standards are related to esthetic concerns.

The assessment of area groundwater for agricultural use was based on guidelines for irrigation of crops presented in Ayers and Wescott (1985) and ASCE (1996). Water quality guidelines for irrigation serve to help avoid possible negative effects from the use of poor quality irrigation water. Such negative effects can include: decreased water availability for plants due to salt buildup in soil water within plant root zones; reduction of infiltration rates of surficial soils due to ion exchange and related degradation of soil structure; and toxicity to plants.

Because of the often complex relationship between the quality of irrigation water and its effect on crops, few if any strict water quality standards exist for irrigation. Thus, assessment of the suitability of groundwater quality within the study area for irrigation uses is based on general guidelines.

No analysis of the suitability of area groundwater for introduction into freshwater aquatic habitats was performed for this preliminary assessment. This issue will be further evaluated in the environmental analysis phase of project development. The final determination of suitability will depend on the chemistry of the individual production wells. The relationship between the concentration of various constituents in water and effects on aquatic life is often complex and can be a function of the hardness, ionic strength, pH, and oxidation-reduction potential of the aquatic environment into which the water is introduced.

Groundwater Quality Conditions

Figure 36 shows approximate locations of water supply and monitoring wells in the study area for which physical parameter, major ion, minor ion, and trace element data are available. Areas where groundwater quality may be of concern as depicted in this and other figures in this chapter were determined subjectively for discussion purposes and are based on data obtained for this assessment. The areas were delineated based on the occurrence of elevated concentrations of various chemical constituents in groundwater from one or more wells. However, depicted areas may include wells where concentrations of constituents of concern are within acceptable levels. The depicted areas are based on data for estimated normal depths of groundwater production and do not include consideration of groundwater below the base of fresh water as defined by Berkstresser (1973).

Comparison of groundwater quality data with applicable water quality standards and guidelines for drinking and irrigation reveal that elevated levels of total dissolved solids/specific conductance, chloride, sodium, bicarbonate, boron, fluoride, nitrate, iron, manganese, and arsenic may be of concern in some portions of the study area.

Feasibility Report

American Basin Conjunctive Use Project

Memorandum Report

Department of Water Resources
Central District

July 1997

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Governor
State of California

Douglas P. Wheeler
Secretary for Resources
The Resources Agency

David N. Kennedy
Director
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