Section L

Technical Analysis

Section L – Technical Analysis

L.1 Introduction

There have been numerous technical analyses and evaluations over time within the Tule River Basin that have been instrumental in shaping the direction, emphasis and priorities of water management activities of the DCTRA IRWM Plan. These studies have then contributed to the rationale of the DCTRA IRWMP objectives and their contribution to the Tule River Basin understanding from the perspective of science and management. The Stakeholder Advisory Group utilized this wealth of information in the establishment of objectives, in the decision of which water resource management strategies were incorporated into the DCTRA IRWMP and the evaluation method of projects that adequately address the DCTRA IRWMP needs.

This section provides a discussion of:

1. The technical information sources and/or data sets used to develop the water management needs.
2. Why this technical information is representative or adequate for developing the IRWM Plan

L.2 Technical Information Sources and Data Used

Although there have been numerous studies that have influenced development of the IRWMP, there are a few key efforts that should be emphasized by a summary of activities and contributions. Additionally, a table has been provided to list the variety of technical analyses that contributed to the IRWMP. (Each of the following technical analysis examples are noted throughout the IRWMP.)

L.2.1 The Water Resources Investigation (WRI)

This is an ongoing process that began with the formation of the DCTRA and continues to date. The investigation has been structured as a series of facilitated exercises, along with supplemental analyses, with the managers of the DCTRA member agencies. In general, the exercises have been structured around an analysis of assets and needs, water resources, specific for each member agency. The analysis exercises have been followed with resource/need matching exercises wherein the needs of one member agency are examined from the perspective of being satisfied with the assets of another member agency.

The matching exercises have then been expanded to a project development phase, where efforts have been undertaken to determine if single-purpose or joint projects could be developed to address resource deficiencies of both single entities, or better yet, multiple agencies. Coming out of this process, as an initial success, was a better understanding of individual and collective resources and needs. Over time, resource exchanges have been extended in some cases and created in others. Joint projects have been identified with some having been developed. The project list to be created and approved as a part of the IRWM development process will use this project list as its starting point. The process has also provided the Tule

River Basin, public water agencies and overlying landowners and water users with a better understanding of the Tule River Basin by answering questions related to the quantity of groundwater, the quality trends related to groundwater, sources and volumes of recharge and trends in water levels in the Tule River Basin. The investigations have provided an improved base on which to examine Tule River Basin hydrological and hydrogeological conditions and will assist in future quantification its water supply capability, or safe yield and degree of groundwater overdraft. Additional member agency studies have been tiered off of these efforts and are leading to projects to allow for improved water management capabilities within the IRWMP.

L.2.2 Water Quality Portal

The Water Quality Portal (WQP) is a service sponsored by the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). Data for this region was provided to the Water Quality Portal by the California Water Resources Control Board Division of Drinking Water. This report utilizes data obtained from this service to report hexavalent chromium levels and perchlorate levels within the IRWMP region.

Hexavalent chromium levels were recorded annually from 2013 to 2017 in 122 wells within the IRWM planning area. These values were averaged to provide a regional mean hexavalent chromium level for each year. A similar process was used to calculate regional perchlorate levels. Perchlorate concentrations were recorded annually from 2001 to 2017 in 179 wells within the IRWM planning area. These values were averaged to identify the regional mean annual perchlorate concentration. The average annual concentrations of these contaminants, as well as the highest concentration observed, are displayed in Section C – Region Description in Figures C-7 and C-8.

L.2.3 The Crop Water Use Model

The most recent of technical analysis resulting in useful information is the Normalized Difference Vegetation Index (NDVI) Crop Water Use Model initiated in 2011 by the KDWCD. A weak area in the use of the developed groundwater models has been the determination of crop water use and this valuable data has historically been estimated using sporadic crop data and previous study estimations in an equation to approximate the data. The NDVI Crop Water Use Model, performed by Davids Engineering, calculates evapotranspiration (ET) using reflective energy data from Landsat satellite imagery on a unit scale necessary to distinguish variations in vegetation types. This data is combined with simulation of irrigation events using a daily rootzone water balance model. The results are unique enough to correlate with agricultural usages as identified through available crop surveys. The crop water use model is expandable to the Tule River Basin through purchase of the appropriate panels of reflective energy data.

The modeling provides:

- Monthly cropping identification by crop type and acreage;
- Regionalized crop coefficients of water demands for agriculture occurring within the Southern San Joaquin Valley;
- Monthly crop water demands from years 1999 through 2009 and annually thereafter.

L.2.4 Community Climate System Model 3.0 (CCSM3)

The CCSM3 is a climate model consisting of four separate models connected by a flux coupler that simultaneously simulate earth's atmosphere, ocean, land surface, and sea ice to provide a realistic simulation of earth's climate system. This model can then be used to make local climate change predictions. CCSM3 was used in this plan to project average annual high temperature and average annual precipitation within the Tule River Basin IRWMP planning area from the present date to 2100.

Like most climate models, CCSM3 divides the area of study into a grid, and the model performs calculations for each individual cell within the grid, which is then represented by a single value for temperature, precipitation, or other climate variable of interest. Nine cells, which cover the large majority of the IRWMP planning area, were used to predict future climate conditions. The individual values of each cell for average annual high temperature and average annual precipitation were averaged to provide a comprehensive view of the region's predicted climate conditions by year.

L.2.5 Groundwater Management Plan

Responding to then recent Groundwater Legislation, in 1995 the DCTRA and participating local entities formally adopted the DCTRA's Groundwater Management Plan (GMP). Th e GMP was updated in 2012. The GMP states, "The purpose of the Groundwater Management Plan (Plan) is to evaluate the monitoring data and information collected compared to the management goals and objectives. The continued efforts for the Plan are to document the existing groundwater management activities of the DCTRA and to formalize other actions that will be used in implementing a monitoring and management program for conjunctive use, replenishment and preservation of the quantity and quality of groundwater within the Basin for long term beneficial uses." The GMP evaluates groundwater conditions and challenges, identifies solutions and establishes goals for the participating stakeholders to best manage this critical resource. Six elements currently shape the GMP:

1. Monitoring Program;
2. Resource Protection;
3. Sustainability;
4. Stakeholder Involvement;
5. Planning and Management; and
6. Information Dissemination

At the core of the GMP is the recognition that the conjunctive management of water supplies within the GMP area must be continued and that achieving hydrologic equilibrium requires the management of both surface and groundwater supplies. The GMP is a vital element of the DCTRA IRWMP as it is one of the strongest stakeholder efforts and with proven results within the Tule River Basin.

L.2.6 Water Management Plans

Based on Friant Division, CVP contract requirements member agencies holding a contract from the United State Bureau of Reclamation (Reclamation) for Central Valley Project (CVP) water from the Friant-Kern Canal, have developed Agricultural Water Management Plans (WMP) in concert with Reclamation. The objective of each WMP is to evaluate, identify, establish and describe best management practices that

will result in efficient use and best conservation/ management of water by setting policy and practice of use of water related devices, equipment or facilities. These WMPs are reevaluated and updated every five (5) years in order to continually search for the best available cost-effective technology and best management practices to achieve the highest level of delivery water management. Each of these technical analyses were directly influential in the development of this IRWMP in that they informed the stakeholders with key aspects of the Tule River Basin and defined effective objectives and resource management strategies based on science, instead of speculation and influenced the emphasis of the project scoring procedures developed by the Stakeholder Advisory Group.

L.2.7 Population and Demographic Information

Population and Demographic Data was obtained from the United States Census Bureau website in April 2018 to develop an overview of social characteristics within the IRWM Region. The IRWM report utilized the United States Census Bureau's American Community Survey (ACS) 5-year estimates, which are developed to more accurately represent smaller communities. Unlike the US Census, which is conducted every 10 years to provide an official count of the entire U.S. population, the ACS is conducted every year and provides up-to-date information about the social and economic needs within a community.