Project Description

Background

ID4 seeks to strengthen its existing groundwater monitoring program by constructing three monitoring wells at varying depths at a single site located northeast of the Rosedale Joint Use well field and adjacent to the Shell Oil Refinery. The monitoring wells will be used to track changes in the contamination plumes caused by past operations of the refinery. Data collected from the wells will also be used to monitor water level changes from water banking recharge and recovery activity as part of the Joint Use Program.

Encroaching urbanization continues to eliminate existing monitoring sites, leaving fewer wells available as reference points for groundwater studies, monitoring, and management activities. Unrestricted access to groundwater data sources will help ensure continued stewardship of the groundwater basin by Agency staff and other surrounding entities with access to the acquired information.

These monitoring wells will be situated as follows:

T29S/R27E – SECT 33 (area near Brimhall and Coffee Roads)
Latitude: 35° 21’ 59”
Longitude: -119° 5’ 23”
Within the City of Bakersfield Service District
Depth of Wells: 250 feet, 500 feet, and 700 feet below ground surface (BGS)

The location of the Joint Use wells in relation to the contamination plumes and the proposed monitoring wells is shown in Figure 2 (Attachment 4.2)

Preliminary Contract documents including a site map, detail drawings of a monitoring well, and technical specifications for construction of the wells are attached as Attachment 5.2. Construction specifics are summarized in the Work Plan.

Rosedale and ID4 Joint Use Groundwater Recovery Program

ID4 has developed a joint water management program with Rosedale that increases the groundwater recovery capacity available to ID4. This program allows ID4 to exchange an equal amount of surface water supplies, when available, with Rosedale for a previously banked groundwater account. Additionally, the Joint Use Program provides ID4 with the ability to recharge surface water within Rosedale for future recovery from the Joint Use facilities, which are owned and operated by ID4. The Joint Use Program increases the amount of recovery capacity available to ID4 and increases the amount of dedicated groundwater storage capacity available to ID4. Construction of the Joint Use facilities was completed in 2007. The program included 45 cubic feet per second (cfs) of water well recovery capacity, 60 cfs of transmission pipeline capacity and 60 cfs of CVC turn-in capacity. Rosedale paid for the construction of seven wells, pipelines and turn-in facilities to the CVC, and ID4 operates and maintains the wells as part of its expanded Allen Road Well Field.

Kern County Water Agency – Improvement District No. 4
Groundwater Monitoring Well Installations

According to a groundwater study completed by Kenneth D. Schmidt and Associates (Schmidt) for the Joint Use Program, a number of groundwater quality problems have been experienced in some parts of the area, including high dibromodichloropropane (DBCP), ethylene dibromide (EDB) and nitrate concentrations, and high uranium activity in shallow groundwater. Trace contamination of shallow groundwater by organics has also been found near refineries in the Rosedale area. Altered movement of contaminant plumes due to pumping of the project wells is a concern. Schmidt's report is included as Attachment 4.3.

During wet years, the potential migration pathway of these contaminants is to the northwest and along a trajectory which misses the capture zone of the Joint Use well field. The issue of concern is that during dry years when the gradient swings westerly, the potential migration pathway of these contaminants is directly toward the Joint Use well field. Furthermore, based on Agency groundwater maps for the area, the potential recharge of water in the Kern River channel just east of these plumes causes steep localized gradients which may accelerate the rate of movement of these plumes. In addition to the recharge gradients, non-program water wells to the east of the program well field will have capture zones of their own which may also create westerly gradients which draw these plumes toward those wells and, hence, also closer to the Joint Use capture zone. It is possible that, over time, these known contaminant plumes and any other unknown plumes may migrate to the Joint Use area.

A further study of the impacts of the Joint Use project, Sierra Scientific Services (Sierra) (Attachment 4.4) points out the following key issues:

> *The number one key issue is that for this project to operate as predicted and desired, the total recharge to this area must start out and remain in long term balance with total recovery in this area. If the area remains balanced, then drawdown and contaminant capture impacts will remain within the predicted limits, subject to the identified uncertainties of this analysis. If the area becomes unbalanced, then draw-downs will worsen and contaminant capture dynamics may change significantly. The project itself is based on a program which is required to operate in balance but this project is only 25% of the identified recovery capacity in the area and the predicted recharge/recovery impacts, operating criteria, and water supply forecasts for these other wells are unknown.*
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> *The second key issue is that it is very important to protect the good water quality within the well field capture zone against any contamination entering the flow paths leading to the wells. There may be sources of contamination within the 30-year capture zone that we have no knowledge of. There are no operational safeguards that we know of to prevent contaminant capture if this is the case other than not pumping. The detection and delineation of unknown contaminant plumes doesn't lessen the seriousness of their eventual impacts unless the knowledge leads to mitigation or remediation. Such detection monitoring is beyond the scope of almost any affordable monitoring program unless there are abundant wells of opportunity up-gradient of the well field that may be monitored in conjunction with dedicated monitoring wells which are installed in critical flowpaths* [See Figure 2 – Attachment 4.2]. *One important mitigation against the potential encroachment of contaminant plumes from the east is through the deliberate and sustained placement of local recharge to maintain the local ground water gradients as favorable levels and gradients.*

The third key issue is that this project represents only 25% of the total installed recovery capacity in the general area, which means that at any given time, some or all of an observed drawdown at some location could be caused by non-project pumping. Since project impacts may well occur at the same time as impacts from other sources, the combined draw-downs from project and non-project wells may be significantly greater that we have predicted due to project pumping alone. During climatic dry cycles, every well in the area may be pumping, and surrounding domestic wells may be significantly impacted. The cause-and-effect relationship between project and non-project wells and their proportionate share of the total impact cannot be easily resolved by direct observation alone. In our opinion, early and continued verification of the project impact model through well testing and drawdown monitoring will provide an important and useful baseline database in case the project has to defend itself against claims for impact damages.

The fourth key issue is that the dominant cause of water level fluctuations may be the basin-wide response to the climatic wet/dry cycle. The rise and fall of the local water table due to the climate cycle is completely independent of and may well be bigger in magnitude than the combined impacts of local recharge and local pumping. For example, in the 20 years from 1984-2004 the water level in the project area has varied by more than 100 feet due to the impact of the climatic wet/dry cycle on the basin. In the decade from 1992-2002, the annual water level change due to non-pumping climatic factors was in the range of 20-30 feet in five different years. The project impacts and other local non-project impacts are superimposed on top of this broader, large-scale climatic trend. The generic cause and effect relationship between pumping and drawdown cannot be used to explain all three draw-downs without also considering the independent effects of basin-wide behavior on the local area.

The fifth key issue is that the quantitative results of this entire study are based on a limited understanding of the aquifer and on a very small data set of existing, available, and verifiable parameter values. In our opinion, the uncertainty in the calculated draw-downs is not just due to the natural variability of the aquifer itself, but in the complete lack of verifiable replicate data apart from the single reported values which we used, which prevents us from even determining the range of actual values let alone estimating the uncertainty in these parameters.

In our opinion, the existence of this project and the likelihood of many more to come, point out the need to improve the quantitative understanding of the Kern Fan aquifer hydrology beyond the current rudimentary state of knowledge. This project presents an opportunity for the groundwater community to greatly benefit and from the results of testing the monitoring that could be incorporated into this project. In some respects, this impact study is the first of its kind in this area, and the project operator has every opportunity to set the standard for good basin management within the program.

Therefore, as detailed by the Schmidt and Sierra reports, the proposed construction of three monitoring wells will provide an important source of information both for plume tracking, as well as for basic hydrogeologic information.

Shell Oil Refinery

Two methyl tert-butyl ether (MTBE) plumes have been identified at the former Shell Oil Refinery. Both of these plumes are primarily located between the Calloway Canal and the AT&SF railroad tracks as shown in Figure 2 (Attachment 4.2). The direction of migration of this plume is to the west-southwest. The flow direction is more predominant during drought periods when there is substantial pumping of wells in the area southwest of the refinery and there is no recharge ridge present along the Kern River. Overall, there is a lack of monitoring wells to determine the down gradient extent of the MTBE plumes from the Shell Refinery.