# SIMULATION OF INCREASED GROUND WATER WITHDRAWALS IN THE LOWER BOISE RIVER BASIN

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# Abstract

Currently there are over 450 unprocessed applications for new water rights in the lower Boise River basin, an area of southwestern Idaho that is home to approximately 35% of Idaho's population. The additional water is being requested for irrigation, municipal, commercial, and aesthetic uses. The water requested for non-supplemental purposes could represent approximately a 20% increase over 1996 levels of ground water withdrawals. The potential impact of processing these new well applications on regional ground water levels was evaluated using the Treasure Valley ground water flow model (Petrich, 2004a).

The Treasure Valley ground water flow model was constructed with the USGS MODFLOW code (McDonald and Harbaugh, 1996) and calibrated to steady-state hydraulic conditions using the PEST parameter estimation code (Doherty, 2000). The calibration was based on over 200 water level and 6 vertical head difference observations. Predictive analysis (Doherty, 2000) was used to estimate worst (and best) potential outcomes given parameter non-uniqueness in the calibrated model.

The simulation results indicated that aquifer level declines might occur if all of these currently unprocessed, non-supplemental, ground water rights were granted. Water level declines could be in the range of 10 feet to over 40 feet, depending on valley location, actual amount of withdrawals, and depth of extraction. Local areas of simulated declines were noted south of Lake Lowell in an area in the northwestern portion of the model and in portions of an area between Boise, Meridian, and Kuna. These may be associated with unrealistically high simulated stresses or excessively low simulated aquifer parameter values. The simulated declines also may indicate potential problems in supplying the increasing ground water demands in these areas.

The least declines were predicted in the uppermost model layer, which corresponds roughly with the uppermost 200 feet of aquifer. Most of the estimated new simulated withdrawals in the uppermost layer resulted in decreased discharge to drains.

The simulated declines presented in this report are the result of both calibration effects and increased withdrawals. Additional comparisons between minimum base calibration heads and prediction heads should be conducted to refine these predicted declines.

# Acknowledgements

The work described in this report was conducted as part of the Treasure Valley Hydrologic Project (TVHP). Participants in the TVHP include the Idaho Department of Water Resources (IDWR), the Idaho Water Resources Research Institute (IWRRI), University of Idaho (UI), United Water Idaho, Inc. (UWI), Boise State University (BSU), U.S. Geological Survey (USGS), U.S. Bureau of Reclamation (USBR), Idaho Water Resource Board (IWRB), Ada and Canyon Counties, and the cities of Boise, Nampa, Caldwell, Meridian, Kuna, and Eagle. The project was funded by the U.S. Environmental Protection Agency, the Idaho State Legislature, UWI, and the IWRB. In addition, in-kind services were provided by UWI, USGS, and the USBR.

The author wishes to acknowledge the following contributions to this report:

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- Dr. John Doherty (Watermark Computing, Brisbane, Australia) helped develop and apply PEST (parameter estimation code) for the model calibration and predictive analysis.
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# 1. INTRODUCTION

## 1.1. Background

The lower Boise River basin (Treasure Valley) of southwestern Idaho has experienced substantial population growth, local ground water declines, and periodic drought conditions in the last two decades. There is a substantial demand for new ground water withdrawals.

New water uses in Idaho require an application to the Idaho Department of Water Resources (IDWR) for a new water right. As of May 2002, there were over 450 unprocessed new water right applications in the Idaho Administrative Basin 63, which includes the lower Boise River basin (Figure 1-1). The unprocessed applications include water right requests filed since July 1987 for primary and supplemental irrigation, commercial, and aesthetic uses. The IDWR wanted to evaluate the potential impact of new ground water withdrawals associated with unprocessed well applications.

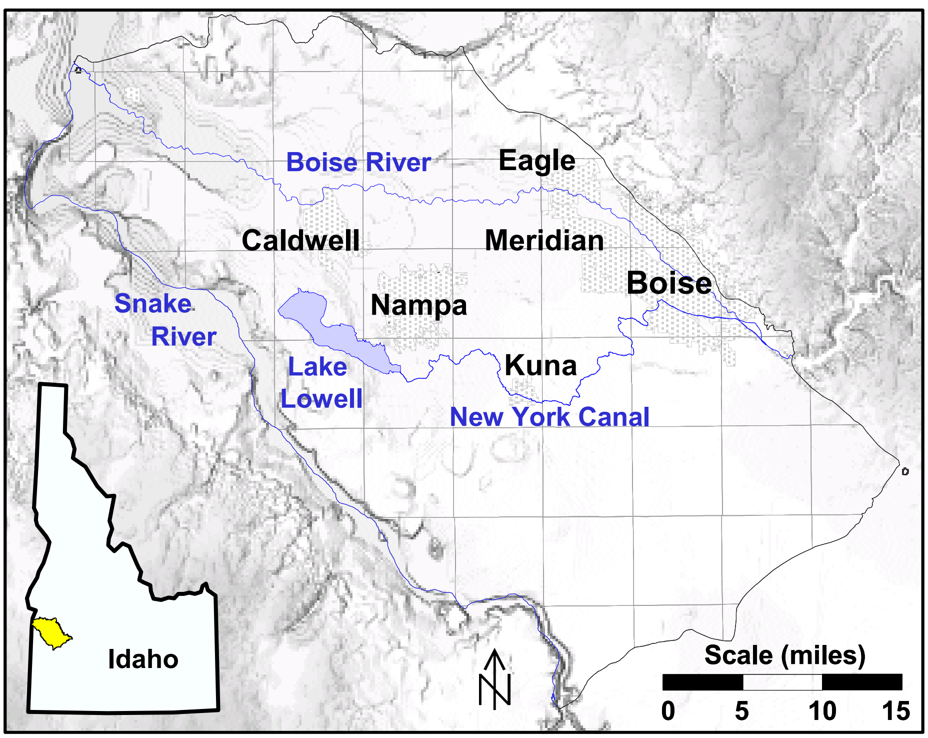


Figure 1-1: The lower Boise River basin and adjoining areas of southwestern Idaho.

## 1.2. Purpose and Objectives

The purpose of these simulations was to evaluate the potential impacts of increased ground water demands on current ground water levels. Specific objectives included the following:

1. Estimate the amount and nature of water use associated with the unprocessed water right applications.
2. Estimate the spatial and vertical distribution of new ground water withdrawals represented in the unprocessed claims.
3. Simulate the potential impact on ground water levels if the currently unprocessed, non-supplemental[1] water right applications were processed.

## 1.3. Report Scope

This report describes one water use scenario evaluated as part of the TVHP. The simulations described herein are based on the hydrologic conditions presented in Petrich and Urban (Petrich and Urban, 2004) and the numerical ground water flow model described in Petrich (Petrich, 2004a). Other research conducted as part of the TVHP is summarized in Petrich (Petrich, 2004b).

[1] See Section 2.1 for an explanation of non-supplemental irrigation.

# 2. METHODS

This section describes the (1) scenario development, (2) Treasure Valley ground water flow model development and calibration process, (3) predictive analysis simulations, and (4) assumptions and limitations inherent to the predictive analyses.

## 2.1. Scenario Development

This scenario consisted of evaluating potential impacts of unprocessed water right applications for non-supplemental water[2] on regional ground water levels. This scenario was limited to new non-supplemental withdrawals for the following reason. The simulations were conducted under steady-state conditions, for which withdrawals were assumed to represent equilibrium values. The use of non-supplemental water was thought to be more consistent on a year-to-year basis. The amount of water required for supplemental irrigation varies from site to site and season to season, depending on the availability of surface water (i.e., the amount of supplemental water used for irrigation presumably is much less for a wet year with adequate surface water storage and availability of irrigation water than for a dry year). Because of the variability, the supplemental withdrawals are more difficult to estimate. Supplemental withdrawals would represent additional withdrawals from those simulated in this scenario. Additional simulations that include estimates for these withdrawals should be conducted.

Estimates for the amount of water represented by the unprocessed water right applications were made from the information provided in the water right applications. Water right applications for ground water uses generally include all or some of the following information: anticipated diversion rate, diversion volume, diversion location, specific water use (e.g., irrigation, commercial, stockwater, domestic, aesthetic, etc.), acreage to be irrigated, whether or not the water will be used for supplementing surface water rights, and a target well depth. Some of the uses are mixed (e.g., commercial and stockwater use). The listed diversion rates are generally listed as maximum rates and do not necessarily reflect average application rates. The season of use, which for some uses is limited, is generally not included in the water rights applications but is established by IDWR in the permitting process.

[2] Supplemental withdrawals are generally used to supplement surface water irrigation. Non-supplemental withdrawals are used for (1) non-irrigation purposes and/or (2) irrigation in areas where surface water is unavailable.

A summary of currently unprocessed water right applications was prepared by the IDWR. Ground water withdrawals were estimated from the water right application data in the following way:

1. Applications for new ground water withdrawals in Basin 63 submitted between July 9, 1987, and February 19, 2002, were compiled; applications for new surface water uses were excluded from the analysis.
2. Requested diversion data were separated based on whether or not the request was for supplemental (to surface water) uses.
3. Anticipated withdrawals of ground water from geothermal aquifers underlying the "cold water" system were excluded from the analysis.
4. Some applications listed a total diversion rate for a given area and listed the same diversion rate for individual points of diversion within the area. In these cases, the total diversion rate was divided equally among the multiple points of diversion.
5. Consumptive use for irrigation withdrawals was estimated in two ways. First, per-acre consumptive use was estimated based on the average per-acre Surface Energy Balance Algorithm for Land (SEBAL) evapotranspiration (ET) rate between March 15, 2000 and October 15, 2000 (Kramber, 2002). The annual consumptive use for new irrigation withdrawals was assumed to be the average ET within the model cell in which the new irrigation would occur. The average ET for these cells was 2.03 feet per year (ft/yr) (Table 2-1). However, this average ET rate was deemed too low. The SEBAL ET is based on current land use. Some of the applications for new withdrawals are to irrigate non-irrigated lands, in which case the current ET does not necessarily reflect the ET rate under irrigated conditions.

   The second approach was to assume a uniform 2.5 feet per acre (ft/ac) consumptive use rate for the entire model domain. This approach does not capture the variability inherent in the spatial distribution of consumptive use in the valley but may represent a more realistic average consumptive use rate. Thus, the diversion rates for requested irrigation water were limited to these estimated withdrawal amounts based on a uniform consumptive use of 2.5 ft/ac, regardless of the diversion requests.
6. It was assumed that the requested diversion rate for non-irrigation water would generally be a maximum rate. The actual rates used over a 12-month average are often less than the maximum requested rate. Thus, the anticipated ground water diversion rate for non-irrigation uses was assumed to be one-half the requested amount, unless other information was available. For some applications, such as fire protection, aesthetic uses, etc., it was assumed that the average annual rate would be substantially less than the requested rate.

7. For those applications listing anticipated target depths, the ground water withdrawals were assigned to model layers[3] based on the target depth listed in the water right application (Table 2-2). This was done using the MODFLOW layer top and bottom data (exported from GMS-MODFLOW files).
8. Many applications did not include anticipated target depths. Ground water withdrawals from these applications were distributed among model layers based on the same *volume* proportion represented by the applications that did include target depths.

| Statistic | Value (ft/yr) |
|---|---|
| Maximum ET | 3.66 |
| Minimum ET | 0.30 |
| Mean ET | 2.03 |
| Range | 3.37 |
| Standard Deviation | 0.67 |

Table 2-1: Summary of SEBAL ET rates for the model cells in which new withdrawals would occur.

<table>
<tr><th></th><th>Layer 1</th><th>Layer 2</th><th>Layer 3</th><th>Layer 4</th><th>Total</th></tr>
<tr><td>Number of unprocessed applications specifying target depth within assigned model layer</td><td>117</td><td>17</td><td>4</td><td>2</td><td>140</td></tr>
<tr><td>Percent (based on applications specifying target depths)</td><td>83.57%</td><td>12.14%</td><td>2.86%</td><td>1.43%</td><td>100%</td></tr>
<tr><td>Total estimated withdrawal rate (represented by unprocessed applications) within model layers ($ft^3$/d):</td><td>1,591,011</td><td>364,591</td><td>128,890</td><td>30,432</td><td>2,114,924</td></tr>
<tr><td>Total estimated withdrawal rate (represented by unprocessed applications) within model layers (acre-feet/yr):</td><td>13,331</td><td>3,055</td><td>1,080</td><td>255</td><td>17,721</td></tr>
<tr><td>Percent (based on applications specifying target depths)</td><td>75.23%</td><td>17.24%</td><td>6.09%</td><td>1.44%</td><td>100%</td></tr>
<tr><td colspan="5">Number of non-supplemental applications included in scenario analysis (with and without target depths)</td><td>304</td></tr>
<tr><td colspan="5">Total estimated withdrawals (in $ft^3$/day) (based on applications with and without estimated target depths)</td><td>4,646,819</td></tr>
<tr><td colspan="5">Total estimated withdrawals (in af/yr) (based on applications with and without estimated target depths)</td><td>38,937</td></tr>
<tr><td colspan="5">Total estimated withdrawals (in af/yr) in 1996 (Urban and Petrich, 1998).</td><td>194,000</td></tr>
</table>

Table 2-2: Relative numbers of applications and withdrawal rates by model layer (with irrigation ET assumed to be 2.5 ft/yr).

[3] Model grid and layers are described in Section 2.2 and in Petrich (2004a).

The amount of estimated ground water represented in the non-processed water right applications for non-supplemental withdrawals (Table 2-2) was approximately 39,000 acre-feet per year (af/yr)[4]. The spatial distribution of these estimated new ground water withdrawals is shown in Figure 2-1 through Figure 2-4. This represents approximately 20% of the estimated 194,000 af of total ground water withdrawals in 1996 (Urban and Petrich, 1998)[5]. However, the new applications represent a larger proportion of water being withdrawn from the uppermost layer (Figure 2-5 and Figure 2-6) than the estimated 1996 withdrawals. These figures (Figure 2-1 through Figure 2-6) illustrate both the estimated withdrawals based on applications in which target depths were specified, as well as those applications for which estimated withdrawals were distributed among four model layers.

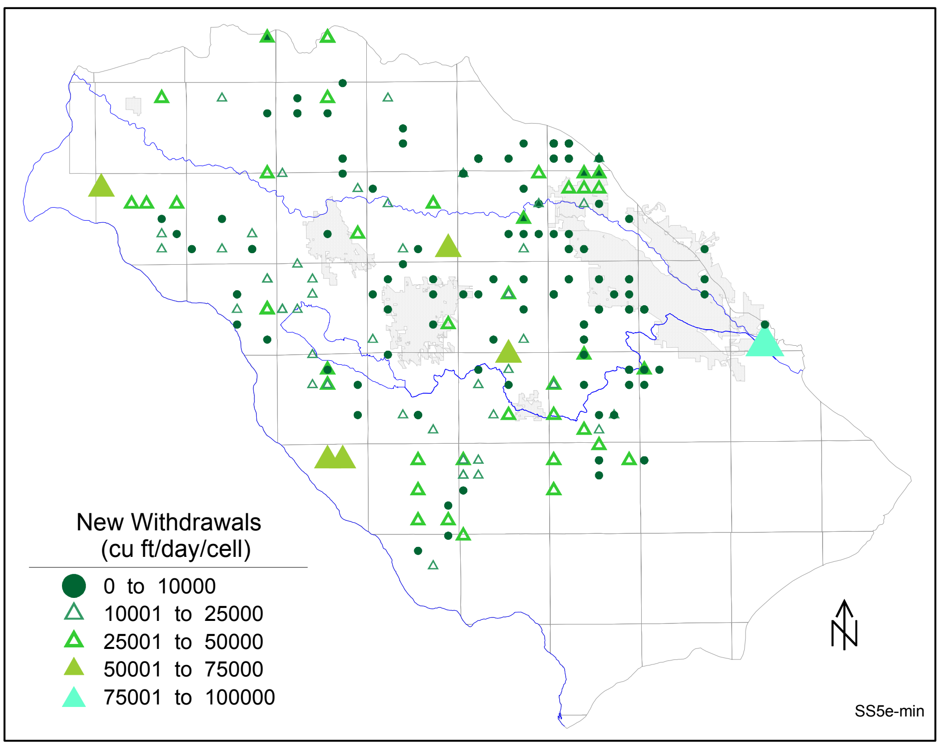


Figure 2-1: Distribution of estimated increased ground water withdrawals, layer 1.

[4] Data contained in "*Basin 63 Applications.xls*."
[5] The original estimates for total 1996 ground water withdrawals were 197,000 af; these estimates have since been revised downward to 194,000 af (S. Urban, written comm., 2003).

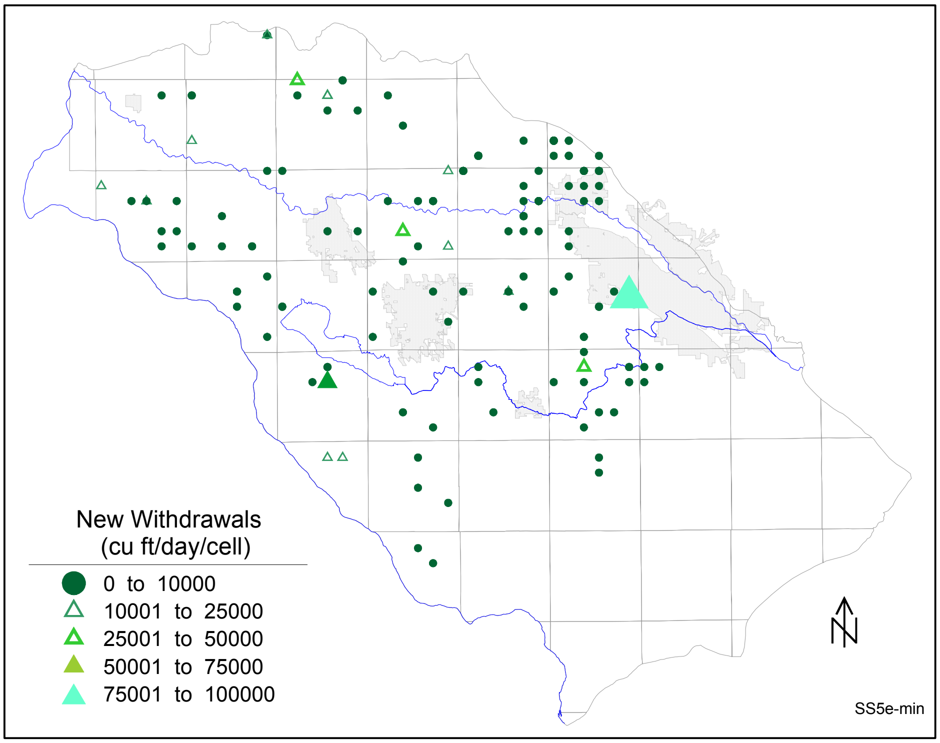


Figure 2-2: Distribution of estimated increased ground water withdrawals, layer 2.

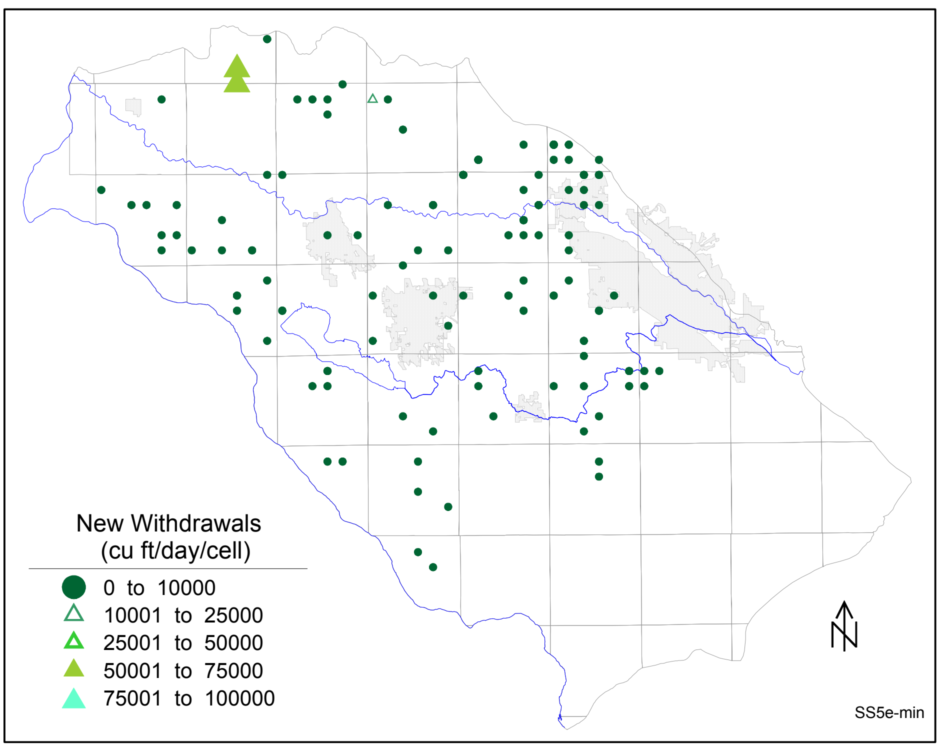


Figure 2-3: Distribution of estimated increased ground water withdrawals, layer 3.

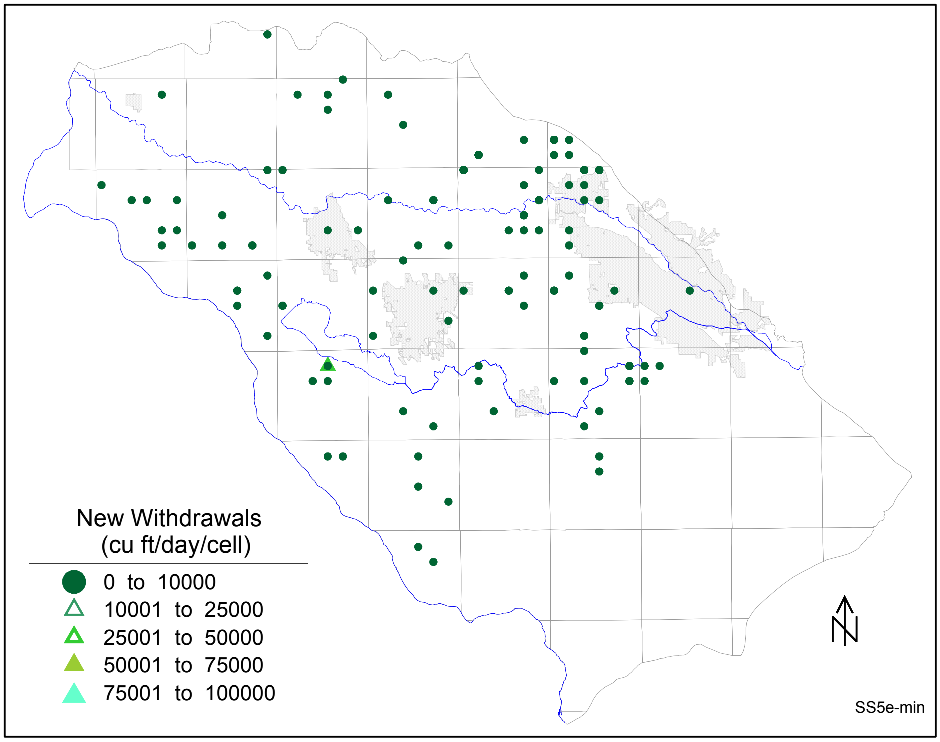


Figure 2-4: Distribution of estimated increased ground water withdrawals, layer 4.

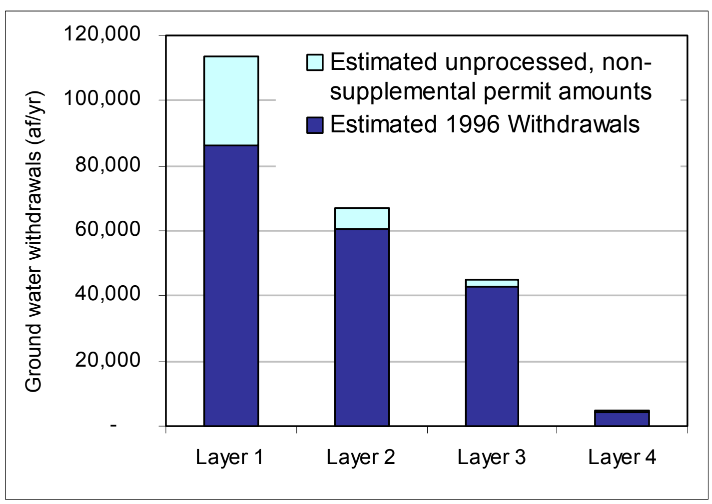


Figure 2-5: Estimated combined 1996 and unprocessed, non-supplemental permit withdrawals.

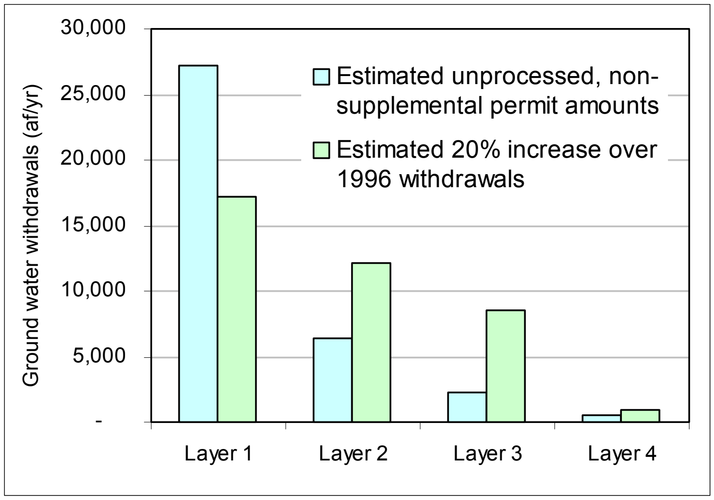


Figure 2-6: Comparison of estimated unprocessed, non-supplemental permit withdrawals and a 20% increase over estimated 1996 withdrawals (Petrich, 2004a).

## 2.2. Model Description

These scenario simulations were conducted with the Treasure Valley ground water flow model (Petrich, 2004a). The model is based on the three-dimensional, finite difference, USGS MODFLOW code (Harbaugh et al., 2000; McDonald and Harbaugh, 1988; McDonald and Harbaugh, 1996). The Treasure Valley ground water flow model was designed to simulate ground water flow on a regional (basin) scale. A model simulating flow on this scale is suitable for evaluating changes in water levels resulting from regional changes in land use and/or increases in withdrawals.

The model domain was discretized into a four-layer, $61\times 49$ uniform grid with square cells representing an area of one square mile (Figure 2-7). Model layers in the Treasure Valley model were defined based on an arbitrary datum connecting the Boise and Snake River elevations (Petrich, 2004a). The two upper model layers were each 200 feet thick; the two lower layers were each 400 feet thick.

Boundary conditions were simulated as no-flow (perimeter and bottom surface), specified flux (Snake River and along Boise Foothills), head-dependent flux (Boise River[6] and Lake Lowell[7]), or free surface (Figure 2-7). Simulated fluxes included recharge, withdrawals, flow to and from the Boise River and Lake Lowell, and discharge to drains and to the Snake River. Model inputs (underflow, recharge, extraction rates, etc.) were averaged over one-year periods.

[6] Simulated using the MODFLOW “River” package.
[7] Simulated using MODFLOW “General Head Boundary” package.

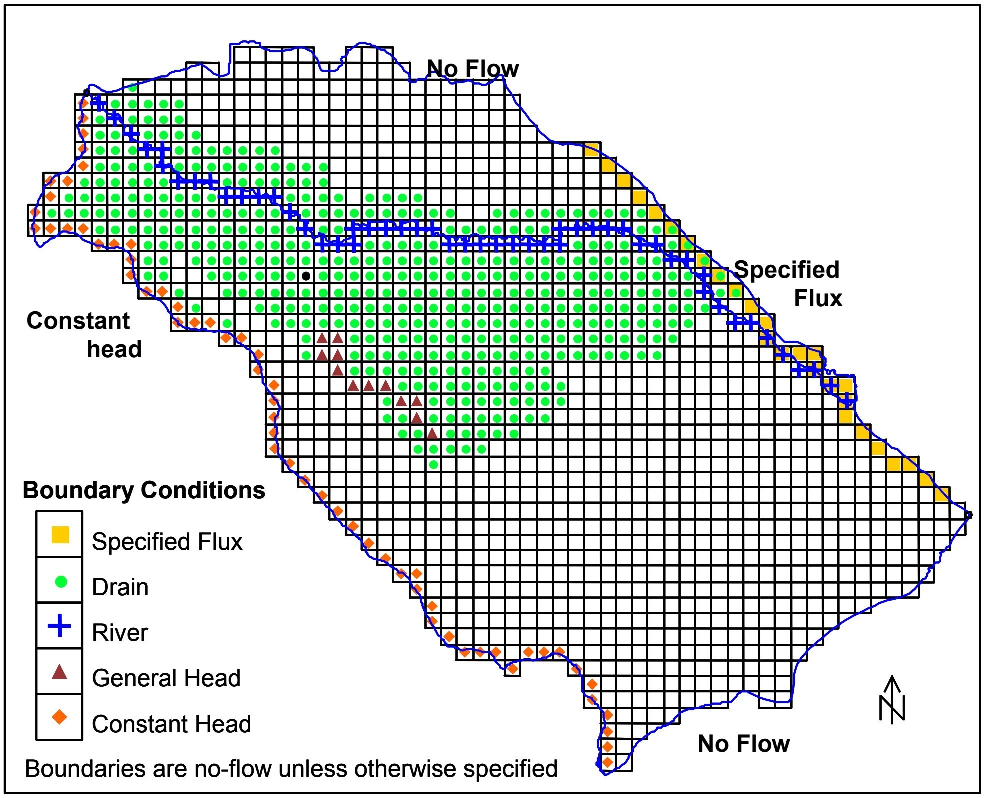


Figure 2-7: Model grid and boundary conditions.

The Treasure Valley model was calibrated to steady-state hydraulic conditions using the parameter estimation code PEST (Doherty, 1998; Doherty, 2000). Primary calibration parameters for the steady-state calibration were horizontal hydraulic conductivity ($K_h$) and vertical hydraulic conductivity ($K_v$). These parameters were defined for each layer at 42 pilot point[8] locations (Figure 2-8), resulting in a total of 143 model parameters (plus 121 tied parameters).

Observations included 200 head measurements ("head" observation group) and 6 assumed or observed vertical head difference values ("grad" observation group). The head measurements consisted of average water levels based on measurements conducted in spring and fall 1996. Regularization was used to incorporate 2,747 articles of "prior information" describing "zero difference" relationships between parameters, which increased the number of parameters that could be estimated while maintaining numerical stability in the inversion process.

[8] See Petrich (2004a) for an explanation of pilot points.

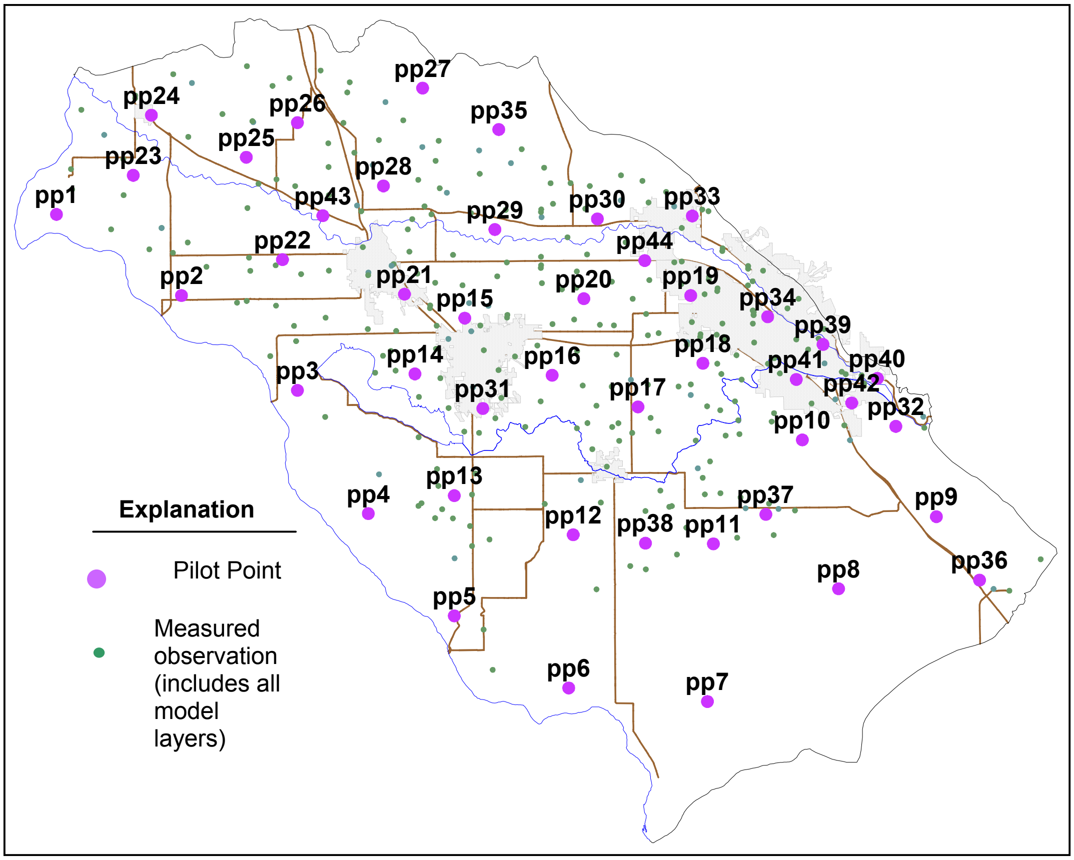


Figure 2-8: Pilot point locations.

## 2.3. Predictive Analysis

All calibrated ground water models have uncertainty associated with individual parameter values. Because the model predictions depend on these parameter values, it follows that the model predictions also have uncertainty. The goal of predictive analysis is to find the worst (and best) possible outcomes while constraining parameter values to those that provide a good fit between calculated and measured observations under base simulation stresses. Thus, PEST ran base simulation stresses (i.e., base-simulation withdrawals) and prediction stresses (i.e., increased withdrawals) iteratively until it found a set of parameter values that would both calibrate the model (under base conditions) and provide the minimum (or maximum) water levels associated with the additional withdrawals.

Thus, calibration with predictive analysis results in a parameter set that gives the worst (and best) outcome within the context of a calibrated model. There are a number of variables influencing the operation of PEST's predictive analyzer. The base calibration is influenced by (1) the number and disposition of measurements used for calibration and (2) the level of fit between these and model outputs achieved through the calibration process (as represented by the objective function, i.e., sum of the squared residuals [$\Phi$]). Setting the target too low forces PEST to introduce heterogeneities into the model domain that may or may not exist; that is, it results in “over-fitting” of parameters. The target objective function was therefore set to achieve a reasonably good fit without unrealistic parameter value distortion.

Smoothing constraints employed in the regularization process were maintained in the predictive analysis process. The prior information weights from the base simulation were multiplied by the optimized weight factor determined through regularized inversion (Petrich, 2004a). Thus, the predictive analysis process was prevented from introducing excessive heterogeneity into the model domain under predictive conditions in order to achieve unduly pessimistic predictions. The calibration target for the predictive analysis was set approximately 7% higher than the prior lowest calibration objective function value. These and other model construction choices influenced the predictive analysis.

Predictions of the impact from new aquifer stresses (e.g., ground water withdrawals) are calculated at one or more prediction points within the model domain. PEST attempts to maximize (or minimize) the average head values at the selected prediction points[9]. Thus, the number of points and the spatial and vertical distribution of the points influence the simulation results. Twelve prediction points (Figure 2-9) were distributed throughout the central portion of the model domain (which was of primary interest for model predictions). Predictions were calculated within the top three layers at each prediction point (i.e., 36 total points).

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[9] The hydrologic impacts of the additional withdrawals are being simulated throughout the model domain. PEST simply uses the prediction points during the calibration process as reference points for simulating maximum or minimum responses.

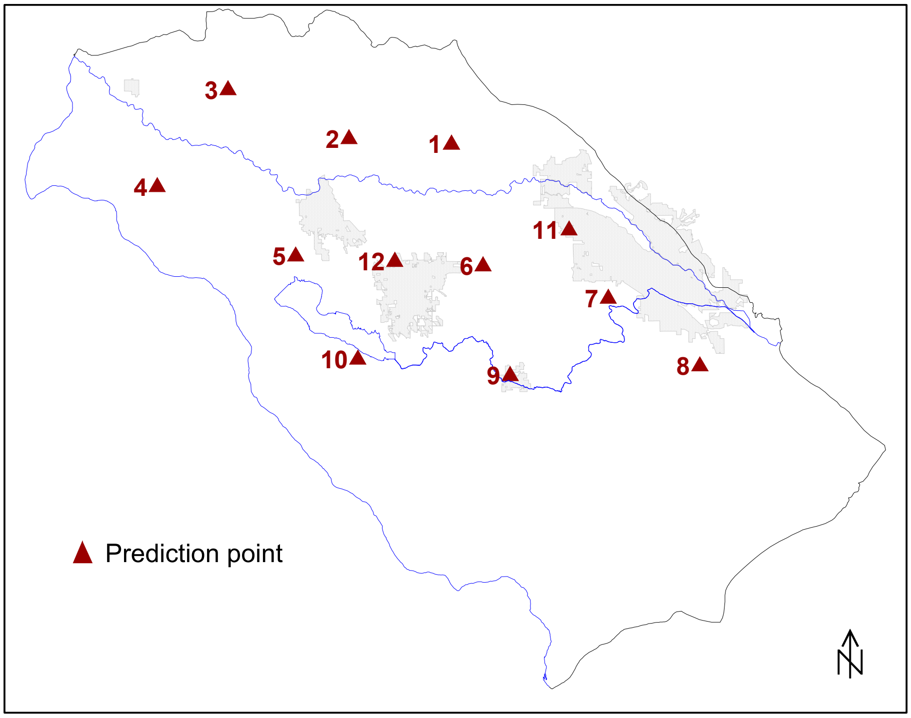


Figure 2-9: Prediction point locations.

## 2.4. Assumptions and Limitations

There are many assumptions, limitations, and potential errors associated with the numerical simulation of ground water flow (Table 2-3). These assumptions and limitations should be kept in mind when reviewing model results.

There are several specific potential sources of error in this Treasure Valley model. First, there is a high degree of geologic uncertainty throughout the system. Many strata, although substantial, are not spatially continuous over the model domain. While it is clear that there are shallow and deep aquifers, with markedly different flow characteristics, residence times, and recharge rates, there are not clearly identifiable strata that separate these aquifers over the entire model domain. There are some areas within the model domain with little or no hydrogeologic data (e.g., southern Ada County) because few or no wells have been drilled in these areas. Horizontal and vertical aquifer heterogeneity is seen in lithologic, chemical, and aquifer test data. In addition, faulting can and does influence ground water flow. The locations of some faults are known or have been inferred, and offsets of some of the faults appear to be greater than 800 feet, but the hydraulic influences of most faults are unknown.

It is impossible for a model to fully represent the hydraulic heterogeneity existing in a system as geologically complex as that in the Treasure Valley. Hydraulic properties in a calibrated model are "integrated" or "averaged" hydraulic properties. There is potential for substantial error in a model prediction that depends on geological heterogeneity beyond that captured by the calibration process. Fortunately, the greater the spatial scale over which predictions are made, the smaller the error is likely to be.

Second, flux rates at boundaries are unknown. There is substantial uncertainty regarding estimates of the quantity and distribution of underflow into the model domain. Streambed and drain conductances are unknown, as are lakebed conductance values. However, streambed and drain conductances are relatively insensitive if they are high values, as was the case in this model.

Observation data were collected from a variety of wells. Some are clearly influenced by ground water pumping, either from within the observation well or from nearby wells. The elevations of some of the wells are known only within general limits (e.g., ±10 feet). Spatial discretization of areas with substantial variations in potentiometric surfaces (e.g., drawdown) can lead to model errors. Some water level measurements from shallow wells, if influenced by surface drainage, may lead to model calibration errors. Wells in which water levels were clearly influenced by surface topography were removed from the calibration (e.g., weights set to zero).

Parameter uncertainty is high in some portions of the model domain because of the lack of observation data. For example, there are few or no wells in some portions of southern Ada County. In general, there are fewer deep wells than shallow wells, and the distribution of deep wells is limited primarily to more highly populated areas, which limits the number of observation points for deeper aquifers in some portions of the model domain.

The water table elevation in some parts of the model domain is controlled by the elevation of land surface. The water table elevations in these areas do not contain information for estimating hydraulic conductivities in these areas, leading to high uncertainty in local $K_h$ estimates.

The nature of the steady-state simulations also contributes to parameter uncertainty. Flux data (e.g., recharge, withdrawals, etc.) were averaged over an entire year, even though the stress may have occurred during only one season (e.g., irrigation season). Observation data for the steady-state simulations also consisted of averaged water levels, based on spring and fall 1996 measurements.

| Category | Potential Limitations, Assumptions, and Errors |
|---|---|
| Potential conceptualization errors | Incorrect flow system conceptualization |
| | Incorrect application of numerical approach |
| | Incorrect layer and/or grid definitions |
| | Errors in assumed boundary conditions |
| | Errors in parameter regularization assumptions (*see note below)* |
| Basic ground water flow assumptions required for using MODFLOW | Ground water flow does not meet Darcian flow assumptions, which include the following: flow is laminar, fluid is incompressible, fluid density is constant, gravitational acceleration is constant, and water movement is caused by mechanical (e.g., hydraulic) gradients. |
| | Borehole storage is negligible. |
| | There is no change in hydraulic characteristics with respect to degree of saturation. |
| Limitations and assumptions associated with the discretization of space and time | Grid resolution is inappropriate for model objectives. |
| | Simulated head values are based on heads in surrounding nodes; steeply sloping and/or non-linear heads (or other dependent variable) and may not be accurately represented by finite difference grid. |
| | Aquifer characteristics, inflows, outlows, and other properties are assumed to be constant within a grid cell. |
| | Flux characteristics are assumed to be constant within time steps. |
| | Hydraulic properties are assumed to be constant in time. |
| | Wells are assumed to be fully penetrating in assigned layers. |
| | Simulated observations are averaged over too large an area (this may be a concern if water level observations are based on wells experiencing substantial drawdown). Model grid is not fine enough to reproduce head curvature in the vicinity of lines and points of groundwater extraction and inflow. |
| Potential causes for numerical errors | Model cells go dry |
| | Incorrect solution closure criteria |
| | Truncation error, roundoff error |
| Potential model input errors | Errors in recharge package inputs (e.g., data errors, interpolation errors, etc). |
| | Errors in well package inputs (e.g., data errors, interpolation errors, etc). |
| | Errors in drain package inputs (e.g., data errors, interpolation errors, etc). |
| | Errors in river package inputs (e.g., data errors, interpolation errors, etc). |
| | Errors in general head boundary package inputs (e.g., data errors, interpolation errors, etc). |
| Potential observation measurement errors | Physical measurement errors |
| | Water levels are influenced by pumping in observation well. |
| | Water levels are influenced by nearby pumping. |
| | Water levels observation are based on approximated or incorrect well elevation. |

Table 2-3: Sources of possible error leading to parameter uncertainty.

Calibration errors can result from incorrect parameterization, assignments of pilot point locations, and parameter regularization relationships. Parameter non-uniqueness and/or correlation can also lead to calibration errors.

Some indication of parameter uncertainty is given during the calibration process. PEST output includes parameter sensitivity values, which are strongly influenced by parameter correlation. However, it is important to remember that some parameter values may be highly uncertain but not relevant to a particular model prediction. Predictive analysis (Doherty, 2000) is therefore probably a more useful approach for evaluating a scenario in the context of various parameter uncertainties.

It is also important to note that no ground water model can be calibrated without some form of implicit or explicit regularization. Regularization is the process by which model parameterization is simplified to the extent that parameter estimation can take place. Where zones are used, regularization is implicit. Where PEST's regularization functionality is used, regularization is explicit, with regularization constraints enforced to the extent necessary (through calculation of an appropriate regularization weight factor). In either case, the complexity of the parameter estimation problem is reduced to a level that is compatible with the information content of the data used for calibration. The less the observation data, the greater the role of regularization in the calibration process.

The parameter field that results from the calibration process cannot be considered as the "true" hydraulic property field prevailing within the model domain; even if the fit between model outputs and field data is perfect. It is one of many possible parameter fields that could fit the data. Where PEST's regularization functionality is used, it is the smoothest of all of these fields; where zones are used, it is the "blockiest" of these fields. In either case, the calibrated field cannot reflect small- or even medium-scale heterogeneity of true aquifer hydraulic properties, for these are simply beyond the ability of the calibration process to capture.

In general, where model predictions depend on regional or averaged hydraulic properties, this model's performance should be relatively good. Where model predictions depend on local detail, use of this model may result in error, or a higher degree of uncertainty.

# 3. Results and Discussion

## 3.1. Introduction

Two simulations were conducted to explore potential effects of the increased withdrawals represented by unprocessed water right applications. The purpose of the first simulation (*SS5e-min*) was to find the minimum water levels resulting from the increased withdrawals (i.e., the maximum possible water level decline from the base case). The purpose of the second simulation (*SS5e-max*) was to find the maximum water levels (minimum decline from the base simulation) under the increased withdrawal scenario. Results from these simulations were compared to the base simulation (*SS2bc*) (see Petrich, 2004a, for a more detailed description of the base simulation).

## 3.2. Base Simulation

Parameter values from the base simulation (Petrich, 2004a) were used as starting points for the predictive analysis. Results from the base simulation are summarized in Table 3-1 and Figure 3-1. Potentiometric surface contour comparisons between observed and simulated heads from the base run are shown in Figure 3-2 through Figure 3-5 (see Petrich, 2004a, for more information about these comparisons).

| **Base Run Results (based on observations with PEST weights greater than zero)** | | | | |
|---|---|---|---|---|
| Contribution to objective function (Φ) from heads | | | 3,220 | |
| Contribution to Φ from regularization | | | 3,150 | |
| Contribution to Φ from gradients | | | 56.46 | |
| Highest eigenvalue | | | 1.176 | |
| Lowest eigenvalue | | | $1.89 \times 10^{-7}$ | |
| Number of PEST iterations | | | 50 | |
| Number of MODFLOW runs | | | ~14,300 | |
| **Run Statistics** | **Total** | **Layer 1** | **Layer 2** | **Layers 3 and 4** |
| Maximum positive residual | 73.59 | 62.86 | 57.05 | 73.59 |
| Minimum negative residual | -67.08 | -67.08 | -52.48 | -44.14 |
| Average absolute residual | 14.62 | 12.42 | 16.01 | 23.29 |
| Median abslute residual | 9.49 | 8.74 | 9.714 | 19.03 |
| Number of values | 200 | 140 | 29 | 31 |
| (Simulation *SS2bc*) | | | | |

Table 3-1: Run information for steady-state base simulation (Petrich, 2004a).

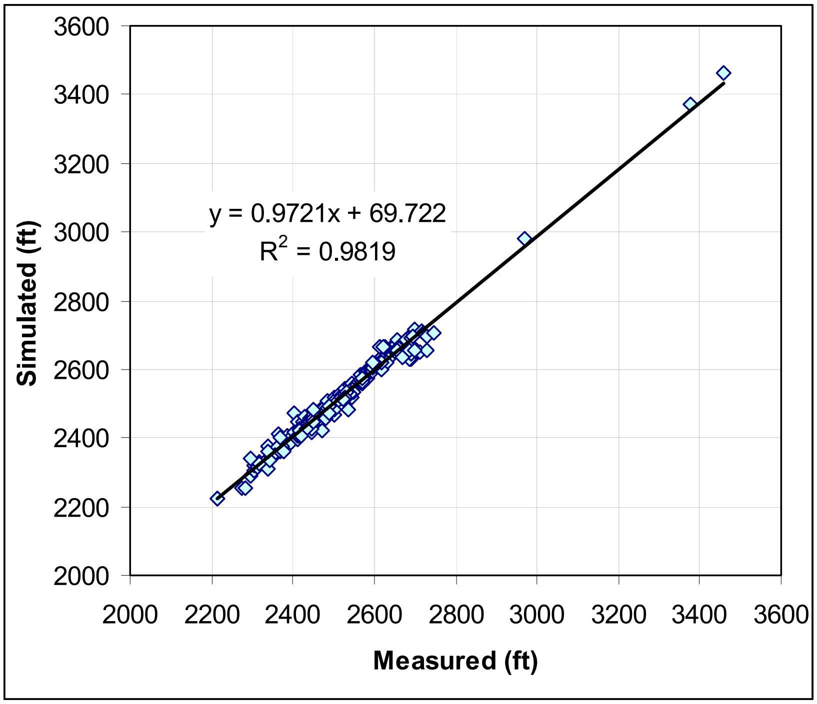


Figure 3-1: Simulated versus measured hydraulic head observations, steady-state hydraulic conditions (base simulation).

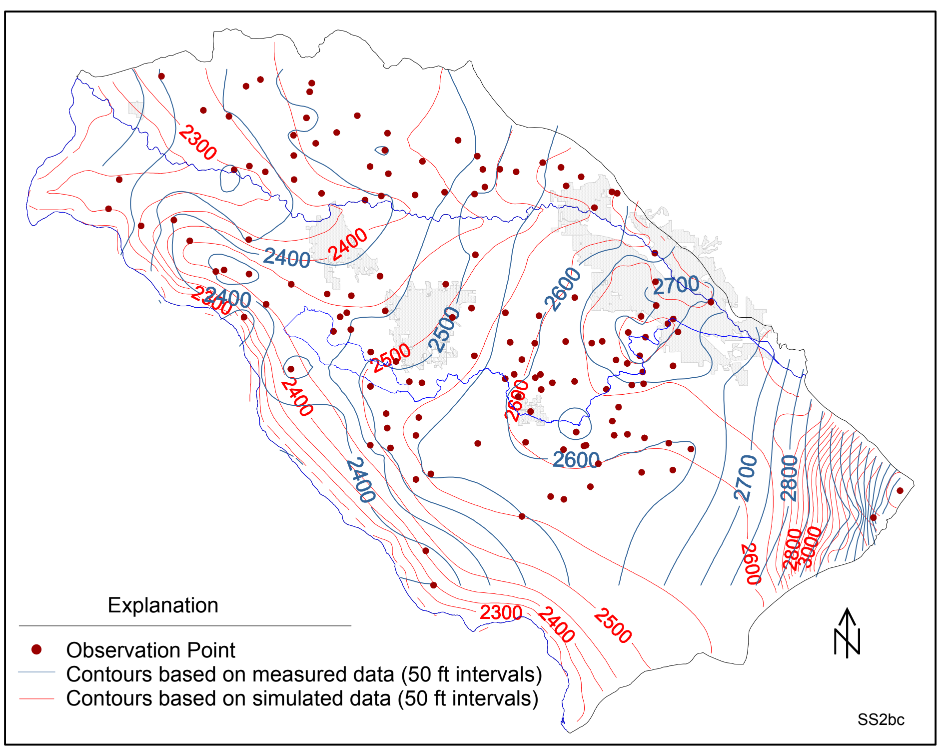


Figure 3-2: Simulated and observed potentiometric contours, layer 1 (base simulation).

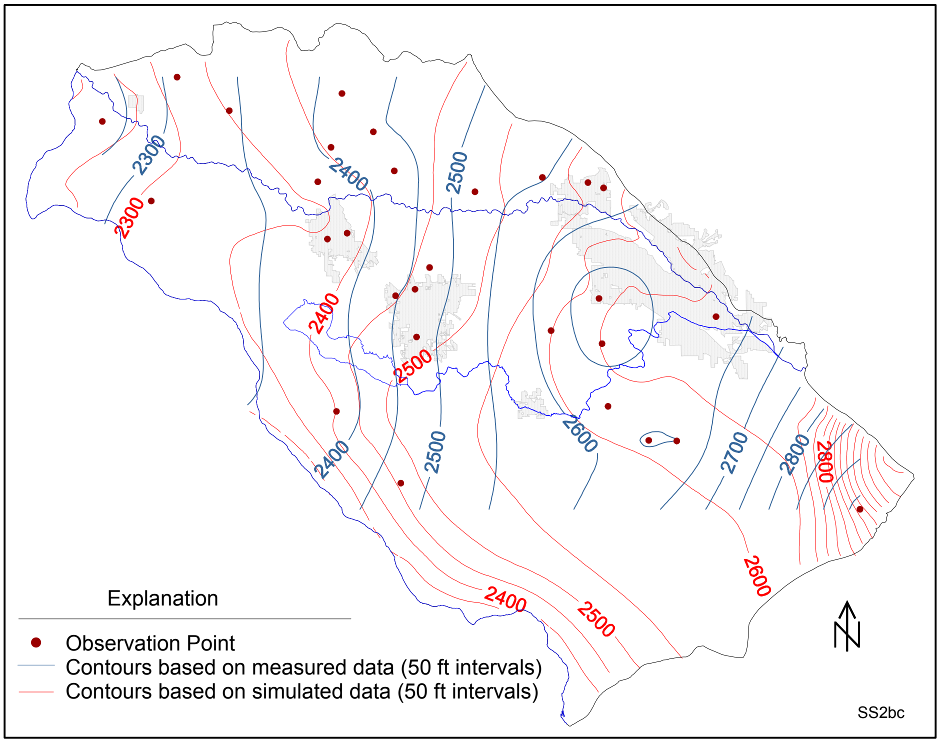


Figure 3-3: Simulated and observed potentiometric contours, layer 2 (base simulation).

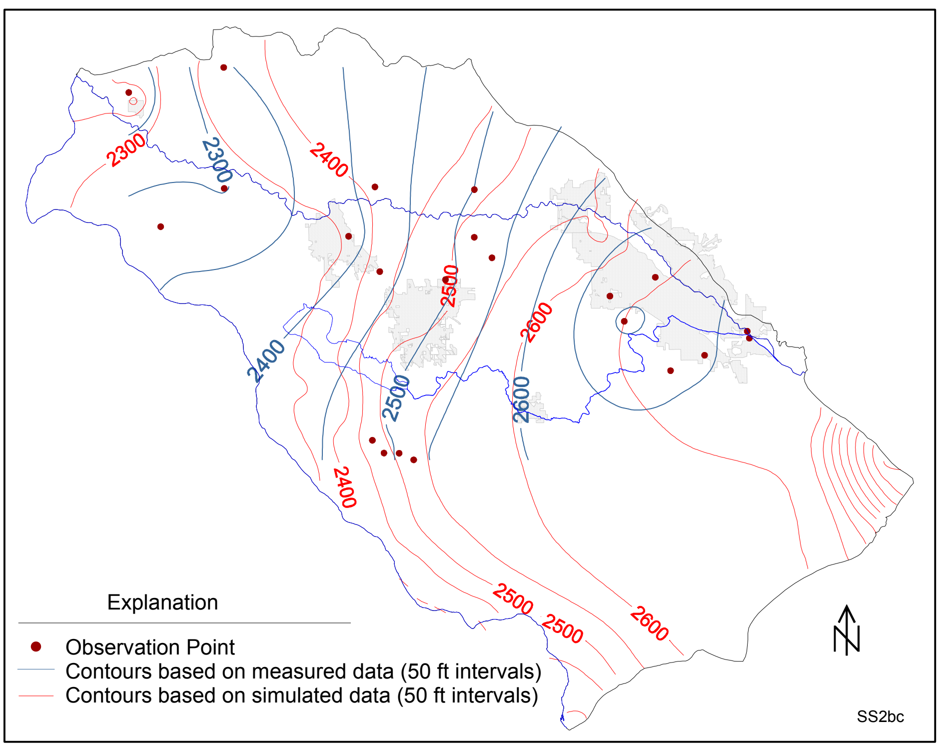


Figure 3-4: Simulated and observed potentiometric contours, layer 3 (base simulation).

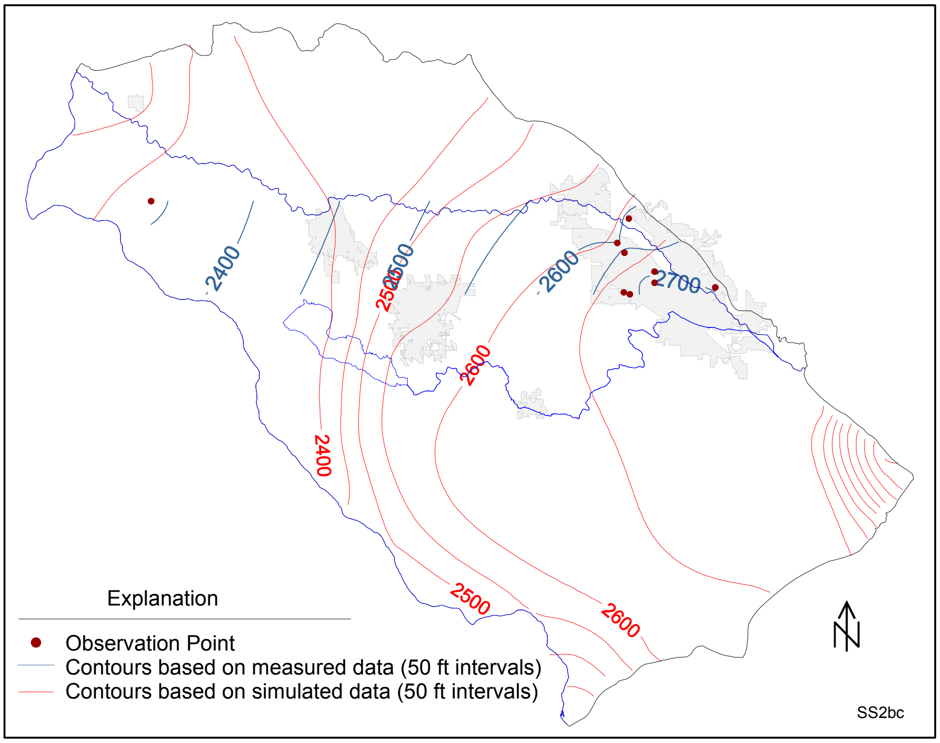


Figure 3-5: Simulated and observed potentiometric contours, layer 4 (base simulation).

## 3.3. Predictive Simulations

A summary of results for the minimum prediction (minimum average hydraulic head elevation at the predictive points) is given in Table 3-2 and Figure 3-6. Results for the maximum prediction are given in Table 3-3 and Figure 3-7.

Simulation of increased withdrawals using predictive analysis resulted in an average decline among 36 prediction points of 11.5 feet (Table 3-4) during the course of the predictive analysis simulation. The maximum simulated average predictive point elevation with the increased withdrawals was 9.5 feet above the beginning elevation, although a rise in water levels in response to increased withdrawals is conceptually impossible. The simulated water level changes are partly the result of increased withdrawals and partly the result of parameter uncertainty (see discussion in Section 3.4, beginning on page 31).

A comparison of volumetric budget components is given in Table 3-5. The comparison includes values from the base simulation (Petrich, 2004a), simulation of 20% across the board withdrawal increase over 1996 levels (Petrich, 2004a), and the minimum and maximum head elevations resulting from the simulation of increased withdrawals associated with unprocessed well applications. As with predicted water level changes, any changes in the volumetric budget components are the result of both increased withdrawals and parameter uncertainty (see discussion in Section 3.4).

| Results – Minimum Head Level Prediction (*SS5e-min*)<br>(based on observations with PEST weights greater than zero) | | | | |
|---|---|---|---|---|
| Initial objective function ($\Phi_{total}$) | | | 6427 | |
| Contribution to objective function ($\Phi$) from heads | | | 3220 | |
| Contribution to $\Phi$ from regularization | | | 3150 | |
| Contribution to $\Phi$ from gradients | | | 56.5 | |
| Ending objective function ($\Phi_{total}$) | | | 7061 | |
| Contribution to $\Phi$ from heads | | | 3742 | |
| Contribution to $\Phi$ from regularization | | | 3146 | |
| Contribution to $\Phi$ from gradients | | | 172.5 | |
| Highest eigenvalue | | | 1.34 | |
| Lowest eigenvalue | | | $1.84 \times 10^{-7}$ | |
| Number of PEST iterations | | | 3 | |
| Number of MODFLOW runs | | | 880 | |
| **Run Statistics** | **Total** | **Layer 1** | **Layer 2** | **Layers 3 and 4** |
| Maximum positive residual | 74.36 | 68.64 | 73.01 | 74.36 |
| Minimum negative residual | -64.47 | -64.47 | -51.12 | -43.28 |
| Average absolute residual | 15.76 | 12.13 | 21.98 | 26.33 |
| Median abslute residual | 11.84 | 7.73 | 22.45 | 25.29 |
| Number of values | 200 | 140 | 29 | 31 |

Table 3-2: Summary of results, minimum head levels.

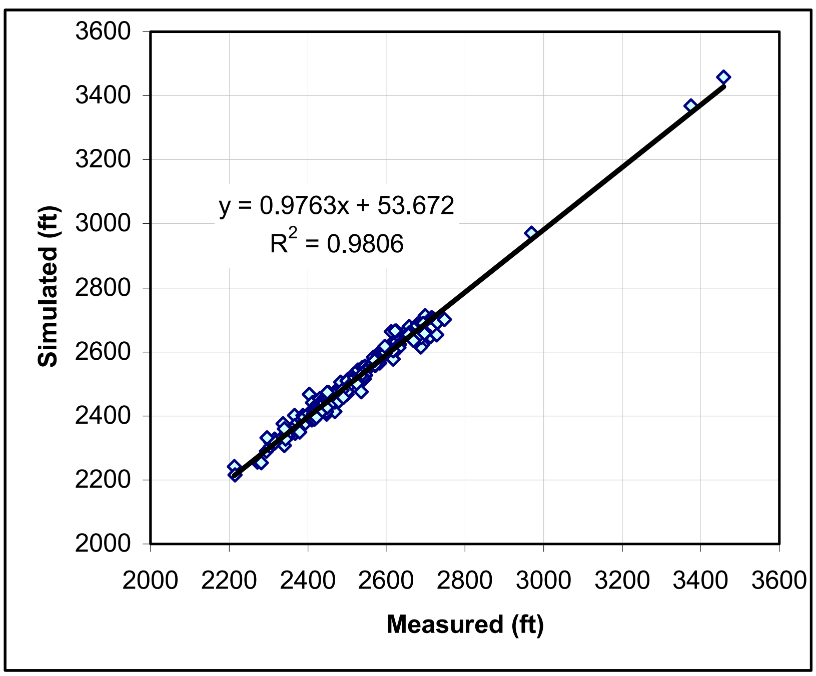


Figure 3-6: Simulated versus measured hydraulic head observations (minimum prediction; simulation *SS5e-min*).

| Results – Minimum Head Level Prediction (*SS5e-max*)<br>(based on observations with PEST weights greater than zero) | | | | |
|---|---|---|---|---|
| Initial objective function ($\Phi_{total}$) | | | 6427 | |
| Contribution to objective function (Φ) from heads | | | 3220 | |
| Contribution to Φ from regularization | | | 3150 | |
| Contribution to Φ from gradients | | | 56.5 | |
| Ending objective function ($\Phi_{total}$) | | | 6908 | |
| Contribution to Φ from heads | | | 3895 | |
| Contribution to Φ from regularization | | | 2992 | |
| Contribution to Φ from gradients | | | 20.5 | |
| Highest eigenvalue | | | 1.45 | |
| Lowest eigenvalue | | | $2.83 \times 10^{-7}$ | |
| Number of PEST iterations | | | 3 | |
| Number of MODFLOW runs | | | 871 | |
| **Run Statistics** | **Total** | **Layer 1** | **Layer 2** | **Layers 3 and 4** |
| Maximum positive residual | 74.93 | 57.01 | 53.72 | 74.93 |
| Minimum negative residual | -73.93 | -73.93 | -53.91 | -52.87 |
| Average absolute residual | 16.91 | 15.48 | 16.72 | 23.54 |
| Median abslute residual | 12.21 | 11.29 | 13.19 | 21.48 |
| Number of values | 200 | 140 | 29 | 31 |

Table 3-3: Summary of results, maximum head levels.

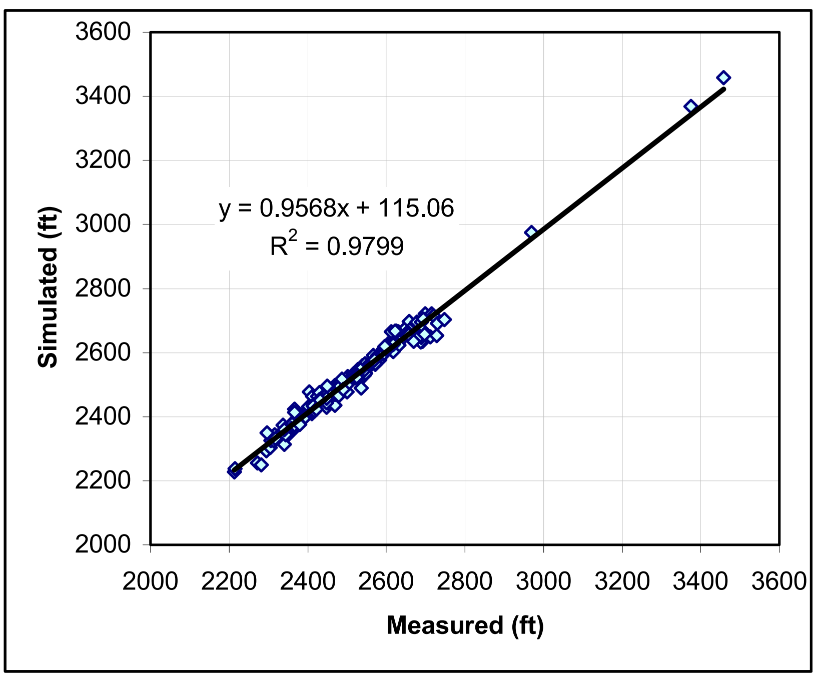


Figure 3-7: Simulated versus measured hydraulic head observations (minimum prediction; simulation *SS5e-max*).

| Average Prediction Point Heads (ft) | Base Simulation (*SS2bc*) | Scenario with Currently Unprocessed, Non-Supplemental Withdrawals | |
|---|---|---|---|
| | | Minimum Heads (*SS5e-min*) | Maximum Heads (*SS5e-max*) |
| Beginning head (36 points) | –– | 2,492.7 | 2,492.7 |
| Ending head (36 points) | 2,497.8 | 2,481.2 | 2,502.1 |
| Change | –– | -11.5 | +9.6 |

Table 3-4: Average predictive point hydraulic head elevations.

| Simulation Volumetric Budget Comparison | | | | |
|---|---|---|---|---|
| | Base Simulation (*SS2bc*) | 20% Increase in 1996 Rates (Minimum heads) (*SS5d-min*) | Unprocessed Non-SupplementalWater Rights(Minimum Heads) (*SS5e-min*) | Unprocessed Non-SupplementalWater Rights (Maximum Heads) (*SS5e-max*) |
| **IN** | | | | |
| Constant head | 28,891 | 28,133 | 27,942 | 30,524 |
| Wells | 108,000 | 108,000 | 108,000 | 108,000 |
| Drains | 0 | 0 | 0 | 0 |
| River leakage | 5,784,137 | 6,827,901 | 6,102,998 | 6,566,623 |
| Head-dependent boundaries | 1,537,895 | 1,673,447 | 1,761,545 | 1,286,633 |
| Recharge | 116,205,088 | 116,205,088 | 116,205,088 | 116,205,088 |
| Total In | 123,664,008 | 124,842,568 | 124,205,568 | 124,196,864 |
| **OUT** | | | | |
| Constant head | 17,350,556 | 16,939,652 | 17,141,098 | 15,928,110 |
| Wells | 23,076,956 | 27,692,348 | 27,410,502 | 27,410,502 |
| Drains | 36,667,716 | 33,778,404 | 33,119,472 | 39,231,744 |
| River leakage | 46,486,872 | 46,368,532 | 46,475,412 | 41,511,812 |
| Head-dependent boundariies | 81,961 | 63,698 | 59,170 | 114,744 |
| Recharge | 0 | 0 | 0 | 0 |
| **SUMMARY** | | | | |
| Total | 123,664,064 | 124,842,624 | 124,205,648 | 124,196,904 |
| In–Out | -56 | -56 | -80 | -40 |
| Percent discrepancy | 0 | 0 | 0 | 0 |

Table 3-5: Simulation volumetric budget comparison.

Drawdown associated with the new withdrawals represented by the unprocessed, non-supplemental water right applications was calculated by subtracting the minimum (or maximum) head elevations from the predictive simulations from the base simulation head elevations. The maximum drawdowns (based on minimum simulated hydraulic head elevations) calculated in this fashion are shown in Figure 3-8 through Figure 3-11. The minimum drawdowns (based on maximum simulated head elevations) are shown in Figure 3-12 and Figure 3-15.

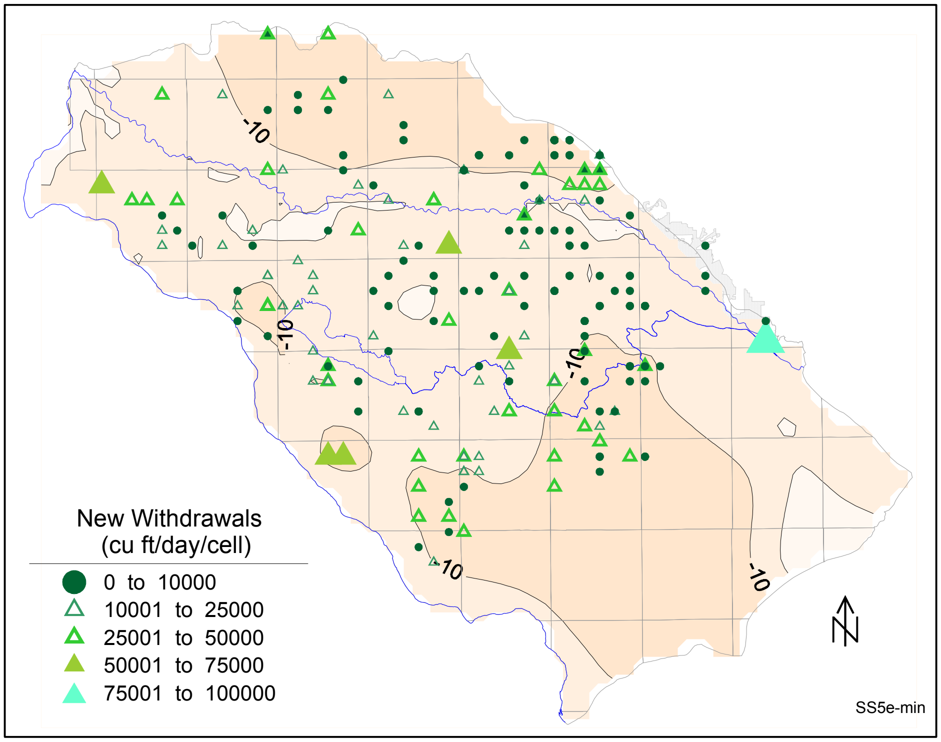


Figure 3-8: Head difference between base case and minimum predictive values, layer 1.

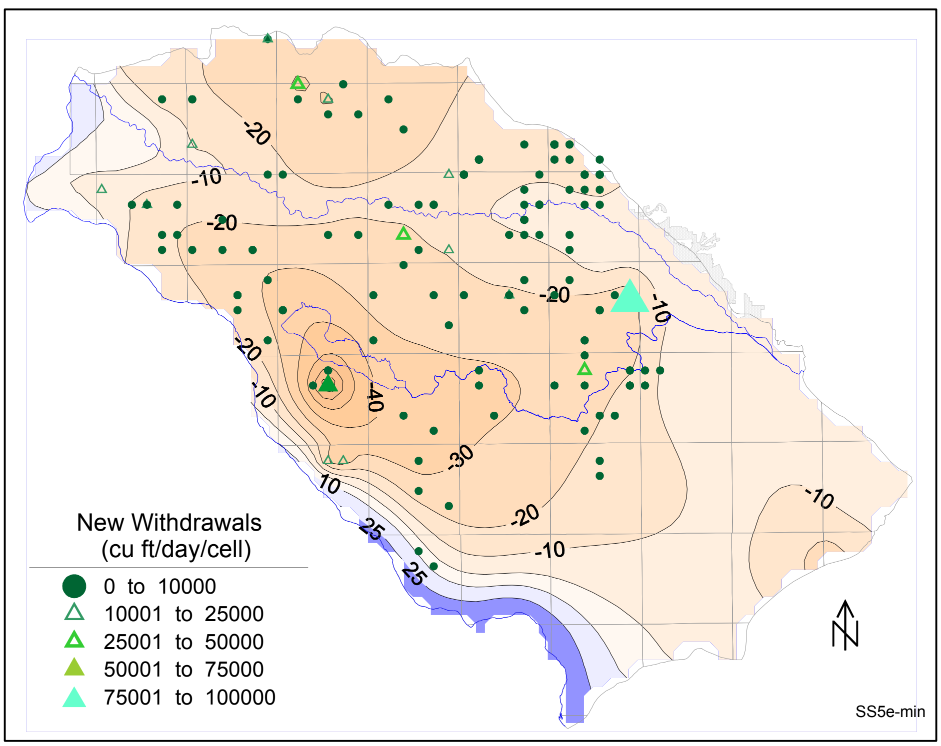


Figure 3-9: Head difference between base case and minimum predictive values, layer 2.

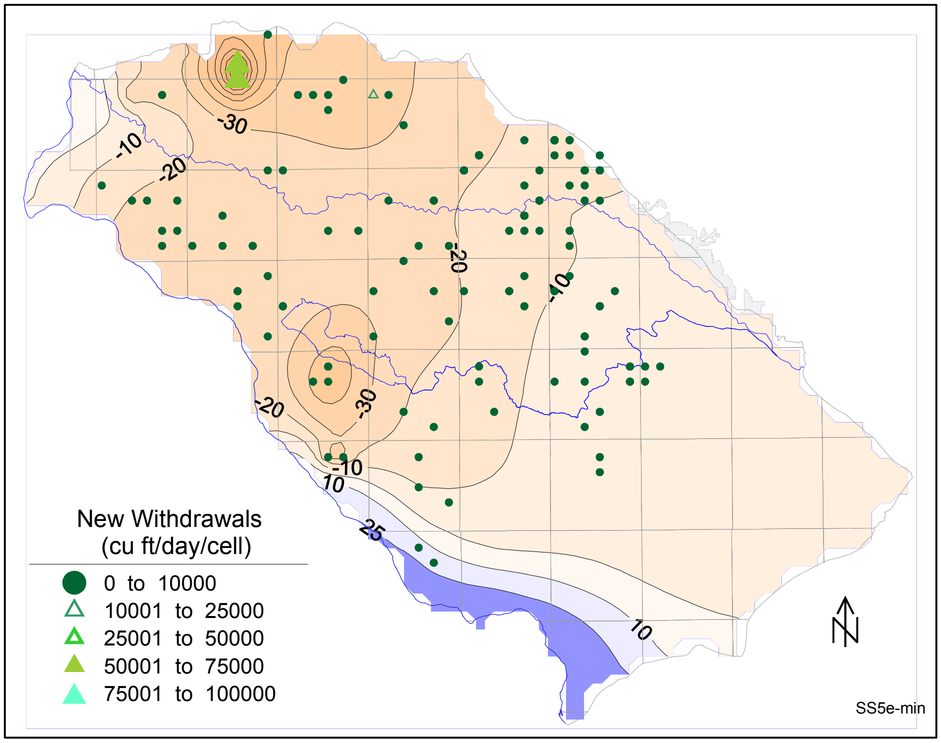


Figure 3-10: Head difference between base case and minimum predictive values, layer 3.

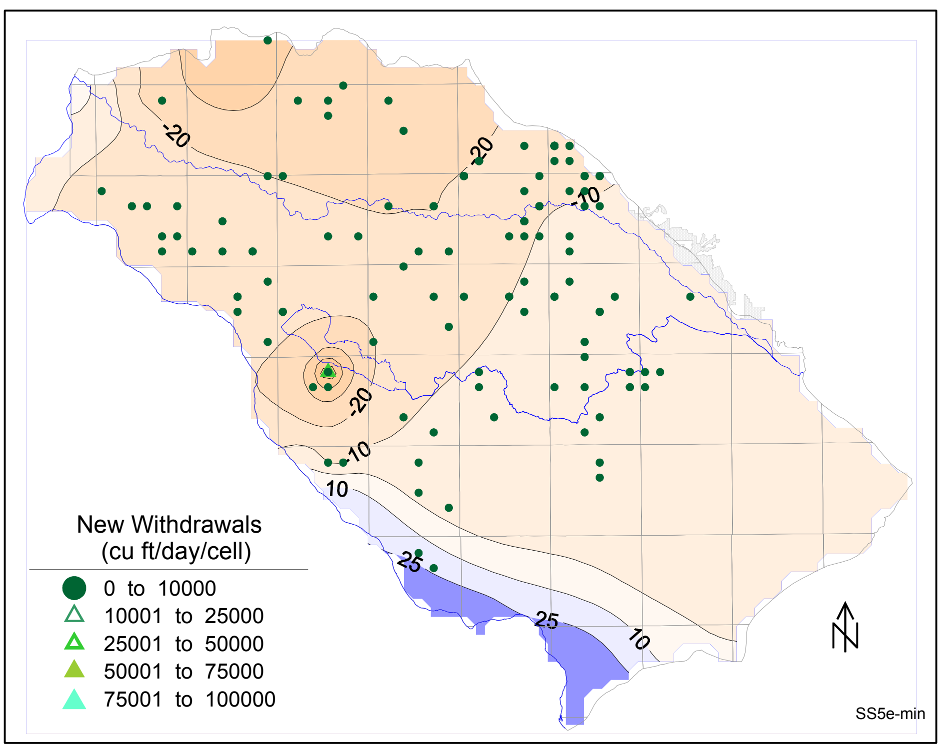


Figure 3-11: Head difference between base case and minimum predictive values, layer 4.

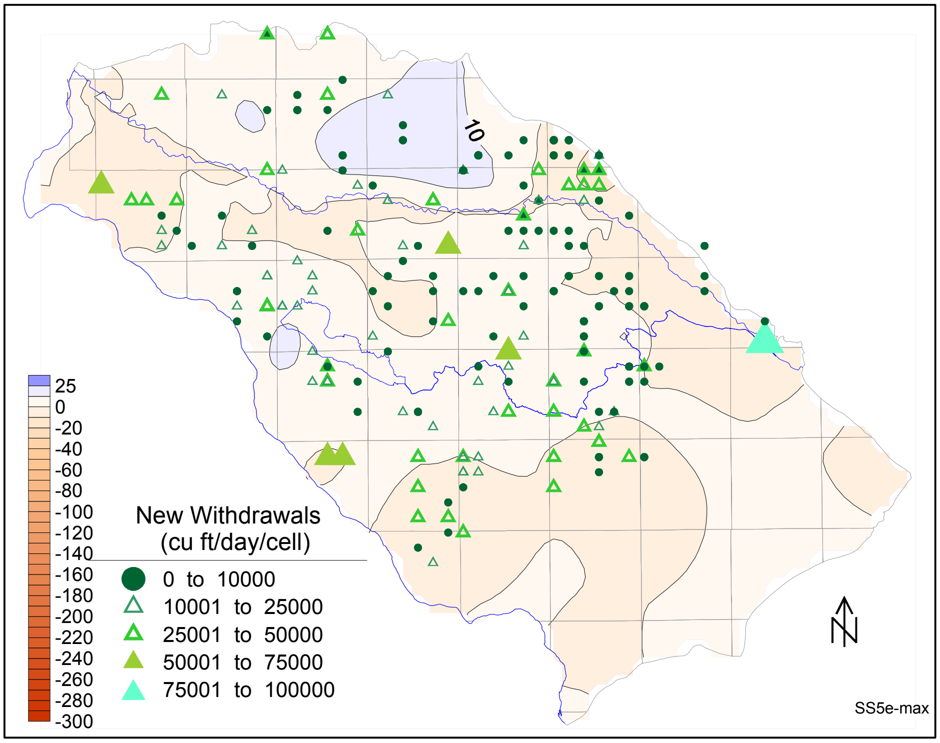


Figure 3-12: Head difference between base case and maximum predictive values, layer 1.

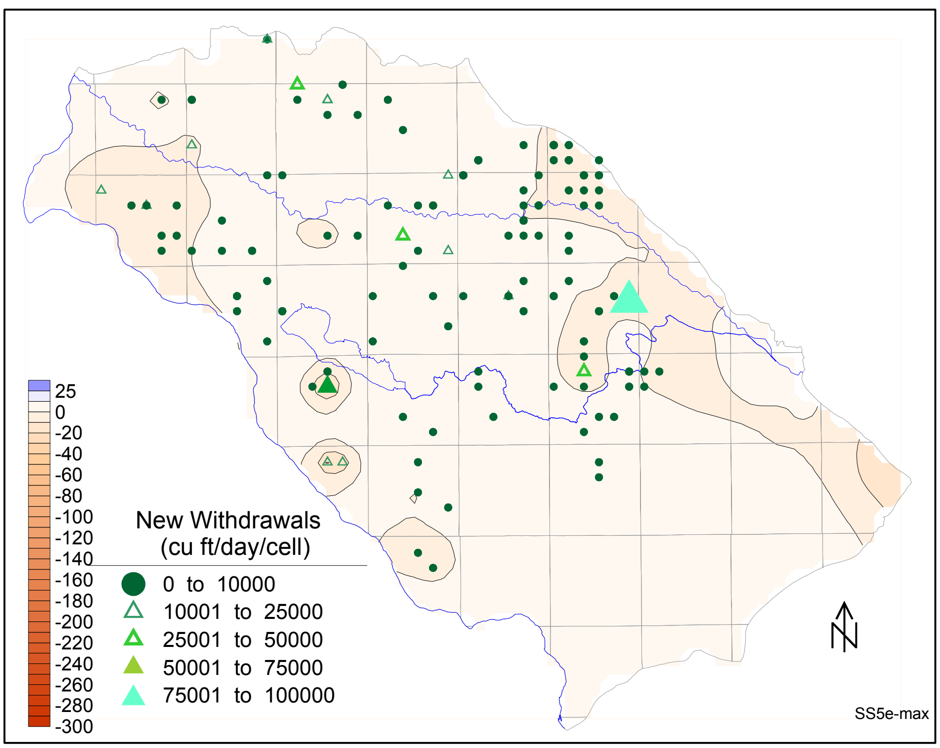


Figure 3-13: Head difference between base case and maximum predictive values, layer 2.

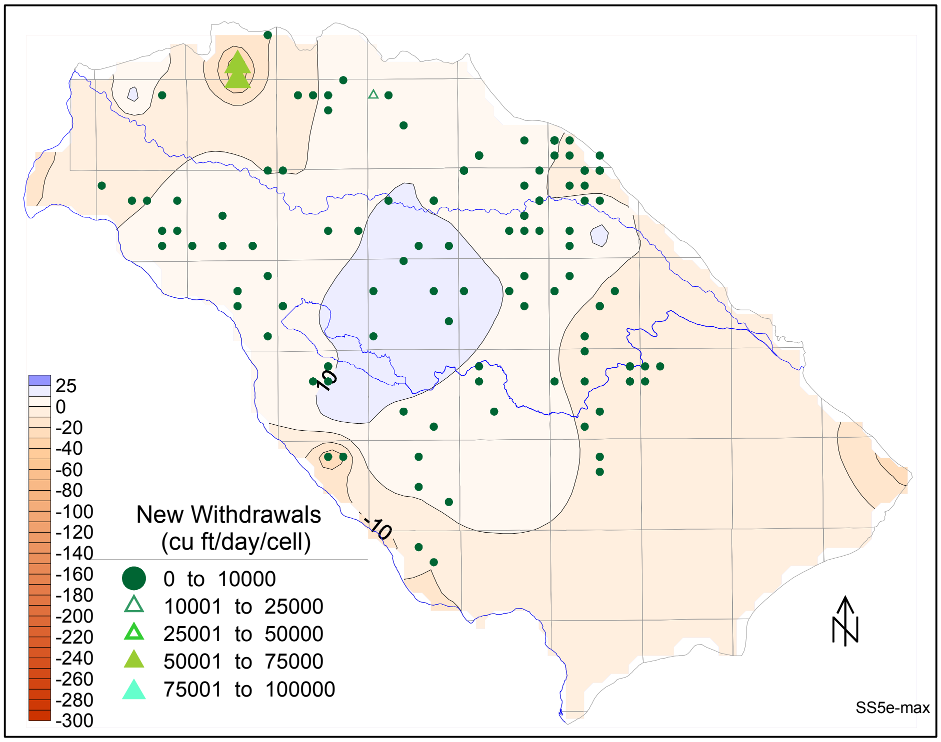


Figure 3-14: Head difference between base case and maximum predictive values, layer 3.

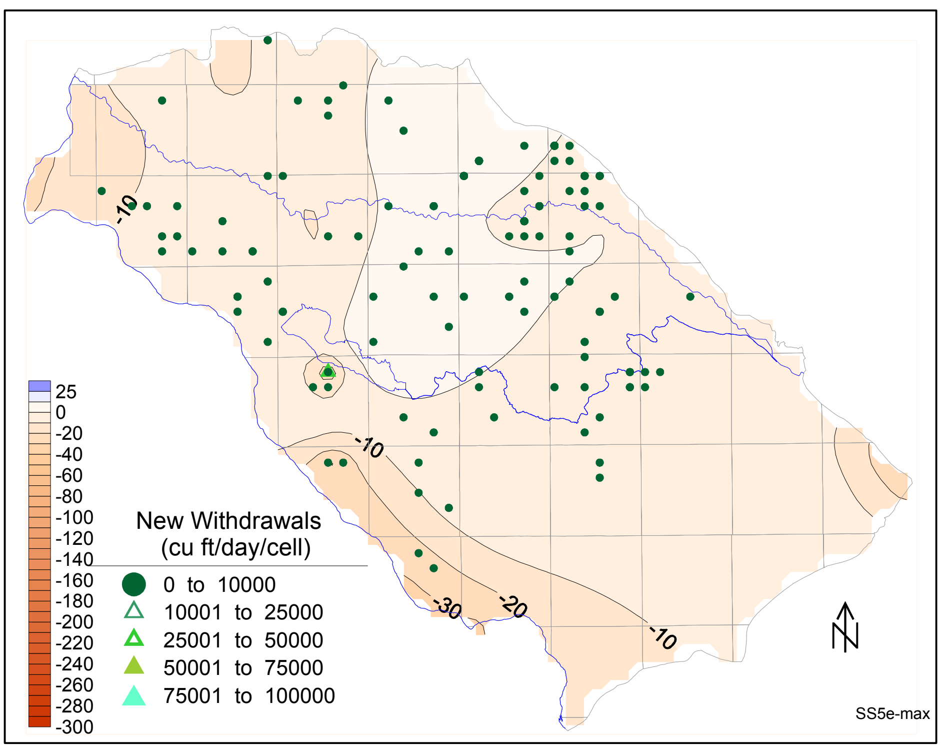


Figure 3-15: Head difference between base case and maximum predictive values, layer 4.

The horizontal and vertical hydraulic conductivity distributions that led to these maximum drawdowns are shown in Figure 3-16 through Figure 3-21. These are very similar to the hydraulic conductivity distributions for the base simulation (Petrich, 2004a).

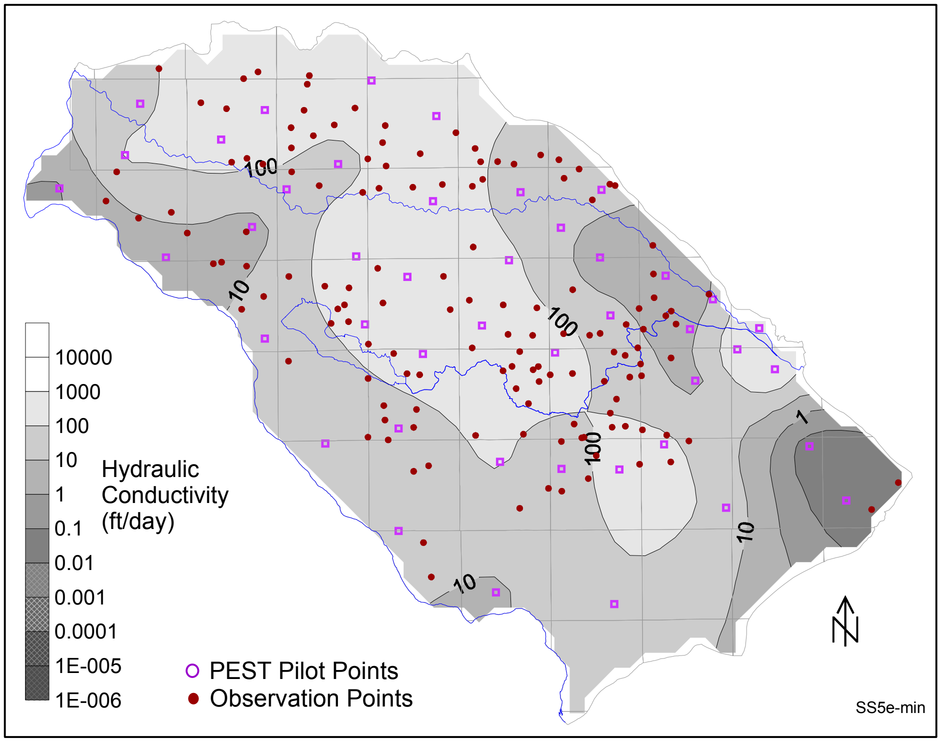


Figure 3-16: Horizontal hydraulic conductivity distribution for minimum predictive values, layer 1.

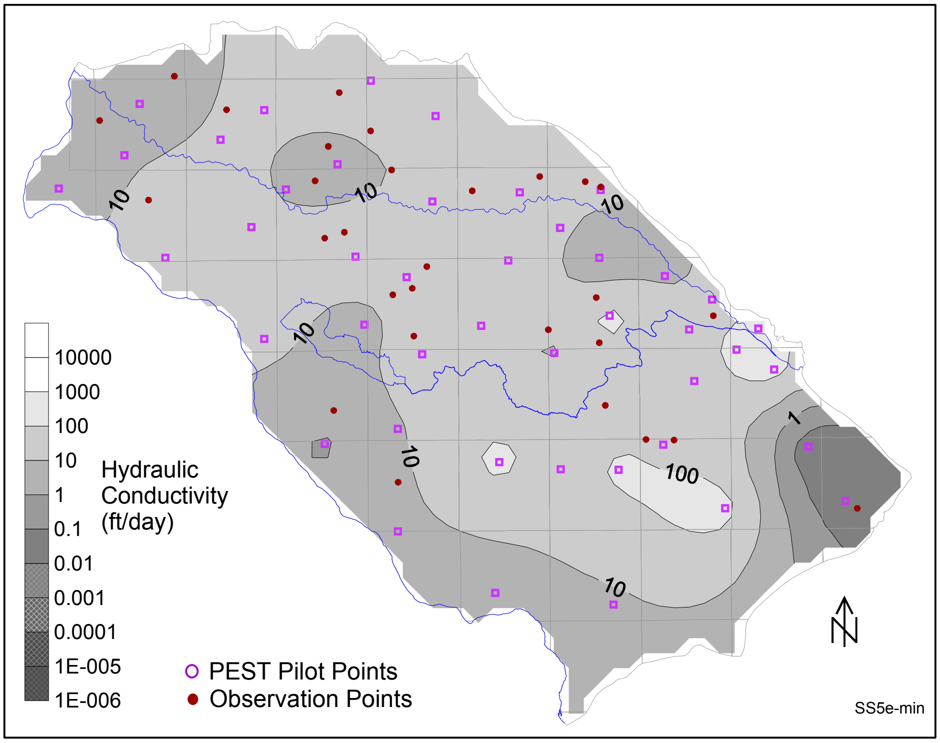


Figure 3-17: Horizontal hydraulic conductivity distribution for minimum predictive values, layer 2.

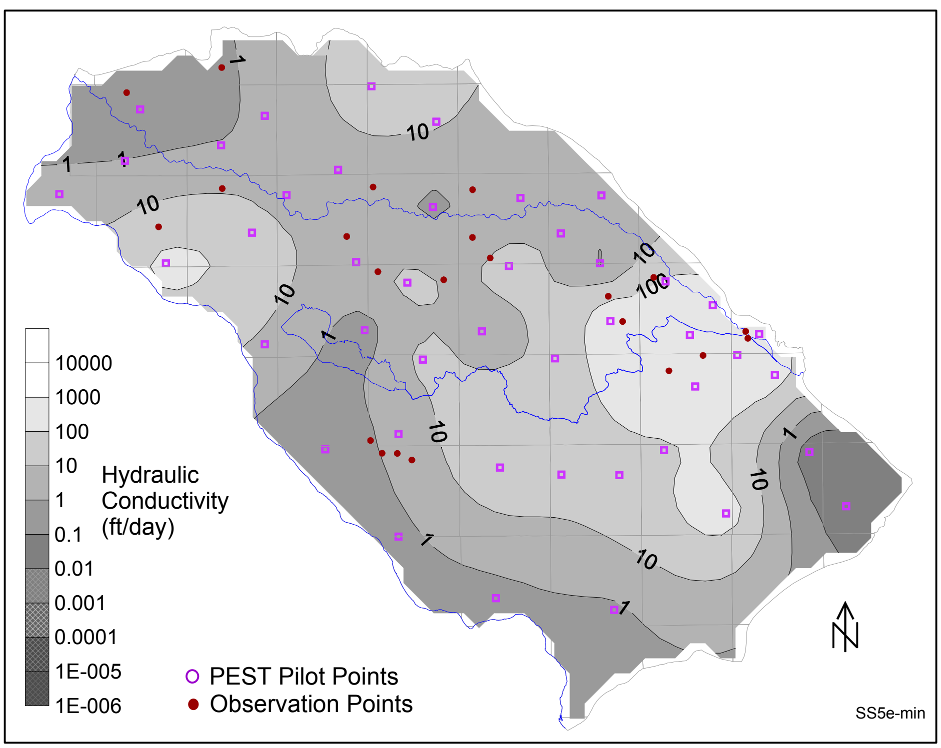


Figure 3-18: Horizontal hydraulic conductivity distribution for minimum predictive values, layers 3 and 4.

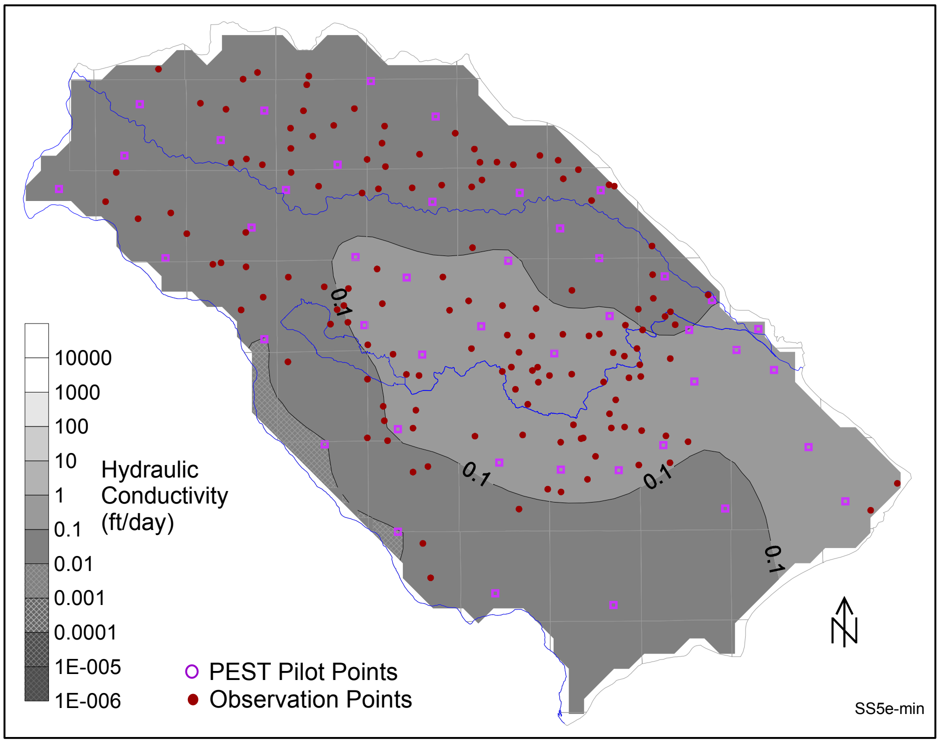


Figure 3-19: Vertical hydraulic conductivity distribution for minimum predictive values, layer 1.

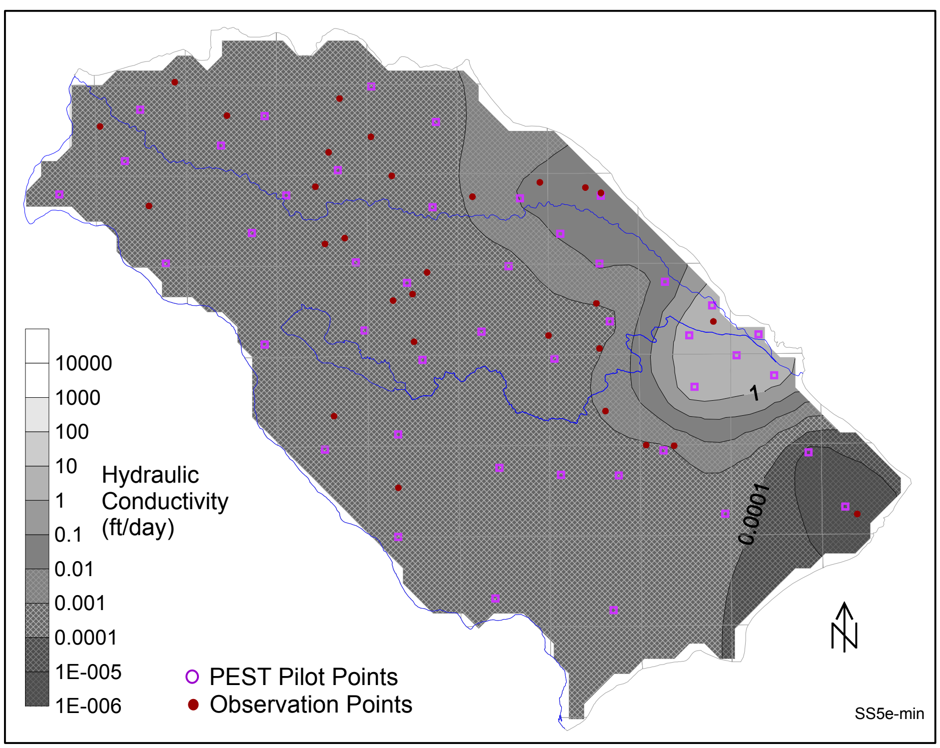


Figure 3-20: Vertical hydraulic conductivity distribution for minimum predictive values, layer 2.

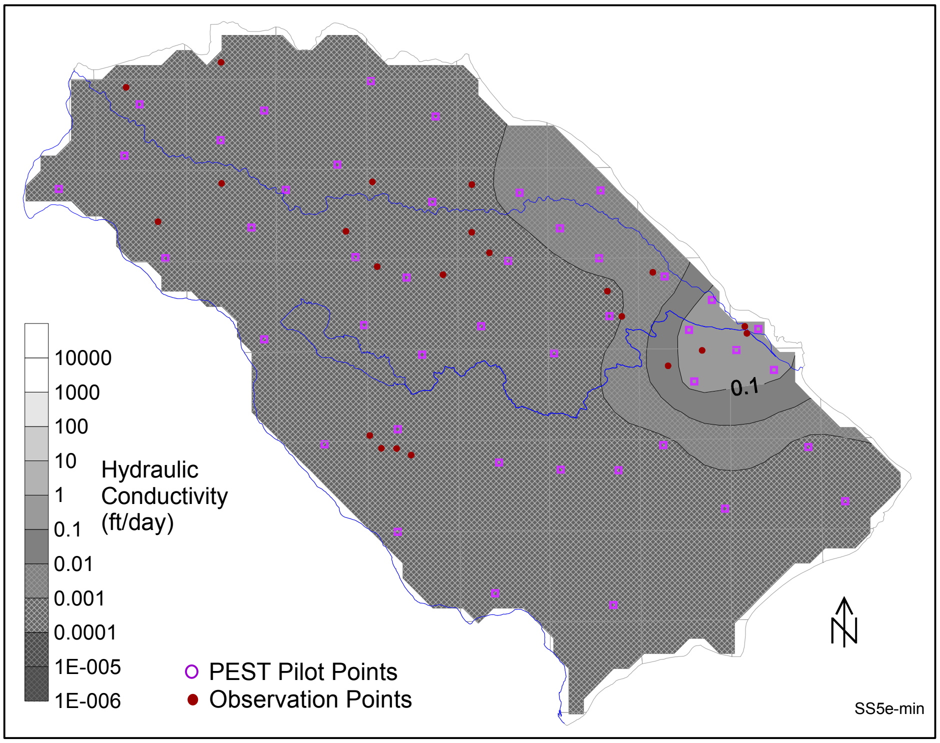


Figure 3-21: Vertical hydraulic conductivity distribution for minimum predictive values, layers 3 and 4.

## 3.4. Discussion

Several simulations were conducted to evaluate potential impact of unprocessed, non-supplemental water right applications on regional ground water levels. The simulations were conducted using the Treasure Valley ground water flow model (Petrich, 2004a) under steady-state conditions.

The difference between minimum and maximum average hydraulic heads at the predictive points represents the uncertainty inherent in the model predictions. Each of these predictions represents a simulation that is similarly well calibrated. In addition to calibration uncertainty, conceptualization errors, discretization of space, numerical errors, model input errors, lack of nearby observations, and/or potential observation errors also may have influenced the model calibration and simulation results.

The predicted head values were compared to head values from the base simulations, which are not optimized for a minimum (or maximum) outcome. Thus, a comparison between the two represents changes in the calibration *and* hydraulic stress. This also applies to the mass balance comparisons between the base simulation and predictive scenario (e.g., Table 3-5). The changes in mass balance reflect both increased withdrawals and parameter uncertainty.

An alternative approach to evaluating potential head declines would have been to first run predictive analyses using the base simulation. Heads (or mass balance terms) could be minimized (or maximized) with no changes in model stresses (e.g., increase in withdrawals). The resulting head distribution from these simulations would then form the basis for the comparison between base simulation and predictive scenarios. Thus, additional comparisons should be done between minimized heads from a base calibration and minimum water levels associated with the increase in withdrawals (see "Recommendations" in Section 4).

The maximum potential drawdowns predicted with the unprocessed water right applications were simulated in an area south of Lake Lowell (layers 2, 3, and 4) and in an area in the northwestern portion of the model domain. The latter simulated cone of depression may have been caused by two withdrawal estimates that were unreasonably high. The general drawdown in the area south of Lake Lowell is consistent with known drawdowns in this area.

Some water level increases were predicted for the very southern portion of the model along the Snake River (Figure 3-10 and Figure 3-11). These appear highly suspect and may be artifacts of near-boundary conditions.

The drawdowns based on maximum predicted head elevations (Figure 3-12 through Figure 3-15) bracket the prediction uncertainty. For instance, an indicated decline of 20 feet in one of these plots might be a minimum decline expected with the additional stress. Again, changes of ± 10 feet, especially near model boundaries, are probably not very meaningful, as this is within the range of error for observation, river, drain elevations, and other inputs.

One area of decline seen in the drawdowns calculated from the maximum predicted head elevations (minimum decline) is a small area of south of Lake Lowell in layer 2 (Figure 3-13). This suggests that additional withdrawals in this area might lead to at least some further water level declines. Another area of decline in layer 2 based on the maximum predicted head elevations (minimum decline) is in the area between Boise, Meridian, and Kuna (Figure 3-13). This area also showed some declines in the maximum predicted drawdowns (Figure 3-9), apparently corresponding, in part, with a large proposed withdrawal in the west Boise–Meridian area.

The comparison of volumetric budget components in Table 3-5 reflected the increased withdrawals over the base simulations. Both scenarios (20% across-the-board increase over 1996 withdrawals reported in Petrich [2004a] and the withdrawals associated with the unprocessed water right applications) represented a 20% increase over 1996 withdrawals. However, the spatial and vertical distribution of withdrawals in these scenarios was substantially different. The additional withdrawals in both scenarios (1) induced more recharge from the Boise River ("river leakage") and from Lake Lowell ("head-dependent boundaries"), (2) less flow to drains, and (3) less discharge into Lake Lowell. The remaining sources of new withdrawals were split among increased recharge from rivers, Lake Lowell, and reduced discharge to Lake Lowell.

Again, these simulated changes represent both parameter uncertainty and response to an increased stress.

Hydraulic conductivity patterns (Figure 3-16 through Figure 3-21) show relatively high $K_h$ characteristics in the central portions of layers 1 and 2 and higher $K_h$ values presumably corresponding with alluvial/deltaic sediments in layers 3 and 4. Estimated $K_h$ values ranging over 100 ft/day enable the movement of simulated ground water between surface sources and sinks to the points of withdrawal. High $K_v$ characteristics in the eastern portion of the basin enable simulated recharge from the Boise River to move vertically downward through the system. As with the base simulation, interpolated parameter characteristics along the model boundaries, especially in areas of few observations, may be uncertain. These simulations represent equilibrium conditions. The time to reach this equilibrium cannot be estimated with a steady-state model.

These simulations included only additional ground water withdrawals associated with non-supplemental withdrawals. Processing permits for supplemental withdrawals would increase the total ground water extraction and would increase the year-to-year variability of the extraction. Increased withdrawals could exacerbate the predicted declines associated with the non-supplemental extraction.

What do these predictions mean for water managers? First, predicted water level declines based on the comparisons between base and predictive simulations reflect both calibration and stress changes. Additional simulations should be conducted to compare minimized base water levels with predicted water levels. These simulations may reduce the area and magnitude of predicted declines. Second, additional withdrawal increases might be considered in areas of stable water levels, even if predictions suggest possible water level decreases. Increases in withdrawals should be accompanied by monitoring of water levels and extraction rates. Third, continued monitoring is warranted in areas experiencing substantially decreased water levels and predicted water level declines. Finally, model predictions for some areas (some shallow aquifers, for instance) indicate that additional withdrawals are probably possible without affecting ground water levels. Additional ground water withdrawals might be considered in these areas. However, additional extractions in these areas may increase losses from, or decrease discharge to, surface water channels.

# 4. CONCLUSIONS AND RECOMMENDATIONS

Results from these simulations of increased aquifer stresses associated with currently unprocessed, non-supplemental ground water right applications in the Treasure Valley aquifer system suggest that:

1. Aquifer level declines may occur if all of these currently unprocessed, non-supplemental ground water rights were granted.
2. Average water level declines would vary, depending on location within the valley, the actual amount of withdrawals, and the depth of extraction.
3. Local areas of simulated declines were noted south of Lake Lowell, in an area in the northwestern portion of the model, and in portions of an area between Boise, Meridian, and Kuna. These may be associated with unrealistically high simulated stresses or excessively low simulated aquifer parameter values. The simulated declines also may indicate potential problems in supplying the increasing ground water demands in these areas.
4. The least declines were predicted in the uppermost model layer, which corresponds roughly with the uppermost 200 feet of aquifer. Approximately 82% of the estimated new withdrawals in the uppermost layer represented water that would otherwise have discharged to drains.

Recommendations include the following:

1. Simulate the maximum and minimum hydraulic head predictions with no changes in model stresses from the base simulation. Use these values for comparisons with scenario predictions.
2. Quantify the increased withdrawals associated with new applications for supplemental water.
3. Conduct additional simulations that include additional withdrawals associated with supplemental withdrawals.
4. Review specific water rights requests that are predicted to result in greater-than average local drawdowns.
5. Consider additional simulations with lower PD0 values (a PEST parameter) in an attempt to tighten the range between minimum and maximum predicted head elevations.
6. Conduct additional simulations increasing the amount of new withdrawals in specific portions of the basin to help identify areas that may be able to sustain additional withdrawals.
7. Identify potential water right applications may have predicted impact on existing water rights, and conduct additional simulations to assess the cumulative predicted impact of approving these applications.
8. Continue to collect data that will result in improvement of the predictive capabilities of this model.

## 5. References


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# Appendix A: Conversion Factors

**Volume**

1 cubic foot of water = 7.4805 gallons = 62.37 pounds of water

1 acre-foot = enough water to cover 1 acre of land 1 foot deep

1 acre-foot = 43,560 cubic feet

1 acre-foot = 325,850 gallons

1 million gallons = 3.0689 acre-feet

**Flow Rates**

1 cubic foot per second = 448.83 gallons per minute = 26,930 gallons per hour

1 cubic foot per second = 646,635 gallons per day = 1.935 acre-feet per day

1 cubic foot per second for 30 days = 59.502 acre-feet

1 cubic foot per second for 1 year = 723.94 acre-feet

1 cubic meter per second = 25.31 cubic feet per second

1 cubic meter per second = 15,850 gallons per minute

1 million gallons per day = 1,120.147 acre-feet per year

1 miner's inch = 9 gallons per minute

1 miner's inch = 0.02 cubic feet per second

**Hydraulic Conductivity**

1 gallon per day per foot$^2$ = 0.134 foot/day = 0.0408 meters/day

**Economic**

$0.10 per 1,000 gallons = $32.59 per acre-foot

# Appendix B: Summary of Permit Applications

This appendix summarizes increased withdrawals represented by unprocessed water right applications for non-supplemental ground water (for the period between July 9, 1987 and February 19, 2002). Further explanation of estimated extraction levels is provided in Section 2.1.

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate ($ft^3/s$) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID number | Sequence number used by IDWR for tracking permit applicaitons | Priority date of permit application | Model row | Model column | Target depth | Assigned model layer; based on anticipated depth listed in application. Applications for which no depths were listed (i.e., “none”) were assigned to a model layer proportionately to those for which anticipated depths were listed. | Northing (Universal Transverse Mercatur) (feet) | Easting (Universal Transverse Mercatur) (feet) | Requested diversion listed in the permit application | Estimated rate (see text) | Type of use |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft$^3$/s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11638 | 2/5/92 | 19 | 40 | 102 | 1 | 1817504.7 | 15845684 | 0.14 | 17.5 | IRRIGATION |
| 2 | 11666 | 2/19/92 | 11 | 34 | 80 | 1 | 1788413.9 | 15883817 | 0.19 | 12.5 | DOMESTIC, IRRIGATION |
| 3 | 11706 | 2/13/92 | 14 | 35 | 170 | 2 | 1791525.7 | 15867857 | 0.2 | 25 | DOMESTIC, IRRIGATION, RECREATION, RECREATION STORAGE |
| 4 | 11748 | 4/2/92 | 17 | 27 | 150 | 1 | 1750250.4 | 15854560 | 1.6 | 200 | IRRIGATION |
| 5 | 11754 | 4/6/92 | 24 | 21 | 400 | 1 | 1716091.5 | 15815695 | 1.48 | 185 | IRRIGATION |
| 6 | 11755 | 4/6/92 | 24 | 34 | 200 | 1 | 1788759.1 | 15816266 | 3.48 | 435 | IRRIGATION |
| 7 | 11764 | 4/8/92 | 24 | 26 | 100 | 1 | 1743993.7 | 15816752 | 0.07 | 2.5 | DOMESTIC, INDUSTRIAL, IRRIGATION |
| 8 | 11769 | 4/14/92 | 23 | 35 | 250 | 1 | 1791345.9 | 15822904 | 1.4 | 175 | IRRIGATION |
| 9 | 11775 | 4/8/92 | 16 | 38 | U | none | 1806805.7 | 15858800 | 0.06 | 5 | DOMESTIC, IRRIGATION |
| 10 | 11778 | 4/17/92 | 35 | 28 | 308 | 1 | 1754717 | 15757782 | 2 | 255 | IRRIGATION |
| 11 | 11780 | 4/17/92 | 17 | 35 | 100 | 1 | 1795114.8 | 15854733 | 0.69 | 86.25 | IRRIGATION |
| 12 | 11784 | 4/23/92 | 37 | 29 | 200 | 1 | 1760535.4 | 15750102 | 0.68 | 85 | IRRIGATION |
| 13 | 11791 | 4/21/92 | 15 | 42 | 15 | 1 | 1828021.2 | 15862840 | 0.2 | 0.2 | AESTHETIC, AESTHETIC STORAGE, DIVERSION TO STORAGE |
| 14 | 11803 | 4/29/92 | 21 | 18 | 400 | 1 | 1701572.2 | 15833831 | 1.5 | 270 | IRRIGATION |
| 15 | 11803 | 4/29/92 | 21 | 18 | 400 | 1 | 1700246.5 | 15833826 | 1.5 | 270 | IRRIGATION |
| 16 | 11803 | 4/29/92 | 21 | 18 | 400 | 1 | 1700256.3 | 15831191 | 1.5 | 270 | IRRIGATION |
| 17 | 11803 | 4/29/92 | 21 | 18 | 400 | 1 | 1701576.9 | 15832511 | 1.5 | 270 | IRRIGATION |
| 18 | 11809 | 5/7/92 | 16 | 17 | 175 | 1 | 1696167.4 | 15859256 | 1.2 | 150 | IRRIGATION |
| 19 | 11811 | 5/7/92 | 20 | 46 | 100-200 | 4 | 1849547.7 | 15839118 | 0.15 | 12.5 | IRRIGATION |
| 20 | 11824 | 5/13/92 | 11 | 23 | 100 | 1 | 1731780.7 | 15883449 | 0.19 | 12.5 | DOMESTIC, IRRIGATION |
| 21 | 11826 | 5/14/92 | 19 | 21 | 300 | 1 | 1718645.4 | 15842147 | 1.58 | 197.5 | IRRIGATION |
| 22 | 11826 | 5/14/92 | 20 | 21 | 300 | 1 | 1718648.8 | 15840820 | 1.58 | 197.5 | IRRIGATION |
| 23 | 11827 | 5/14/92 | 18 | 20 | 300 | 1 | 1713268.9 | 15850139 | 1.64 | 205 | IRRIGATION |
| 24 | 11828 | 5/14/92 | 10 | 13 | 300 | 2 | 1678961.1 | 15893488 | 1.6 | 200 | IRRIGATION |
| 25 | 11830 | 5/14/92 | 36 | 31 | 400 | 1 | 1769293.4 | 15755170 | 2 | 285 | IRRIGATION |
| 26 | 11830 | 5/14/92 | 35 | 30 | 400 | 1 | 1766617.6 | 15759128 | 2 | 285 | IRRIGATION |
| 27 | 11834 | 5/18/92 | 31 | 31 | 200 | 1 | 1771774.3 | 15782978 | 2.4 | 300 | IRRIGATION |
| 28 | 11836 | 5/21/92 | 14 | 10 | 500 | 2 | 1661965.4 | 15868280 | 1.6 | 200 | IRRIGATION |
| 29 | 11849 | 6/8/92 | 22 | 39 | 90 | 1 | 1813678.8 | 15828395 | 0.09 | 7.5 | IRRIGATION |
| 30 | 11862 | 6/12/92 | 36 | 30 | 300 | 1 | 1766645.4 | 15755164 | 0.03 | 2.5 | IRRIGATION |
| 31 | 11864 | 6/15/92 | 22 | 39 | 100 | 1 | 1813678.8 | 15828395 | 0.09 | 7.5 | IRRIGATION |
| 32 | 11865 | 6/15/92 | 26 | 22 | 330 | 1 | 1721412.3 | 15807809 | 2 | 400 | IRRIGATION |
| 33 | 11869 | 6/18/92 | 12 | 40 | U | none | 1821290.2 | 15881350 | 0.1 | 6.25 | IRRIGATION, STOCKWATER |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft$^3$/s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | 11900 | 5/4/92 | 15 | 39 | U | none | 1813431.6 | 15867384 | 0 | 0 | AESTHETIC STORAGE |
| 35 | 11900 | 5/4/92 | 14 | 39 | U | none | 1814084.6 | 15868685 | 0 | 0 | AESTHETIC STORAGE |
| 36 | 11900 | 5/4/92 | 15 | 39 | U | none | 1812099.9 | 15866785 | 0 | 0 | AESTHETIC STORAGE |
| 37 | 11900 | 5/4/92 | 14 | 39 | U | none | 1812101.2 | 15868344 | 0 | 0 | AESTHETIC STORAGE |
| 38 | 11900 | 5/4/92 | 14 | 39 | U | none | 1812099.7 | 15869609 | 0 | 0 | AESTHETIC STORAGE |
| 39 | 11900 | 5/4/92 | 15 | 39 | U | none | 1813430.7 | 15865338 | 0 | 0 | AESTHETIC STORAGE |
| 40 | 11900 | 5/4/92 | 15 | 39 | U | none | 1814760.3 | 15865335 | 0 | 0 | AESTHETIC STORAGE |
| 41 | 11900 | 5/4/92 | 15 | 39 | U | none | 1812099.7 | 15865316 | 0 | 0 | AESTHETIC STORAGE |
| 42 | 11912 | 8/7/92 | 12 | 30 | 300 | 2 | 1768786.5 | 15881077 | 1.2 | 150 | IRRIGATION |
| 43 | 11935 | 8/10/92 | 12 | 23 | 78 | 1 | 1727805.8 | 15882062 | 0.03 | 2.5 | IRRIGATION |
| 44 | 11947 | 10/26/92 | 26 | 37 | 300 | 1 | 1803248.8 | 15808358 | 3.1 | 387.5 | IRRIGATION |
| 45 | 11965 | 12/1/92 | 25 | 39 | 400 | 2 | 1811162.5 | 15813736 | 3 | 391 | IRRIGATION |
| 46 | 12058 | 8/31/93 | 11 | 38 | 171 | 1 | 1809307 | 15885182 | 0.12 | 10 | DOMESTIC, IRRIGATION, STOCKWATER |
| 47 | 12071 | 11/1/93 | 14 | 29 | pond | none | 1763430.3 | 15867784 | 3.6 | 450 | IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |
| 48 | 12071 | 11/1/93 | 14 | 29 | pond | none | 1759479.4 | 15868125 | 3.6 | 450 | IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |
| 49 | 12090 | 12/17/93 | 5 | 16 | 700 | 3 | 1690665.1 | 15918740 | 3.55 | 435 | DOMESTIC, IRRIGATION, STOCKWATER |
| 50 | 12090 | 12/17/93 | 6 | 16 | 700 | 3 | 1690706.4 | 15913466 | 3.55 | 435 | DOMESTIC, IRRIGATION, STOCKWATER |
| 51 | 12097 | 1/26/94 | 24 | 39 | 200 | 1 | 1815091 | 15817790 | 2.3 | 287.5 | IRRIGATION |
| 52 | 12145 | 9/20/94 | 0 | 0 | 400 | 0 | 1945674.3 | 15922240 | 0.18 | 22.5 | IRRIGATION |
| 53 | 12219 | 6/9/95 | 25 | 43 | 200 | 1 | 1833796.1 | 15812618 | 2.9 | 362.5 | IRRIGATION |
| 54 | 12223 | 6/29/95 | 16 | 27 | 350 | 2 | 1750235.9 | 15861167 | 0.67 | 242.52893 | COMMERCIAL, DOMESTIC, HEATING, STOCKWATER |
| 55 | 12224 | 6/7/95 | 10 | 37 | U | none | 1803974.3 | 15889110 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 56 | 12231 | 7/6/95 | 17 | 47 | 307 | 1 | 1853441.7 | 15855055 | 0.42 | 52.5 | IRRIGATION |
| 57 | 12235 | 6/7/95 | 10 | 37 | U | none | 1803974.3 | 15889110 | 0.2 | 25 | DOMESTIC, IRRIGATION |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft$^3$/s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | 12236 | 6/7/95 | 10 | 37 | U | none | 1803974.3 | 15889110 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 59 | 12236 | 6/7/95 | 10 | 37 | U | none | 1805300.8 | 15889124 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 60 | 12237 | 6/7/95 | 10 | 37 | U | none | 1805300.8 | 15889124 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 61 | 12237 | 6/7/95 | 10 | 37 | U | none | 1803974.3 | 15889110 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 62 | 12238 | 6/7/95 | 10 | 37 | U | none | 1805300.8 | 15889124 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 63 | 12239 | 6/7/95 | 10 | 37 | U | none | 1805300.8 | 15889124 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 64 | 12240 | 6/7/95 | 10 | 37 | U | none | 1803974.3 | 15889110 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 65 | 12240 | 6/7/95 | 10 | 37 | U | none | 1805300.8 | 15889124 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 66 | 12242 | 7/5/95 | 13 | 35 | U | none | 1795010.7 | 15875840 | 0.2 | 25 | IRRIGATION |
| 67 | 12243 | 7/11/95 | 4 | 9 | 300 | 1 | 1657386.3 | 15924037 | 0.2 | 25 | IRRIGATION |
| 68 | 12248 | 6/29/95 | 11 | 23 | 100 | 1 | 1727816.9 | 15886084 | 0.15 | 18.75 | IRRIGATION |
| 69 | 12249 | 7/19/95 | 17 | 38 | 180 | 1 | 1809498.8 | 15852187 | 0.1 | 12.5 | IRRIGATION |
| 70 | 12253 | 6/2/95 | 31 | 37 | 500 | 1 | 1803557.5 | 15780609 | 2.78 | 347.5 | IRRIGATION |
| 71 | 12260 | 7/21/95 | 30 | 40 | 400 | 1 | 1818022.4 | 15784642 | 3.22 | 403 | IRRIGATION |
| 72 | 12263 | 9/1/95 | 19 | 42 | 50 | 1 | 1829502.9 | 15843111 | 0.04 | 1.5 | IRRIGATION |
| 73 | 12264 | 7/17/95 | 21 | 43 | 200 | 1 | 1832222.2 | 15835162 | 0.29 | 35.75 | IRRIGATION |
| 74 | 12265 | 7/17/95 | 21 | 43 | 200 | 1 | 1833611.2 | 15833831 | 0.22 | 28 | IRRIGATION |
| 75 | 12274 | 9/19/95 | 20 | 47 | 100 | 1 | 1855275.6 | 15840012 | 0.17 | 3 | IRRIGATION |
| 76 | 12274 | 9/19/95 | 19 | 47 | 100 | 1 | 1854871.6 | 15841814 | 0.17 | 3 | IRRIGATION |
| 77 | 12276 | 8/28/95 | 13 | 25 | 100 | 1 | 1742300.3 | 15876921 | 0.14 | 11.5 | IRRIGATION |
| 78 | 12277 | 9/1/95 | 19 | 42 | 50 | 1 | 1828194.1 | 15841776 | 0.11 | 9.25 | IRRIGATION |
| 79 | 12278 | 7/7/95 | 32 | 32 | 460 | 1 | 1774434 | 15776395 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 80 | 12278 | 7/7/95 | 31 | 31 | 460 | 1 | 1773106.5 | 15779029 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 81 | 12278 | 7/7/95 | 31 | 32 | 460 | 1 | 1774426.8 | 15779045 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 82 | 12278 | 7/7/95 | 32 | 31 | 460 | 1 | 1770507.3 | 15777677 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 83 | 12278 | 7/7/95 | 32 | 31 | 460 | 1 | 1773110.6 | 15777704 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 84 | 12279 | 8/18/95 | 28 | 28 | 250 | 1 | 1754586.5 | 15796172 | 0.39 | 49 | IRRIGATION, STOCKWATER |
| 85 | 12288 | 10/27/95 | 14 | 28 | 140 | 2 | 1755537.7 | 15871776 | 0.06 | 5 | IRRIGATION |
| 86 | 12293 | 11/6/95 | 17 | 39 | 150 | 1 | 1816104.9 | 15856241 | 0.32 | 40.5 | IRRIGATION |
| 87 | 12294 | 11/6/95 | 20 | 32 | 125 | 1 | 1774098.1 | 15836150 | 0.07 | 2.5 | DOMESTIC, IRRIGATION |
| 88 | 12299 | 11/29/95 | 10 | 27 | 154 | 1 | 1752878.5 | 15891511 | 0.09 | 7.5 | IRRIGATION |
| 89 | 12303 | 12/26/95 | 16 | 36 | U | none | 1796423.5 | 15857380 | 0.08 | 12.5 | IRRIGATION, STOCKWATER |
| 90 | 12309 | 1/3/96 | 11 | 37 | 124 | 1 | 1802674 | 15886462 | 0.19 | 12.5 | DOMESTIC, IRRIGATION |
| 91 | 12320 | 2/13/96 | 3 | 10 | 300 | 1 | 1658732.5 | 15930522 | 0.4 | 50 | IRRIGATION |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 12321 | 2/13/96 | 3 | 10 | 300 | 1 | 1658739.2 | 15927883 | 0.9 | 112.5 | COMMERCIAL, IRRIGATION, STOCKWATER |
| 93 | 12327 | 2/26/96 | 20 | 37 | 100 | 1 | 1802983.4 | 15837556 | 0.06 | 5 | IRRIGATION |
| 94 | 12328 | 2/26/96 | 20 | 37 | 100 | 1 | 1801770.9 | 15836205 | 0.15 | 12.5 | IRRIGATION |
| 95 | 12331 | 4/10/96 | 6 | 23 | 345 | 2 | 1727685.5 | 15913553 | 0.2 | 42.5 | IRRIGATION |
| 96 | 12333 | 4/4/96 | 31 | 42 | 400 | 1 | 1831339.3 | 15779386 | 1.96 | 245 | IRRIGATION |
| 97 | 12371 | 11/21/96 | 0 | 0 | 218 | 0 | 1662639.8 | 15959781 | 0.14 | 12.5 | DOMESTIC, IRRIGATION, STOCKWATER |
| 98 | 12372 | 11/29/96 | 12 | 31 | U | none | 1770037.7 | 15882412 | 0.06 | 5 | IRRIGATION |
| 99 | 12373 | 12/4/96 | 10 | 42 | 400 | 1 | 1827738.5 | 15890662 | 0.2 | 25 | IRRIGATION |
| 100 | 12392 | 4/11/97 | 21 | 42 | 100 | 1 | 1830927 | 15832500 | 0.1 | 36.198347 | DOMESTIC |
| 101 | 12408 | 8/25/97 | 7 | 15 | 400 | 1 | 1685343.6 | 15905513 | 1.64 | 200 | DOMESTIC, IRRIGATION |
| 102 | 12418 | 9/12/97 | 20 | 16 | U | none | 1690961.5 | 15840427 | 0.58 | 50 | DOMESTIC, IRRIGATION, STOCKWATER |
| 103 | 12419 | 9/18/97 | 26 | 24 | 245 | 1 | 1735969.4 | 15807999 | 0.04 | 5 | IRRIGATION |
| 104 | 12421 | 10/24/97 | 33 | 37 | 440 | 1 | 1804939.9 | 15769971 | 3 | 400 | DOMESTIC, IRRIGATION, STOCKWATER |
| 105 | 12426 | 11/12/97 | 10 | 42 | 250 | 1 | 1829079.8 | 15889347 | 0.14 | 12.5 | DOMESTIC, IRRIGATION |
| 106 | 12429 | 1/8/98 | 10 | 38 | 235 | 1 | 1807946.5 | 15889149 | 0.12 | 10 | IRRIGATION |
| 107 | 12433 | 1/14/98 | 28 | 41 | 320 | 1 | 1825852.8 | 15796648 | 1 | 115 | DOMESTIC, IRRIGATION, STOCKWATER |
| 108 | 12435 | 1/20/98 | 19 | 26 | 100 | 1 | 1743715.2 | 15843910 | 0.05 | 18.099174 | INDUSTRIAL |
| 109 | 12439 | 2/11/98 | 10 | 43 | 130 | 1 | 1834507.1 | 15889335 | 0.19 | 23.75 | IRRIGATION |
| 110 | 12441 | 4/17/98 | 7 | 26 | U | none | 1743521.5 | 15908606 | 1.6 | 200 | IRRIGATION |
| 111 | 12459 | 3/11/98 | 14 | 36 | U | none | 1796343.8 | 15871889 | 0.004 | 1.4479339 | AESTHETIC STORAGE, DIVERSION TO STORAGE, RECREATION STORAGE |
| 112 | 12459 | 3/11/98 | 14 | 36 | U | none | 1796348.7 | 15870619 | 0.004 | 1.4479339 | AESTHETIC STORAGE, DIVERSION TO STORAGE, RECREATION STORAGE |
| 113 | 12475 | 9/24/98 | 22 | 29 | 83 | 1 | 1762395.6 | 15828140 | 0.01 | 1.25 | IRRIGATION |
| 114 | 12486 | 9/14/98 | 12 | 40 | 216 | 1 | 1821263.3 | 15882664 | 0.08 | 10 | IRRIGATION |
| 115 | 12487 | 8/28/98 | 26 | 34 | 120 | 1 | 1784863.1 | 15808289 | 0.1 | 15 | IRRIGATION |
| 116 | 12489 | 10/2/98 | 21 | 20 | 160 | 1 | 1712049 | 15835377 | 0.28 | 101.35537 | COMMERCIAL |
| 117 | 12490 | 9/30/98 | 25 | 42 | 299 | 1 | 1829758.4 | 15809953 | 0.34 | 37.5 | DOMESTIC, IRRIGATION |
| 118 | 12503 | 12/29/98 | 3 | 22 | 200 | 1 | 1726291.8 | 15929383 | 3.2 | 400 | IRRIGATION |
| 119 | 12503 | 12/29/98 | 3 | 22 | 200 | 1 | 1724965.7 | 15929377 | 3.2 | 400 | IRRIGATION |
| 120 | 12503 | 12/29/98 | 3 | 22 | 200 | 1 | 1724972.2 | 15928059 | 3.2 | 400 | IRRIGATION |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 121 | 12503 | 12/29/98 | 3 | 22 | 200 | 1 | 1723648.4 | 15928053 | 3.2 | 400 | IRRIGATION |
| 122 | 12520 | 4/23/99 | 28 | 24 | 200 | 1 | 1733389.1 | 15797362 | 0.2 | 25 | IRRIGATION |
| 123 | 12524 | 4/30/99 | 19 | 29 | 185 | 1 | 1759591.7 | 15845345 | 0.07 | 2.5 | DOMESTIC, IRRIGATION |
| 124 | 12541 | 4/15/99 | 31 | 43 | 400 | 1 | 1832652 | 15780715 | 0.02 | 7.2396694 | INDUSTRIAL |
| 125 | 12541 | 4/15/99 | 31 | 43 | 400 | 1 | 1832659.3 | 15779385 | 0.02 | 7.2396694 | INDUSTRIAL |
| 126 | 12542 | 3/24/99 | 20 | 31 | U | none | 1770177.4 | 15837452 | 0.069 | 24.97686 | STOCKWATER |
| 127 | 12563 | 1/13/00 | 7 | 20 | U | none | 1713229.8 | 15907202 | 0.36 | 45 | IRRIGATION |
| 128 | 12571 | 2/2/00 | 7 | 25 | 500 | 3 | 1739581.3 | 15907254 | 1.6 | 200 | IRRIGATION |
| 129 | 12592 | 7/14/00 | 25 | 43 | U | none | 1835184 | 15809947 | 0.19 | 12.5 | DOMESTIC, IRRIGATION |
| 130 | 31192 | 3/1/01 | 6 | 20 | 250 | 2 | 1715792.1 | 15914821 | 2 | 300 | IRRIGATION |
| 131 | 31256 | 6/7/01 | 7 | 13 | 400 | 2 | 1676098.6 | 15908106 | 0.3 | 37.5 | IRRIGATION |
| 132 | 31256 | 6/7/01 | 7 | 13 | 400 | 2 | 1676098.6 | 15908106 | 0.3 | 37.5 | IRRIGATION |
| 133 | 31271 | 4/10/98 | 28 | 28 | 260 | 1 | 1755902 | 15798823 | 0.15 | 8.75 | DOMESTIC, IRRIGATION, STOCKWATER |
| 134 | 31325 | 10/1/01 | 21 | 42 | 250 | 1 | 1830927 | 15832500 | 0.24 | 30 | IRRIGATION |
| 135 | 31325 | 10/1/01 | 21 | 43 | 250 | 1 | 1832237.4 | 15833836 | 0.24 | 30 | IRRIGATION |
| 136 | 31327 | 10/1/01 | 20 | 42 | 168 | 1 | 1828232.7 | 15837793 | 0.14 | 17.5 | IRRIGATION |
| 137 | 31406 | 1/18/02 | 20 | 42 | 320 | 2 | 1826906.7 | 15837785 | 2 | 723.96694 | MUNICIPAL |
| 138 | 31407 | 1/18/02 | 23 | 51 | 200 | 1 | 1877335.3 | 15822022 | 2 | 723.96694 | MUNICIPAL |
| 139 | 31408 | 2/6/02 | 11 | 40 | 200 | 1 | 1819891 | 15885320 | 0 | 0 | AESTHETIC STORAGE, DIVERSION TO STORAGE, STOCKWATER STORAGE |
| 140 | 31415 | 12/16/99 | 14 | 36 | LAKE | none | 1800312.1 | 15871938 | 0 | 0 | AESTHETIC STORAGE, WILDLIFE STORAGE |
| 141 | 31415 | 12/16/99 | 14 | 36 | LAKE | none | 1800312.1 | 15871938 | 0 | 0 | AESTHETIC STORAGE, WILDLIFE STORAGE |
| 142 | 11677 | 2/10/92 | 21 | 16 | 0 | none | 1693643.9 | 15832491 | 1.28 | 160 | IRRIGATION |
| 143 | 11686 | 3/4/92 | 17 | 11 | 0 | none | 1663346.6 | 15852308 | 1.6 | 200 | IRRIGATION |
| 144 | 11694 | 3/6/92 | 28 | 27 | 0 | none | 1751935.4 | 15798807 | 1.56 | 195 | IRRIGATION |
| 145 | 11716 | 3/13/92 | 29 | 39 | 0 | none | 1812619.9 | 15791205 | 1.6 | 442.5 | IRRIGATION |
| 146 | 11718 | 3/17/92 | 20 | 25 | 0 | none | 1737195 | 15838558 | 0.72 | 90 | IRRIGATION |
| 147 | 11741 | 5/22/92 | 31 | 28 | 0 | none | 1755952.9 | 15780288 | 2.3 | 287.5 | IRRIGATION |
| 148 | 11747 | 4/2/92 | 16 | 11 | 0 | none | 1667278.6 | 15860317 | 0.98 | 197.5 | IRRIGATION |
| 149 | 11756 | 3/18/92 | 13 | 7 | 0 | none | 1646040.9 | 15873565 | 3.7 | 559.5 | IRRIGATION |
| 150 | 11761 | 4/7/92 | 21 | 19 | 0 | none | 1708080.4 | 15833960 | 1 | 127.75 | IRRIGATION |
| 151 | 11761 | 4/7/92 | 21 | 19 | 0 | none | 1706817.1 | 15833932 | 1 | 127.75 | IRRIGATION |
| 152 | 11763 | 4/8/92 | 20 | 34 | 0 | none | 1784668 | 15836143 | 3 | 500 | IRRIGATION |
| 153 | 11772 | 4/15/92 | 33 | 28 | 0 | none | 1753341.2 | 15768346 | 2.19 | 385 | IRRIGATION |
| 154 | 11773 | 4/16/92 | 25 | 22 |  | 4 | 1724050.3 | 15810490 | 1.18 | 242.5 | DOMESTIC, IRRIGATION |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 155 | 11774 | 4/7/92 | 21 | 40 | 0 | none | 1818968.8 | 15832421 | 0.12 | 10 | IRRIGATION |
| 160 | 11783 | 4/10/92 | 24 | 54 | 0 | none | 1894418.3 | 15818180 | 0.3 | 37.5 | DOMESTIC, IRRIGATION, STOCKWATER |
| 161 | 11797 | 4/16/92 | 38 | 29 | 0 | none | 1761885.9 | 15740875 | 1.8 | 225 | IRRIGATION |
| 162 | 11799 | 4/20/92 | 25 | 32 | 0 | none | 1776926.6 | 15809612 | 0.06 | 2.5 | DOMESTIC, IRRIGATION |
| 163 | 11802 | 4/29/92 | 20 | 16 | 0 | none | 1693595 | 15840429 | 0.52 | 65 | IRRIGATION |
| 164 | 11835 | 5/20/92 | 17 | 28 | 0 | none | 1754229.5 | 15853259 | 0.7 | 87.5 | IRRIGATION |
| 165 | 11848 | 5/21/92 | 20 | 29 | 0 | none | 1759655.4 | 15837401 | 0.09 | 7.5 | IRRIGATION |
| 166 | 11860 | 6/11/92 | 20 | 34 | 0 | none | 1785983 | 15837475 | 2 | 257.5 | IRRIGATION |
| 167 | 11866 | 6/16/92 | 14 | 9 | 0 | none | 1656659.7 | 15870926 | 2.2 | 375 | IRRIGATION |
| 168 | 11866 | 6/16/92 | 14 | 10 | 0 | none | 1657990.8 | 15868258 | 2.2 | 375 | IRRIGATION |
| 169 | 11870 | 6/18/92 | 37 | 28 | 0 | none | 1757912.8 | 15748782 | 0.8 | 100 | IRRIGATION |
| 170 | 11874 | 6/25/92 | 23 | 39 | 0 | none | 1811086.9 | 15820408 | 0.72 | 90 | IRRIGATION |
| 171 | 11874 | 6/25/92 | 24 | 39 | 0 | none | 1812427.9 | 15819087 | 0.72 | 90 | IRRIGATION |
| 172 | 11874 | 6/25/92 | 23 | 39 | 0 | none | 1812413.6 | 15820422 | 0.72 | 90 | IRRIGATION |
| 173 | 11875 | 6/2/92 | 19 | 18 | 0 | none | 1701537 | 15841764 | 0.7 | 208 | IRRIGATION |
| 174 | 11876 | 6/12/92 | 12 | 19 | 0 | none | 1706629.9 | 15883405 | 1.66 | 207.5 | IRRIGATION |
| 175 | 11885 | 6/24/92 | 23 | 18 | 0 | none | 1701618.2 | 15821971 | 0.19 | 12.5 | DOMESTIC, IRRIGATION |
| 176 | 11891 | 6/3/92 | 17 | 15 | 0 | none | 1688309.4 | 15853825 | 2 | 250 | IRRIGATION |
| 177 | 11892 | 6/29/92 | 7 | 11 | 0 | none | 1663245.2 | 15906654 | 3.2 | 402.5 | IRRIGATION |
| 178 | 11907 | 7/20/92 | 12 | 31 | 0 | none | 1773935.5 | 15878425 | 1.6 | 200 | IRRIGATION |
| 179 | 11910 | 8/4/92 | 20 | 41 | 0 | none | 1824228.9 | 15839097 | 0.06 | 2.5 | DOMESTIC, IRRIGATION |
| 180 | 11911 | 8/10/92 | 23 | 25 | 0 | none | 1737243.6 | 15822663 | 1.3 | 162.5 | IRRIGATION |
| 181 | 11933 | 9/28/92 | 12 | 18 | 0 | none | 1705285 | 15883053 | 3 | 402.5 | IRRIGATION |
| 182 | 11962 | 11/13/92 | 34 | 30 | 0 | none | 1765268.1 | 15765734 | 0.72 | 90 | IRRIGATION |
| 183 | 11971 | 12/16/92 | 22 | 30 | 0 | none | 1766396.4 | 15825506 | 3.48 | 435 | IRRIGATION |
| 184 | 11984 | 12/28/92 | 11 | 37 | 0 | none | 1805310 | 15887797 | 0.11 | 14 | IRRIGATION |
| 185 | 12001 | 3/5/93 | 31 | 40 | 0 | none | 1816810.8 | 15778010 | 0.24 | 30 | IRRIGATION |
| 186 | 12007 | 4/14/93 | 25 | 22 | 0 | none | 1725374.3 | 15810503 | 3.4 | 400 | IRRIGATION, STOCKWATER |
| 187 | 12007 | 4/14/93 | 26 | 22 | 0 | none | 1725380 | 15809175 | 3.4 | 400 | IRRIGATION, STOCKWATER |
| 188 | 12070 | 10/28/93 | 26 | 42 | 0 | none | 1831100.8 | 15808629 | 0.64 | 75 | DIVERSION TO STORAGE, DOMESTIC, IRRIGATION, STOCKWATER STORAGE, WILDLIFE STORAGE |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 189 | 12070 | 10/28/93 | 26 | 43 | 0 | none | 1832434.9 | 15808633 | 0.64 | 75 | DIVERSION TO STORAGE, DOMESTIC, IRRIGATION, STOCKWATER STORAGE, WILDLIFE STORAGE |
| 190 | 12075 | 11/4/93 | 28 | 40 | 0 | none | 1817919.2 | 15793907 | 0.2 | 25 | IRRIGATION |
| 191 | 12089 | 11/23/93 | 10 | 38 | 0 | none | 1809267.8 | 15889160 | 0.15 | 12.5 | IRRIGATION |
| 192 | 12096 | 1/4/94 | 17 | 30 | 0 | none | 1766175.2 | 15854647 | 2 | 723.96694 | AESTHETIC, AESTHETIC STORAGE, DOMESTIC |
| 193 | 12108 | 3/22/94 | 15 | 35 | 0 | none | 1793761.7 | 15862661 | 0.13 | 7.5 | DOMESTIC, IRRIGATION |
| 194 | 12114 | 6/2/94 | 22 | 51 | 0 | none | 1876045.1 | 15825954 | 0.14 | 17.5 | DIVERSION TO STORAGE, IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |
| 195 | 12115 | 5/27/94 | 26 | 39 | 0 | none | 1813868.7 | 15804453 | 0.03 | 2.5 | IRRIGATION |
| 196 | 12142 | 8/2/94 | 15 | 35 | 0 | none | 1795073.7 | 15864150 | 4.87 | 87.5 | DOMESTIC, FIRE PROTECTION, IRRIGATION |
| 197 | 12142 | 8/2/94 | 15 | 35 | 0 | none | 1791120.4 | 15863956 | 4.87 | 87.5 | DOMESTIC, FIRE PROTECTION, IRRIGATION |
| 198 | 12142 | 8/2/94 | 16 | 35 | 0 | none | 1792454 | 15861329 | 4.87 | 87.5 | DOMESTIC, FIRE PROTECTION, IRRIGATION |
| 199 | 12150 | 10/7/94 | 3 | 37 | 0 | none | 1805220.1 | 15927152 | 0.94 | 112.5 | DOMESTIC, IRRIGATION, STOCKWATER |
| 200 | 12156 | 10/27/94 | 16 | 12 | 0 | none | 1671244.1 | 15861671 | 0.52 | 60 | DOMESTIC, IRRIGATION, STOCKWATER |
| 201 | 12177 | 3/2/95 | 26 | 32 | 0 | none | 1775639.2 | 15805628 | 0.96 | 120 | IRRIGATION |
| 202 | 12187 | 3/8/95 | 15 | 35 | 0 | none | 1791120.4 | 15863956 | 2.98 | 372.5 | AESTHETIC STORAGE, IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 203 | 12190 | 4/6/95 | 3 | 18 | 0 | none | 1701249.2 | 15926690 | 0.66 | 75 | DIVERSION TO STORAGE, DOMESTIC, IRRIGATION, WILDLIFE, WILDLIFE STORAGE |
| 204 | 12194 | 4/5/95 | 12 | 31 | 0 | none | 1771303.6 | 15881078 | 0.2 | 25 | IRRIGATION |
| 205 | 12204 | 4/26/95 | 10 | 38 | 0 | none | 1806625.2 | 15889136 | 0.12 | 10 | IRRIGATION |
| 206 | 12222 | 6/27/95 | 15 | 15 | 0 | none | 1688214.6 | 15864468 | 0.06 | 5 | IRRIGATION |
| 208 | 12498 | 10/7/98 | 28 | 33 | 0 | none | 1779682.5 | 15794982 | 0.4 | 144.79339 | COMMERCIAL, STOCKWATER |
| 209 | 12525 | 2/24/99 | 11 | 32 | 0 | none | 1775250.9 | 15883782 | 0.2 | 25 | IRRIGATION |
| 210 | 12526 | 2/24/99 | 11 | 32 | 0 | none | 1775250.9 | 15883782 | 0.2 | 25 | IRRIGATION |
| 211 | 12527 | 2/24/99 | 11 | 32 | 0 | none | 1775250.9 | 15883782 | 0.2 | 27.5 | IRRIGATION |
| 212 | 12528 | 2/24/99 | 11 | 32 | 0 | none | 1775243.6 | 15885115 | 0.2 | 25 | IRRIGATION |
| 213 | 12529 | 2/24/99 | 11 | 32 | 0 | none | 1775243.6 | 15885115 | 0.2 | 25 | IRRIGATION |
| 214 | 12531 | 2/24/99 | 11 | 32 | 0 | none | 1775243.6 | 15885115 | 0.2 | 25 | IRRIGATION |
| 215 | 10960 | 9/7/89 | 25 | 34 | 50 | 1 | 1787502.6 | 15809633 | 0.8 | 100 | IRRIGATION, STOCKWATER |
| 216 | 11645 | 2/10/92 | 17 | 17 | U | none | 1697518.7 | 15855294 | 0.2 | 20 | DOMESTIC, IRRIGATION |
| 217 | 11998 | 2/26/93 | 29 | 40 | 300 | 1 | 1817945.4 | 15789943 | 0.7 | 87.5 | IRRIGATION |
| 218 | 12050 | 8/31/93 | 8 | 20 | 250 | 1 | 1714566.9 | 15901928 | 0.42 | 52.5 | IRRIGATION |
| 219 | 12105 | 3/4/94 | 13 | 24 | 120 | 1 | 1737095.7 | 15875538 | 0.56 | 202.71074 | COMMERCIAL |
| 220 | 12153 | 10/24/94 | 0 | 0 | 75 | 0 | 1941771.2 | 15920929 | 0.4 | 50 | IRRIGATION |
| 221 | 12160 | 11/2/94 | 10 | 35 | U | none | 1791028.6 | 15889097 | 0.12 | 10 | IRRIGATION |
| 222 | 12161 | 11/21/94 | 19 | 18 | 100 | 1 | 1701530.5 | 15843090 | 1 | 200 | IRRIGATION |
| 223 | 12166 | 12/19/94 | 19 | 33 | 139 | 1 | 1783294.9 | 15845422 | 0.16 | 10 | DOMESTIC, IRRIGATION |
| 224 | 12169 | 1/20/95 | 7 | 22 | 300 | 2 | 1722463.9 | 15907193 | 1.3 | 162.5 | IRRIGATION |
| 225 | 12188 | 4/4/95 | 15 | 11 | 300 | 1 | 1663303.2 | 15862953 | 0.54 | 50 | COMMERCIAL, DOMESTIC |
| 226 | 12206 | 5/5/95 | 28 | 41 | 300 | 1 | 1824549 | 15795302 | 0.2 | 25 | IRRIGATION |
| 227 | 12207 | 5/8/95 | 28 | 34 | 250 | 1 | 1784955 | 15796349 | 2.76 | 345 | IRRIGATION |
| 228 | 12208 | 5/11/95 | 20 | 49 | U | none | 1864141.2 | 15840547 | 1.62 | 200 | DOMESTIC, IRRIGATION |
| 229 | 12210 | 5/19/95 | 21 | 26 | 15 | 1 | 1745128.1 | 15832006 | 0.03 | 2.5 | IRRIGATION |
| 230 | 12211 | 5/11/95 | 28 | 37 | 300 | 1 | 1804657.9 | 15797783 | 1.8 | 225 | IRRIGATION |
| 231 | 12212 | 5/23/95 | 22 | 39 | 140 | 1 | 1812359 | 15827066 | 0.05 | 2.25 | DOMESTIC, IRRIGATION |
| 232 | 12214 | 5/9/95 | 25 | 22 | U | none | 1725374.3 | 15810503 | 0.54 | 67.5 | DOMESTIC, IRRIGATION |
| 233 | 12220 | 6/13/95 | 19 | 38 | 200 | 1 | 1806890.4 | 15845590 | 0.2 | 62.5 | IRRIGATION |
| 234 | 12226 | 7/3/95 | 8 | 18 | 200 | 1 | 1701189.2 | 15900257 | 0.2 | 25 | DOMESTIC, IRRIGATION, STOCKWATER |
| 235 | 12227 | 7/5/95 | 11 | 40 | 100 | 1 | 1821235.5 | 15884001 | 0.7 | 87.5 | IRRIGATION |
| 236 | 12233 | 7/10/95 | 17 | 17 | U | none | 1697518.7 | 15855294 | 0.1 | 7.5 | DOMESTIC, IRRIGATION, STOCKWATER |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 237 | 12241 | 7/14/95 | 33 | 31 | 300 | 1 | 1773149.8 | 15768438 | 0.2 | 20 | DOMESTIC, IRRIGATION, STOCKWATER |
| 238 | 12245 | 9/14/95 | 23 | 33 | 300 | 1 | 1783433.9 | 15824204 | 0.17 | 12.5 | IRRIGATION, STOCKWATER |
| 239 | 12246 | 7/21/95 | 7 | 21 | 500 | 3 | 1717188.1 | 15907196 | 0.16 | 10 | DOMESTIC, IRRIGATION |
| 240 | 12252 | 8/3/95 | 10 | 27 | 200 | 1 | 1750226.5 | 15892818 | 0.14 | 12.5 | DOMESTIC, IRRIGATION |
| 241 | 12262 | 8/22/95 | 10 | 38 | 280 | 1 | 1810589.2 | 15889173 | 0.1 | 12.5 | IRRIGATION |
| 242 | 12269 | 8/28/95 | 26 | 22 | 600 | 2 | 1721416.6 | 15806483 | 2 | 492.5 | IRRIGATION |
| 243 | 12270 | 9/7/95 | 20 | 50 | 400 | 1 | 1870541.3 | 15840535 | 0.16 | 150 | DOMESTIC, IRRIGATION |
| 244 | 12280 | 10/10/95 | 28 | 41 | 500 | 2 | 1823227 | 15795288 | 0.2 | 25 | IRRIGATION |
| 245 | 12282 | 8/28/95 | 12 | 40 | U | none | 1819939.9 | 15882651 | 0.34 | 42.5 | DOMESTIC, IRRIGATION, STOCKWATER |
| 246 | 12283 | 10/17/95 | 8 | 20 | 200 | 1 | 1714563.1 | 15903245 | 0.62 | 77.5 | IRRIGATION |
| 247 | 12285 | 10/30/95 | 25 | 42 | U | none | 1829750.1 | 15811282 | 0.44 | 50 | DOMESTIC, IRRIGATION |
| 248 | 12286 | 10/30/95 | 25 | 42 | U | none | 1829758.4 | 15809953 | 0.24 | 25 | DOMESTIC, IRRIGATION |
| 249 | 12287 | 10/30/95 | 26 | 42 | U | none | 1829766.7 | 15808624 | 0.24 | 25 | DOMESTIC, IRRIGATION |
| 250 | 12289 | 11/1/95 | 31 | 40 | 350 | 1 | 1818135.4 | 15779344 | 0.2 | 25 | DOMESTIC, IRRIGATION |
| 251 | 12291 | 11/2/95 | 28 | 28 | 300 | 1 | 1755902 | 15798823 | 0.16 | 10 | DOMESTIC, IRRIGATION |
| 252 | 12302 | 1/5/96 | 16 | 37 | 130 | 1 | 1804177.9 | 15857441 | 0.08 | 10 | IRRIGATION |
| 253 | 12306 | 1/18/96 | 0 | 0 | U | 0 | 1943075.6 | 15920925 | 0.14 | 17.5 | IRRIGATION |
| 254 | 12313 | 1/30/96 | 1 | 11 | 200 | 1 | 1664007.1 | 15937160 | 0.8 | 100 | IRRIGATION |
| 255 | 12337 | 5/10/96 | 32 | 40 | U | none | 1816812.5 | 15776685 | 0.28 | 30 | DOMESTIC, IRRIGATION, STOCKWATER |
| 256 | 12341 | 6/13/96 | 10 | 38 | 32 | 1 | 1810589.2 | 15889173 | 0.1 | 5 | DOMESTIC, IRRIGATION |
| 257 | 12357 | 8/16/96 | 22 | 16 | 150 | 1 | 1691014.2 | 15828554 | 0.12 | 10 | IRRIGATION |
| 258 | 12404 | 7/29/97 | 26 | 22 | 350 | 1 | 1725390.3 | 15806523 | 0.82 | 100 | DOMESTIC, IRRIGATION |
| 259 | 12473 | 10/2/98 | 8 | 24 | 314 | 2 | 1734353.5 | 15903269 | 0.15 | 12.5 | IRRIGATION |
| 260 | 12522 | 5/17/99 | 11 | 38 | 350 | 2 | 1806633.8 | 15887804 | 0.09 | 7.5 | DIVERSION TO STORAGE, IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE, RECREATION STORAGE |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | 11460 | 2/25/91 | 16 | 24 | 0 | none | 1734399.5 | 15860993 | 2.96 | 370 | IRRIGATION |
| 262 | 11661 | 2/13/92 | 19 | 35 | 0 | none | 1791230.5 | 15845441 | 0.4 | 50 | IRRIGATION |
| 263 | 11808 | 5/5/92 | 26 | 37 | 0 | none | 1800734.6 | 15804376 | 1.6 | 200 | IRRIGATION |
| 264 | 11810 | 5/7/92 | 12 | 36 | 0 | none | 1800294.5 | 15881176 | 3.34 | 417.5 | IRRIGATION |
| 265 | 11872 | 6/19/92 | 14 | 39 | 0 | none | 1814752.6 | 15872099 | 0.93 | 200 | IRRIGATION |
| 266 | 11937 | 10/1/92 | 14 | 12 | 0 | none | 1672562.8 | 15868318 | 2.4 | 300 | IRRIGATION |
| 267 | 11966 | 12/11/92 | 0 | 0 | replaced with 67-7322 | 0 | 1625932.6 | 16079740 | 0.42 | 52.5 | IRRIGATION |
| 268 | 11976 | 1/19/93 | 26 | 21 | 0 | none | 1720094 | 15806466 | 1.6 | 200 | IRRIGATION |
| 269 | 11996 | 2/25/93 | 6 | 34 | 0 | none | 1788237.8 | 15912731 | 2 | 407.5 | IRRIGATION |
| 270 | 11999 | 3/19/93 | 21 | 40 | 0 | none | 1818957 | 15833749 | 0.14 | 11.25 | IRRIGATION |
| 271 | 12015 | 4/16/93 | 12 | 39 | 0 | none | 1811995.7 | 15882569 | 0.09 | 3.75 | DOMESTIC, IRRIGATION, STOCKWATER |
| 272 | 12020 | 5/21/93 | 20 | 37 | 0 | none | 1801770.5 | 15838855 | 0.44 | 50 | DOMESTIC, IRRIGATION |
| 273 | 12020 | 5/21/93 | 20 | 37 | 0 | none | 1802981.1 | 15838881 | 0.44 | 50 | DOMESTIC, IRRIGATION |
| 274 | 12021 | 5/21/93 | 11 | 38 | 0 | none | 1810613.3 | 15886512 | 0.12 | 12.5 | IRRIGATION, STOCKWATER |
| 275 | 12027 | 6/14/93 | 17 | 13 | 0 | none | 1677739 | 15852467 | 0.7 | 87.5 | IRRIGATION |
| 276 | 12028 | 6/15/93 | 17 | 38 | 0 | none | 1809498.8 | 15852187 | 0.09 | 7.5 | AESTHETIC, AESTHETIC STORAGE, DIVERSION TO STORAGE, DOMESTIC, IRRIGATION |
| 277 | 12091 | 12/30/93 | 9 | 27 | 0 | none | 1748898.1 | 15894139 | 0.09 | 21.5 | DOMESTIC, IRRIGATION, STOCKWATER |
| 278 | 12094 | 1/21/94 | 25 | 44 | 0 | none | 1837818 | 15812566 | 0.12 | 12.5 | DOMESTIC, IRRIGATION |
| 279 | 12129 | 6/24/94 | 12 | 31 | 0 | none | 1770037.7 | 15882412 | 0.1 | 12 | DOMESTIC, IRRIGATION |
| 280 | 12130 | 6/6/94 | 12 | 31 | 0 | none | 1770037.7 | 15882412 | 0.11 | 14 | DOMESTIC, IRRIGATION |
| 281 | 12148 | 10/3/94 | 12 | 39 | 0 | none | 1813395.1 | 15878663 | 0.1 | 5 | DOMESTIC, IRRIGATION |
| 282 | 12154 | 10/14/94 | 12 | 39 | 0 | none | 1813368.6 | 15879979 | 0.07 | 3.25 | DOMESTIC, IRRIGATION |
| 283 | 12165 | 12/16/94 | 21 | 35 | 0 | none | 1793956.6 | 15830863 | 0.13 | 17.5 | DIVERSION TO STORAGE, IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |
| 284 | 12182 | 2/28/95 | 22 | 56 | 0 | none | 1902105.1 | 15830171 | 0.09 | 11.25 | IRRIGATION |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate (ft /s) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 285 | 12205 | 4/3/95 | 8 | 22 | 0 | none | 1725121.3 | 15903238 | 0.4 | 50 | DIVERSION TO STORAGE, IRRIGATION, IRRIGATION FROM STORAGE, IRRIGATION STORAGE |
| 286 | 12228 | 7/6/95 | 14 | 40 | 0 | none | 1821379.6 | 15870852 | 0.19 | 2.5 | COMMERCIAL, IRRIGATION |
| 287 | 12425 | 12/16/97 | 19 | 38 | 0 | none | 1810854.7 | 15842995 | 0.3 | 52.5 | AESTHETIC, AESTHETIC STORAGE, DIVERSION TO STORAGE, IRRIGATION |
| 288 | 12448 | 4/8/98 | 12 | 40 | 0 | none | 1817363.8 | 15878701 | 1 | 361.98347 | MUNICIPAL |
| 289 | 12448 | 4/8/98 | 13 | 40 | 0 | none | 1817392.3 | 15877391 | 1 | 361.98347 | MUNICIPAL |
| 290 | 12448 | 4/8/98 | 13 | 39 | 0 | none | 1812101.6 | 15877332 | 1 | 361.98347 | MUNICIPAL |
| 291 | 12448 | 4/8/98 | 12 | 39 | 0 | none | 1816037.3 | 15878689 | 1 | 361.98347 | MUNICIPAL |
| 292 | 12448 | 4/8/98 | 13 | 38 | 0 | none | 1808116.9 | 15877314 | 1 | 361.98347 | MUNICIPAL |
| 293 | 12450 | 5/4/98 | 6 | 34 | 0 | none | 1788237.8 | 15912731 | 2.16 | 895 | DIVERSION TO STORAGE, IRRIGATION, RECREATION STORAGE, WILDLIFE STORAGE |
| 294 | 12530 | 2/24/99 | 11 | 32 | 0 | none | 1775243.6 | 15885115 | 0.2 | 25 | IRRIGATION |
| 295 | 12555 | 11/15/99 | 16 | 22 | 0 | none | 1726446.1 | 15862201 | 0.12 | 15 | IRRIGATION |
| 296 | 31134 | 1/12/01 | 15 | 32 | 0 | none | 1779294 | 15863930 | 0 | 0 | AESTHETIC STORAGE |
| 297 | 31135 | 1/12/01 | 15 | 32 | 0 | none | 1779278.9 | 15866791 | 0 | 0 | AESTHETIC STORAGE |
| 298 | 31135 | 1/12/01 | 15 | 32 | 0 | none | 1779286.7 | 15865258 | 0 | 0 | AESTHETIC STORAGE |
| 299 | 31136 | 1/12/01 | 15 | 32 | 0 | none | 1779278.9 | 15866791 | 0 | 0 | AESTHETIC STORAGE |
| 300 | 31145 | 1/25/01 | 7 | 22 | 0 | none | 1722463.9 | 15907193 | 4 | 500 | IRRIGATION |
| 301 | 31177 | 3/29/01 | 3 | 18 | 0 | none | 1702571.3 | 15928017 | 3.96 | 495 | IRRIGATION |
| 302 | 31178 | 3/29/01 | 3 | 20 | 0 | none | 1711787.3 | 15926688 | 2.42 | 302.5 | IRRIGATION |
| 303 | 31207 | 3/28/01 | 14 | 26 | 0 | none | 1744929.6 | 15869020 | 0.477 | 172.66612 | DOMESTIC, INDUSTRIAL |
| 304 | 31208 | 4/20/95 | 6 | 23 | 0 | none | 1727733.6 | 15912356 | 0.1 | 12.5 | IRRIGATION |
| 305 | 31276 | 4/6/01 | 12 | 28 | 0 | none | 1754248.7 | 15878330 | 0 | 0 | DOMESTIC |
| 306 | 31276 | 4/6/01 | 12 | 28 | 0 | none | 1754248.7 | 15878330 | 0 | 0 | DOMESTIC |
| 307 | 31311 | 8/17/01 | 0 | 0 | 0 | 0 | 2068656.4 | 15776857 | 0.004 | 1.4479339 | COMMERCIAL, DOMESTIC |
| 308 | 31315 | 9/17/01 | 14 | 36 | 0 | none | 1798992.1 | 15871923 | 0.5 | 180.99174 | COMMERCIAL, COOLING, HEATING |

| ID | Sequence Number | Priority Date | ROW | COL | Target Depth | Assigned Layer | UTMX(ft) | UTMY(ft) | Requested Diversion Rate ($ft^3/s$) | Total Estimated Extraction (af/yr) | Water Use List |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 311 | 31355 | 11/7/01 | 29 | 33 | 0 | none | 1779686.9 | 15792323 | 0 | 0 | COMMERCIAL, DOMESTIC, STOCKWATER |
| 312 | 31378 | 11/30/01 | 11 | 40 | 0 | none | 1821235.5 | 15884001 | 0.12 | 10 | IRRIGATION |
| 313 | 31394 | 1/4/02 | 29 | 29 | 0 | none | 1758558.3 | 15793544 | 1.34 | 167.5 | IRRIGATION |
| 314 | 31416 | 2/8/02 | 16 | 34 | 0 | none | 1789821.6 | 15861315 | 0.001 | 0.3619835 | DIVERSION TO STORAGE, FIRE PROTECTION, FIRE PROTECTION STORAGE |
| 318 | 31423 | 1/15/02 | 31 | 23 | 0 | none | 1726832.4 | 15781476 | 2 | 723.96694 | COMMERCIAL, STOCKWATER |
| 319 | 31423 | 1/15/02 | 31 | 22 | 0 | none | 1725509 | 15781471 | 2 | 723.96694 | COMMERCIAL, STOCKWATER |
| 320 | 31430 | 2/14/02 | 18 | 27 | 0 | none | 1751625.6 | 15849268 | 0.039 | 14.117355 | DOMESTIC |
| 321 | 31432 | 2/19/02 | 0 | 0 | 0 | 0 | 1948271.5 | 15920964 | 0.004 | 1.4479339 | COMMERCIAL |

Costs associated with this publication are available from the Idaho Department of Water Resources in accordance with Section 60-202, *Idaho Code*. IDWR-21000-20-03/2004.