

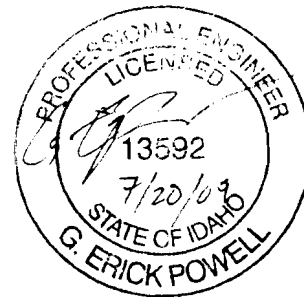
Project No. 938-01-2006

Evaluation of the Impact of the Proposed Dry Lot, LLC, Water Right Applications Using a Big Wood River Aquifer Groundwater Model

Prepared for:

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REVISED – July 16, 2009



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Prepared by: Brockway Engineering, PLLC
Date: REVISED March 18, 2009

A. Introduction

The Big Wood Valley, located in Blaine County, Idaho, consists of alluvium depositional material overlain on bedrock. The Cities of Bellevue, Hailey, Ketchum, and Sun Valley are located within the Valley or its tributaries. The valley is dominated by the Big Wood River, which flows through the valley, and is confined on the east and west by the Sawtooth Mountains. The primary water source of tributaries to the Big Wood River is snow precipitation.

The Big Wood Valley aquifer is hydrologically connected to the Big Wood River. Proposed activities to either the river or the aquifer will have impacts to the water source respectively. Historically, surface water rights and groundwater rights in the state of Idaho have been managed separately. However, in the future the State will begin to manage irrigation rights conjunctively.

Several proposed transfers have been or will be submitted to the Idaho Department of Water Resources involving new groundwater irrigation permits with recharge mitigation for Dry Lot, LLC. IDWR currently does not have a tool to evaluate the impacts of these proposed transfers. A groundwater model of the Big Wood Valley aquifer was developed by Brockway Engineering, PLLC, to evaluate the submitted transfers. The

groundwater model final report was submitted to IDWR, dated February 3, 2009 (Brockway Engineering, 2009).

B. Model Overview

The groundwater model was developed using MODFLOW, a three-dimensional, cell centered, finite-difference model developed by the United State Geological Survey. The Groundwater Modeling System (GMS) was used as the graphical user interface for MODFLOW, thus allowing for the use of existing geographical information system (GIS) data sets. The groundwater model was developed using the conceptual model approach by using available GIS data sets for all model attributes and converting the data layers to the corresponding MODFLOW cells.

The Big Wood Valley MODFLOW model consists of 33,452 individual cells that were sized to be 100 ft by 100 ft. The model consists of 467 rows and 258 columns. All model cells are oriented according to the compass (north/south and east/west), not aligned with the valley (Brockway Engineering, 2009). The model utilized for this scenario has been initially calibrated and may be further adjusted to reflect a better fit to historical data.

The northern model boundary was located at the narrowest valley width, just on the south side of the Golden Eagle residential development. The southern boundary is located immediately north of Bellevue, Idaho (Brockway Engineering, 2009). The east and west boundaries are the natural interface between the valley alluvium material and the mountains that confine the valley.

C. Objective of the Dry Lot, LLC Model Scenarios

The Valley Club Owners Association, dba Dry Lot, LLC, has submitted a water right transfer and new water right permit to the Idaho Department of Water Resources. The new water right permit is for irrigation of residential land owned by members of the owners association. The water right transfer proposes to recharge surface irrigation

rights from the Big Wood River into the aquifer for mitigation of the new groundwater irrigation permit.

Concerns have been raised by local groundwater and surface water users. The objective of the model scenarios is to quantify the relative impact of the proposed water right permit and water right transfer on concerned neighboring groundwater right holders and the associated impacts to the Big Wood River.

D. Dry Lot, LLC Scenario Inputs

The Dry Lot, LLC scenario inputs consists of the proposed irrigation water extraction under the new irrigation water right permit and the proposed mitigation by injecting water to the aquifer. Data for irrigation pumping and mitigation are graphed in Figure 1. Table 1 contains the associated data.

Table 1: Monthly volumes (acre-feet) of irrigation extraction under the proposed new permit and monthly volumes (acre-feet) of water to be recharged to the aquifer as mitigation.

	Apr	May	Jun	Jul	Aug	Sept	Oct	Total
Extraction (acft)	1	10	20	27	23	13	2	96
Mitigation (acft)	10	19	19	19	19	10	0	96

Two possible locations for groundwater recharge exist for the proposed transfer. The proposed recharge locations are identified in Figure 2. Dry Lot scenario 1 models the mitigation recharge location south of the extraction well. Dry Lot scenario 2 models the mitigation recharge location east of the extraction well.

E. Results

The groundwater model was run with the addition of the proposed extraction and mitigation. The baseline model results were compared with the results from this scenario to quantify the impacts of the proposed project.

Figure 3 indicates the location of the model nodes used to evaluate the impact from the proposed recharge mitigation well and the irrigation well for the owners association. Points A, B, C, D, and E are shown in Figure 3 with locations ranging from north of the proposed project, within the Heatherlands development, to south of the proposed project, at the mouth of Indian Creek. All five nodes were used to evaluate the changes of groundwater surface elevations from the baseline model data and the Dry Lot, LLC scenarios 1 and 2.

Figures 4 through 8 show the groundwater elevations of the baseline data and the model scenario 1 data. The largest decrease in water surface elevation occurs at point B of 0.27 ft, located immediately north of the irrigation well near Ohio Gulch road. The model node at the mouth of Indian Creek showed no detectable change in the water surface elevations under the proposed scenario.

Figures 9 through 13 show the groundwater elevations of the baseline data and the model scenario 2 data. The largest model decrease in water surface elevation occurred at observation node C with a decrease of 0.01 ft in September during the proposed groundwater recharge and extraction in scenario 2. The model node at the mouth of Indian Creek showed no decrease in the model surface water elevations under either of the proposed scenarios.

Six Big Wood River reaches were evaluated to quantify the change in the river/aquifer exchange based on the proposed scenarios. Figure 14 identifies the location of the river reaches. Figures 15 and 16 are graphs of the changes of river reach gain/loss based on the proposed scenario 1 and 2, respectively. The zero line in each figure represents the baseline model data; if the scenario reach data produced different results than the baseline model, then the difference for each river reach was plotted relative to the baseline model (positive = river gain; negative = river loss).

Scenario 1 resulted in an annual loss of 3 acre-ft/year in Reach 1 (Northern Boundary to Starweather Bridge). Reach 2 (Starweather Bridge to Deer Creek Bridge) showed a

river annual gain of 14 acre-ft/year. Reach 3 (Deer Creek Bridge to Aspen Lake) resulted in an annual river gain of 1 acre-ft/year. All other reaches showed no detectible reach gain/loss.

Scenario 2 resulted in an annual river gain of 2 acre-ft/year in reach 1 (Northern Boundary to Starweather Bridge) and 3 acre-ft/year loss in Reach 2 (Starweather Bridge to Deer Creek Bridge). All other reaches showed no detectible reach gain/loss.

F. Discussion

The Heatherlands model node (Point A, Figure 3) was identified and analyzed in these scenarios because of the potential impact to the Heatherland's subdivision groundwater wells from the proposed transfer. The maximum negative impact on groundwater level at the Heatherlands occurs in Scenario 1 during September, when the groundwater levels show a decrease of 0.03 ft. The baseline model shows an annual natural variation of the groundwater levels at this location of 0.8 ft. Evaluating scenario 2, the Heatherlands observation node does not show any decrease, but a slight increase in groundwater levels. The impact of the proposed project under either scenario on nearby wells is not discernable in comparison to the annual changes in the groundwater levels.

The annual discharge volume in the Big Wood River is 302,300 acre-feet/year using USGS gage data at Hailey. In Scenario 1, the changes in river reaches were 3 acft/year loss, 14 acft/year gain, and 1 acft/year gain represent a fraction of a percent of total stream volume, 0.001%, 0.005%, and <0.001%, respectively.

In Scenario 2, the changes in river reaches were 2 acft/year gain and 3 acft/year loss. These changes represent a fraction of a percent of the total stream flow, or 0.001% and 0.001%, respectively. Similar to the groundwater levels, the impact to the respective river reach from the proposed project under either scenario is not significant on an annual basis.

G. Summary

1. A new water right permit and water right transfer have been submitted to IDWR by Dry Lot, LLC.
2. IDWR concluded that no tool existed to evaluate the impact of these applications and could not process the transfer and permit.
3. Brockway Engineering, PLLC developed a groundwater model of the Big Wood Aquifer to evaluate the transfer and permit applications impact.
4. Dry Lot, LLC recharge and extraction scenarios were evaluated and compared with the baseline model data.
5. Model results indicated insignificant impacts to local groundwater and/or surface water users as a result of the proposed project.

H. References

Brockway Engineering, 2009. Development of a Groundwater Flow Model for the Big Wood River Aquifer: East Fork to Bellevue. Submitted to IDWR – Feb. 3, 2009.
Brockway Engineering, PLLC. Twin Falls, Idaho.

Valley Club Homeowners Mitigation Plan
Irrigation and Extended Season 27.5 Acres Purchased and 27.5 New Acres Irrigated
Subsurface Infiltration, No Ponds. Scenarios 1&2

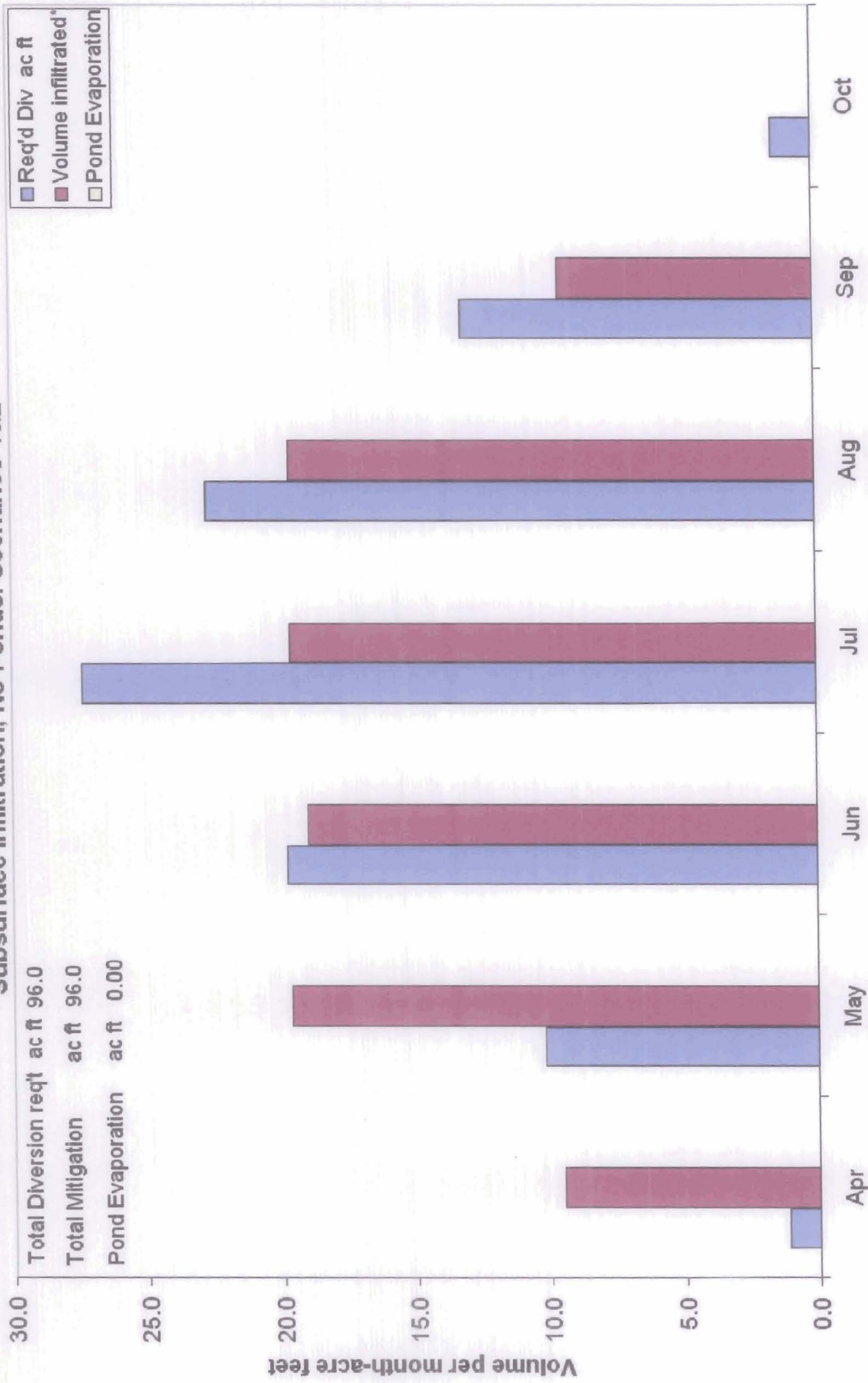
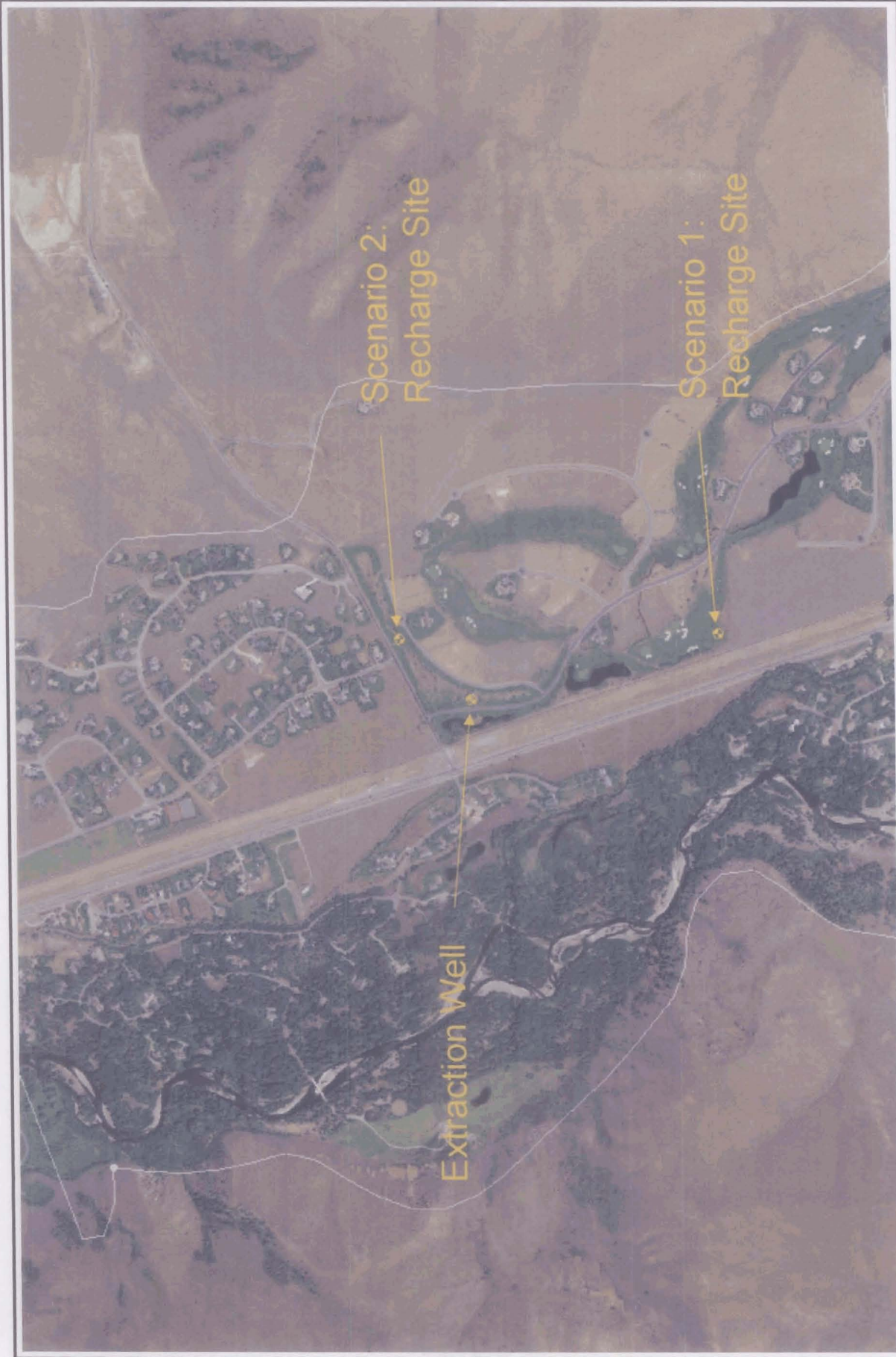


FIGURE 1: DRY LOT, LLC PUMPING AND MITIGATION
MODFLOW GROUNDWATER MODEL
 BIG WOOD VALLEY AQUIFER



LEGEND

- Valley Club OA Wells
- MODFLOW Boundary

FIGURE 2: DRY LOT, LLC
IRRIGATION EXTRACTION AND
SCENARIO 1 AND 2 MITIGATION WELLS

NAIP 2006 AERIAL PHOTO



**FIGURE 3: DRY LOT, LLC
GROUNDWATER LEVELS
EVALUATIONS NODES**

NAIP 2006 AERIAL PHOTO

Point A: Heatherlands

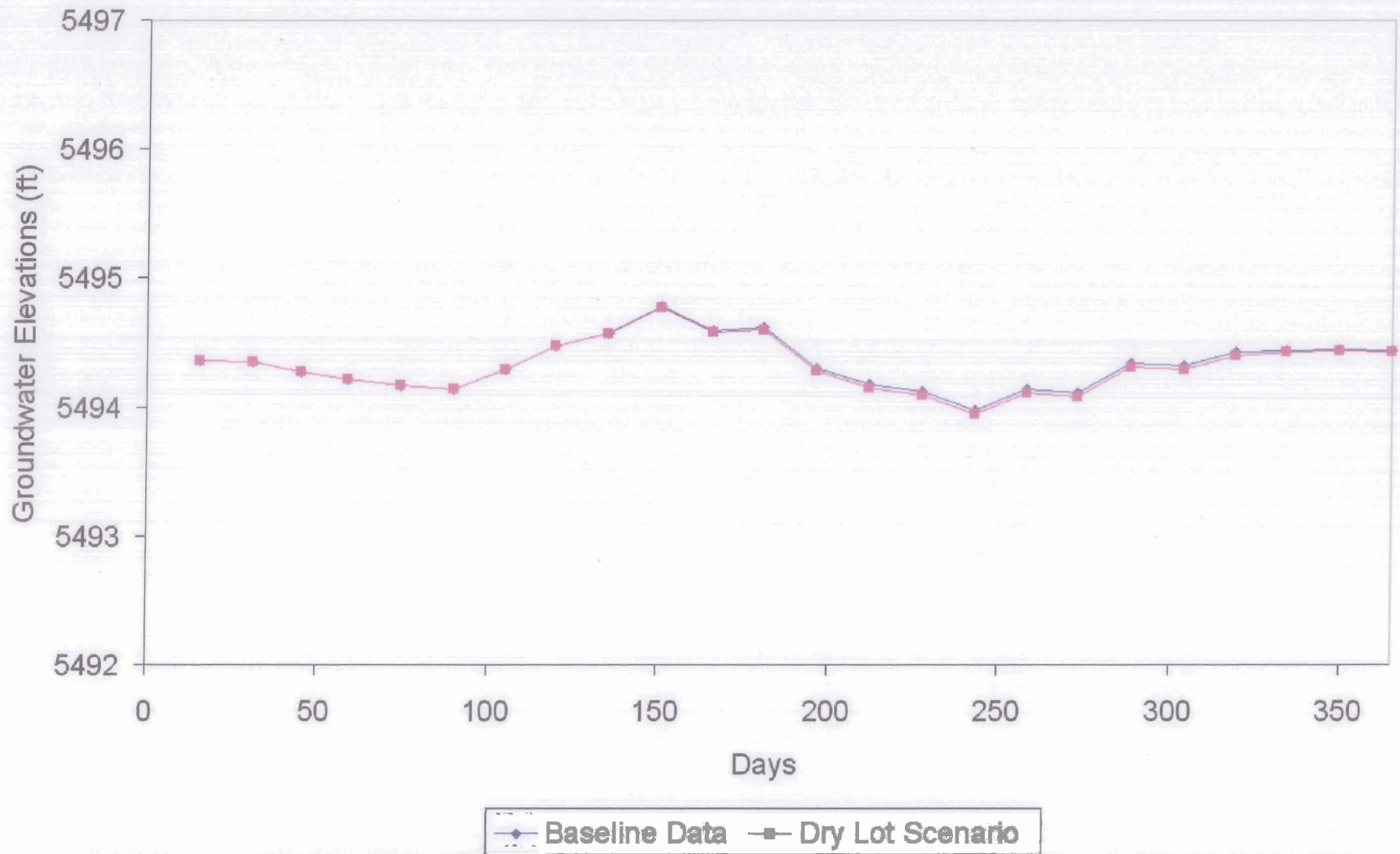


FIGURE 4: GROUNDWATER ELEVATIONS, SCENARIO 1 AT POINT A: HEATHERLANDS
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point B: North of Valley Club

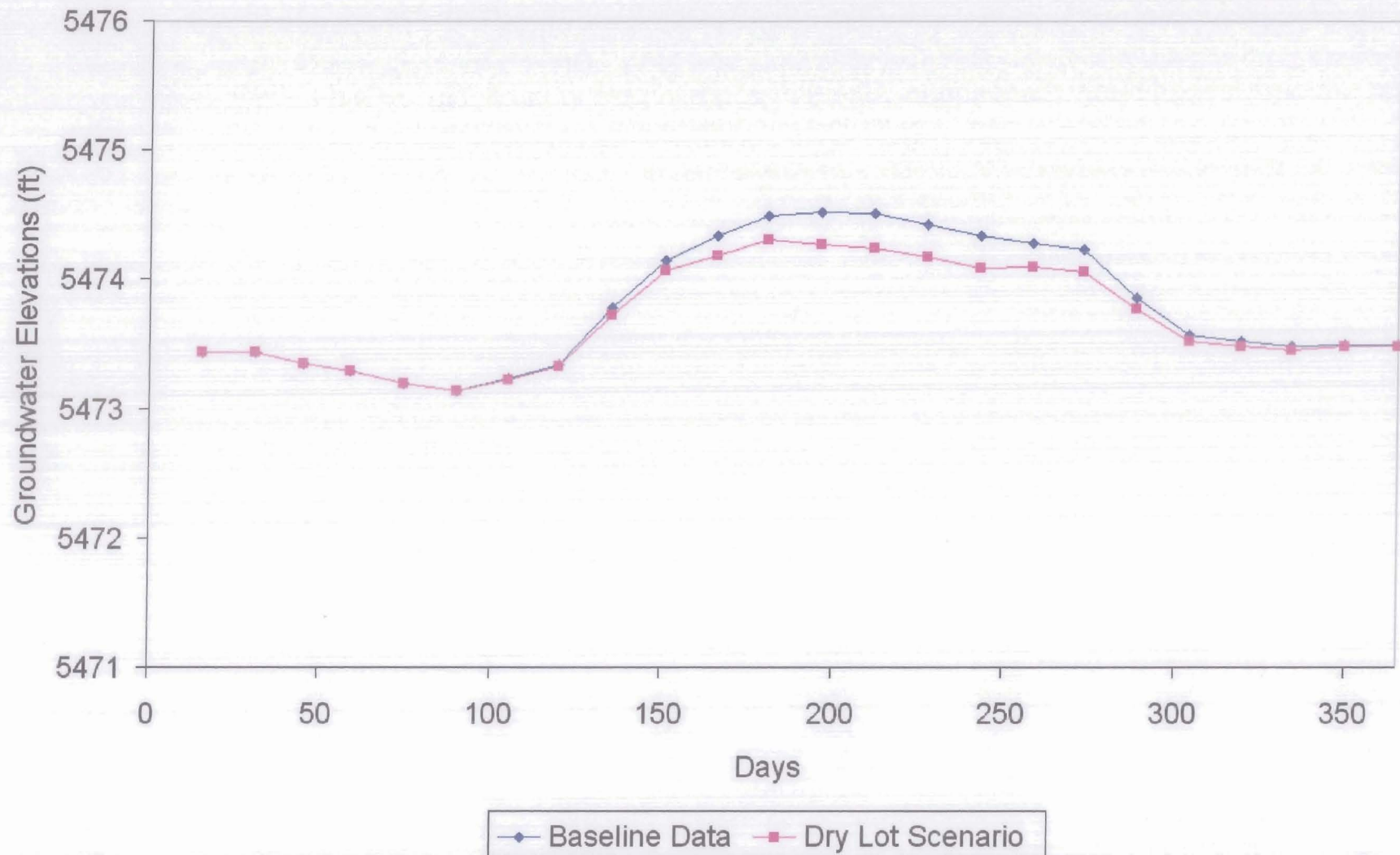


FIGURE 5: GROUNDWATER ELEVATIONS, SCENARIO 1 AT POINT B: NORTH OF VALLEY CLUB
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point C: South of Valley Club

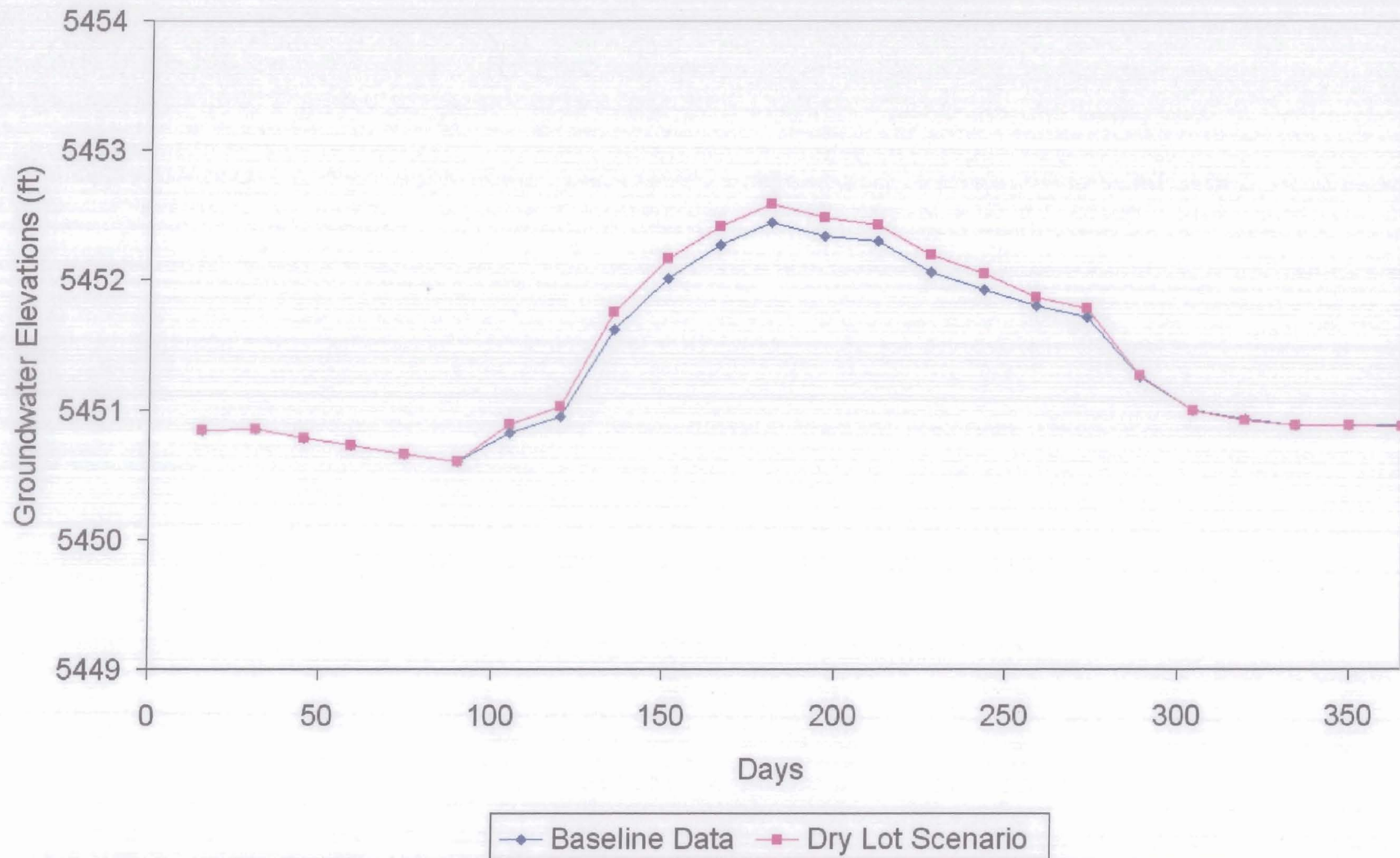


FIGURE 6: GROUNDWATER ELEVATIONS, SCENARIO 1 POINT C: SOUTH OF VALLEY CLUB
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point D: North of KSKI

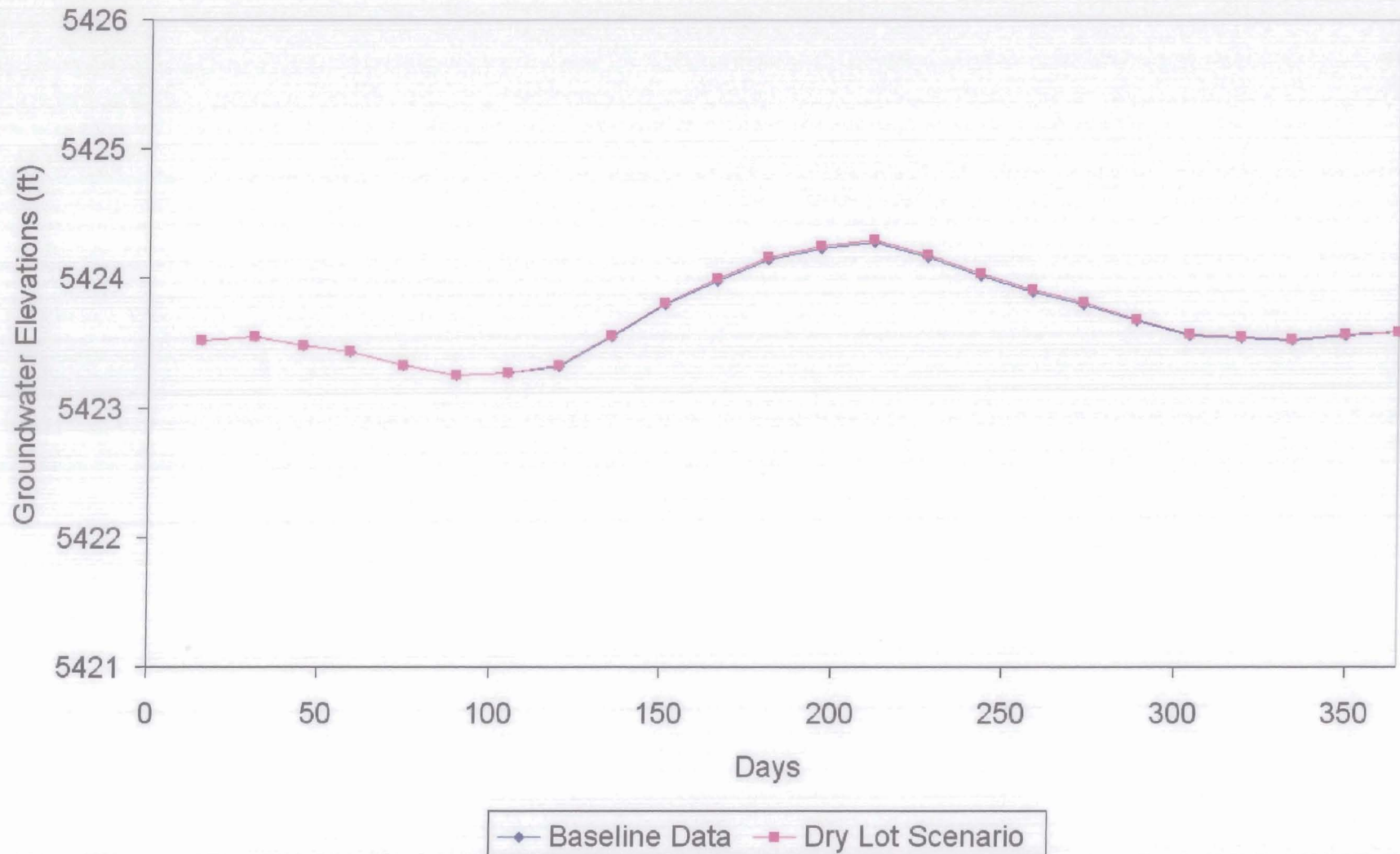
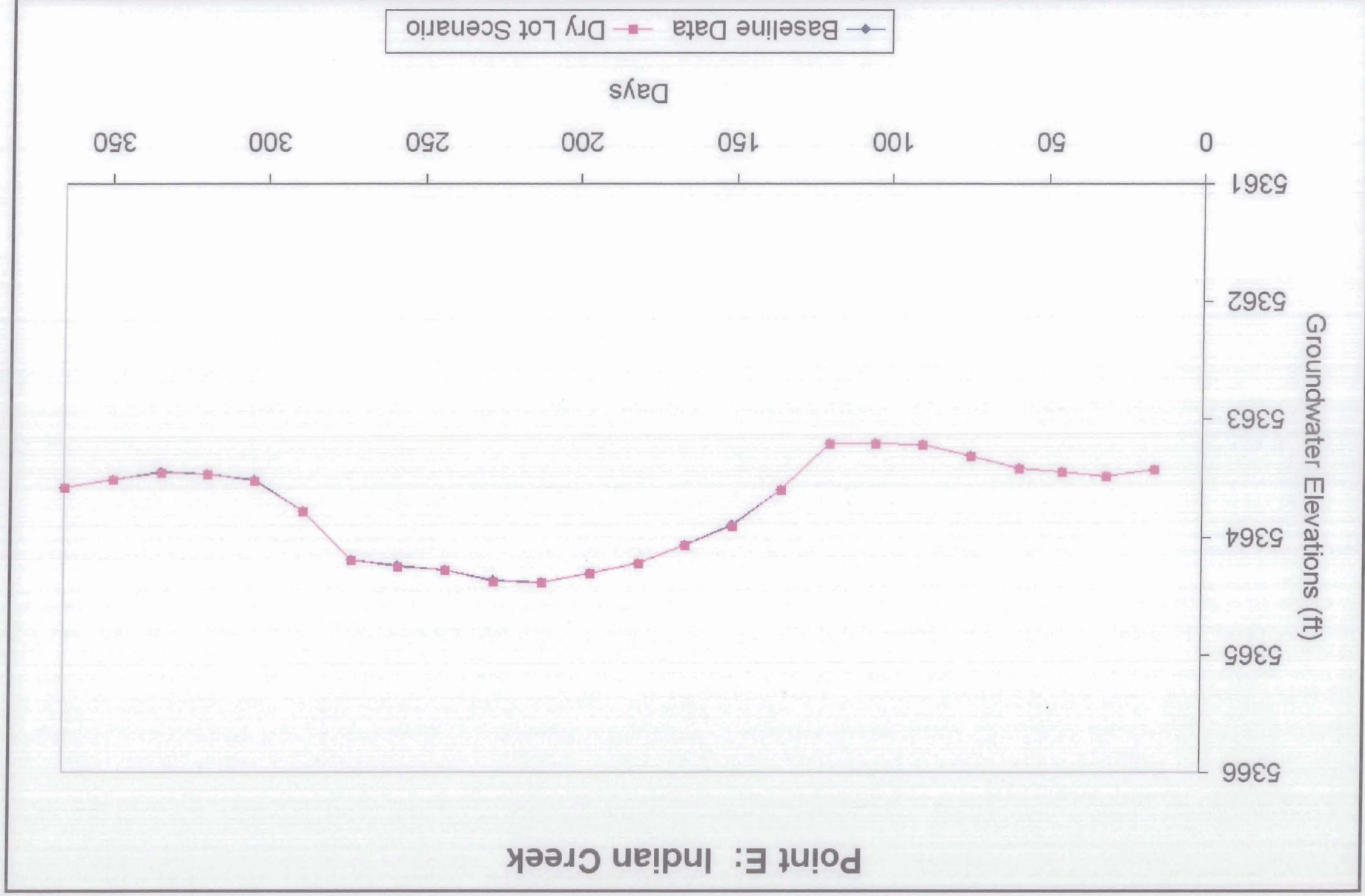


FIGURE 7: GROUNDWATER ELEVATIONS, SCENARIO 1 AT POINT D: NORTH OF KSKI PROPERTY
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

FIGURE 8: GROUNDWATER ELEVATIONS, SCENARIO 1 AT POINT E: INDIAN CREEK
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER



Point A: Heatherlands

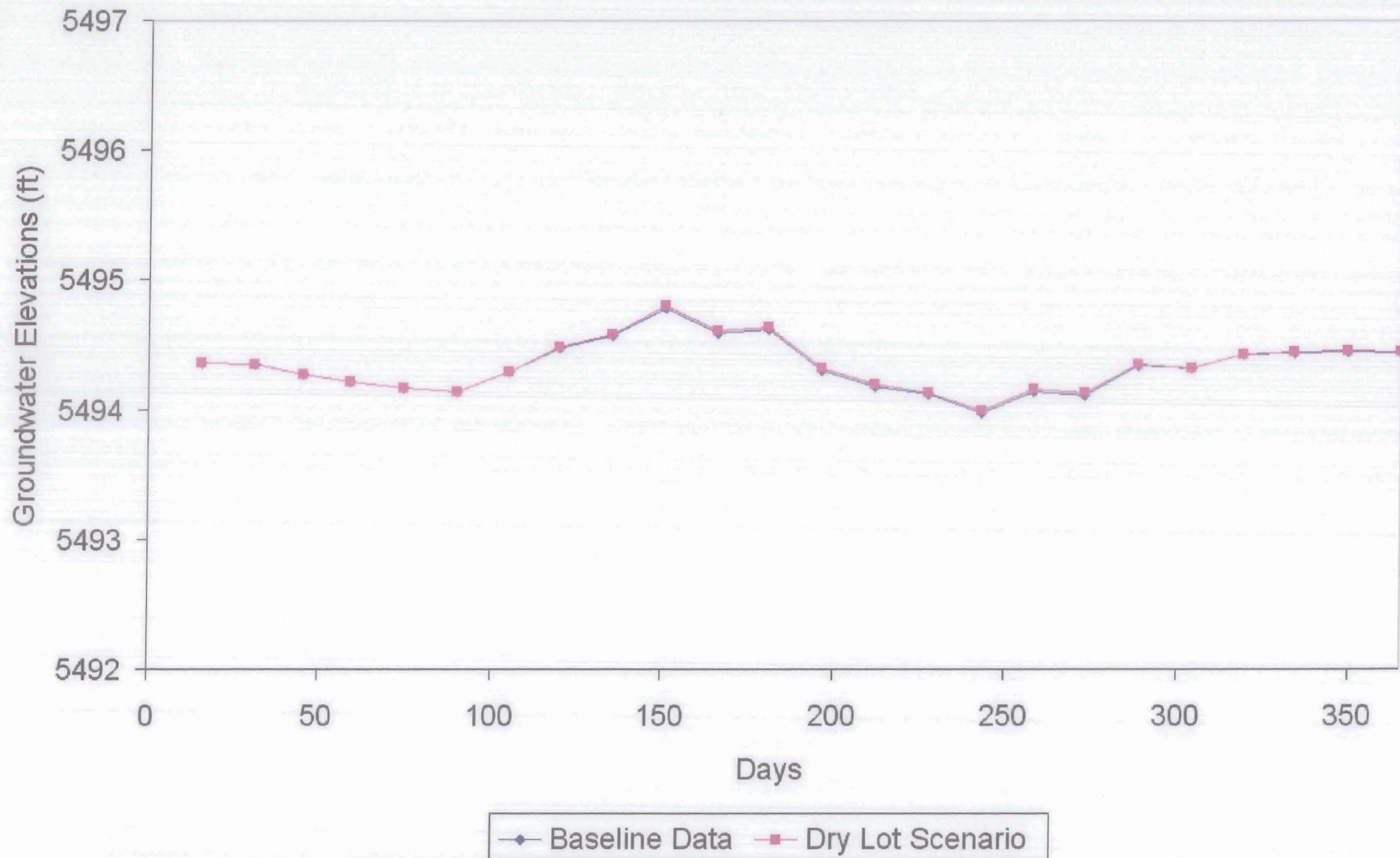


FIGURE 9: GROUNDWATER ELEVATIONS, SCENARIO 2 AT POINT A: HEATHERLANDS
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point B: North of Valley Club

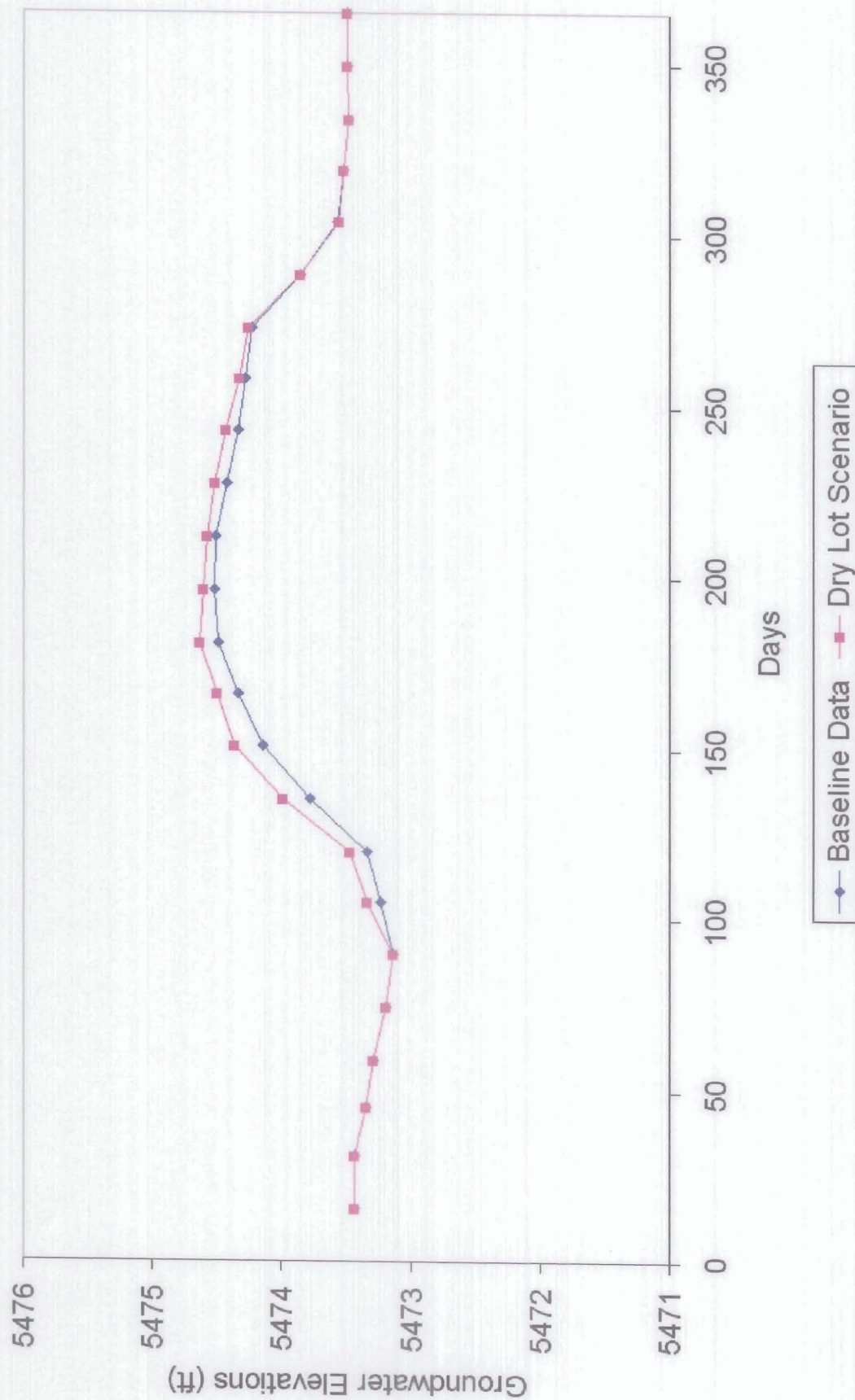


FIGURE 10: GROUNDWATER ELEVATIONS, SCENARIO 2 AT POINT B: NORTH OF VALLEY CLUB
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point C: South of Valley Club

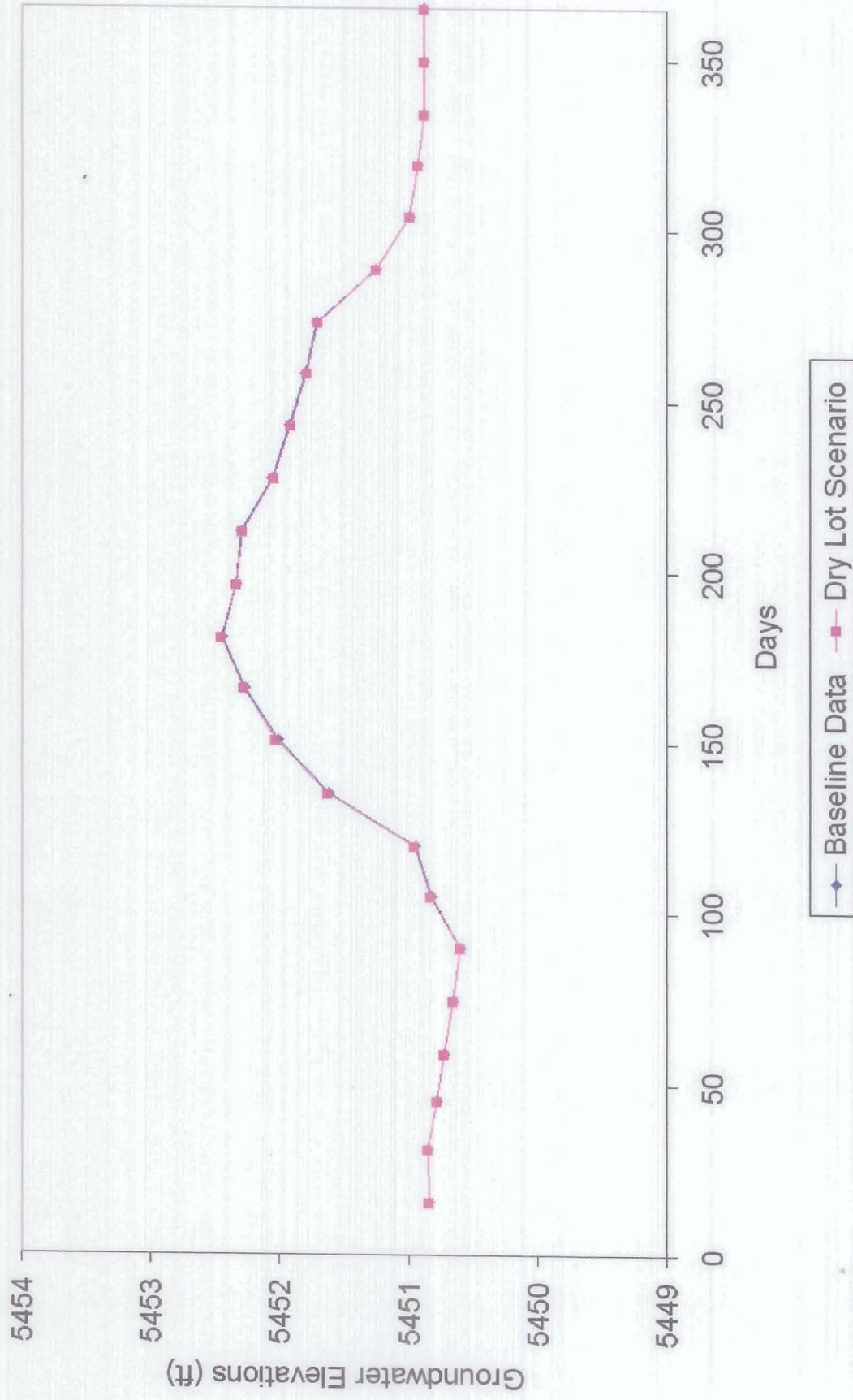


FIGURE 11: GROUNDWATER ELEVATIONS, SCENARIO 2 POINT C: SOUTH OF VALLEY CLUB
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

Point D: North of KSKI

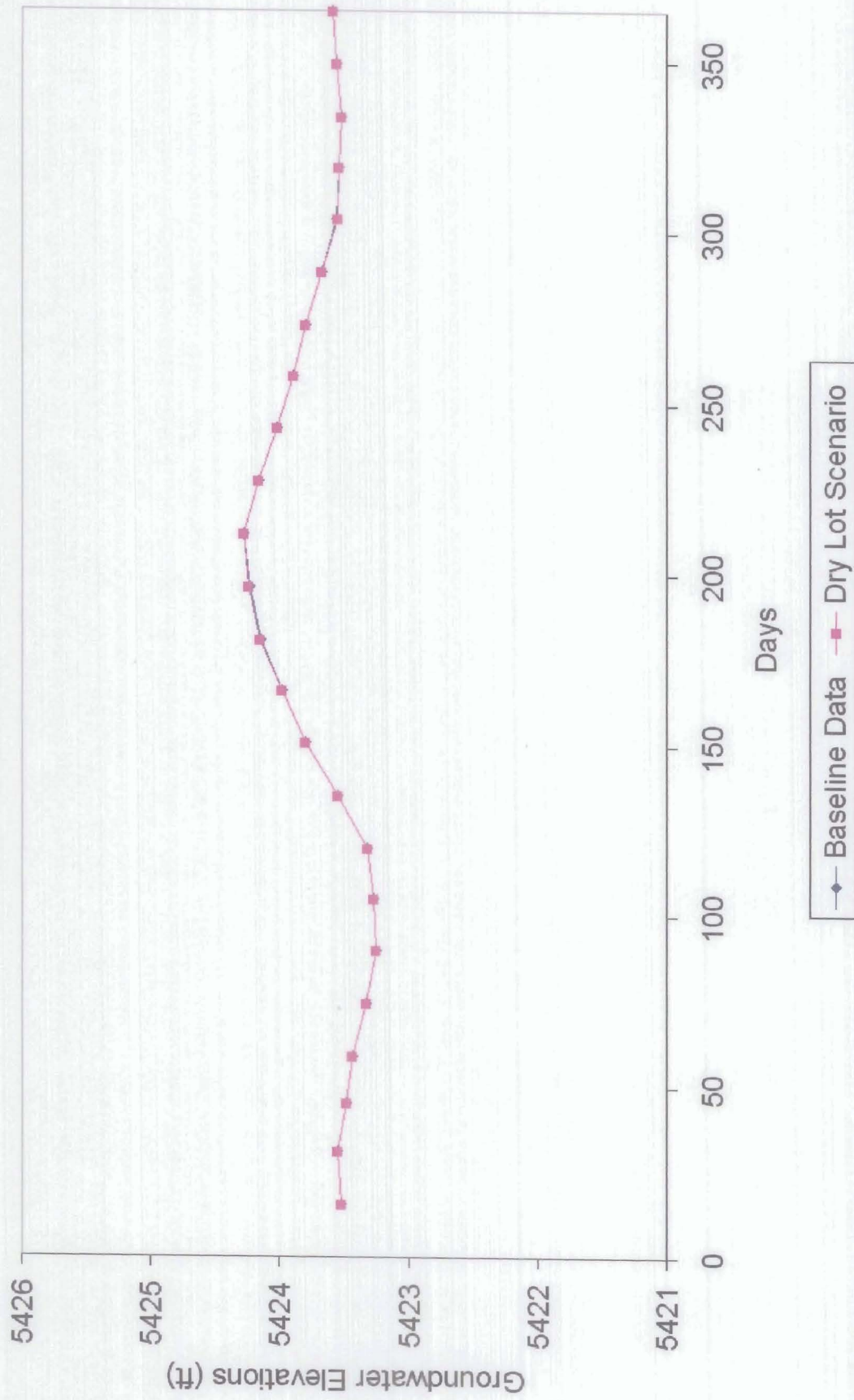


FIGURE 12: GROUNDWATER ELEVATIONS, SCENARIO 2 AT POINT D: NORTH OF KSKI PROPERTY
 MODFLOW GROUNDWATER MODEL
 BIG WOOD VALLEY AQUIFER

Point E: Indian Creek

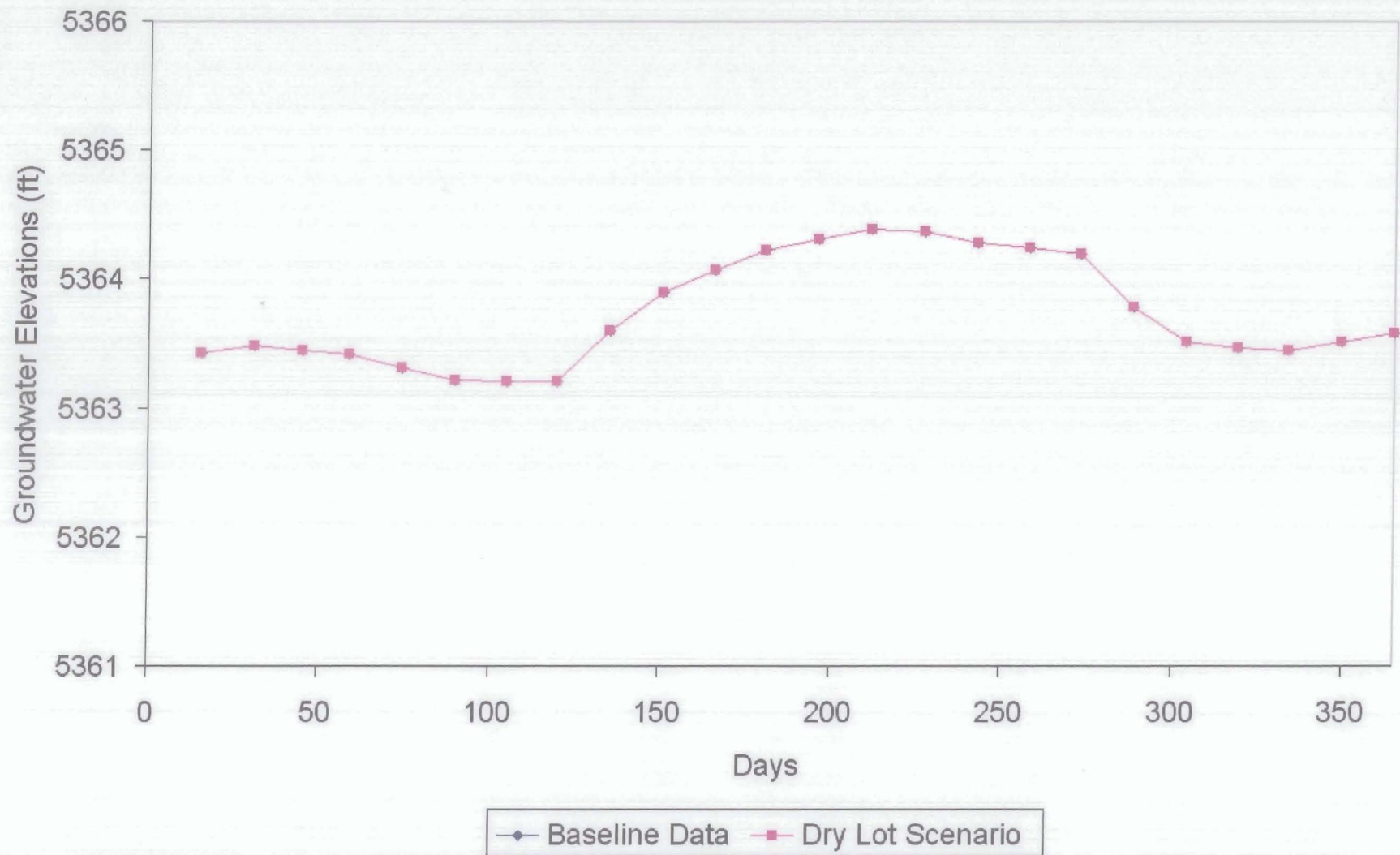


FIGURE 13: GROUNDWATER ELEVATIONS, SCENARIO 2 AT POINT E: INDIAN CREEK
MODFLOW GROUNDWATER MODEL
BIG WOOD VALLEY AQUIFER

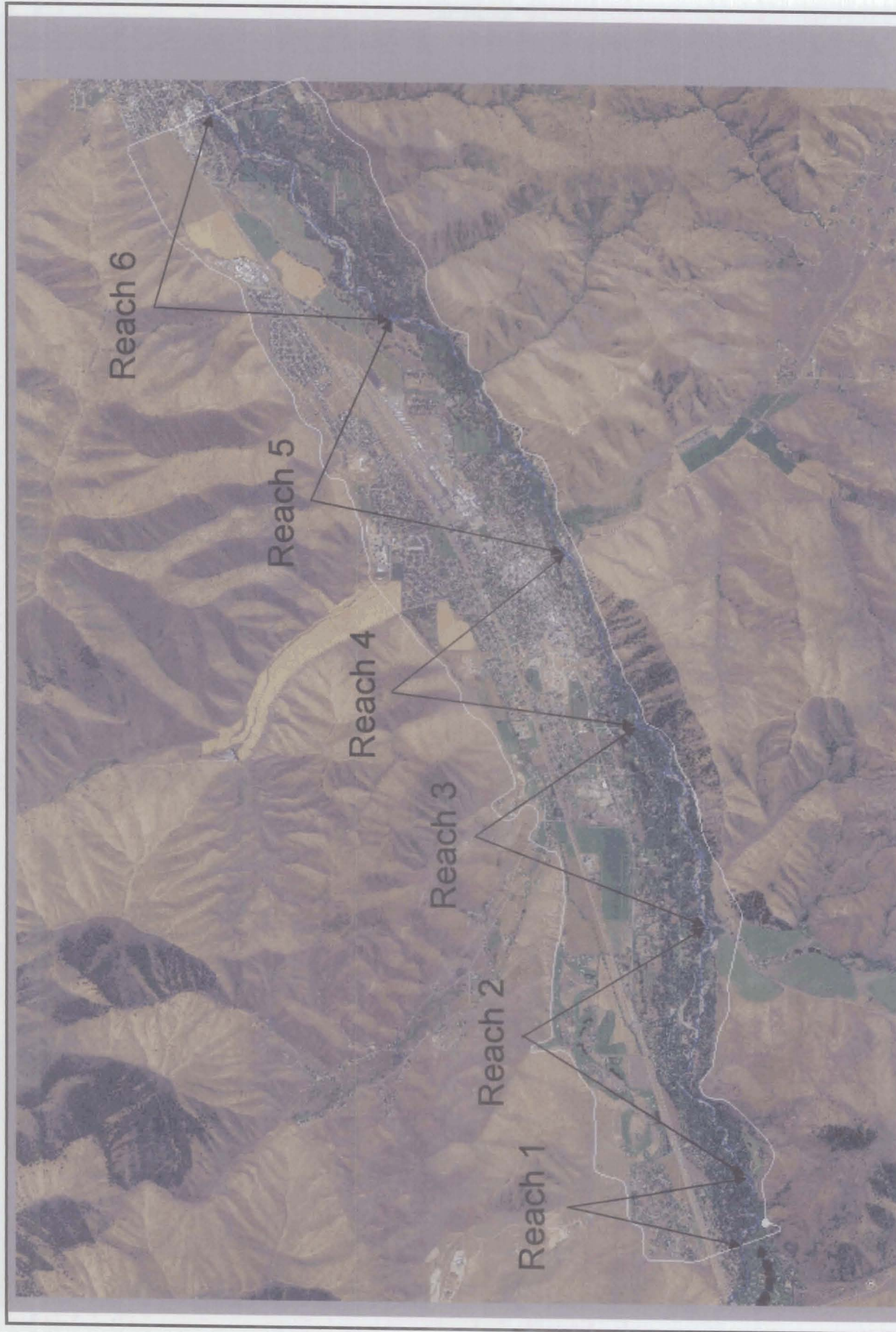


FIGURE 14: DRY LOT, LLC
Big Wood River Reach
 NAIP 2006 AERIAL PHOTO

Big Wood River Reach Gain/Loss

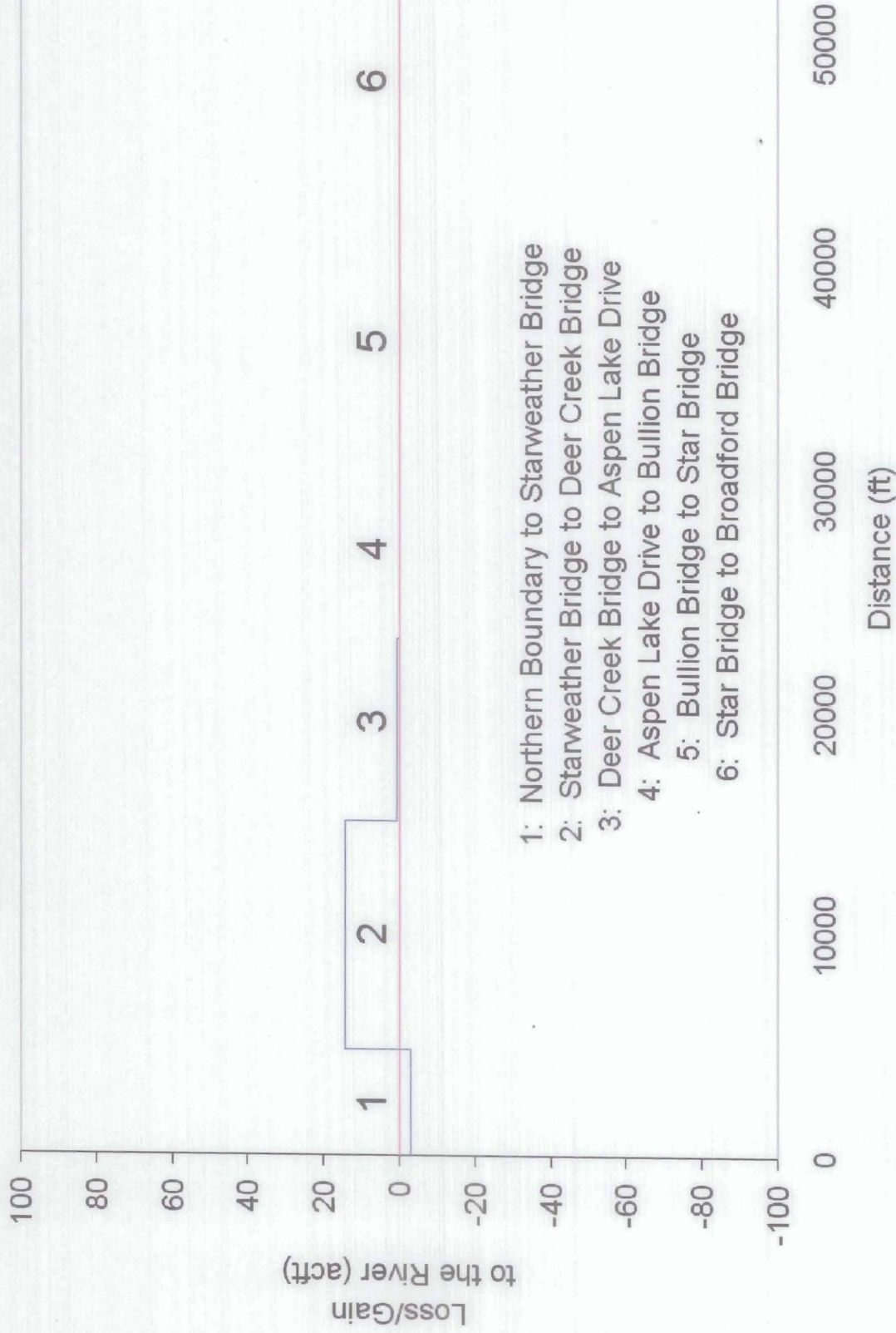


FIGURE 15: DRY LOT, LLC SCENARIO 1 BIG WOOD RIVER REACH GAIN/LOSS
 MODFLOW GROUNDWATER MODEL
 BIG WOOD VALLEY AQUIFER

Big Wood River Reach Gain/Loss

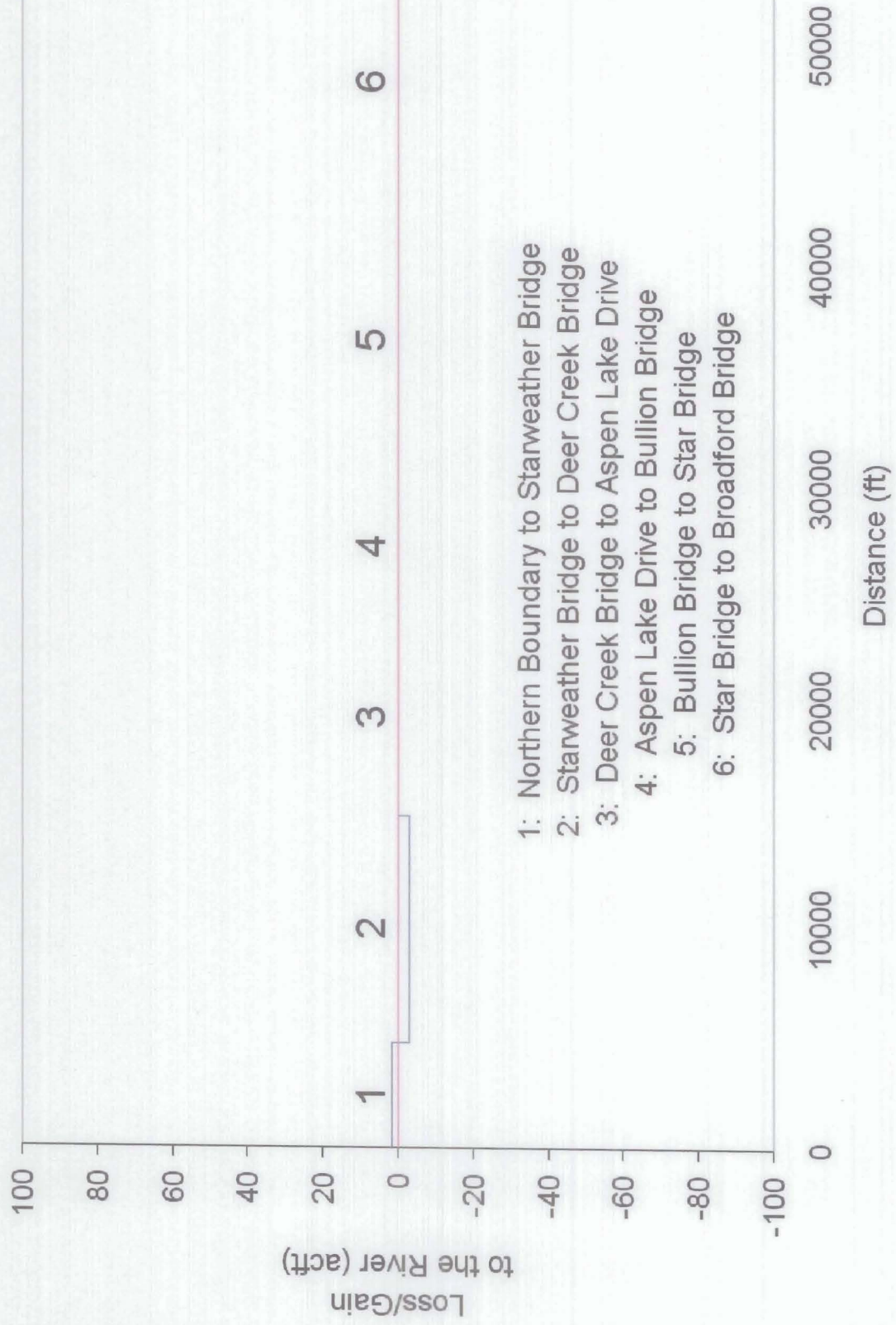


FIGURE 16: DRY LOT, LLC SCENARIO 2 BIG WOOD RIVER REACH GAIN/LOSS
 MODFLOW GROUNDWATER MODEL
 BIG WOOD VALLEY AQUIFER