URS
1333 Broadway, Suite 800
Oakland, CA 94612-1924
Telephone: (510) 893-3600
Facsimile: (510) 874-3268

MEMORANDUM

To:	**John Kessler – California Energy Commission (CEC)**	**From:**	**George Muehleck, PG, Jim Zhang, PhD, PE, Liz Elliott, PG**
cc:	**Paul Marshall – CEC Christopher Dennis – CEC Caryn Holmes – CEC John Fio – HydroFocus Kris Helm – CPV Bob Hren – CPV Mark Turner – CPV Dale Shileikis - URS**	**Office:**	**Oakland, CA**
		Date:	**October 16, 2008**

DOCKET	
07-AFC-3	
DATE:	10/16/08
REC'D:	10/17/08

Re: CPV Sentinel Energy Project – Riverside County, California

Subject: Analysis of Pre-charge Time to Avoid Negative Impact (Project-specific Drawdown) to the Mesquite Hummocks Vegetative Community

URS Corporation (URS) used the existing groundwater flow model constructed for the Mission Creek Subbasin aquifer system (the subbasin) to evaluate the necessary lead time for recharge before pumping (i.e., pre-charge) at the CPV Sentinel, LLC (CPV), site in North Palm Springs, Riverside County, California, to avoid impacts to the mesquite hummocks vegetative community. URS followed the methodology presented in the CEC staff's draft summary of its *Modeling to Analyze Lead Time Needed for Recharge Before Project Pumping to Avoid Significant Impacts to the Mesquite Hummocks Vegetative Community,* prepared by John Fio of HydroFocus (consultant to the CEC) and submitted by the CEC on September 25, 2008. URS also used a transmissivity (T) distribution based on an analysis by Krieger & Stewart (K&S), which was submitted to the CEC on October 7, 2008.

Background

The methodology used by John Fio and followed by URS involved simulating pumping and recharge separately and summing the results to calculate the necessary pre-charge time to avoid drawdown in the mesquite hummocks area. John Fio simulated pumping for 30 years at a rate of 1,100 acre-feet per year (afy), recharge at Desert Water Agency's Mission Creek recharge basins (DWA basins) for 30 years at a rate of 1,186 afy, Tyley's (1974[1]) T distribution, and an anisotropy ratio of 2:1. John Fio also assumed that pumping and recharge rates were uniformly distributed over time and used 1-month time steps. The results were presented as monthly average simulated water level changes at the mesquite hummocks observation point locations.

John Fio concluded that 33 months of pre-charge are necessary to avoid drawdown in the mesquite hummocks area. This timeframe included 12 months for water to percolate from the ground surface at the DWA basins to the water table. Available information now confirms that 4 months is the appropriate percolation time, as described in further detail below. Applying the 4-month percolation time to John Fio's results indicates that 25 months of pre-charge (i.e., 4 months to percolate to the water table plus 21 months of residence time in the aquifer system) are necessary to avoid drawdown in the mesquite hummocks area.

In a letter submitted to the CEC on October 7, 2008, K&S presented an analysis of the estimated time for water discharged into the DWA basin to reach the water table, as well as an analysis of subbasin transmissivities. K&S concluded that it would take 2 to 4 months for water to percolate from the DWA basin to the water table. K&S updated Tyley's T distribution based on a review of currently available reports, post-Tyley well data, and an analysis of specific capacity data from pumping data collected between May 1970 and June 2008 for wells belonging to Mission Springs Water District (MSWD), Coachella Valley Water District (CVWD), and CPV's recently installed and tested well PW-1. K&S concluded that adjustments to Tyley's T distribution were warranted and that Tyley's T figures could be increased by a factor of 1.5 to 2. The resulting T distribution is herein referred to as Krieger's T, and is illustrated on Figure 1.

Methodology

URS used the existing groundwater flow model and followed John Fio's methodology, using Krieger's T distribution, to simulate pumping and recharge in the subbasin. The objective was to estimate the length of pre-charge necessary to avoid drawdown at the mesquite hummocks in the Willow Hole Conservation Area (WHCA). Apart from the T distribution, the model parameters were the same as those used by John Fio: pumping for 30 years at a rate of 1,100 afy, recharge at the DWA basin for 30 years at a rate of 1,186 afy, and an anisotropy ratio of 2:1.

Three scenarios were simulated: (1) Scenario One simulated project pumping and recharge at the DWA basin using Krieger's T distribution, (2) Scenario Two simulated project pumping and recharge at the DWA basin using Krieger's T distribution, but with Tyley's T

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[1] Tyley, S. 1974. Analog Model of the Ground-Water Basin of the Upper Coachella Valley, California. Geological Survey Water-Supply Paper 2027. United States Government Printing Office, Washington.

distribution within the WHCA, and (3) Scenario Three simulated project pumping and recharge at the DWA basin using Krieger's T distribution, but with half of Tyley's T distribution within the WHCA. The T distributions used for Scenario One, Scenario Two, and Scenario Three are shown on Figures 1, 2, and 3, respectively.

Results

Simulation results show that to avoid drawdown in the WHCA, an estimated 15 months of pre-charge are necessary for Scenario One and Scenario Two, and 14 to 15 months of pre-charge are necessary for Scenario Three. The simulation results are based on the average of the four observation points within the WHCA, with output from the model on a monthly basis. For each scenario, pumping and recharge were simulated separately and the resulting water level curves were combined. The lag time between recharge and pumping were manipulated until no simulated drawdown was observed within the WHCA. The combined water level rises for Scenarios One, Two, and Three are shown on Figures 4, 5, and 6, respectively.

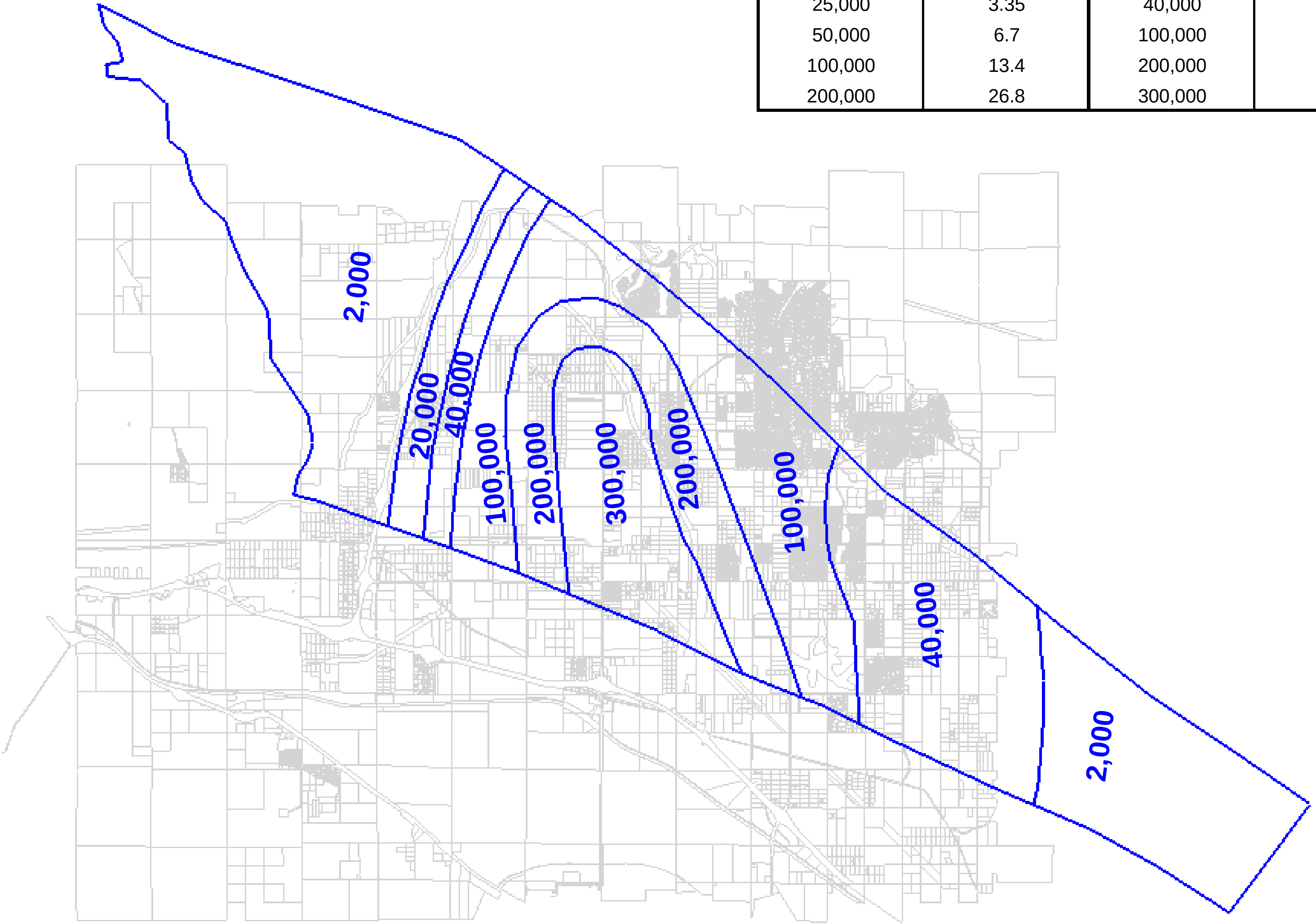
Conclusions

These model simulations show that using Krieger's T distribution, the pre-charge timeframe is reduced from 25 months, as simulated by John Fio using Tyley's T distribution, to either 14 or 15 months, depending on the T within the WHCA. In essence, the overriding factor controlling pre-charge time is not the T value at the WHCA, but the T values within the subbasin between the DWA recharge basins, the CPV well field, and the WHCA. Accordingly, it is our opinion that necessary pre-charge time prior to project-specific pumping would be closer to 14 to 15 months, rather than 25 months, as extrapolated from John Fio's submittal of September 25, 2008.

Attachments

Figure 1: Scenario One – Transmissivity Distribution Based on Krieger's T
Figure 2: Scenario Two – Transmissivity Distribution Based on Tyley's T in the Willow Hole Conservation Area and Krieger's T in the Rest
Figure 3: Scenario Three – Transmissivity Distribution Based on Half of Tyley's T in the Willow Hole Conservation Area and Krieger's T in the Rest
Figure 4: Scenario One – Water Level Rise Based on Krieger's T
Figure 5: Scenario Two – Water Level Rise Based on Tyley's T in the Willow Hole Conservation Area and Krieger's T in the Rest
Figure 6: Scenario Three – Water Level Rise Based on Half of Tyley's T in the Willow Hole Conservation Area and Krieger's T in the Rest

Tyley		Krieger and Stewart		
gpd/ft	ft/day (in model)	gpd/ft	factor change	ft/day (in model)
2,000	0.268	2,000	1	0.268
10,000	1.34	20,000	2	2.68
25,000	3.35	40,000	1.6	5.36
50,000	6.7	100,000	2	13.4
100,000	13.4	200,000	2	26.8
200,000	26.8	300,000	1.5	40.2



Note: unit in gpd/ft

Figure 1: Scenario One - Transmissivity distribution based on Krieger's T

Tyley		Krieger and Stewart		
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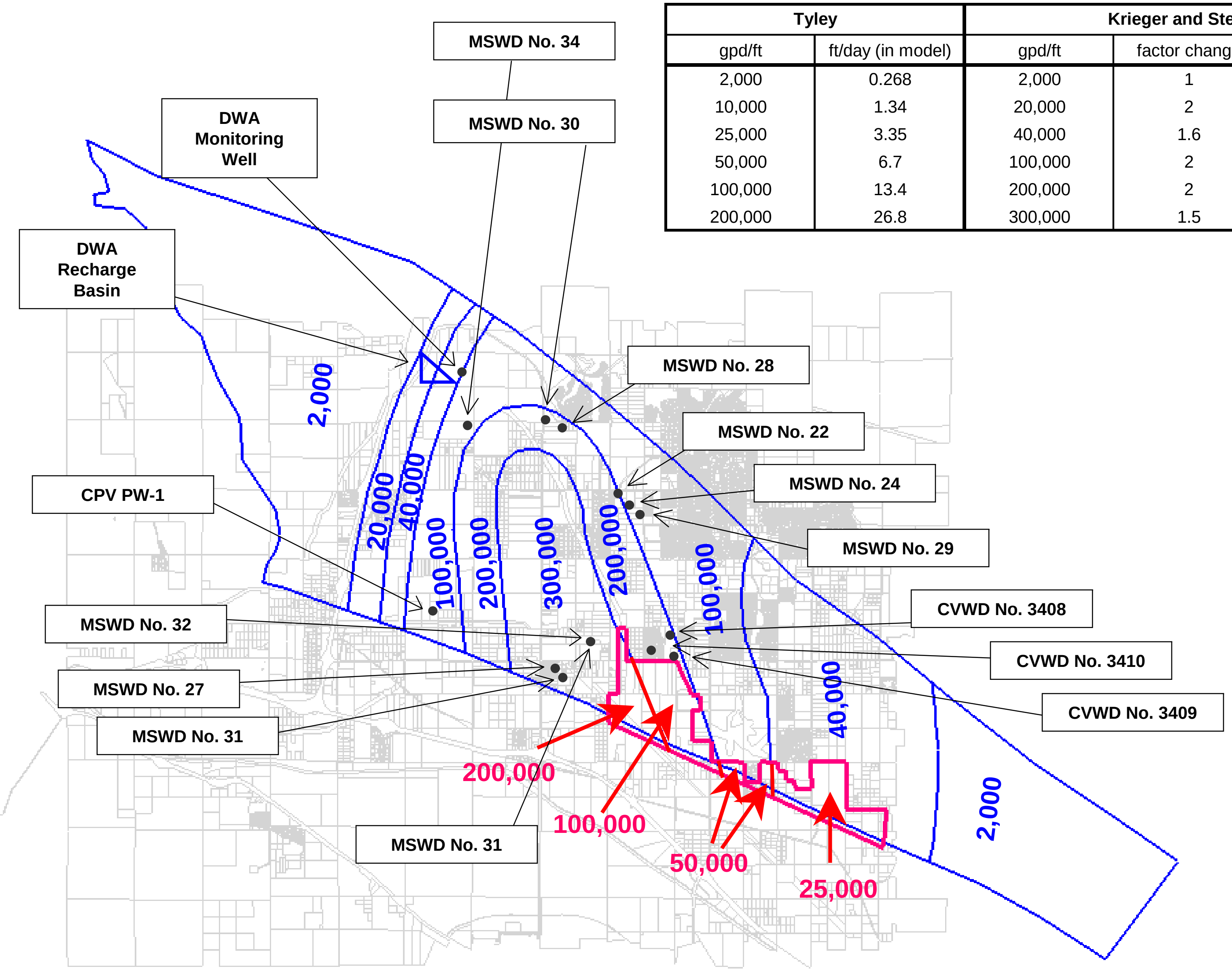

Note: unit in gpd/ft

Figure 2: Scenario Two - Transmissivity distribution based on Tyley's T in the Willow Hole Conservation Area and Krieger's T in the rest

Tyley		Krieger and Stewart		
gpd/ft	ft/day (in model)	gpd/ft	factor change	ft/day (in model)
2,000	0.268	2,000	1	0.268
10,000	1.34	20,000	2	2.68
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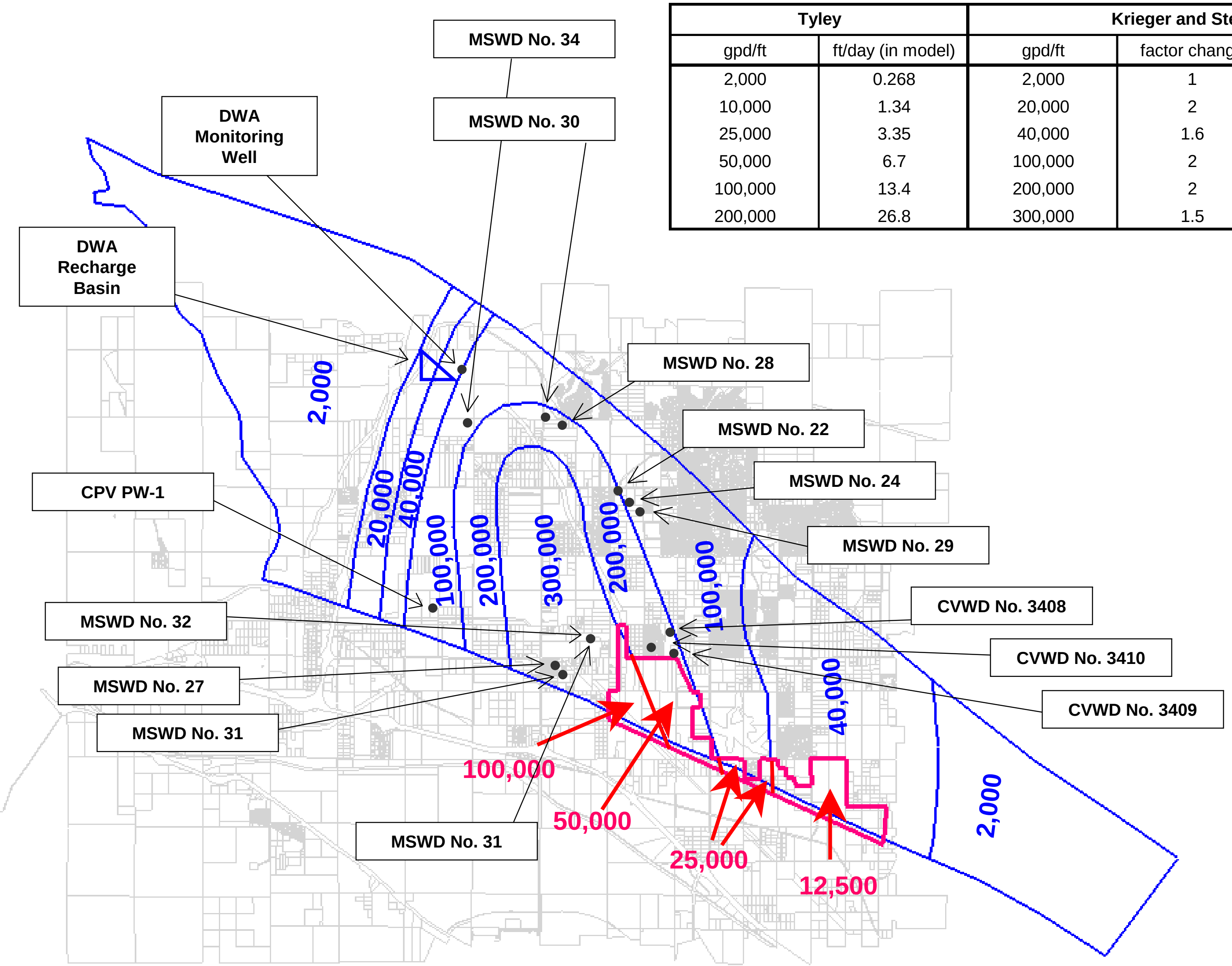

Note: unit in gpd/ft

Figure 3: Scenario Three - Transmissivity distribution based on half of Tyley's T in the Willow Hole Conservation Area and Krieger's T in the rest

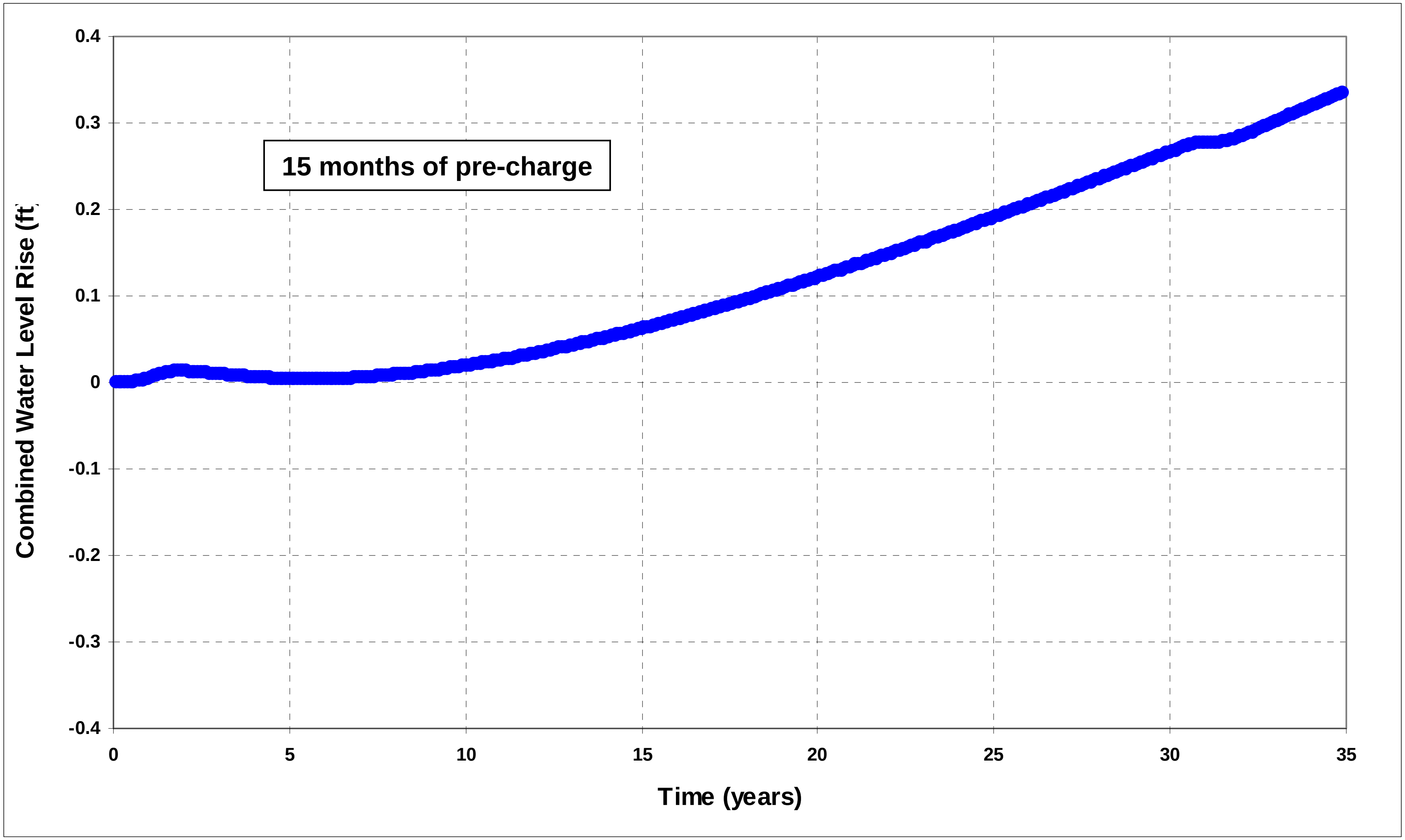

Figure 4: Scenario One - Water Level Rise based on Krieger's T
(anisotropic ratio = 2.0)

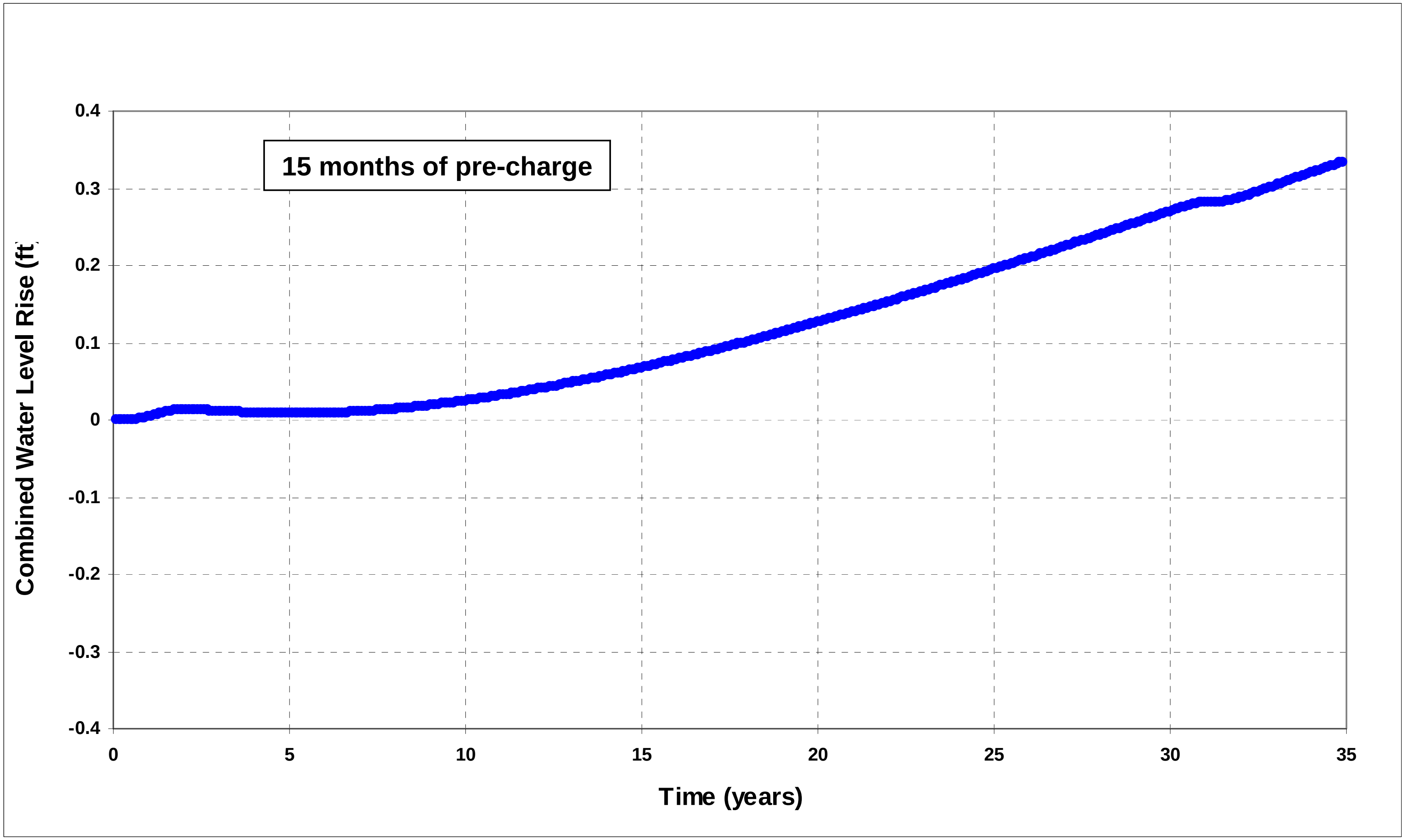

Figure 5: Scenario Two - Water Level Rise based on Tyley's T in the Willow Hole Conservation Area and Krieger's T in the rest
(anisotropic ratio = 2.0)

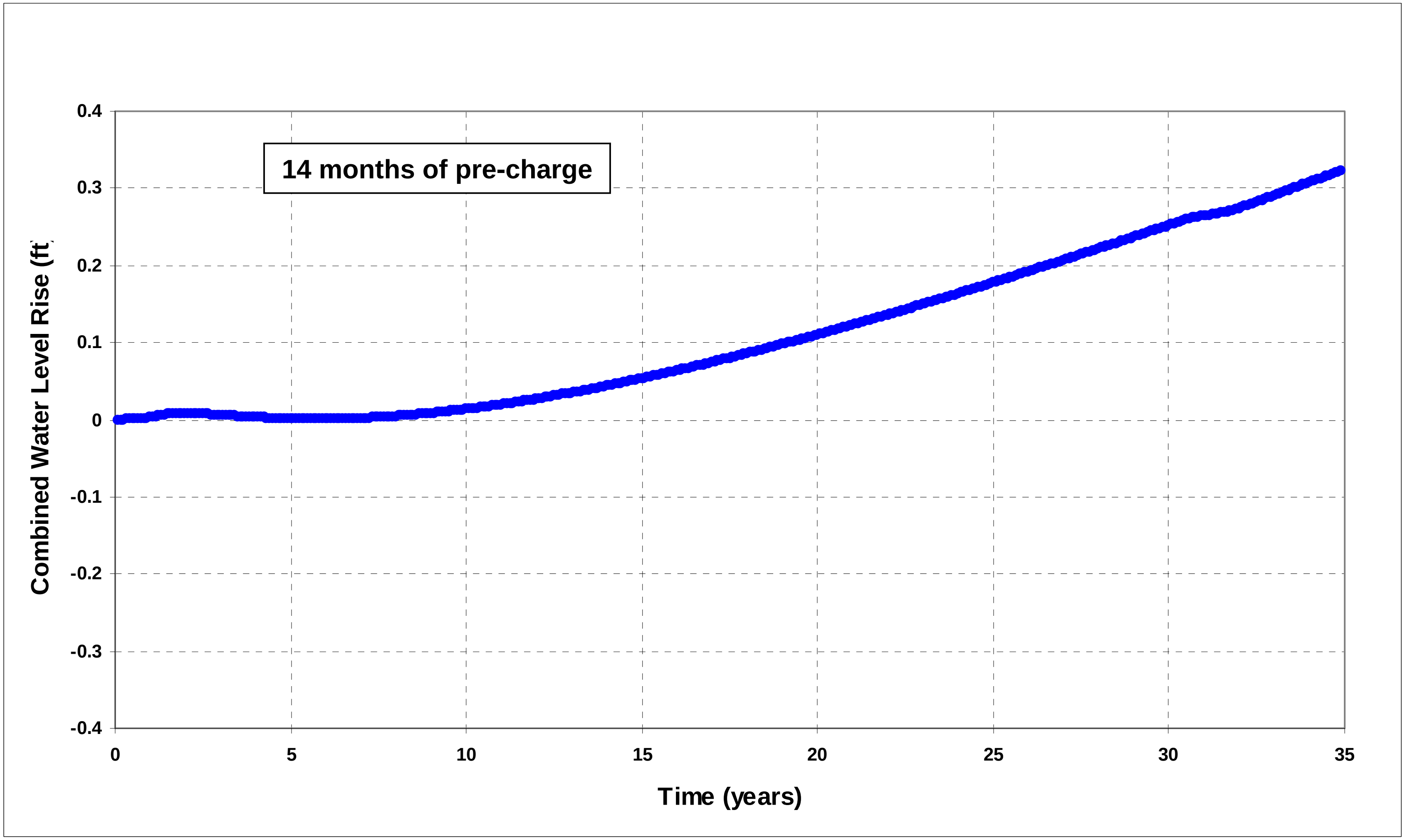

Figure 6: Scenario Three - Water Level Rise based on half of Tyley's T in the Willow Hole Conservation Area and Krieger's T in the rest
(anisotropic ratio = 2.0)