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FINAL
GROUNDWATER MODELING SUMMARY REPORT
SITES 1 AND 3 AND EASTERN PLUME
APRIL 2009

Naval Air Station
Brunswick, Maine

Prepared for

Department of the Navy
Naval Facilities Engineering Command
BRAC Program Management Office - Northeast
4911 South Broad Street
Philadelphia, Pennsylvania 19112-1303

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1. INTRODUCTION

ECC has completed a groundwater flow mode for the Eastern Plume and Sites 1 and 3 at Naval Air Station Brunswick, Maine and surrounding areas in support of ongoing groundwater treatment system operations and improvements related to these two sites. This Groundwater Modeling Summary Report was prepared to summarize the results and findings of the groundwater flow modeling completed at this Site, and to document the process by which the modeling efforts were completed. A site location map is shown on Figure 1. A map of hydrologic features is provided as Figure 2. A groundwater extraction system has been in operation since 1995 to address the dissolved phase plume of volatile organic compounds (VOC) present in groundwater which comprise the Eastern Plume.

A 3-dimensional modeling effort was previously completed for the Site by ABB Environmental Services, Inc for the U.S. Department of the Navy (ABB Environmental Services 1993). This previous work was used as a starting point for this modeling project. The current groundwater model focused on development of a groundwater flow model for the Site to provide assessment of remedial options specified in the Feasibility Study for the Eastern Plume and Sites 1 and 3. The groundwater flow modeling was completed as per the Final Groundwater Modeling Work Plan (EA 2006). Flow model calibration was completed by following the American Society for Testing and Materials (ASTM) Standard Guide for Calibrating a Groundwater Flow Model Application, D 5981-96 (ASTM 2002a), and was documented by following the Standard Guide for Documenting a Groundwater Flow Application, ASTM D 5718-95 (ASTM 2002b).

1.1 MODELING OBJECTIVES

As noted in the Final Groundwater Modeling Work Plan, the groundwater flow model was developed to achieve two primary objectives:

1. Develop a reliable simulation of groundwater flow which can define the capture effectiveness of the extraction well network in the Eastern Plume.

2. Assess the effects of the cap and slurry wall at Sites 1 and 3 on downgradient areas such as Mere Brook.

This Summary Report satisfies one portion of first objective listed above. This summary report describes in detail the reliability of the groundwater model in simulating groundwater flow and the process by which the flow model was developed and calibrated. The remainder of the first objective (i.e. defining the effectiveness of the extraction well network) and the second objective (i.e., assessing the downgradient effects of the cap and slurry wall at Sites 1 and 3) will be completed after the review and subsequent concurrence from site stakeholders on this Draft Summary Report which specifically provides documentation on the model design and calibration. After this Summary Report is issued as Final, a separate technical memorandum will be issued to the project stakeholders which will assess the current remedies in place at the Eastern Plume and Sites 1 and 3 Landfill. The technical memorandum will also assess the

planned future modifications to the extraction well network at the Eastern Plume to increase the efficiency of the system in providing hydraulic control.

1.2 MODELING CODE

Pre- and post-processing were completed using the Groundwater Modeling System (GMS) Program, Version 6.0. The groundwater flow model was developed using the MODFLOW 2000 (Harbaugh et al. 2000) computer code. MODFLOW is run directly through the GMS package. MODFLOW has been heavily tested and is the industry standard for groundwater flow software. The MODFLOW model is run directly through the GMS pre-processor, and output results can be viewed in graphical or tabular form.

1.3 REPORT ORGANIZATION

Section 1 of this document provides an overview of Site modeling objectives. Section 2 details the Site hydrogeological conceptual model. Section 3 summarizes the model design. Section 4 summarizes the calibration of the flow, model verification and sensitivity analysis. Section 5 summarizes the model limitations and data gaps. Section 6 summarizes the conclusions drawn from the modeling effort. Model input and output results are provided in the following appendixes: model layer interpolation (Appendix A), slug test results (Appendix B), recovery-drawdown test results (Appendix C), recharge (Appendix D), results of calibration to steady-state, non-pumping conditions (Appendix E), verification to steady-state, pumping conditions (Appendix F), verification to transient conditions (Appendix G) and sensitivity analysis results (Appendix H).

2. SITE CONCEPTUAL MODEL

A brief overview of site conditions is presented in this section to provide a summary of the major features that were included in the groundwater model. Extensive amounts of additional information are available in the Remedial Investigation (E.C. Jordan 1990), Supplemental Remedial Investigation (E.C. Jordan 1991), and the previous Groundwater Modeling Report (ABB-ES 1993). The current understanding of site geology has also been greatly expanded since the previous model was completed with data collected from investigations in the Southern Boundary area, as summarized in the Draft Final Summary Report for the Direct-Push Investigation at the Southern Boundary of the Eastern Plume (EA 2004), as well as other investigations completed throughout NAS Brunswick. A general overview of the site geology has been developed in conjunction with site decision makers in the Conceptual Model for the Eastern Plume (ECC 2008).

2.1 SITE GEOLOGY AND HYDROGEOLOGY

The stratigraphy of the portion of Naval Air Station Brunswick that includes Sites 1 and 3 and the Eastern Plume is comprised of interbedded sand, silt, and clay units that overlie the undulating bedrock surface and some occasional discontinuous till. The majority of the overburden units at the Eastern Plume are interpreted to be part of the Presumpscot Formation. This Formation is comprised of water deposited clay, silt, and sand with some minor gravel units (E.C. Jordan 1990). The formation exhibits a general coarsening upwards sequence (E.C. Jordan 1990). Three major overburden layers are present: upper sand, transition which contains a sandy interval often referred to as the lower sand, and clay.

The Presumpscot Formation was deposited on the ocean floor during a submergence of the area during the last period of glaciation. Sediments were deposited over a till or directly over bedrock (E.C. Jordan 1990). The Presumpscot clay and transition are comprised of marine deposits (i.e., deposited under low energy marine conditions) which resulted in the generally fine-grained nature of the overburden material. Clay thickness is variable but generally ranges from less than 10-ft thick to more than 80-ft thick (E.C. Jordan 1990).

The upper sand unit has a non-marine origin, and was deposited by the Androscoggin River as it shifted laterally in a post-glacial course following a drop in sea level. In some areas, the upper sand was reworked by wind action. Following deposition of these units, streams have carved steep sided gullies into these units, particularly the upper sand (E.C. Jordan 1990). The site conceptual model (ECC 2008) contains the following descriptions of the significant water-bearing units at the site:

- The upper sand unit consists of fine sand that readily transmits groundwater. The unit is approximately 10- to 20-ft thick across the Eastern Plume area. In the vicinity of Sites 1 and 3, the upper sand unit thickens to greater than 40 ft (EA 2000). The upper layers of fine sand are mostly silt-free and have the highest conductivity of the overburden units (E.C. Jordan 1990).

- The transition unit lies between the upper sand and the clay, and is composed of interbedded sand, silt, and clay (E.C. Jordan 1990). The transition unit ranges in thickness from 0 to 80 ft (EA 2000). The transition forms a wedge that increases in thickness from west to east across the Eastern Plume, and pinches out just east of the Eastern Plume. The upper portions of the transition unit exhibit unconfined groundwater conditions, while deeper intervals in the transition exhibit confined conditions due to the presence of low permeability zones within this unit. The majority of the transition unit is silt and clay, although sand layers are present with thickness ranging from inches to several feet. The transition unit contains relatively thin and possibly continuous sand layers that may act as preferential pathways for groundwater movement within this unit. A mappable sandy interval has been identified near the base of the transition unit in some portions of the Eastern Plume. This sandy interval is referred to as the lower sand. Both the upper and lower sands have been targeted by remedial extraction at the Eastern Plume since remedial operations (i.e., groundwater pump and treat) were started in 1995. Approximately 453 kg of contaminant mass has been removed by the extraction system and destroyed by the treatment plant as of the end of 2008. The bulk of the mass resides in the deep sand unit.

- Vertical movement of groundwater is limited by fine-grained interbeds of the transition, and vertical hydraulic conductivity is at least one order of magnitude lower than horizontal hydraulic conductivity (E.C. Jordan 1990). The transition unit is acting as an aquitard between the shallow sand and lower sand. The lateral continuity of transition zone sand layers appears highly variable, and some sand layers may provide conduits to groundwater flow, although others may be isolated and may not conduct significant amounts of groundwater (E.C. Jordan 1990).

- The transition unit has a horizontal hydraulic conductivity 1-2 orders of magnitude below that of the upper sand (E.C. Jordan 1990). Hydraulic conductivity for the transition units ranges from 10^{-4} to 10^{-5} cm/sec (from 0.3 to 0.03 ft/day) for the fine grained interbeds, and can range up to 10^{-3} cm/sec (3 ft/day) for sandy intervals (E.C. Jordan 1990). Although not tested, the vertical hydraulic conductivity is believed to be one order of magnitude lower than the horizontal hydraulic conductivity.

- The Presumpscot clay underlies the transition unit and is draped over the bedrock or till surface in a nearly continuous layer. The clay has low permeability which ranges from 10^{-6} to 10^{-8} cm/sec (from 3×10^{-3} ft/day to 3×10^{-5} ft/day) (E.C. Jordan 1990). The clay thickness has been measured up to 80 ft, although the thickness of the clay may be greater in some areas (EA 2000). In one area, near MW-323, the clay appears to be very thin or may not be present. The remaining portions of the Eastern Plume appear to be underlain by several feet or tens of feet of clay. This clay forms the base of the overburden flow system and prevents significant groundwater flow between the overburden and bedrock or till.

- A geophysical investigation was completed by the U.S. Environmental Protection Agency in late 2003 for Site 11 and areas to the east (Hager Geoscience 2004). The results of the geophysical investigation focused on identifying unit thickness and the top elevations of the transition, clay unit, and bedrock. The topography of the top of the clay unit is similar to the top of bedrock surface, exhibiting an easterly slope from high elevations near Site 11, decreasing eastward. However, the thickness of the clay also shows considerable variation over the entire plume. Minimal clay thickness was noted east of Site 11 (0- to 10-ft thick) with much greater thickness (up to 110+ ft) noted further east in the vicinity of a bedrock depression parallel with the Weapons Area Road. The clay thins further east toward Picnic Pond with a thickness varying from near 0 to 25 ft. The top elevation and thickness of the transition unit generally mimics the clay, showing an eastward slope with greatest thickness noted where bedrock depressions are present.

2.2 EXISTING PUMP-AND-TREAT SYSTEM

Groundwater extraction has been occurring via a network of extraction wells since 1995 to reduce volatile organic compound concentrations and maintain hydraulic control of the Eastern Plume. Deep overburden groundwater flow patterns have been locally altered by pumping at extraction wells, but only small changes in groundwater flow patterns have been measured away from the immediate vicinity of most extraction wells. The largest changes in lower groundwater flow patterns are seen at EW-2A, which was installed to intersect only the lower sand interval. Potentiometric head at this location has been approximately 12 ft lower than noted in the shallow flow system (EA 2000). Extraction well EW-5 has been replaced by EW-5A, which is screened only across the deep sand interval. Other operating extraction wells (EW-1 and EW-4) are screened across the upper sand and lower transition intervals. Effects on the deep flow system due to extraction well pumping at these two wells have been limited due to shallow groundwater preferentially moving into extraction wells. Overall, the groundwater extraction system has not established hydraulic control of the Eastern Plume, although natural geologic conditions appear to have helped contain the eastward movement of groundwater contamination.

2.3 GAUGING DATA

Numerous rounds of groundwater gauging data and contaminant concentration data are available for site monitoring wells. Site monitoring wells have been gauged and sampled on a quarterly or semi-annual basis from 1995 to present. A site-wide database of gauging data and laboratory analysis is maintained for the site and was used during the project for model calibration and validation. Data from sampling points included in the Long-Term Monitoring Program for Sites 1 and 3 and Eastern Plume were used during model development.

3. MODEL DESIGN

The area included in the groundwater model covers a large area which includes the majority of the NAS Brunswick facility, and a much greater area than the two sites of primary interest (i.e., the Eastern Plume and Sites 1 and 3). The model grid was positioned to include major hydrologic features in the area surrounding NAS Brunswick including Mere Brook and Merriconeag Stream. The model grid was extended horizontally to the regional groundwater divides formed by Mere Brook and Merriconeag Stream. The model assumed the drainage divide is fully penetrating to the overburden groundwater system and the groundwater divide is congruous with the surface water divide. A review of the basewide water table contour map (Fig 5-3, E.C. Jordan 1990) indicates that these are valid assumptions. The groundwater basin was therefore modeled using no-flow boundaries along its perimeter which assumes there is no groundwater flux across these boundaries. Figure 3 provides the layout of the model grid. Normally, when modeling groundwater basins, some underflow across the model boundary is assumed in the area of the basin's discharge point. However, the Mere Brook/Merriconeag Stream basin discharges directly to the Atlantic Ocean, and the presence of the saltwater/freshwater interface is normally modeled as a no-flow boundary.

It is assumed that extraction rates from water supply wells of the Brunswick Topsham Water District in the adjacent groundwater basin to the north are located far enough away from the model boundary have a minor effect on the position of the overburden groundwater divide. Therefore these water production wells were not accounted for in the groundwater model.

3.1 GRID LAYOUT

In any groundwater flow model the natural groundwater flow system is simplified so it can be effectively simulated. In this process a grid comprised of rows and layers is constructed based on the natural system. The size of the model grid cells were established based on the spacing of monitoring wells to prevent one grid block from containing several monitoring wells, but large enough to minimize model execution times. The model grid consists of 144 rows, 123 columns, and 8 layers. The model grid is composed of cells that range in size from a maximum size of 800 ft on a side (in areas of lower interest such as the model grid boundary) to a minimum size of 65 ft on a side (in areas of higher interest such Sites 1 and 3 and the Eastern Plume).

3.2 DEFINING MODEL LAYERS

The model was divided vertically into eight layers with each layer representing all or part of a particular hydrostratigraphic unit. The upper sand unit was represented by the topmost model layer, model layer 1. The transition unit overlying the lower sand was represented by two layers, model layers 2 and 3. The lower sand was also represented by two layers, model layers 4 and 5. Two model layers each were used to simulate the transition and lower sand units to adequately simulate the significant vertical head gradients present in some areas of the site. The part of the transition unit underlying the lower sand was represented by layer 6. Note that the Model Work Plan proposed the top of the Presumpscot clay would form the bottom boundary of the model.

After subsequent calibration efforts encountered model stability issues, and after further consideration of modeling protocol that model boundaries should be located far enough away so that the effects of applied stresses to the groundwater system (i.e., pumping from the lower sand) do not extend to model boundaries, two layers were added to the model to represent the Presumpscot clay and the underlying till and bedrock. These additions resulted in a more stable groundwater flow model. The Presumpscot clay was represented by layer 7. Till and bedrock were represented by the bottom layer, model layer 8. The bottom of model layer 8 was assigned an elevation of 100-ft lower than the bottom of layer 7.

Note that model layers 7 and 8 which simulate the Presumpscot clay, till unit and bedrock were included in this model only to increase model accuracy in the simulated flow field in the overburden above the top of clay surface and for model stability reasons. Water level data from these units was not analyzed during model calibration and the groundwater model is not likely to accurately reflect flow conditions in these layers. Therefore the model results for layers 7 and 8 should not be considered accurate simulations of groundwater flow patterns in these units.

3.3 MODEL LAYER INTERPOLATION

Model layer surfaces were interpolated from available site specific data including soil boring logs, electrical conductivity logs, cone penetrometer logs, geophysical surveys completed for Site 11 (Hager Geoscience 2004), seismic refraction surveys completed for Sites 1 and 3(E.C. Jordan 1990), available cross-section data, and overburden geology maps. Digital elevation models (DEM) were used to obtain surface elevations across the model grid.

The top of layer 1 was interpolated from publicly available DEM files for the Orr's Island and Brunswick 7.5' quadrangles. The top of each subsequent layer was interpolated from available point data for each stratigraphic contact. In addition, previously interpolated surfaces for the top of clay, transition, and bedrock at Site 11 were digitized into point data and added to the available point data set generated for each respective layer with some modifications. Where contact elevations as reported in soil boring logs indicated a discrepancy with contact elevations derived from the geophysical survey, the contact elevation as reported in the soil boring log took precedence. At these locations the previously interpolated surface was not digitized.

Selected stratigraphic contact data was then reviewed including a comparison of contact elevations at each point to surrounding stratigraphic data, and if necessary corrected or modified to meet modeling requirements. Note that for the model, each model layer is continuous throughout the model domain. At each point location, every layer has to be represented even if the unit which it represents is in reality absent. If necessary, a nominal thickness was assigned at point locations where a unit was absent. Also, where necessary, 'ghost points' were used in areas where stratigraphic data was limited. Table A-1 in Appendix A provides the stratigraphic contacts that were used for layer interpolation.

Layer surfaces were generated using Kriging methods which is a statistical interpolation method that chooses the best linear unbiased estimate. Using this method, a 3-dimensional surface for each layer was generated from data points. Figures A-1 through A-9 in Appendix A provide the

generated interpolated surfaces for each stratigraphic unit, and the data points used to generate each layer. After layer interpolation was completed, some model layers overlapped in some areas. In these limited cases it was assumed that more data is available in the upper unit contact elevations and therefore the upper surface would have more confidence than a lower surface. Areas of overlay were corrected by preserving the elevations of the top-most layer and the layer(s) below it were assigned a minimum elevation of 1-ft below the layer above it in an effort to avoid thin cell issues during subsequent model development.

3.4 ASSIGNING MODEL INPUT PARAMETER VALUES

3.4.1 Aquifer Parameters - Hydraulic Conductivity and Storativity

Aquifer parameter values such as hydraulic conductivity, vertical anisotropy, and for the transient simulation, specific storage and specific yield were assigned to each model layer. Table 1 provides the final calibrated input parameter values. Hydraulic conductivity describes the ease with which water can move through pore spaces. Vertical anisotropy is the ratio of vertical to horizontal hydraulic conductivity. Specific storage is the volume of water that an aquifer releases from storage, per volume of aquifer, per unit change in hydraulic head while remaining fully saturated. Specific yield is a ratio less than or equal to the effective porosity, indicating the volumetric fraction of the bulk aquifer volume that a given aquifer will yield when all the water is allowed to drain out of it under the forces of gravity.

Each model layer was designated as convertible or confined. For model layers 1, 6, 7 and 8, representing the upper sand, transition underlying the upper sand, clay and till/bedrock units respectively, a uniform value for each parameter was applied over each layer. For model layers 2 and 3 (transition unit), and 4 and 5 (lower sand unit), there are areas within the model domain where the transition and lower sand units are absent. However, in MODFLOW, layers must be continuous throughout the model domain. Therefore, these model layers were subsequently divided corresponding to areas where these units were present or absent (Figure B-1 and B-2). In areas where the transition and lower sand units are absent, layers were assigned aquifer parameter values corresponding to the upper sand. Where the lower sand is present, layers 4 and 5 were further divided into areas corresponding to differences in measured hydraulic conductivities calculated from analytical solutions to recovery test data (Figure B-2). Where the transition unit is present, model layers 2 and 3 were further divided into sub areas during calibration to provide for a better fit of calculated to observed water levels.

Hydraulic Conductivity

Hydraulic conductivity values for site hydrostratigraphy were calculated from slug tests completed during the RI and Supplemental RI (E.C. Jordan, 1990, 1991) (Appendix C), and from recovery-drawdown test data (Appendix D). Note that slug test data tend to underestimate bulk aquifer properties. Table B-1 in Appendix B provides the reported conductivity values for each well that was slug tested. The calculated geometric mean, mean, maximum and minimum values, and number of wells tested for each hydrostratigraphic unit are presented in the table below:

Hydraulic Conductivity Results of Slug Tests (ft/day)						
	Sand	Transition	Lower Sand	Sand/ Transition	Clay	Bedrock
Geometric Mean	5.31	0.21	16.36	0.63	0.00027	0.43
Mean	10.35	0.55	19.45	4.02	0.00033	0.70
Maximum	49.05	1.86	36.85	56.70	0.00051	2.13
Minimum	0.009	0.0001	4.11	0.01	0.00014	0.11
Number of Wells Tested	46	24	9	18	2	8

Conductivity values used for model layers 1 (upper sand), 2, 3, and 6 (transition), 7 (clay), and 8 (bedrock) were based on the calculated values from slug test data. Values for each model layer were adjusted during calibration within the range of plausible values as determined from slug testing.

Vertical anisotropy was set at 10:1 for layers 1, and 4 through 8 which is considered likely for sand, silt or fractured bedrock units. Vertical anisotropy was set at 20:1 for layers 2 and 3 as the units which these layers represent have a higher degree of heterogeneity which limits the vertical movement of groundwater flow. These values were not adjusted during calibration.

Hydraulic conductivity and specific storage values for the lower sand (model layers 4 and 5) were calculated from data collected during the April-May 2008 recovery-drawdown test (Appendix C). Values for model layers 4 and 5 were adjusted during calibration within the range of calculated values. The table below provides the average values of hydraulic conductivity for the lower sand calculated for each well group where recorded water level data was usable:

Well Group	Range (in parentheses) and Average of Hydraulic Conductivity (ft/d)
EW-01	(26.2 – 38.1) **31.58**
EW-02A	(8.9 – 47.3) **31.02**
EW-04	(28.3 – 144) **56.37**
EW-05A	(2.9 – 6.5) **4.69**

The results of the analytical solutions indicate that the conductivity of lower sand varies over the areas affected by pumping from the aquifer. There is also a relative degree of uniformity between values calculated for each observation point within each well group. For instance, there is a relative small range of conductivity values, from 26 to 38 ft/day, for wells and piezometers screened within the lower sand within the EW-1 radius of influence. This is also the case with EW-4, and EW-5A although the higher conductivities calculated for observation points furthest away from the extraction wells may be the result of intersecting cones of influence. Conductivity values for observation points monitoring EW-2A show a slight lessening of conductivities from west to east. Based on this data, model layers 4 and 5 were divided into zones based on the interpreted distribution of hydraulic conductivity (Figure B-2).

Specific Storage

Values for specific storage were also obtained from recovery-drawdown test data. These values were used as the range for model layers 4 and 5 (lower sand) for the transient simulation that was used to verify the steady-state non-pumping calibrated model.

Well Group	Range (in parentheses) and Average of Specific Storage (1/ft)
EW-01	(0.000014 - 0.00047) **0.00023**
EW-02A	(0.000021 - 0.000070) **0.000048**
EW-04	(0.000017 - 0.0011) **0.00027**
EW-05A	(0.0000006 - 0.0000064) **0.0000035**

Specific storage values used for model layers 1, 2, 3, 6, 7, and 8 were obtained from literature values (Table 3.4, Anderson and Woesnner 1992). A uniform value was applied to each of these model layers.

Specific Yield

In MODFLOW, specific yield is only used for unconfined model layers, i.e., model layers 1 and 2. Specific yield values used for model layers were obtained from literature values (Table 3.5, Anderson and Woessner 1992).

3.4.2 Recharge

Recharge refers to the volume of infiltrated water that crosses the water table and becomes part of the groundwater system and represents a source of water entering the groundwater system. The model grid encompasses the entire drainage basin.

It is reasonable to assume that some areas of the Mere Brook/Merriconneag Stream drainage basin receive more recharge than others. For example, the grassy, relatively flat, upland areas which comprise a good portion of the drainage basin can be assumed to receive more recharge than other areas within the basin while it reasonable to assume that the incised relatively steep sloped stream valleys are net discharge areas and therefore receive little recharge from precipitation. Based on a review of utility drawings for NAS Brunswick, and the prevalence of impermeable surfaces (as shown in aerial photography of the Site), it was concluded that precipitation falling on developed areas within the basin are directed toward the storm sewer system which ultimately discharges both to Mere Brook, and to Merriconeag Stream. Therefore, only nominal recharge to the groundwater system would be expected to occur in these areas. Similarly, little recharge is expected to occur across the landfill cap at Sites 1 and 3. Based on the above assumptions, the model area was divided into zones representing upland areas, stream valley areas, developed areas, and the Sites 1 and 3 landfill (Figure D-1). Also, for model verification simulations, the infiltration gallery was modeled as an area of elevated recharge. The recharge rate was input into the model as the aerial equivalent of the total groundwater extraction flow rate.

The runway area was included as part of the upland zone since runoff from the runway is directed towards the grassy areas alongside the runways and to what appear to be dry wells located along the length of the runways. A review of utility drawings indicates that these dry wells are not connected to the basewide storm sewer system so it is estimated that the net recharge for this area would be similar if the runways were not present.

For the steady-state non-pumping simulation, and the steady-state pumping verification simulation, a percentage of the average daily precipitation observed at NASB for the four month period prior to the gauging event was used. This value was adjusted during calibration within a range of plausible values.

The range of values considered plausible for the groundwater model were based on the range of estimated recharge values reported in Table 1 of Ground-Water Recharge in Humid Areas of the United States (Delin and Risser, 2007). This table is presented as Table D-1 in Appendix D. Average values reported in various studies ranged from 10 to 64 percent of average annual precipitation. After excluding extreme or unrealistic values from this data set, the range of recharge considered likely for this area is from 19 to 29 percent of precipitation. This range was used as the plausible range of recharge values for upland areas of the Mere Brook/Merrriconeag Stream drainage basin.

3.4.3 River Package

The MODFLOW river package was used to simulate groundwater interactions with the major surface water features within the model grid including Mere Brook (and tributaries), Merriconeag Stream (and tributaries), the Harpswell Cove tidal area, and Picnic Area Pond. The overburden and shallow bedrock groundwater flow system is interpreted to discharge to these surface water systems. The river package of the groundwater model calculates flow out of or into the stream as a function of a driving head (the difference in river stage and groundwater head) and resistance of some confining streambed layer and therefore can act as either a source or sink for the underlying aquifer. Mere Brook flows beneath runways at NAS Brunswick through culverts, where the stream is not believed to have any significant impact/interaction with the groundwater flow system. Surface water systems that are diverted or redirected via culverts were not included in the model simulation.

Figure 3 illustrates the model nodes for which the river package was specified. A 3-foot sediment thickness was assumed for the model based on estimated sediment thickness values observed during the RI seepage meter and stream piezometer study program. Reportedly, the hydraulic conductivities calculated for the sediments from seepage meter and stream piezometer measurements were estimated to range from 0.003 to 0.3 ft/day (ABB 1993). In the model the input parameter of riverbed conductance is defined as K (vertical hydraulic conductivity of riverbed material) x L (length of river) x W (width of river)/M (thickness of riverbed material). The model simulates surface water systems over individual model nodes; therefore, the length and width values may depend on the actual model node size. To avoid unnecessary model complexity, a uniform value of conductance/length-of-reach-per-grid-cell was input into the model for each stream segment. This value was adjusted during calibration.

The model then calculated the stream length per model cell to obtain a conductance value for each cell.

Fluxes calculated in the river package also depend on surface water elevations interpreted at each model node. Surface water stage elevations were interpolated from this data and available topographic information.

3.4.4 Horizontal Flow Barrier Package

The Horizontal Flow Barrier (HFB) package was used to simulate the effect of the slurry wall that surrounds Landfill 1 and 3 on the west, north and east sides. Horizontal flow barriers in the model are simulated in the HFB package by identifying model grid block boundaries which approximately coincide with the location of the barrier and assigning a hydraulic characteristic to each grid boundary. In the HFB Package, the hydraulic characteristic is the barrier hydraulic conductivity divided by the width of the barrier. Since no data was readily available regarding the hydraulic characteristic of the slurry wall, this input parameter value was based on the value that provided the best match of observed to simulated heads for points located within the slurry wall. The hydraulic conductivity of the slurry wall was considered to have a very low hydraulic characteristic of 2.5×10^{-4} ($time^{-1}$) to simulate the presence of this feature in the model.

4. MODEL CALIBRATION AND RESULTS

4.1 MODEL CALIBRATION

The purpose of model calibration is to adjust model parameters until the model can reasonably reproduce the natural system under a variety of conditions. Flow model calibration included running steady-state conditions which simulate the aquifer without pumping conditions and comparing the model calculated water elevations at monitoring wells to field measured values. As noted in the Work Plan, a calibration target of 1.73 feet was selected based on the standard deviation calculated for water level elevations collected from 1995 and 2004. In addition to this primary calibration, a secondary comparison to observed stream flow rates was also completed.

The model was calibrated to steady-state conditions using groundwater elevation data collected on 29 October 2001. Observation points used for the steady-state, non-pumping calibration included 106 wells and piezometers. This data set was selected because it represents the aquifer under quasi steady-state unstressed conditions. During the collection of this data set the groundwater extraction system had been off-line for 49 days prior to well gauging. The initial calibration to water levels without extraction wells running was used because it reduced the number of variables required to simulate the natural system and therefore provided a greater degree of confidence in model results. Additional verifications were subsequently completed to further refine model accuracy.

A trial and error method was used to calibrate the steady-state non-pumping model by adjusting individual input parameters within a range of site specific values. For each model run, the simulated heads were compared to the measured heads at each well/piezometer location. Note that well/piezometer locations are represented in the model as points in 3-D space, and therefore the mid-screen elevation was selected as the elevation of the observation point. The model calibration efforts were focused on: accurately simulating groundwater elevations within the lower sand as the first objective of this modeling effort is to define the capture effectiveness of the extraction well network in the Eastern Plume; and accurately simulating groundwater elevations within and downgradient of the Sites 1 and 3 landfill as the second objective of the modeling effort is to assess the effects of the cap and slurry wall at Sites 1 and 3 on downgradient areas such as Mere Brook. Therefore, the primary targets used for model calibration included those points screened partly or entirely within the lower sand unit:

EP-10	MW-225A	MW-331
EP-11	MW-229A	P-105
EP-12	MW-230A	P-106
EP-13	MW-231A	EP-01
EP-14	MW-303	EP-02
EP-15	MW-305	EP-03
MW-106	MW-306	EP-04
MW-206A	MW-310	EP-05
MW-209	MW-311	EP-06
MW-222	MW-319	EP-07

MW-223	MW-330	EP-08

and those points located within and downgradient of the Sites 1 and 3 landfill:

Name	Unit	Name	Unit
EP-16	Transition	MW-216A	Upper Sand
EP-17	Upper Sand	MW-217A	Transition
EP-18	Upper Sand	MW-217B	Upper Sand
EP-19	Upper Sand	MW-218	Transition
EP-20	Upper Sand	MW-219	Transition
MW-202A	Transition	MW-220	Transition
MW-203	Transition	MW-232A	Transition
MW-204	Upper Sand	MW-233R	Upper Sand
MW-210B	Upper Sand	MW-234R	Transition
MW-211B	Upper Sand	MW-240	Upper Sand

A regression plot was generated for each model run that compared measured and modeled water elevations. If a model calculated water elevation is exactly the same as the observed elevation, the point on the regression plot will fall along a 1:1 line. In a regression plot, the R^2 value is a statistical measure of how well a regression line approximates real data points. An R^2 of 1.0 indicates a perfect fit of modeled to measured results. Regression plots were used to evaluate the overall fit of the model water elevations compared to measured data for steady-state simulations. Additionally, to quantify improvements in model calibration, other comparison statistics were used to quantify each calibration run including the mean error, mean absolute error, and root mean squared error. These calibration statistics were used to track the effect of changing model conditions, and to compare model calibration runs.

This trial and error method was repeated until the differences between simulated and observed heads, and the calculated mean errors were minimized. The calibration statistics for the final calibrated model are presented in the table below:

Calibration to Steady-State Non-Pumping Conditions	
Measure of Calibration	**Result**
R^2	0.95
Mean error	1.213
Mean Absolute Error	2.237
Root Mean Squared Error	2.867

The final calibrated model input parameters are provided in Table 1. Appendix E provides:

- residual values for each observation point for the final calibration of the steady-state, non-pumping simulation in table format (Table E-1),

- a plot of observation values vs. simulated values showing deviation from a straight-line correspondence (the R^2 value) for observation points (Figure E-1),
- plots of observation values vs. simulated values showing deviation from a straight-line correspondence grouped by observation points screened in the upper sand, transition, lower sand, and Sites 1 and 3 points (Figure E-2),
- and simulated potentiometric contours with the modeled vs. measured error shown for each observation point for model layers 1 (upper sand), 3 (transition), and 5 (lower sand) (Figures E-3 through E-5).

A secondary calibration was completed that compared observed and simulated stream flow rates. Stream flow calculations obtained along Mere Brook and Merriconeag Stream at the site in October 1990 indicate that the surface water system at the most downstream measurement point (MB-5) had a discharge of approximately 4.43 cubic feet per second (cfs), 930 ft downstream of the confluence of Mere Brook and Merriconeag Stream. The simulated stream discharge was a comparable 1.73 cfs. It is noted that October 2001 was a period low recharge/flow relative to October 1990 so lower stream discharge would be expected.

The table below provides the water balance for the calibrated steady-state non-pumping flow model:

Water Balance for Calibrated Steady-State Non-Pumping Simulation		
	Flow In (ft^3/day)	Flow Out (ft^3/day)
Sources/Sinks	---	---
Storage	---	---
Constant heads	0	0
Drains	---	---
General heads	---	---
Rivers	119567.7727	-311205.8297
Streams	---	---
Wells	---	---
Recharge	191639.9069	0
Evapotranspiration	---	---
Lake	---	---
Total Source/Sink	**311207.6795**	**-311205.8297**
Summary	In - Out	% difference
Sources/Sinks	1.849827294	0.000594403
Total	**1.849827294**	**0.000594403**

As noted in the table above, the water balance error (0.00059%) is several orders of magnitude below the suggested 1% error criteria (Anderson and Woessner 1992). Based on these measures the model water balance was considered to be within acceptable limits.

4.1.1 Discussion of Model Calibration

Results of the model calibration include the following observations:

- The results of the steady-state, non-pumping calibration show the groundwater flow model has a satisfactory match to measured water elevations. The model calibration efforts were focused on most accurately simulating groundwater elevations within the lower sand as this unit contains the majority of the VOC impacts within the aquifer and is the primary focus of the existing extraction remedy. The calibration statistics for the final calibration show the model can adequately simulate water elevations in the three major hydrostratigraphic units (upper sand, transition and lower sand).

- The combined data for the upper sand, transition and lower sand units shows the model has an excellent match to measure data (R^2 of 0.950). Based on R^2 values (as shown on Figure E-2) the calibrated model most accurately simulates water elevations within the lower sand unit (R^2 of 0.906) with somewhat less model accuracy in the transition unit (R^2 of 0.801), the upper sand (R^2 of 0.787).

- The model was least accurate in simulating water elevations at Sites 1 and 3. Water levels for observation points at Sites 1 and 3 had an R^2 of 0.829 (as shown on Figure E-2). Generally, a better match between observed and calculated water levels was achieved for points downgradient of the landfill than those points located within the landfill. The error is probably due to the complex nature of the flow system in this area, and the associated increase in both the number of parameters and uncertainty in parameter values used to simulate the Sites 1 and 3 area. The proximity of Mere Brook and uncertainties regarding riverbed conductance, recharge rate through the landfill cap, the hydraulic characteristic of the slurry wall, and the pinching out of transition and lower sand units in this area all contribute to this complexity. Also, differences between modeled and observed water elevations at points close to the slurry wall may be a result of discrepancies between the actual and simulated slurry wall location. Note that the slurry wall is simulated as a barrier between grid cells and some offset from the slurry wall's actual location is to be expected.

- At 17 observation points, the simulated water table was below the gauging point elevation (gauging point elevations were assigned mid-screen elevations). At the remaining 89 observation points, simulated water elevations at 43 points fell within the target calibration criteria of 1.73 ft. Simulated water elevations at 22 points fell within two times the target calibration criteria, 14 wells fell within three times the associated error of the calibration target, and nine wells had residual values greater than three times the target calibration. The primary calibration points for the Eastern Plume (i.e. those points screened within the lower sand) achieved a better calibration in regard to calibration criteria of 1.73 ft compared to wells screened within other units.

- A secondary calibration was completed that compared observed and simulated stream flow rates. Stream flow calculations obtained along Mere Brook and Merriconeag Stream at the site in October 1990 indicate that the surface water system at the most

downstream measurement point (MB-5) had a discharge of approximately 4.43 cubic feet per second (cfs), 930 ft downstream of the confluence of Mere Brook and Merriconeag Stream. The simulated stream discharge up to this point was a comparable 1.73 cfs. It is noted that October 2001 was a period low recharge/flow relative to October 1990 so lower stream discharge would be expected.

- Based on the calibration statistics this groundwater flow model provides an accurate simulation of groundwater elevations across the Eastern Plume and Sites 1 and 3. The R^2 value for the final calibration is 0.950 which indicates a high degree of model accuracy. The flow model can predict the general flow patterns of groundwater (as shown on Figures E-3 through E-5). The model is most accurate at predicting groundwater elevations within the lower sand.

- Based on the calibration results, the groundwater flow model is considered to have sufficient accuracy to proceed with the next phases of the modeling effort; to assess both the current remedies in place and planned future modifications to the extraction well network.

4.2 MODEL VERIFICATION

The purpose of model verification is to establish greater confidence in the model by using the set of calibrated parameter values and stresses to reproduce additional sets of field data. To verify the steady-state non-pumping calibration, the calibrated flow model was tested to a second independent set of water levels representing steady-state pumping conditions. This data set was obtained from transducer data collected before beginning the April-May 2008 recovery test. Verification to this data set was selected because extraction well flow rates were accurately measured in the field prior to the start of the recovery test, and verification to this data set provided a set of initial head values for the transient simulation. The verification assumed that the majority of model parameters (hydraulic conductivity, riverbed conductance, etc.) did not change over time. Therefore the changes in water elevations should only be due to changes in recharge and extraction well pumping rates. Based on this assumption, only recharge and extraction well pumping rates were adjusted during the steady-state verification. Other aquifer parameters were not changed during verification. Also, a second verification test to transient conditions was completed using the data obtained during the April-May 2008 recovery test.

4.2.1 Verification to Steady-State Pumping Conditions

The water elevation data used for this scenario were obtained during the April-May 2008 recovery test and were collected at 8:00 AM on 28 April 2008 from transducers, one hour prior to the cessation of extraction well pumping. Observation points used for the steady-state, pumping verification included 23 wells and piezometers. Extraction wells were not used as verification points due to well efficiency issues which are likely to have added additional error to these measurements. In the verification scenario, the model simulated the operation of Site extraction wells at extraction rates measured prior to the recovery test. A review of influent totalizer records indicates that the extraction rates had been fairly consistent for several months

prior to the gauging date. Therefore, the aquifer was assumed to be at equilibrium with regard to these extraction flow rates. The pumping rates as input into the model are presented in the table below:

Extraction Well	Pumping Rate (gpm)	Pumping Rate (ft3/day)
EW-01	4.23	814
EW-02A	7.95	1530
EW-04	28.8	5548
EW-05A	1.6	308
Total	**42.6**	**8201**

The other model parameter that was varied during model verification was recharge which was adjusted until the differences between simulated and observed heads were minimized. The infiltration gallery was modeled as an area of elevated recharge receiving flow from the extraction wells. The applied recharge rate to the infiltration gallery was the equivalent of the total extraction well rate. Verification results of the steady-state pumping simulation were summarized by generating a regression plot, in addition to the mean error, mean absolute error, and root mean squared error that compared the measured and modeled water elevations. These results are summarized below:

Verification to Steady-State Pumping Conditions	
Measure of Calibration	**Result**
R^2	0.942
Mean error	-0.035
Mean Absolute Error	1.362
Root Mean Squared Error	1.787

Appendix F provides a plot of observation values vs. simulated values showing the deviation from the straight-line correspondence (the R^2 value) (Figure F-1).

4.2.2 Verification to Transient Conditions

Model verification was completed for a transient data set collected during the recovery-drawdown test conducted from 9:00AM on 28 April 2008 to 9:00AM on 6 May 2008. During this time period site extraction wells were shut down and restarted. Water elevations and extraction well pumping rates were recorded by transducers installed in selected wells. Water levels were recorded for approximately 48 hours prior to the cessation of pumping on 28 April 2008 and for about 70 hours after resumption of pumping on 6 May 2008. During the verfication process, the calculated water elevations were tracked in 23 monitoring wells and piezometers for the period of record. Transient model stress periods were based on the interval for which extraction well data were recorded. Initially, time variant values for recharge and stream stage were assigned to the transient simulation. However, because of model stability issues, a constant

value for each parameter was applied. This was considered a valid approach since the period of the transient simulation was relatively short, and the purpose of the transient simulation was to assess the model's response to pumping stresses.

Figures G-1 through G-4 in Appendix G provide a comparison of the model calculated water elevations compared to observed data in time history plots for the transient pumping simulation. Time series plots showing modeled head vs. measured head for the period of the recovery-drawdown test are presented for each of the 23 observation points and four extraction wells included in the model verification simulation.

Results of the model verification include the following observations:

- The results of the verification to steady-state, pumping conditions show the groundwater flow model has a satisfactory match to measured water elevations. The model verification efforts were focused on most accurately simulating groundwater elevations within the lower sand as this unit contains the majority of the VOC impacts within the aquifer and is the primary focus of the existing extraction remedy. The verification statistics for the final calibration show the model can adequately simulate water elevations. The combined data for all units shows the model has an excellent match to measure data (R^2 of 0.942).

- The results of the verification to transient conditions show the groundwater flow model has a satisfactory match to observed changes in head caused by pumping stresses to the aquifer. The verification simulations show the groundwater model can simulate the water level effects of extraction wells turning on and off, especially within the lower sand unit.

4.3 SENSITIVITY ANALYSIS

The purpose of the sensitivity analysis is to quantify the uncertainty in the calibrated model caused by uncertainty in the estimates of aquifer parameters, stresses, and boundary conditions. A sensitivity analysis was completed to quantitatively assess how changes in model input affect model output results. The primary goal of the sensitivity analysis was to identify which parameters are the least well defined and most critical to the model. The sensitivity analysis was also completed to establish which aquifer parameters have the largest effect on groundwater flow result. Parameters that were modified during the steady-state, non-pumping sensitivity analysis included hydraulic conductivity for model layers 2 and 3 (transition above lower sand), vertical anisotropy for model layers 2 and 3, layers 4 and 5 (lower sand), recharge, and riverbed conductance. Based on the understanding of the flow system determined during model calibration, these parameters have the largest effect on model output results. The results of the sensitivity analysis are presented as a graph showing the average change in water elevation which resulted from a specific percentage parameter change from the final calibrated value.

The results of the sensitivity analysis are presented in Appendix H. Specific yield and specific storage values used for the transient simulation were qualitatively assessed during calibration but

were not quantitatively assessed during the sensitivity analysis because these parameters only affect temporal changes in the aquifer.

Results of the flow model calibration for steady-state, non-pumping conditions include the following observations:

- The steady-state, non-pumping sensitivity analysis indicates the model is slightly sensitive to hydraulic conductivity of Layers 4 and 5. Model output changed in a linear fashion for the range of values tested (i.e., a 25 percent increase results in a nominal elevation change, and a 50 percent increase results in a slightly greater but still nominal change in modeled water elevations). These results suggest that relatively large changes in aquifer hydraulic conductivities of 25-50 percent result in small changes in modeled water elevations.

- The model is highly sensitive to recharge which affected model output in a linear fashion. A 50 percent increase or decrease in recharge resulted in a 2.2-ft elevation change. This linear response to changes in recharge is typical in groundwater modeling simulations.

- The model appears to be moderately to highly sensitive to changes in Layers 2 and 3 (transition) hydraulic conductivity. Hydraulic conductivity affects model output in a non-linear fashion, a 50 percent decrease in transition hydraulic conductivity resulted in a 1.6-ft elevation change while a 50 percent increase resulted in a 0.8-ft elevation change. This indicates that the hydraulic conductivity in Layers 2 and 3 is an important controlling factor to model results.

- The model appears to be moderately to highly sensitive to changes in Layers 2 and 3 (transition) vertical anisotropy. Vertical anisotropy affects model output in a non-linear fashion, a 50 percent decrease (a vertical to horizontal conductivity ratio of 1:10) in transition vertical anisotropy resulted in a 1.0-ft elevation change while a 50 percent increase (a vertical to horizontal K ratio of 1:30) resulted in a 0.7-ft elevation change. This indicates that the hydraulic conductivity in Layers 2 and 3 is an important controlling factor to model results.

- Similar to Layer 2 and 3 hydraulic conductivity, the model appears to be moderately to highly sensitive to changes in riverbed conductance. Riverbed conductance affects model output in a non-linear fashion, a 50 percent decrease in Riverbed conductance/Length resulted a 1.0-ft elevation change while a 50 percent increase resulted in a 0.3-ft elevation change. This indicates that the riverbed conductance is an important controlling factor to model results.

- The sensitivity analysis indicates the three parameters with the greatest impact on the groundwater model results are recharge, layer 2 and 3 hydraulic conductivity and riverbed conductance. A significant number of data points were used in the groundwater model to estimate Layer 2 and 3 hydraulic conductivity. Therefore this parameter is considered to have low uncertainty as this input value is closely tied to site specific data.

Recharge values have a higher uncertainty as this value was not measured at the site and was based on literature values. Also, the riverbed conductance input value has higher uncertainty as this value was based on relatively few data points. Additional discussion of the uncertainty of riverbed conductance is provided in the Model Limitation and Uncertainties section (Section 5.0).

5. MODEL LIMITATIONS AND UNCERTAINTIES

The groundwater flow model that was developed is a simplification of a highly complex natural system and, therefore, results should be used with a degree of caution. Input parameters used in the flow model contain a degree of uncertainty due to the complexity of the natural aquifer system. These uncertainties can become compounded during the estimation of multiple input factors, resulting in differences between model output and the natural system. In addition, point sources of data estimation (i.e. monitoring wells) will have inherent inaccuracies when they are used to describe changes in a heterogeneous flow system. The differences between measured and modeled heads are likely due to the complex nature of the natural system which cannot be fully simulated by a groundwater flow model.

5.1 CAUSES OF MODEL LIMITATIONS

Several general causes can contribute to non-agreement between model and observed data, including:

- **Simplifying Model Assumptions**—The natural flow system was simplified so that it could be modeled. Numerous assumptions (i.e., layer homogeneity) were made to simplify the natural system, or because sufficient site-specific data were not available.

- **Boundary Conditions**—Correct selection of boundary conditions is a critical step in model design. In steady-state simulations, the boundaries largely determine the flow pattern. Setting boundary conditions is the step in model design that is most subject to serious error.

- **Non-Uniqueness**—One of the most important limitations of the groundwater flow model relates to the issue of non-uniqueness of the solution. Because the model calibration was based on matching head values to measured values, changes to several input parameters could provide similar results. More than one combination of model parameters can result in similar head values.

During the modeling process, efforts were made to reduce the amount of uncertainty that was included in the flow model. Whenever possible, the assumptions used in the model were documented so that assumptions and subsequent decisions could be discussed and presented to the data user. Sources of data have been noted and referenced, and assumptions have been based on site-specific data whenever possible.

5.2 SPECIFIC MODEL LIMITATIONS AND UNCERTAINTIES

Specific model limitations and uncertainties identified during the modeling process included the following:

- **Simplification of Transition Unit**—The transition unit is highly heterogeneous especially in the vertical direction. This unit was represented by two model layers using hydraulic conductivity values that represented the bulk aquifer properties of the unit. Discrepancies between observed and simulated heads are likely to result due to this simplification in the groundwater model.

- **Simplification of Lower Sand Unit**—The lower sand unit was mapped as a continuous unit where present. However, in reality, the lateral continuity of sand layers appears highly variable, and some sand layers may provide conduits to groundwater flow, while others may be isolated and may not conduct significant amounts of groundwater.

- **Simplification of Stream-Aquifer Interaction**—MODFLOW's river package was used to simulate the flow of water between the aquifer and Mere Brook and Merriconeag Stream. The river package uses the riverbed conductance to account for the length and width of the river channel in the cell, the thickness of the riverbed sediments and their vertical hydraulic conductivity. It is noted that there is considerable uncertainty regarding this model input parameter: the degree of accuracy of the method used to obtain values for vertical conductivity of riverbed sediments; the high range of calculated values (3 orders of magnitude between minimum and maximum values); small number of data points; and uncertainty regarding riverbed heterogeneities and scaling effects all contribute to this uncertainty.

- **Simplification of Recharge**—In the absence of basin specific recharge estimates, the range of recharge values used during calibration of the flow model relied upon literature values.

- **Boundary Conditions**—It is assumed that extraction rates from water supply wells including groundwater extraction rates from the adjacent groundwater basin to the north for the Brunswick Topsham Water District have a minor effect on the position of the overburden groundwater divide and therefore have a negligible effect on groundwater patterns within the study area.

- **Non-Unique Solutions**—It is acknowledged that a better fit to observed heads could have been achieved through increasing model complexity. For instance, the recharge areas could have been further discretized into multiple polygons with varying recharge rate values. Riverbed conductance/Length-of-reach-per-grid-cell values could have been varied along stream reaches instead of being assigned one uniform value. Model layers representing the transition unit could have been further discretized. Conceivably, there are potentially multiple non-unique solutions that could result in a better fit to observed heads. The possibility of non-unique solutions is especially true for the complex flow system in and around Sites 1 and 3. The proximity of the landfill to Mere Brook, the recharge rate through the landfill cap, the hydraulic characteristic of the slurry wall, and the pinching out of the and lower sand units in this area all contribute to this complexity. However, taking into account the principle of parsimony in groundwater modeling and without the field data to support it, increased model complexity would not necessarily

result in a more accurate representation of the natural system. Given the increased model instability and execution times associated with more complex models, and the lack of a sufficient data on recharge and riverbed conductance, the level of complexity as developed for this model is considered adequate.

- **Calibration Targets**—Well/piezometer locations were represented in the model as points in 3-dimensional space, and therefore the mid-screen elevation was selected as the elevation of the observation point. However, if a well screen is long or transects multiple hyrdostratigraphic units the measured head may not be representative of the water elevation at the mid-screen point, especially if there is a significant vertical gradient. Also, small-scale heterogeneities which were not accounted for in the model may be a cause of error in simulated heads.

- **Vertical Extent**—This model was not designed to assess flow patterns below top of clay surface (i.e., below model layer 6). Model predictions for the Presumpscot Clay and Bedrock (i.e., model layers 7 and 8) should not be considered accurate reflections of groundwater flow or water elevations.

- Available hydrostratigraphic data for areas outside of the focus area (Sites 1 and 3 and the Eastern plume) but within the model domain (western areas of the Mere Brook/Merriconeag drainage basin) is sparse. Ghost points were used where data was absent to control interpolated surfaces for each model layer, and hydraulic conductivity values were assigned based on measured values obtained from points within the focus area.

6. SUMMARY AND CONCLUSIONS

6.1 SUMMARY

A groundwater flow model was developed in order to assess the remedies in place and the anticipated future modifications for Sites 1 and 3, and the Eastern Plume. This report summarizes the development of the groundwater flow model and the results of the calibration. After concurrence from site stakeholders, a technical memorandum will be completed to assess the current remedies in place, i.e., the slurry wall at Sites 1 and 3, and the extraction well network for the Eastern Plume, and possible modifications to these remedies. The subsequent technical memorandum will be issued to the project stakeholders for review and comment once this Summary Report is issued as Final.

The groundwater flow model was developed using the MODFLOW 2000 (Harbaugh et al. 2000) computer code. MODFLOW has been heavily tested and is the industry standard for groundwater flow software. Pre- and post-processing were completed using the Groundwater Modeling System (GMS) Program, Version 6.0. The groundwater flow model was constructed using available site-specific data. The model was extended to include the entire Mere Brook/Merriconeag Stream drainage basin as the drainage divide offered a plausible no-flow boundary. The model was extended in the vertical direction from ground surface to 100-ft below the top of bedrock in order to satisfy the modeling principle that the effects of applied stresses to the aquifer should not extend to model boundaries. The model was divided into 8 layers in order to adequately represent site hydrostratigraphy. Each layer represented part or all of a hydrostratigraphic unit. The geometry of each layer was interpolated from available site stratigraphic data. Ranges of aquifer properties such as hydraulic conductivity, vertical anisotropy and storativity were based on site specific data or literature values and applied to each model layer. Recharge was applied to the top of the model domain and input into the model as a percentage of precipitation. Mere Brook and Merriconeag stream were represented using MODFLOW's river package. Both head stage and riverbed conductance values were assigned for this package.

The steady-state groundwater flow model was calibrated to a set of groundwater elevation data collected when there were no pumping stresses on the aquifer, and the system was assumed to be under pseudo steady-state conditions. A secondary calibration was performed on measured stream flow rates. Additionally, to increase model confidence, the model was subsequently verified to two sets of data: a data set representing pseudo steady-state conditions when the aquifer was under stress from pumping; and a transient data set collected during a recovery/drawdown test of the extraction well system. A sensitivity analysis was also completed for the flow model. The results of the sensitivity analysis indicate that the model is highly sensitive to changes in recharge, hydraulic conductivity of the confining unit, and riverbed conductance.

6.2 CONCLUSIONS

Conclusions from the ground water modeling effort include:

- The groundwater model that was developed can simulate groundwater flow conditions, water elevations and overall flow patterns of the two areas of interested for the study, the Eastern Plume and the areas downgradient of the Sites 1 and 3 Landfill.

- The groundwater model is most accurate for simulating groundwater flow conditions in the lower sand unit, which contains the majority of the VOC impacts and is the focus for extraction wells in the Eastern Plume. The model is less accurate in predicting flow pattern in the transition unit and upper sand although the accuracy of the model within these units is believed to be sufficient to satisfy the goals and objectives of the groundwater flow model.

- The model is least accurate in simulating flow conditions at Sites 1 and 3. This is probably due to the complex nature of the flow system in this area. However, the accuracy of the model within this area is believed to be sufficient to satisfy the objectives of the groundwater flow model.

- The model input parameters are considered to be a realistic simplification of the natural conditions at the Sites 1 and 3, and the Eastern Plume. The model input parameters used in the model were within measured ranges when site-specific data was available or was taken from literature values if site-specific data was not available.

- Based on a comparison of the modeled water elevations to measured data, the model with a fair degree of accuracy can predict changes in water elevation that occur in the lower sand due to pumping of extraction wells. Model verification indicates the groundwater model was tested against unique data sets from steady state conditions and pumping conditions.

- Based on the results provided in this Summary Report the calibrated groundwater flow model is believed to have sufficient accuracy to be used to assess the goals stated in the Final Groundwater Modeling Work Plan.

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TABLES

TABLE 1 FINAL CALIBRATED MODEL INPUT PARAMETERS

Sites 1 and 3 and the Eastern Plume

Parameter	Layer 1 (Upper Sand)	Layer 2 & 3 (Transition)	Layer 4 & 5 (Lower Sand)	Layer 6 (Transition)	Layer 7 (Clay)	Layer 8 (Till/Bedorck)
MODFLOW LAYER PROPERTIES						
Hydraulic Conductivity (ft/day):						
Uniform Value	25	---	---	1.1	0.0007	2
Where Unit not Present	---	25	25	---	---	---
Where Unit Present	---	0.278/0.48	25/35/8	---	---	---
Ratio of Horizontal to Vertical Hydraulic Conductivity:	10:1	20:1	10:1	20:1	10:1	10:1
Specific Storage (1/ft):						
Uniform Value	0.00005	---	---	1.00E-08	0.000338	0.000011
Where Unit not Present	---	0.0000503	0.0000503	---	---	---
Where Unit Present	---	0.00001	0.00001	---	---	---
Specific Yield:						
Uniform Value	0.33	---	0.33	0.2	0.06	0.26
Where Unit not Present	---	0.33	---	---	---	---
Where Unit Present	---	0.2	---	---	---	---
Model Layer Type	Convertible	Convertible (Layer 2) Confined (Layer 3)	Confined	Confined	Confined	Confined

MODFLOW PACKAGES

Flow Package: Layer Property Flow

Solver: Preconditioned conjugate Gradient Method (PCG2)

Maximum Outer Iterations: 1000

Maximum Inner Iterations: 1000

Head Change Criterion for Convergence (ft): 0.1

Source/Sink Packages Used: Recharge Package
River Package
Horizontal Flow Barrier
Well Package

RECHARGE

	Recharge Rate (in/yr)	Recharge Rate as a Percent of Average Recorded Precipitation for Four Month Period Prior to Gauging
Steady State Non-Pumping		
Upland Areas:	7.84	24.88%
Developed Areas:	0.39	1.24%
Stream Discharge Areas:	1.17	3.73%
Landfill 1 and 3:	0.39	1.24%
Steady State Pumping/Transient		
Infiltration Gallery:	897.9	---
Upland Areas:	12.94	20.16%
Developed Areas:	0.65	1.01%
Stream Discharge Areas:	1.94	3.02%
Landfill 1 and 3:	0.65	1.01%

RIVER PACKAGE

Riverbed Conductance/Length of Reach per Grid Cell (applied to top-most active mdel layer) (ft^2/day)/ft: 4

Head Stage (ft MSL): Ground Surface Elevation Plus 0.5-ft

Riverbed Bottom Elevation (Ft MSL): Ground Surface Elevation Minus 3-ft

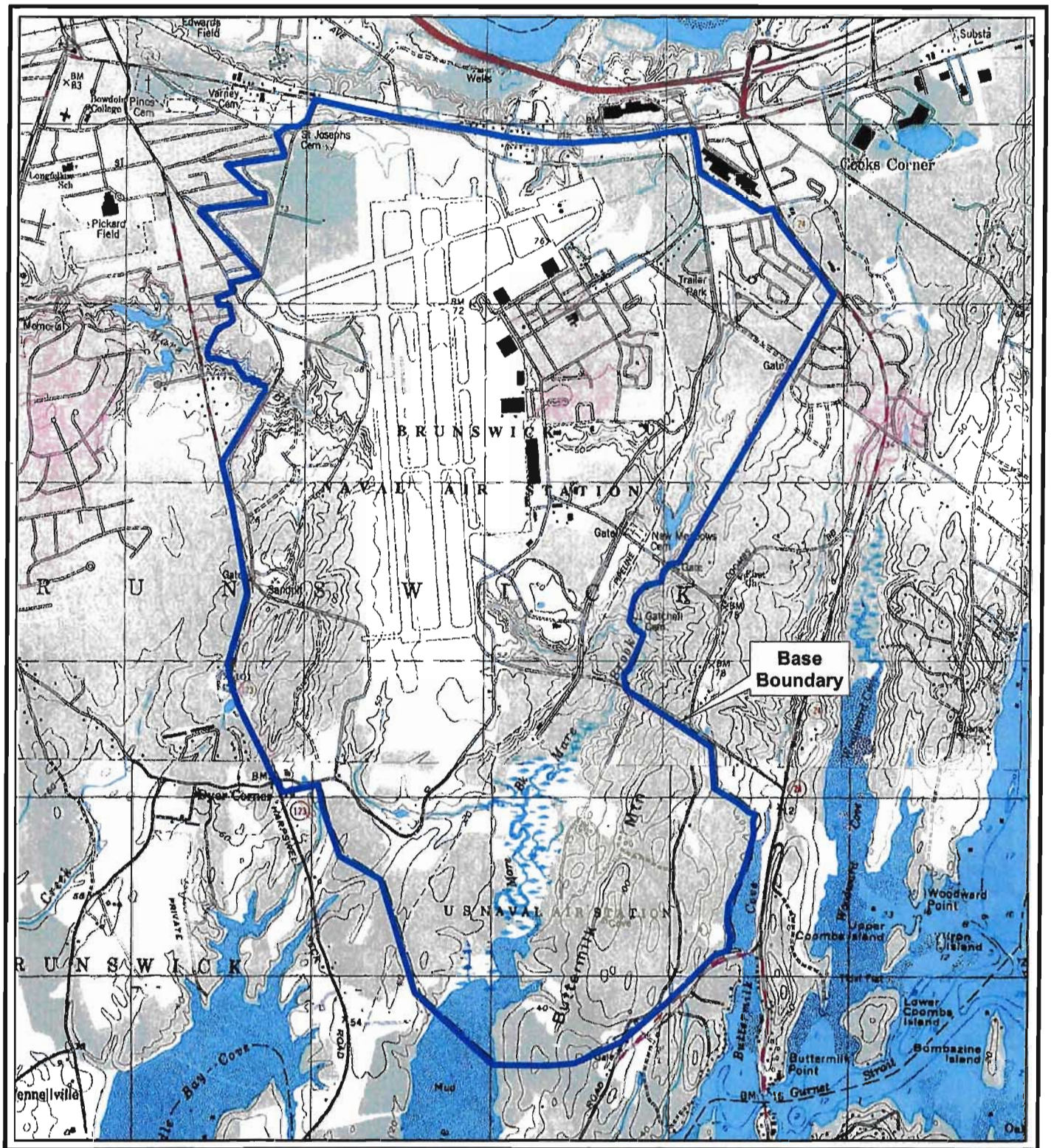
HORIZONTAL FLOW BARRIER

Hydraulic Characteristic ($time^{-1}$): 2.500E-04

WELL PACKAGE

Extraction Well	Pumping Rate (gpm)	Pumping Rate (ft3/day)
EW-01	4.23	814
EW-02A	7.95	1530
EW-04	28.8	5548
EW-05A	1.6	308

FIGURES



Contract No.	N62472-02-D-0810
Description	Site 17 Site Location
Coordinate system	NAD 1983, UTM, Zone 19 N in meter
Sources	Naval Base Boundary provided by Navy. Orrs Island (1978) and Brunswick (1980) 7.5 minute quadrangles provided by USGS.

Date	8-OCT-2008	Rev.	Date	App. By
DB	C Guido			
CB	J. Gatherer			
AB				

Legend

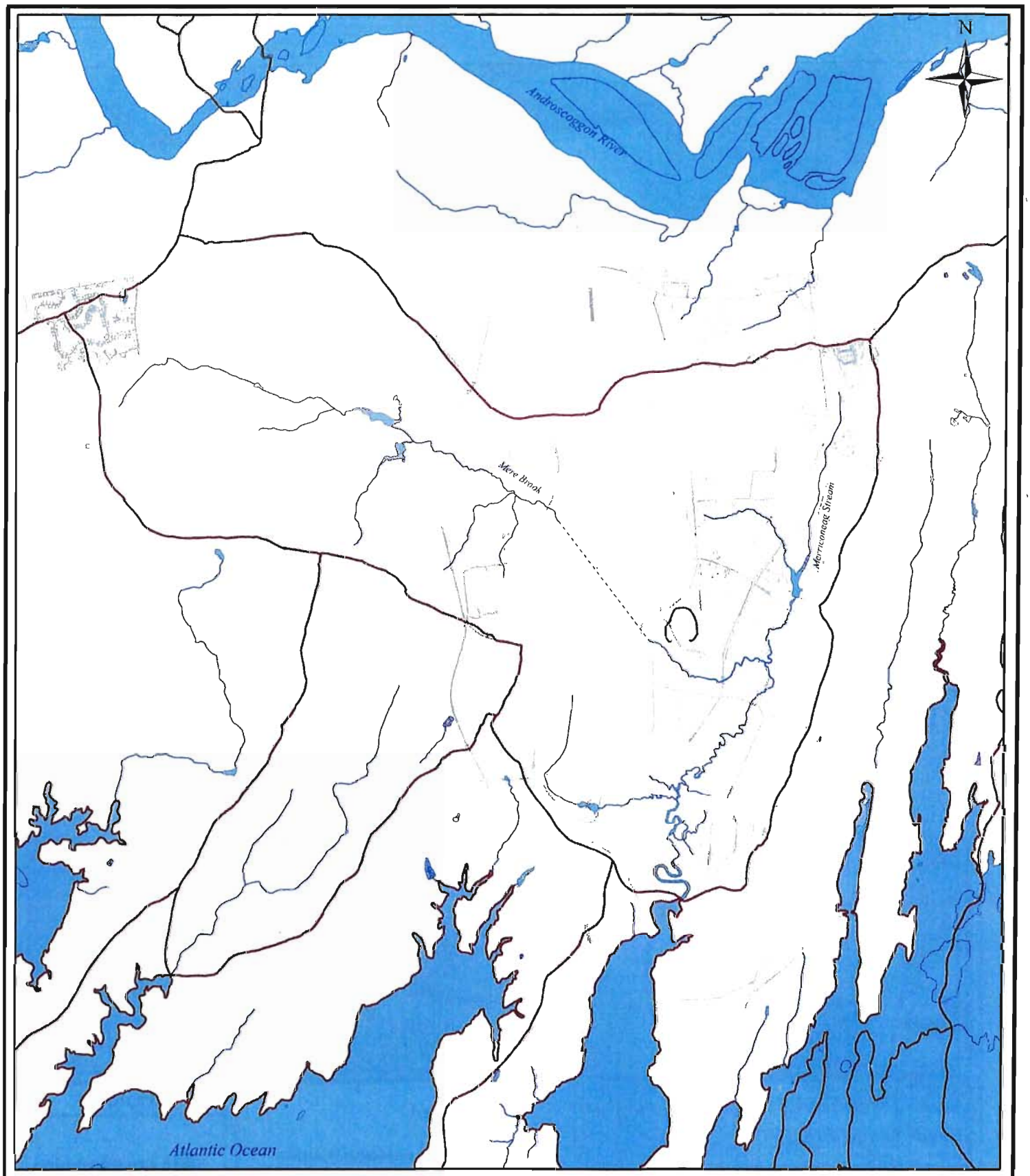
NAS Brunswick Boundary

Figure 1

Site Location Map

Naval Air Station
Brunswick, Maine

0 850 1,700 3,400 Feet



Contract No.	N62472-02-D-0810
Description	NASB Brunswick, ME
Coordinate system	NAD 1983, UTM Zone 19N in meters
Source	Naval Base Boundary provided by Navy.

0 0.2 0.4 0.8 Miles

Date	2-OCT-2008	Rev.	Date	App. By
DB	J. Gatherer			
CB	G. Calderone			
AB				

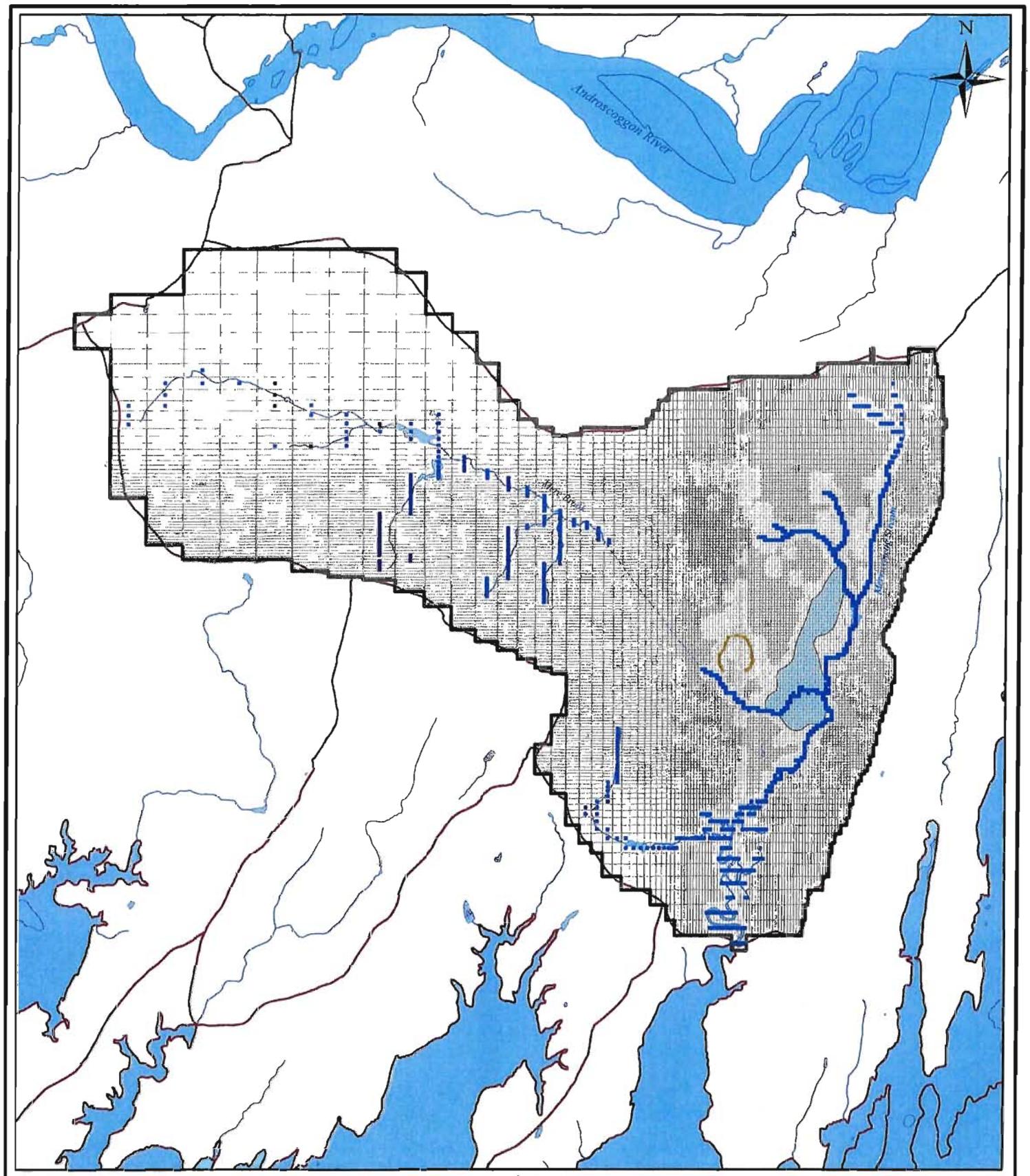
Legend

- Drainage Divide
- Sites1 and 3 Slurrywall
- Stream
- Atlantic Ocean
- Eastern Plume

Figure 2

Hydrologic Features

Naval Air Station
Brunswick, Maine



Contract No.	N62472-02-D-0810
Description	NASB Brunswick, ME
Coordinate system	NAD 1983, UTM Zone 19N in meters
Source	Naval Base Boundary provided by Navy.

0 0.2 0.4 0.8 Miles

Date	2-OCT-2008	Rev.	Date	App. By
DB	J. Gatherer			
CB	G. Calderone			
AB				

Legend

- Grid Cells
- No Flow Boundary
- Horizontal Flow Barrier
- River Boundary
- Drainage Divide
- Eastern Plume

Figure 3

Model Grid Layout

Naval Air Station
Brunswick, Maine

APPENDIX A

Hydrostratigraphic Unit Interpolation

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_TOP	ELEV_BASE	UNIT	USE
AAS-1	425434.5693	4860676.883	67.53	49.53	UPPER SAND	Y
AAS-1	425434.5693	4860676.883	49.53	49.03	TRANSITION	Y
AAS-1	425434.5693	4860676.883	49.03	48.53	LOWER SAND	Y
AAS-1	425434.5693	4860676.883	48.53	48.03	TRANSITION2	Y
AAS-1	425434.5693	4860676.883	48.03	-999	CLAY	Y
AAS-10	425463.1135	4860648.11	66.71	59.71	UPPER SAND	Y
AAS-10	425463.1135	4860648.11	59.71	59.21	TRANSITION	Y
AAS-10	425463.1135	4860648.11	59.21	58.71	LOWER SAND	Y
AAS-10	425463.1135	4860648.11	58.71	57.91	TRANSITION2	Y
AAS-10	425463.1135	4860648.11	57.91	-999	CLAY	Y
AAS-11	425407.4084	4860615.741	63.49	52.99	UPPER SAND	Y
AAS-11	425407.4084	4860615.741	52.99	52.49	TRANSITION	Y
AAS-11	425407.4084	4860615.741	52.49	51.99	LOWER SAND	Y
AAS-11	425407.4084	4860615.741	51.99	51.49	TRANSITION2	Y
AAS-11	425407.4084	4860615.741	51.49	-999	CLAY	Y
AAS-12	425415.255	4860621.115	64.36	52.86	UPPER SAND	Y
AAS-12	425415.255	4860621.115	52.86	52.36	TRANSITION	Y
AAS-12	425415.255	4860621.115	51.86	51.36	LOWER SAND	Y
AAS-12	425415.255	4860621.115	51.36	50.86	TRANSITION2	Y
AAS-12	425415.255	4860621.115	50.86	50.36	CLAY	Y
AAS-13	425466.8913	4863672.608	65.11	54.61	UPPER SAND	N
AAS-13	425466.8913	4863672.608	54.61	54.11	TRANSITION	N
AAS-13	425466.8913	4863672.608	54.11	53.61	LOWER SAND	N
AAS-13	425466.8913	4863672.608	53.61	53.11	TRANSITION2	N
AAS-13	425466.8913	4863672.608	53.11	-999	CLAY	N
AAS-2	425433.3993	4860663.065	66.94	44.94	UPPER SAND	N
AAS-2	425433.3993	4860663.065	-999	-999	TRANSITION	N
AAS-2	425433.3993	4860663.065	-999	-999	LOWER SAND	N
AAS-2	425433.3993	4860663.065	-999	-999	TRANSITION2	N
AAS-3R	425431.9084	4860652.42	67.94	50.44	UPPER SAND	Y
AAS-3R	425431.9084	4860652.42	50.44	49.44	TRANSITION	Y
AAS-3R	425431.9084	4860652.42	49.44	48.94	LOWER SAND	Y
AAS-3R	425431.9084	4860652.42	48.94	48.44	TRANSITION2	Y
AAS-3R	425431.9084	4860652.42	48.44	-999	CLAY	Y
AAS-4R	425449.4334	4860663.417	67.89	56.89	UPPER SAND	Y
AAS-4R	425449.4334	4860663.417	56.89	56.89	TRANSITION	Y
AAS-4R	425449.4334	4860663.417	56.89	56.39	LOWER SAND	Y
AAS-4R	425449.4334	4860663.417	56.39	55.89	TRANSITION2	Y
AAS-4R	425449.4334	4860663.417	55.89	-999	CLAY	Y
AAS-5	425437.9255	4860653.402	67.52	54.52	UPPER SAND	Y
AAS-5	425437.9255	4860653.402	54.52	54.72	TRANSITION	Y
AAS-5	425437.9255	4860653.402	54.72	54.22	LOWER SAND	Y
AAS-5	425437.9255	4860653.402	54.22	53.72	TRANSITION2	Y
AAS-5	425437.9255	4860653.402	53.72	-999	CLAY	Y
AAS-6	425431.4355	4860629.694	65.78	52.78	UPPER SAND	Y

Label	X	Y	ELEV_TOP	ELEV_BASE	UNIT	USE
AAS-6	425431.4355	4860629.694	52.78	51.98	TRANSITION	Y
AAS-6	425431.4355	4860629.694	51.98	51.48	LOWER SAND	Y
AAS-6	425431.4355	4860629.694	51.48	50.98	TRANSITION2	Y
AAS-6	425431.4355	4860629.694	50.98	-999	CLAY	Y
AAS-7	425439.7888	4860634.269	66.01	55.01	UPPER SAND	Y
AAS-7	425439.7888	4860634.269	55.01	55.51	TRANSITION	Y
AAS-7	425439.7888	4860634.269	55.51	55.01	LOWER SAND	Y
AAS-7	425439.7888	4860634.269	55.01	54.51	TRANSITION2	Y
AAS-7	425439.7888	4860634.269	54.51	-999	CLAY	Y
AAS-8	425447.565	4860638.974	66.17	58.17	UPPER SAND	Y
AAS-8	425447.565	4860638.974	58.17	57.67	TRANSITION	Y
AAS-8	425447.565	4860638.974	57.67	57.17	LOWER SAND	Y
AAS-8	425447.565	4860638.974	57.17	56.67	TRANSITION2	Y
AAS-8	425447.565	4860638.974	56.67	-999	CLAY	Y
AAS-9	425455.4283	4860643.373	66.37	60.87	UPPER SAND	Y
AAS-9	425455.4283	4860643.373	60.87	60.37	TRANSITION	Y
AAS-9	425455.4283	4860643.373	60.37	59.87	LOWER SAND	Y
AAS-9	425455.4283	4860643.373	59.87	59.37	TRANSITION2	Y
AAS-9	425455.4283	4860643.373	59.37	-999	CLAY	Y
B-805	425395.2763	4861827.205	37.3	23.8	UPPER SAND	Y
B-805	425395.2763	4861827.205	23.8	19.8	TRANSITION	Y
B-805	425395.2763	4861827.205	19.8	19.3	LOWER SAND	Y
B-805	425395.2763	4861827.205	19.3	18.8	TRANSITION2	Y
B-805	425395.2763	4861827.205	18.8	-19.2	CLAY	Y
B-805	425395.2763	4861827.205	-19.2	-29.7	BEDROCKorTILL	Y
B-809	425402.3712	4861846.93	35.3	21.8	UPPER SAND	Y
B-809	425402.3712	4861846.93	21.8	17.8	TRANSITION	Y
B-809	425402.3712	4861846.93	17.8	17.3	LOWER SAND	Y
B-809	425402.3712	4861846.93	17.3	16.8	TRANSITION2	Y
B-809	425402.3712	4861846.93	16.8	5.3	CLAY	Y
CP-101	425453.4561	4859642.641	61.8	36.8	UPPER SAND	Y
CP-101	425453.4561	4859642.641	36.8	36.3	TRANSITION	Y
CP-101	425453.4561	4859642.641	36.3	36	LOWER SAND	Y
CP-101	425453.4561	4859642.641	36	29.8	TRANSITION2	Y
CP-101	425453.4561	4859642.641	29.8	-999	CLAY	Y
CP-102	425510.8464	4859651.783	57.9	28.9	UPPER SAND	Y
CP-102	425510.8464	4859651.783	28.9	28.4	TRANSITION	Y
CP-102	425510.8464	4859651.783	28.4	27.9	LOWER SAND	Y
CP-102	425510.8464	4859651.783	27.9	20.9	TRANSITION2	Y
CP-102	425510.8464	4859651.783	20.9	-999	CLAY	Y
CP-103	425570.0244	4859666.702	60.9	30.2	UPPER SAND	Y
CP-103	425570.0244	4859666.702	30.2	30	TRANSITION	Y
CP-103	425570.0244	4859666.702	30	3.1	LOWER SAND	Y
CP-103	425570.0244	4859666.702	3.1	2.9	TRANSITION2	Y
CP-103	425570.0244	4859666.702	2.9	-999	CLAY	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-104	425628.4037	4859674.362	54.5	29.5	UPPER SAND	Y
CP-104	425628.4037	4859674.362	29.5	26.5	TRANSITION	Y
CP-104	425628.4037	4859674.362	26.5	5.5	LOWER SAND	Y
CP-104	425628.4037	4859674.362	5.5	2.5	TRANSITION2	Y
CP-104	425628.4037	4859674.362	2.5	-4.5	CLAY	Y
CP-105	425691.1224	4859656.363	51	33	UPPER SAND	Y
CP-105	425691.1224	4859656.363	33	22	TRANSITION	Y
CP-105	425691.1224	4859656.363	22	-8	LOWER SAND	Y
CP-105	425691.1224	4859656.363	-8	-10	TRANSITION2	Y
CP-105	425691.1224	4859656.363	-10	-999	CLAY	Y
CP-106	425734.8924	4859681.192	48.6	24.6	UPPER SAND	Y
CP-106	425734.8924	4859681.192	24.6	8.6	TRANSITION	Y
CP-106	425734.8924	4859681.192	8.6	-12.2	LOWER SAND	Y
CP-106	425734.8924	4859681.192	-12.2	-12.4	TRANSITION2	Y
CP-106	425734.8924	4859681.192	-12.4	-999	CLAY	Y
CP-107	425763.1512	4859738.692	48	24	UPPER SAND	Y
CP-107	425763.1512	4859738.692	24	-6	TRANSITION	Y
CP-107	425763.1512	4859738.692	-6	-16.8	LOWER SAND	Y
CP-107	425763.1512	4859738.692	-16.8	-17	TRANSITION2	Y
CP-107	425763.1512	4859738.692	-17	-34	CLAY	Y
CP-107	425763.1512	4859738.692	-34	-999	BEDROCKorTILL	Y
CP-108	425783.4	4859796.911	47.7	35.7	UPPER SAND	Y
CP-108	425783.4	4859796.911	35.7	-7.3	TRANSITION	Y
CP-108	425783.4	4859796.911	-7.3	-25.1	LOWER SAND	Y
CP-108	425783.4	4859796.911	-25.1	-25.3	TRANSITION2	Y
CP-108	425783.4	4859796.911	-25.3	-999	CLAY	Y
CP-109	425846.3886	4859837.531	41	31	UPPER SAND	Y
CP-109	425846.3886	4859837.531	31	-13	TRANSITION	Y
CP-109	425846.3886	4859837.531	-13	-29	LOWER SAND	Y
CP-109	425846.3886	4859837.531	-29	-39	TRANSITION2	Y
CP-109	425846.3886	4859837.531	-39	-999	CLAY	Y
CP-110	425618.3193	4859353.286	41.5	31.5	UPPER SAND	Y
CP-110	425618.3193	4859353.286	31.5	11.5	TRANSITION	Y
CP-110	425618.3193	4859353.286	11.5	-28.5	LOWER SAND	Y
CP-110	425618.3193	4859353.286	-28.5	-35.5	TRANSITION2	Y
CP-110	425618.3193	4859353.286	-35.5	-999	CLAY	Y
CP-111	425665.1994	4859318.477	36.2	26.2	UPPER SAND	Y
CP-111	425665.1994	4859318.477	26.2	-5.8	TRANSITION	Y
CP-111	425665.1994	4859318.477	-5.8	-34.8	LOWER SAND	Y
CP-111	425665.1994	4859318.477	-34.8	-36.8	TRANSITION2	Y
CP-111	425665.1994	4859318.477	-36.8	-999	CLAY	Y
CP-112	425739.3693	4859278.288	24.6	14.6	UPPER SAND	Y
CP-112	425739.3693	4859278.288	14.6	-25.4	TRANSITION	Y
CP-112	425739.3693	4859278.288	-25.4	-30.4	LOWER SAND	Y
CP-112	425739.3693	4859278.288	-30.4	-44.4	TRANSITION2	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-112	425739.3693	4859278.288	-44.4	-93.4	CLAY	Y
CP-113	425797.6792	4859248.518	23.4	12.4	UPPER SAND	Y
CP-113	425797.6792	4859248.518	12.4	-27.6	TRANSITION	Y
CP-113	425797.6792	4859248.518	-27.6	-29.6	LOWER SAND	Y
CP-113	425797.6792	4859248.518	-29.6	-35.6	TRANSITION2	Y
CP-113	425797.6792	4859248.518	-35.6	-999	CLAY	Y
CP-114	425698.2983	4859364.166	33	25	UPPER SAND	Y
CP-114	425698.2983	4859364.166	25	-6	TRANSITION	Y
CP-114	425698.2983	4859364.166	-6	-29	LOWER SAND	Y
CP-114	425698.2983	4859364.166	-29	-37	TRANSITION2	Y
CP-114	425698.2983	4859364.166	-37	-67	CLAY	Y
CP-115	425737.2971	4859407.196	29.2	23.2	UPPER SAND	Y
CP-115	425737.2971	4859407.196	23.2	-8.8	TRANSITION	Y
CP-115	425737.2971	4859407.196	-8.8	-22.8	LOWER SAND	Y
CP-115	425737.2971	4859407.196	-22.8	-25.8	TRANSITION2	Y
CP-115	425737.2971	4859407.196	-25.8	-40.8	CLAY	Y
CP-115	425737.2971	4859407.196	-40.8	-999	BEDROCKorTILL	Y
CP-116	425294.4699	4858945.75	45.7	39.7	UPPER SAND	Y
CP-116	425294.4699	4858945.75	39.7	2	TRANSITION	Y
CP-116	425294.4699	4858945.75	2	-10	LOWER SAND	Y
CP-116	425294.4699	4858945.75	-10	-45.3	TRANSITION2	Y
CP-116	425294.4699	4858945.75	-45.3	-80.3	CLAY	Y
CP-117	425356.3294	4858937.74	42.4	12.5	UPPER SAND	Y
CP-117	425356.3294	4858937.74	12.5	-7.5	TRANSITION	Y
CP-117	425356.3294	4858937.74	-7.5	-17.5	LOWER SAND	Y
CP-117	425356.3294	4858937.74	-17.5	-35.6	TRANSITION2	Y
CP-117	425356.3294	4858937.74	-35.6	-999	CLAY	Y
CP-118	425419.1388	4858930.951	39.5	4.5	UPPER SAND	Y
CP-118	425419.1388	4858930.951	4.5	-31	TRANSITION	Y
CP-118	425419.1388	4858930.951	-31	-42.5	LOWER SAND	Y
CP-118	425419.1388	4858930.951	-42.5	-50.5	TRANSITION2	Y
CP-118	425419.1388	4858930.951	-50.5	-999	CLAY	Y
CP-119	425481.9082	4858925.831	35.9	18.9	UPPER SAND	Y
CP-119	425481.9082	4858925.831	18.9	-34.1	TRANSITION	Y
CP-119	425481.9082	4858925.831	-34.1	-54.1	LOWER SAND	Y
CP-119	425481.9082	4858925.831	-54.1	-64.1	TRANSITION2	Y
CP-119	425481.9082	4858925.831	-64.1	-999	CLAY	Y
CP-120	425621.3469	4858909.132	30	12	UPPER SAND	Y
CP-120	425621.3469	4858909.132	12	-71.6	TRANSITION	Y
CP-120	425621.3469	4858909.132	-999	-999	LOWER SAND	Y
CP-120	425621.3469	4858909.132	-999	-999	TRANSITION2	Y
CP-120	425621.3469	4858909.132	-72	-999	CLAY	Y
CP-121	425644.8467	4858905.912	28.3	3.3	UPPER SAND	Y
CP-121	425644.8467	4858905.912	3.3	-27.3	TRANSITION	Y
CP-121	425644.8467	4858905.912	-27.3	-27.5	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-121	425644.8467	4858905.912	-27.5	-27.7	TRANSITION2	Y
CP-121	425644.8467	4858905.912	-27.7	-999	CLAY	Y
CP-122	425704.2964	4858888.133	21	18	UPPER SAND	Y
CP-122	425704.2964	4858888.133	18	-5.6	TRANSITION	Y
CP-122	425704.2964	4858888.133	-5.6	-5.8	LOWER SAND	Y
CP-122	425704.2964	4858888.133	-5.8	-6	TRANSITION2	Y
CP-122	425704.2964	4858888.133	-6	-37	CLAY	Y
CP-122	425704.2964	4858888.133	-37	-999	BEDROCKorTILL	Y
CP-123	425863.6779	4859868.62	41.7	31.7	UPPER SAND	Y
CP-123	425863.6779	4859868.62	31.7	-10.3	TRANSITION	Y
CP-123	425863.6779	4859868.62	-10.3	-33.3	LOWER SAND	Y
CP-123	425863.6779	4859868.62	-33.3	-35.3	TRANSITION2	Y
CP-123	425863.6779	4859868.62	-35.3	-45.3	CLAY	Y
CP-124	425900.1566	4859922.05	42.9	30.9	UPPER SAND	Y
CP-124	425900.1566	4859922.05	30.9	-16.1	TRANSITION	Y
CP-124	425900.1566	4859922.05	-16.1	-36.1	LOWER SAND	Y
CP-124	425900.1566	4859922.05	-36.1	-40.1	TRANSITION2	Y
CP-124	425900.1566	4859922.05	-40.1	-49.1	CLAY	Y
CP-125	425928.9354	4859975.339	39	29	UPPER SAND	Y
CP-125	425928.9354	4859975.339	29	-4	TRANSITION	Y
CP-125	425928.9354	4859975.339	-4	-29	LOWER SAND	Y
CP-125	425928.9354	4859975.339	-29	-40	TRANSITION2	Y
CP-125	425928.9354	4859975.339	-40	-999	CLAY	Y
CP-127	425796.8048	4859503.475	28.3	24.3	UPPER SAND	Y
CP-127	425796.8048	4859503.475	24.3	-7.7	TRANSITION	Y
CP-127	425796.8048	4859503.475	-7.7	-10.7	LOWER SAND	Y
CP-127	425796.8048	4859503.475	-10.7	-11.7	TRANSITION2	Y
CP-127	425796.8048	4859503.475	-11.7	-999	CLAY	Y
CP-128	425822.6939	4859543.234	32.4	25.4	UPPER SAND	Y
CP-128	425822.6939	4859543.234	25.4	-0.2	TRANSITION	Y
CP-128	425822.6939	4859543.234	-0.2	-0.4	LOWER SAND	Y
CP-128	425822.6939	4859543.234	-0.4	-0.6	TRANSITION2	Y
CP-128	425822.6939	4859543.234	-0.6	-18.6	CLAY	Y
CP-128	425822.6939	4859543.234	-18.6	-999	BEDROCKorTILL	Y
CP-129	425857.9326	4859598.484	34.9	25.9	UPPER SAND	Y
CP-129	425857.9326	4859598.484	25.9	-5.7	TRANSITION	Y
CP-129	425857.9326	4859598.484	-5.7	-5.9	LOWER SAND	Y
CP-129	425857.9326	4859598.484	-5.9	-6.1	TRANSITION2	Y
CP-129	425857.9326	4859598.484	-6.1	-999	BEDROCKorTILL	Y
CP-130	425961.4807	4859644.774	34.6	17.6	UPPER SAND	Y
CP-130	425961.4807	4859644.774	17.6	-29.4	TRANSITION	Y
CP-130	425961.4807	4859644.774	-29.4	-34.4	LOWER SAND	Y
CP-130	425961.4807	4859644.774	-34.4	-35.4	TRANSITION2	Y
CP-130	425961.4807	4859644.774	-35.4	-999	CLAY	Y
CP-131	425913.3506	4859679.243	35.7	13.7	UPPER SAND	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-131	425913.3506	4859679.243	13.7	-31.3	TRANSITION	Y
CP-131	425913.3506	4859679.243	-31.3	-44.3	LOWER SAND	Y
CP-131	425913.3506	4859679.243	-44.3	-50.3	TRANSITION2	Y
CP-131	425913.3506	4859679.243	-50.3	-999	CLAY	Y
CP-132	425961.3387	4859759.492	37.6	18.6	UPPER SAND	Y
CP-132	425961.3387	4859759.492	18.6	-29.4	TRANSITION	Y
CP-132	425961.3387	4859759.492	-29.4	-40.4	LOWER SAND	Y
CP-132	425961.3387	4859759.492	-40.4	-46.4	TRANSITION2	Y
CP-132	425961.3387	4859759.492	-46.4	-999	CLAY	Y
CP-133	425956.5277	4859822.191	38.9	18.9	UPPER SAND	Y
CP-133	425956.5277	4859822.191	18.9	-17.1	TRANSITION	Y
CP-133	425956.5277	4859822.191	-17.1	-38.1	LOWER SAND	Y
CP-133	425956.5277	4859822.191	-38.1	-45.1	TRANSITION2	Y
CP-133	425956.5277	4859822.191	-45.1	-999	CLAY	Y
CP-134	425808.2761	4858838.824	22.4	16	UPPER SAND	Y
CP-134	425808.2761	4858838.824	16	15.8	TRANSITION	Y
CP-134	425808.2761	4858838.824	15.8	15.6	LOWER SAND	Y
CP-134	425808.2761	4858838.824	15.6	15.4	TRANSITION2	Y
CP-134	425808.2761	4858838.824	15.4	-29.6	CLAY	Y
CP-135	426042.2817	4859532.296	23.5	13.5	UPPER SAND	Y
CP-135	426042.2817	4859532.296	13.5	13.3	TRANSITION	Y
CP-135	426042.2817	4859532.296	13.3	13.1	LOWER SAND	Y
CP-135	426042.2817	4859532.296	13.1	12.9	TRANSITION2	Y
CP-135	426042.2817	4859532.296	12.9	-17.5	CLAY	Y
CP-135	426042.2817	4859532.296	-17.5	-999	BEDROCKorTILL	Y
CP-136	426093.0503	4859586.045	39.3	23.3	UPPER SAND	Y
CP-136	426093.0503	4859586.045	23.3	23.1	TRANSITION	Y
CP-136	426093.0503	4859586.045	22.9	22.7	LOWER SAND	Y
CP-136	426093.0503	4859586.045	22.7	22.5	TRANSITION2	Y
CP-136	426093.0503	4859586.045	22.3	-999	BEDROCKorTILL	Y
CP-137	426124.7689	4859646.904	38.1	20.7	UPPER SAND	Y
CP-137	426124.7689	4859646.904	20.7	20.5	TRANSITION	Y
CP-137	426124.7689	4859646.904	20.5	20.3	LOWER SAND	Y
CP-137	426124.7689	4859646.904	20.3	20.1	TRANSITION2	Y
CP-137	426124.7689	4859646.904	20.1	-999	BEDROCKorTILL	Y
CP-138	426168.3872	4859721.354	45.1	34.7	UPPER SAND	Y
CP-138	426168.3872	4859721.354	34.7	34.5	TRANSITION	Y
CP-138	426168.3872	4859721.354	34.5	34.3	LOWER SAND	Y
CP-138	426168.3872	4859721.354	34.3	34.1	TRANSITION2	Y
CP-138	426168.3872	4859721.354	34.1	2.1	CLAY	Y
CP-139	426204.9857	4859786.703	47.8	36.4	UPPER SAND	Y
CP-139	426204.9857	4859786.703	36.4	36.2	TRANSITION	Y
CP-139	426204.9857	4859786.703	36.2	36	LOWER SAND	Y
CP-139	426204.9857	4859786.703	36	35.8	TRANSITION2	Y
CP-139	426204.9857	4859786.703	35.8	-999	CLAY	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-140	425364.082	4858781.432	37.3	24.3	UPPER SAND	Y
CP-140	425364.082	4858781.432	24.3	13	TRANSITION	Y
CP-140	425364.082	4858781.432	13	4	LOWER SAND	Y
CP-140	425364.082	4858781.432	4	-15.7	TRANSITION2	Y
CP-140	425364.082	4858781.432	-15.7	-34.7	CLAY	Y
CP-141	425405.7324	4858732.553	23.7	6.7	UPPER SAND	Y
CP-141	425405.7324	4858732.553	6.7	-22	TRANSITION	Y
CP-141	425405.7324	4858732.553	-22	-33	LOWER SAND	Y
CP-141	425405.7324	4858732.553	-33	-41.3	TRANSITION2	Y
CP-141	425405.7324	4858732.553	-41.3	-47.3	CLAY	Y
CP-142	425472.4118	4858723.914	18.5	11.5	UPPER SAND	Y
CP-142	425472.4118	4858723.914	11.5	-49.5	TRANSITION	Y
CP-142	425472.4118	4858723.914	-49.5	-65.5	LOWER SAND	Y
CP-142	425472.4118	4858723.914	-65.5	-71.5	TRANSITION2	Y
CP-142	425472.4118	4858723.914	-71.5	-999	CLAY	Y
CP-143	425540.9406	4858747.424	20.7	12.7	UPPER SAND	Y
CP-143	425540.9406	4858747.424	12.7	-49.3	TRANSITION	Y
CP-143	425540.9406	4858747.424	-49.3	-54.3	LOWER SAND	Y
CP-143	425540.9406	4858747.424	-54.3	-57.3	TRANSITION2	Y
CP-143	425540.9406	4858747.424	-57.3	-93.3	CLAY	Y
CP-144	425600.5594	4858779.594	20.8	7.8	UPPER SAND	Y
CP-144	425600.5594	4858779.594	7.8	-0.8	TRANSITION	Y
CP-144	425600.5594	4858779.594	-0.8	-1	LOWER SAND	Y
CP-144	425600.5594	4858779.594	-1	-1.2	TRANSITION2	Y
CP-144	425600.5594	4858779.594	-1.2	-28.2	CLAY	Y
CP-145	425650.5378	4858840.263	20.3	15.3	UPPER SAND	Y
CP-145	425650.5378	4858840.263	15.3	-4.3	TRANSITION	Y
CP-145	425650.5378	4858840.263	-4.3	-4.5	LOWER SAND	Y
CP-145	425650.5378	4858840.263	-4.5	-4.7	TRANSITION2	Y
CP-145	425650.5378	4858840.263	-4.7	-39.7	CLAY	Y
CP-146	425647.6299	4859880.509	55.9	47.9	UPPER SAND	Y
CP-146	425647.6299	4859880.509	47.9	33.3	TRANSITION	Y
CP-146	425647.6299	4859880.509	33.3	33.1	LOWER SAND	Y
CP-146	425647.6299	4859880.509	33.1	32.9	TRANSITION2	Y
CP-146	425647.6299	4859880.509	32.9	-999	BEDROCKorTILL	Y
CP-147	425753.0467	4860005.118	50.8	40	UPPER SAND	Y
CP-147	425753.0467	4860005.118	40	39.8	TRANSITION	Y
CP-147	425753.0467	4860005.118	39.8	14	LOWER SAND	Y
CP-147	425753.0467	4860005.118	14	13.8	TRANSITION2	Y
CP-147	425753.0467	4860005.118	13.8	7.8	CLAY	Y
CP-148	425823.2462	4859991.588	50.4	41.4	UPPER SAND	Y
CP-148	425823.2462	4859991.588	41.4	15.4	TRANSITION	Y
CP-148	425823.2462	4859991.588	15.4	-22.4	LOWER SAND	Y
CP-148	425823.2462	4859991.588	-22.4	-22.6	TRANSITION2	Y
CP-148	425823.2462	4859991.588	-22.6	-999	CLAY	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-149	425998.2537	4860030.737	41.1	21.1	UPPER SAND	Y
CP-149	425998.2537	4860030.737	21.1	-8.9	TRANSITION	Y
CP-149	425998.2537	4860030.737	-8.9	-38.9	LOWER SAND	Y
CP-149	425998.2537	4860030.737	-38.9	-43.9	TRANSITION2	Y
CP-149	425998.2537	4860030.737	-43.9	-999	CLAY	Y
CP-151	425499.8163	4860142.896	54	46	UPPER SAND	Y
CP-151	425499.8163	4860142.896	46	12.4	TRANSITION	Y
CP-151	425499.8163	4860142.896	12.4	12.2	LOWER SAND	Y
CP-151	425499.8163	4860142.896	12.2	12	TRANSITION2	Y
CP-151	425499.8163	4860142.896	12	-23	CLAY	Y
CP-152	425566.1662	4860145.385	54.4	44.4	UPPER SAND	Y
CP-152	425566.1662	4860145.385	44.4	29.8	TRANSITION	Y
CP-152	425566.1662	4860145.385	29.8	29.6	LOWER SAND	Y
CP-152	425566.1662	4860145.385	29.6	29.4	TRANSITION2	Y
CP-152	425566.1662	4860145.385	29.4	-999	CLAY	Y
CP-153	425627.1448	4860193.105	53.5	39.1	UPPER SAND	Y
CP-153	425627.1448	4860193.105	39.1	38.9	TRANSITION	Y
CP-153	425627.1448	4860193.105	38.9	38.7	LOWER SAND	Y
CP-153	425627.1448	4860193.105	38.7	38.5	TRANSITION2	Y
CP-153	425627.1448	4860193.105	38.5	-999	CLAY	Y
CP-154	425591.479	4859968.218	55	41	UPPER SAND	Y
CP-154	425591.479	4859968.218	41	40.5	TRANSITION	Y
CP-154	425591.479	4859968.218	40.5	40	LOWER SAND	Y
CP-154	425591.479	4859968.218	40	36	TRANSITION2	Y
CP-154	425591.479	4859968.218	36	8	CLAY	Y
CP-154	425591.479	4859968.218	8	-999	BEDROCKorTILL	Y
CP-155	425622.4401	4859888.039	57.5	40	UPPER SAND	Y
CP-155	425622.4401	4859888.039	40	39.5	TRANSITION	Y
CP-155	425622.4401	4859888.039	39.5	39	LOWER SAND	Y
CP-155	425622.4401	4859888.039	39	38.5	TRANSITION2	Y
CP-155	425622.4401	4859888.039	38.5	17	CLAY	Y
CP-155	425622.4401	4859888.039	17	-999	BEDROCKorTILL	Y
CP-156	425591.679	4859967.608	57	44	UPPER SAND	N
CP-156	425591.679	4859967.608	44	37.4	TRANSITION	N
CP-156	425591.679	4859967.608	37.4	37.2	LOWER SAND	N
CP-156	425591.679	4859967.608	37.2	37	TRANSITION2	N
CP-156	425591.679	4859967.608	37	-999	CLAY	N
CP-157	426022.2712	4860078.379	43.3	21.3	UPPER SAND	Y
CP-157	426022.2712	4860078.379	21.3	-10.7	TRANSITION	Y
CP-157	426022.2712	4860078.379	-10.7	-33.7	LOWER SAND	Y
CP-157	426022.2712	4860078.379	-33.7	-34.7	TRANSITION2	Y
CP-157	426022.2712	4860078.379	-34.7	-999	CLAY	Y
CP-158	426060.2208	4860133.768	42.6	25.6	UPPER SAND	Y
CP-158	426060.2208	4860133.768	25.6	-17.4	TRANSITION	Y
CP-158	426060.2208	4860133.768	-11.4	-22.4	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
CP-158	426060.2208	4860133.768	-22.4	-24.4	TRANSITION2	Y
CP-158	426060.2208	4860133.768	-24.4	-999	CLAY	Y
CP-159	425940.0316	4859601.024	31.7	17.7	UPPER SAND	Y
CP-159	425940.0316	4859601.024	17.7	8.1	TRANSITION	Y
CP-159	425940.0316	4859601.024	8.1	7.9	LOWER SAND	Y
CP-159	425940.0316	4859601.024	7.9	7.7	TRANSITION2	Y
CP-159	425940.0316	4859601.024	7.7	-19.3	CLAY	Y
CP-159	425940.0316	4859601.024	-19.3	-999	BEDROCKorTILL	Y
CP-160	426017.5645	4859955.299	40.5	28.5	UPPER SAND	Y
CP-160	426017.5645	4859955.299	28.5	-20.5	TRANSITION	Y
CP-160	426017.5645	4859955.299	-20.5	-47.5	LOWER SAND	Y
CP-160	426017.5645	4859955.299	-47.5	-51.5	TRANSITION2	Y
CP-160	426017.5645	4859955.299	-51.5	-57.5	CLAY	Y
DP-01	425803.1158	4859279.369	23.6	12.6	UPPER SAND	Y
DP-01	425803.1158	4859279.369	12.6	-25.4	TRANSITION	Y
DP-01	425803.1158	4859279.369	-25.4	-28.2	LOWER SAND	Y
DP-01	425803.1158	4859279.369	-28.2	-28.4	TRANSITION2	Y
DP-01	425803.1158	4859279.369	-28.4	-47.4	CLAY	Y
DP-02	425814.3775	4859218.336	23.4	12.4	UPPER SAND	Y
DP-02	425814.3775	4859218.336	12.4	-31.6	TRANSITION	Y
DP-02	425814.3775	4859218.336	-31.6	-37.4	LOWER SAND	Y
DP-02	425814.3775	4859218.336	-37.4	-37.6	TRANSITION2	Y
DP-02	425814.3775	4859218.336	-37.6	-94.6	CLAY	Y
DP-03	425767.1055	4859251.205	22.5	8.5	UPPER SAND	Y
DP-03	425767.1055	4859251.205	8.5	-31.5	TRANSITION	Y
DP-03	425767.1055	4859251.205	-31.5	-34.3	LOWER SAND	Y
DP-03	425767.1055	4859251.205	-34.3	-34.5	TRANSITION2	Y
DP-03	425767.1055	4859251.205	-34.5	-91.5	CLAY	Y
DP-EP-01	425768.1084	4859006.711	23.5	9.5	UPPER SAND	Y
DP-EP-01	425768.1084	4859006.711	9.5	-16.5	TRANSITION	Y
DP-EP-01	425768.1084	4859006.711	-16.5	-19.5	LOWER SAND	Y
DP-EP-01	425768.1084	4859006.711	-19.5	-23	TRANSITION2	Y
DP-EP-01	425768.1084	4859006.711	-23	-999	CLAY	Y
DP-EP-02	425736.619	4858960.592	24.4	13.4	UPPER SAND	Y
DP-EP-02	425736.619	4858960.592	13.4	-9.6	TRANSITION	Y
DP-EP-02	425736.619	4858960.592	-9.6	-12.6	LOWER SAND	Y
DP-EP-02	425736.619	4858960.592	-12.6	-16	TRANSITION2	Y
DP-EP-02	425736.619	4858960.592	-16	-999	CLAY	Y
DP-EP-03	425681.2286	4858922.429	26.3	11.3	UPPER SAND	Y
DP-EP-03	425681.2286	4858922.429	11.3	-9.7	TRANSITION	Y
DP-EP-03	425681.2286	4858922.429	-9.7	-11.7	LOWER SAND	Y
DP-EP-03	425681.2286	4858922.429	-11.7	-15	TRANSITION2	Y
DP-EP-03	425681.2286	4858922.429	-15	-999	CLAY	Y
DP-EP-04	425638.131	4858930.503	28.1	6.1	UPPER SAND	Y
DP-EP-04	425638.131	4858930.503	6.1	-25.9	TRANSITION	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
DP-EP-04	425638.131	4858930.503	-25.9	-28.7	LOWER SAND	Y
DP-EP-04	425638.131	4858930.503	-28.7	-28.9	TRANSITION2	Y
DP-EP-04	425638.131	4858930.503	-28.9	-68.9	CLAY	Y
DP-EP-05	425839.8447	4859197.042	9.9	6.9	UPPER SAND	Y
DP-EP-05	425839.8447	4859197.042	6.9	-13.1	TRANSITION	Y
DP-EP-05	425839.8447	4859197.042	-13.1	-15.9	LOWER SAND	Y
DP-EP-05	425839.8447	4859197.042	-15.9	-16.1	TRANSITION2	Y
DP-EP-05	425839.8447	4859197.042	-16.1	-70.1	CLAY	Y
DP-EP-05	425839.8447	4859197.042	-70.1	-999	BEDROCKorTILL	Y
DP-EP-06	425824.9842	4859275.598	13.7	8.7	UPPER SAND	Y
DP-EP-06	425824.9842	4859275.598	8.7	-24.3	TRANSITION	Y
DP-EP-06	425824.9842	4859275.598	-24.3	-29.1	LOWER SAND	Y
DP-EP-06	425824.9842	4859275.598	-29.1	-29.3	TRANSITION2	Y
DP-EP-06	425824.9842	4859275.598	-29.3	-84.3	CLAY	Y
DP-EP-07	425764.7763	4859219.95	11	-1	UPPER SAND	Y
DP-EP-07	425764.7763	4859219.95	-1	-40	TRANSITION	Y
DP-EP-07	425764.7763	4859219.95	-40	-42.8	LOWER SAND	Y
DP-EP-07	425764.7763	4859219.95	-42.8	-43	TRANSITION2	Y
DP-EP-07	425764.7763	4859219.95	-43	-107	CLAY	Y
EP-07	425592.6577	4859448.57	45.09	30.09	UPPER SAND	Y
EP-07	425592.6577	4859448.57	30.09	20.09	TRANSITION	Y
EP-07	425592.6577	4859448.57	20.09	-19.71	LOWER SAND	Y
EP-07	425592.6577	4859448.57	-19.71	-19.91	TRANSITION2	Y
EP-07	425592.6577	4859448.57	-19.91	-26.91	CLAY	Y
EP-08	425644.4336	4859444.973	44.66	40.66	UPPER SAND	Y
EP-08	425644.4336	4859444.973	40.66	4.66	TRANSITION	Y
EP-08	425644.4336	4859444.973	4.66	-14.34	LOWER SAND	Y
EP-08	425644.4336	4859444.973	-14.34	-35.34	TRANSITION2	Y
EP-08	425644.4336	4859444.973	-35.34	-37.34	CLAY	Y
EP-09	425776.124	4859579.681	-999	-999	UPPER SAND	N
EP-09	425776.124	4859579.681	35.19	-1.81	TRANSITION	N
EP-09	425776.124	4859579.681	-1.81	-11.81	LOWER SAND	N
EP-09	425776.124	4859579.681	-11.81	-19.81	TRANSITION2	N
EP-09	425776.124	4859579.681	-19.81	-27.81	CLAY	N
EP-10	425795.9558	4859587.873	34.6	19.8	UPPER SAND	Y
EP-10	425795.9558	4859587.873	19.8	19.6	TRANSITION	Y
EP-10	425795.9558	4859587.873	19.6	-0.4	LOWER SAND	Y
EP-10	425795.9558	4859587.873	-0.4	-17.9	TRANSITION2	Y
EP-10	425795.9558	4859587.873	-17.9	-22.4	CLAY	Y
EP-11	425775.6087	4859628.324	39.72	20	UPPER SAND	Y
EP-11	425775.6087	4859628.324	20	2.72	TRANSITION	Y
EP-11	425775.6087	4859628.324	2.72	-17.28	LOWER SAND	Y
EP-11	425775.6087	4859628.324	-17.28	-22.78	TRANSITION2	Y
EP-11	425775.6087	4859628.324	-22.78	-28.28	CLAY	Y
EP-12	425737.1636	4859628.288	47.12	22.12	UPPER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
EP-12	425737.1636	4859628.288	22.12	2.12	TRANSITION	Y
EP-12	425737.1636	4859628.288	2.12	-12.88	LOWER SAND	Y
EP-12	425737.1636	4859628.288	-12.88	-17.88	TRANSITION2	Y
EP-12	425737.1636	4859628.288	-17.88	-20.88	CLAY	Y
EP-13	425883.3223	4859796.358	36.71	21.71	UPPER SAND	Y
EP-13	425883.3223	4859796.358	21.71	-18.29	TRANSITION	Y
EP-13	425883.3223	4859796.358	-18.29	-28.09	LOWER SAND	Y
EP-13	425883.3223	4859796.358	-28.09	-28.29	TRANSITION2	Y
EP-13	425883.3223	4859796.358	-28.29	-35.29	CLAY	Y
EP-14	425878.234	4859810.173	41.3	26.3	UPPER SAND	Y
EP-14	425878.234	4859810.173	26.3	-3.7	TRANSITION	Y
EP-14	425878.234	4859810.173	-3.7	-33.5	LOWER SAND	Y
EP-14	425878.234	4859810.173	-33.5	-33.7	TRANSITION2	Y
EP-14	425878.234	4859810.173	-33.7	-40.7	CLAY	Y
EP-15	425926.6134	4859792.334	42.95	27.95	UPPER SAND	N
EP-15	425926.6134	4859792.334	27.95	-27.05	TRANSITION	N
EP-15	425926.6134	4859792.334	-999	-999	LOWER SAND	N
EP-15	425926.6134	4859792.334	-999	-999	TRANSITION2	N
EP-16	425355.336	4859375.034	53.9	36.4	UPPER SAND	Y
EP-16	425355.336	4859375.034	36.4	24.3	TRANSITION	Y
EP-16	425355.336	4859375.034	24.3	24.1	LOWER SAND	Y
EP-16	425355.336	4859375.034	24.1	23.9	TRANSITION2	Y
EP-16	425355.336	4859375.034	23.9	1.9	CLAY	Y
EP-17	425320.9057	4859440.899	67	38	UPPER SAND	N
EP-17	425320.9057	4859440.899	38	23	TRANSITION	N
EP-17	425320.9057	4859440.899	-999	-999	LOWER SAND	N
EP-17	425320.9057	4859440.899	-999	-999	TRANSITION2	N
EP-18	425335.5016	4859458.124	65.5	39.5	UPPER SAND	Y
EP-18	425335.5016	4859458.124	39.5	26.9	TRANSITION	Y
EP-18	425335.5016	4859458.124	26.9	26.7	LOWER SAND	Y
EP-18	425335.5016	4859458.124	26.7	26.5	TRANSITION2	Y
EP-18	425335.5016	4859458.124	26.5	25.5	CLAY	Y
EP-19	425231.4699	4859501.706	65.8	45.8	UPPER SAND	N
EP-19	425231.4699	4859501.706	45.8	28.8	TRANSITION	N
EP-19	425231.4699	4859501.706	28.8	21.8	LOWER SAND	N
EP-19	425231.4699	4859501.706	-999	-999	TRANSITION2	N
EP-20	425218.6827	4859480.921	66.9	48.9	UPPER SAND	N
EP-20	425218.6827	4859480.921	48.9	35.9	TRANSITION	N
EP-20	425218.6827	4859480.921	35.9	22.4	LOWER SAND	N
EP-20	425218.6827	4859480.921	-999	-999	TRANSITION2	N
EP-DP-1	425298.7988	4858947.992	44.7	35	UPPER SAND	Y
EP-DP-1	425298.7988	4858947.992	35	2	TRANSITION	Y
EP-DP-1	425298.7988	4858947.992	2	-10	LOWER SAND	Y
EP-DP-1	425298.7988	4858947.992	-10	-37.5	TRANSITION2	Y
EP-DP-1	425298.7988	4858947.992	-37.5	-999	CLAY	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
EP-DP-10	425505.8831	4858742.528	20.9	6	UPPER SAND	Y
EP-DP-10	425505.8831	4858742.528	6	-42	TRANSITION	Y
EP-DP-10	425505.8831	4858742.528	-42	-47.5	LOWER SAND	Y
EP-DP-10	425505.8831	4858742.528	-47.5	-67.5	TRANSITION2	Y
EP-DP-10	425505.8831	4858742.528	-67.5	-999	CLAY	Y
EP-DP-11	425231.0634	4858760.661	50.2	40.2	UPPER SAND	Y
EP-DP-11	425231.0634	4858760.661	40.2	10.6	TRANSITION	Y
EP-DP-11	425231.0634	4858760.661	10.6	10.4	LOWER SAND	Y
EP-DP-11	425231.0634	4858760.661	10.4	10.2	TRANSITION2	Y
EP-DP-11	425231.0634	4858760.661	10.2	-999	CLAY	Y
EP-DP-12	425518.8221	4858897.937	32.7	11	UPPER SAND	Y
EP-DP-12	425518.8221	4858897.937	11	-35	TRANSITION	Y
EP-DP-12	425518.8221	4858897.937	-35	-56	LOWER SAND	Y
EP-DP-12	425518.8221	4858897.937	-56	-67.5	TRANSITION2	Y
EP-DP-12	425518.8221	4858897.937	-67.5	-999	CLAY	Y
EP-DP-13	425543.4318	4858898.531	33.1	11	UPPER SAND	Y
EP-DP-13	425543.4318	4858898.531	11	-35	TRANSITION	Y
EP-DP-13	425543.4318	4858898.531	-35	-56	LOWER SAND	Y
EP-DP-13	425543.4318	4858898.531	-56	-70	TRANSITION2	Y
EP-DP-13	425543.4318	4858898.531	-70	-86.9	CLAY	Y
EP-DP-13	425543.4318	4858898.531	-86.9	-999	BEDROCKorTILL	Y
EP-DP-14	425576.6875	4858901.554	30.3	13	UPPER SAND	Y
EP-DP-14	425576.6875	4858901.554	13	-49.8	TRANSITION	Y
EP-DP-14	425576.6875	4858901.554	-999	-999	LOWER SAND	Y
EP-DP-14	425576.6875	4858901.554	-999	-999	TRANSITION2	Y
EP-DP-14	425576.6875	4858901.554	-75	-84.7	CLAY	Y
EP-DP-14	425576.6875	4858901.554	-84.7	-999	BEDROCKorTILL	Y
EP-DP-15	425218.506	4858960.665	46.7	43	UPPER SAND	Y
EP-DP-15	425218.506	4858960.665	43	5	TRANSITION	Y
EP-DP-15	425218.506	4858960.665	5	-5	LOWER SAND	Y
EP-DP-15	425218.506	4858960.665	-5	-35	TRANSITION2	Y
EP-DP-15	425218.506	4858960.665	-35	-999	CLAY	Y
EP-DP-16	425238.0599	4858672.887	47.1	34	UPPER SAND	Y
EP-DP-16	425238.0599	4858672.887	34	-4.8	TRANSITION	Y
EP-DP-16	425238.0599	4858672.887	-4.8	-5	LOWER SAND	Y
EP-DP-16	425238.0599	4858672.887	-5	-7	TRANSITION2	Y
EP-DP-16	425238.0599	4858672.887	-7	-999	CLAY	Y
EP-DP-17	425655.9333	4858874.497	22	16	UPPER SAND	Y
EP-DP-17	425655.9333	4858874.497	16	-7.3	TRANSITION	Y
EP-DP-17	425655.9333	4858874.497	-7.3	-7.5	LOWER SAND	Y
EP-DP-17	425655.9333	4858874.497	-7.5	-8	TRANSITION2	Y
EP-DP-17	425655.9333	4858874.497	-8	-40	CLAY	Y
EP-DP-17	425655.9333	4858874.497	-40	-999	BEDROCKorTILL	Y
EP-DP-18	425366.3796	4858682.952	19.5	17	UPPER SAND	Y
EP-DP-18	425366.3796	4858682.952	17	-18	TRANSITION	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
EP-DP-18	425366.3796	4858682.952	-18	-25	LOWER SAND	Y
EP-DP-18	425366.3796	4858682.952	-25	-33.5	TRANSITION2	Y
EP-DP-18	425366.3796	4858682.952	-33.5	-999	CLAY	Y
EP-DP-2	425423.8174	4858930.979	38.2	-5	UPPER SAND	Y
EP-DP-2	425423.8174	4858930.979	-5	-31	TRANSITION	Y
EP-DP-2	425423.8174	4858930.979	-31	-43	LOWER SAND	Y
EP-DP-2	425423.8174	4858930.979	-43	-55	TRANSITION2	Y
EP-DP-2	425423.8174	4858930.979	-55	-999	CLAY	Y
EP-DP-3	425377.3517	4858880.208	40.1	8.5	UPPER SAND	Y
EP-DP-3	425377.3517	4858880.208	8.5	-9	TRANSITION	Y
EP-DP-3	425377.3517	4858880.208	-9	-24	LOWER SAND	Y
EP-DP-3	425377.3517	4858880.208	-24	-33	TRANSITION2	Y
EP-DP-3	425377.3517	4858880.208	-33	-999	CLAY	Y
EP-DP-4	425432.6513	4858848.597	36.2	12.2	UPPER SAND	Y
EP-DP-4	425432.6513	4858848.597	12.2	-1.8	TRANSITION	Y
EP-DP-4	425432.6513	4858848.597	-1.8	-15.8	LOWER SAND	Y
EP-DP-4	425432.6513	4858848.597	-15.8	-51.8	TRANSITION2	Y
EP-DP-4	425432.6513	4858848.597	-51.8	-999	CLAY	Y
EP-DP-5	425370.6119	4858781.703	36	24.3	UPPER SAND	Y
EP-DP-5	425370.6119	4858781.703	24.3	13	TRANSITION	Y
EP-DP-5	425370.6119	4858781.703	13	4	LOWER SAND	Y
EP-DP-5	425370.6119	4858781.703	4	-15.7	TRANSITION2	Y
EP-DP-5	425370.6119	4858781.703	-15.7	-34.7	CLAY	Y
EP-DP-6	425446.3504	4858797.02	30	-58.7	UPPER SAND	Y
EP-DP-6	425446.3504	4858797.02	6	-20	TRANSITION	Y
EP-DP-6	425446.3504	4858797.02	-20	-25	LOWER SAND	Y
EP-DP-6	425446.3504	4858797.02	-25	-58	TRANSITION2	Y
EP-DP-6	425446.3504	4858797.02	-58	-999	CLAY	Y
EP-DP-7	425392.0748	4858717.75	22.2	11	UPPER SAND	Y
EP-DP-7	425392.0748	4858717.75	11	-22	TRANSITION	Y
EP-DP-7	425392.0748	4858717.75	-22	-26	LOWER SAND	Y
EP-DP-7	425392.0748	4858717.75	-26	-41	TRANSITION2	Y
EP-DP-7	425392.0748	4858717.75	-41	-999	CLAY	Y
EP-DP-9	425456.9038	4858722.692	18.3	11	UPPER SAND	Y
EP-DP-9	425456.9038	4858722.692	11	-51	TRANSITION	Y
EP-DP-9	425456.9038	4858722.692	-51	-55	LOWER SAND	Y
EP-DP-9	425456.9038	4858722.692	-55	-62	TRANSITION2	Y
EP-DP-9	425456.9038	4858722.692	-62	-999	CLAY	Y
EW-01	425587.726	4859022.025	27.23	12.23	UPPER SAND	Y
EW-01	425587.726	4859022.025	12.23	-42.77	TRANSITION	Y
EW-01	425587.726	4859022.025	-42.77	-57.77	LOWER SAND	Y
EW-01	425587.726	4859022.025	-57.77	-62.77	TRANSITION2	Y
EW-01	425587.726	4859022.025	-62.77	104.77	CLAY	Y
EW-02	425684.8322	4859307.714	33.28	23.28	UPPER SAND	Y
EW-02	425684.8322	4859307.714	23.28	-6.72	TRANSITION	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
EW-02	425684.8322	4859307.714	-6.72	-37.52	LOWER SAND	Y
EW-02	425684.8322	4859307.714	-37.52	-37.72	TRANSITION2	Y
EW-02	425684.8322	4859307.714	-37.72	-79.72	CLAY	Y
EW-02A	425785.8941	4859248.023	25.27	13.27	UPPER SAND	Y
EW-02A	425785.8941	4859248.023	13.27	-22.23	TRANSITION	Y
EW-02A	425785.8941	4859248.023	-22.23	-39.03	LOWER SAND	Y
EW-02A	425785.8941	4859248.023	-39.03	-39.23	TRANSITION2	Y
EW-02A	425785.8941	4859248.023	-39.23	-97.23	CLAY	Y
EW-03	425592.5475	4859437.706	45.65	30.65	UPPER SAND	Y
EW-03	425592.5475	4859437.706	30.65	7.15	TRANSITION	Y
EW-03	425592.5475	4859437.706	7.15	-19.15	LOWER SAND	Y
EW-03	425592.5475	4859437.706	-19.15	-19.35	TRANSITION2	Y
EW-03	425592.5475	4859437.706	-19.35	-62.35	CLAY	Y
EW-04	425775.0532	4859588.982	42.77	28.77	UPPER SAND	Y
EW-04	425775.0532	4859588.982	28.77	2.77	TRANSITION	Y
EW-04	425775.0532	4859588.982	2.77	-15.03	LOWER SAND	Y
EW-04	425775.0532	4859588.982	-15.03	-15.23	TRANSITION2	Y
EW-04	425775.0532	4859588.982	-15.23	-22.23	CLAY	Y
EW-05	425906.7581	4859802.823	41.42	21.42	UPPER SAND	Y
EW-05	425906.7581	4859802.823	21.42	-13.58	TRANSITION	Y
EW-05	425906.7581	4859802.823	-13.58	-43.38	LOWER SAND	Y
EW-05	425906.7581	4859802.823	-43.38	-43.58	TRANSITION2	Y
EW-05	425906.7581	4859802.823	-43.58	-60.58	CLAY	Y
EW-06	425175.6287	4859357.654	60.74	40.74	UPPER SAND	Y
EW-06	425175.6287	4859357.654	40.74	16.14	TRANSITION	Y
EW-06	425175.6287	4859357.654	16.14	15.94	LOWER SAND	Y
EW-06	425175.6287	4859357.654	15.94	15.74	TRANSITION2	Y
EW-06	425175.6287	4859357.654	15.74	8.74	CLAY	Y
EW-07	425328.4824	4859349.762	54.13	44.13	UPPER SAND	Y
EW-07	425328.4824	4859349.762	44.13	24.53	TRANSITION	Y
EW-07	425328.4824	4859349.762	24.53	24.33	LOWER SAND	Y
EW-07	425328.4824	4859349.762	24.33	24.13	TRANSITION2	Y
EW-07	425328.4824	4859349.762	24.13	10.13	CLAY	Y
MW-101	425050.2226	4859541.023	51.6	20.1	UPPER SAND	Y
MW-101	425050.2226	4859541.023	20.1	14	TRANSITION	Y
MW-101	425050.2226	4859541.023	14	13.8	LOWER SAND	Y
MW-101	425050.2226	4859541.023	13.8	13.6	TRANSITION2	Y
MW-101	425050.2226	4859541.023	13.6	4.6	CLAY	Y
MW-102	425098.3853	4859320.358	24.1	18.5	UPPER SAND	Y
MW-102	425098.3853	4859320.358	18.5	16.5	TRANSITION	Y
MW-102	425098.3853	4859320.358	16.5	16.3	LOWER SAND	Y
MW-102	425098.3853	4859320.358	16.3	16.1	TRANSITION2	Y
MW-102	425098.3853	4859320.358	16.1	7.1	CLAY	Y
MW-103	425109.9936	4859142.793	54.2	33.2	UPPER SAND	Y
MW-103	425109.9936	4859142.793	33.2	28.6	TRANSITION	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-103	425109.9936	4859142.793	28.6	28.4	LOWER SAND	Y
MW-103	425109.9936	4859142.793	28.4	28.2	TRANSITION2	Y
MW-103	425109.9936	4859142.793	28.2	17.2	CLAY	Y
MW-104	425237.4844	4859087.661	19.1	-1.9	UPPER SAND	Y
MW-104	425237.4844	4859087.661	-1.9	-999	TRANSITION	Y
MW-104	425237.4844	4859087.661	-999	-999	LOWER SAND	Y
MW-104	425237.4844	4859087.661	-999	-999	TRANSITION2	Y
MW-105A	425501.9935	4859056.947	20.9	6.9	UPPER SAND	Y
MW-105A	425501.9935	4859056.947	6.9	-999	TRANSITION	Y
MW-105A	425501.9935	4859056.947	-999	-999	LOWER SAND	Y
MW-105A	425501.9935	4859056.947	-999	-999	TRANSITION2	Y
MW-105B	425503.4392	4859058.567	21.1	7.1	UPPER SAND	N
MW-105B	425503.4392	4859058.567	7.1	1.1	TRANSITION	N
MW-105B	425503.4392	4859058.567	-999	-999	LOWER SAND	N
MW-105B	425503.4392	4859058.567	-999	-999	TRANSITION2	N
MW-106	425578.9179	4859382.567	47.7	27.3	UPPER SAND	N
MW-106	425578.9179	4859382.567	27.3	11.1	TRANSITION	N
MW-106	425578.9179	4859382.567	11.1	10.9	LOWER SAND	N
MW-106	425578.9179	4859382.567	10.9	10.7	TRANSITION2	N
MW-106	425578.9179	4859382.567	10.7	-17.7	CLAY	N
MW-1104	425610.1255	4859856.833	57.6	26.2	UPPER SAND	Y
MW-1104	425610.1255	4859856.833	26.2	26	TRANSITION	Y
MW-1104	425610.1255	4859856.833	26	25.8	LOWER SAND	Y
MW-1104	425610.1255	4859856.833	25.8	25.6	TRANSITION2	Y
MW-1104	425610.1255	4859856.833	25.6	5.6	CLAY	Y
MW-1301	425398.0526	4859834.306	59	39	UPPER SAND	N
MW-1301	425398.0526	4859834.306	-999	-999	TRANSITION	N
MW-1301	425398.0526	4859834.306	-999	-999	LOWER SAND	N
MW-1301	425398.0526	4859834.306	-999	-999	TRANSITION2	N
MW-1302	425486.3724	4859755.194	61.6	36.6	UPPER SAND	N
MW-1302	425486.3724	4859755.194	-999	-999	TRANSITION	N
MW-1302	425486.3724	4859755.194	-999	-999	LOWER SAND	N
MW-1302	425486.3724	4859755.194	-999	-999	TRANSITION2	N
MW-1303	425445.4643	4859770.702	59.6	19.6	UPPER SAND	N
MW-1303	425445.4643	4859770.702	-999	-999	TRANSITION	N
MW-1303	425445.4643	4859770.702	-999	-999	LOWER SAND	N
MW-1303	425445.4643	4859770.702	-999	-999	TRANSITION2	N
MW-201	425200.0448	4859521.432	57.7	26.7	UPPER SAND	N
MW-201	425200.0448	4859521.432	-999	-999	TRANSITION	N
MW-201	425200.0448	4859521.432	-999	-999	LOWER SAND	N
MW-201	425200.0448	4859521.432	-999	-999	TRANSITION2	N
MW-202A	425139.1147	4859317.778	50.6	42.6	UPPER SAND	Y
MW-202A	425139.1147	4859317.778	42.6	23	TRANSITION	Y
MW-202A	425139.1147	4859317.778	23	22.8	LOWER SAND	Y
MW-202A	425139.1147	4859317.778	22.8	22.6	TRANSITION2	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-202A	425139.1147	4859317.778	22.6	20.6	CLAY	Y
MW-202B	425132.6006	4859314.876	51.4	43.4	UPPER SAND	Y
MW-202B	425132.6006	4859314.876	43.4	23.8	TRANSITION	Y
MW-202B	425132.6006	4859314.876	23.8	23.6	LOWER SAND	Y
MW-202B	425132.6006	4859314.876	23.6	23.4	TRANSITION2	Y
MW-202B	425132.6006	4859314.876	23.4	14.4	CLAY	Y
MW-203	425201.714	4859237.8	50.5	14.5	UPPER SAND	Y
MW-203	425201.714	4859237.8	14.5	-999	TRANSITION	Y
MW-203	425201.714	4859237.8	-999	-999	LOWER SAND	Y
MW-203	425201.714	4859237.8	-999	-999	TRANSITION2	Y
MW-204	425326.2978	4859130.228	48.6	6.6	UPPER SAND	N
MW-204	425326.2978	4859130.228	-999	-999	TRANSITION	N
MW-204	425326.2978	4859130.228	-999	-999	LOWER SAND	N
MW-204	425326.2978	4859130.228	-999	-999	TRANSITION2	N
MW-205	425459.8603	4859076.687	44	13.5	UPPER SAND	Y
MW-205	425459.8603	4859076.687	13.5	-38.8	TRANSITION	Y
MW-205	425459.8603	4859076.687	-38.8	-40	LOWER SAND	Y
MW-205	425459.8603	4859076.687	-40	-55	TRANSITION2	Y
MW-205	425459.8603	4859076.687	-55	-96	CLAY	Y
MW-206A	425518.5398	4859200.346	40.6	0.6	UPPER SAND	Y
MW-206A	425518.5398	4859200.346	0.6	-29.4	TRANSITION	Y
MW-206A	425518.5398	4859200.346	-29.4	-34.2	LOWER SAND	Y
MW-206A	425518.5398	4859200.346	-34.2	-34.4	TRANSITION2	Y
MW-206A	425518.5398	4859200.346	-34.4	-79.4	CLAY	Y
MW-206B	425523.6414	4859200.778	40.5	8.5	UPPER SAND	N
MW-206B	425523.6414	4859200.778	-999	-999	TRANSITION	N
MW-206B	425523.6414	4859200.778	-999	-999	LOWER SAND	N
MW-206B	425523.6414	4859200.778	-999	-999	TRANSITION2	N
MW-207A	425650.1256	4859221.666	21.6	15.1	UPPER SAND	Y
MW-207A	425650.1256	4859221.666	15.1	-23.4	TRANSITION	Y
MW-207A	425650.1256	4859221.666	-23.4	-48.4	LOWER SAND	Y
MW-207A	425650.1256	4859221.666	-48.4	-55.4	TRANSITION2	Y
MW-207A	425650.1256	4859221.666	-55.4	-999	CLAY	Y
MW-207B	425650.4168	4859215.196	21.1	15.1	UPPER SAND	N
MW-207B	425650.4168	4859215.196	15.1	-999	TRANSITION	N
MW-207B	425650.4168	4859215.196	-999	-999	LOWER SAND	N
MW-207B	425650.4168	4859215.196	-999	-999	TRANSITION2	N
MW-208	425591.8395	4859406.078	47.4	32.6	UPPER SAND	Y
MW-208	425591.8395	4859406.078	32.6	32.4	TRANSITION	Y
MW-208	425591.8395	4859406.078	32.4	-42.6	LOWER SAND	Y
MW-208	425591.8395	4859406.078	-42.6	-57.6	TRANSITION2	Y
MW-208	425591.8395	4859406.078	-57.6	-999	CLAY	Y
MW-209	425522.325	4859448.777	52.9	38.2	UPPER SAND	Y
MW-209	425522.325	4859448.777	38.2	38	TRANSITION	Y
MW-209	425522.325	4859448.777	38	-999	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-209	425522.325	4859448.777	-999	-999	TRANSITION2	Y
MW-210A	425353.8588	4859324.976	36.8	-4.2	UPPER SAND	Y
MW-210A	425353.8588	4859324.976	-4.2	-16.3	TRANSITION	Y
MW-210A	425353.8588	4859324.976	-16.3	-16.5	LOWER SAND	Y
MW-210A	425353.8588	4859324.976	-16.5	-16.7	TRANSITION2	Y
MW-210A	425353.8588	4859324.976	-16.7	-36.2	CLAY	Y
MW-210A	425353.8588	4859324.976	-36.2	-999	BEDROCKorTILL	Y
MW-210B	425360.5667	4859330.385	35.8	18.68	CAP	N
MW-210B	425360.5667	4859330.385	18.68	10.8	UPPER SAND	N
MW-210B	425360.5667	4859330.385	-999	-999	TRANSITION	N
MW-210B	425360.5667	4859330.385	-999	-999	LOWER SAND	N
MW-210B	425360.5667	4859330.385	-999	-999	TRANSITION2	N
MW-210R	425250.3426	4859329.478	52.1	41.1	UPPER SAND	Y
MW-210R	425250.3426	4859329.478	41.1	17.5	TRANSITION	Y
MW-210R	425250.3426	4859329.478	-999	-999	LOWER SAND	Y
MW-210R	425250.3426	4859329.478	-999	-999	TRANSITION2	Y
MW-210R	425250.3426	4859329.478	17.1	-41.4	CLAY	Y
MW-210R	425250.3426	4859329.478	-41.4	-55.9	BEDROCKorTILL	Y
MW-211A	425277.7452	4859539.983	58.6	54.02	CAP	Y
MW-211A	425277.7452	4859539.983	54.02	29.02	UPPER SAND	Y
MW-211A	425277.7452	4859539.983	29.02	28.02	TRANSITION	Y
MW-211A	425277.7452	4859539.983	28.02	27.52	LOWER SAND	Y
MW-211A	425277.7452	4859539.983	27.52	-10.98	TRANSITION2	Y
MW-211A	425277.7452	4859539.983	-10.98	-71.28	CLAY	Y
MW-211A	425277.7452	4859539.983	-71.28	-81.28	BEDROCKorTILL	Y
MW-211B	425284.7774	4859536.21	58.8	54.12	CAP	N
MW-211B	425284.7774	4859536.21	54.12	29.12	UPPER SAND	N
MW-211B	425284.7774	4859536.21	29.12	-999	TRANSITION	N
MW-211B	425284.7774	4859536.21	-999	-999	LOWER SAND	N
MW-211B	425284.7774	4859536.21	-999	-999	TRANSITION2	N
MW-212	425089.9251	4859098.986	48.1	36.1	UPPER SAND	Y
MW-212	425089.9251	4859098.986	36.1	32.5	TRANSITION	Y
MW-212	425089.9251	4859098.986	32.5	32.3	LOWER SAND	Y
MW-212	425089.9251	4859098.986	32.3	32.1	TRANSITION2	Y
MW-212	425089.9251	4859098.986	32.1	30.1	CLAY	Y
MW-213	425189.5146	4859157.337	25.4	10.4	UPPER SAND	Y
MW-213	425189.5146	4859157.337	10.4	-1.2	TRANSITION	Y
MW-213	425189.5146	4859157.337	-1.2	-1.4	LOWER SAND	Y
MW-213	425189.5146	4859157.337	-1.4	-1.6	TRANSITION2	Y
MW-213	425189.5146	4859157.337	-1.6	-3.6	CLAY	Y
MW-214	425156.4301	4859417.943	59.9	47.9	UPPER SAND	Y
MW-214	425156.4301	4859417.943	47.9	-999	TRANSITION	Y
MW-214	425156.4301	4859417.943	-999	-999	LOWER SAND	Y
MW-214	425156.4301	4859417.943	-999	-999	TRANSITION2	Y
MW-215	425149.6355	4859367.975	58.1	44.1	UPPER SAND	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-215	425149.6355	4859367.975	44.1	20.5	TRANSITION	Y
MW-215	425149.6355	4859367.975	20.5	20.3	LOWER SAND	Y
MW-215	425149.6355	4859367.975	20.3	20.1	TRANSITION2	Y
MW-215	425149.6355	4859367.975	20.1	12.1	CLAY	Y
MW-216A	425317.9603	4859430.86	52.5	35.04	CAP	Y
MW-216A	425317.9603	4859430.86	35.04	34.04	UPPER SAND	Y
MW-216A	425317.9603	4859430.86	34.04	19.9	TRANSITION	Y
MW-216A	425317.9603	4859430.86	19.9	19.7	LOWER SAND	Y
MW-216A	425317.9603	4859430.86	19.7	19.5	TRANSITION2	Y
MW-216A	425317.9603	4859430.86	19.5	-999	CLAY	Y
MW-216B	425336.9319	4859447.334	52.2	38.2	UPPER SAND	N
MW-216B	425336.9319	4859447.334	38.2	-999	TRANSITION	N
MW-216B	425336.9319	4859447.334	-999	-999	LOWER SAND	N
MW-216B	425336.9319	4859447.334	-999	-999	TRANSITION2	N
MW-217A	425245.8539	4859345.973	53	47.26	CAP	Y
MW-217A	425245.8539	4859345.973	47.26	37.26	UPPER SAND	Y
MW-217A	425245.8539	4859345.973	37.26	5.66	TRANSITION	Y
MW-217A	425245.8539	4859345.973	-999	-999	LOWER SAND	Y
MW-217A	425245.8539	4859345.973	-999	-999	TRANSITION2	Y
MW-217A	425245.8539	4859345.973	5.26	3.26	CLAY	Y
MW-217B	425248.4479	4859346.971	53.2	48.4	CAP	Y
MW-217B	425248.4479	4859346.971	48.4	38.4	UPPER SAND	Y
MW-217B	425248.4479	4859346.971	38.4	-999	TRANSITION	Y
MW-217B	425248.4479	4859346.971	-999	-999	LOWER SAND	Y
MW-217B	425248.4479	4859346.971	-999	-999	TRANSITION2	Y
MW-218	425199.4078	4859239.792	51	15	UPPER SAND	Y
MW-218	425199.4078	4859239.792	15	0.4	TRANSITION	Y
MW-218	425199.4078	4859239.792	0.4	0.2	LOWER SAND	Y
MW-218	425199.4078	4859239.792	0.2	0	TRANSITION2	Y
MW-218	425199.4078	4859239.792	0	-21	CLAY	Y
MW-219	425328.5394	4859129.097	48.6	5.6	UPPER SAND	Y
MW-219	425328.5394	4859129.097	5.6	-31	TRANSITION	Y
MW-219	425328.5394	4859129.097	-31	-31.2	LOWER SAND	Y
MW-219	425328.5394	4859129.097	-31.2	-31.4	TRANSITION2	Y
MW-219	425328.5394	4859129.097	-31.4	-33.4	CLAY	Y
MW-220	425359.3472	4859324.297	36.5	28.76	CAP	N
MW-220	425359.3472	4859324.297	28.76	8.76	UPPER SAND	N
MW-220	425359.3472	4859324.297	8.76	-999	TRANSITION	N
MW-220	425359.3472	4859324.297	-999	-999	LOWER SAND	N
MW-220	425359.3472	4859324.297	-999	-999	TRANSITION2	N
MW-222	425556.4905	4859486.692	54.1	40	UPPER SAND	Y
MW-222	425556.4905	4859486.692	40	38.8	TRANSITION	Y
MW-222	425556.4905	4859486.692	38.8	-2.7	LOWER SAND	Y
MW-222	425556.4905	4859486.692	-2.7	-2.9	TRANSITION2	Y
MW-222	425556.4905	4859486.692	-2.9	-44.9	CLAY	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-223	425568.6471	4859429.276	51.1	36.2	UPPER SAND	Y
MW-223	425568.6471	4859429.276	36.2	36	TRANSITION	Y
MW-223	425568.6471	4859429.276	36	-999	LOWER SAND	Y
MW-223	425568.6471	4859429.276	-999	-999	TRANSITION2	Y
MW-224	425584.3162	4859530.528	54.7	35.6	UPPER SAND	Y
MW-224	425584.3162	4859530.528	35.6	35.4	TRANSITION	Y
MW-224	425584.3162	4859530.528	35.4	35.2	LOWER SAND	Y
MW-224	425584.3162	4859530.528	35.2	-5.8	TRANSITION2	Y
MW-224	425584.3162	4859530.528	-5.8	-40.8	CLAY	Y
MW-225A	425546.0411	4859289.426	43	0	UPPER SAND	Y
MW-225A	425546.0411	4859289.426	0	-17	TRANSITION	Y
MW-225A	425546.0411	4859289.426	-17	-37	LOWER SAND	Y
MW-225A	425546.0411	4859289.426	-37	-999	TRANSITION2	Y
MW-225B	425545.5899	4859285.112	-999	-999	UPPER SAND	N
MW-225B	425545.5899	4859285.112	43.3	1.3	TRANSITION	N
MW-225B	425545.5899	4859285.112	-999	-999	LOWER SAND	N
MW-225B	425545.5899	4859285.112	-999	-999	TRANSITION2	N
MW-229A	425590.5443	4858976.833	30.6	-1.4	UPPER SAND	Y
MW-229A	425590.5443	4858976.833	-1.4	-20	TRANSITION	Y
MW-229A	425590.5443	4858976.833	-20	-45	LOWER SAND	Y
MW-229A	425590.5443	4858976.833	-45	-60.4	TRANSITION2	Y
MW-229A	425590.5443	4858976.833	-60.4	-999	CLAY	Y
MW-229B	425592.9731	4858977.186	30.3	0.3	UPPER SAND	N
MW-229B	425592.9731	4858977.186	-999	-999	TRANSITION	N
MW-229B	425592.9731	4858977.186	-999	-999	LOWER SAND	N
MW-229B	425592.9731	4858977.186	-999	-999	TRANSITION2	N
MW-230A	425541.641	4858878.009	33.7	13.7	UPPER SAND	Y
MW-230A	425541.641	4858878.009	13.7	-16	TRANSITION	Y
MW-230A	425541.641	4858878.009	-16	-56	LOWER SAND	Y
MW-230A	425541.641	4858878.009	-56	-67.3	TRANSITION2	Y
MW-230A	425541.641	4858878.009	-67.3	-999	CLAY	Y
MW-230B	425544.3937	4858881.276	33.6	13.6	UPPER SAND	N
MW-230B	425544.3937	4858881.276	13.6	-26.4	TRANSITION	N
MW-230B	425544.3937	4858881.276	-999	-999	LOWER SAND	N
MW-230B	425544.3937	4858881.276	-999	-999	TRANSITION2	N
MW-231A	425352.2784	4858869.336	42.5	27.5	UPPER SAND	Y
MW-231A	425352.2784	4858869.336	27.5	-7.5	TRANSITION	Y
MW-231A	425352.2784	4858869.336	-7.5	-14.5	LOWER SAND	Y
MW-231A	425352.2784	4858869.336	-14.5	-22.5	TRANSITION2	Y
MW-231A	425352.2784	4858869.336	-22.5	-29.5	CLAY	Y
MW-231B	425350.4235	4858868.063	42.2	27.2	UPPER SAND	N
MW-231B	425350.4235	4858868.063	27.2	6.2	TRANSITION	N
MW-231B	425350.4235	4858868.063	-999	-999	LOWER SAND	N
MW-231B	425350.4235	4858868.063	-999	-999	TRANSITION2	N
MW-232A	425277.2435	4859383.041	53.1	37.57	CAP	Y
MW-232A	425277.2435	4859383.041	37.57	35.57	UPPER SAND	Y
MW-232A	425277.2435	4859383.041	35.57	10.5	TRANSITION	Y
MW-232A	425277.2435	4859383.041	-999	-999	LOWER SAND	Y
MW-232A	425277.2435	4859383.041	-999	-999	TRANSITION2	Y
MW-232A	425277.2435	4859383.041	10.1	-2.43	NULL	Y
MW-232B	425279.6042	4859385.824	53.1	41.1	UPPER SAND	N
MW-232B	425279.6042	4859385.824	41.1	33.1	TRANSITION	N
MW-232B	425279.6042	4859385.824	-999	-999	LOWER SAND	N
MW-232B	425279.6042	4859385.824	-999	-999	TRANSITION2	N
MW-233	425204.967	4859521.133	58.1	8.1	UPPER SAND	Y
MW-233	425204.967	4859521.133	8.1	7.6	TRANSITION	Y
MW-233	425204.967	4859521.133	7.6	7.1	LOWER SAND	Y
MW-233	425204.967	4859521.133	7.1	-21.9	TRANSITION2	Y
MW-233	425204.967	4859521.133	-21.9	-999	CLAY	Y
MW-234	425237.151	4859389.33	52.9	32.9	UPPER SAND	Y
MW-234	425237.151	4859389.33	32.9	13.3	TRANSITION	Y
MW-234	425237.151	4859389.33	-999	-999	LOWER SAND	Y
MW-234	425237.151	4859389.33	-999	-999	TRANSITION2	Y
MW-234	425237.151	4859389.33	12.9	-999	CLAY	Y
MW-240	425265.341	4859191.527	49.1	7.1	UPPER SAND	N
MW-240	425265.341	4859191.527	-999	-999	TRANSITION	N
MW-240	425265.341	4859191.527	-999	-999	LOWER SAND	N
MW-240	425265.341	4859191.527	-999	-999	TRANSITION2	N
MW-302	425806.7041	4860108.277	48.8	30	UPPER SAND	Y
MW-302	425806.7041	4860108.277	30	28.8	TRANSITION	Y
MW-302	425806.7041	4860108.277	28.8	-2.2	LOWER SAND	Y
MW-302	425806.7041	4860108.277	-2.2	-6.2	TRANSITION2	Y
MW-302	425806.7041	4860108.277	-6.2	-8.2	CLAY	Y
MW-303	426081.5322	4860096.6	42	20	UPPER SAND	Y
MW-303	426081.5322	4860096.6	20	10	TRANSITION	Y
MW-303	426081.5322	4860096.6	10	-29.8	LOWER SAND	Y
MW-303	426081.5322	4860096.6	-29.8	-30	TRANSITION2	Y
MW-303	426081.5322	4860096.6	-30	-999	CLAY	Y
MW-304	426081.5322	4860096.6	-999	-999	UPPER SAND	N
MW-304	426081.5322	4860096.6	-999	-999	TRANSITION	N
MW-304	426081.5322	4860096.6	-8	-29	LOWER SAND	N
MW-304	426081.5322	4860096.6	-29	-31	TRANSITION2	N
MW-305	426074.5359	4859908.635	39.9	10.9	UPPER SAND	Y
MW-305	426074.5359	4859908.635	10.9	-2	TRANSITION	Y
MW-305	426074.5359	4859908.635	-2	-12	LOWER SAND	Y
MW-305	426074.5359	4859908.635	-12	-25.3	TRANSITION2	Y
MW-305	426074.5359	4859908.635	-25.3	-47.3	CLAY	Y
MW-306	425780.4205	4859797.3	49.3	-5.7	UPPER SAND	N
MW-306	425780.4205	4859797.3	-999	-999	TRANSITION	N
MW-306	425780.4205	4859797.3	-999	-999	LOWER SAND	N

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-306	425780.4205	4859797.3	-999	-999	TRANSITION2	N
MW-307	425478.5946	4859644.833	59.8	36.8	UPPER SAND	Y
MW-307	425478.5946	4859644.833	36.8	36.3	TRANSITION	Y
MW-307	425478.5946	4859644.833	36.3	36	LOWER SAND	Y
MW-307	425478.5946	4859644.833	36	27.8	TRANSITION2	Y
MW-307	425478.5946	4859644.833	27.8	1.8	CLAY	Y
MW-308	425858.1349	4859597.511	34.9	24.9	UPPER SAND	N
MW-308	425858.1349	4859597.511	24.9	-5.6	TRANSITION	N
MW-308	425858.1349	4859597.511	-999	-999	LOWER SAND	N
MW-308	425858.1349	4859597.511	-999	-999	TRANSITION2	N
MW-308	425858.1349	4859597.511	-5.6	-999	BEDROCKorTILL	N
MW-309A	425985.3948	4859542.554	19.8	5.8	UPPER SAND	Y
MW-309A	425985.3948	4859542.554	5.8	-7.8	TRANSITION	Y
MW-309A	425985.3948	4859542.554	-7.8	-8	LOWER SAND	Y
MW-309A	425985.3948	4859542.554	-8	-8.2	TRANSITION2	Y
MW-309A	425985.3948	4859542.554	-8.2	-23.7	CLAY	Y
MW-309A	425985.3948	4859542.554	-23.7	-999	BEDROCKorTILL	Y
MW-309B	425986.2131	4859544.012	19.4	5.8	UPPER SAND	Y
MW-309B	425986.2131	4859544.012	5.8	-8.2	TRANSITION	Y
MW-309B	425986.2131	4859544.012	-8.2	-8.4	LOWER SAND	Y
MW-309B	425986.2131	4859544.012	-8.4	-8.6	TRANSITION2	Y
MW-309B	425986.2131	4859544.012	-8.6	-25.6	CLAY	Y
MW-309B	425986.2131	4859544.012	-25.6	-999	BEDROCKorTILL	Y
MW-310	425483.564	4859247.801	50.3	31.3	UPPER SAND	Y
MW-310	425483.564	4859247.801	31.3	-21.3	TRANSITION	Y
MW-310	425483.564	4859247.801	-10.7	-20.7	LOWER SAND	Y
MW-310	425483.564	4859247.801	-21.5	-21.7	TRANSITION2	Y
MW-310	425483.564	4859247.801	-21.7	-66.7	CLAY	Y
MW-311	425799.5546	4859246.977	23.6	12.6	UPPER SAND	Y
MW-311	425799.5546	4859246.977	12.6	-27.9	TRANSITION	Y
MW-311	425799.5546	4859246.977	-27.9	-33.2	LOWER SAND	Y
MW-311	425799.5546	4859246.977	-33.2	-33.4	TRANSITION2	Y
MW-311	425799.5546	4859246.977	-33.4	-999	CLAY	Y
MW-312	425969.2104	4859325.975	33.5	21.5	UPPER SAND	Y
MW-312	425969.2104	4859325.975	21.5	14.9	TRANSITION	Y
MW-312	425969.2104	4859325.975	14.9	14.7	LOWER SAND	Y
MW-312	425969.2104	4859325.975	14.7	14.5	TRANSITION2	Y
MW-312	425969.2104	4859325.975	14.5	-34.5	CLAY	Y
MW-312	425969.2104	4859325.975	-34.5	-999	BEDROCKorTILL	Y
MW-313	425814.2229	4858996.652	18.5	4.5	UPPER SAND	Y
MW-313	425814.2229	4858996.652	4.5	-36.1	TRANSITION	Y
MW-313	425814.2229	4858996.652	-36.1	-36.3	LOWER SAND	Y
MW-313	425814.2229	4858996.652	-36.3	-36.5	TRANSITION2	Y
MW-313	425814.2229	4858996.652	-36.5	-79.5	CLAY	Y
MW-313	425814.2229	4858996.652	-79.5	-999	BEDROCKorTILL	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-314A	425409.2933	4858737.767	24.3	3.3	UPPER SAND	N
MW-314A	425409.2933	4858737.767	3.3	-35.2	TRANSITION	N
MW-314A	425409.2933	4858737.767	-999	-999	LOWER SAND	N
MW-314A	425409.2933	4858737.767	-999	-999	TRANSITION2	N
MW-314B	425407.8016	4858735.582	23.9	2.9	UPPER SAND	N
MW-314B	425407.8016	4858735.582	2.9	-38.1	TRANSITION	N
MW-314B	425407.8016	4858735.582	-999	-999	LOWER SAND	N
MW-314B	425407.8016	4858735.582	-999	-999	TRANSITION2	N
MW-315A	425539.4131	4858747.626	20.6	12.6	UPPER SAND	N
MW-315A	425539.4131	4858747.626	12.6	-56.4	TRANSITION	N
MW-315A	425539.4131	4858747.626	-999	-999	LOWER SAND	N
MW-315A	425539.4131	4858747.626	-999	-999	TRANSITION2	N
MW-315B	425541.2746	4858749.176	20.5	12.5	UPPER SAND	N
MW-315B	425541.2746	4858749.176	12.5	-4.6	TRANSITION	N
MW-315B	425541.2746	4858749.176	-999	-999	LOWER SAND	N
MW-315B	425541.2746	4858749.176	-999	-999	TRANSITION2	N
MW-316A	426007.6381	4858884.4	51.1	44.7	UPPER SAND	Y
MW-316A	426007.6381	4858884.4	44.7	44.5	TRANSITION	Y
MW-316A	426007.6381	4858884.4	44.5	44.3	LOWER SAND	Y
MW-316A	426007.6381	4858884.4	44.3	44.1	TRANSITION2	Y
MW-316A	426007.6381	4858884.4	44.1	15.1	CLAY	Y
MW-316A	426007.6381	4858884.4	15.1	-999	BEDROCKorTILL	Y
MW-316B	426008.8112	4858880.309	-999	-999	UPPER SAND	N
MW-316B	426008.8112	4858880.309	51.9	44.9	TRANSITION	N
MW-316B	426008.8112	4858880.309	-999	-999	LOWER SAND	N
MW-316B	426008.8112	4858880.309	-999	-999	TRANSITION2	N
MW-316B	426008.8112	4858880.309	44.9	15.9	CLAY	N
MW-316B	426008.8112	4858880.309	15.9	-999	BEDROCKorTILL	N
MW-317A	426172.8746	4859042.712	67.7	62.7	UPPER SAND	Y
MW-317A	426172.8746	4859042.712	62.7	62.5	TRANSITION	Y
MW-317A	426172.8746	4859042.712	62.5	62.3	LOWER SAND	Y
MW-317A	426172.8746	4859042.712	62.3	62.1	TRANSITION2	Y
MW-317A	426172.8746	4859042.712	62.1	61.9	CLAY	Y
MW-317A	426172.8746	4859042.712	61.9	-999	BEDROCKorTILL	Y
MW-317B	426173.0745	4859044.423	67.5	63.5	UPPER SAND	N
MW-317B	426173.0745	4859044.423	-999	-999	TRANSITION	N
MW-317B	426173.0745	4859044.423	-999	-999	LOWER SAND	N
MW-317B	426173.0745	4859044.423	-999	-999	TRANSITION2	N
MW-317B	426173.0745	4859044.423	63.5	-999	BEDROCKorTILL	N
MW-318	425599.703	4858781.405	21.1	1.1	UPPER SAND	N
MW-318	425599.703	4858781.405	1.1	-0.9	TRANSITION	N
MW-318	425599.703	4858781.405	-999	-999	LOWER SAND	N
MW-318	425599.703	4858781.405	-999	-999	TRANSITION2	N
MW-319	425660.3243	4859316.798	37	30	UPPER SAND	Y
MW-319	425660.3243	4859316.798	30	2	TRANSITION	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-319	425660.3243	4859316.798	2	-33	LOWER SAND	Y
MW-319	425660.3243	4859316.798	-33	-35	TRANSITION2	Y
MW-319	425660.3243	4859316.798	-35	-76	CLAY	Y
MW-320	425739.792	4860142.953	50.7	40.7	UPPER SAND	Y
MW-320	425739.792	4860142.953	40.7	-999	TRANSITION	Y
MW-320	425739.792	4860142.953	-999	-999	LOWER SAND	Y
MW-320	425739.792	4860142.953	-999	-999	TRANSITION2	Y
MW-321	425806.1738	4860110.67	48.4	26.4	UPPER SAND	N
MW-321	425806.1738	4860110.67	-999	-999	TRANSITION	N
MW-321	425806.1738	4860110.67	-999	-999	LOWER SAND	N
MW-321	425806.1738	4860110.67	-999	-999	TRANSITION2	N
MW-322	425839.4437	4860186.861	34.7	23.7	UPPER SAND	Y
MW-322	425839.4437	4860186.861	23.7	-999	TRANSITION	Y
MW-322	425839.4437	4860186.861	-999	-999	LOWER SAND	Y
MW-322	425839.4437	4860186.861	-999	-999	TRANSITION2	Y
MW-330	425819.6714	4859545.028	32.8	22.8	UPPER SAND	N
MW-330	425819.6714	4859545.028	22.8	7.8	TRANSITION	N
MW-330	425819.6714	4859545.028	7.8	6.8	LOWER SAND	N
MW-330	425819.6714	4859545.028	-999	-999	TRANSITION2	N
MW-331	425737.7783	4859427.551	27.7	23.7	UPPER SAND	Y
MW-331	425737.7783	4859427.551	23.7	-13.3	TRANSITION	Y
MW-331	425737.7783	4859427.551	-13.3	-25.1	LOWER SAND	Y
MW-331	425737.7783	4859427.551	-25.1	-25.3	TRANSITION2	Y
MW-331	425737.7783	4859427.551	-25.3	-70.3	CLAY	Y
MW-332	425811.9394	4859219.254	22.3	14.3	UPPER SAND	N
MW-332	425811.9394	4859219.254	14.3	6.3	TRANSITION	N
MW-332	425811.9394	4859219.254	-999	-999	LOWER SAND	N
MW-332	425811.9394	4859219.254	-999	-999	TRANSITION2	N
MW-332	425811.9394	4859219.254	6.3	2.3	CLAY	N
MW-333	425744.847	4858971.416	24.3	14.3	UPPER SAND	Y
MW-333	425744.847	4858971.416	14.3	-10.7	TRANSITION	Y
MW-333	425744.847	4858971.416	-10.7	-11.5	LOWER SAND	Y
MW-333	425744.847	4858971.416	-11.5	-11.7	TRANSITION2	Y
MW-333	425744.847	4858971.416	-11.7	-30.7	CLAY	Y
MW-334	425668.8472	4858921.781	28	12	UPPER SAND	Y
MW-334	425668.8472	4858921.781	12	-14	TRANSITION	Y
MW-334	425668.8472	4858921.781	-14	-15.3	LOWER SAND	Y
MW-334	425668.8472	4858921.781	-15.3	-15.5	TRANSITION2	Y
MW-334	425668.8472	4858921.781	-15.5	-52.5	CLAY	Y
MW-401	425443.4113	4859882.025	54.7	26.7	UPPER SAND	Y
MW-401	425443.4113	4859882.025	26.7	26.2	TRANSITION	Y
MW-401	425443.4113	4859882.025	26.2	26	LOWER SAND	Y
MW-401	425443.4113	4859882.025	26	9.2	TRANSITION2	Y
MW-401	425443.4113	4859882.025	9.2	2.7	CLAY	Y
MW-402	425483.5623	4859835.773	57.7	39.7	UPPER SAND	Y
MW-402	425483.5623	4859835.773	39.7	-999	TRANSITION	Y
MW-402	425483.5623	4859835.773	-999	-999	LOWER SAND	Y
MW-402	425483.5623	4859835.773	-999	-999	TRANSITION2	Y
MW-404	425420.509	4859836.819	58.7	22.7	UPPER SAND	Y
MW-404	425420.509	4859836.819	22.7	-999	TRANSITION	Y
MW-404	425420.509	4859836.819	-999	-999	LOWER SAND	Y
MW-404	425420.509	4859836.819	-999	-999	TRANSITION2	Y
MW-405	425415.8194	4859863.208	58.6	32.6	UPPER SAND	Y
MW-405	425415.8194	4859863.208	32.6	-999	TRANSITION	Y
MW-405	425415.8194	4859863.208	-999	-999	LOWER SAND	Y
MW-405	425415.8194	4859863.208	-999	-999	TRANSITION2	Y
MW-406	425422.6845	4859711.121	59.8	10.8	UPPER SAND	Y
MW-406	425422.6845	4859711.121	10.8	-999	TRANSITION	Y
MW-406	425422.6845	4859711.121	-999	-999	LOWER SAND	Y
MW-406	425422.6845	4859711.121	-999	-999	TRANSITION2	Y
MW-407	425482.6047	4859752.41	60.8	18.3	UPPER SAND	Y
MW-407	425482.6047	4859752.41	18.3	17.8	TRANSITION	Y
MW-407	425482.6047	4859752.41	17.8	17.3	LOWER SAND	Y
MW-407	425482.6047	4859752.41	17.3	3.3	TRANSITION2	Y
MW-407	425482.6047	4859752.41	3.3	-0.2	CLAY	Y
MW-408	425435.587	4859864.311	58.4	34.4	UPPER SAND	N
MW-408	425435.587	4859864.311	-999	-999	TRANSITION	N
MW-408	425435.587	4859864.311	-999	-999	LOWER SAND	N
MW-408	425435.587	4859864.311	-999	-999	TRANSITION2	N
MW-801	425420.1578	4861722.059	39.7	36.7	UPPER SAND	N
MW-801	425420.1578	4861722.059	36.7	32.9	TRANSITION	N
MW-801	425420.1578	4861722.059	-999	-999	LOWER SAND	N
MW-801	425420.1578	4861722.059	-999	-999	TRANSITION2	N
MW-801	425420.1578	4861722.059	32.9	22.7	CLAY	N
MW-802	425384.6448	4861817.795	30	21	UPPER SAND	Y
MW-802	425384.6448	4861817.795	21	17.4	TRANSITION	Y
MW-802	425384.6448	4861817.795	17.4	17.2	LOWER SAND	Y
MW-802	425384.6448	4861817.795	17.2	17	TRANSITION2	Y
MW-802	425384.6448	4861817.795	17	13	CLAY	Y
MW-803	425433.9064	4862064.639	27.9	21.4	UPPER SAND	N
MW-803	425433.9064	4862064.639	21.4	-999	TRANSITION	N
MW-803	425433.9064	4862064.639	-999	-999	LOWER SAND	N
MW-803	425433.9064	4862064.639	-999	-999	TRANSITION2	N
MW-804	425527.2553	4861758.586	98.6	88.6	UPPER SAND	Y
MW-804	425527.2553	4861758.586	88.6	80.5	TRANSITION	Y
MW-804	425527.2553	4861758.586	80.5	80.3	LOWER SAND	Y
MW-804	425527.2553	4861758.586	80.3	80.1	TRANSITION2	Y
MW-804	425527.2553	4861758.586	80.1	78.2	BEDROCKorTILL	Y
MW-807	425490.5786	4861794.61	65.8	55.8	UPPER SAND	Y
MW-807	425490.5786	4861794.61	55.8	48.2	TRANSITION	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-807	425490.5786	4861794.61	48.2	48	LOWER SAND	Y
MW-807	425490.5786	4861794.61	48	47.8	TRANSITION2	Y
MW-807	425490.5786	4861794.61	47.8	33.8	CLAY	Y
MW-808	425399.669	4861844.677	-999	-999	UPPER SAND	N
MW-808	425399.669	4861844.677	36	19	TRANSITION	N
MW-808	425399.669	4861844.677	-999	-999	LOWER SAND	N
MW-808	425399.669	4861844.677	-999	-999	TRANSITION2	N
MW-808	425399.669	4861844.677	19	10	CLAY	N
MW-810	425497.243	4861819.117	64.6	46.6	UPPER SAND	Y
MW-810	425497.243	4861819.117	46.6	36	TRANSITION	Y
MW-810	425497.243	4861819.117	36	35.8	LOWER SAND	Y
MW-810	425497.243	4861819.117	35.8	35.6	TRANSITION2	Y
MW-810	425497.243	4861819.117	35.6	30.6	CLAY	Y
MW-811	425495.2276	4861845.61	36.9	29.9	UPPER SAND	N
MW-811	425495.2276	4861845.61	29.9	29.7	TRANSITION	N
MW-811	425495.2276	4861845.61	29.7	29.5	LOWER SAND	N
MW-811	425495.2276	4861845.61	29.5	29.3	TRANSITION2	N
MW-811	425495.2276	4861845.61	29.3	24.9	CLAY	N
MW-812	425441.0534	4862050.467	62.4	19.4	UPPER SAND	Y
MW-812	425441.0534	4862050.467	19.4	-6.2	TRANSITION	Y
MW-812	425441.0534	4862050.467	-6.2	-6.4	LOWER SAND	Y
MW-812	425441.0534	4862050.467	-6.4	-6.6	TRANSITION2	Y
MW-812	425441.0534	4862050.467	-6.6	-12.6	CLAY	Y
MW-813	425439.4519	4862091.481	57.3	31.3	UPPER SAND	Y
MW-813	425439.4519	4862091.481	31.3	14.8	TRANSITION	Y
MW-813	425439.4519	4862091.481	14.8	14.6	LOWER SAND	Y
MW-813	425439.4519	4862091.481	14.6	14.4	TRANSITION2	Y
MW-813	425439.4519	4862091.481	14.4	4.3	CLAY	Y
MW-814	425464.6499	4862095.584	62	7.5	UPPER SAND	Y
MW-814	425464.6499	4862095.584	7.5	-14.6	TRANSITION	Y
MW-814	425464.6499	4862095.584	-14.6	-14.8	LOWER SAND	Y
MW-814	425464.6499	4862095.584	-14.8	-15	TRANSITION2	Y
MW-814	425464.6499	4862095.584	-15	-17	CLAY	Y
MW-NASB-001	424458.8088	4861870.403	64.3	38.3	UPPER SAND	N
MW-NASB-001	424458.8088	4861870.403	-999	-999	TRANSITION	N
MW-NASB-001	424458.8088	4861870.403	-999	-999	LOWER SAND	N
MW-NASB-001	424458.8088	4861870.403	-999	-999	TRANSITION2	N
MW-NASB-002	424739.7784	4861807.491	61.1	35.1	UPPER SAND	N
MW-NASB-002	424739.7784	4861807.491	-999	-999	TRANSITION	N
MW-NASB-002	424739.7784	4861807.491	-999	-999	LOWER SAND	N
MW-NASB-002	424739.7784	4861807.491	-999	-999	TRANSITION2	N
MW-NASB-003	425029.4537	4861848.898	60.8	46.8	UPPER SAND	Y
MW-NASB-003	425029.4537	4861848.898	46.8	-999	TRANSITION	Y
MW-NASB-003	425029.4537	4861848.898	-999	-999	LOWER SAND	Y
MW-NASB-003	425029.4537	4861848.898	-999	-999	TRANSITION2	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-004	425155.6331	4861605.642	74.2	37.2	UPPER SAND	N
MW-NASB-004	425155.6331	4861605.642	-999	-999	TRANSITION	N
MW-NASB-004	425155.6331	4861605.642	-999	-999	LOWER SAND	N
MW-NASB-004	425155.6331	4861605.642	-999	-999	TRANSITION2	N
MW-NASB-005	425500.7506	4861728.639	68.3	25.3	UPPER SAND	N
MW-NASB-005	425500.7506	4861728.639	-999	-999	TRANSITION	N
MW-NASB-005	425500.7506	4861728.639	-999	-999	LOWER SAND	N
MW-NASB-005	425500.7506	4861728.639	-999	-999	TRANSITION2	N
MW-NASB-006	425558.159	4860637.199	67.3	58.3	UPPER SAND	Y
MW-NASB-006	425558.159	4860637.199	58.3	58.1	TRANSITION	Y
MW-NASB-006	425558.159	4860637.199	58.1	57.9	LOWER SAND	Y
MW-NASB-006	425558.159	4860637.199	57.9	57.7	TRANSITION2	Y
MW-NASB-006	425558.159	4860637.199	57.7	55.3	CLAY	Y
MW-NASB-007	425521.8634	4860572.255	57.6	49.27	UPPER SAND	Y
MW-NASB-007	425521.8634	4860572.255	49.27	49.07	TRANSITION	Y
MW-NASB-007	425521.8634	4860572.255	49.07	48.87	LOWER SAND	Y
MW-NASB-007	425521.8634	4860572.255	48.87	48.67	TRANSITION2	Y
MW-NASB-007	425521.8634	4860572.255	48.67	42.1	CLAY	Y
MW-NASB-008	425429.6406	4860562.921	57.6	52.1	UPPER SAND	Y
MW-NASB-008	425429.6406	4860562.921	52.1	51.9	TRANSITION	Y
MW-NASB-008	425429.6406	4860562.921	51.9	51.7	LOWER SAND	Y
MW-NASB-008	425429.6406	4860562.921	51.7	51.5	TRANSITION2	Y
MW-NASB-008	425429.6406	4860562.921	51.5	43.6	CLAY	Y
MW-NASB-009	425373.6524	4860558.013	59.3	45.3	UPPER SAND	Y
MW-NASB-009	425373.6524	4860558.013	45.3	45.1	TRANSITION	Y
MW-NASB-009	425373.6524	4860558.013	45.1	44.9	LOWER SAND	Y
MW-NASB-009	425373.6524	4860558.013	44.9	44.7	TRANSITION2	Y
MW-NASB-009	425373.6524	4860558.013	44.7	45.3	CLAY	Y
MW-NASB-010	425331.4659	4860598.285	63.1	49.1	UPPER SAND	N
MW-NASB-010	425331.4659	4860598.285	-999	-999	TRANSITION	N
MW-NASB-010	425331.4659	4860598.285	-999	-999	LOWER SAND	N
MW-NASB-010	425331.4659	4860598.285	-999	-999	TRANSITION2	N
MW-NASB-020	425423.8974	4860468.992	58.8	36.8	UPPER SAND	Y
MW-NASB-020	425423.8974	4860468.992	36.8	36.2	TRANSITION	Y
MW-NASB-020	425423.8974	4860468.992	36.2	36	LOWER SAND	Y
MW-NASB-020	425423.8974	4860468.992	36	35.8	TRANSITION2	Y
MW-NASB-020	425423.8974	4860468.992	35.8	34.8	CLAY	Y
MW-NASB-021	425431.3957	4860382.676	56	22	UPPER SAND	Y
MW-NASB-021	425431.3957	4860382.676	22	9.4	TRANSITION	Y
MW-NASB-021	425431.3957	4860382.676	9.4	9.2	LOWER SAND	Y
MW-NASB-021	425431.3957	4860382.676	9.2	9	TRANSITION2	Y
MW-NASB-021	425431.3957	4860382.676	9	6	CLAY	Y
MW-NASB-022	425343.1263	4860368.442	56.7	56.1	UPPER SAND	Y
MW-NASB-022	425343.1263	4860368.442	56.1	34.1	TRANSITION	Y
MW-NASB-022	425343.1263	4860368.442	34.1	33.9	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-022	425343.1263	4860368.442	33.9	33.7	TRANSITION2	Y
MW-NASB-022	425343.1263	4860368.442	33.7	32.7	CLAY	Y
MW-NASB-023	425435.6363	4860683.389	67.59	46.86	UPPER SAND	Y
MW-NASB-023	425435.6363	4860683.389	46.86	46.66	TRANSITION	Y
MW-NASB-023	425435.6363	4860683.389	46.66	46.46	LOWER SAND	Y
MW-NASB-023	425435.6363	4860683.389	46.46	46.26	TRANSITION2	Y
MW-NASB-023	425435.6363	4860683.389	46.26	43.59	CLAY	Y
MW-NASB-024	425458.4513	4860635.163	65.8	57.3	UPPER SAND	Y
MW-NASB-024	425458.4513	4860635.163	57.3	57.1	TRANSITION	Y
MW-NASB-024	425458.4513	4860635.163	57.1	56.9	LOWER SAND	Y
MW-NASB-024	425458.4513	4860635.163	56.9	56.7	TRANSITION2	Y
MW-NASB-024	425458.4513	4860635.163	56.7	51.8	CLAY	Y
MW-NASB-025	425420.2682	4860609.251	64.8	53.8	UPPER SAND	Y
MW-NASB-025	425420.2682	4860609.251	53.8	53.6	TRANSITION	Y
MW-NASB-025	425420.2682	4860609.251	53.6	53.4	LOWER SAND	Y
MW-NASB-025	425420.2682	4860609.251	53.4	53.2	TRANSITION2	Y
MW-NASB-025	425420.2682	4860609.251	53.2	48.8	CLAY	Y
MW-NASB-026	425443.9046	4860660.326	67.05	55.55	UPPER SAND	Y
MW-NASB-026	425443.9046	4860660.326	55.55	53.05	TRANSITION	Y
MW-NASB-026	425443.9046	4860660.326	53.05	52.85	LOWER SAND	Y
MW-NASB-026	425443.9046	4860660.326	52.85	52.65	TRANSITION2	Y
MW-NASB-026	425443.9046	4860660.326	52.65	49.05	CLAY	Y
MW-NASB-027	425455.8116	4860603.569	61	57	UPPER SAND	Y
MW-NASB-027	425455.8116	4860603.569	57	56.8	TRANSITION	Y
MW-NASB-027	425455.8116	4860603.569	56.8	56.6	LOWER SAND	Y
MW-NASB-027	425455.8116	4860603.569	56.6	56.4	TRANSITION2	Y
MW-NASB-027	425455.8116	4860603.569	56.4	47	CLAY	Y
MW-NASB-043	425774.4957	4861236.087	70.8	64.8	UPPER SAND	Y
MW-NASB-043	425774.4957	4861236.087	64.8	64.6	TRANSITION	Y
MW-NASB-043	425774.4957	4861236.087	64.6	64.4	LOWER SAND	Y
MW-NASB-043	425774.4957	4861236.087	64.4	64.2	TRANSITION2	Y
MW-NASB-043	425774.4957	4861236.087	64.2	61.8	CLAY	Y
MW-NASB-044	425656.5888	4861313.263	73.18	66.18	UPPER SAND	Y
MW-NASB-044	425656.5888	4861313.263	66.18	59.18	TRANSITION	Y
MW-NASB-044	425656.5888	4861313.263	59.18	58.98	LOWER SAND	Y
MW-NASB-044	425656.5888	4861313.263	58.98	58.78	TRANSITION2	Y
MW-NASB-044	425656.5888	4861313.263	58.78	57.18	CLAY	Y
MW-NASB-045	425657.5314	4861313.388	71.88	64.88	UPPER SAND	Y
MW-NASB-045	425657.5314	4861313.388	64.88	57.88	TRANSITION	Y
MW-NASB-045	425657.5314	4861313.388	57.88	57.68	LOWER SAND	Y
MW-NASB-045	425657.5314	4861313.388	57.68	57.48	TRANSITION2	Y
MW-NASB-045	425657.5314	4861313.388	57.48	24.88	CLAY	Y
MW-NASB-045	425657.5314	4861313.388	24.88	14.88	BEDROCKorTILL	Y
MW-NASB-046	425850.2528	4861249.036	69.8	61.8	UPPER SAND	Y
MW-NASB-046	425850.2528	4861249.036	61.8	59.8	TRANSITION	Y
MW-NASB-046	425850.2528	4861249.036	59.8	59.6	LOWER SAND	Y
MW-NASB-046	425850.2528	4861249.036	59.6	59.4	TRANSITION2	Y
MW-NASB-046	425850.2528	4861249.036	59.4	54.8	CLAY	Y
MW-NASB-047	425849.6631	4861248.282	70	64	UPPER SAND	Y
MW-NASB-047	425849.6631	4861248.282	64	58	TRANSITION	Y
MW-NASB-047	425849.6631	4861248.282	58	57.8	LOWER SAND	Y
MW-NASB-047	425849.6631	4861248.282	57.8	57.6	TRANSITION2	Y
MW-NASB-047	425849.6631	4861248.282	57.6	53	CLAY	Y
MW-NASB-047	425849.6631	4861248.282	53	42	BEDROCKorTILL	Y
MW-NASB-049	425875.6502	4861219.118	65	61	UPPER SAND	Y
MW-NASB-049	425875.6502	4861219.118	61	58	TRANSITION	Y
MW-NASB-049	425875.6502	4861219.118	58	57.8	LOWER SAND	Y
MW-NASB-049	425875.6502	4861219.118	57.8	57.6	TRANSITION2	Y
MW-NASB-049	425875.6502	4861219.118	57.6	50	CLAY	Y
MW-NASB-050	425875.0425	4861220.432	64.88	60.88	UPPER SAND	Y
MW-NASB-050	425875.0425	4861220.432	60.88	57.28	TRANSITION	Y
MW-NASB-050	425875.0425	4861220.432	57.28	57.08	LOWER SAND	Y
MW-NASB-050	425875.0425	4861220.432	57.08	56.88	TRANSITION2	Y
MW-NASB-050	425875.0425	4861220.432	56.88	38.88	CLAY	Y
MW-NASB-051	425865.4399	4861323.298	71.2	63.2	UPPER SAND	Y
MW-NASB-051	425865.4399	4861323.298	63.2	63	TRANSITION	Y
MW-NASB-051	425865.4399	4861323.298	63	62.8	LOWER SAND	Y
MW-NASB-051	425865.4399	4861323.298	62.8	62.6	TRANSITION2	Y
MW-NASB-051	425865.4399	4861323.298	62.6	56.2	CLAY	Y
MW-NASB-054	425635.4512	4861176.853	74	57.5	UPPER SAND	N
MW-NASB-054	425635.4512	4861176.853	-999	-999	TRANSITION	N
MW-NASB-054	425635.4512	4861176.853	-999	-999	LOWER SAND	N
MW-NASB-054	425635.4512	4861176.853	-999	-999	TRANSITION2	N
MW-NASB-055	425636.5542	4861176.721	73.5	57.6	UPPER SAND	Y
MW-NASB-055	425636.5542	4861176.721	57.6	57.4	TRANSITION	Y
MW-NASB-055	425636.5542	4861176.721	57.4	57.2	LOWER SAND	Y
MW-NASB-055	425636.5542	4861176.721	57.2	57	TRANSITION2	Y
MW-NASB-055	425636.5542	4861176.721	57	29.5	CLAY	Y
MW-NASB-056	425693.7629	4861217.565	71.8	60.8	UPPER SAND	Y
MW-NASB-056	425693.7629	4861217.565	60.8	-999	TRANSITION	Y
MW-NASB-056	425693.7629	4861217.565	-999	-999	LOWER SAND	Y
MW-NASB-056	425693.7629	4861217.565	-999	-999	TRANSITION2	Y
MW-NASB-056R	425693.5302	4861216.057	72.3	66.3	UPPER SAND	Y
MW-NASB-056R	425693.5302	4861216.057	66.3	60.3	TRANSITION	Y
MW-NASB-056R	425693.5302	4861216.057	60.3	60.1	LOWER SAND	Y
MW-NASB-056R	425693.5302	4861216.057	60.1	59.9	TRANSITION2	Y
MW-NASB-056R	425693.5302	4861216.057	59.9	58.3	CLAY	Y
MW-NASB-057	425694.242	4861217.284	72.5	61.5	UPPER SAND	Y
MW-NASB-057	425694.242	4861217.284	61.5	61.3	TRANSITION	Y
MW-NASB-057	425694.242	4861217.284	61.3	61.1	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-057	425694.242	4861217.284	61.1	59.9	TRANSITION2	Y
MW-NASB-057	425694.242	4861217.284	59.9	36.5	CLAY	Y
MW-NASB-058	425823.9458	4861189.124	68	62	UPPER SAND	Y
MW-NASB-058	425823.9458	4861189.124	62	-999	TRANSITION	Y
MW-NASB-058	425823.9458	4861189.124	-999	-999	LOWER SAND	Y
MW-NASB-058	425823.9458	4861189.124	-999	-999	TRANSITION2	Y
MW-NASB-061R	425595.6595	4861256.451	72.2	66.2	UPPER SAND	Y
MW-NASB-061R	425595.6595	4861256.451	66.2	62.2	TRANSITION	Y
MW-NASB-061R	425595.6595	4861256.451	62.2	62	LOWER SAND	Y
MW-NASB-061R	425595.6595	4861256.451	62	61.8	TRANSITION2	Y
MW-NASB-061R	425595.6595	4861256.451	61.8	60.2	CLAY	Y
MW-NASB-062	425576.2511	4861334.832	78.7	72.7	UPPER SAND	Y
MW-NASB-062	425576.2511	4861334.832	72.7	-999	TRANSITION	Y
MW-NASB-062	425576.2511	4861334.832	-999	-999	LOWER SAND	Y
MW-NASB-062	425576.2511	4861334.832	-999	-999	TRANSITION2	Y
MW-NASB-063	425575.1605	4861335.088	79.02	71.02	UPPER SAND	Y
MW-NASB-063	425575.1605	4861335.088	71.02	41.92	TRANSITION	Y
MW-NASB-063	425575.1605	4861335.088	41.92	41.72	LOWER SAND	Y
MW-NASB-063	425575.1605	4861335.088	41.72	41.52	TRANSITION2	Y
MW-NASB-063	425575.1605	4861335.088	41.52	28.52	BEDROCKorTILL	Y
MW-NASB-065	425586.1076	4861140.395	72.32	60.12	UPPER SAND	Y
MW-NASB-065	425586.1076	4861140.395	60.12	-999	TRANSITION	Y
MW-NASB-065	425586.1076	4861140.395	-999	-999	LOWER SAND	Y
MW-NASB-065	425586.1076	4861140.395	-999	-999	TRANSITION2	Y
MW-NASB-066	425556.2902	4861138.569	76.93	63.93	UPPER SAND	Y
MW-NASB-066	425556.2902	4861138.569	63.93	-999	TRANSITION	Y
MW-NASB-066	425556.2902	4861138.569	-999	-999	LOWER SAND	Y
MW-NASB-066	425556.2902	4861138.569	-999	-999	TRANSITION2	Y
MW-NASB-067	425568.8115	4861129.026	73.58	60.58	UPPER SAND	Y
MW-NASB-067	425568.8115	4861129.026	60.58	-999	TRANSITION	Y
MW-NASB-067	425568.8115	4861129.026	-999	-999	LOWER SAND	Y
MW-NASB-067	425568.8115	4861129.026	-999	-999	TRANSITION2	Y
MW-NASB-068	425585.9886	4861128.556	72.81	59.81	UPPER SAND	Y
MW-NASB-068	425585.9886	4861128.556	59.81	-999	TRANSITION	Y
MW-NASB-068	425585.9886	4861128.556	-999	-999	LOWER SAND	Y
MW-NASB-068	425585.9886	4861128.556	-999	-999	TRANSITION2	Y
MW-NASB-069	425444.9136	4860345.078	54.5	19.5	UPPER SAND	Y
MW-NASB-069	425444.9136	4860345.078	19.5	-999	TRANSITION	Y
MW-NASB-069	425444.9136	4860345.078	-999	-999	LOWER SAND	Y
MW-NASB-069	425444.9136	4860345.078	-999	-999	TRANSITION2	Y
MW-NASB-070	425494.5874	4860368.107	55.5	30.5	UPPER SAND	Y
MW-NASB-070	425494.5874	4860368.107	30.5	-999	TRANSITION	Y
MW-NASB-070	425494.5874	4860368.107	-999	-999	LOWER SAND	Y
MW-NASB-070	425494.5874	4860368.107	-999	-999	TRANSITION2	Y
MW-NASB-071	425501.5931	4860311.129	42.5	28.5	UPPER SAND	Y
MW-NASB-071	425501.5931	4860311.129	28.5	22.9	TRANSITION	Y
MW-NASB-071	425501.5931	4860311.129	22.9	22.7	LOWER SAND	Y
MW-NASB-071	425501.5931	4860311.129	22.7	22.5	TRANSITION2	Y
MW-NASB-071	425501.5931	4860311.129	22.5	20.5	CLAY	Y
MW-NASB-072	425569.4765	4860245.86	47.7	34.2	UPPER SAND	Y
MW-NASB-072	425569.4765	4860245.86	34.2	34	TRANSITION	Y
MW-NASB-072	425569.4765	4860245.86	34	33.8	LOWER SAND	Y
MW-NASB-072	425569.4765	4860245.86	33.8	33.6	TRANSITION2	Y
MW-NASB-072	425569.4765	4860245.86	33.6	30.7	CLAY	Y
MW-NASB-073	425613.4573	4860278.109	49.6	43.1	UPPER SAND	Y
MW-NASB-073	425613.4573	4860278.109	43.1	40.1	TRANSITION	Y
MW-NASB-073	425613.4573	4860278.109	40.1	39.9	LOWER SAND	Y
MW-NASB-073	425613.4573	4860278.109	39.9	39.7	TRANSITION2	Y
MW-NASB-073	425613.4573	4860278.109	39.7	16.6	CLAY	Y
MW-NASB-074	425531.3477	4860239.568	49.6	26.1	UPPER SAND	Y
MW-NASB-074	425531.3477	4860239.568	26.1	24.5	TRANSITION	Y
MW-NASB-074	425531.3477	4860239.568	24.5	24.3	LOWER SAND	Y
MW-NASB-074	425531.3477	4860239.568	24.3	24.1	TRANSITION2	Y
MW-NASB-074	425531.3477	4860239.568	24.1	21.6	CLAY	Y
MW-NASB-075	425505.8666	4860245.466	52.5	48.5	UPPER SAND	Y
MW-NASB-075	425505.8666	4860245.466	48.5	-999	TRANSITION	Y
MW-NASB-075	425505.8666	4860245.466	-999	-999	LOWER SAND	Y
MW-NASB-075	425505.8666	4860245.466	-999	-999	TRANSITION2	Y
MW-NASB-076	425524.4821	4860277.786	50.8	20.8	UPPER SAND	N
MW-NASB-076	425524.4821	4860277.786	-999	-999	TRANSITION	N
MW-NASB-076	425524.4821	4860277.786	-999	-999	LOWER SAND	N
MW-NASB-076	425524.4821	4860277.786	-999	-999	TRANSITION2	N
MW-NASB-077	425540.4106	4860182.481	50.8	16.4	UPPER SAND	Y
MW-NASB-077	425540.4106	4860182.481	16.4	16.2	TRANSITION	Y
MW-NASB-077	425540.4106	4860182.481	16.2	16	LOWER SAND	Y
MW-NASB-077	425540.4106	4860182.481	16	15.8	TRANSITION2	Y
MW-NASB-077	425540.4106	4860182.481	15.8	10.8	CLAY	Y
MW-NASB-078	425607.8612	4860205.417	56	46	UPPER SAND	Y
MW-NASB-078	425607.8612	4860205.417	46	41.4	TRANSITION	Y
MW-NASB-078	425607.8612	4860205.417	41.4	41.2	LOWER SAND	Y
MW-NASB-078	425607.8612	4860205.417	41.2	41	TRANSITION2	Y
MW-NASB-078	425607.8612	4860205.417	41	39	CLAY	Y
MW-NASB-079	425450.662	4860365.888	50.6	40.6	UPPER SAND	Y
MW-NASB-079	425450.662	4860365.888	40.6	37.5	TRANSITION	Y
MW-NASB-079	425450.662	4860365.888	37.5	37.3	LOWER SAND	Y
MW-NASB-079	425450.662	4860365.888	37.3	37.1	TRANSITION2	Y
MW-NASB-079	425450.662	4860365.888	37.1	33.6	CLAY	Y
MW-NASB-080	425433.2846	4860380.486	56.1	39.1	UPPER SAND	N
MW-NASB-080	425433.2846	4860380.486	-999	-999	TRANSITION	N
MW-NASB-080	425433.2846	4860380.486	-999	-999	LOWER SAND	N

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-080	425433.2846	4860380.486	-999	-999	TRANSITION2	N
MW-NASB-081	425421.8095	4860428.979	56	39	UPPER SAND	N
MW-NASB-081	425421.8095	4860428.979	-999	-999	TRANSITION	N
MW-NASB-081	425421.8095	4860428.979	-999	-999	LOWER SAND	N
MW-NASB-081	425421.8095	4860428.979	-999	-999	TRANSITION2	N
MW-NASB-082	425583.9676	4860019.44	53.9	45.9	UPPER SAND	Y
MW-NASB-082	425583.9676	4860019.44	45.9	45.7	TRANSITION	Y
MW-NASB-082	425583.9676	4860019.44	45.7	45.5	LOWER SAND	Y
MW-NASB-082	425583.9676	4860019.44	45.5	45.3	TRANSITION2	Y
MW-NASB-082	425583.9676	4860019.44	45.3	31.9	CLAY	Y
MW-NASB-083	425648.1898	4859880.944	-999	-999	UPPER SAND	N
MW-NASB-083	425648.1898	4859880.944	55.9	31.9	TRANSITION	N
MW-NASB-083	425648.1898	4859880.944	-999	-999	LOWER SAND	N
MW-NASB-083	425648.1898	4859880.944	-999	-999	TRANSITION2	N
MW-NASB-083	425648.1898	4859880.944	31.9	16.9	BEDROCKorTILL	N
MW-NASB-084	425511.7804	4859891.569	56.4	42.4	UPPER SAND	Y
MW-NASB-084	425511.7804	4859891.569	42.4	42	TRANSITION	Y
MW-NASB-084	425511.7804	4859891.569	42	41.8	LOWER SAND	Y
MW-NASB-084	425511.7804	4859891.569	41.8	33.4	TRANSITION2	Y
MW-NASB-084	425511.7804	4859891.569	33.4	24.4	CLAY	Y
MW-NASB-085	425584.2341	4859894.665	57.8	23.8	UPPER SAND	Y
MW-NASB-085	425584.2341	4859894.665	23.8	21.8	TRANSITION	Y
MW-NASB-085	425584.2341	4859894.665	21.8	21.6	LOWER SAND	Y
MW-NASB-085	425584.2341	4859894.665	21.6	21.4	TRANSITION2	Y
MW-NASB-085	425584.2341	4859894.665	21.4	19.8	CLAY	Y
MW-NASB-086	425557.0936	4859908.488	58.5	38.5	UPPER SAND	N
MW-NASB-086	425557.0936	4859908.488	-999	-999	TRANSITION	N
MW-NASB-086	425557.0936	4859908.488	-999	-999	LOWER SAND	N
MW-NASB-086	425557.0936	4859908.488	-999	-999	TRANSITION2	N
MW-NASB-087	425585.7387	4859917.26	57.7	37.7	UPPER SAND	N
MW-NASB-087	425585.7387	4859917.26	-999	-999	TRANSITION	N
MW-NASB-087	425585.7387	4859917.26	-999	-999	LOWER SAND	N
MW-NASB-087	425585.7387	4859917.26	-999	-999	TRANSITION2	N
MW-NASB-088	425582.8846	4859893.254	57.9	34.9	UPPER SAND	Y
MW-NASB-088	425582.8846	4859893.254	34.9	-999	TRANSITION	Y
MW-NASB-088	425582.8846	4859893.254	-999	-999	LOWER SAND	Y
MW-NASB-088	425582.8846	4859893.254	-999	-999	TRANSITION2	Y
MW-NASB-089	425610.13	4859856.834	57.6	31.1	UPPER SAND	Y
MW-NASB-089	425610.13	4859856.834	31.1	-999	TRANSITION	Y
MW-NASB-089	425610.13	4859856.834	-999	-999	LOWER SAND	Y
MW-NASB-089	425610.13	4859856.834	-999	-999	TRANSITION2	Y
MW-NASB-091	425868.734	4861376.919	72.5	64.5	UPPER SAND	Y
MW-NASB-091	425868.734	4861376.919	64.5	64.3	TRANSITION	Y
MW-NASB-091	425868.734	4861376.919	64.3	64.1	LOWER SAND	Y
MW-NASB-091	425868.734	4861376.919	64.1	63.9	TRANSITION2	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-091	425868.734	4861376.919	63.9	56	CLAY	Y
MW-NASB-091	425868.734	4861376.919	56	-999	BEDROCKorTILL	Y
MW-NASB-092	425869.7606	4861471.375	73.2	66.2	UPPER SAND	Y
MW-NASB-092	425869.7606	4861471.375	66.2	61.6	TRANSITION	Y
MW-NASB-092	425869.7606	4861471.375	61.6	61.4	LOWER SAND	Y
MW-NASB-092	425869.7606	4861471.375	61.4	61.2	TRANSITION2	Y
MW-NASB-092	425869.7606	4861471.375	61.2	61.5	BEDROCKorTILL	Y
MW-NASB-093	425882.1278	4861478.947	74.4	62.8	UPPER SAND	Y
MW-NASB-093	425882.1278	4861478.947	62.8	57.8	TRANSITION	Y
MW-NASB-093	425882.1278	4861478.947	57.8	57.6	LOWER SAND	Y
MW-NASB-093	425882.1278	4861478.947	57.6	57.4	TRANSITION2	Y
MW-NASB-093	425882.1278	4861478.947	57.4	47.4	CLAY	Y
MW-NASB-094	425880.4451	4861463.006	75.4	64.9	UPPER SAND	Y
MW-NASB-094	425880.4451	4861463.006	64.9	64.7	TRANSITION	Y
MW-NASB-094	425880.4451	4861463.006	64.7	64.5	LOWER SAND	Y
MW-NASB-094	425880.4451	4861463.006	64.5	64.3	TRANSITION2	Y
MW-NASB-094	425880.4451	4861463.006	64.3	53.4	CLAY	Y
MW-NASB-095	425851.0476	4861453.223	76.8	63.9	UPPER SAND	Y
MW-NASB-095	425851.0476	4861453.223	63.9	63.7	TRANSITION	Y
MW-NASB-095	425851.0476	4861453.223	63.7	63.5	LOWER SAND	Y
MW-NASB-095	425851.0476	4861453.223	63.5	63.3	TRANSITION2	Y
MW-NASB-095	425851.0476	4861453.223	63.3	59.8	CLAY	Y
MW-NASB-096	425871.4456	4861375.542	71.7	63.2	UPPER SAND	N
MW-NASB-096	425871.4456	4861375.542	-999	-999	TRANSITION	N
MW-NASB-096	425871.4456	4861375.542	-999	-999	LOWER SAND	N
MW-NASB-096	425871.4456	4861375.542	-999	-999	TRANSITION2	N
MW-NASB-096	425871.4456	4861375.542	63.2	59.7	CLAY	N
MW-NASB-204	425339.0463	4860498.347	59.3	47.3	UPPER SAND	Y
MW-NASB-204	425339.0463	4860498.347	47.3	40.7	TRANSITION	Y
MW-NASB-204	425339.0463	4860498.347	40.7	40.5	LOWER SAND	Y
MW-NASB-204	425339.0463	4860498.347	40.5	40.3	TRANSITION2	Y
MW-NASB-204	425339.0463	4860498.347	40.3	39.3	CLAY	Y
MW-NASB-225	425415.1379	4860631.546	64.95	49.95	UPPER SAND	N
MW-NASB-225	425415.1379	4860631.546	-999	-999	TRANSITION	N
MW-NASB-225	425415.1379	4860631.546	-999	-999	LOWER SAND	N
MW-NASB-225	425415.1379	4860631.546	-999	-999	TRANSITION2	N
MW-NASB-226	425397.4917	4860606.19	62.57	48.57	UPPER SAND	Y
MW-NASB-226	425397.4917	4860606.19	48.57	-999	TRANSITION	Y
MW-NASB-226	425397.4917	4860606.19	-999	-999	LOWER SAND	Y
MW-NASB-226	425397.4917	4860606.19	-999	-999	TRANSITION2	Y
MW-NASB-227	425341.8468	4860294.988	55.7	43.7	UPPER SAND	Y
MW-NASB-227	425341.8468	4860294.988	43.7	18.1	TRANSITION	Y
MW-NASB-227	425341.8468	4860294.988	18.1	17.9	LOWER SAND	Y
MW-NASB-227	425341.8468	4860294.988	17.9	17.7	TRANSITION2	Y
MW-NASB-227	425341.8468	4860294.988	17.7	13.7	CLAY	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
MW-NASB-228	425900.8713	4861467.394	72.4	65.4	UPPER SAND	Y
MW-NASB-228	425900.8713	4861467.394	65.4	65.2	TRANSITION	Y
MW-NASB-228	425900.8713	4861467.394	65.2	65	LOWER SAND	Y
MW-NASB-228	425900.8713	4861467.394	65	64.8	TRANSITION2	Y
MW-NASB-228	425900.8713	4861467.394	64.8	62.4	CLAY	Y
P-132	426074.5359	4859908.635	39.7	10.7	UPPER SAND	N
P-132	426074.5359	4859908.635	10.7	-52.3	TRANSITION	N
P-132	426074.5359	4859908.635	-999	-999	LOWER SAND	N
P-132	426074.5359	4859908.635	-999	-999	TRANSITION2	N
SB-B-01	425437.8538	4858931.779	34.58	-5	UPPER SAND	Y
SB-B-01	425437.8538	4858931.779	-5	-35	TRANSITION	Y
SB-B-01	425437.8538	4858931.779	-35	-51.5	LOWER SAND	Y
SB-B-01	425437.8538	4858931.779	-51.5	-63	TRANSITION2	Y
SB-B-01	425437.8538	4858931.779	-63	-112.4	CLAY	Y
SB-B-01	425437.8538	4858931.779	-112.4	-999	BEDROCKorTILL	Y
SB-B-02	425531.3007	4858899.378	31.03	7.5	UPPER SAND	Y
SB-B-02	425531.3007	4858899.378	7.5	-35	TRANSITION	Y
SB-B-02	425531.3007	4858899.378	-35	-57.5	LOWER SAND	Y
SB-B-02	425531.3007	4858899.378	-57.5	-67.5	TRANSITION2	Y
SB-B-02	425531.3007	4858899.378	-67.5	-999	CLAY	Y
SB-B-03	425626.2125	4858886.258	23.64	5	UPPER SAND	Y
SB-B-03	425626.2125	4858886.258	5	-2.1	TRANSITION	Y
SB-B-03	425626.2125	4858886.258	-999	-999	LOWER SAND	Y
SB-B-03	425626.2125	4858886.258	-999	-999	TRANSITION2	Y
SB-B-03	425626.2125	4858886.258	-2.5	-65.36	CLAY	Y
SB-B-03	425626.2125	4858886.258	-65.36	-999	BEDROCKorTILL	Y
SB-B-04	425479.6344	4858729.405	16.21	3	UPPER SAND	Y
SB-B-04	425479.6344	4858729.405	3	-48	TRANSITION	Y
SB-B-04	425479.6344	4858729.405	-48	-66	LOWER SAND	Y
SB-B-04	425479.6344	4858729.405	-66	-72	TRANSITION2	Y
SB-B-04	425479.6344	4858729.405	-72	-120	CLAY	Y
SB-B-04	425479.6344	4858729.405	-120	-999	BEDROCKorTILL	Y
SB-B-05	425495.8458	4858735.34	16.87	3.5	UPPER SAND	Y
SB-B-05	425495.8458	4858735.34	3.5	-46	TRANSITION	Y
SB-B-05	425495.8458	4858735.34	-46	-57	LOWER SAND	Y
SB-B-05	425495.8458	4858735.34	-57	-71	TRANSITION2	Y
SB-B-05	425495.8458	4858735.34	-71	-999	CLAY	Y
SB-B-06	425560.4532	4858757.25	16.68	13	UPPER SAND	Y
SB-B-06	425560.4532	4858757.25	13	-41.6	TRANSITION	Y
SB-B-06	425560.4532	4858757.25	-41.6	-41.8	LOWER SAND	Y
SB-B-06	425560.4532	4858757.25	-41.8	-42	TRANSITION2	Y
SB-B-06	425560.4532	4858757.25	-42	-999	CLAY	Y
SB-B-07	425580.989	4858769.516	17.5	13	UPPER SAND	Y
SB-B-07	425580.989	4858769.516	13	-36.6	TRANSITION	Y
SB-B-07	425580.989	4858769.516	-36.6	-36.8	LOWER SAND	Y
SB-B-07	425580.989	4858769.516	-36.8	-37	TRANSITION2	Y
SB-B-07	425580.989	4858769.516	-37	-77	CLAY	Y
SB-B-07	425580.989	4858769.516	-77	-999	BEDROCKorTILL	Y
Golf Well 2	424154.0055	4858384.01	-18.20	-999.00	BEDROCKorTILL	Y
Golf Well 2	424154.0055	4858384.01	38.80	-18.20	CLAY	Y
Golf Well 2	424154.0055	4858384.01	58.80	40.30	UPPER SAND	Y
Golf Well 2	424154.0055	4858384.01	40.30	39.80	TRANSITION	Y
Golf Well 2	424154.0055	4858384.01	39.80	39.30	LOWER SAND	Y
Golf Well 2	424154.0055	4858384.01	39.30	38.80	TRANSITION2	Y
SBEC-01	424140.9255	4858182.11	-12.40	-999.00	BEDROCKorTILL	Y
SBEC-01	424140.9255	4858182.11	20.50	-12.40	CLAY	Y
SBEC-01	424140.9255	4858182.11	49.60	22.00	UPPER SAND	Y
SBEC-01	424140.9255	4858182.11	22.00	21.50	TRANSITION	Y
SBEC-01	424140.9255	4858182.11	21.50	21.00	LOWER SAND	Y
SBEC-01	424140.9255	4858182.11	21.00	20.50	TRANSITION2	Y
SBEC-02	424202.1572	4857955.68	-11.60	-999.00	BEDROCKorTILL	Y
SBEC-02	424202.1572	4857955.68	11.40	-11.60	CLAY	Y
SBEC-02	424202.1572	4857955.68	41.90	12.90	UPPER SAND	Y
SBEC-02	424202.1572	4857955.68	12.90	12.40	TRANSITION	Y
SBEC-02	424202.1572	4857955.68	12.40	11.90	LOWER SAND	Y
SBEC-02	424202.1572	4857955.68	11.90	11.40	TRANSITION2	Y
SBEC-03	424421.4715	4857811.438	-0.40	-999.00	BEDROCKorTILL	Y
SBEC-03	424421.4715	4857811.438	23.00	-0.40	CLAY	Y
SBEC-03	424421.4715	4857811.438	41.00	24.50	UPPER SAND	Y
SBEC-03	424421.4715	4857811.438	24.50	24.00	TRANSITION	Y
SBEC-03	424421.4715	4857811.438	24.00	23.50	LOWER SAND	Y
SBEC-03	424421.4715	4857811.438	23.50	23.00	TRANSITION2	Y
SBEC-04	424520.3036	4857592.79	12.70	-999.00	BEDROCKorTILL	Y
SBEC-04	424520.3036	4857592.79	41.70	12.70	CLAY	Y
SBEC-04	424520.3036	4857592.79	47.20	43.20	UPPER SAND	Y
SBEC-04	424520.3036	4857592.79	43.20	42.70	TRANSITION	Y
SBEC-04	424520.3036	4857592.79	42.70	42.20	LOWER SAND	Y
SBEC-04	424520.3036	4857592.79	42.20	41.70	TRANSITION2	Y
SBEC-05	424414.4341	4857815.351	-0.10	-999.00	BEDROCKorTILL	Y
SBEC-05	424414.4341	4857815.351	26.80	-0.10	CLAY	Y
SBEC-05	424414.4341	4857815.351	40.80	28.30	UPPER SAND	Y
SBEC-05	424414.4341	4857815.351	28.30	27.80	TRANSITION	Y
SBEC-05	424414.4341	4857815.351	27.80	27.30	LOWER SAND	Y
SBEC-05	424414.4341	4857815.351	27.30	26.80	TRANSITION2	Y
SBEC-06	424293.3657	4857862.331	17.70	-999.00	BEDROCKorTILL	Y
SBEC-06	424293.3657	4857862.331	34.10	17.70	CLAY	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
SBEC-06	424293.3657	4857862.331	46.90	35.60	UPPER SAND	Y
SBEC-06	424293.3657	4857862.331	35.60	35.10	TRANSITION	Y
SBEC-06	424293.3657	4857862.331	35.10	34.60	LOWER SAND	Y
SBEC-06	424293.3657	4857862.331	34.60	34.10	TRANSITION2	Y
SBEC-07	424236.4731	4857894.189	34.00	- 999.00	BEDROCKorTILL	Y
SBEC-07	424236.4731	4857894.189	40.40	34.00	CLAY	Y
SBEC-07	424236.4731	4857894.189	45.80	41.90	UPPER SAND	Y
SBEC-07	424236.4731	4857894.189	41.90	41.40	TRANSITION	Y
SBEC-07	424236.4731	4857894.189	41.40	40.90	LOWER SAND	Y
SBEC-07	424236.4731	4857894.189	40.90	40.40	TRANSITION2	Y
SBEC-08	424216.3708	4857925.257	13.70	- 999.00	BEDROCKorTILL	Y
SBEC-08	424216.3708	4857925.257	31.70	13.70	CLAY	Y
SBEC-08	424216.3708	4857925.257	44.40	33.20	UPPER SAND	Y
SBEC-08	424216.3708	4857925.257	33.20	32.70	TRANSITION	Y
SBEC-08	424216.3708	4857925.257	32.70	32.20	LOWER SAND	Y
SBEC-08	424216.3708	4857925.257	32.20	31.70	TRANSITION2	Y
SBEC-09	424173.9032	4858026.669	10.40	- 999.00	BEDROCKorTILL	Y
SBEC-09	424173.9032	4858026.669	28.40	10.40	CLAY	Y
SBEC-09	424173.9032	4858026.669	44.80	29.90	UPPER SAND	Y
SBEC-09	424173.9032	4858026.669	29.90	29.40	TRANSITION	Y
SBEC-09	424173.9032	4858026.669	29.40	28.90	LOWER SAND	Y
SBEC-09	424173.9032	4858026.669	28.90	28.40	TRANSITION2	Y
SBEC-10	424157.3407	4858104.405	-4.30	- 999.00	BEDROCKorTILL	Y
SBEC-10	424157.3407	4858104.405	27.80	-4.30	CLAY	Y
SBEC-10	424157.3407	4858104.405	48.50	29.30	UPPER SAND	Y
SBEC-10	424157.3407	4858104.405	29.30	28.80	TRANSITION	Y
SBEC-10	424157.3407	4858104.405	28.80	28.30	LOWER SAND	Y
SBEC-10	424157.3407	4858104.405	28.30	27.80	TRANSITION2	Y
SBEC-11	424185.5917	4857990.979	3.80	- 999.00	BEDROCKorTILL	Y
SBEC-11	424185.5917	4857990.979	25.90	3.80	CLAY	Y
SBEC-11	424185.5917	4857990.979	43.70	27.40	UPPER SAND	Y
SBEC-11	424185.5917	4857990.979	27.40	26.90	TRANSITION	Y
SBEC-11	424185.5917	4857990.979	26.90	26.40	LOWER SAND	Y
SBEC-11	424185.5917	4857990.979	26.40	25.90	TRANSITION2	Y
SBEC-12	424427.8082	4857808.697	-0.10	- 999.00	BEDROCKorTILL	Y
SBEC-12	424427.8082	4857808.697	24.50	-0.10	CLAY	Y
SBEC-12	424427.8082	4857808.697	41.40	26.00	UPPER SAND	Y
SBEC-12	424427.8082	4857808.697	26.00	25.50	TRANSITION	Y
SBEC-12	424427.8082	4857808.697	25.50	25.00	LOWER SAND	Y
SBEC-12	424427.8082	4857808.697	25.00	24.50	TRANSITION2	Y
SBEC-13	424434.526	4857805.446	-10.20	- 999.00	BEDROCKorTILL	Y
SBEC-13	424434.526	4857805.446	24.70	-10.20	CLAY	Y
SBEC-13	424434.526	4857805.446	41.90	26.20	UPPER SAND	Y
SBEC-13	424434.526	4857805.446	26.20	25.70	TRANSITION	Y
SBEC-13	424434.526	4857805.446	25.70	25.20	LOWER SAND	Y
SBEC-13	424434.526	4857805.446	25.20	24.70	TRANSITION2	Y
SBEC-14	424448.75	4857800.04	-10.50	- 999.00	BEDROCKorTILL	Y
SBEC-14	424448.75	4857800.04	27.80	-10.50	CLAY	Y
SBEC-14	424448.75	4857800.04	42.60	29.30	UPPER SAND	Y
SBEC-14	424448.75	4857800.04	29.30	28.80	TRANSITION	Y
SBEC-14	424448.75	4857800.04	28.80	28.30	LOWER SAND	Y
SBEC-14	424448.75	4857800.04	28.30	27.80	TRANSITION2	Y
SBEC-15	424462.2985	4857793.929	-3.50	- 999.00	BEDROCKorTILL	Y
SBEC-15	424462.2985	4857793.929	31.80	-3.50	CLAY	Y
SBEC-15	424462.2985	4857793.929	43.70	33.30	UPPER SAND	Y
SBEC-15	424462.2985	4857793.929	33.30	32.80	TRANSITION	Y
SBEC-15	424462.2985	4857793.929	32.80	32.30	LOWER SAND	Y
SBEC-15	424462.2985	4857793.929	32.30	31.80	TRANSITION2	Y
SBEC-16	424504.4469	4857666.747	-6.00	- 999.00	BEDROCKorTILL	Y
SBEC-16	424504.4469	4857666.747	35.00	-6.00	CLAY	Y
SBEC-16	424504.4469	4857666.747	47.00	36.50	UPPER SAND	Y
SBEC-16	424504.4469	4857666.747	36.50	36.00	TRANSITION	Y
SBEC-16	424504.4469	4857666.747	36.00	35.50	LOWER SAND	Y
SBEC-16	424504.4469	4857666.747	35.50	35.00	TRANSITION2	Y
SBEC-17	424491.7695	4857729.484	-0.70	- 999.00	BEDROCKorTILL	Y
SBEC-17	424491.7695	4857729.484	32.80	-0.70	CLAY	Y
SBEC-17	424491.7695	4857729.484	45.70	34.30	UPPER SAND	Y
SBEC-17	424491.7695	4857729.484	34.30	33.80	TRANSITION	Y
SBEC-17	424491.7695	4857729.484	33.80	33.30	LOWER SAND	Y
SBEC-17	424491.7695	4857729.484	33.30	32.80	TRANSITION2	Y
SBEC-18	424353.7758	4857838.991	16.00	- 999.00	BEDROCKorTILL	Y
SBEC-18	424353.7758	4857838.991	33.50	16.00	CLAY	Y
SBEC-18	424353.7758	4857838.991	45.90	35.00	UPPER SAND	Y
SBEC-18	424353.7758	4857838.991	35.00	34.50	TRANSITION	Y
SBEC-18	424353.7758	4857838.991	34.50	34.00	LOWER SAND	Y
SBEC-18	424353.7758	4857838.991	34.00	33.50	TRANSITION2	Y
SBEC-19	424125.6917	4858240.315	-24.00	- 999.00	BEDROCKorTILL	Y
SBEC-19	424125.6917	4858240.315	16.00	-24.00	CLAY	Y
SBEC-19	424125.6917	4858240.315	52.40	17.50	UPPER SAND	Y
SBEC-19	424125.6917	4858240.315	17.50	17.00	TRANSITION	Y
SBEC-19	424125.6917	4858240.315	17.00	16.50	LOWER SAND	Y
SBEC-19	424125.6917	4858240.315	16.50	16.00	TRANSITION2	Y
SBEC-20	424957.1293	4857415.502	-26.00	-	BEDROCKorTILL	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
				999.00		
SBEC-20	424957.1293	4857415.502	8.50	-26.00	CLAY	Y
SBEC-20	424957.1293	4857415.502	18.50	10.00	UPPER SAND	Y
SBEC-20	424957.1293	4857415.502	10.00	9.50	TRANSITION	Y
SBEC-20	424957.1293	4857415.502	9.50	9.00	LOWER SAND	Y
SBEC-20	424957.1293	4857415.502	9.00	8.50	TRANSITION2	Y
SBEC-21	424965.748	4857399.605	-24.50	999.00	BEDROCKorTILL	Y
SBEC-21	424965.748	4857399.605	8.30	-24.50	CLAY	Y
SBEC-21	424965.748	4857399.605	17.90	9.80	UPPER SAND	Y
SBEC-21	424965.748	4857399.605	9.80	9.30	TRANSITION	Y
SBEC-21	424965.748	4857399.605	9.30	8.80	LOWER SAND	Y
SBEC-21	424965.748	4857399.605	8.80	8.30	TRANSITION2	Y
SBEC-22	424941.5156	4857476.963	-24.90	999.00	BEDROCKorTILL	Y
SBEC-22	424941.5156	4857476.963	14.00	-24.90	CLAY	Y
SBEC-22	424941.5156	4857476.963	25.90	15.50	UPPER SAND	Y
SBEC-22	424941.5156	4857476.963	15.50	15.00	TRANSITION	Y
SBEC-22	424941.5156	4857476.963	15.00	14.50	LOWER SAND	Y
SBEC-22	424941.5156	4857476.963	14.50	14.00	TRANSITION2	Y
SBEC-23	424912.0915	4857535.437	-21.10	999.00	BEDROCKorTILL	Y
SBEC-23	424912.0915	4857535.437	21.20	-21.10	CLAY	Y
SBEC-23	424912.0915	4857535.437	31.30	22.70	UPPER SAND	Y
SBEC-23	424912.0915	4857535.437	22.70	22.20	TRANSITION	Y
SBEC-23	424912.0915	4857535.437	22.20	21.70	LOWER SAND	Y
SBEC-23	424912.0915	4857535.437	21.70	21.20	TRANSITION2	Y
SBEC-24	424842.5595	4857706.492	-13.20	999.00	BEDROCKorTILL	Y
SBEC-24	424842.5595	4857706.492	30.80	-13.20	CLAY	Y
SBEC-24	424842.5595	4857706.492	41.90	32.30	UPPER SAND	Y
SBEC-24	424842.5595	4857706.492	32.30	31.80	TRANSITION	Y
SBEC-24	424842.5595	4857706.492	31.80	31.30	LOWER SAND	Y
SBEC-24	424842.5595	4857706.492	31.30	30.80	TRANSITION2	Y
SBEC-25	424757.1841	4857789.483	-1.20	999.00	BEDROCKorTILL	Y
SBEC-25	424757.1841	4857789.483	34.50	-1.20	CLAY	Y
SBEC-25	424757.1841	4857789.483	44.00	36.00	UPPER SAND	Y
SBEC-25	424757.1841	4857789.483	36.00	35.50	TRANSITION	Y
SBEC-25	424757.1841	4857789.483	35.50	35.00	LOWER SAND	Y
SBEC-25	424757.1841	4857789.483	35.00	34.50	TRANSITION2	Y
SM-01	420923.4688	4860541	88	53	UPPER SAND	Y
SM-01	420923.4688	4860541	53	52.8	TRANSITION	Y
SM-01	420923.4688	4860541	52.8	52.6	LOWER SAND	Y
SM-01	420923.4688	4860541	52.6	18	TRANSITION2	Y
SM-01	420923.4688	4860541	18	-72	CLAY	Y
SM-01	420923.4688	4860541	-72	-999	BEDROCKorTILL	Y

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
SM-04	421822.4375	4860057	82	44.5	UPPER SAND	Y
SM-04	421822.4375	4860057	44.5	44.3	TRANSITION	Y
SM-04	421822.4375	4860057	44.3	44.1	LOWER SAND	Y
SM-04	421822.4375	4860057	44.1	7	TRANSITION2	Y
SM-04	421822.4375	4860057	7	-60	CLAY	Y
SM-04	421822.4375	4860057	-60	-999	BEDROCKorTILL	Y
SM-05	422436.125	4861008	71	34.5	UPPER SAND	Y
SM-05	422436.125	4861008	34.5	34.3	TRANSITION	Y
SM-05	422436.125	4861008	34.3	34.1	LOWER SAND	Y
SM-05	422436.125	4861008	34.1	-2	TRANSITION2	Y
SM-05	422436.125	4861008	-2	-63	CLAY	Y
SM-05	422436.125	4861008	-63	-999	BEDROCKorTILL	Y
SM-06	423075.7813	4860757	70	41.5	UPPER SAND	Y
SM-06	423075.7813	4860757	41.5	41.3	TRANSITION	Y
SM-06	423075.7813	4860757	41.3	41.1	LOWER SAND	Y
SM-06	423075.7813	4860757	41.1	13	TRANSITION2	Y
SM-06	423075.7813	4860757	13	-1	CLAY	Y
SM-06	423075.7813	4860757	-1	-999	BEDROCKorTILL	Y
SM-07	423525.25	4859953.5	71	48.5	UPPER SAND	Y
SM-07	423525.25	4859953.5	48.5	48.3	TRANSITION	Y
SM-07	423525.25	4859953.5	48.3	48.1	LOWER SAND	Y
SM-07	423525.25	4859953.5	48.1	26	TRANSITION2	Y
SM-07	423525.25	4859953.5	26	-26	CLAY	Y
SM-07	423525.25	4859953.5	-26	-999	BEDROCKorTILL	Y
SM-08	423836.4375	4859348	109	108.8	UPPER SAND	Y
SM-08	423836.4375	4859348	108.8	108.6	TRANSITION	Y
SM-08	423836.4375	4859348	108.6	108.4	LOWER SAND	Y
SM-08	423836.4375	4859348	108.4	108.2	TRANSITION2	Y
SM-08	423836.4375	4859348	108.2	108	CLAY	Y
SM-08	423836.4375	4859348	108	-999	BEDROCKorTILL	Y
SM-09	423914.2188	4859210	120	119.8	UPPER SAND	Y
SM-09	423914.2188	4859210	119.8	119.6	TRANSITION	Y
SM-09	423914.2188	4859210	119.6	119.4	LOWER SAND	Y
SM-09	423914.2188	4859210	119.4	119.2	TRANSITION2	Y
SM-09	423914.2188	4859210	119.2	119	CLAY	Y
SM-09	423914.2188	4859210	119	-999	BEDROCKorTILL	Y
SM-10	423663.5625	4859063	108	107.8	UPPER SAND	Y
SM-10	423663.5625	4859063	107.8	107.6	TRANSITION	Y
SM-10	423663.5625	4859063	107.6	107.4	LOWER SAND	Y
SM-10	423663.5625	4859063	107.4	107.2	TRANSITION2	Y
SM-10	423663.5625	4859063	107.2	107	CLAY	Y
SM-10	423663.5625	4859063	107	-999	BEDROCKorTILL	Y
SM-11	423620.3438	4858942	102	101.8	UPPER SAND	Y
SM-11	423620.3438	4858942	101.8	101.6	TRANSITION	Y
SM-11	423620.3438	4858942	101.6	101.4	LOWER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV_ TOP	ELEV_ BASE	UNIT	USE
SM-11	423620.3438	4858942	101.4	101.2	TRANSITION2	Y
SM-11	423620.3438	4858942	101.2	101	CLAY	Y
SM-11	423620.3438	4858942	101	-999	BEDROCKorTILL	Y
SM-12	423758.625	4858570.5	96	95.8	UPPER SAND	Y
SM-12	423758.625	4858570.5	95.8	95.6	TRANSITION	Y
SM-12	423758.625	4858570.5	95.6	95.4	LOWER SAND	Y
SM-12	423758.625	4858570.5	95.4	95.2	TRANSITION2	Y
SM-12	423758.625	4858570.5	95.2	95	CLAY	Y
SM-12	423758.625	4858570.5	95	-999	BEDROCKorTILL	Y
SM-13	423845.0625	4861639	75	60	UPPER SAND	Y
SM-13	423845.0625	4861639	60	59.8	TRANSITION	Y
SM-13	423845.0625	4861639	59.8	59.6	LOWER SAND	Y
SM-13	423845.0625	4861639	59.6	45	TRANSITION2	Y
SM-13	423845.0625	4861639	45	35	CLAY	Y
SM-13	423845.0625	4861639	35	-999	BEDROCKorTILL	Y
SM-16	423058.5	4862105.5	73	26	UPPER SAND	Y
SM-16	423058.5	4862105.5	26	25.8	TRANSITION	Y
SM-16	423058.5	4862105.5	25.8	25.6	LOWER SAND	Y
SM-16	423058.5	4862105.5	25.6	-21	TRANSITION2	Y
SM-16	423058.5	4862105.5	-21	-83	CLAY	Y
SM-16	423058.5	4862105.5	-83	-999	BEDROCKorTILL	Y
SM-17	421969.375	4862417	70	65	UPPER SAND	Y
SM-17	421969.375	4862417	65	64.8	TRANSITION	Y
SM-17	421969.375	4862417	64.8	64.6	LOWER SAND	Y
SM-17	421969.375	4862417	64.6	60	TRANSITION2	Y
SM-17	421969.375	4862417	60	18	CLAY	Y
SM-17	421969.375	4862417	18	-999	BEDROCKorTILL	Y
MW-MB-01-C	425795.45	4859089.11	17.16	10.66	UPPER SAND	Y
MW-MB-01-C	425795.45	4859089.11	10.66	-31.84	TRANSITION	Y
MW-MB-01-C	425795.45	4859089.11	-31.84	-36.84	LOWER SAND	Y
MW-MB-01-C	425795.45	4859089.11	-36.84	-40.84	TRANSITION2	Y
MW-MB-01-C	425795.45	4859089.11	-40.84	-999	CLAY	Y
MW-MB-02-C	425788.20	4859133.63	11.68	4.93	UPPER SAND	Y
MW-MB-02-C	425788.20	4859133.63	4.93	-31.32	TRANSITION	Y
MW-MB-02-C	425788.20	4859133.63	-31.32	-47.32	LOWER SAND	Y
MW-MB-02-C	425788.20	4859133.63	-47.32	-47.52	TRANSITION2	Y
MW-MB-02-C	425788.20	4859133.63	-47.52	-999	CLAY	Y
MW-MB-03-C	425806.02	4859291.48	23.76	15.76	UPPER SAND	Y
MW-MB-03-C	425806.02	4859291.48	15.76	-23.44	TRANSITION	Y
MW-MB-03-C	425806.02	4859291.48	-23.44	-32.24	LOWER SAND	Y
MW-MB-03-C	425806.02	4859291.48	-32.24	-32.44	TRANSITION2	Y
MW-MB-03-C	425806.02	4859291.48	-32.44	-999	CLAY	Y
MW-MB-04-C	425833.13	4859034.74	17.52	17.32	UPPER SAND	Y
MW-MB-04-C	425833.13	4859034.74	17.32	-8.08	TRANSITION	Y
MW-MB-04-C	425833.13	4859034.74	-8.08	-10.78	LOWER SAND	Y
MW-MB-04-C	425833.13	4859034.74	-10.78	-16.48	TRANSITION2	Y
MW-MB-04-C	425833.13	4859034.74	-16.48	-999	CLAY	Y
MW-MB-05-C	425823.65	4859261.20	21.8	13.8	UPPER SAND	Y
MW-MB-05-C	425823.65	4859261.20	13.8	-26	TRANSITION	Y
MW-MB-05-C	425823.65	4859261.20	-26	-32.7	LOWER SAND	Y
MW-MB-05-C	425823.65	4859261.20	-32.7	-33.6	TRANSITION2	Y
MW-MB-05-C	425823.65	4859261.20	-33.6	-999	CLAY	Y
MW-MB-06-C	425835.34	4859208.13	21.83	10.08	UPPER SAND	Y
MW-MB-06-C	425835.34	4859208.13	10.08	-23.67	TRANSITION	Y
MW-MB-06-C	425835.34	4859208.13	-23.67	-25.92	LOWER SAND	Y
MW-MB-06-C	425835.34	4859208.13	-25.92	-26.77	TRANSITION2	Y
MW-MB-06-C	425835.34	4859208.13	-26.77	-999	CLAY	Y
PZ-MB-A1-C	425794.12	4859197.53	9.91	2.91	UPPER SAND	Y
PZ-MB-A1-C	425794.12	4859197.53	2.91	-999	TRANSITION	Y
PZ-MB-A2-C	425814.20	4859195.08	9.09	0.59	UPPER SAND	Y
PZ-MB-A2-C	425814.20	4859195.08	0.59	-999	TRANSITION	Y
PZ-MB-A3-C	425797.83	4859161.69	9.68	1.18	UPPER SAND	Y
PZ-MB-A3-C	425797.83	4859161.69	1.18	-999	TRANSITION	Y
PZ-MB-B1-C	425837.22	4859200.94	19.39	11.89	UPPER SAND	Y
PZ-MB-B1-C	425837.22	4859200.94	11.89	-999	TRANSITION	Y
PZ-MB-B2-C	425839.55	4859176.29	9.63	-0.37	UPPER SAND	Y
PZ-MB-B2-C	425839.55	4859176.29	-0.37	-999	TRANSITION	Y
PZ-MB-B3-C	425840.34	4859164.65	9.33	6.83	UPPER SAND	Y
PZ-MB-B3-C	425840.34	4859164.65	6.83	-999	TRANSITION	Y
PZ-MB-B4-C	425845.15	4859143.74	8.84	-3.16	UPPER SAND	Y
PZ-MB-B4-C	425845.15	4859143.74	-3.16	-999	TRANSITION	Y
PZ-MB-B5-C	425852.95	4859123.62	9.36	-3.14	UPPER SAND	Y
PZ-MB-B5-C	425852.95	4859123.62	-3.14	-999	TRANSITION	Y
PZ-MB-B6-C	425844.31	4859096.33	8.35	3.35	UPPER SAND	Y
PZ-MB-B6-C	425844.31	4859096.33	3.35	-999	TRANSITION	Y
PZ-MB-B7-C	425865.61	4859074.79	8.12	2.62	UPPER SAND	Y
PZ-MB-B7-C	425865.61	4859074.79	2.62	-999	TRANSITION	Y
PZ-MB-C1-C	425810.11	4859162.70	8.87	1.87	UPPER SAND	Y
PZ-MB-C1-C	425810.11	4859162.70	1.87	-999	TRANSITION	Y
PZ-MB-C2-C	425818.81	4859167.05	9.35	-0.65	UPPER SAND	Y
PZ-MB-C2-C	425818.81	4859167.05	-0.65	-999	TRANSITION	Y
PZ-MB-C3-C	425854.84	4859169.08	8.58	4.28	UPPER SAND	Y
PZ-MB-C3-C	425854.84	4859169.08	4.28	-999	TRANSITION	Y
PZ-MB-C4-C	425870.10	4859168.51	8.87	4.87	UPPER SAND	Y
PZ-MB-C4-C	425870.10	4859168.51	4.87	-999	TRANSITION	Y
PZ-MB-O1-C	425839.48	4859155.20	9.25	2.25	UPPER SAND	Y
PZ-MB-O1-C	425839.48	4859155.20	2.25	-999	TRANSITION	Y
PZ-MB-O2-C	425825.93	4859121.78	8.77	3.77	UPPER SAND	Y
PZ-MB-O2-C	425825.93	4859121.78	3.77	-999	TRANSITION	Y
EP-LOG-01	425945.49	4859717.70	37.9	17.9	UPPER SAND	Y

Table A-1 Stratigraphic Contacts Used For Layer Interpolation

Label	X	Y	ELEV TOP	ELEV BASE	UNIT	USE
EP-LOG-01	425945.49	4859717.70	17.9	-24.6	TRANSITION	Y
EP-LOG-01	425945.49	4859717.70	-24.6	-44.3	LOWER SAND	Y
EP-LOG-01	425945.49	4859717.70	-44.3	-44.5	TRANSITION2	Y
EP-LOG-01	425945.49	4859717.70	-44.5	-73.6	CLAY	Y
EP-LOG-01	425945.49	4859717.70	-73.6	-999	BEDROCKorTILL	Y
EP-LOG-02	425850.94	4859770.57	39.5	30.5	UPPER SAND	Y
EP-LOG-02	425850.94	4859770.57	30.5	-14	TRANSITION	Y
EP-LOG-02	425850.94	4859770.57	-14	-18	LOWER SAND	Y
EP-LOG-02	425850.94	4859770.57	-18	-22	TRANSITION2	Y
EP-LOG-02	425850.94	4859770.57	-22	-49.5	CLAY	Y
EP-LOG-02	425850.94	4859770.57	-49.5	-999	BEDROCKorTILL	Y
EP-LOG-03	425915.18	4859640.89	34.3	20.4	UPPER SAND	Y
EP-LOG-03	425915.18	4859640.89	20.4	-20.7	TRANSITION	Y
EP-LOG-03	425915.18	4859640.89	-20.7	-35.7	LOWER SAND	Y
EP-LOG-03	425915.18	4859640.89	-35.7	-38.7	TRANSITION2	Y
EP-LOG-03	425915.18	4859640.89	-38.7	-74.9	CLAY	Y
EP-LOG-03	425915.18	4859640.89	-74.9	-999	BEDROCKorTILL	Y
EP-LOG-04	425947.72	4859876.93	33.7	8.7	UPPER SAND	Y
EP-LOG-04	425947.72	4859876.93	8.7	-25.8	TRANSITION	Y
EP-LOG-04	425947.72	4859876.93	-25.8	-53.4	LOWER SAND	Y
EP-LOG-04	425947.72	4859876.93	-53.4	-53.6	TRANSITION2	Y
EP-LOG-04	425947.72	4859876.93	-53.6	-109.3	CLAY	Y
EP-LOG-04	425947.72	4859876.93	-109.3	-999	BEDROCKorTILL	Y
EP-LOG-05	425688.00	4859522.54	46.1	39.1	UPPER SAND	Y
EP-LOG-05	425688.00	4859522.54	39.1	-0.9	TRANSITION	Y
EP-LOG-05	425688.00	4859522.54	-0.9	-24.7	LOWER SAND	Y
EP-LOG-05	425688.00	4859522.54	-24.7	-24.9	TRANSITION2	Y
EP-LOG-05	425688.00	4859522.54	-24.9	-48.6	CLAY	Y
EP-LOG-05	425688.00	4859522.54	-48.6	-999	BEDROCKorTILL	Y

Elev (Ft MSL)

Fig A-1 Top of Upper Sand/Ground Surface (Model Layer 1) Interpolated Surface

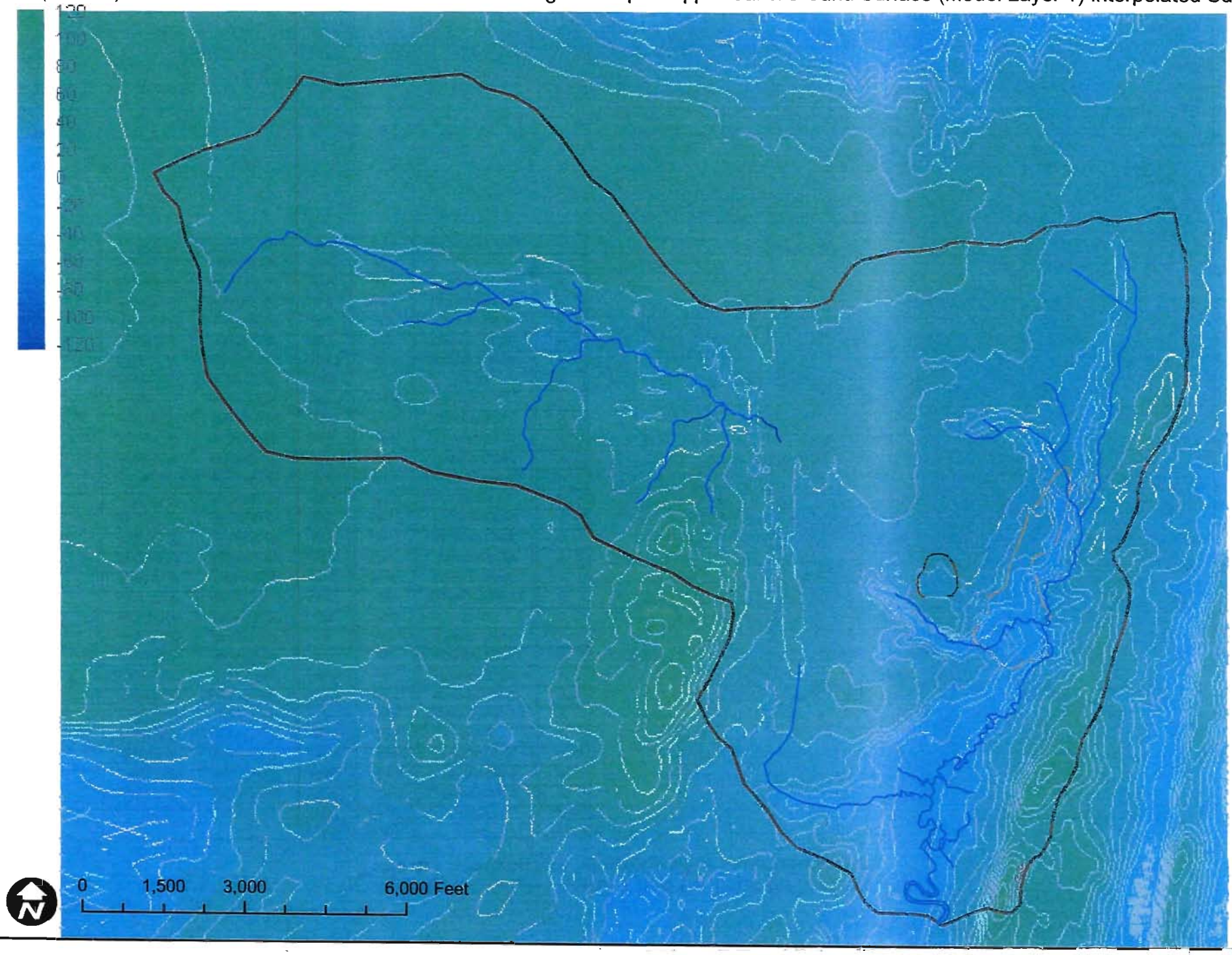


Fig A-2 Top of Transition (Model Layer 2) Interpolated Surface

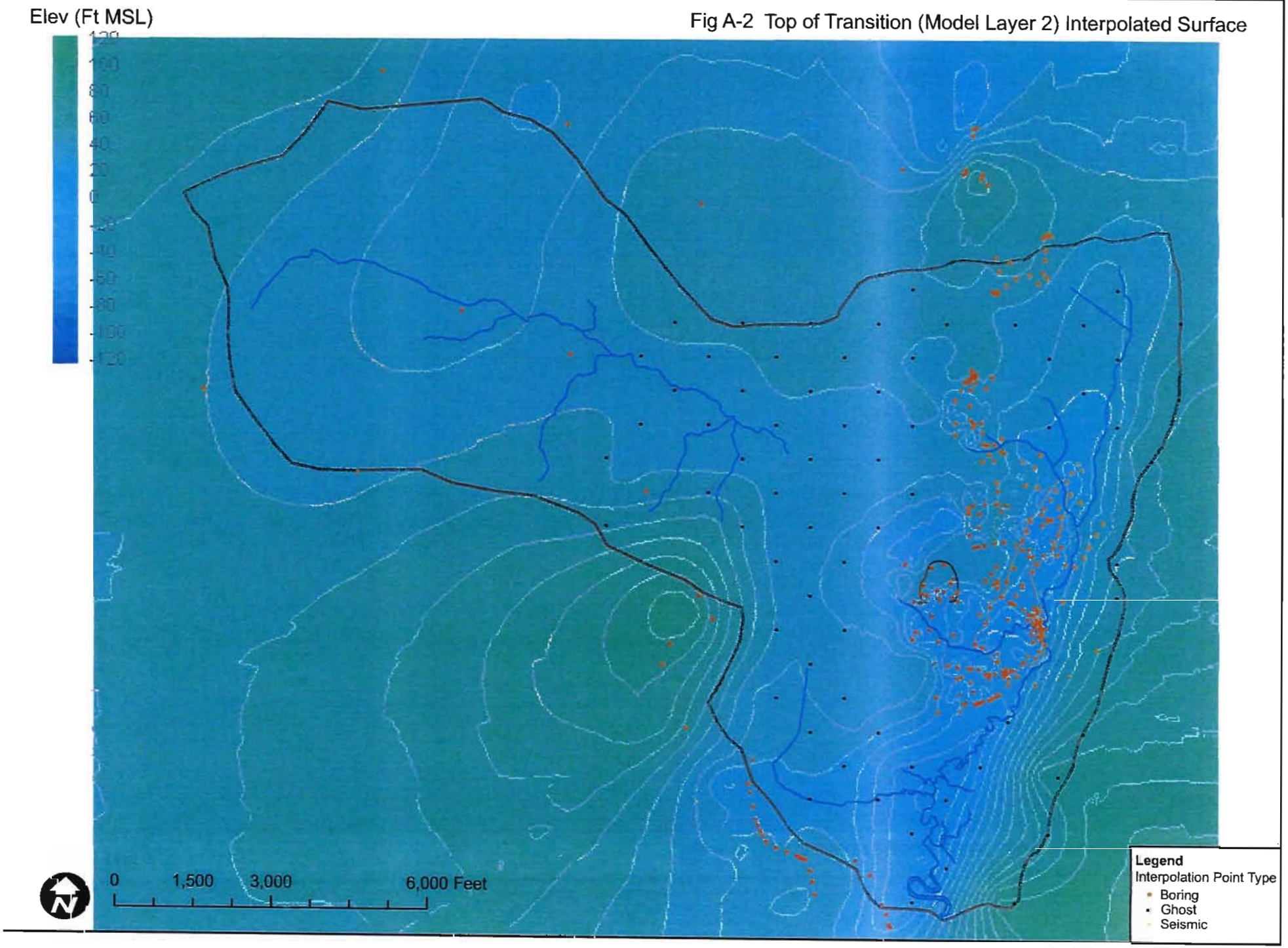


Fig A-3 Top of Lower Sand (Model Layer 4) Interpolated Surface

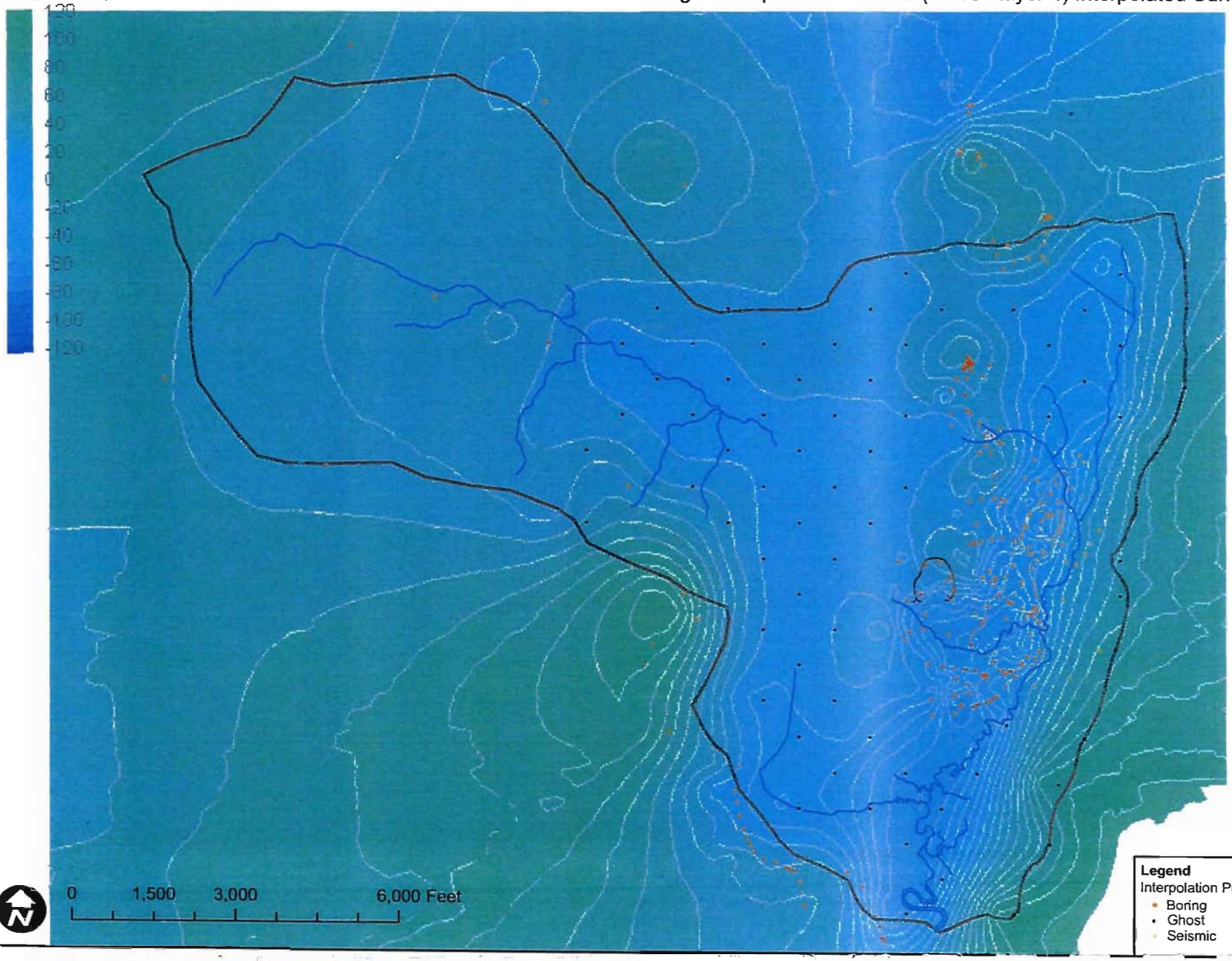


Fig A-4 Top of Transition below Lower Sand (Model Layer 6) Interpolated Surface

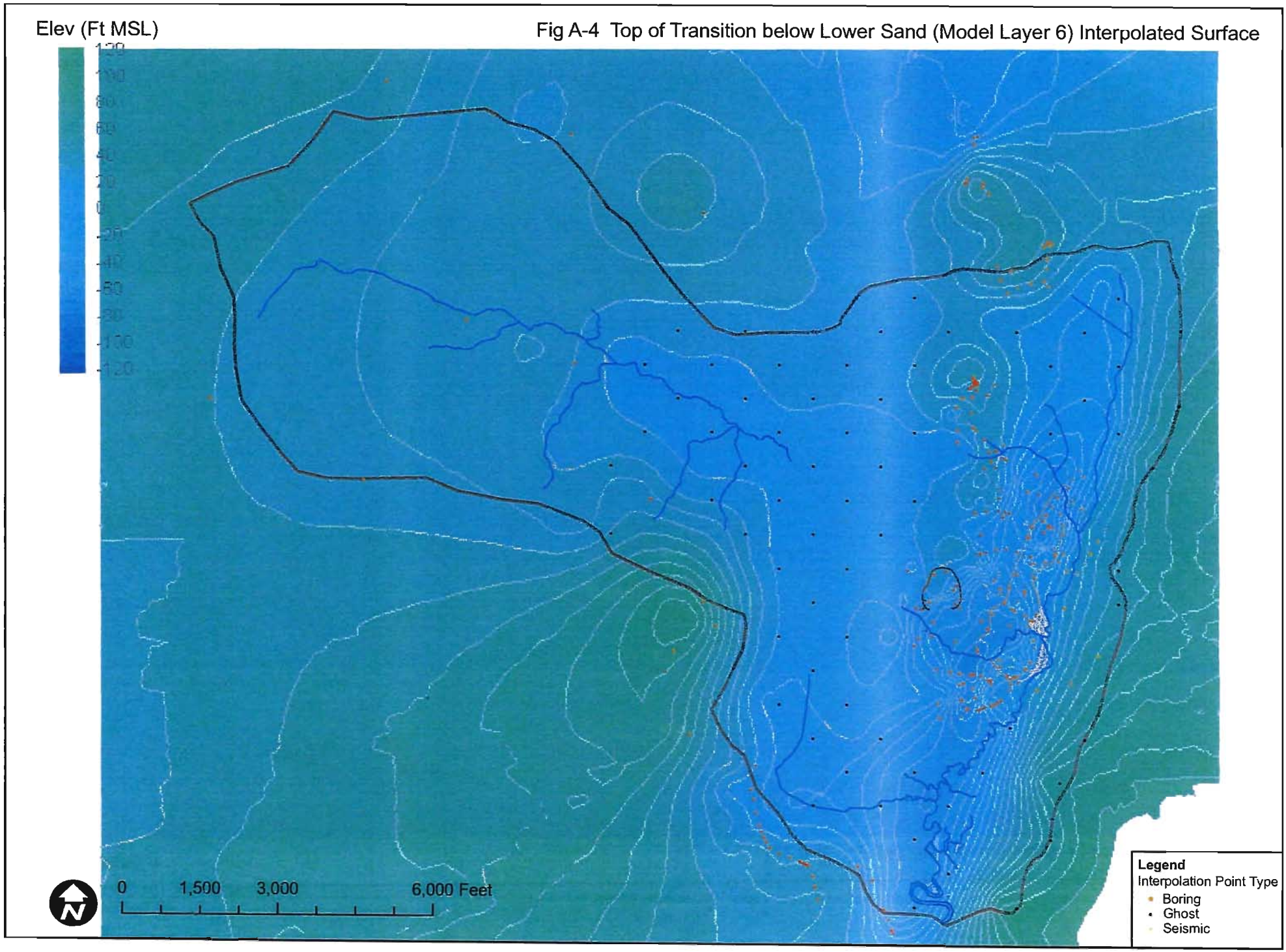


Fig A-5 Top of Clay (Model Layer 7) Interpolated Surface

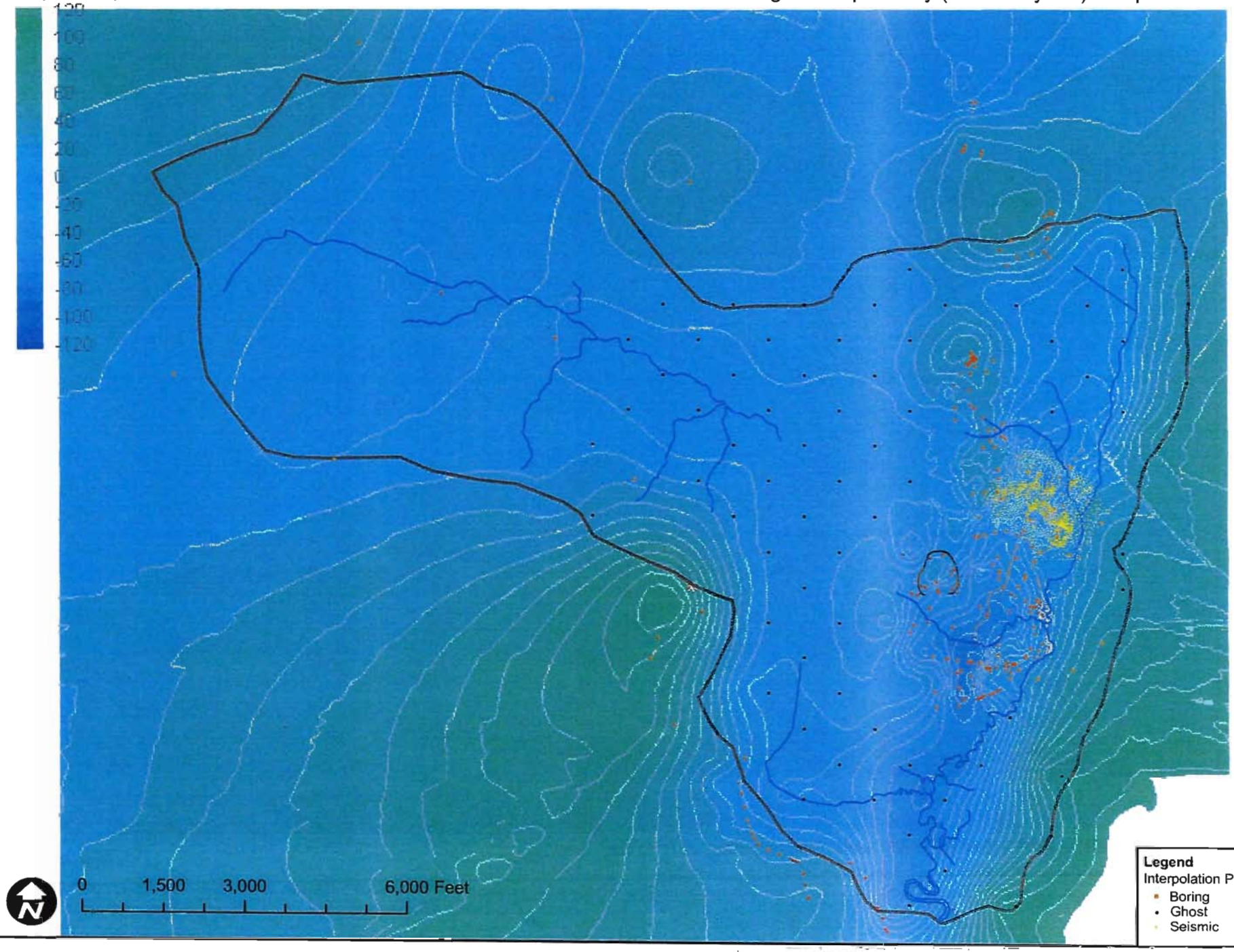


Fig A-6 Top of Till/Bedrock (Model Layer 8) Interpolated Surface

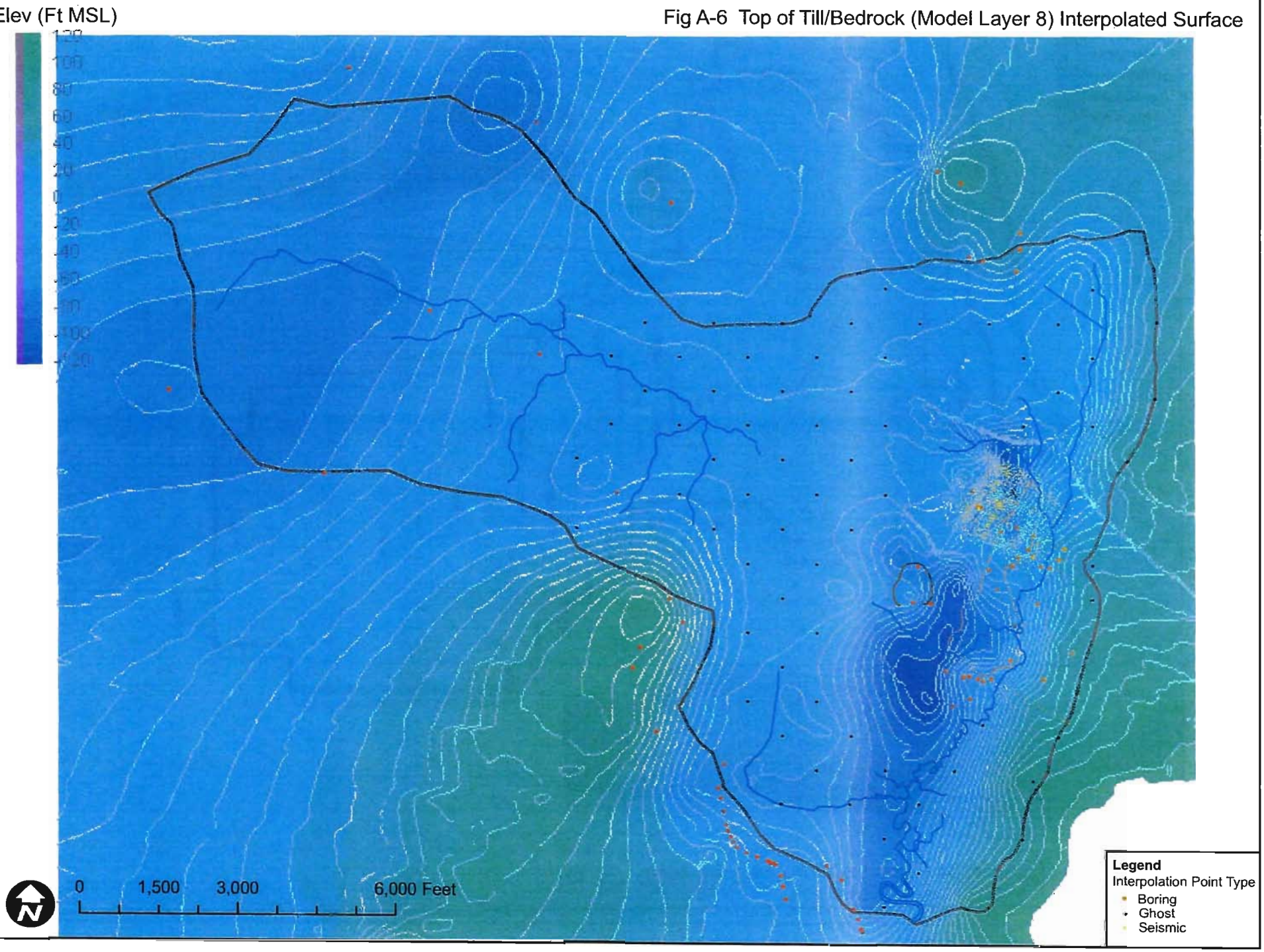


Fig. A-7 Cross-Sections Through Study Area Showing Fixed Model Layers

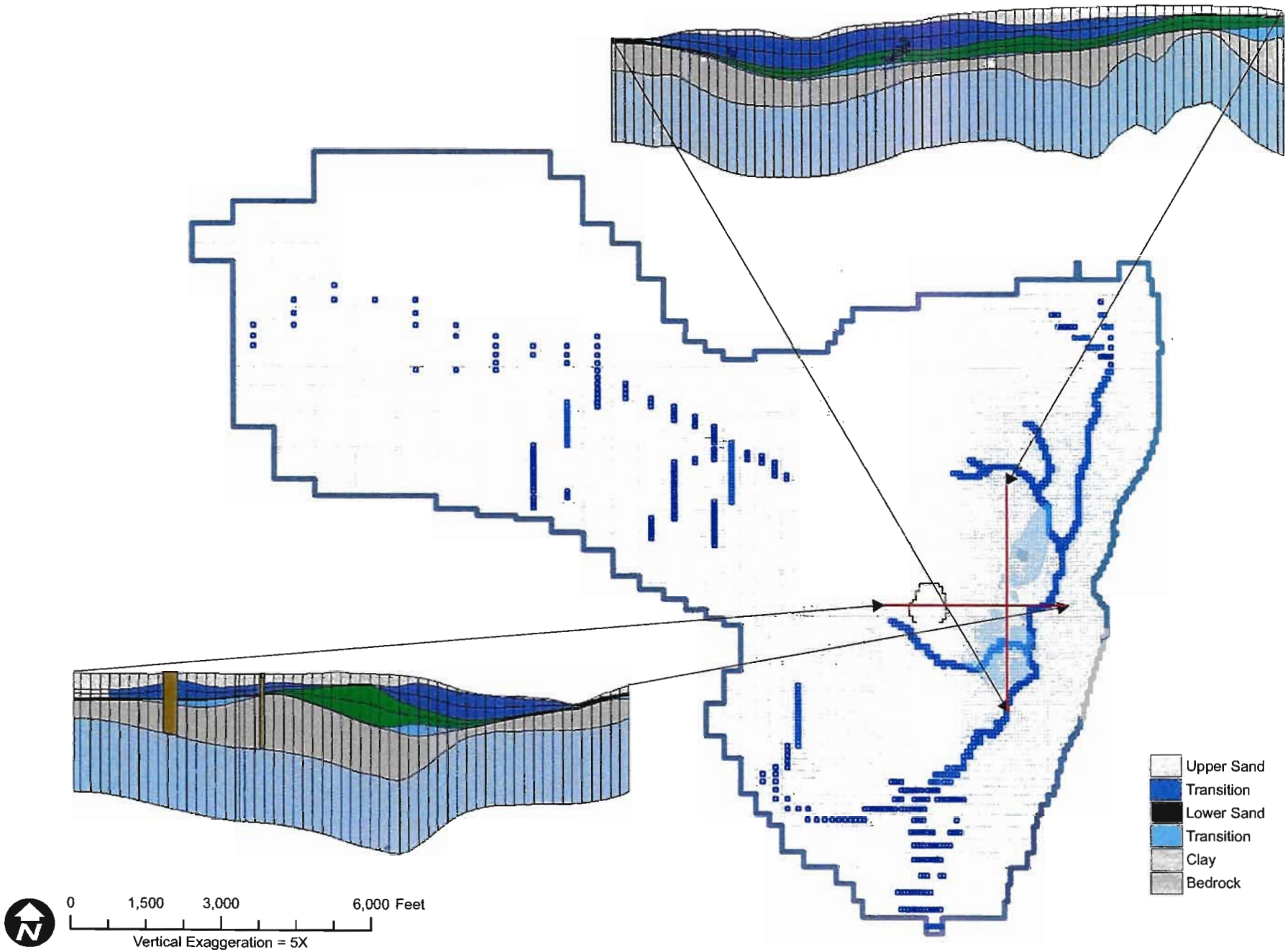


Fig. A-8 Cross-Sections Through Model Domain Showing Fixed Model Layers

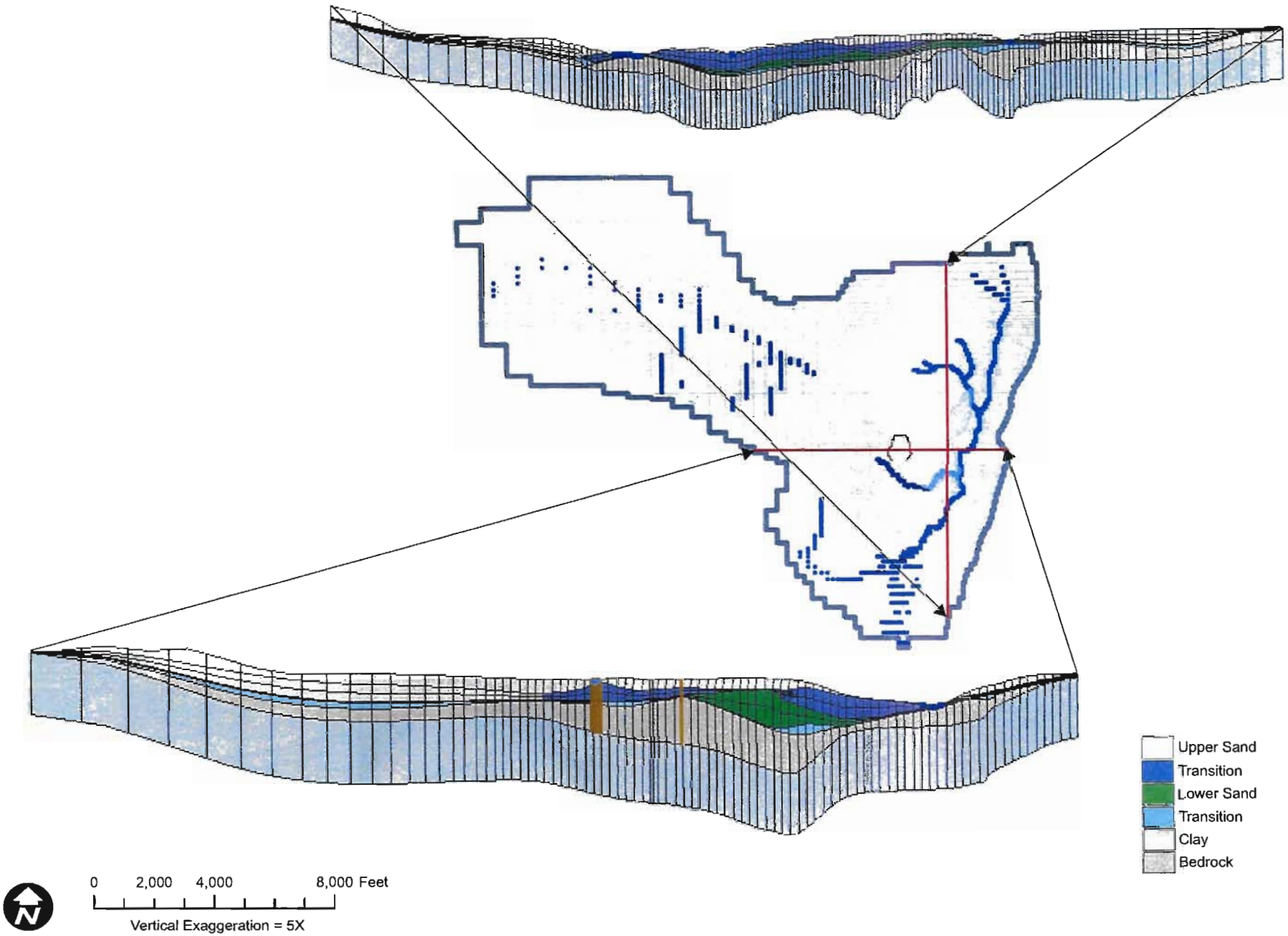
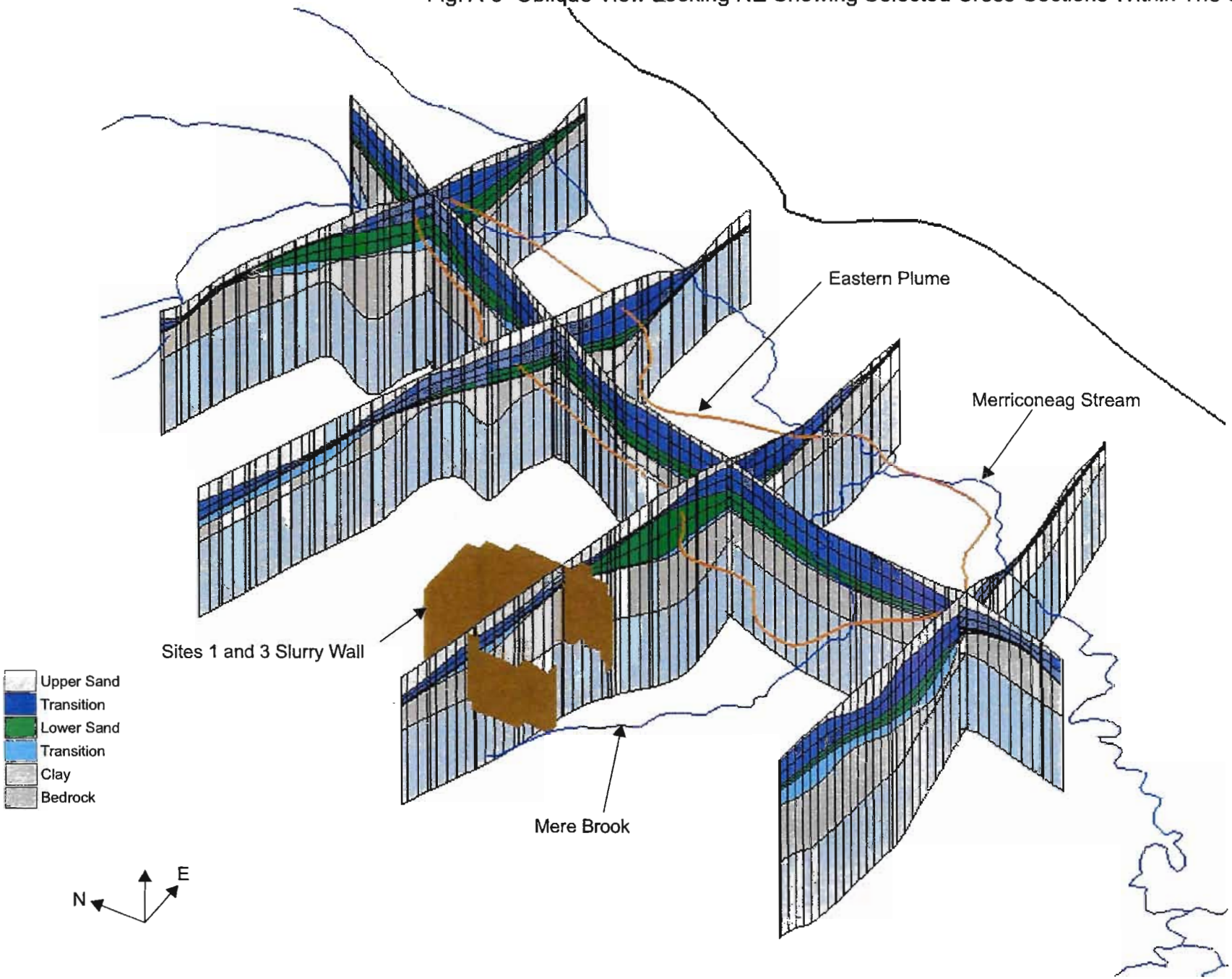


Fig. A-9 Oblique View Looking NE Showing Selected Cross-Sections Within The Study Area



APPENDIX B

Slug Test Data

Table B-1 - Calculated Hydraulic Conductivities From Slug Test Data
(Modified From Remedial Investigation and Supplemental Remedial Investigation)

Current Well ID	Original Well ID:	Number of Tests	Type of Test	K (cm/sec)	K (ft/day)	K (ft/day) [Sand]	K (ft/day) [Transition]	K (ft/day) [Lower Sand]	K (ft/day) [Sand/Trans]	K (ft/day) [Clay]	K (ft/day) [Bedrock]	Stratigraphic Unit	Site	Source
MW-101	MW-101	NA	F	6.35E-05	0.18				0.18			S/T	EP	1
MW-102	MW-102	NA	F	3.88E-05	0.11							T/C	1 & 9	1
MW-103	MW-103	NA	F	7.76E-05	0.22				0.22			S/T	2	1
MW-104	MW-104	NA	F	2.90E-03	8.22	8.22						S	2	1
MW-105B	MW-105B	NA	F	5.19E-04	1.47				1.47			S/T	EP	1
MW-106	MW-106	NA	NA	2.80E-03	7.94	7.94						S	EP	3
MW-NASB-086	MW-1101	NA	R	2.40E-03	6.8	6.8						S	11	1
MW-NASB-087	MW-1102	NA	R	2.90E-03	8.22	8.22						S	11	1
MW-NASB-088	MW-1103	NA	R	1.20E-03	3.4	3.4						S	11	1
MW-NASB-089	MW-1104	NA	R	1.50E-03	4.25	4.25						S	11	1
MW-1301	MW-1301	NA	R	1.10E-03	3.12	3.12						S	EP	1
MW-1302	MW-1302	NA	R	8.01E-04	2.27	2.27						S	EP	1
MW-1303	MW-1303	NA	R	8.40E-04	2.38	2.38						S	EP	1
MW-201	MW-201	NA	R	1.75E-02	49.05	49.05						S	1 & 3	1
MW-202	MW-202	NA	R	7.27E-04	2.06				2.06			S/T	1 & 3	1
MW-203	MW-203	NA	R	2.00E-02	56.7				56.7			S/T	1 & 3	1
MW-204	MW-204	NA	R	1.23E-02	34.87	34.87						S	1 & 3	1
MW-205	MW-205	NA	R	6.58E-04	1.86		1.86					T	EP	1
MW-205B	MW-205B	NA	NA	8.30E-03	23.53	23.53						S	EP	3
MW-206A	MW-206A	NA	R	1.45E-03	4.11			4.11				S	EP	1
MW-206B	MW-206B	NA	R	8.28E-03	23.47	23.47						S	EP	1
MW-207B	MW-207B	NA	R	4.80E-04	1.36				1.36			S	EP	1
MW-208	MW-208	NA	R	8.47E-05	0.24		0.24					T	EP	1
MW-209	MW-209	NA	R	9.06E-03	25.74	25.74						S	EP	1
MW-210A	MW-210A	NA	R	9.53E-05	0.27						0.27	B	1 & 3	1
MW-210B	MW-210B	NA	R	2.58E-03	7.31	7.31						S	1 & 3	1
MW-211A	MW-211A	NA	R	4.23E-05	0.12						0.12	B	1 & 3	1
MW-211B	MW-211B	NA	R	2.15E-04	0.61				0.61			S	1 & 3	1
MW-212	MW-212	NA	R	9.53E-05	0.27				0.27			S/T	NA	1
MW-213	MW-213	NA	R	4.30E-04	1.22		1.22					T	NA	1
MW-214	MW-214	NA	R	8.18E-04	2.32	2.32						S	1 & 3	1
MW-214A	MW-214A	2	RF	1.30E-02	36.85			36.85				T	1 & 3	2
MW-215	MW-215	NA	R	9.53E-05	0.27		0.27					T	1 & 3	1
MW-216A	MW-216A	NA	R	1.20E-04	0.34				0.34			S/T	1 & 3	1
MW-216B	MW-216B	NA	R	3.30E-03	9.36							F/S	1 & 3	1
MW-217A	MW-217A	NA	RF	3.88E-05	0.11				0.11			S/T	1 & 3	1
MW-217B	MW-217B	NA	R	4.23E-05	0.12		0.12					S	1 & 3	1
MW-218	MW-218	NA	RF	3.53E-06	0.01		0.01					T	1 & 3	1
MW-219	MW-219	NA	RF	5.50E-04	1.56		1.56					S	1 & 3	1
MW-220	MW-220	NA	R	3.70E-04	1.05		1.05					S	1 & 3	1
MW-222	MW-222	NA	R	4.50E-03	12.76	12.76						S	EP	1
MW-223	MW-223	NA	R	2.40E-03	6.8	6.8						S	EP	1
MW-224	MW-224	NA	R	3.70E-03	10.49	10.49						S	EP	1
MW-225A	MW-225A	NA	R	1.30E-03	3.69	3.69						S	EP	1
MW-225B	MW-225B	NA	R	4.50E-03	12.76	12.76						S	EP	1
MW-229A	MW-229A	NA	R	3.21E-04	0.91		0.91					T	EP	1
MW-229B	MW-229B	NA	R	6.36E-05	0.18	0.18						S	EP	1
MW-230A	MW-230A	NA	R	4.59E-05	0.13		0.13					T	EP	1
MW-230B	MW-230B	NA	R	5.64E-05	0.16		0.16					T	EP	1
MW-231A	MW-231A	NA	R	2.72E-04	0.77		0.77					T	EP	1
MW-231B	MW-231B	NA	R	6.00E-05	0.17		0.17					T	EP	1
MW-232A	MW-232A	NA	RF	6.70E-05	0.19				0.19			S/T	1 & 3	1
MW-232B	MW-232B	NA	R	7.41E-04	2.1							F/S	1 & 3	1
MW-233	MW-233	NA	RF	3.63E-08	0.0001		0.0001					T	1 & 3	1
MW-234	MW-234	NA	R	3.32E-04	0.94							F/S	1 & 3	1
MW-301	MW-301	2	RR	6.80E-03	19.28	19.28						S	1 & 3	2
MW-302	MW-302	3	RF	5.10E-03	14.46			14.46				S	1 & 3	2
MW-302	MW-302	NA	NA	5.80E-03	16.44	16.44						S	ER	3
MW-304	MW-304	2	RF	1.80E-03	5.10	5.10						S	1 & 3	2
MW-305	MW-305	3	RF	7.70E-03	21.83			21.83				T	1 & 3	2
MW-306	MW-306	2	RF	2.00E-03	5.67	5.67						S	1 & 3	2
MW-307	MW-307	2	RR	9.90E-03	28.06	28.06						S	1 & 3	2
MW-308	MW-308	2	RF	7.50E-04	2.1259843						2.1259843	B	1 & 3	2
MW-310	MW-310	2	RF	7.50E-03	21.26			21.26				S	1 & 3	2
MW-312	MW-312	2	RF	3.10E-04	0.88		0.88					T	1 & 3	2
MW-314A	MW-314A	NA	NA	1.20E-02	34.02			34.02				S	EP	3
MW-314B	MW-314B	NA	NA	2.90E-03	8.22	8.22						S	EP	3
MW-314B	MW-314B	2	RF	1.90E-04	0.54		0.54					T	1 & 3	2
MW-315A	MW-315A	2	RF	4.00E-05	0.11		0.11					T	1 & 3	2
MW-315A	MW-315A	NA	NA	3.80E-05	0.11		0.11					T	EP	3
MW-315B	MW-315B	NA	NA	2.90E-03	8.22	8.22						S	EP	3
MW-315B	MW-315B	2	RF	3.00E-03	8.50			8.50				T	1 & 3	2
MW-316A	MW-316A	1	F	3.80E-05	0.1077165						0.1077165	B	1 & 3	2
MW-316B	MW-316B	2	RF	2.70E-04	0.7653544						0.7653544	B	1 & 3	2
MW-317A	MW-317A	1	F	4.80E-04	1.36063						1.36063	B	1 & 3	2
MW-317B	MW-317B	1	F	9.20E-05	0.2607874						0.2607874	B	1 & 3	2
MW-318	MW-318	1	F	1.10E-03	3.12	3.12						T	1 & 3	2
MW-319	MW-319	3	FR	6.70E-03	18.99			18.99				T	1 & 3	2
MW-320	MW-320	2	RR	5.30E-03	15.02			15.02				T	1 & 3	2
MW-321	MW-321	2	RR	1.10E-02	31.18	31.18						S	1 & 3	2
MW-322	MW-322	1	R	4.20E-03	11.91	11.91						T	1 & 3	2
MW-323	MW-323	2	FF	2.20E-04	0.6236221						0.6236221	B	1 & 3	2
MW-401	MW-401	NA	F	9.88E-05	0.28		0.28					T	EP	1
MW-402	MW-402	NA	F	7.69E-04	2.18				2.18			S/T	EP	1
MW-403	MW-403	NA	F	5.19E-04	1.47		1.47					T	NA	1
MW-404	MW-404	NA	R	7.37E-04	2.09				2.09			S/T	EP	1
MW-405	MW-405	NA	R	5.13E-03	14.54	14.54						S	EP	1
MW-406	MW-406	NA	R	2.50E-04	0.71	0.71						S	EP	1
MW-407	MW-407	NA	R	1.31E-04	0.37		0.37					T	EP	1
MW-408	MW-408	NA	R	1.90E-03	5.39	5.39						S	EP	1
MW-NASB-091	MW-701	NA	F	3.49E-04	0.99							S/C/L	7	1
MW-NASB-092	MW-702	NA	F	7.58E-04	2.15				2.15			S/T	7	1
MW-NASB-093	MW-703	NA	F	6.00E-04	1.7				1.7			S/T	7	1
MW-NASB-094	MW-704	NA	R	5.90E-03	16.73	16.73						S	7	1
MW-NASB-095	MW-705	NA	R	6.00E-03	17.01	17.01						S	7	1
MW-NASB-096	MW-706	NA	R	1.06E-03	3.01	3.01						S	7	1
MW-801	MW-801	NA	F	1.41E-04	0.4				0.4			S/T	8	1

Common Well Id	Well Id	Screened Int	Type of Test	K (cm/sec)	K (ft/d)	K (ft/day) (Sand)	K (ft/day) (Transition)	K (ft/day) (Lower Sand)	K (ft/day) (Bedrock)	K (ft/day) (Clay)	K (ft/day) (Clock)	Stratigraphic Unit	Site	Source
MW-802	MW-802	NA	F	1.20E-04	0.34				0.34			S/T	8	1
MW-803	MW-803	NA	F	1.83E-04	0.52							T/C	8	1
MW-804	MW-804	NA	F	1.06E-05	0.03							S/T/C	8	1
MW-807	MW-807	NA	R	2.36E-04	0.67		0.67					T	8	1
MW-808	MW-808	NA	R	7.06E-05	0.2		0.2					T	8	1
MW-808	MW-808	NA	Constant Head - Lab	1.80E-07	0.00051					0.00051		C	8	1
MW-808	MW-808	NA	Constant Head - Lab	4.80E-08	0.00014					0.00014		C	8	1
MW-810	MW-810	NA	R	1.30E-02	36.86							T/F	8	1
MW-811	MW-811	NA	RF	2.47E-06	0.007							T/C	8	1
MW-NASB-069	MW-901	NA	NA	2.90E-03	8.22	8.22						S	9	1
MW-NASB-070	MW-902	NA	NA	2.90E-03	8.22	8.23						S	9	1
MW-NASB-071	MW-903	NA	F	5.61E-04	1.59	1.59						S	9	1
MW-NASB-072	MW-904	NA	R	4.80E-04	1.36	1.36						S	9	1
MW-NASB-073	MW-905	NA	R	3.18E-06	0.009	0.009						S	9	1
MW-NASB-074	MW-906	NA	R	2.50E-04	0.71	0.71						S	9	1
MW-NASB-075	MW-907	NA	R	2.01E-04	0.57							C/T	9	1
MW-NASB-076	MW-908	NA	R	3.60E-04	1.02	1.02						S	9	1
MW-812	OW-812	NA	RF	1.76E-06	0.005		0.005					T	8	1
MW-813	OW-813	NA	R	3.00E-04	0.85	0.85						S	8	1
MW-814	OW-814	NA	RF	3.53E-06	0.01				0.01			S/T	8	1
					Geometric Mean	**5.31**	**0.21**	**16.36**	**0.63**	**0.0002672**	**0.43**			
					Mean	**10.35**	**0.55**	**19.45**	**4.02**	**0.000325**	**0.70**			
					Maximum	**49.05**	**1.86**	**36.85**	**56.70**	**0.00051**	**2.13**			
					Minimum	**0.009**	**0.0001**	**4.11**	**0.01**	**0.00014**	**0.11**			
					Count	**46**	**24**	**9**	**18**	**2**	**8**			

Sources
1 Table 4-3, Remedial Investigation (E.C. Jordan 1990)
2 Table 3-2, Supplemental Remedial Investigation (E.C. Jordan 1991)
3 Table 8-3, Supplemental Remedial Investigation (E.C. Jordan 1991).

Stratigraphic Units
S Sand
T Transition
F Fill
C Clay
L Till
B Bedrock

Literature Sources

Fetter, 1994, Applied Hydrogeology - Table 4-5

	Cm/Sec		ft/d	
	Low	Hi	Low	Hi
Clay	1.00E-09	1.00E-06	2.84E-06	0.002835
Silt, Sandy Silt	1.00E-06	1.00E-04	0.002835	0.2835
Silty Sand, Fine Sand	1.00E-05	1.00E-03	0.02835	2.84
Sand, outwash	1.00E-03	1.00E-01	2.84	283.50
WS Gravel	1.00E-02	1.00E+00	28.35	2835.00

Andersen, 1992, Applied Groundwater Modeling - Table 3.3

	Cm/Sec		ft/d	
	Low	Hi	Low	Hi
Clay	3.53E-11	3.53E-07	1.00E-07	1.00E-03
Silty Sand	7.05E-05	2.12E-02	2.00E-01	60
Clean Sand	3.53E-04	2.82E-01	1	8.00E+02
Gravel	1.76E-01	7.05E+00	5.00E+02	2.00E+04

Fig B-1 Model Layers 2 and 3 (Transition Unit) Final Calibrated K Values

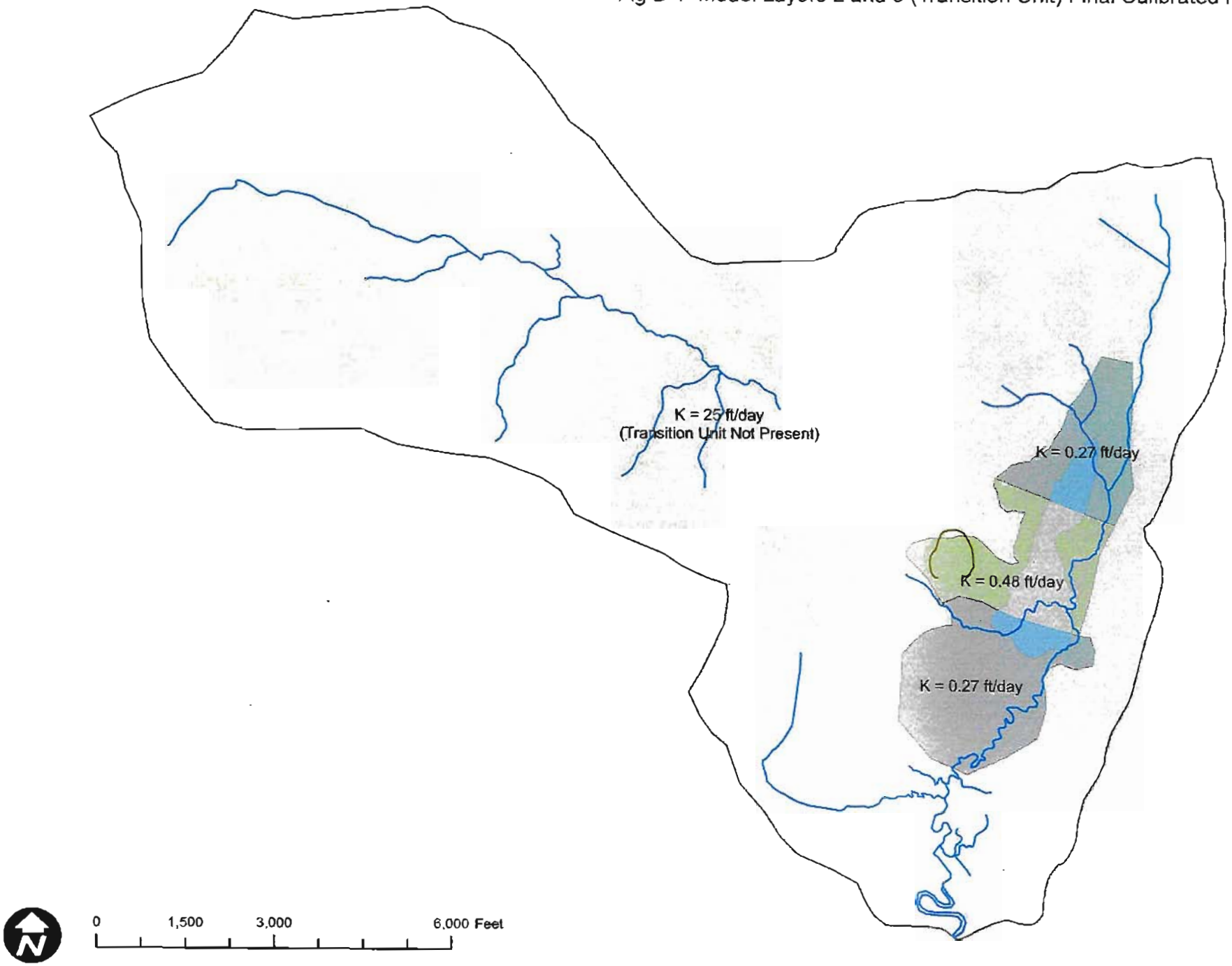
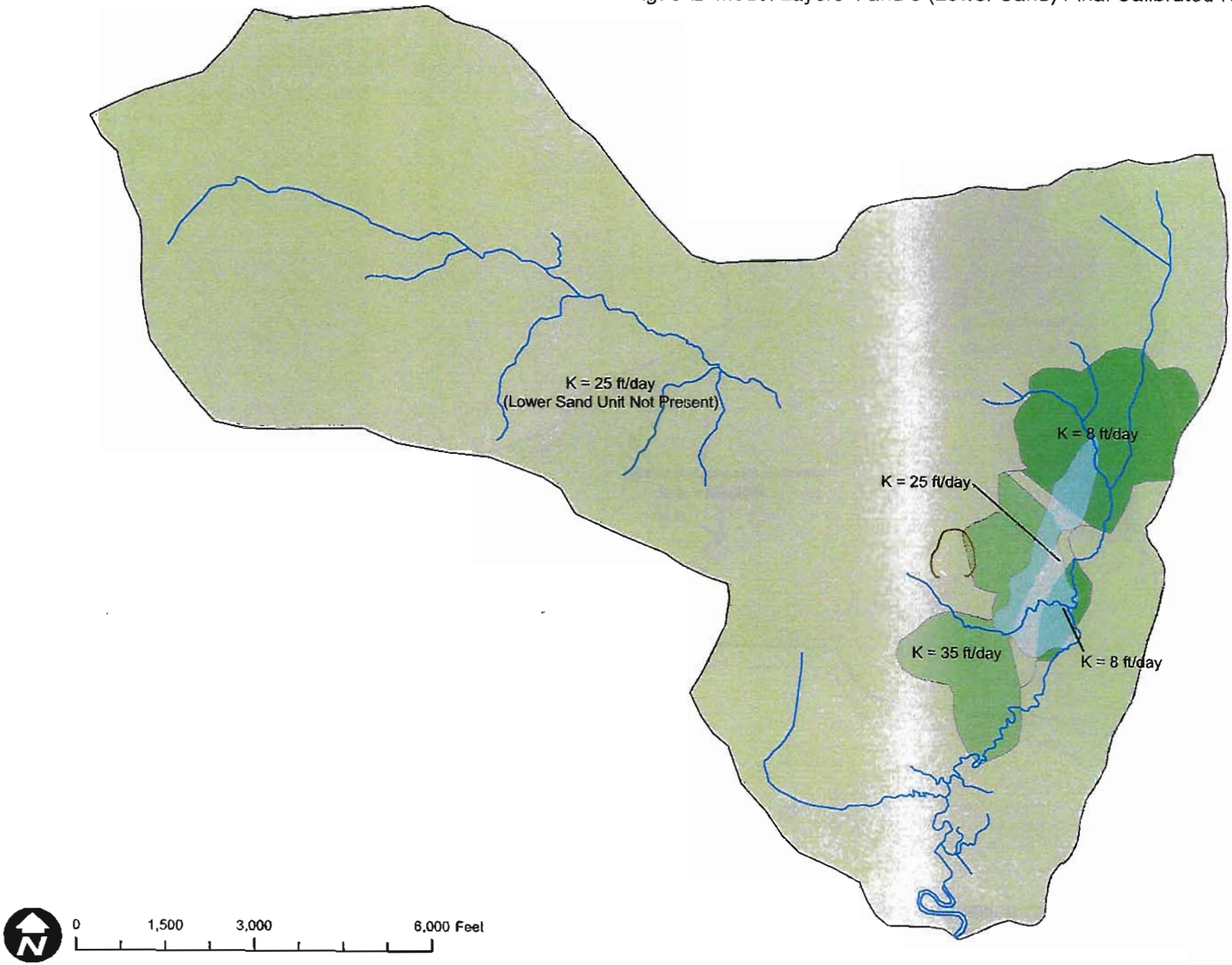


Fig. B-2 Model Layers 4 and 5 (Lower Sand) Final Calibrated K Values



APPENDIX C

Recovery-Drawdown Test

RECOVERY-DRAWDOWN TEST RESULTS

The aquifer recovery-drawdown test included shutting down the four operating extraction wells at the Eastern Plume from 9:00AM on 28 April 2008 to 9:00AM on 6 May 2008 and collecting water level data at 23 observation points (EP-01, EP-02, EP-03, MW-229A, MW-229B, MW-311, EP-04, EP-06, MW-MB-05-B, MW-MB-05-C, EP-09, EP-10, EP-11, EP-12, MW-331, MW-330, MW-308, MW-309B, EP-13, EP-15, P-106, MW-306, and MW-209). The data collected during the recovery-drawdown test was used to calibrate the groundwater flow model developed for the Eastern Plume. The details of the recovery-drawdown test are provided below. This plan was revised on the basis of regulator comments received on the proposed procedure issued on 31 October 2007.

Recovery Test

An aquifer recovery-drawdown test was completed for overburden hydrogeologic units under the influence of the extraction well system at the Eastern Plume. The objective of the recovery-drawdown test was to better estimate hydraulic properties of the various units present at the site, in particular the lower sand unit, which contains most of the impacted groundwater at the site. Previous estimates of hydraulic conductivity for the hydrogeologic units underlying Naval Air Station (NAS) Brunswick have been based on slug test data obtained during the Remedial Investigation and Supplemental Remedial Investigations conducted by E.C. Jordan (1990 and 1991, respectively). The limitations of slug test data are that they estimate the hydraulic conductivity of aquifer materials immediately surrounding the tested well, are greatly affected by well construction characteristics, and do not provide sufficient data to quantify vertical hydraulic conductivity for the stratigraphic units beneath the Eastern Plume. Recovery-drawdown test data was able to provide a better estimate of aquifer-scale hydraulic conductivity values and other hydraulic properties, such as transmissivity and storativity. Values for these parameters were estimated from analytical solutions of observation data, and verified by using the groundwater model developed for the Eastern Plume.

The recovery-drawdown test involved the simultaneous shutdown and subsequent start-up of all four operating extraction wells. The extraction well network remained off line for eight days, and subsequently started up. Water level data was recorded in selected wells and piezometers during this period. The recovery-drawdown data was analyzed using analytical solutions and the numerical ground water flow model developed for the site.

Pressure transducers (In-Situ Level Trolls) were installed at a select group of wells and were monitored during the recovery-drawdown test. Transducers were installed in selected wells (see table below) and water levels were recorded for a period of time (~48 hrs) prior to system shutdown in order to assess and account for fluctuations in water levels while the extraction system was running. Transducers continued to record water levels for the entire recovery period after system shut-down, and for the subsequent drawdown period after system start-up. Monitoring wells and piezometers selected for monitoring were chosen in order to obtain an

adequate data set of recovering water levels that were used to determine hydraulic properties in the hydrogeologic units beneath the Eastern Plume.

Observation points for this recovery-drawdown test were selected based on the location of each well relative to site extraction wells. The selected observation points have a large portion of their screens in either the lower sand unit or transition unit. In addition, one monitoring well was selected which is located outside the radius of influence of the extraction system was monitored to account for any change in water levels not attributable to system shutdown (i.e., a background well).

The table below provides the observation points for each extraction well.

OBSERVATION WELLS					
Geologic Unit	**EW-1**	**EW-2A**	**EW-4**	**EW-5A**	**Background Well**
Lower Sand Unit Wells	EP-01 EP-02 EP-03 MW-229A	MW-311 EP-04 EP-06 MW-MB-05-C	EP-09 EP-10 EP-11 EP-12 MW-331	EP-13 EP-15 P-106	MW-209
Transition Unit Wells	MW-229B	MW-MB-05-B	MW-330	MW-306	---
Bedrock Wells	---	---	MW-308 MW-309B	---	---

The proposed observation point, P-128, was blocked. MW-MB-05-C was monitored in its place.

Precipitation was monitored during the recovery-drawdown test to assess whether rain events affected the aquifer recovery. For each transducer, the timing interval between measurements was on a log scale so water level data were collected from each well more frequently at the beginning of the test when elevations will be changing more rapidly.

The extraction system was off-line for eight days. The test continued until sufficient recovery data had been collected to delineate values for the hydrogeologic unit constants and to determine whether there were any recharge or barrier boundaries. The extraction system was subsequently turned back on, and transducers continued to collect water level data in order to capture the aquifer drawdown response.

Aquifer Analysis

Transmissivity, storativity, hydraulic conductivity and specific storage values for the lower sand were calculated from data collected during the April-May 2008 recovery-drawdown test. In order to increase confidence in estimates of aquifer parameter values, values were calculated using analytical solutions for both the recovery and drawdown phases of the test. These values were then used as plausible ranges for the lower sand hydraulic conductivity during flow model calibration. Type curves were matched to early time recovery and drawdown data to obtain

transmissivity, storativity, hydraulic conductivity and specific storage values. Recovery data was corrected for the increase in water levels due to the large precipitation event that began a few hours after extraction system shut-down. It was assumed that water level trends increased linearly over the course of the recovery-drawdown test. The formula used for the correction of the recovery-drawdown data was:

$$WL_c = WL_m - (t/T \times \Delta WL)$$

where

WL_c	=	Corrected water level at each observation point
WL_m	=	Measured water level at each observation point
t	=	Time at which measurement was logged as measured from the cessation of pumping
T	=	Total time of logged period, from cessation of pumping to end of logging period after resumption of pumping
ΔWL	=	Change in water elevation from start of logging to end of logging; this method factored out changes due to pumping since pumping stopped after recording began, and pumping had resumed with water levels returning to near maximum drawdown before recording ended.

For the most part, the Theis solution for confined aquifers was used for observation well data. For certain data sets, the Cooper-Jacob straight line method was used to match to later time data where observation data could not be matched to the Theis curve. Table 1 provides the calculated values for each well. Table 2 provides a summary of average usable hydraulic conductivity values grouped by extraction well.

The results of the analytical solutions indicate that the conductivity of lower sand varies by an order of magnitude (from 4.69 to 56.37ft/day) over the areas affected by pumping from the aquifer. There is also a relative degree of uniformity between values calculated for each observation point within each well group. For instance, there is a relative small range of conductivity values, from 26 to 38 ft/day, for wells and piezometers screened within the lower sand within the EW-1 radius of influence. This is also the case with EW-4, and EW-5A although the higher conductivities calculated for observation points furthest away from the extraction wells may be the result of intersecting cones of influence. Conductivity values for observation points monitoring EW-2A show a slight lessening of conductivities from west to east. Based on this data, model layers 4 and 5 were divided into zones based on the interpreted distribution of hydraulic conductivity. Figure B.1-2 shows the distribution of hydraulic conductivity zones for model layers 4 and 5 representing the lower sand.

Values for specific storage and storativity were also obtained from pump test data. These values were used as the range for model layers 4 and 5 (lower sand) for the transient simulation that was used to verify the steady-state non-pumping calibrated model. Table 3 provides a summary of average usable storage coefficient values grouped by extraction well.

Table 1 - Calculated Aquifer Parameter Values From April-May 2008 Recovery-Drawdown Test

Group	Well	Type	Solution	Test	T (ft2/d)	Storativity	K (ft/d)	Specific Storage Ss (1/ft)	Use For Hydraulic Conductivity?	Use For Specific Storage?
Background	MW-209	NA	NA	NA	NA	NA	NA	NA	N	N
EW-01	EP-01	Displacement-Time	Theis/Hantusch	Recovery	553.3	0.003067	36.89	0.0002045	Y	Y
EW-01	EP-01	Displacement-Time	Theis/Hantusch	Drawdown	669.8	0.002207	39.21	0.0001292	Y	Y
EW-01	EP-02	Displacement-Time	Theis/Hantusch	Recovery	583.05	0.005194	38.9	0.0003463	Y	Y
EW-01	EP-02	Displacement-Time	Theis/Hantusch	Drawdown	437.5	0.004263	25.61	0.0002496	Y	Y
EW-01	EP-03	Displacement-Time	Theis/Hantusch	Recovery	430.2	0.008237	28.68	0.0005491	Y	Y
EW-01	EP-03	Displacement-Time	Theis/Hantusch	Drawdown	405.8	0.00676	23.76	0.0003958	Y	Y
EW-01	EW-01	Displacement-Time	Cooper-Jacob	Recovery	191.7	7.76E-08	11.28	4.543E-09	Y	N
EW-01	MW-229A	Displacement-Time	Theis/Hantusch	Recovery	500	0.0002351	33.33	0.00001567	Y	Y
EW-01	MW-229A	Displacement-Time	Theis/Hantusch	Drawdown	448.6	0.0002201	26.26	0.00001289	Y	Y
EW-01	MW-229B	Displacement-Time	Theis	Recovery	21.83	0.01306	0.2756	0.0001688	Y	Y
EW-02A	EP-04	Displacement-Time	Theis/Hantusch	Recovery	908.8	0.001587	34.95	0.00006105	Y	Y
EW-02A	EP-04	Displacement-Time	Theis/Hantusch	Drawdown	931.9	0.001934	35.84	0.00007439	Y	Y
EW-02A	EP-06	Displacement-Time	Theis/Hantusch	Recovery	1181.8	0.0007202	45.45	0.0000277	Y	Y
EW-02A	EP-06	Displacement-Time	Theis/Hantusch	Drawdown	1279.6	0.0009373	49.21	0.00003605	Y	Y
EW-02A	EW-02A	NA	NA	NA	NA	NA	NA	NA	N	N
EW-02A	MW-311	Displacement-Time	Theis/Hantusch	Recovery	98.61	0.0007693	8.924	0.00006962	Y	Y
EW-02A	MW-311	Displacement-Time	Cooper-Jacob	Drawdown	203.3	0.002517	18.4	0.0002278	N	N
EW-02A	MW-MB-05-B	NA	NA	NA	NA	NA	NA	NA	N	N
EW-02A	MW-MB-05-C	Displacement-Time	Theis/Hantusch	Recovery	140.2	0.0002511	11.79	0.00002112	Y	Y
EW-02A	MW-MB-05-C	Displacement-Time	Cooper-Jacob	Drawdown	372.9	0.004263	31.36	0.0003586	N	N
EW-04	EP-09	Displacement-Time	Cooper-Jacob	Drawdown	435.5	0.005482	27.72	0.000349	N	N
EW-04	EP-09	Displacement-Time	Theis/Hantusch	Recovery	628.2	0.002066	39.99	0.0001315	Y	Y
EW-04	EP-10	Displacement-Time	Cooper-Jacob	Drawdown	348.1	0.001124	18.42	0.00005948	N	N
EW-04	EP-10	Displacement-Time	Theis/Hantusch	Recovery	535.8	0.0003268	28.35	1.73E-05	Y	Y
EW-04	EP-11	Displacement-Time	Cooper-Jacob	Drawdown	635.1	0.0005414	33.6	0.00002865	Y	N
EW-04	EP-11	Displacement-Time	Theis/Hantusch	Recovery	798.1	0.0004253	42.23	2.25E-05	Y	Y
EW-04	EP-12	Displacement-Time	Cooper-Jacob	Drawdown	635.1	0.0005414	51.78	0.00002348	Y	N
EW-04	EP-12	Displacement-Time	Theis/Hantusch	Recovery	872.4	0.01824	54.39	0.001143	Y	Y
EW-04	EW-04	Displacement-Time	Cooper-Jacob	Recovery	587.4	1.93E-05	34.39	0.000001127	Y	N
EW-04	MW-308	Displacement-Time	Cooper-Jacob	Recovery	1000	0.001811	58.55	0.000106	N	N
EW-04	MW-309B	NA	NA	NA	NA	NA	NA	NA	N	N
EW-04	MW-330	NA	NA	NA	NA	NA	NA	NA	N	N
EW-04	MW-331	Displacement-Time	Theis/Hantusch	Recovery	2135.1	0.0003728	144.3	0.00002519	N	N
EW-05A	EP-13	Displacement-Time	Theis/Hantusch	Recovery	143	0.0005911	4.766	0.0000197	Y	N
EW-05A	EP-15	Displacement-Time	Theis/Hantusch	Recovery	154.6	0.01145	5.154	0.0003816	Y	N
EW-05A	EP-15	Displacement-Time	Theis/Hantusch	Drawdown	234.7	0.01591	7.823	0.0005305	Y	N
EW-05A	EW-05A	Displacement-Time	Cooper-Jacob	Recovery	134.8	1.73E-07	4.495	5.756E-09	Y	N
EW-05A	MW-306	Displacement-Time	Theis/Hantusch	Recovery	100.6	1.93E-05	3.352	6.415E-07	Y	Y
EW-05A	MW-306	Displacement-Time	Theis/Hantusch	Drawdown	173.9	0.0000158	5.796	5.265E-07	Y	N
EW-05A	P-106	Displacement-Time	Theis/Hantusch	Recovery	100.6	0.0001929	3.352	0.000006431	Y	Y
EW-05A	P-106	Displacement-Time	Theis/Hantusch	Drawdown	70.71	0.0003268	2.357	0.00001089	Y	N

Table 2 - Summary of Calculated Hydraulic Conductivities From Recovery-Drawdown Data

UseForK? Y

Well Group	Values Average of K (ft/d)	Average of T (ft2/d)
EW-01	31.58	503.53125
EP-01	38.05	611.55
Drawdown	39.21	669.8
Theis/Hantusch	39.21	669.8
Recovery	36.89	553.3
Theis/Hantusch	36.89	553.3
EP-02	32.255	510.275
Drawdown	25.61	437.5
Theis/Hantusch	25.61	437.5
Recovery	38.9	583.05
Theis/Hantusch	38.9	583.05
EP-03	26.22	418
Drawdown	23.76	405.8
Theis/Hantusch	23.76	405.8
Recovery	28.68	430.2
Theis/Hantusch	28.68	430.2
MW-229A	29.795	474.3
Drawdown	26.26	448.6
Theis/Hantusch	26.26	448.6
Recovery	33.33	500
Theis/Hantusch	33.33	500
EW-02A	31.02733333	756.8183333
EP-04	35.395	920.35
Drawdown	35.84	931.9
Theis/Hantusch	35.84	931.9
Recovery	34.95	908.8
Theis/Hantusch	34.95	908.8
EP-06	47.33	1230.7
Drawdown	49.21	1279.6
Theis/Hantusch	49.21	1279.6
Recovery	45.45	1181.8
Theis/Hantusch	45.45	1181.8
MW-311	8.924	98.61
Recovery	8.924	98.61
Theis/Hantusch	8.924	98.61
MW-MB-05-C	11.79	140.2
Recovery	11.79	140.2
Theis/Hantusch	11.79	140.2
EW-04	56.37	891.4
EP-09	39.99	628.2
Recovery	39.99	628.2
Theis/Hantusch	39.99	628.2
EP-10	28.35	535.8
Recovery	28.35	535.8
Theis/Hantusch	28.35	535.8
EP-11	37.915	716.6
Drawdown	33.6	635.1
Cooper-Jacob	33.6	635.1
Recovery	42.23	798.1
Theis/Hantusch	42.23	798.1
EP-12	53.06	753.75
Drawdown	51.73	635.1
Cooper-Jacob	51.73	635.1
Recovery	54.39	872.4
Theis/Hantusch	54.39	872.4
MW-331	144.3	2135.1
Recovery	144.3	2135.1
Theis/Hantusch	144.3	2135.1
EW-05A	4.6904	140.722
EP-13	4.766	143
Recovery	4.766	143
Theis/Hantusch	4.766	143
EP-15	6.4885	194.65
Drawdown	7.823	234.7
Theis/Hantusch	7.823	234.7
Recovery	5.154	154.6
Theis/Hantusch	5.154	154.6
P-106	2.8545	85.655
Drawdown	2.357	70.71
Theis/Hantusch	2.357	70.71
Recovery	3.352	100.6
Theis/Hantusch	3.352	100.6
Grand Total	32.95561538	596.6373077

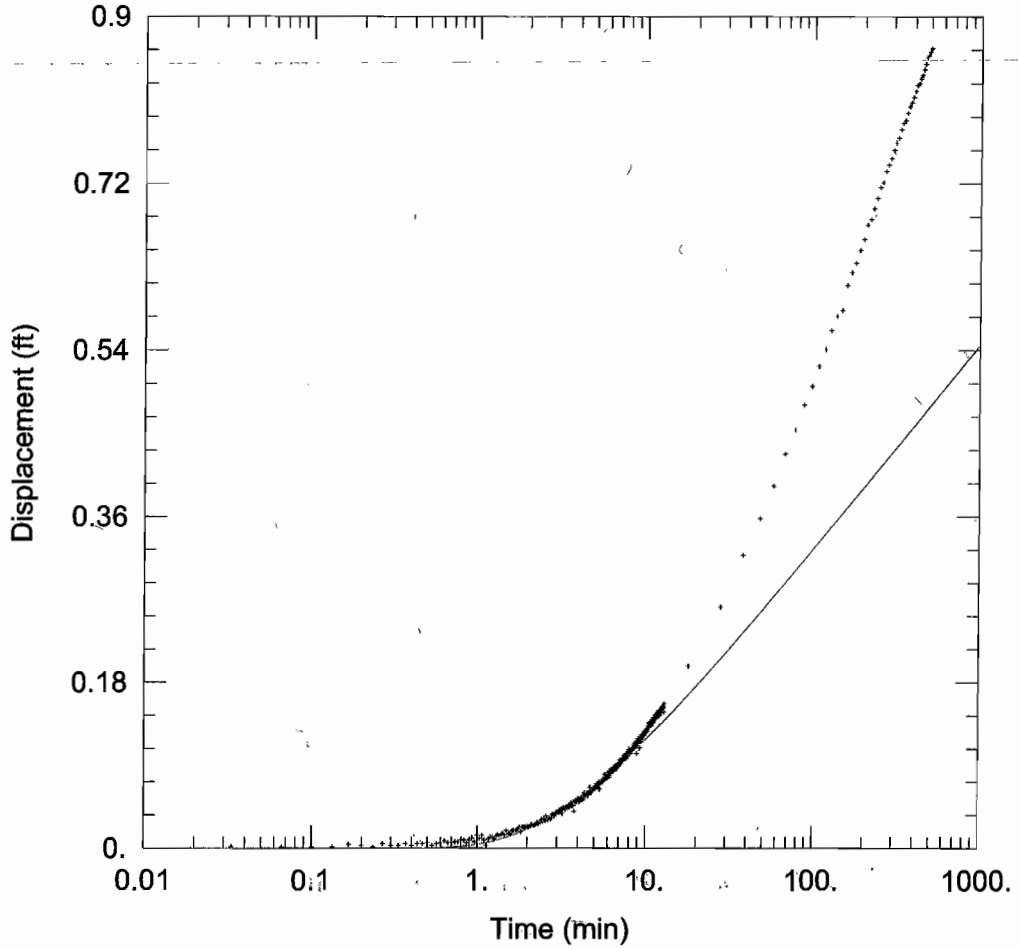
Table 3 - Summary of Calculated Specific Storage Values From Recovery-Drawdown Data

UseForS? Y

Well Group	Values Average of Specific Storage (1/ft)	Average of Storativity
EW-01	**0.0002302**	**0.0048048**
EP-01	**0.0001669**	**0.002637**
Drawdown	0.0001292	0.002207
Theis/Hantusch	0.0001292	0.002207
Recovery	0.0002045	0.003067
Theis/Hantusch	0.0002045	0.003067
EP-02	**0.0002980**	**0.0047285**
Drawdown	0.0002496	0.004263
Theis/Hantusch	0.0002496	0.004263
Recovery	0.0003463	0.005194
Theis/Hantusch	0.0003463	0.005194
EP-03	**0.0004725**	**0.0074985**
Drawdown	0.0003958	0.00676
Theis/Hantusch	0.0003958	0.00676
Recovery	0.0005491	0.008237
Theis/Hantusch	0.0005491	0.008237
MW-229A	**0.0000143**	**0.0002276**
Drawdown	0.0000129	0.0002201
Theis/Hantusch	0.0000129	0.0002201
Recovery	0.0000157	0.0002351
Theis/Hantusch	0.0000157	0.0002351
MW-229B	**0.0001688**	**0.01306**
Recovery	0.0001688	0.01306
Theis	0.0001688	0.01306
EW-02A	**0.0000483**	**0.00103315**
EP-04	**0.0000677**	**0.0017605**
Drawdown	0.0000744	0.001934
Theis/Hantusch	0.0000744	0.001934
Recovery	0.0000611	0.001587
Theis/Hantusch	0.0000611	0.001587
EP-06	**0.0000319**	**0.00082875**
Drawdown	0.0000361	0.0009373
Theis/Hantusch	0.0000361	0.0009373
Recovery	0.0000277	0.0007202
Theis/Hantusch	0.0000277	0.0007202
MW-311	**0.0000696**	**0.0007693**
Recovery	0.0000696	0.0007693
Theis/Hantusch	0.0000696	0.0007693
MW-MB-05-C	**0.0000211**	**0.0002511**
Recovery	0.0000211	0.0002511
Theis/Hantusch	0.0000211	0.0002511
EW-04	**0.0002679**	**0.00428618**
EP-09	**0.0001315**	**0.002066**
Recovery	0.0001315	0.002066
Theis/Hantusch	0.0001315	0.002066
EP-10	**0.0000173**	**0.0003268**
Recovery	0.0000173	0.0003268
Theis/Hantusch	0.0000173	0.0003268
EP-11	**0.0000225**	**0.0004253**
Recovery	0.0000225	0.0004253
Theis/Hantusch	0.0000225	0.0004253
EP-12	**0.0011430**	**0.01824**
Recovery	0.0011430	0.01824
Theis/Hantusch	0.0011430	0.01824
MW-331	**0.0000252**	**0.0003728**
Recovery	0.0000252	0.0003728
Theis/Hantusch	0.0000252	0.0003728
EW-05A	**0.0000035**	**0.000106075**
MW-306	**0.0000006**	**0.00001925**
Recovery	0.0000006	0.00001925
Theis/Hantusch	0.0000006	0.00001925
P-106	**0.0000064**	**0.0001929**
Recovery	0.0000064	0.0001929
Theis/Hantusch	0.0000064	0.0001929
Grand Total	**0.0001686**	**0.003731143**

ATTACHMENT A

Analytical Solutions



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-01_Drawdown.aqt
Date: 09/16/08 Time: 13:39:13

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

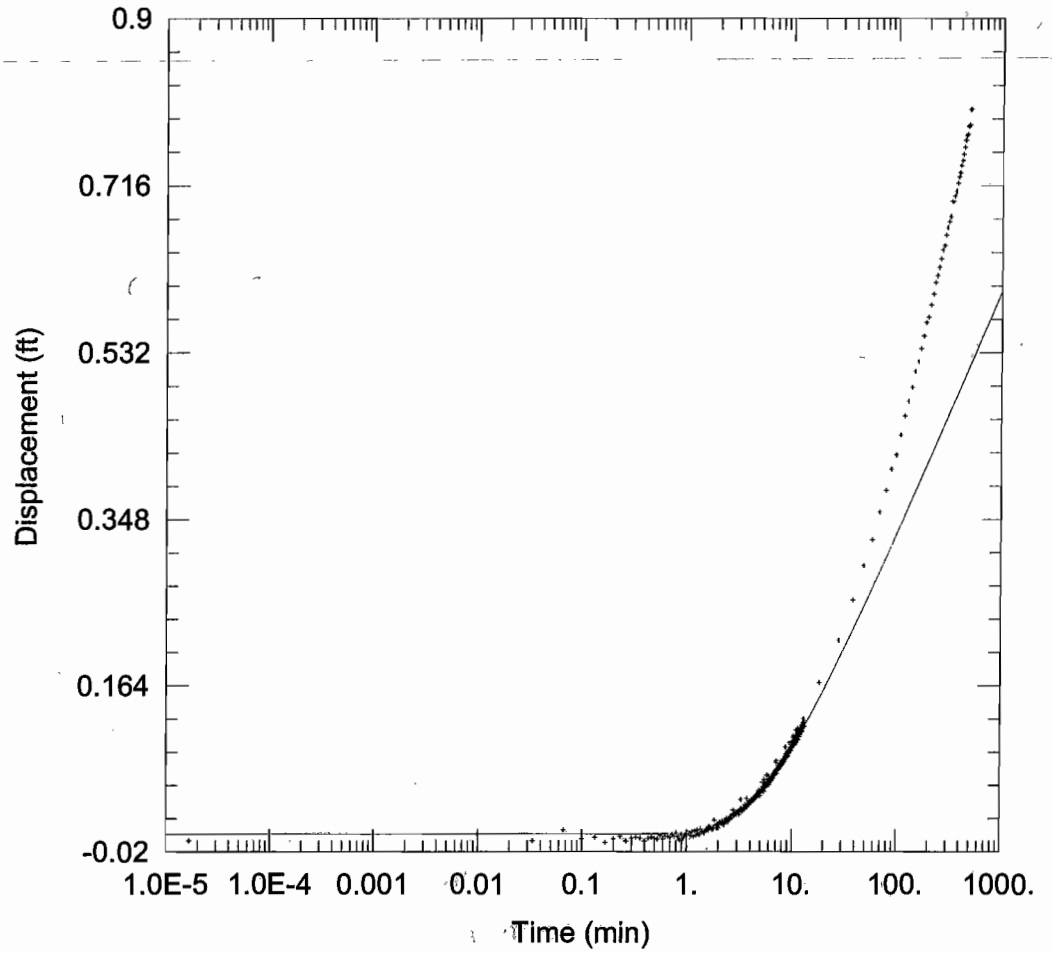
Observation Wells

Well Name	X (ft)	Y (ft)
EP-01	1396302.883	15941605.78

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 669.8 ft^2/day
S = 0.002207
Kz/Kr = 0.09661
b = 17.08 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-01_Recovery.aqt
Date: 09/16/08 Time: 13:39:33

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

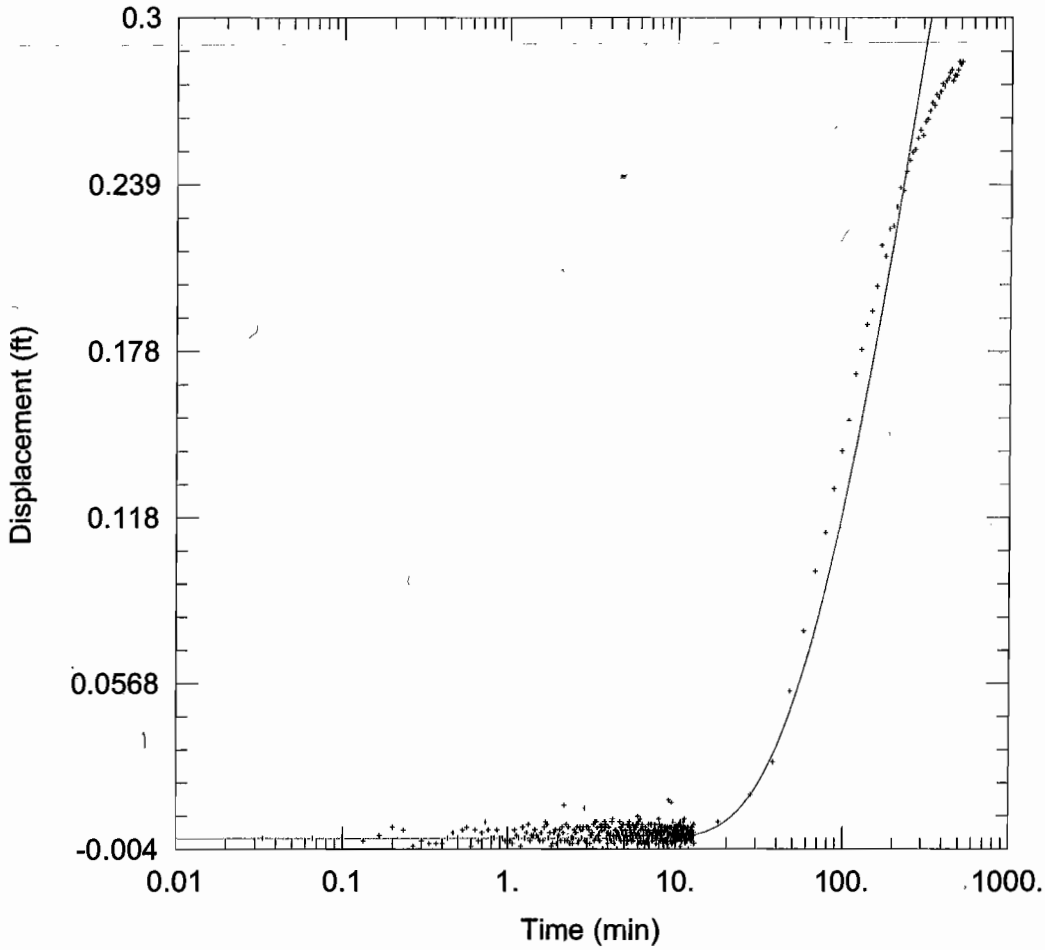
Observation Wells

Well Name	X (ft)	Y (ft)
EP-01	1396302.883	15941605.78

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 553.3 ft^2/day
S = 0.003067
Kz/Kr = 0.1
b = 15. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-P-106_Drawdown.aqt
Date: 09/16/08 Time: 13:38:18

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

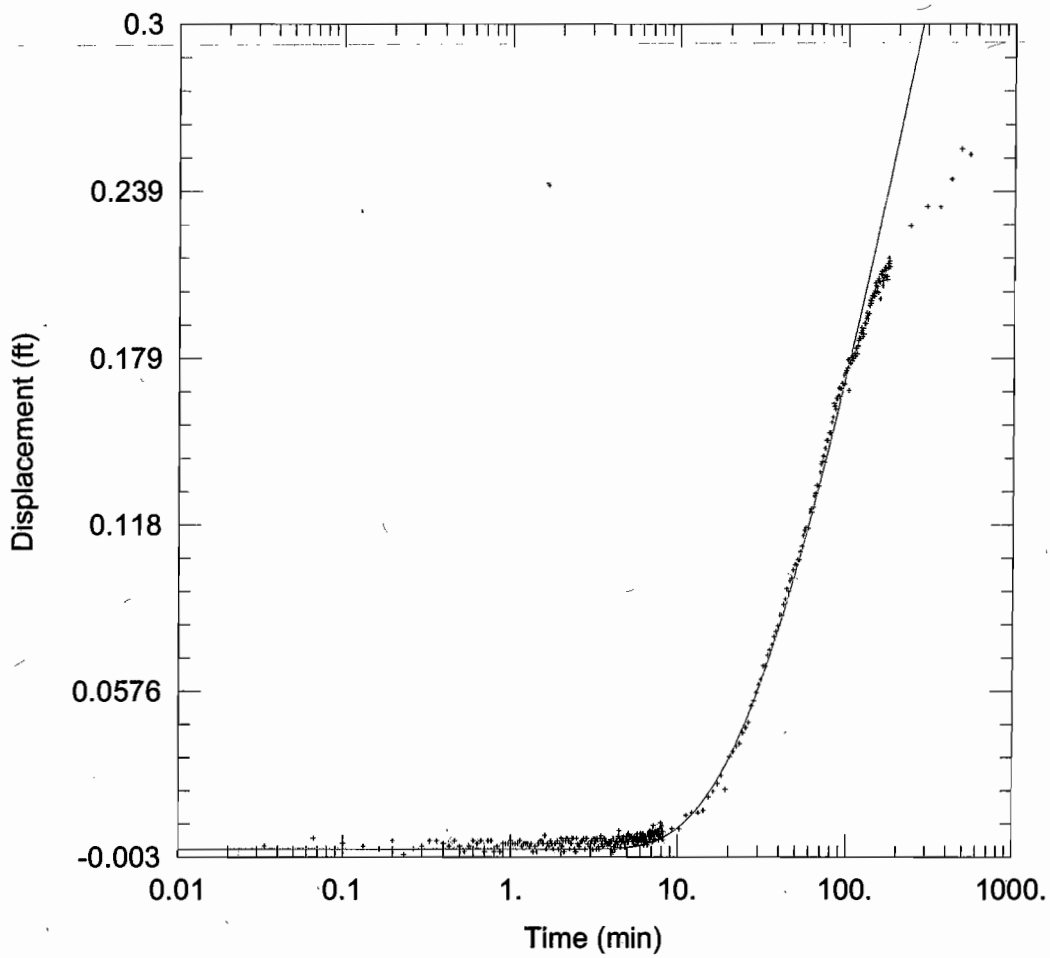
Observation Wells

Well Name	X (ft)	Y (ft)
P-106	1397370.204	15943990.03

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 70.71 ft^2/day
S = 0.0003268
Kz/Kr = 0.1
b = 30. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-MW-306_Recovery.aqt
Date: 09/16/08 Time: 13:37:16

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

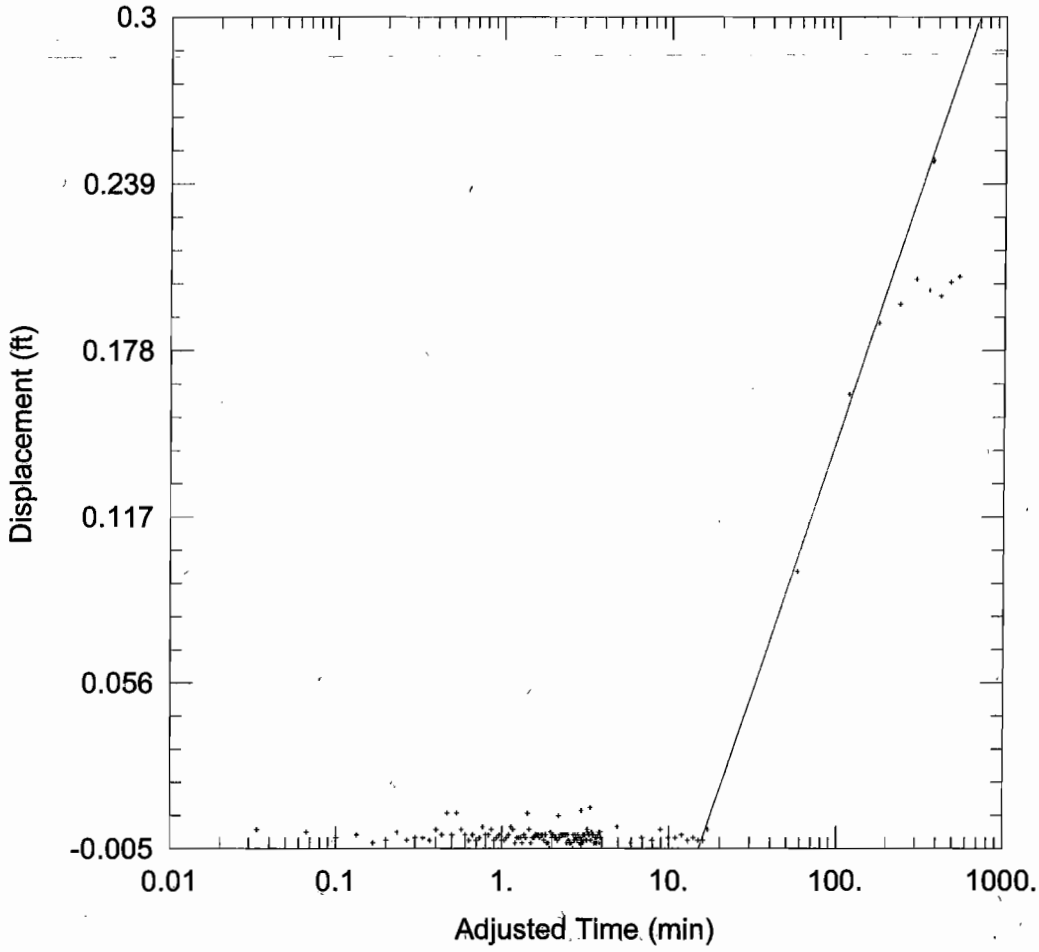
Observation Wells

Well Name	X (ft)	Y (ft)
MW-306	1396914.562	15944184.98

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 100.6 ft^2/day
S = 1.925E-5
Kz/Kr = 0.1
b = 30. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-MW-306_Drawdown.aqt
Date: 09/16/08 Time: 13:36:43

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

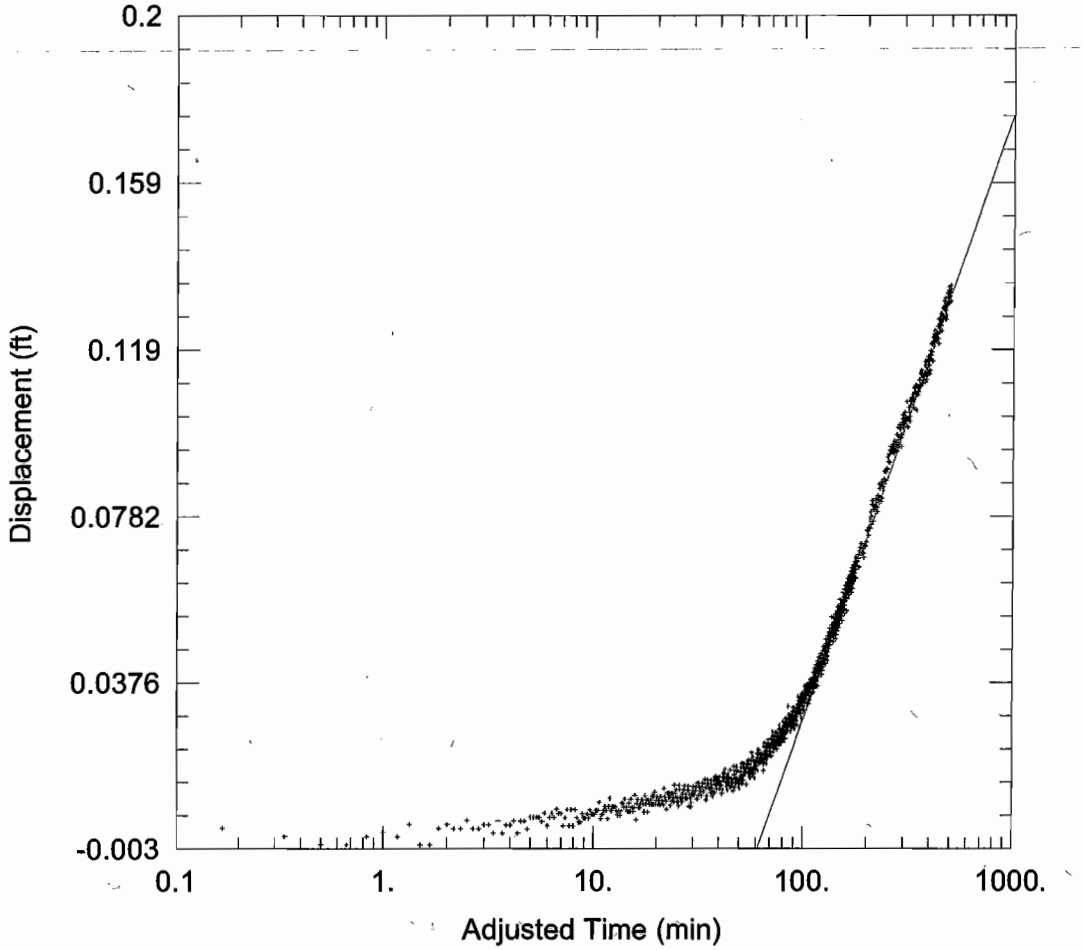
Observation Wells

Well Name	X (ft)	Y (ft)
MW-306	1396914.562	15944184.98

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 173.9 ft^2/day S = 1.58E-5



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-EP-15_Recovery.aqt
Date: 09/16/08 Time: 13:36:12

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.62	15944141.83

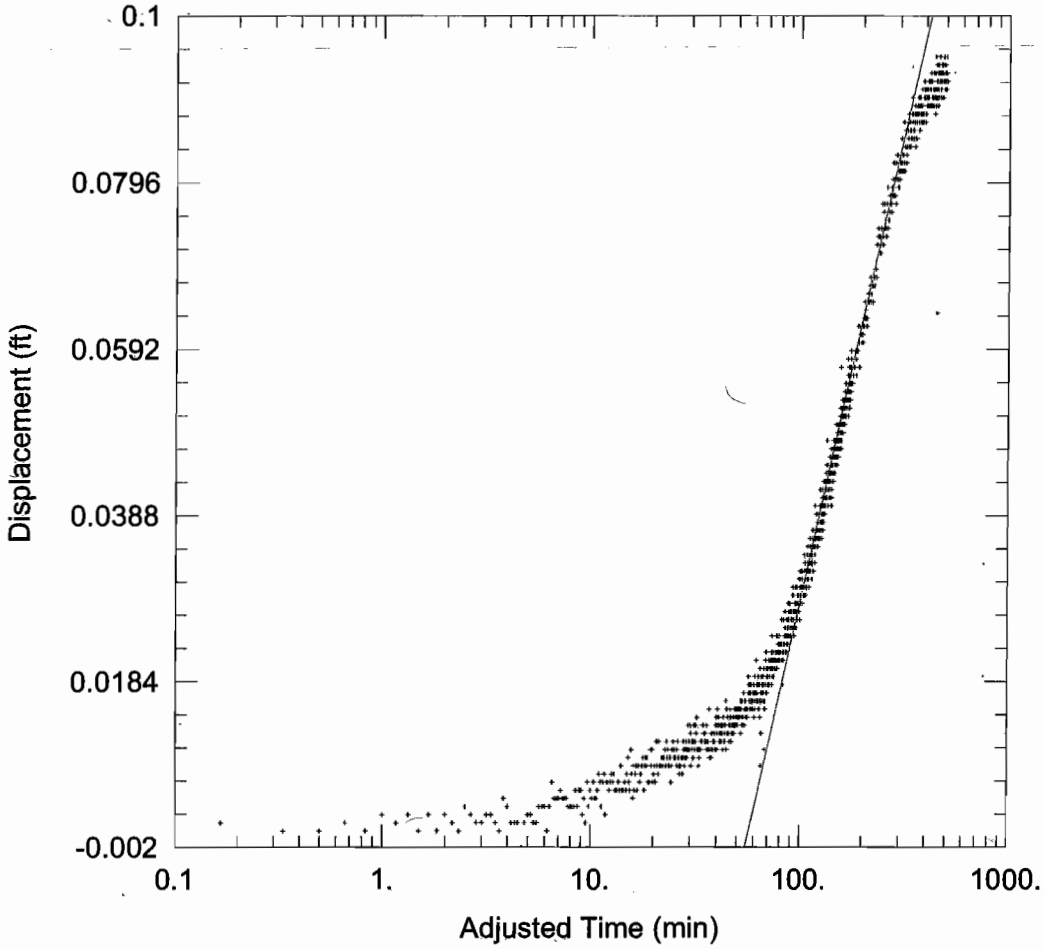
Observation Wells

Well Name	X (ft)	Y (ft)
EP-15	1397394.22	15944168.67

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 215.6 ft^2/day S = 0.008797



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-EP-15_Drawdown.aqt
Date: 09/16/08 Time: 13:35:41

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

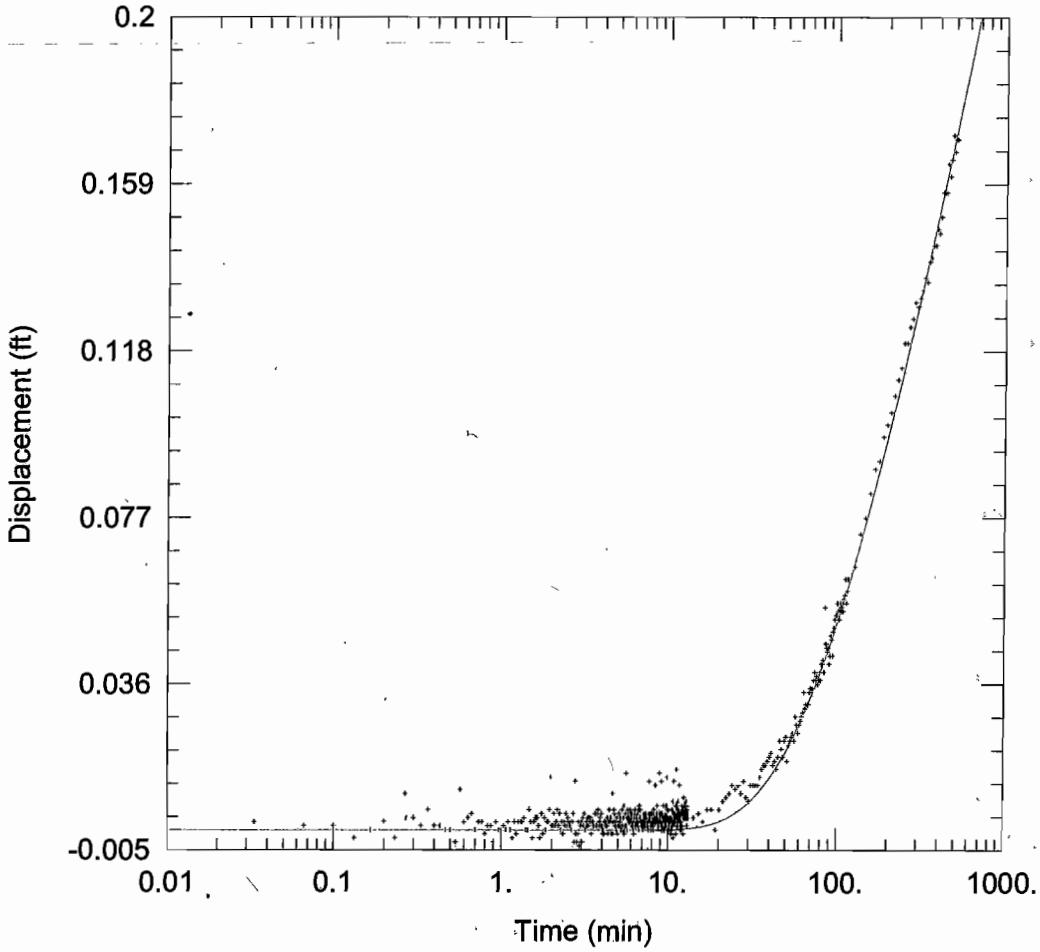
Observation Wells

Well Name	X (ft)	Y (ft)
EP-15	1397394.22	15944168.67

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 275.7 ft^2/day S = 0.01004



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-EP-13_Recovery.aqt
Date: 09/16/08 Time: 13:35:10

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

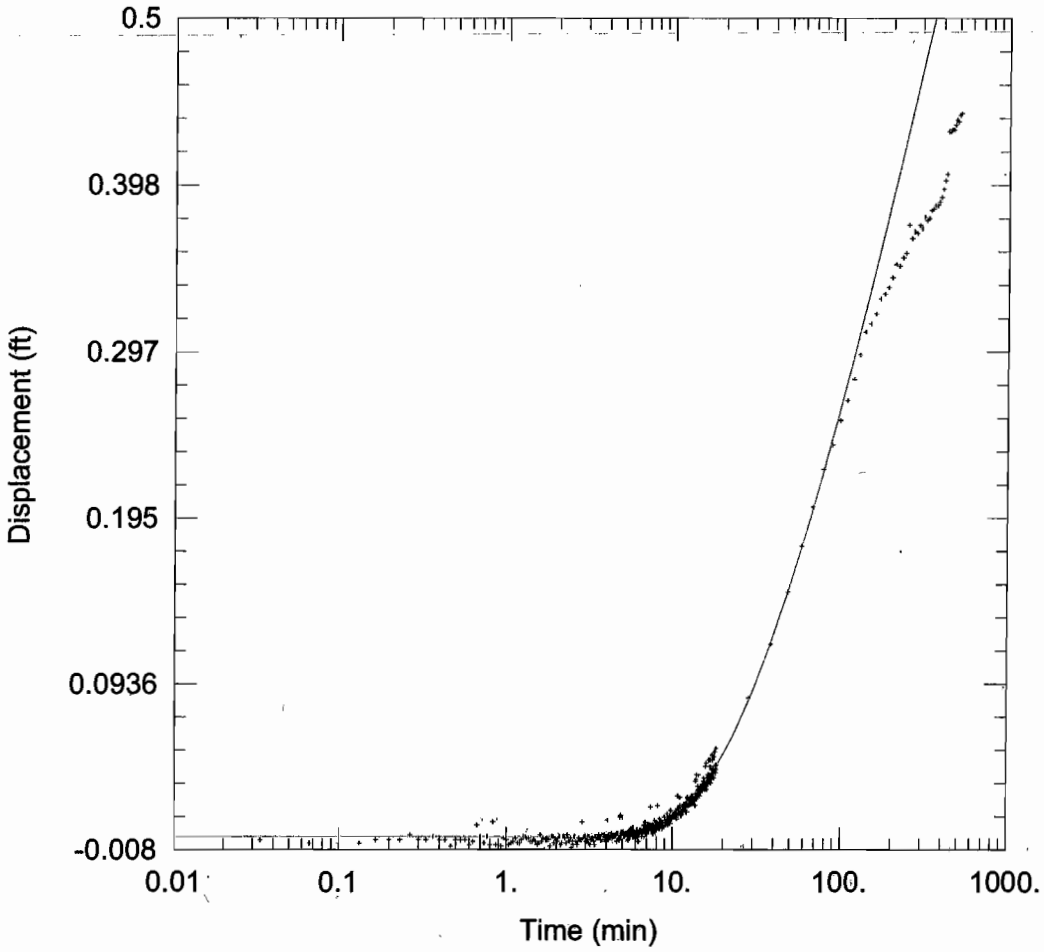
Observation Wells

Well Name	X (ft)	Y (ft)
EP-13	1397252.192	15944181.86

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 143. ft^2/day
S = 0.0005911
Kz/Kr = 0.1
b = 30. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-MW-331_Recovery.aqt
Date: 09/16/08 Time: 13:34:45

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

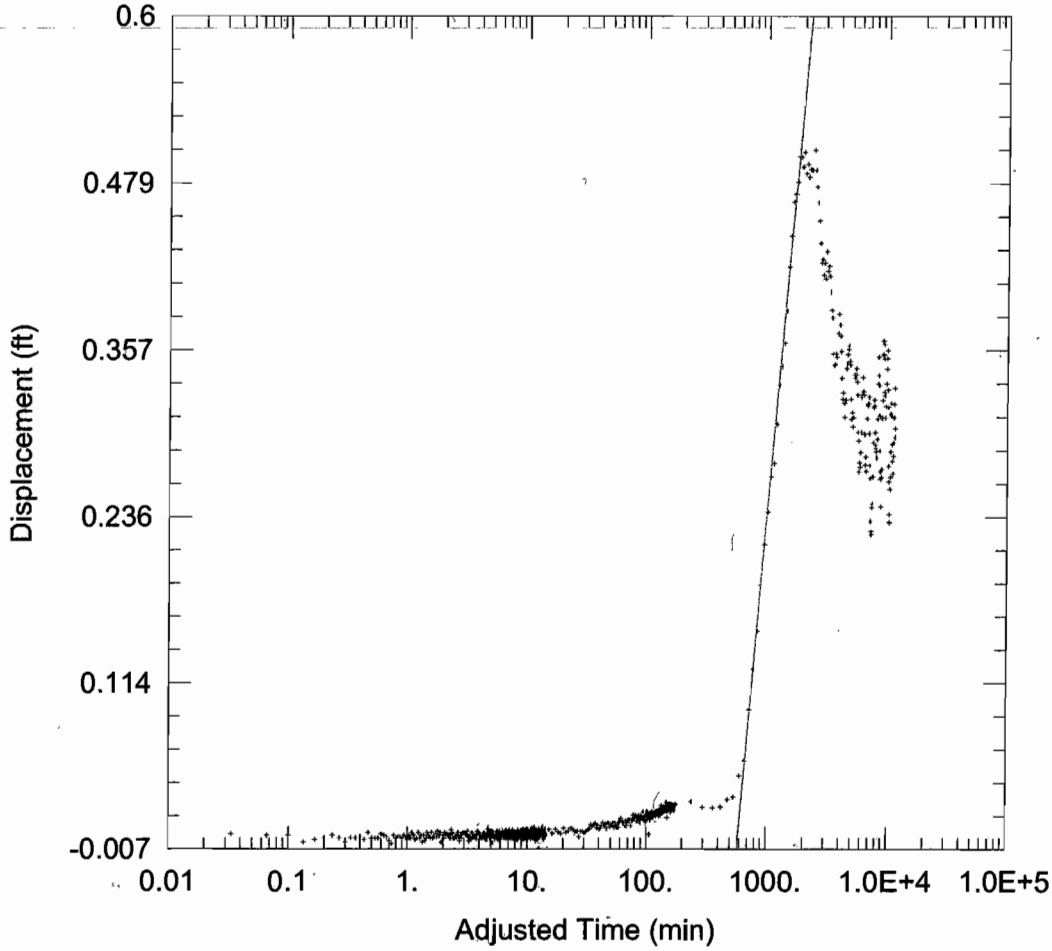
Observation Wells

Well Name	X (ft)	Y (ft)
MW-331	1396774.667	15942971.89

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 2135.1 ft^2/day
S = 0.0003728
Kz/Kr = 0.1
b = 14.8 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-MW-308_Recovery.aqt
Date: 09/16/08 Time: 13:34:24

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 17.08 ft Anisotropy Ratio (Kz/Kr): 0.09661

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

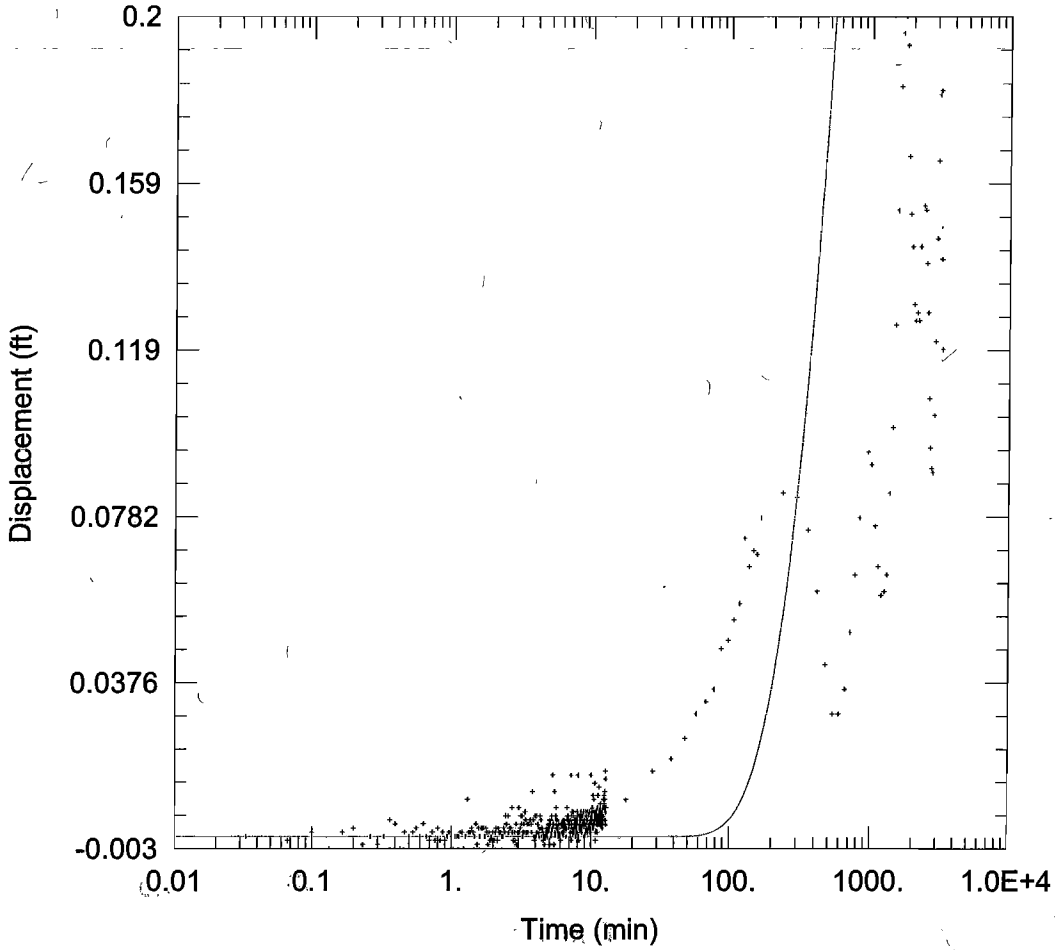
Observation Wells

Well Name	X (ft)	Y (ft)
MW-308	1397587.067	15943349.18

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 1000. ft^2/day S = 0.001811



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-MW-308_Drawdown.aqt
Date: 09/16/08 Time: 13:33:50

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

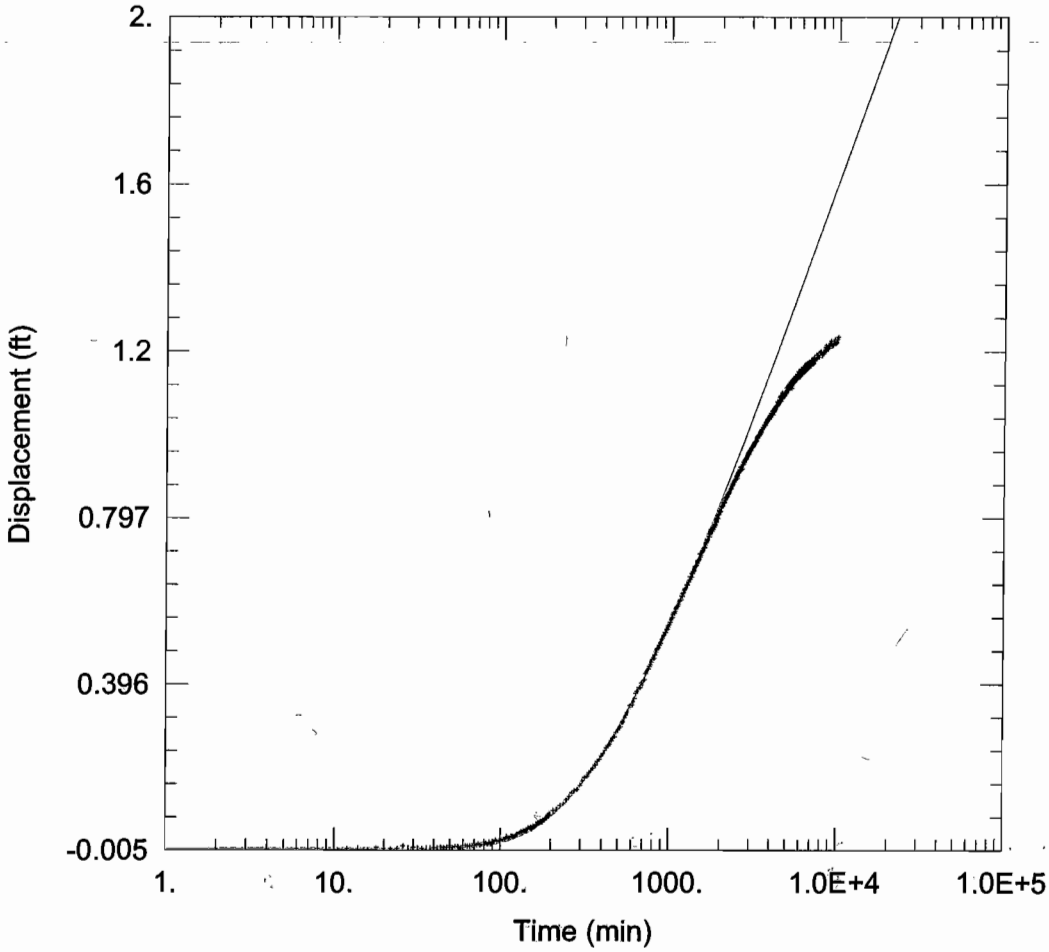
Observation Wells

Well Name	X (ft)	Y (ft)
MW-308	1397587.067	15943349.18

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 1000. ft^2/day
S = 0.001811
Kz/Kr = 0.09661
b = 17.08 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-12_Recovery.aqt
Date: 09/16/08 Time: 13:33:18

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

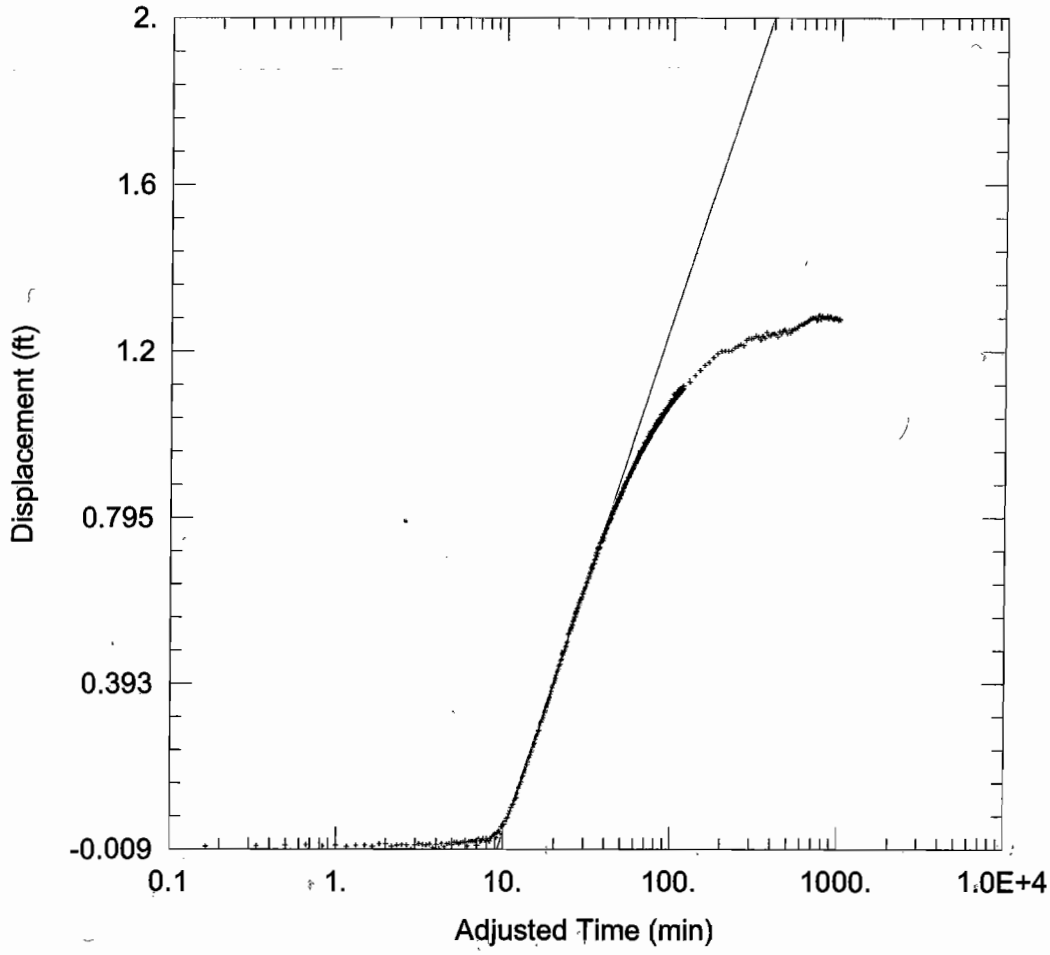
Observation Wells

Well Name	X (ft)	Y (ft)
EP-12	1396772.666	15943630.45

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 872.4 ft^2/day
S = 0.01834
Kz/Kr = 0.1
b = 16.04 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-12_Drawdown.aqt
Date: 09/16/08 Time: 13:32:53

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 16.04 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

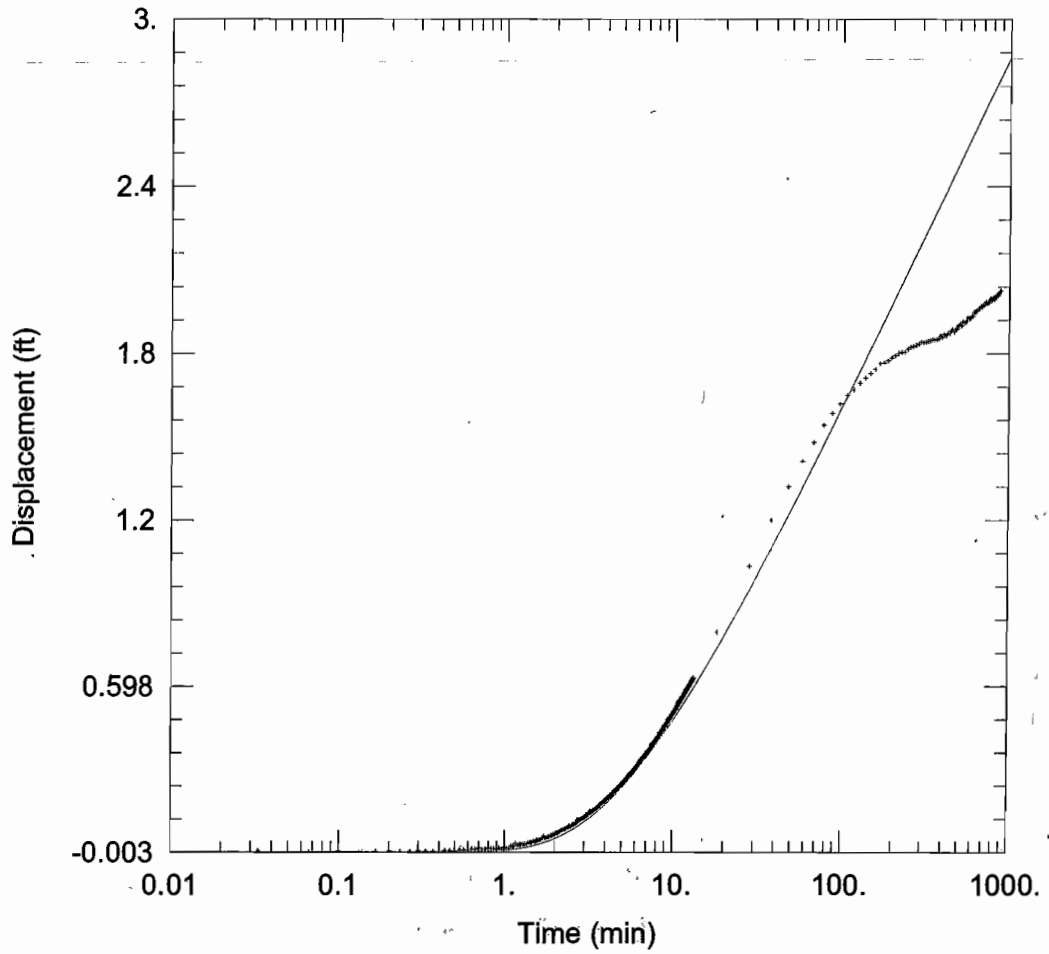
Observation Wells

Well Name	X (ft)	Y (ft)
EP-12	1396772.666	15943630.45

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 829.7 ft^2/day S = 0.0003766



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-11_Recovery.aqt
Date: 09/16/08 Time: 13:32:29

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

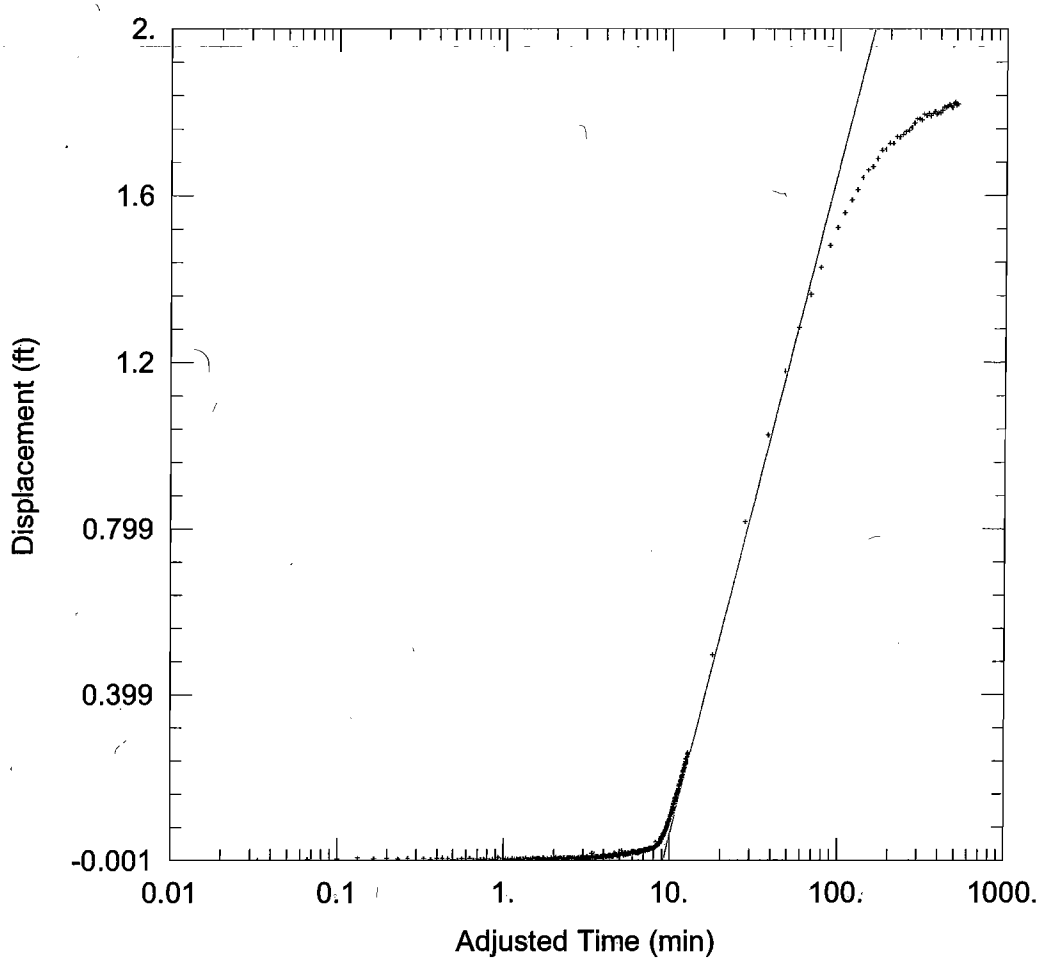
Observation Wells

Well Name	X (ft)	Y (ft)
EP-11	1396898.781	15943630.58

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 798.1 ft^2/day
S = 0.0004253
Kz/Kr = 0.1
b = 18.9 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-11_Drawdown.aqt
Date: 09/16/08 Time: 13:32:02

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 18.9 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

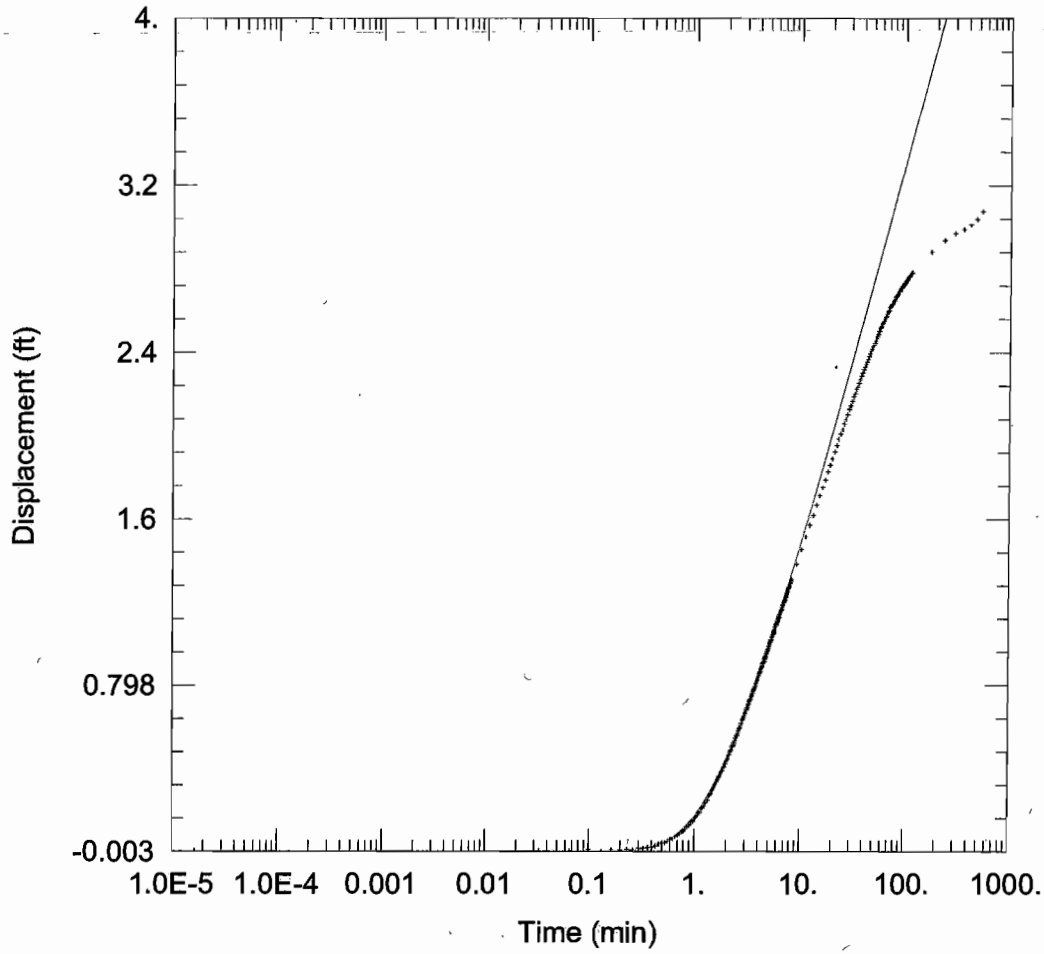
Observation Wells

Well Name	X (ft)	Y (ft)
EP-11	1396898.781	15943630.58

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 635.1 ft^2/day S = 0.0005414



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-10_Recovery.aqt
Date: 09/16/08 Time: 13:31:34

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

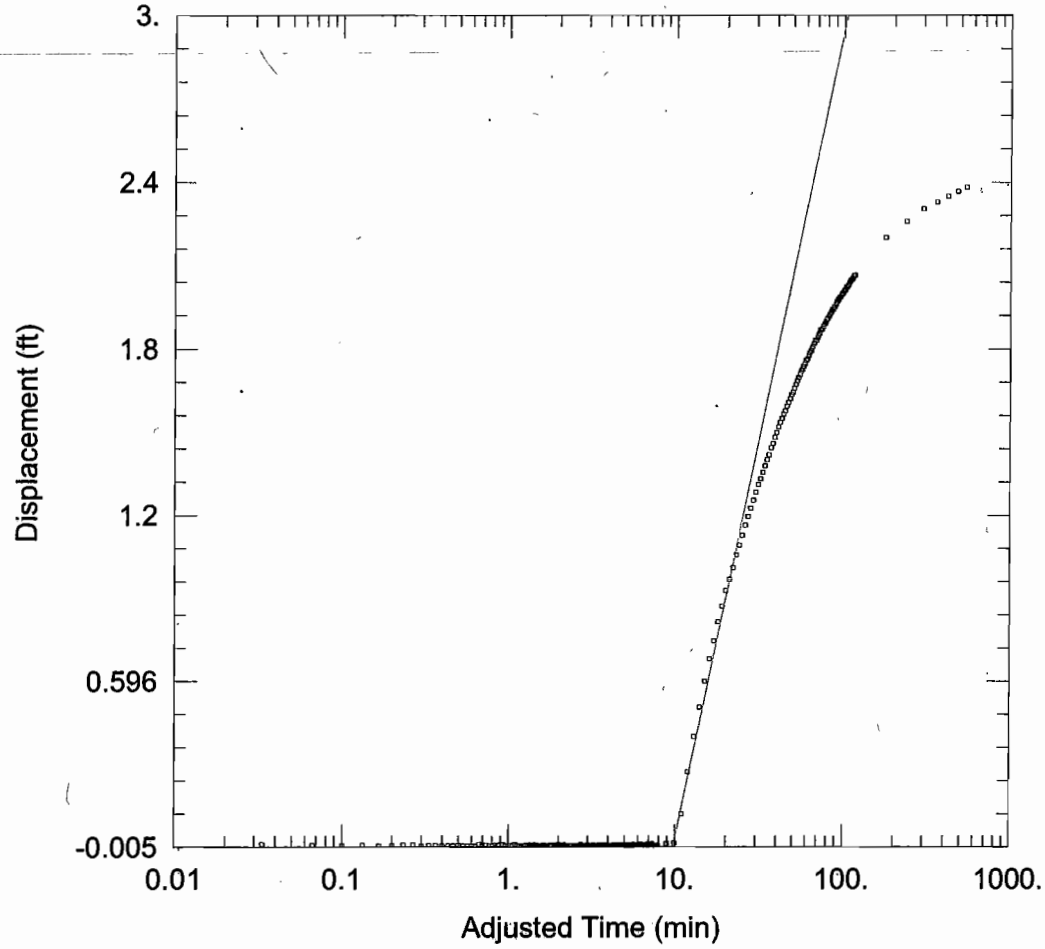
Observation Wells

Well Name	X (ft)	Y (ft)
EP-10	1396965.546	15943497.87

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 535.8 ft^2/day
S = 0.0003268
Kz/Kr = 0.1
b = 18.9 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-10_Drawdown.aqt
Date: 09/16/08 Time: 13:31:16

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 18.9 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

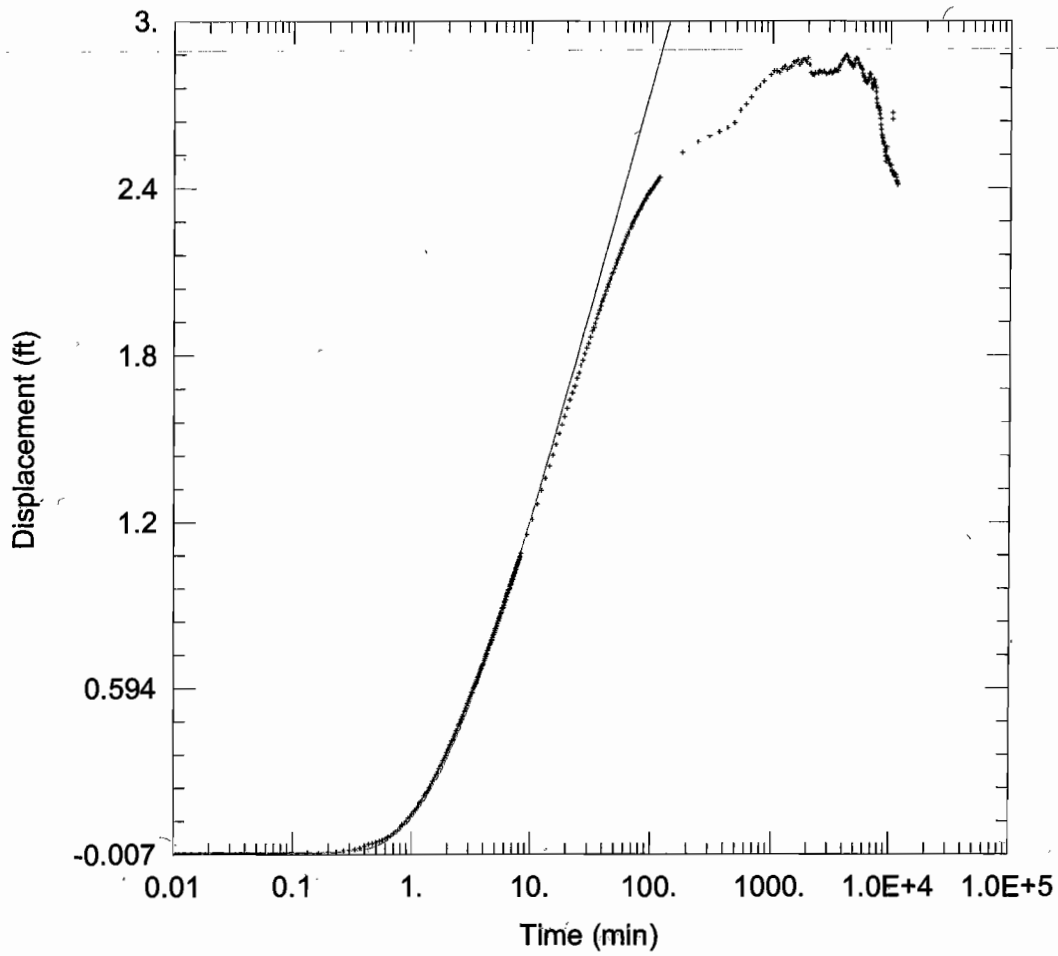
Observation Wells

Well Name	X (ft)	Y (ft)
EP-10	1396965.546	15943497.87

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 348.1 ft^2/day S = 0.001124



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-09_Recovery.aqt
Date: 09/16/08 Time: 13:29:40

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

Observation Wells

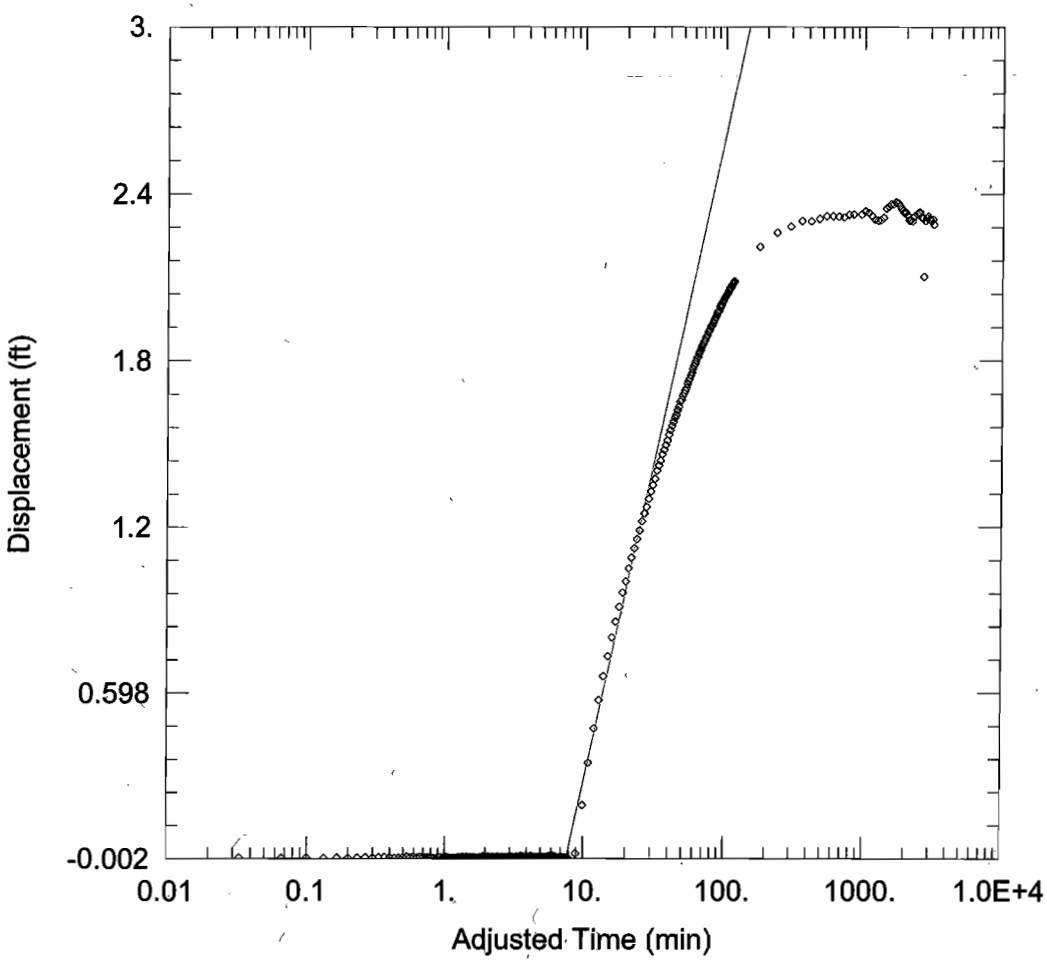
Well Name	X (ft)	Y (ft)
EP-09	1396900.487	15943471

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 628.2 ft^2/day
Kz/Kr = 0.09661

S = 0.002066
b = 15.71 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-04-EP-09_Drawdown.aqt
Date: 09/16/08 Time: 13:30:57

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 15.71 ft Anisotropy Ratio (Kz/Kr): 0.1072

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-04	1396896.977	15943501.51

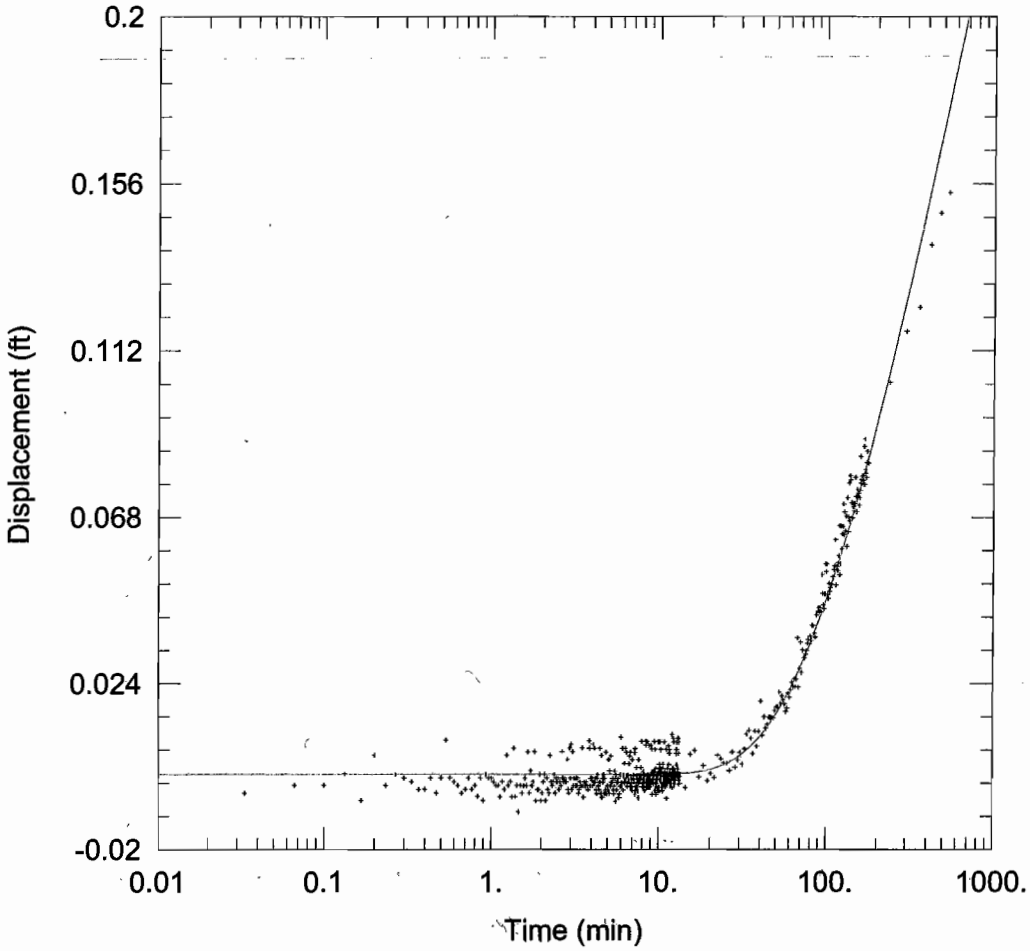
Observation Wells

Well Name	X (ft)	Y (ft)
◦ EP-09	1396900.487	15943471

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 435.5 ft^2/day S = 0.005482



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A-EP-06_Recovery.aqt
Date: 09/16/08 Time: 13:49:16

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

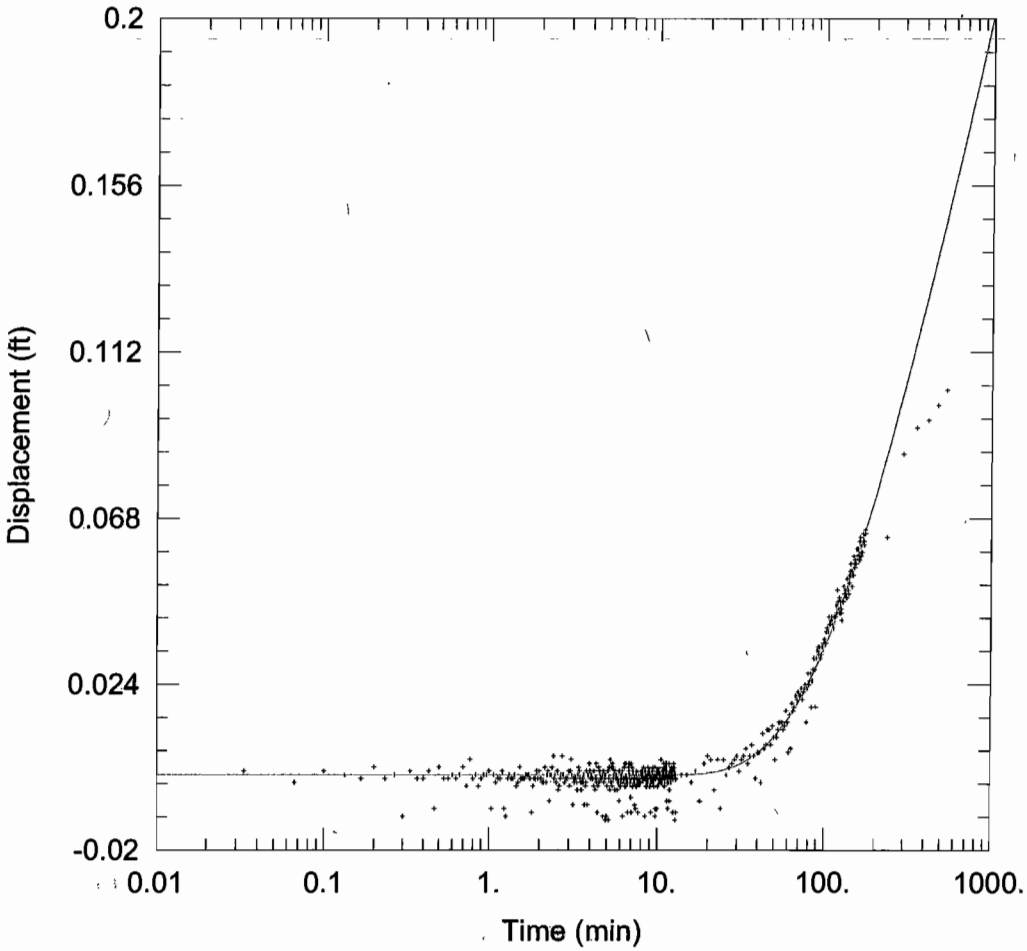
Observation Wells

Well Name	X (ft)	Y (ft)
EP-06	1396436.216	15942554.27

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 1181.8 ft^2/day
S = 0.0007202
Kz/Kr = 0.1
b = 26. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A-EP-06_Drawdown.aqt
Date: 09/16/08 Time: 13:47:52

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

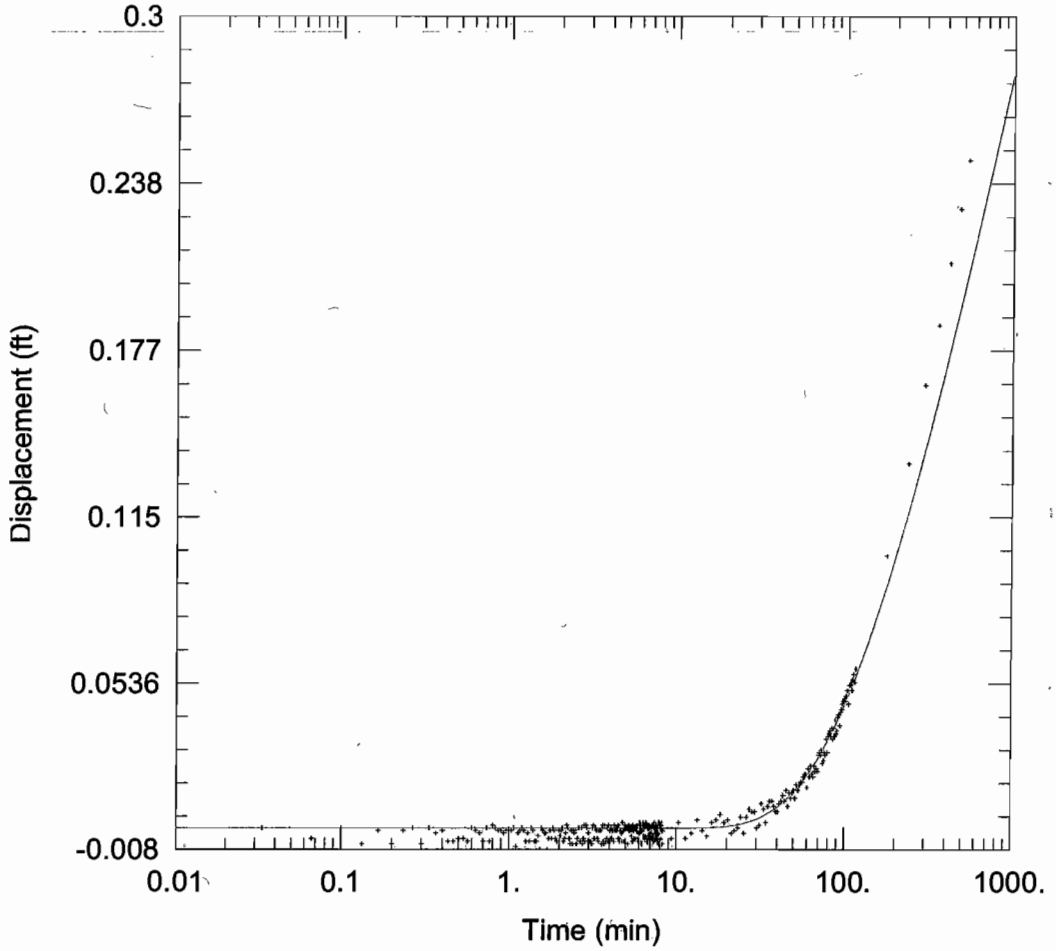
Observation Wells

Well Name	X (ft)	Y (ft)
EP-06	1396436.216	15942554.27

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 1279.6 ft^2/day
S = 0.0009373
Kz/Kr = 0.1
b = 26. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A-EP-04_Recovery.aqt
Date: 09/16/08 Time: 13:47:19

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

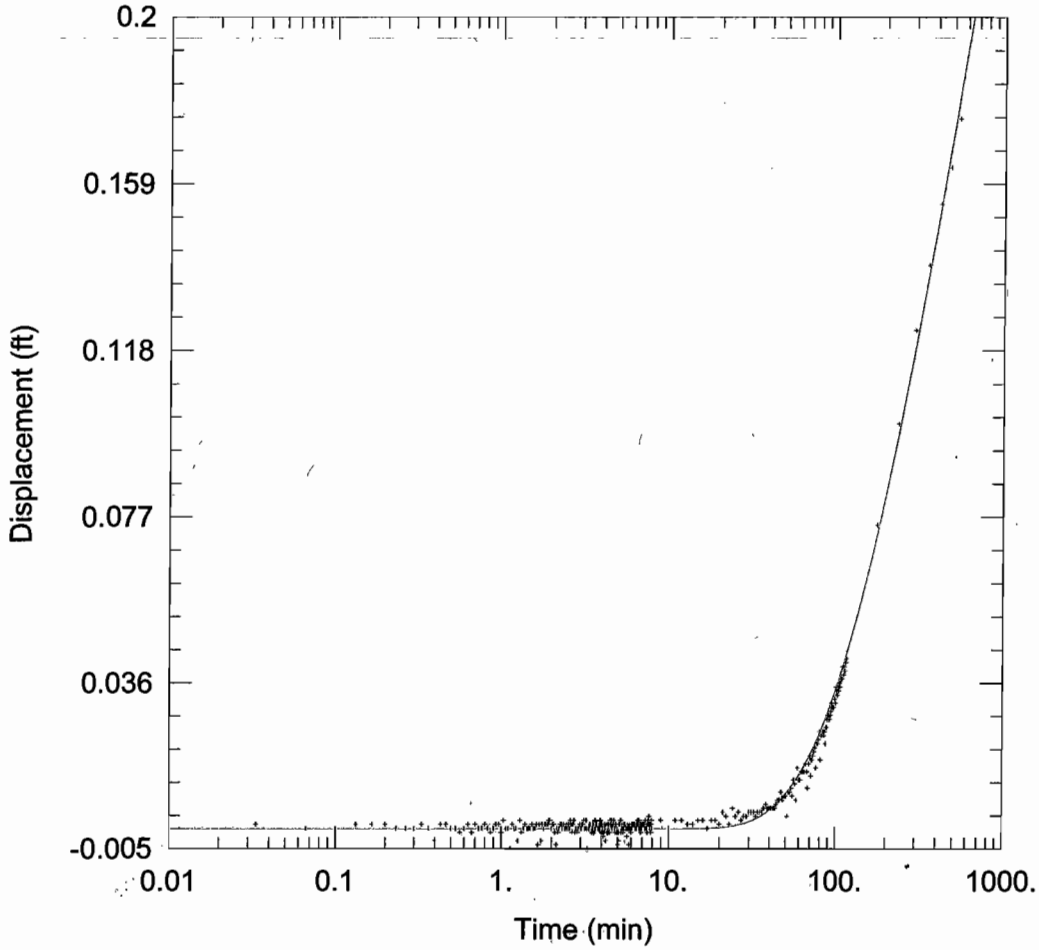
Observation Wells

Well Name	X (ft)	Y (ft)
EP-04	1396609.313	15942503.65

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 908.8 ft^2/day
S = 0.001587
Kz/Kr = 0.1
b = 26. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A-EP-04_Drawdown.aqt
Date: 09/16/08 Time: 13:46:50

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

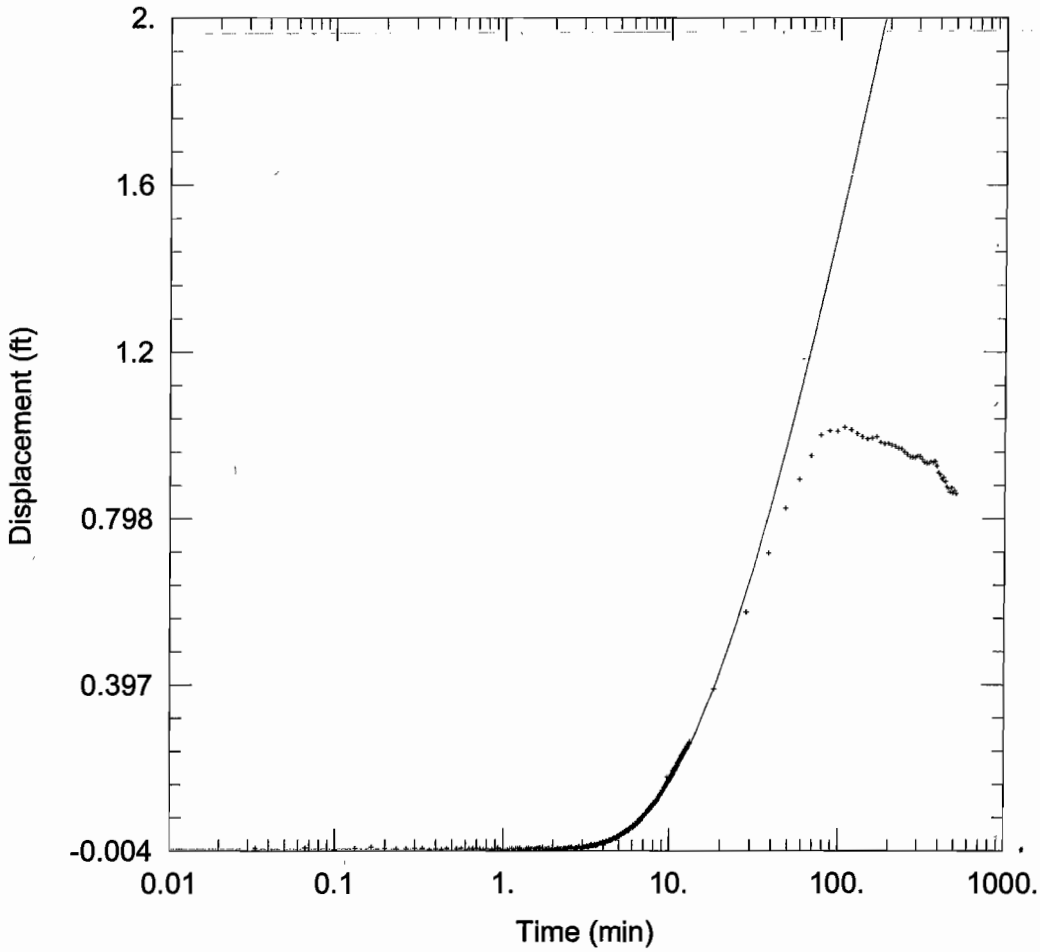
Observation Wells

Well Name	X (ft)	Y (ft)
EP-04	1396609.313	15942503.65

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 931.9 ft^2/day
S = 0.001934
Kz/Kr = 0.1
b = 26. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A_MW-MB-05C_Recovery.aqt
Date: 09/16/08 Time: 13:46:13

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

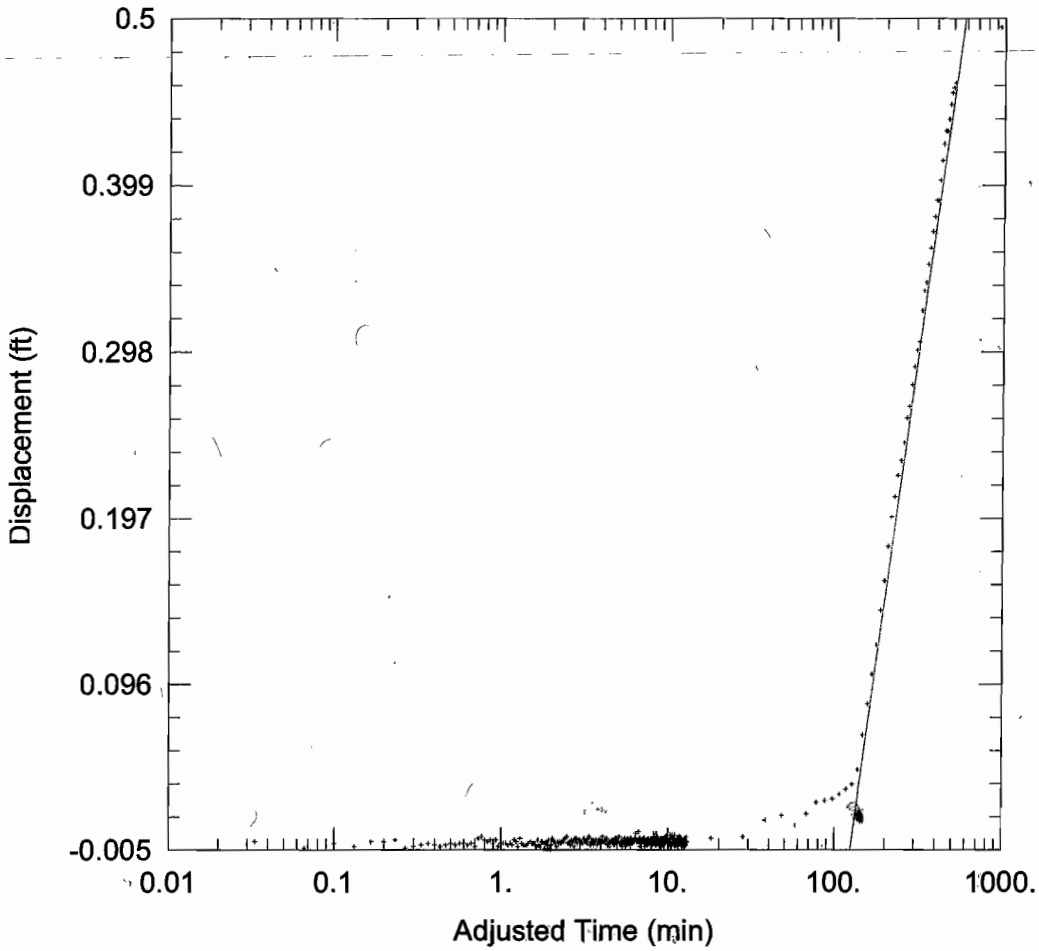
Observation Wells

Well Name	X (ft)	Y (ft)
MW-MB-05C	1397056.42	15942426.12

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 140.2 ft^2/day
S = 0.0002511
Kz/Kr = 0.1
b = 11.89 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A_MW-MB-05C_Drawdown.aqt
Date: 09/16/08 Time: 13:45:15

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 11.89 ft Anisotropy Ratio (Kz/Kr): 0.09661

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

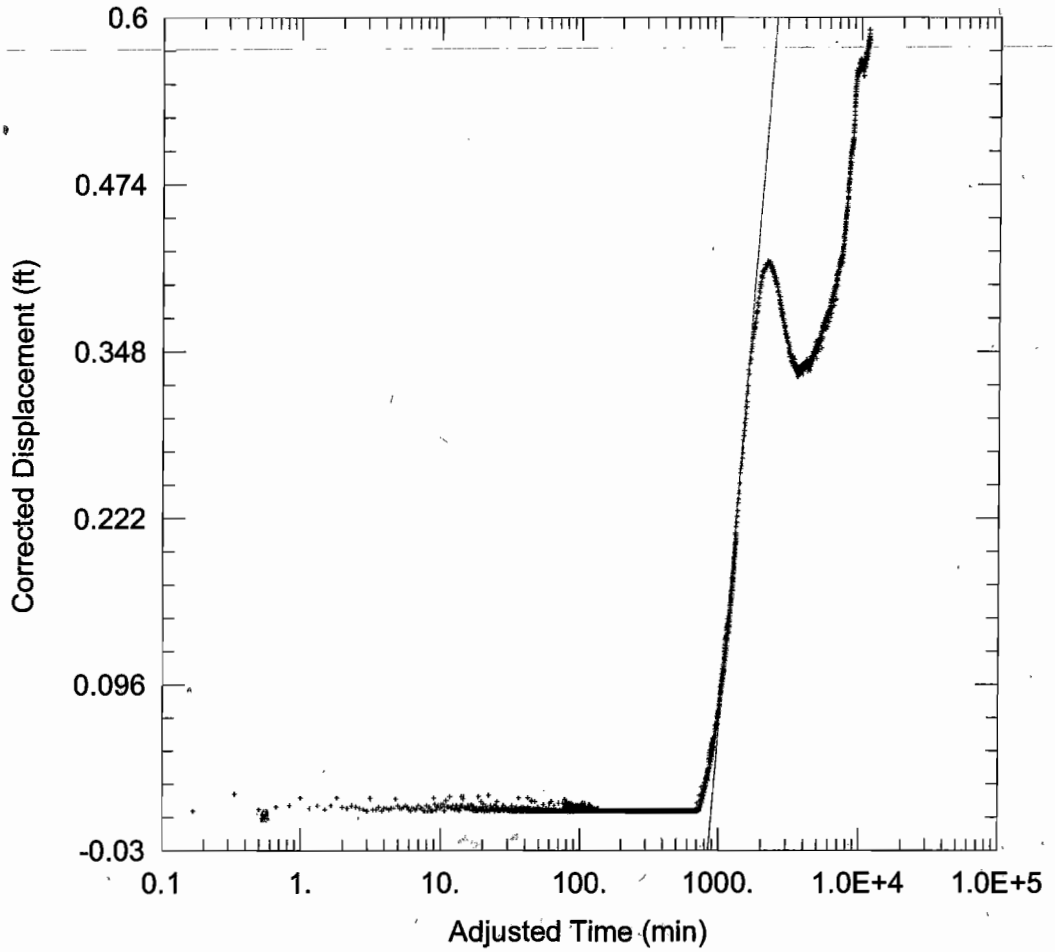
Observation Wells

Well Name	X (ft)	Y (ft)
MW-MB-05C	1397056.42	15942426.12

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 372.9 ft^2/day S = 0.004263



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A_MW-MB-05B_Recovery.aqt
Date: 09/16/08 Time: 13:44:42

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 51.77 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.54	15942382.88

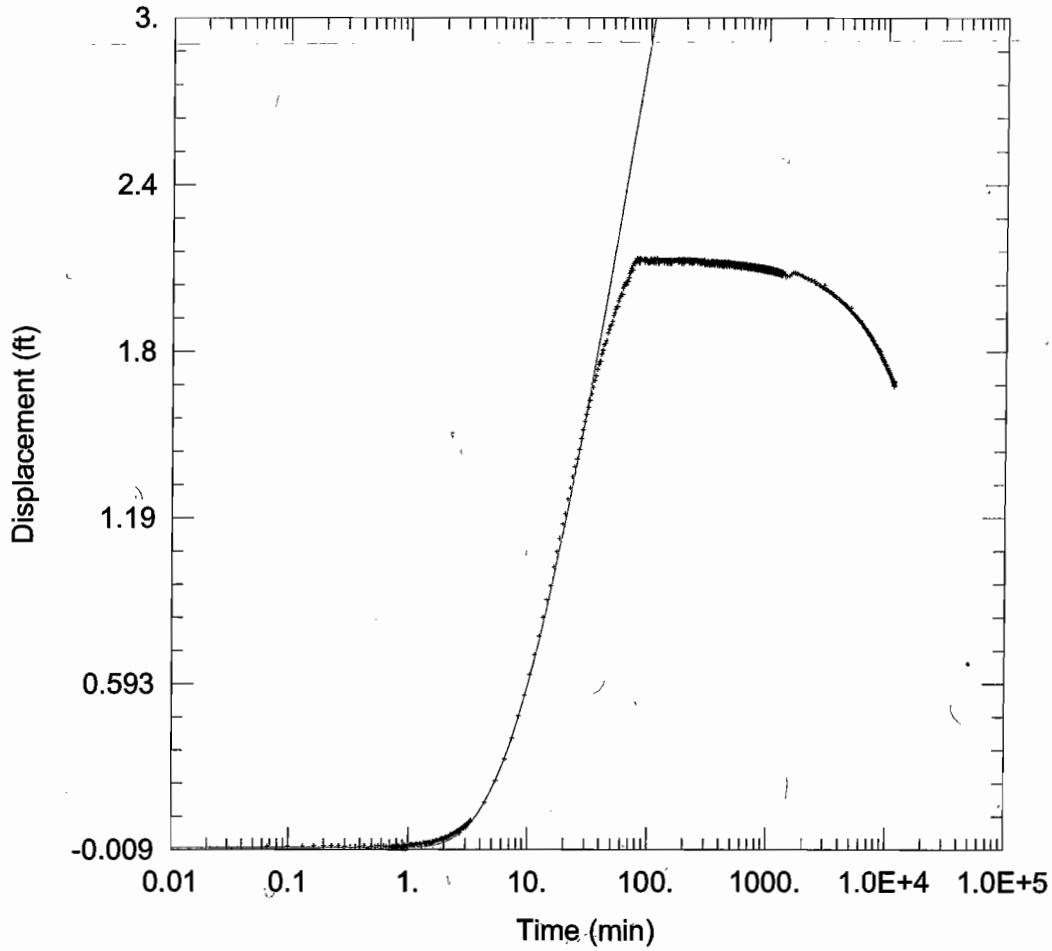
Observation Wells

Well Name	X (ft)	Y (ft)
MW-MB-05B	1397056.42	15942426.12

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 211.4 ft^2/day S = 0.017



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A_MW-311_Recovery.aqt
Date: 09/16/08 Time: 13:44:13

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

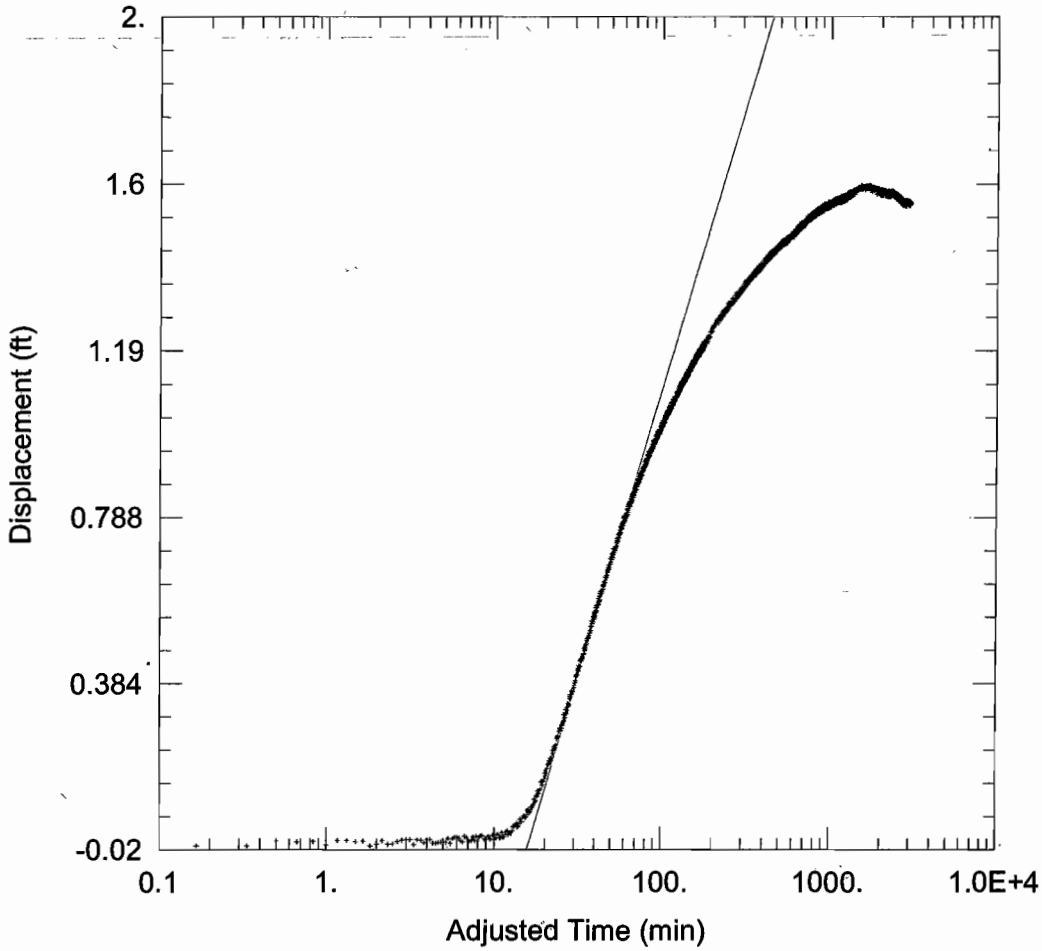
Observation Wells

Well Name	X (ft)	Y (ft)
MW-311	1396977.357	15942379.43

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 98.61 ft^2/day
S = 0.0007693
Kz/Kr = 0.1
b = 11.05 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-02A_MW-311_Drawdown.aqt
Date: 09/16/08 Time: 13:43:44

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 11.05 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-02A	1396932.541	15942382.88

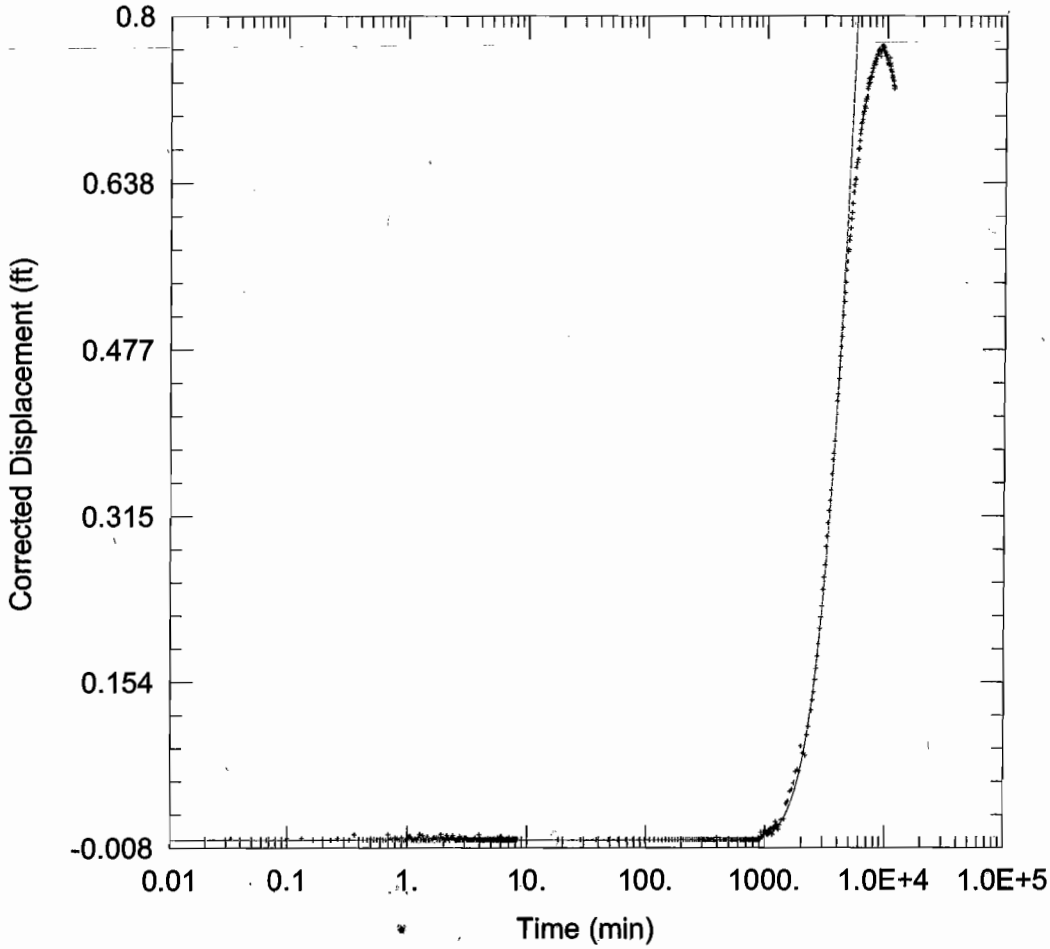
Observation Wells

Well Name	X (ft)	Y (ft)
MW-311	1396977.357	15942379.43

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 203.3 ft^2/day S = 0.002517



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-MW-229B_Recovery.aqt
Date: 09/16/08 Time: 13:43:02

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

Observation Wells

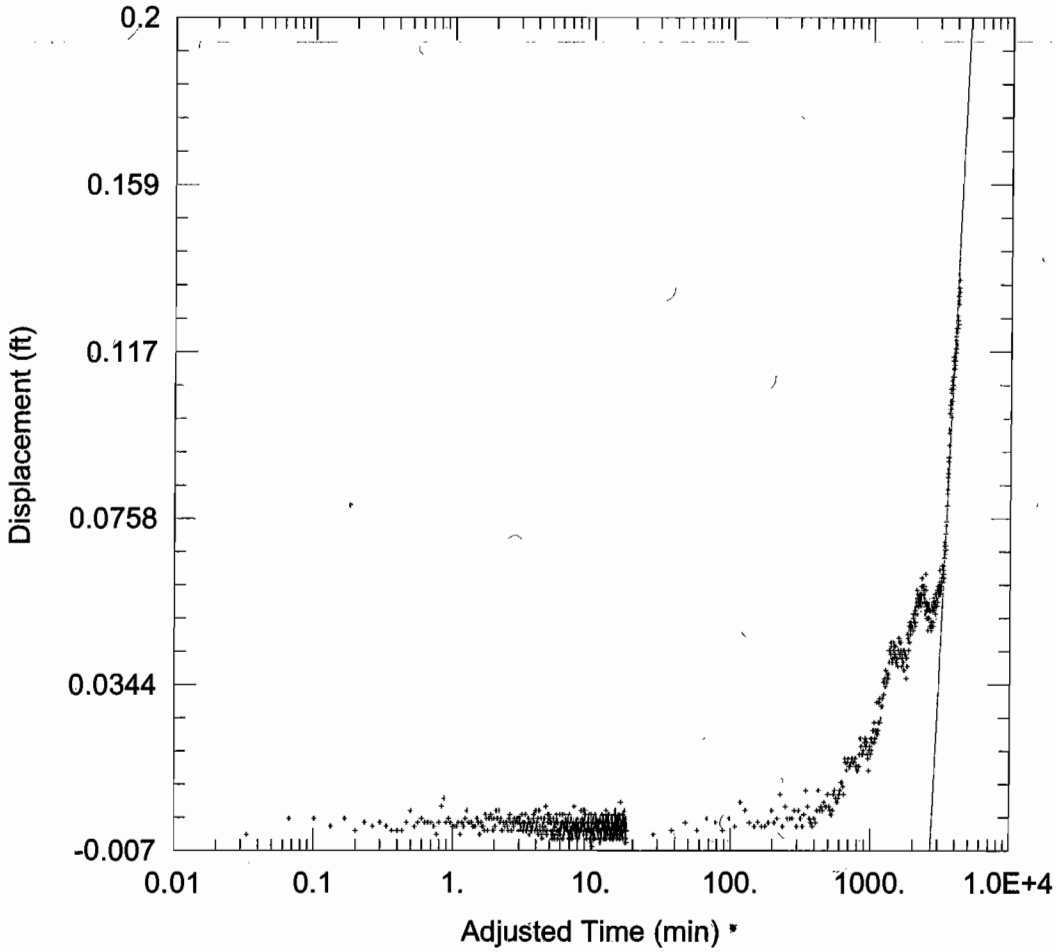
Well Name	X (ft)	Y (ft)
MW-229B	1396291.63	15941493.15

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 21.33 ft^2/day
Kz/Kr = 0.1

S = 0.01306
b = 77.39 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-MW-229B_Drawdown.aqt
Date: 09/16/08 Time: 13:42:34

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

AQUIFER DATA

Saturated Thickness: 15. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

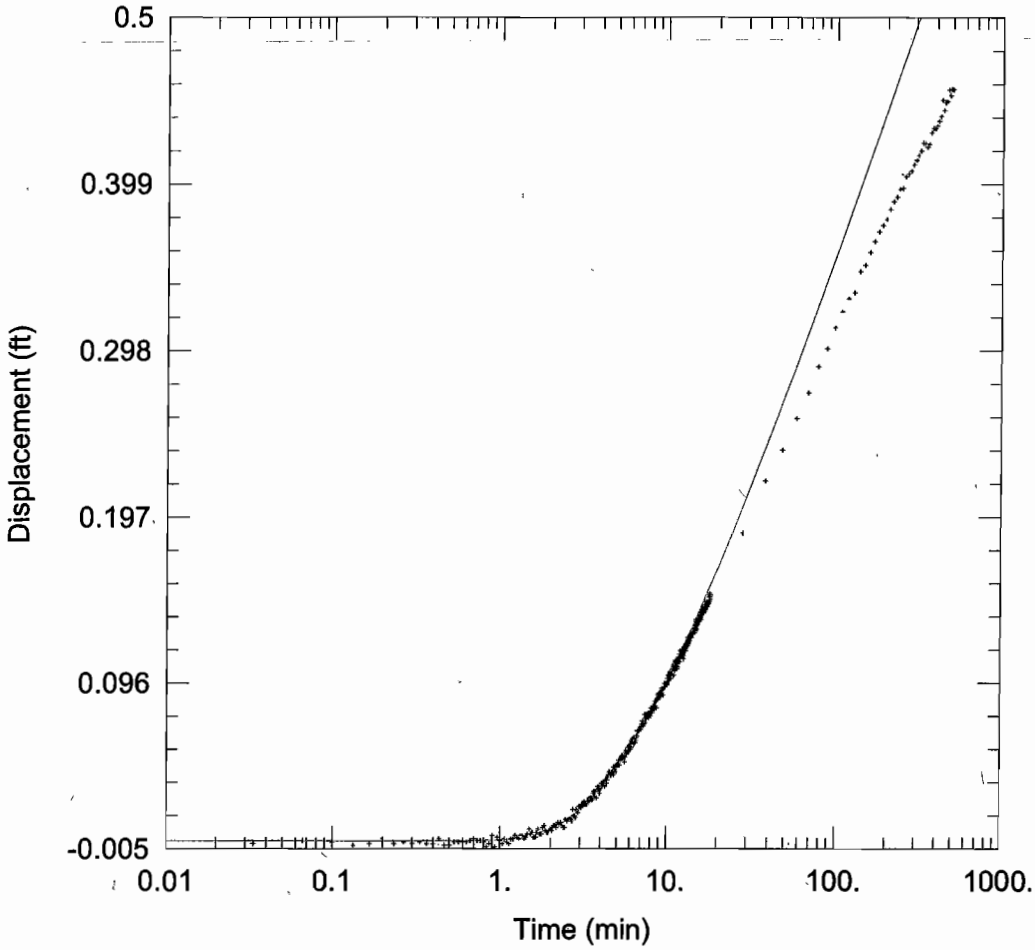
Observation Wells

Well Name	X (ft)	Y (ft)
MW-229B	1396291.63	15941493.15

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 194.5 ft^2/day S = 0.03746



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-MW-229A_Recovery.aqt
Date: 09/16/08 Time: 13:42:00

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.37	15941641.41

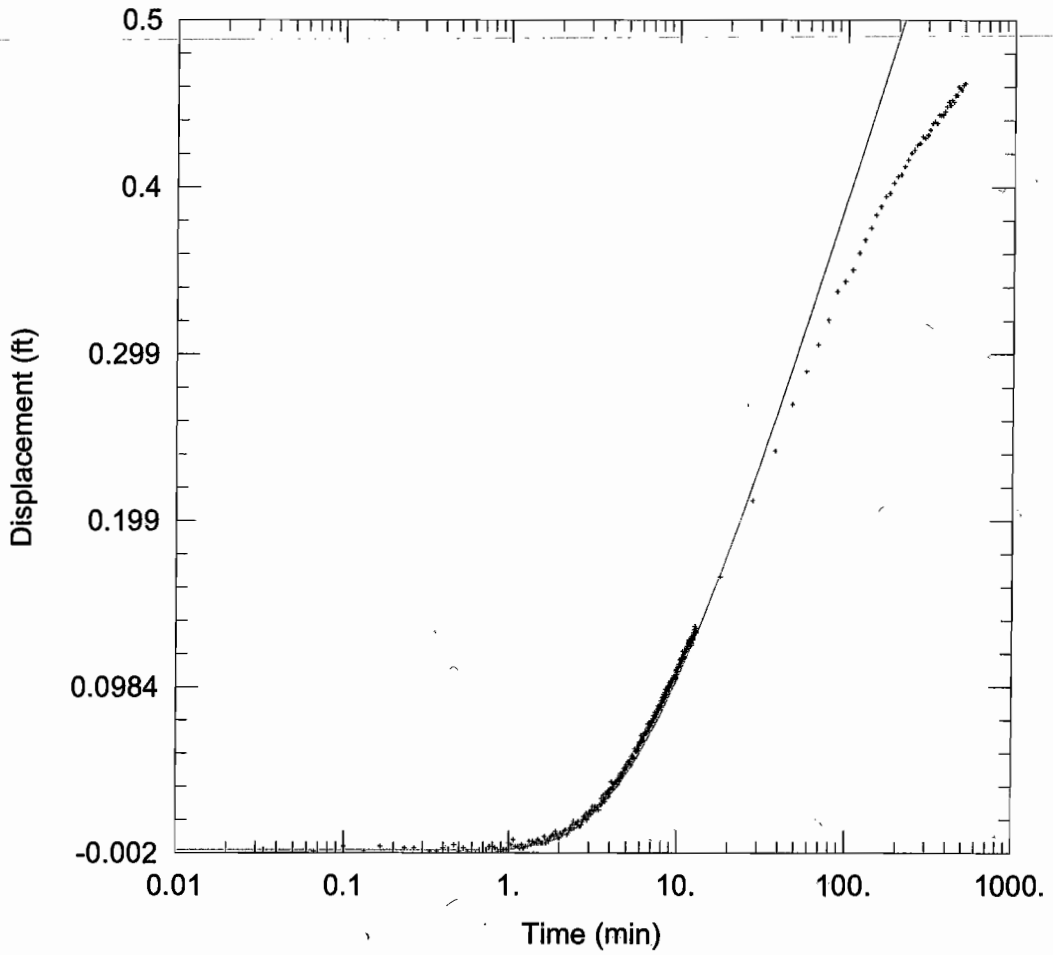
Observation Wells

Well Name	X (ft)	Y (ft)
MW-229A	1396291.63	15941493.15

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 500. ft^2/day
S = 0.0002351
Kz/Kr = 0.1
b = 15. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-MW-229A_Drawdown.aqt
Date: 09/16/08 Time: 13:41:42

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

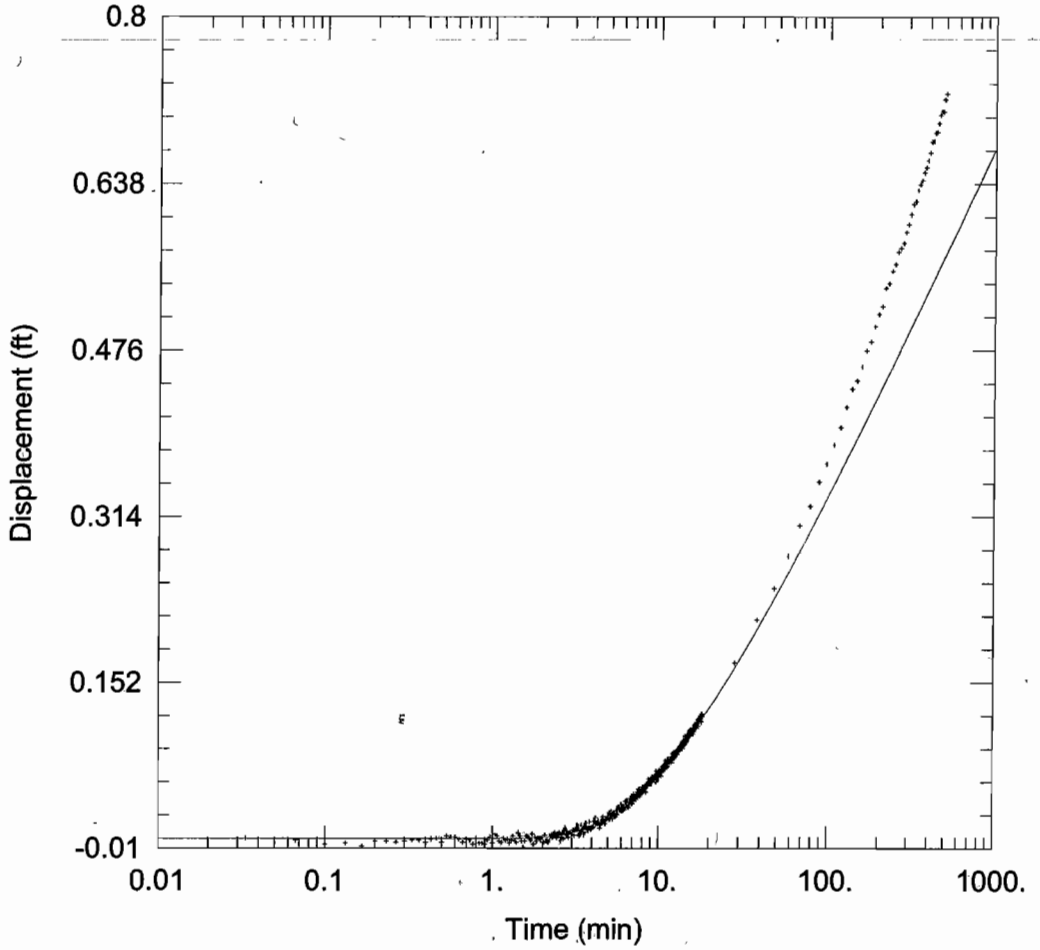
Observation Wells

Well Name	X (ft)	Y (ft)
MW-229A	1396291.63	15941493.15

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 448.6 ft^2/day
S = 0.0002201
Kz/Kr = 0.09661
b = 17.08 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-03_Recovery.aqt
Date: 09/16/08 Time: 13:41:28

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

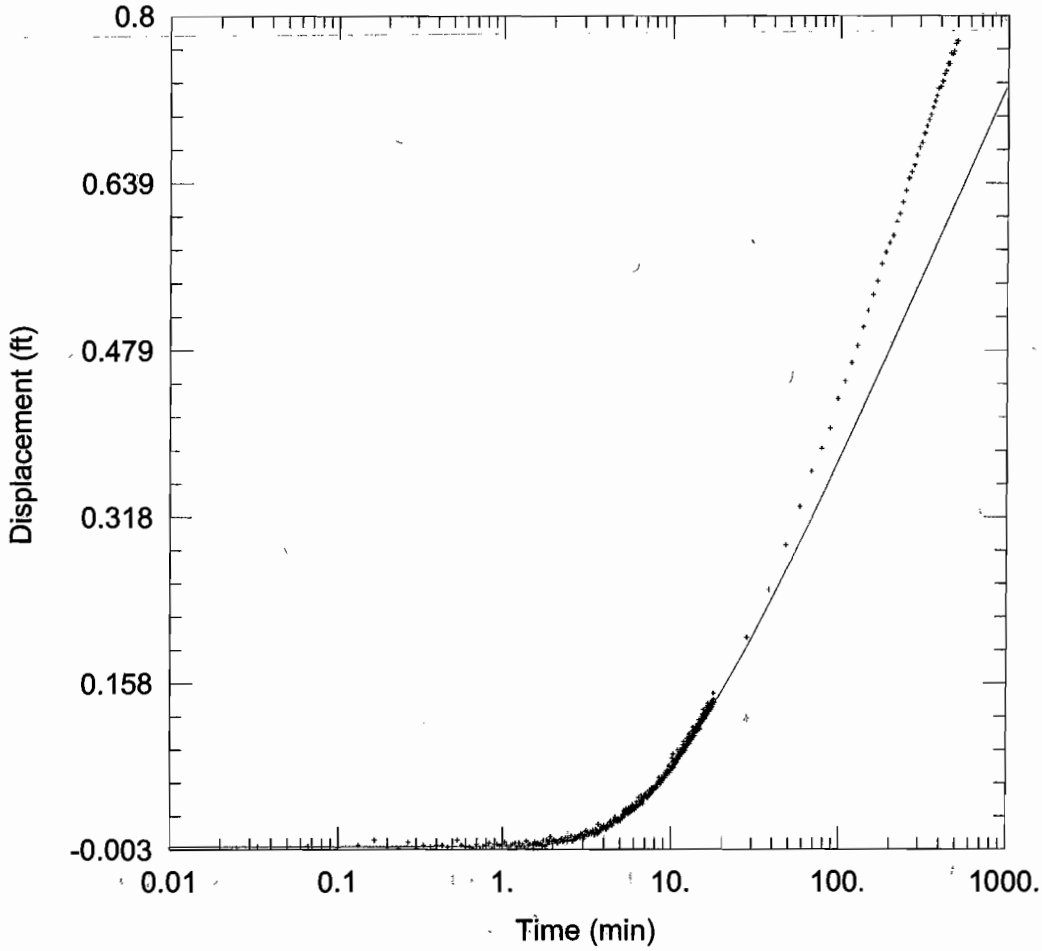
Observation Wells

Well Name	X (ft)	Y (ft)
EP-03	1396252.49	15941634.06

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 430.2 ft^2/day
S = 0.008237
Kz/Kr = 0.1
b = 15. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-03_Drawdown.aqt
Date: 09/16/08 Time: 13:41:14

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

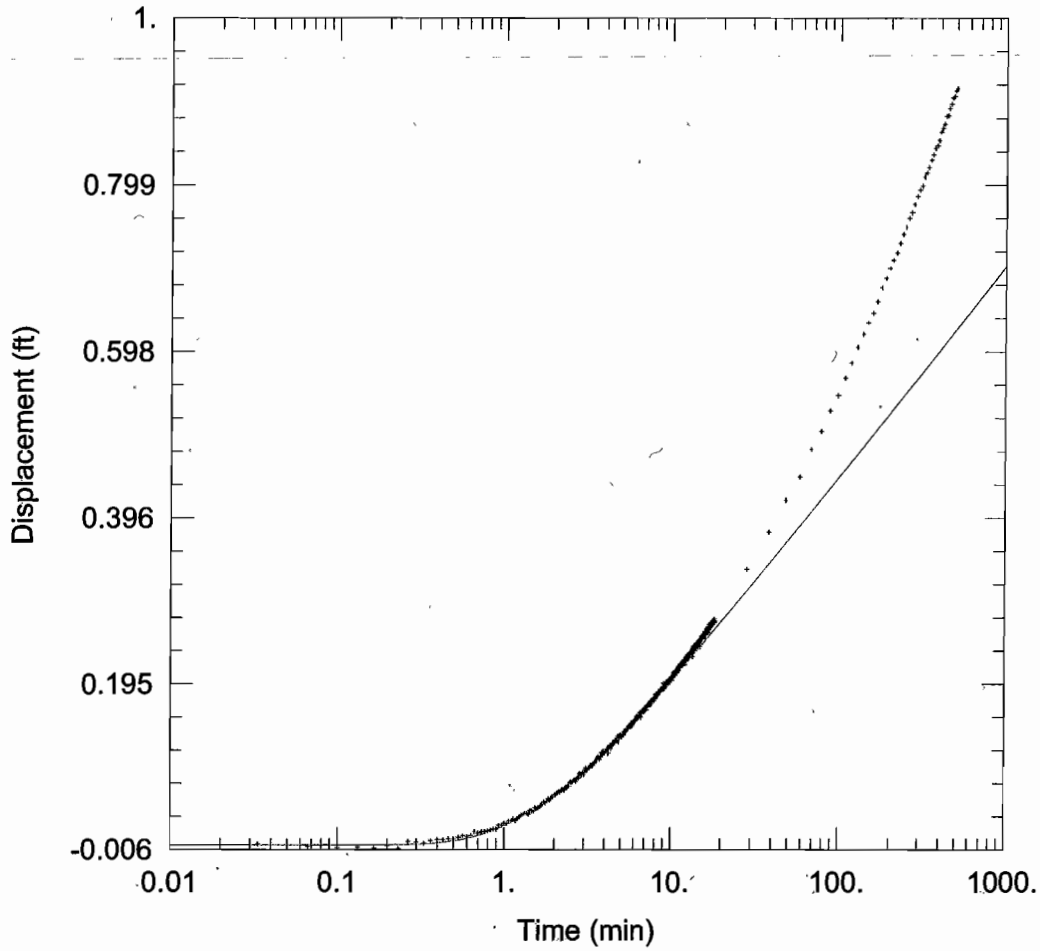
Observation Wells

Well Name	X (ft)	Y (ft)
EP-03	1396252.49	15941634.06

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 405.8 ft^2/day
S = 0.00676
Kz/Kr = 0.09661
b = 17.08 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-02_Recovery.aqt
Date: 09/16/08 Time: 13:41:00

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

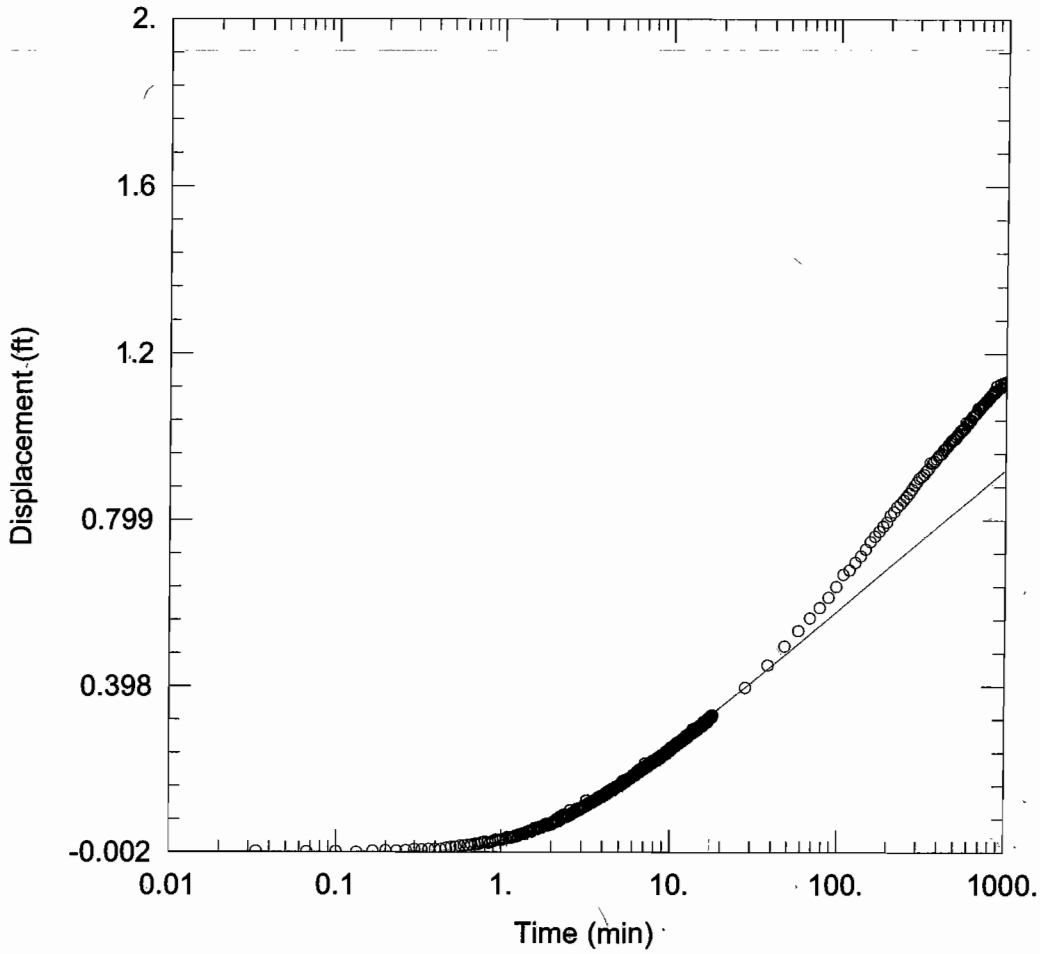
Observation Wells

Well Name	X (ft)	Y (ft)
EP-02	1396268.599	15941630.03

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 583.5 ft^2/day
S = 0.005194
Kz/Kr = 0.1
b = 15. ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-01-EP-02_Drawdown.aqt
Date: 09/16/08 Time: 13:40:44

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-01	1396282.378	15941641.41

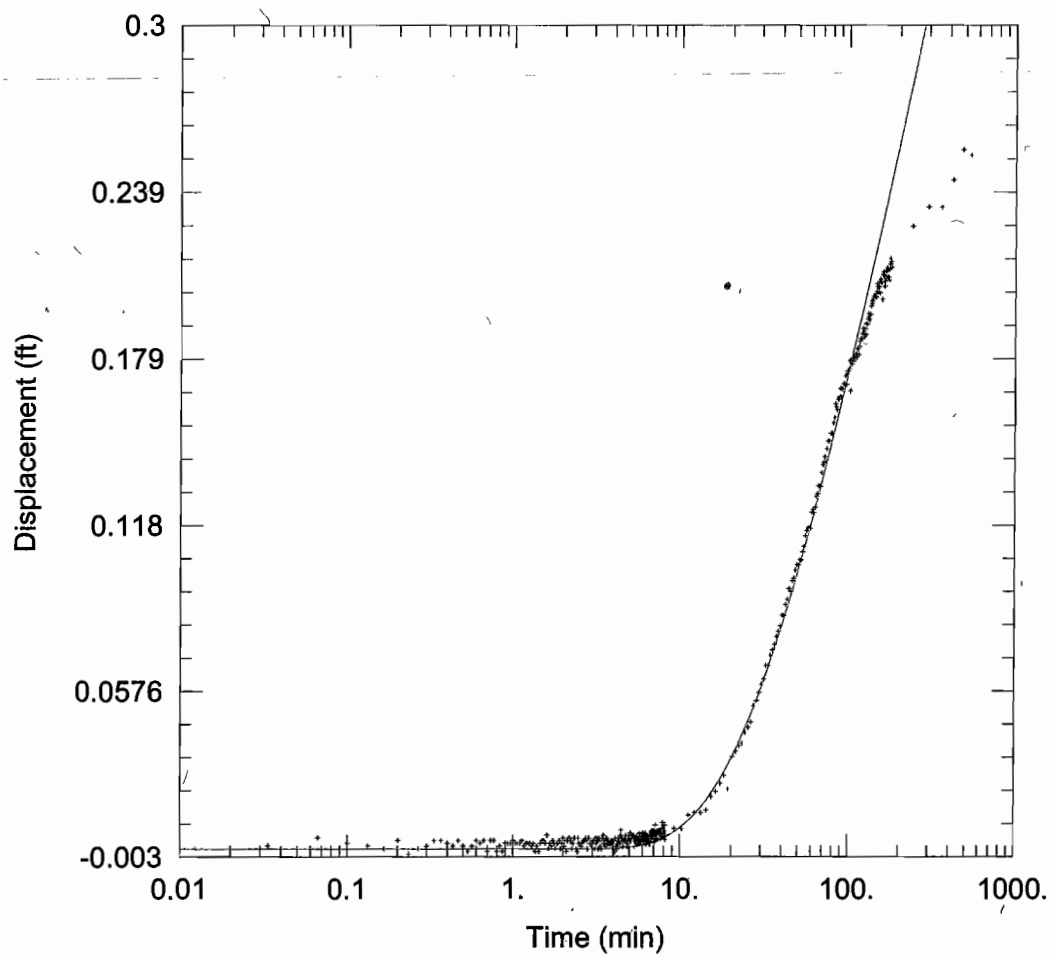
Observation Wells

Well Name	X (ft)	Y (ft)
EP-02	1396268.599	15941630.03

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 437.5 ft^2/day
S = 0.004263
Kz/Kr = 0.09661
b = 17.08 ft



WELL TEST ANALYSIS

Data Set: C:\...\EW-05A-P-106_Recovery.aqt
Date: 09/16/08 Time: 13:38:42

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-04
Test Date: 4/28/08

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05A	1397435.624	15944141.83

Observation Wells

Well Name	X (ft)	Y (ft)
P-106	1397370.204	15943990.03

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 100.6 ft^2/day
S = 0.0001929
Kz/Kr = 0.1
b = 30. ft

APPENDIX D

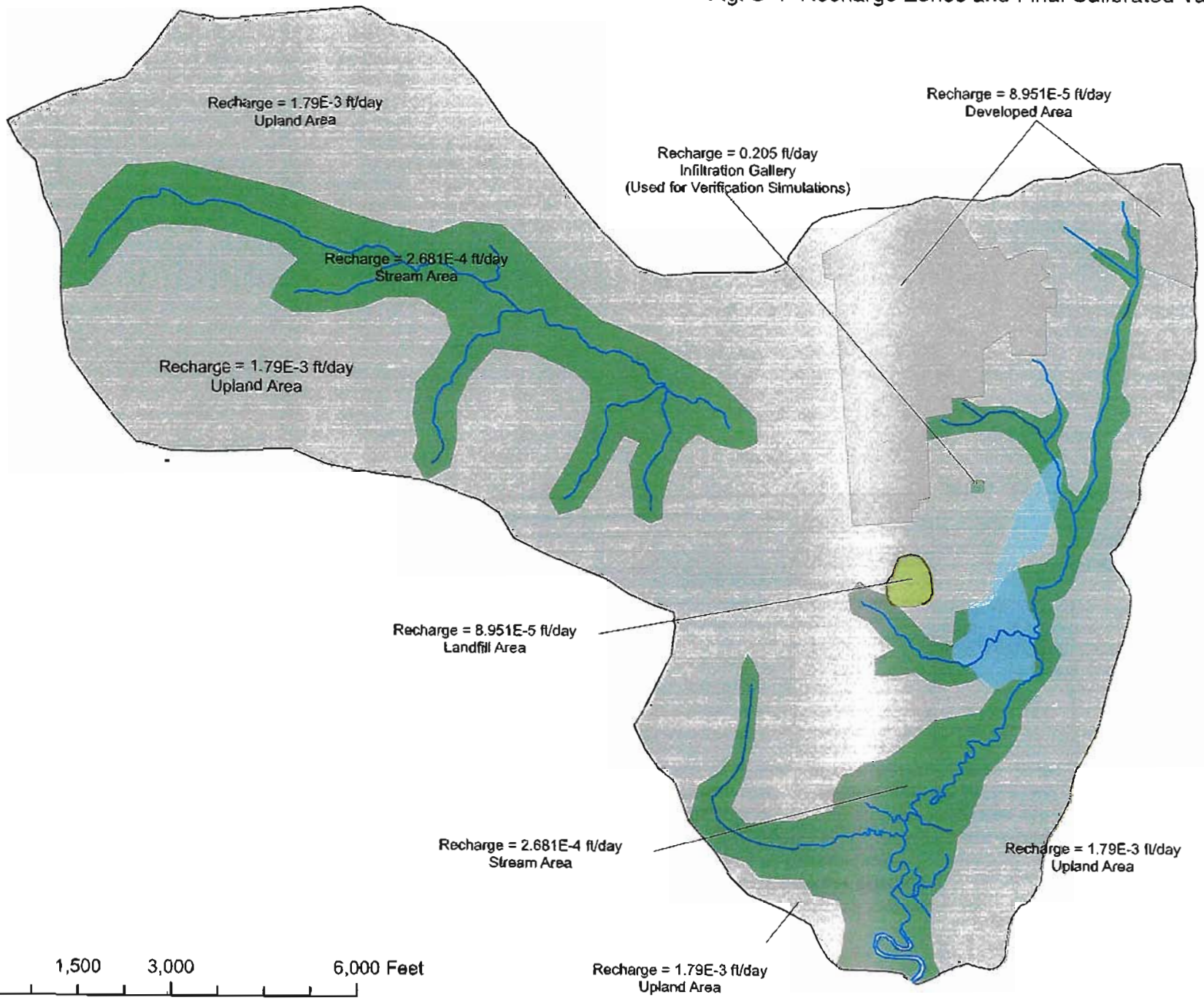
Recharge

Table D-1 Summary of Recharge Methods Used in Six Principal Studies and the Range of Estimated Recharge as a Percent of Precipitation

METHODS	GWRP STUDY SITES					
	Minnesota (Delin and others, 2007)	North Carolina (Coes and others, 2007)	Pennsylvania (Risser and others, 2005)	Wisconsin (Gebert and others, 2007)	NAWQA study (Nolan and others, 2007)	Model study (Ely, 2006)
Local Scale						
Water-table fluctuation	6-56 (21) [Note 2]	25-94 (56)	19-48 (24)			
Age dating of ground water	7-49 (24)	2-36 (12)				
Unsaturated-zone water balance (UZWB)	25-60 (43)					
Gravity-drainage lysimeters			25-33 (29)			
Water-balance equation			25-32 (29)			
Darcian flux		62-69 (66)			0.00-1,064 (64)	
Chloride unsaturated-zone tracer					0.05-119 (10)	
Chloride saturated-zone tracer					0.1-327 (17)	
Basin Scale						
Rorabaugh equations	8-44 (19)	16-27 (24)	24-33 (29)			
Streamflow-hydrograph separation			21-28 (25)	3-54 (21)		
Model analyses						0.3-63 (24)
Regional Scale						
Regional or statewide regression equations	8-38 (21)			2-42 (20)		

Note:
1. Adapted from Table 1 (Delin and Risser, 2007)
2. Range and average values (in parentheses) provided

Fig. D-1 Recharge Zones and Final Calibrated Values



APPENDIX E

Calibration Results

Table E-1 Calibrated Head Values

Name	Observed Head (ft MSL)	Lower Calibration Limit (ft MSL)	Upper Calibration Limit (ft MSL)	Calculated Head (ft MSL)	Residual
EP-10	31.75	30.02	33.48	33.14	1.39
EP-11	31.79	30.06	33.52	33.80	2.01
EP-12	31.66	29.93	33.39	34.32	2.66
EP-13	32.37	30.64	34.10	31.82	-0.55
EP-14	32.46	30.73	34.19	32.15	-0.31
EP-15	32.45	30.72	34.18	30.59	-1.86
EP-16	24.80	23.07	26.53	29.31	4.51
EP-17	31.93	30.20	33.66		
EP-18	31.93	30.20	33.66		
EP-19	31.77	30.04	33.50	31.96	0.19
EP-20	32.04	30.31	33.77	31.96	-0.08
MW-103	34.77	33.04	36.50		
MW-104	19.90	18.17	21.63	20.72	0.82
MW-105A	21.70	19.97	23.43	20.45	-1.25
MW-105B	18.82	17.09	20.55	17.73	-1.09
MW-106	28.26	26.53	29.99	29.86	1.60
MW-202A	30.18	28.45	31.91	30.58	0.40
MW-203	20.83	19.10	22.56	21.40	0.57
MW-204	20.52	18.79	22.25	19.22	-1.30
MW-205	22.49	20.76	24.22	20.90	-1.59
MW-206A	24.47	22.74	26.20	24.32	-0.15
MW-206B	23.25	21.52	24.98	19.66	-3.59
MW-207B	15.82	14.09	17.55	21.96	6.14
MW-208	28.51	26.78	30.24	30.09	1.58
MW-209	28.92	27.19	30.65	31.11	2.19
MW-210B	24.55	22.82	26.28	23.55	-1.00
MW-211B	32.83	31.10	34.56		
MW-216A	33.19	31.46	34.92		
MW-217A	30.87	29.14	32.60	27.70	-3.17
MW-217B	31.87	30.14	33.60		
MW-218	20.05	18.32	21.78	22.37	2.32
MW-219	21.46	19.73	23.19	21.48	0.02
MW-220	19.91	18.18	21.64	23.48	3.57
MW-222	29.72	27.99	31.45	31.50	1.78
MW-223	28.61	26.88	30.34	30.55	1.94
MW-224	30.51	28.78	32.24	32.95	2.44
MW-225A	26.86	25.13	28.59	28.23	1.37
MW-225B	15.44	13.71	17.17	21.68	6.24
MW-229A	20.29	18.56	22.02	20.70	0.41
MW-229B	13.47	11.74	15.20	17.41	3.94
MW-230A	21.06	19.33	22.79	20.37	-0.69
MW-231A	20.70	18.97	22.43	22.54	1.84
MW-231B	20.60	18.87	22.33	24.17	3.57
MW-232A	31.58	29.85	33.31	28.90	-2.68
MW-233R	31.62	29.89	33.35	32.00	0.38
MW-234R	31.53	29.80	33.26	29.10	-2.43
MW-240	20.97	19.24	22.70	20.23	-0.74
MW-303	31.28	29.55	33.01	30.97	-0.31
MW-305	28.66	26.93	30.39	28.21	-0.45
MW-306	32.97	31.24	34.70	35.26	2.29
MW-307	45.31	43.58	47.04		
MW-310	25.38	23.65	27.11	27.47	2.09
MW-311	19.45	17.72	21.18	19.52	0.07
MW-312	22.92	21.19	24.65	26.72	3.80
MW-313	12.24	10.51	13.97	11.92	-0.32
MW-318	17.01	15.28	18.74	18.16	1.15
MW-319	27.53	25.80	29.26	28.19	0.66
MW-330	30.91	29.18	32.64	31.83	0.92

Table E-1 Calibrated Head Values

Name	Observed Head (ft MSL)	Lower Calibration Limit (ft MSL)	Upper Calibration Limit (ft MSL)	Calculated Head (ft MSL)	Residual
MW-331	29.07	27.34	30.80	29.76	0.69
MW-332	15.43	13.70	17.16	14.07	-1.36
MW-333	16.31	14.58	18.04	16.02	-0.29
MW-334	19.51	17.78	21.24	18.08	-1.43
MW-NASB-008	55.74	54.01	57.47	53.42	-2.32
MW-NASB-009	54.60	52.87	56.33	54.37	-0.23
MW-NASB-021	45.85	44.12	47.58	51.24	5.39
MW-NASB-022	48.64	46.91	50.37	52.52	3.88
MW-NASB-023	59.02	57.29	60.75	55.57	-3.45
MW-NASB-024	58.39	56.66	60.12		
MW-NASB-025	57.31	55.58	59.04		
MW-NASB-026	58.63	56.90	60.36		
MW-NASB-062	69.61	67.88	71.34		
MW-NASB-204	51.93	50.20	53.66	54.00	2.07
MW-NASB-225	57.59	55.86	59.32		
MW-NASB-226	56.99	55.26	58.72	54.96	-2.03
MW-NASB-227	47.74	46.01	49.47	52.02	4.28
P-103	33.84	32.11	35.57		
P-105	32.74	31.01	34.47	30.26	-2.48
P-106	28.45	26.72	30.18	29.99	1.54
P-111	25.02	23.29	26.75	31.31	6.29
P-121	34.51	32.78	36.24		
P-132	24.11	22.38	25.84	23.65	-0.46
MW-NASB-065	68.42	66.69	70.15		
MW-NASB-066	68.81	67.08	70.54		
MW-NASB-067	68.37	66.64	70.10		
MW-NASB-068	68.25	66.52	69.98		
MW-NASB-069	45.54	43.81	47.27	50.65	5.11
MW-NASB-070	45.48	43.75	47.21	50.05	4.57
MW-NASB-071	43.42	41.69	45.15	49.35	5.93
MW-NASB-072	40.21	38.48	41.94	44.46	4.25
MW-NASB-073	42.36	40.63	44.09	41.59	-0.77
MW-NASB-074	41.62	39.89	43.35	46.40	4.78
MW-NASB-075	42.35	40.62	44.08	47.90	5.55
MW-NASB-076	41.12	39.39	42.85	48.13	7.01
MW-NASB-077	42.24	40.51	43.97	45.75	3.51
MW-NASB-078	42.13	40.40	43.86	40.36	-1.77
MW-NASB-079	45.32	43.59	47.05	50.79	5.47
MW-NASB-080	46.26	44.53	47.99	51.20	4.94
MW-NASB-081	46.24	44.51	47.97	51.75	5.51
EP-01	22.72	20.99	24.45	20.96	-1.76
EP-02	22.63	20.90	24.36	21.07	-1.56
EP-03	22.65	20.92	24.38	21.10	-1.55
EP-04	26.37	24.64	28.10	27.20	0.83
EP-05	27.37	25.64	29.10	27.89	0.52
EP-06	26.74	25.01	28.47	27.99	1.25
EP-07	28.74	27.01	30.47	30.75	2.01
EP-08	29.01	27.28	30.74	30.60	1.59
				Mean Error	**1.213**
				Mean Absolute Error	**2.237**
				Root Mean Squared Error	**2.867**
				R Squared Value	**0.95**

Fig. E-1 Final Calibration Results of Steady-State, Non-Pumping Simulation

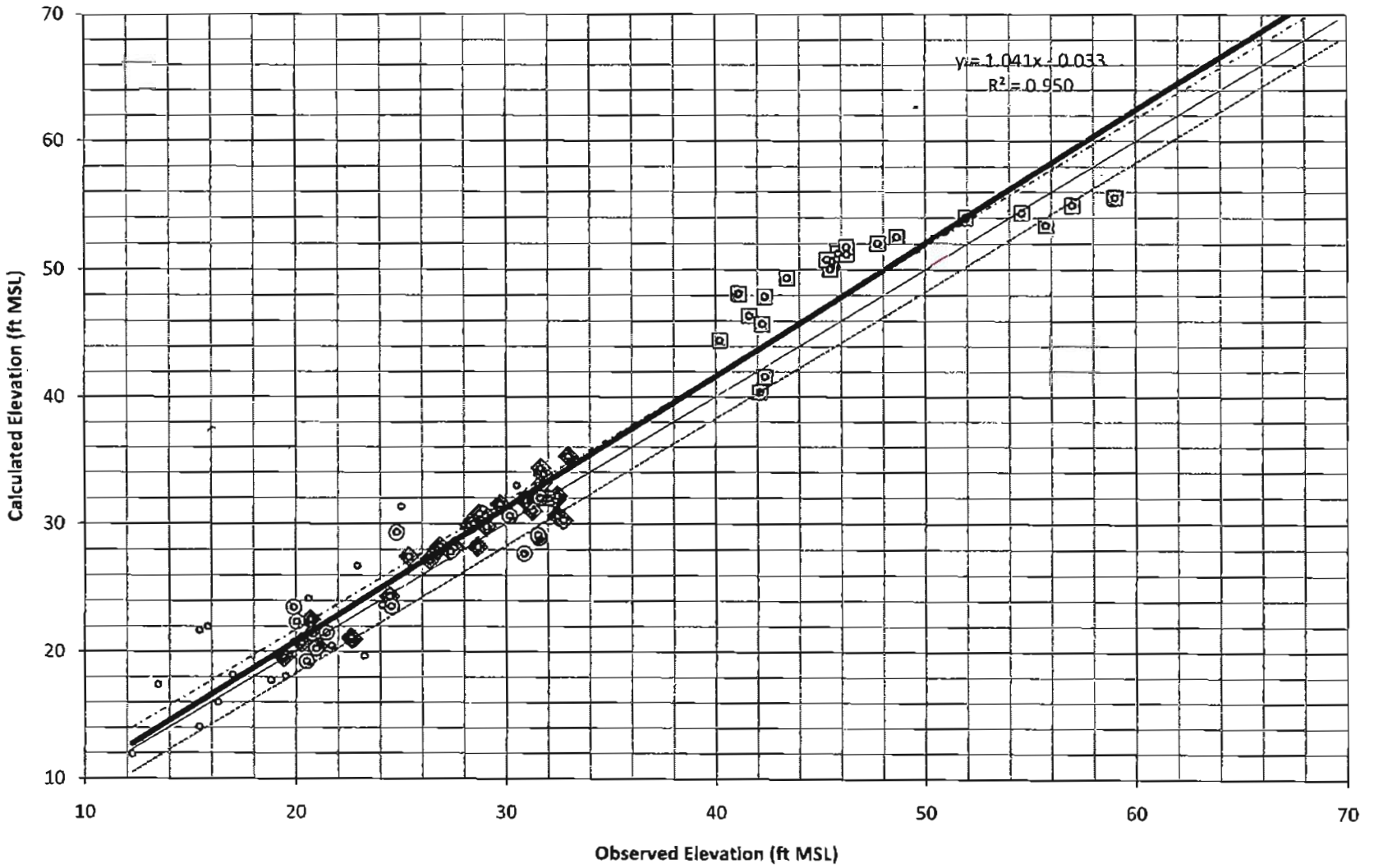
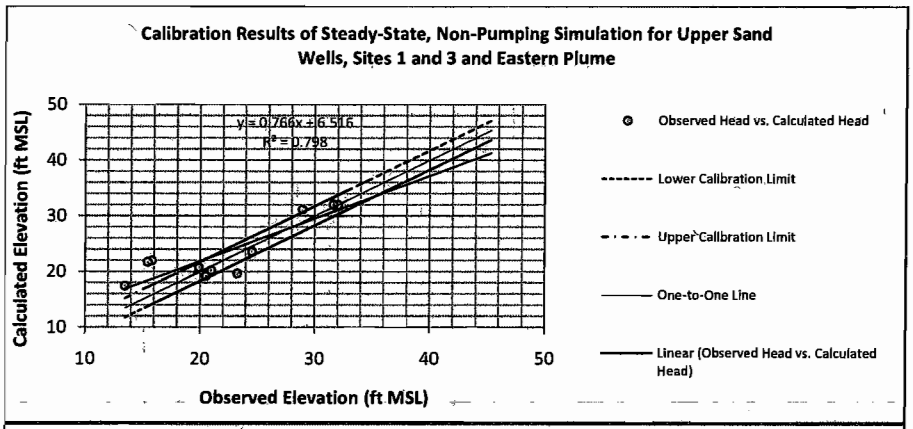
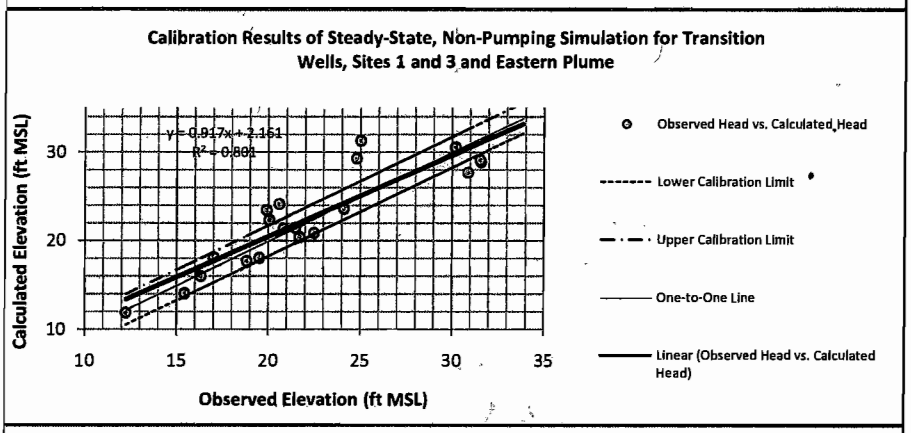
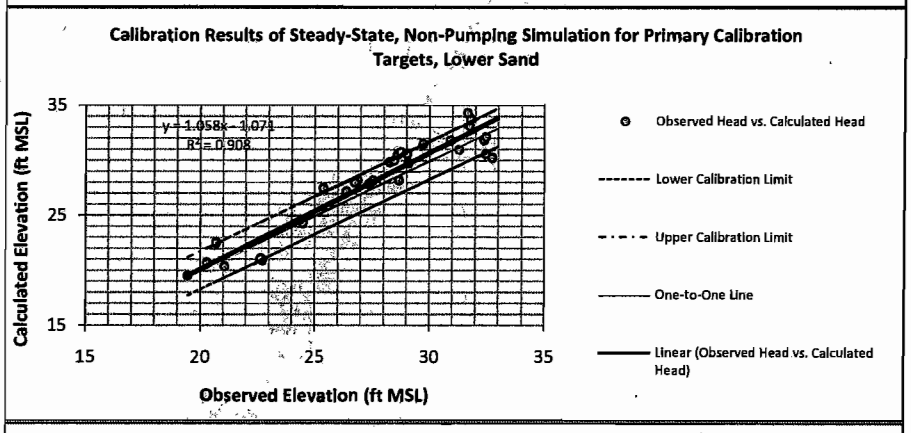


Fig. E-2 Calibration Results for Steady-State Non-Pumping by Selected Groups







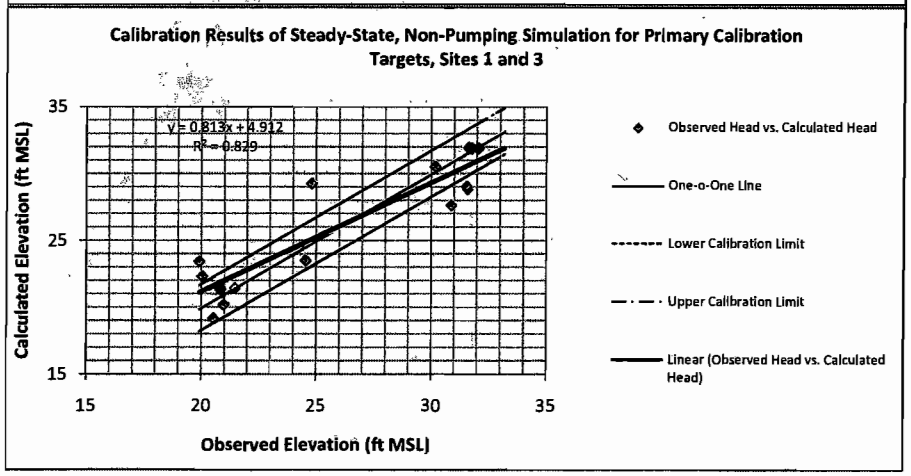


Fig. E-3 Simulated Groundwater Contours for Model Layer 1 (Upper Sand) for Calibrated Steady-State Model

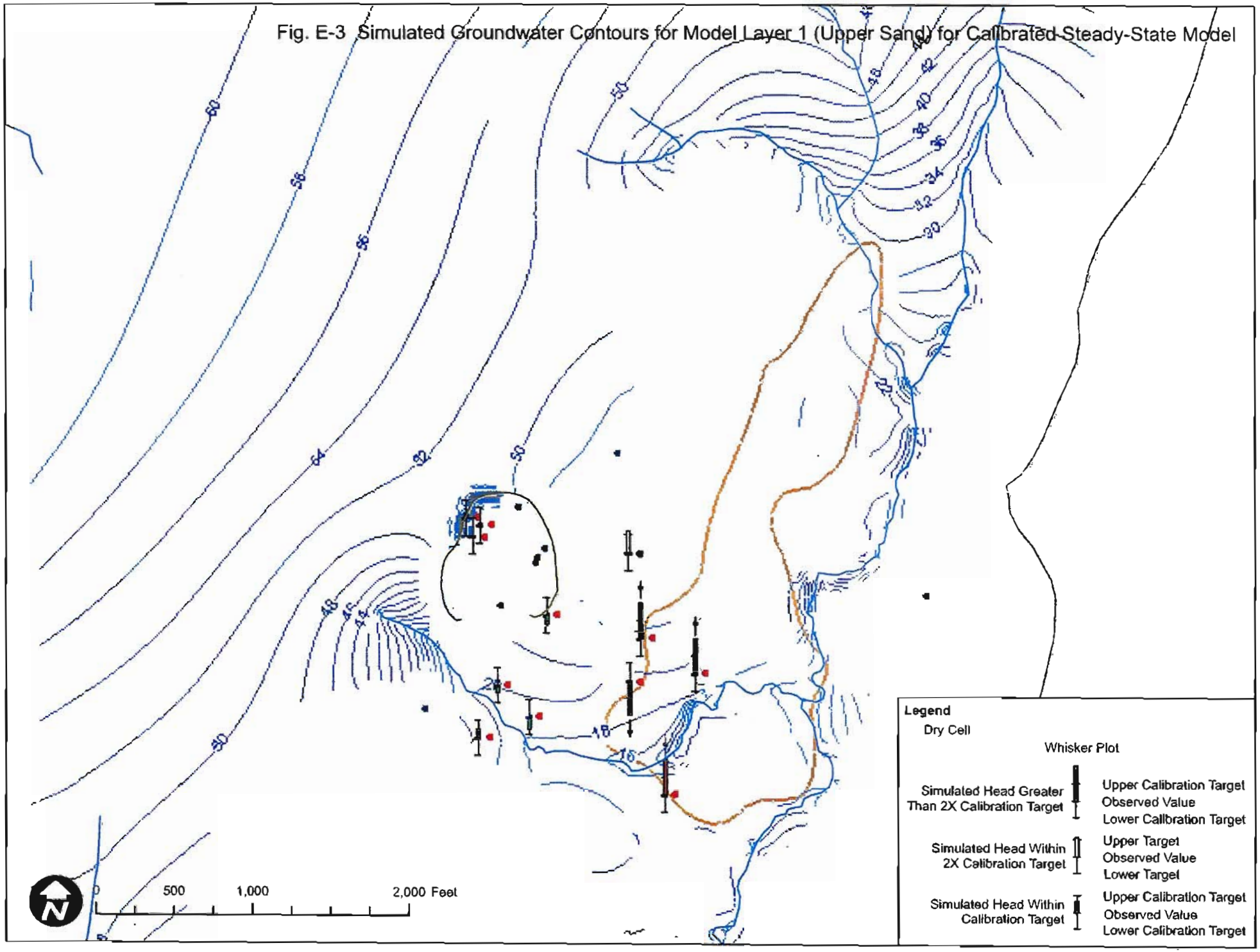


Fig. E-4 Simulated Groundwater Contours for Model Layer 3 (Transition) for Calibrated Steady-State Model

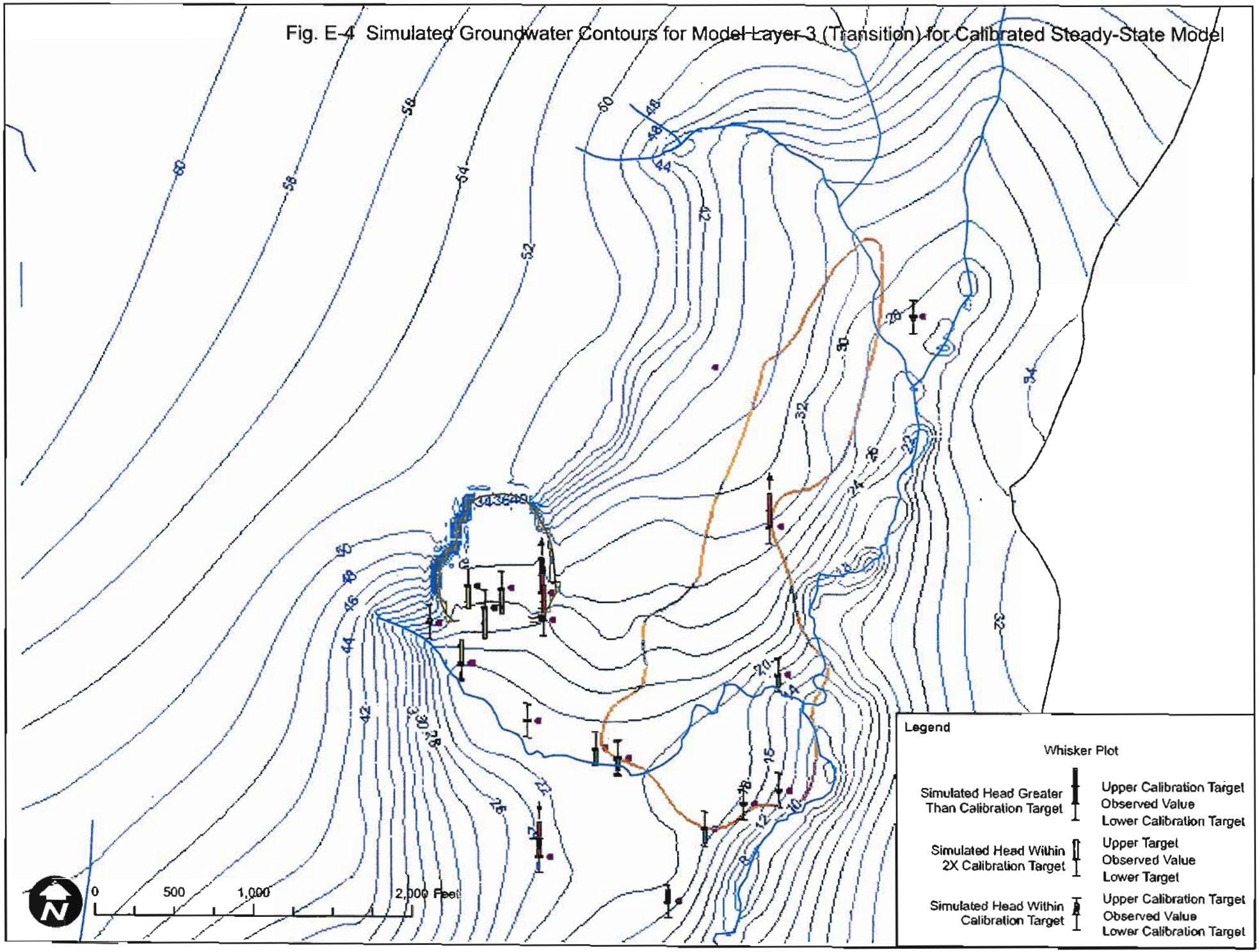
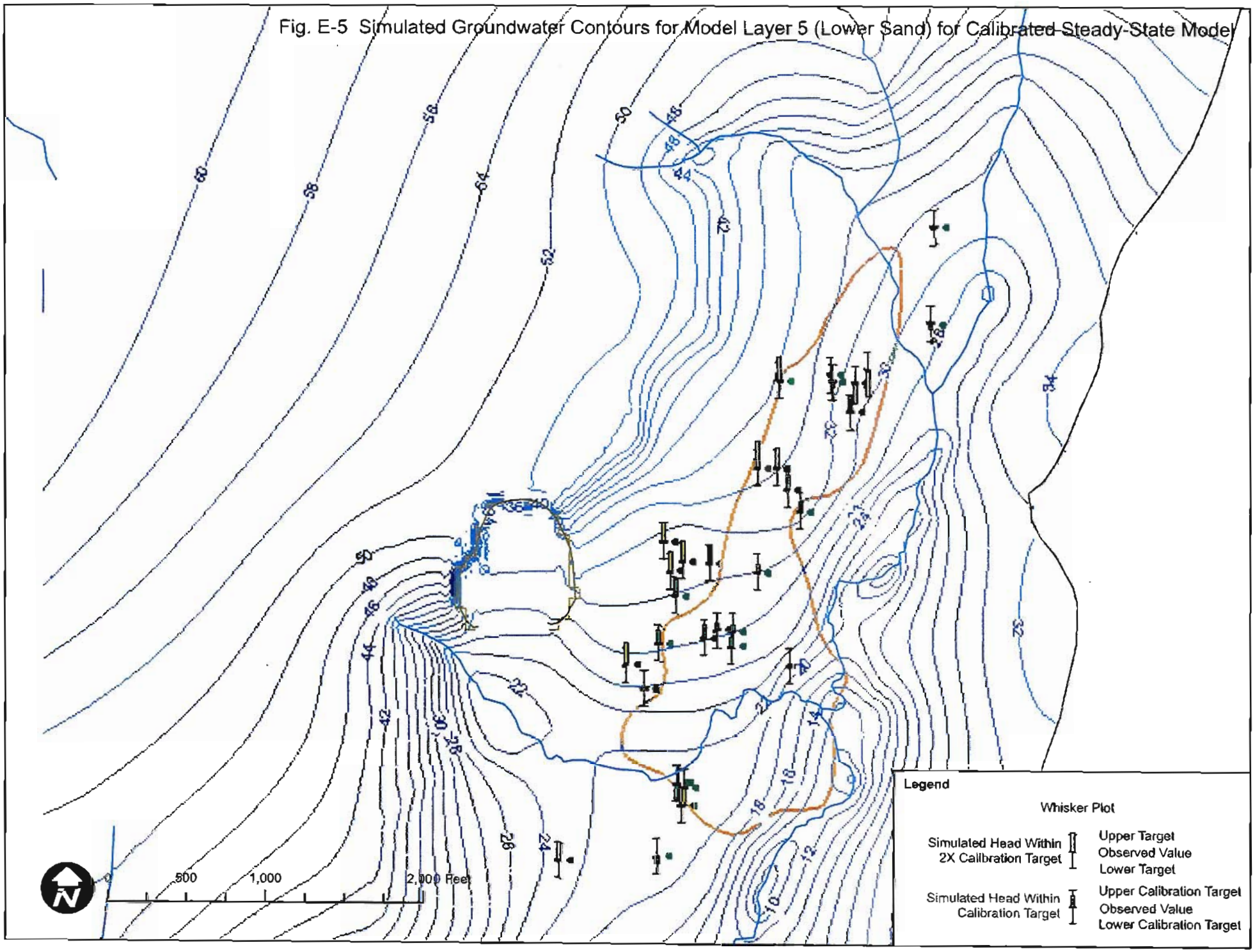


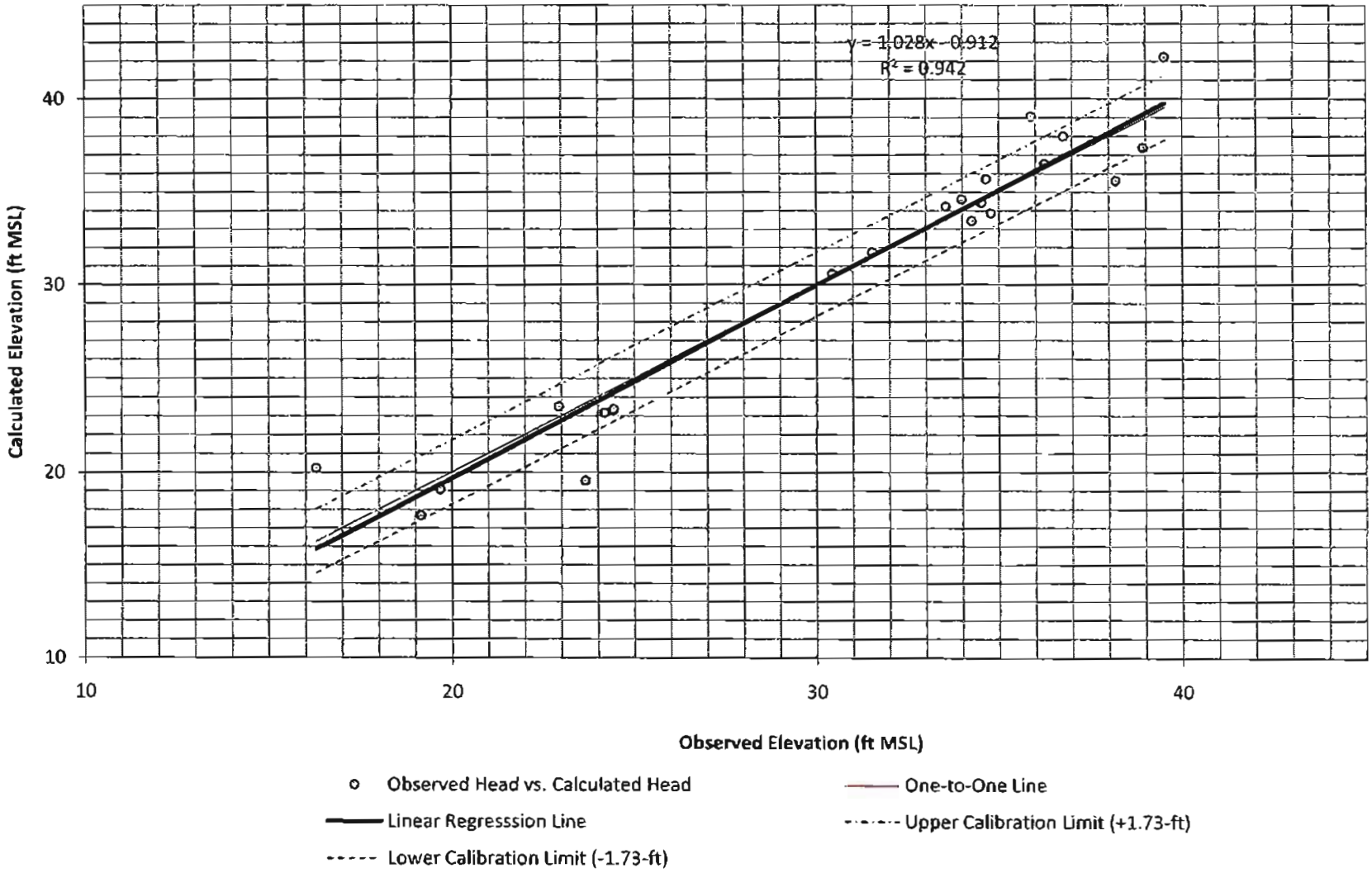
Fig. E-5 Simulated Groundwater Contours for Model Layer 5 (Lower Sand) for Calibrated Steady-State Model



APPENDIX F

Steady-State Verification

Fig. F-1 Verification to Steady-State Pumping Conditions



APPENDIX G

Transient Verification

Fig. G-1 Observations Near EW-01

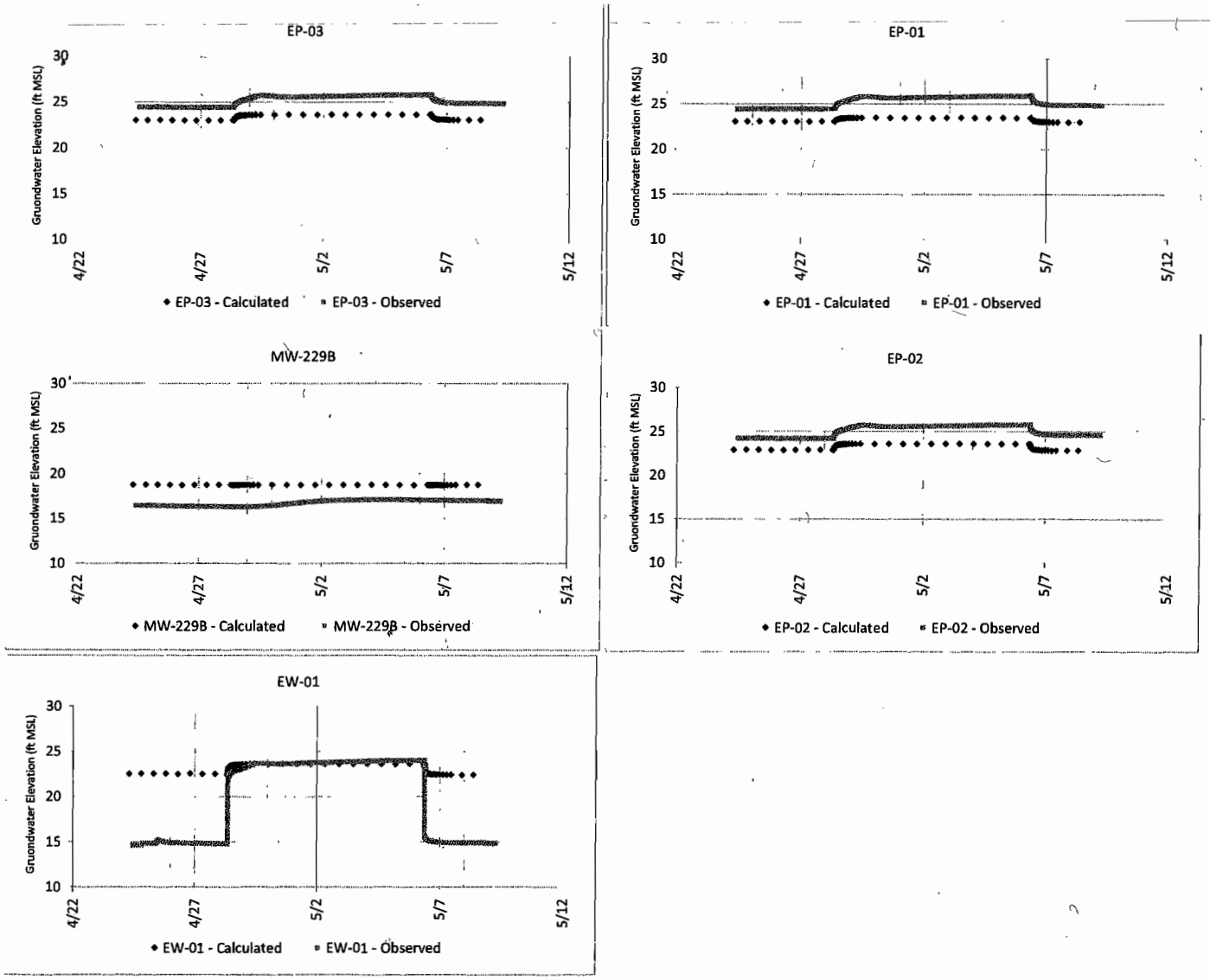


Fig. G-2 Observations Near EW-02A

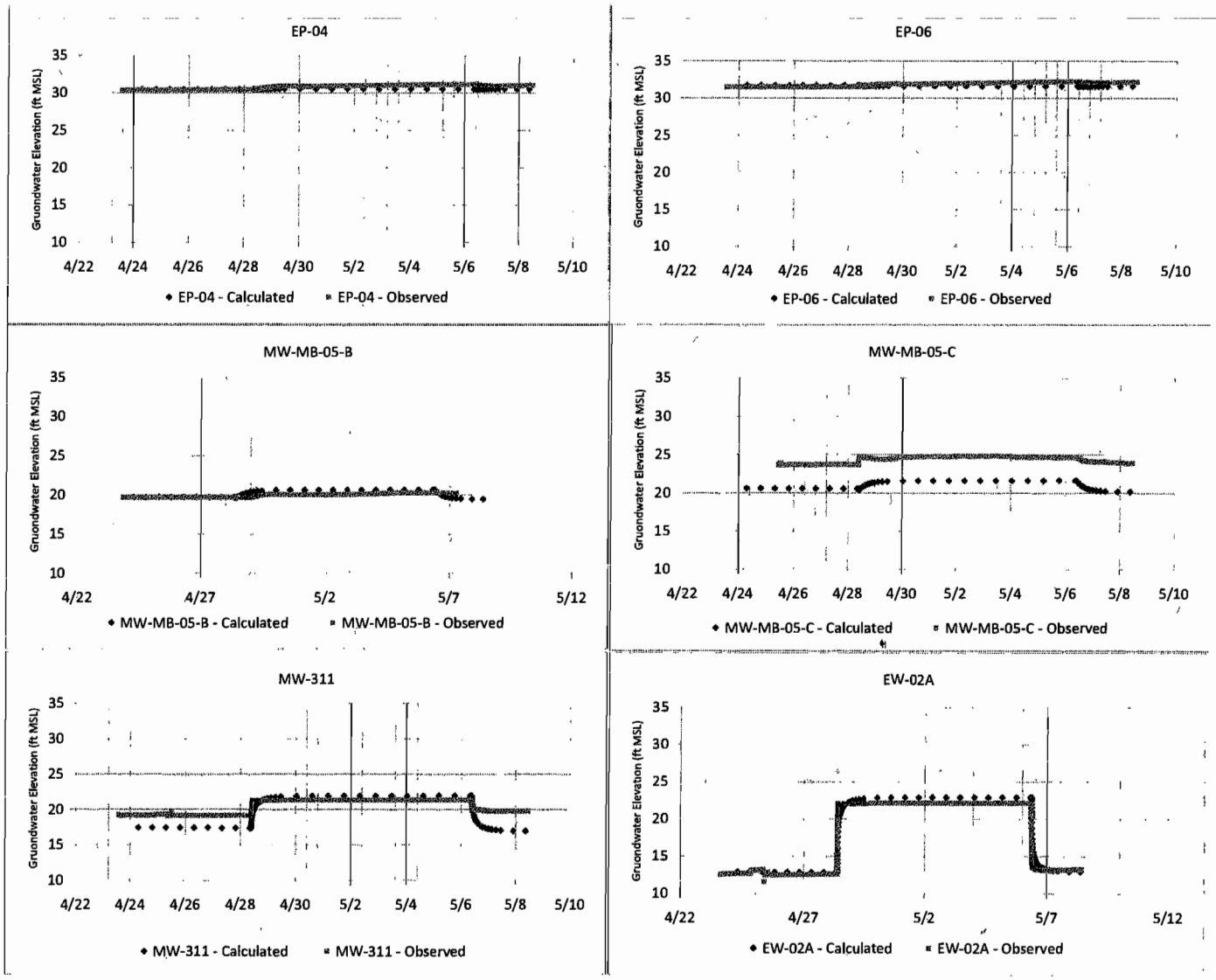
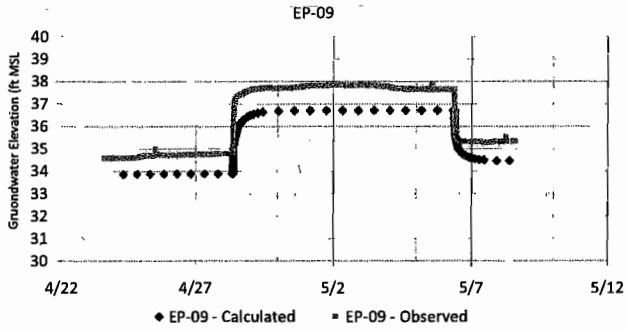
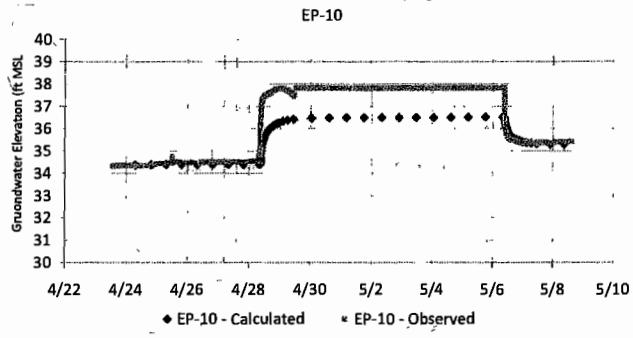
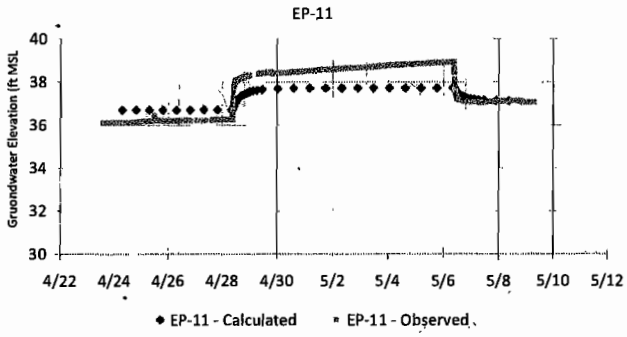
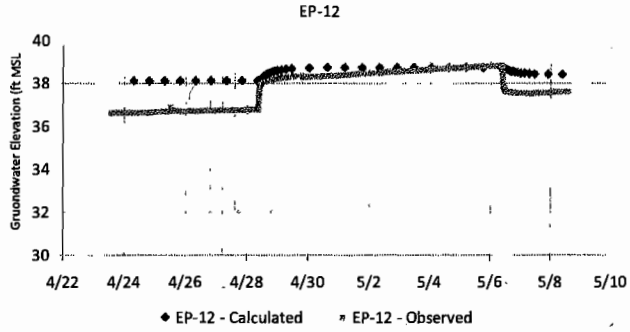


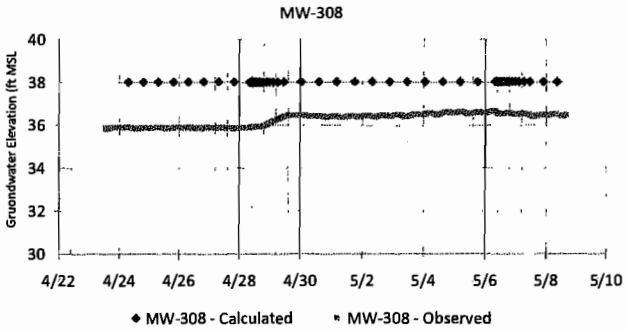
Fig. G-3 Observations Near EW-04

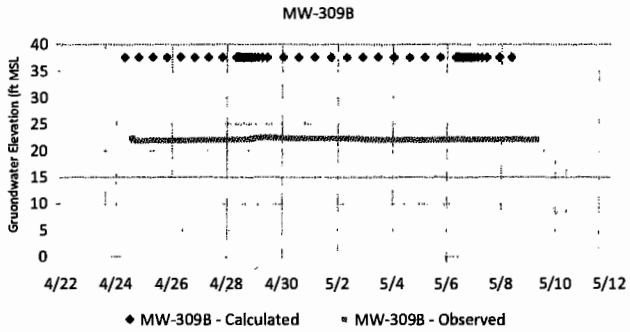


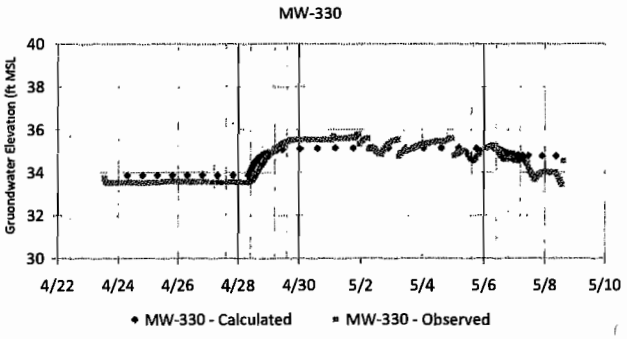


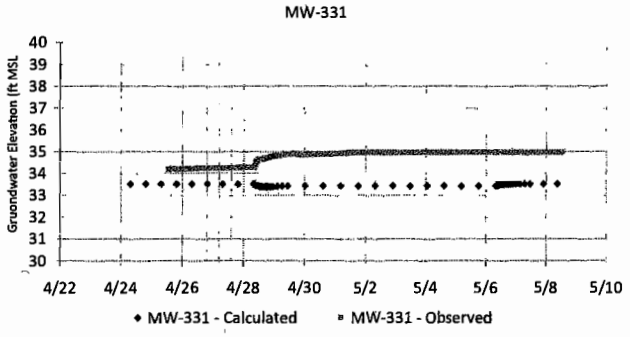












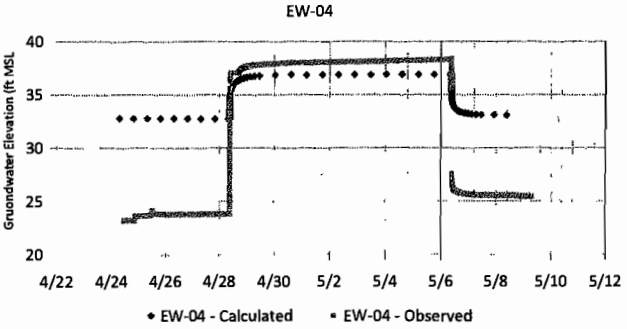
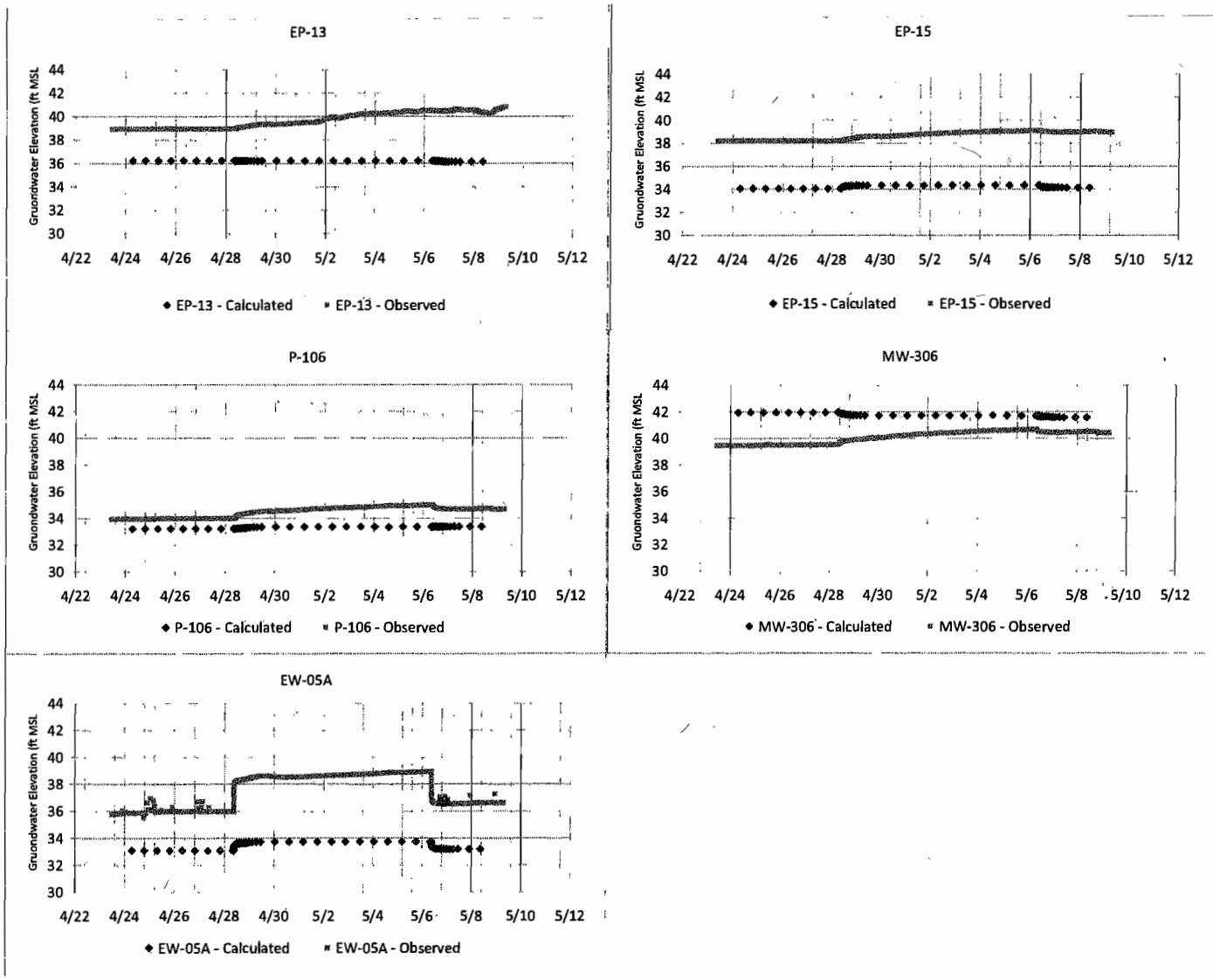


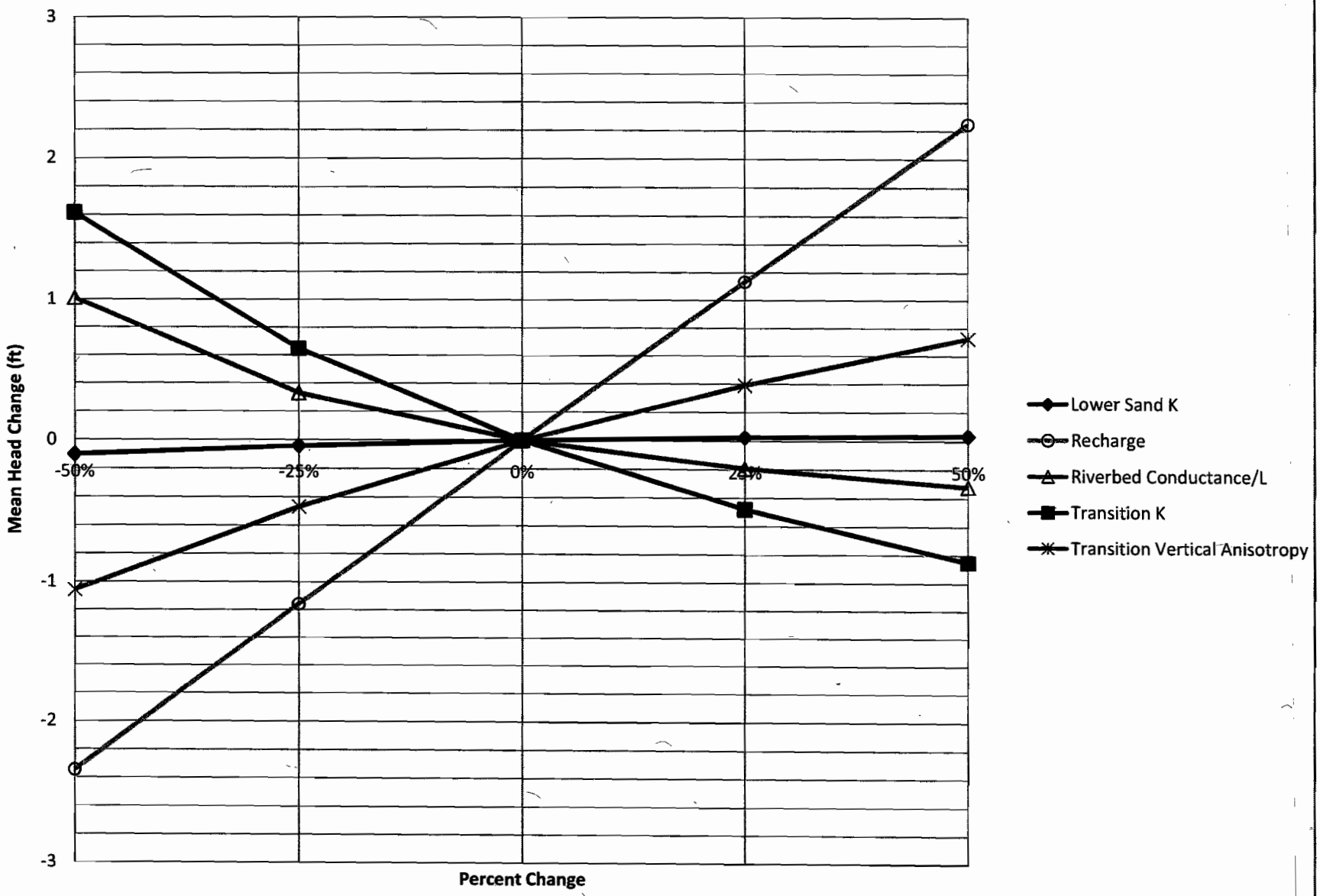
Fig. G-4 Observations Near EW-04



APPENDIX H

Sensitivity Analysis

Fig. H-1 Sensitivity Analysis, Steady-State Non-Pumping



APPENDIX I

Response to Regulator Comments

RESPONSE TO COMMENTS FROM THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION – BUREAU OF REMEDIATION AND WASTE MANAGEMENT DRAFT GROUNDWATER MODELING SUMMARY REPORT SITES 1 AND 3 AND THE EASTERN PLUME NAVAL AIR STATION BRUNSWICK, BRUNSWICK, MAINE

Commentor: Claudia Sait, MEDEP - Project Manager-Federal Facilities Bureau of Remediation & Waste Management	
Comment Issue Date: 22 Jan 2009	**Navy Response Date: 17 Mar 2009**

General Comments:

1. The title of the document is misleading since it does not fulfill the workplan objectives. MEDEP suggests the following title: "Groundwater Modeling *Interim* Report ..."

Response: Interim suggests that the report will not be finalized. Once there is concurrence, a Final Groundwater Modeling Summary Report will be issued. A Technical Memorandum will be issued that will specifically address the objectives outlined in the Final Groundwater Modeling Work Plan (EA 2006), as well as provide recommendations.

2. If available please provide a spreadsheet or text file version of Table A-1 that details the locations utilized and reference elevations for the associated stratigraphic units.

Response: An electronic version of Table A-1 will be provided to MEDEP.

3. The heterogeneity of the layers targeted by the model (in particular the transition) was a significant concern for development of the model. There are a number of stochastic models that can address parameter heterogeneity (including Stochastic Modflow, Modflow-Sto, etc.) that are well represented in peer-reviewed literature. Were stochastic methods considered to address the heterogeneity issues at the site and, if so, please explain why weren't they used?

Response: Stochastic models were considered during model development. However, the non-stochastic approach was chosen because it met the goals of the Work Plan and appeared more transparent in its development. It was presumed that this approach could adequately simulate groundwater flow to meet the objectives outlined in the Work Plan. The model was developed in accordance with the Final Work Plan to include assumptions agreed to by the stakeholder and once developed will become a useful tool for use by the project stakeholders that will enhance the overall understanding of groundwater flow conditions at the Eastern Plume.

4. To ensure that the information generated by this modeling effort is available in the future, the Navy should obtain the model code from ECC.

Response: The Navy will have the model input files for the final calibrated model, to distribute as needed.

Specific Comments:

5. Page 3, Section 2 Site Conceptual Model:

   a.) The Summary Report for the Direct-Push Investigation at the Southern Boundary of the Eastern Plume was never finalized because the agencies did not agree with some key geologic interpretations, therefore it must be noted both here and in the references that the Summary Report for the Direct-Push Investigation at the Southern Boundary of the Eastern Plume is a draft final version.

Response: The text was revised to correctly state the Draft Final version of this report.

   b.) The conceptual model has been revised, please reference the latest version from 2006 and update the text as needed.

Response: The 2006 version of the conceptual model has been referenced in the Groundwater Model Summary Report.

6. Page 4, Section 2.1, Site Geology and Hydrogeology, bullet 1: This bullet cites the amount of contaminant mass removed by the Ground Water Extraction Treatment System to 2003. Please update.

Response: The total mass removed through 2008 is 453 Kg and this amount will be cited in the text.

7. Page 5, Section 2.2, Existing Pump-and-Treat System, last sentence: "Overall, the groundwater extraction system has not established hydraulic control of the Eastern Plume, although natural geologic conditions appear to have helped contain movement of the groundwater contamination."

   This appears to be true to the south but is not true of the eastward migration. Please revise accordingly.

Response: The referenced sentence has been revised to, "…although natural geologic conditions appear to have helped contain the *eastward* movement of groundwater contamination."

8. Page 8, Section 3.4.1 Aquifer Parameters and Table 1:

   a.) Please reference Table 1 in the text; it presents data relevant to the discussion presented.

Response: Table 1 has been referenced in Section 3.4.1 of the report.

b.) A brief justification for setting the Upper Sand to "convertible" rather than "unconfined" needs to be included in this section.

Response: In the Layer Property Flow Package, there are only two layer types: convertible and confined. Since there is no unconfined option, model layer one representing the Upper Sand was set to convertible. In the second paragraph of Section 3.4.1, the word "unconfined" has been omitted from the first sentence which now reads, "Each model layer was designated as convertible, or confined."

9. Page 9, Section 3.4.1 Hydraulic Conductivity paragraph 3: *"The table below provides the average values of hydraulic conductivity for the lower sand calculated for each well where…"*

   For clarity please revise the text to "…each well group where…".

Response: The text has been revised accordingly.

10. Page 9, Section 3.4.1 Hydraulic Conductivity last sentence, and Figure B-2: Based on a review of the logs for locations closest to Mere Brook and south of New Gurnett Road, MEDEP is uncertain why the Lower Sand would not have a lower hydraulic conductivity (K) in the area near the brook (as it does to the north). It also seems doubtful that the lower sand extends beyond the east side of the brook to any extent, based on terrain in the area and logs for CP-134 and PL-20 (from the 1,4 Dioxane study) east of the brook near New Gurnett Road. A "zonation" of the hydraulic conductivities must be considered for the southernmost portion of the lower sand, as was applied near EW-2A.

Response: We believe that there is some evidence for this higher 35 ft/day zone south of New Gurnett Road. For instance, the hydraulic conductivity calculated from slug test data for MW-314A is 34 ft/day (Table 8-3, Supplemental Remedial Investigation (E.C. Jordan 1991). This is close to the calibrated value of 35 ft/day for this zone. Therefore, it is believed that the need for an additional zone for the lower sand in this area is not necessary.

Regarding the extent of the lower sand unit, the presence or absence of the lower sand was based on a comparison of the top and bottom interpolated surfaces for the lower sand. Therefore the aerial extent of the lower sand unit is an approximation although it appears to be accurate given the large amount of boring data available. Note that the lower sand is absent in the model at the location of CP-134.

11. Page 10, Section 3.4.1 Aquifer Parameters – Specific Yield: The reference for the values needs to be added to the text.

Response: The text has been revised to include the following reference: (Table 3.5, Anderson and Woessner 1992).

12. Pages 10-11, Section 3.4.2 Recharge, Table 1 and Appendix D Figure D-1:

    a.) Table 1 indicates a 4-month average daily precipitation was applied to calculate the recharge rates for the model, while the text on page 11 indicates a 90-day average. Please revise the text utilizing a 4-month period.

Response: The text has been revised to note the 4-month average daily precipitation was used in the model.

    b.) When future simulations are run recharge values based on longer-term averages need to be evaluated. The 2001 data represent relatively low precipitation while the 2008 data were influenced by a significant precipitation event.

Response: We agree with this comment and future simulations will use recharge rates based on longer-term average precipitation.

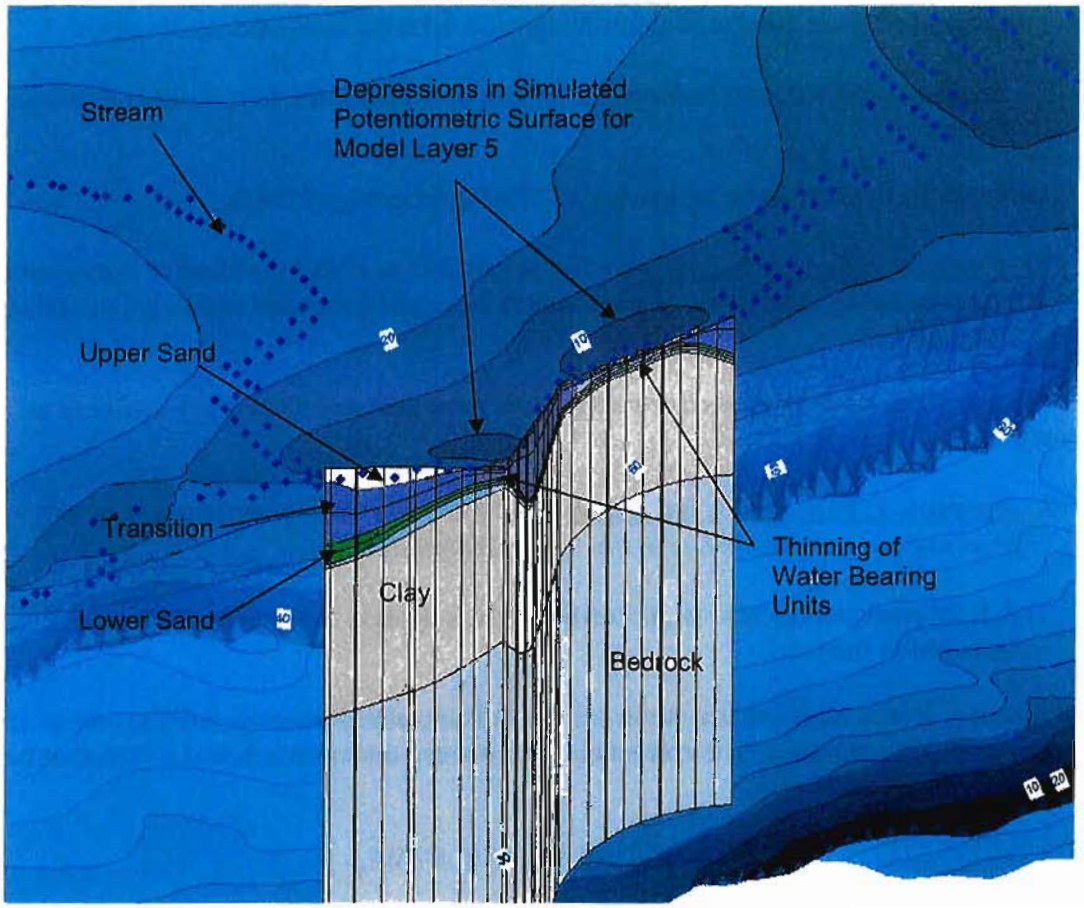
13. Page 13, Section 4.1, Model Calibration (table), Table B-1 and Figure E-5: MW-209 is not screened in the deep lower sand but is instead a shallow water table well. Please revise the hydraulic conductivities and tables as necessary. This incorrect designation may explain the apparent variation in the simulated head depicted on Figure E-5. If this impacts the model significantly the text needs to discuss the changes.

Response: We agree with this comment. Well MW-209 is not screened in the lower sand. Table B-1 and relevant sections of the text have been revised accordingly. While its designation is incorrect, its vertical location in the model was correct. Therefore, this error will not impact the model construction or model calibration.

14. Page 17, Section 4.1.1, Discussion of Model Calibration and Figures E-4 and E-5: The elevations within the stream channel indicate, as depicted, several areas with depressions or "undulations" along the flowpath. If possible, the river package data needs to be revised to improve the depiction of flow to the channel. Improving the model calibration is warranted based on the importance of the surface waters as discharge points for the Eastern Plume.

Response: The presence of depressions in the simulated flow field for model layers 3 and 5 is not necessarily an indication that something is "wrong" with the way surface water bodies are represented in the model, but is associated with the changing thickness of the model layers. The graphic below shows an oblique view from a view point below the potentiometric surface (i.e., looking up), of a cross-section taken from the model showing stratigraphy along a reach of Mere Brook just below the confluence with Merriconeag Stream and the simulated potentiometric surface for model layer 5. As can be seen in the graphic, the depressions in the flow field coincide with a thinning of the water bearing units above the clay layer. Note that the simulated potentiometric surface for model layer

5 represents the aquifer under confined conditions and therefore do not simulate the interaction of the water table with surface water bodies.



15. Page 19, Section 4.3, Sensitivity Analysis and Page 9, Section 3.4.1 Hydraulic Conductivity paragraph 2: MEDEP accepts the relative variation in vertical anisotropy (20:1 vs 10:1) proposed for the transition. However, as the value was set without direct measurements referenced some assessment of this parameter in the sensitivity analysis might improve the model.

Response: An additional sensitivity analysis for the vertical anisotropy of the transition unit was completed. An additional bullet will be added to Section 4.3 that reads, "The model appears to be moderately to highly sensitive to changes in Layers 2 and 3 (transition) vertical anisotropy. Vertical anisotropy affects model output in a nonlinear fashion, a 50 percent decrease (vertical to horizontal K ratio is 1:10) in transition hydraulic conductivity resulted a one-ft elevation change while a 50 percent increase (vertical to horizontal K ratio is 1:30) resulted in a 0.7-ft elevation change. This indicates that the vertical anisotropy in Layers 2 and 3 is an important controlling factor to model results." Figure H-1 and applicable portions of the text of Section 4.3 have been revised accordingly to reflect that vertical anisotropy was assessed as part of the sensitivity analysis.

16. Page 25, Section 6.2, Conclusions, bullet 4: "The model input parameters are considered to be a realistic simplification of the natural conditions at the site."

    Please clarify in the text which site (Sites 1 & 3 and/or the Eastern Plume) is being discussed.

Response: Both sites are being discussed. The text has been clarified.

17. Appendix A Figures A-1 to A-6: If it is possible to adjust the shading or the stream color so the location of the surface waters is more visible that would help improve the figures.

Response: The shading of surface waters have been adjusted to improve visibility as suggested.

18. Appendix C Page 3 of 3, first paragraph: *"Recovery data was corrected for the increase in water levels due to the large precipitation event ..."*

    A brief explanation of how the correction was applied to the data needs to be included in the text.

Response: It was assumed that water level trends increased linearly over the course of the recovery-drawdown test. The correction for recovery-drawdown data can therefore be stated as shown below:

$$WL_c = WL_m - (t/T \times \Delta WL)$$

Where,

WL_c	=	Corrected water level
WL_m	=	Measured water level
t	=	time at which measurement was logged as measured from the cessation of pumping
T	=	Total time of logged period, from cessation of pumping to end of logging period after resumption of pumping
ΔWL	=	Total change in water elevation over logging period, factoring out changes due to pumping

This description has been included in the text in Appendix C – Recovery-Drawdown Test.

RESPONSE TO COMMENTS FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY NEW ENGLAD REGION 1 DRAFT GROUNDWATER MODELING SUMMARY REPORT SITES 1 AND 3 AND THE EASTERN PLUME NAVAL AIR STATION BRUNSWICK, BRUNSWICK, MAINE

Commentor: Michael J. Daly, EPA - Remedial Project Manager Federal Facilities Superfund Section	
Comment Issue Date: 22 Jan 2009	**Navy Response Date: 17 Mar 2009**

General Comments:

1. The groundwater model should provide an adequate basis for evaluation of the Eastern Plume extraction system and the Sites 1 and 3 slurry wall. Vertical discretization (8 layers) is ample. Horizontal discretization is adequate for the regional scale of the model, but may prove to be somewhat coarse for more local characterization (e.g., the Sites 1 and 3 slurry wall is approximately 12 grid cells across). A smaller scale model in the vicinity of the Eastern Plume and Sites 1 and 3 should be considered for detailed site-specific evaluations.

Response: We agree the horizontal discretization is adequate for the regional scale of the model, but may prove to be somewhat coarse for more local characterization. However we believe the model grid size is adequate for the goals and objectives of this modeling effort. The objective for the groundwater model as planned and as detailed in the Final Groundwater Model Work Plan (EA 2006) was to produce a plume scale approximation of the groundwater flow pattern in the areas of Sites 1 and 3 Landfill and the Eastern Plume.. Localized, site-specific, finer scale simulations may follow and can be built over this base groundwater model.

2. There are many potential uses for this ground water model beyond the report's stated objectives. EPA strongly recommends that the Navy receive all model data deliverables from their consultant. The Navy or other Brunswick cleanup team stakeholders can further refine and utilize the model for other site-specific remedial evaluations that may be necessary and/or to evaluate whether future land alterations associated with the redevelopment of Brunswick have the potential to impact any of the Navy's on-going ground water restoration efforts.

Response: The Navy will have the model input files for the final calibrated model to distribute to the project stakeholder, as needed.

Specific Comments:

3. **Page 4, Section 2.1, first bullet**: The text cites the total contaminant mass removed by the extraction system by the end of 2003. A more current figure should be supplied. How much mass was removed in the period 2004 – 2008?

Response: The total mass removed through 2008 is 453 Kg (approximately 1,000 lbs) and this amount will be cited in the text.

4. **Page 6, Section 3, ¶1**: The text states that the entire perimeter of the basin was modeled as a no-flow boundary, including that along the ocean. Is it correct to conclude that the entire discharge of groundwater from the basin must go to Mere Brook/Merriconeag Stream in the model?

Response: The entire discharge of groundwater from the basin was assumed to go to Mere Brook/Merriconeag Stream in the model. The model was constructed to incorporate the stakeholder-agreed-to Conceptual Site Model approximation. This Conceptual Site Model assumed that the majority of flow within the drainage basin discharges to surface water. Therefore, the model was built using no-flow boundary conditions and presumption that groundwater discharges to the Mere Brook/Merriconeag surface drainage system.

5. **Page 6, Section 3, ¶2**: The text states that the Topsham Water District supply wells are believed to have only a minor effect on the location of the groundwater divide, and that, "Therefore these water production wells were accounted for in the groundwater flow model." Since it appears that the supply wells were *ignored* based on judgment, rather than "accounted for" by some explicit inclusion in the model, it would be more transparent to state that the supply wells were "considered, but ultimately neglected based on the argument given. Please revise the text for clarity.

Response: The referenced sentence was intended as, "Therefore these water production wells were *not* accounted for in the groundwater model." The text has been revised.

6. **Page 12, Section 3.4.4**: The text defines the "hydraulic characteristic" for the slurry wall as, "... the barrier hydraulic conductivity divided by the width of the barrier." This implies that the hydraulic characteristic carries dimensions of [$time^{-1}$]. However, the text indicates that the hydraulic characteristic is unitless. Please check for internal consistency.

Response: The correct unit for the hydraulic characteristic is [$time^{-1}$]. The text and tables have been checked for unit consistency and revised.

7. **Page 13, Section 4.1, ¶3**: *typo:* Please change, "... screened partly or entirely with the lower sand unit" to, "... screened ... with*in* the lower sand ... ."

Response: The text has been revised to correct this typo.

8. **Page 15, Section 4.1 and Figure E-1**: For control points at higher elevations (shown on the figure with a filled circle surrounded by an open square, labeled "wells outside focus area"), the error shown appears to be systematic. At the highest elevations, the model under-predicts the observed water levels; at lower elevations, the model over-predicts the observed values. That is, the predicted hydraulic gradient in this portion of the domain is significantly smaller than observed. Assuming that the recharge is reasonably well constrained, this would suggest that the modeled hydraulic conductivity in the upland portion of the domain is too large. According to the description given on page 8, Section 3.4.1, this area appears to have been assigned the K given to the upper sand unit in the Eastern Plume area (calibrated value: 25 ft/d; *cf.* Figs. B-1 and B-2). While allowance for a lower K value over the northwestern portion of the domain may not have a large influence on the model results in the in the Eastern Plume area, it may allow for a better overall calibration.

Response: It is believed this comment refers to the comparison of observed groundwater elevations at the NEX and Site 9. We agree the modeled hydraulic gradient in this area is significantly smaller than observed, but the actual hydraulic gradient between the two sites is very large, 0.129 ft/ft (12.8 ft of head change over 994 ft between MW-NASB-23 and MW-NASB-80 for the October 2001 gauging) which seems suspect. To assess whether the actual hydraulic gradient could be simulated by decreasing the Upper Sand hydraulic conductivity, a cursory sensitivity analysis was completed where the Upper Sand model layer hydraulic conductivity was changed to roughly an order of magnitude less that 25 ft/day. This change did not significantly steepen the modeled hydraulic gradient in this area. The sensitivity testing allowed for the conclusion that the measured data maybe non-representative of actual conditions or that some hydraulic controlling factor is unaccounted for. Attempting to calibrate the model to potentially suspect data was deemed beyond the requirements of the model, and since it was outside the focus area, calibration to this data set (NEX and Site 9 wells) was not pursued beyond a general fit to observed water levels.

9. **Page 18, Section 4.2.1**: The verification step comparing modeled, and observed, water levels under steady pumping conditions is well conceived, and the results (e.g., Fig. F-1) is quite satisfying. However, past well gauging results have indicated that measurable draw-downs are fairly local to the extraction wells. If this is the case, then one might expect that the agreement between calculated and observed water levels will be similar for the un-stressed and the steady-state pumping models, because few of the available monitoring points register significant changes due to the pumping. This limitation of the verification exercise should be acknowledged, if applicable.

Response: The purpose of first calibrating the model to non-pumping conditions was so that the effects from pumping could be subsequently isolated during model verification and therefore more accurately simulated. The purpose of model verification was to build confidence in the ability of the model to accurately simulate conditions under a different set of stresses which not only included stresses from pumping but also included stresses related to different rates of recharge. In this respect, the purpose of model verification was achieved.

The implication of the comment seems to be that since drawdown from pumping is minor, the effect of pumping on groundwater flow patterns is minor. However, keep in mind that the aquifer is under confined conditions and that even though measurable drawdown is small, the radius of influence in a confined aquifer can be relatively large.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
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COMMISSIONER

March 25, 2009

Mr. Todd Bober
Department of Navy
Base Realignment and Closure
Program Management Office-Northeast
4911 South Broad Street
Philadelphia, PA 19112-1303

Re: Groundwater Model – Interim Summary Report-Response to Comments (RTCs)
Naval Air Station, Brunswick, Maine

Dear Mr. Bober:

Pursuant to Section VI of the Naval Air Station, Brunswick, Maine Federal Facility Agreement (Oct 1990), as amended, the Maine Department of Environmental Protection (MEDEP) has reviewed the Navy's responses dated March 17, 2009, to MEDEP's comments, dated January 22, 2009, for draft "Groundwater Modeling Summary Report, Sites 1 and 3 and Eastern Plume", (November 2008) prepared by ECC.

Based on that review, MEDEP has no further comments provided that:

- RTC #7: "Eastward" is changed to "southward" in the RTC (Natural geologic conditions appear to contain groundwater to the south and the groundwater is moving eastward.) and the report text revised accordingly.

- RTC #18: The response is acceptable if the description also includes the basis for the "ΔWL" parameter (Total Change in Water level over the logging period, factoring out pumping). For example was it based on total precipitation and modeled infiltration rates, or measured water level change at a well outside the pumping influence, or other values?

- The proposed revisions and additions are incorporated into the final report along with regulator comments, responses and this letter.

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Respectfully,

Claudia Sait

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CONCURRENCE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER MODELING SUMMARY REPORT
SITES 1 AND 3 AND EASTAERN PLUME
NAVY RESPONSES TO REGULATOR COMMENTS

From: <Daly.Mike@epamail.epa.gov>
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Date: 3/25/2009 4:06 PM
Subject: NAS Brunswick Draft GW Modeling Summary Report, RTCs

Hi Gina,

After my quick consult with Dave M. on a couple of ECC/Navy's comment responses to EPA's letter on the flow model summary report, we have no additional issues that would hold up the Navy's efforts to utilize the model as a tool to evaluate and/or optimize the Sites 1&3 and E. Plume remedies. Please accept this e-mail as EPA's concurrence with the report.

Go forth now and model!

Thanks,

Mike