Diablo Water District Groundwater Management Plan for AB 3030

May 2007

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

DIABLO
WATER
DISTRICT

Diablo Water District Groundwater Management Plan for AB 3030

Prepared for

Diablo Water District

Luhdorff and Scalmanini Consulting Engineers, Inc.

Woodland, California

May 2007

DIABLO
WATER
DISTRICT

May 31, 2007

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Oakley, CA 94561-0127
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To Interested Parties and Individuals:

The Diablo Water District (District) is pleased to release this Groundwater Management Plan (Plan), adopted May 23, 2007. The Plan establishes a framework for maintaining a high quality and sustainable groundwater supply for the District. The Plan also supports basin management objectives directed toward the sustainability of groundwater supplies on a regional scale.

The District's primary objective is to provide a safe and reliable supply of water to the citizens and businesses of Oakely and the unincorporated portions of its service area. Since 2006, the District's surface water source has been supplemented by groundwater. As the District expands its use of groundwater to meet population growth in the next 30 years, it has taken steps to preserve the valuable groundwater resources underlying the region. The components of local groundwater management planning already implemented and future actions are described in the Plan.

The Plan has benefited by valuable input from public agencies as well as the public. This Plan acts as a guide as the District embarks on groundwater development and presents a strategy and management actions to ensure sustained conjunctive use of the two subject sources of supply. Comments and suggestions offered in support of the District's groundwater management objectives are welcome and encouraged.

Sincerely,

Mike Yeraka, P.E.
General Manager

RESOLUTION No. 2007-4

RESOLUTION OF THE BOARD OF DIRECTORS OF DIABLO WATER DISTRICT AUTHORIZING ADOPTION OF GROUNDWATER MANAGEMENT PLAN

The Board of the Directors of the Diablo Water District (District) does hereby find that:

WHEREAS, the District was formed in 1953 by a vote of the citizens of Oakley for the purpose of serving a safe, adequate, and reliable supply of water to the residents and businesses within the District; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq., permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District is an authorized local agency and may therefore adopt and implement such a Groundwater Management Plan; and

WHEREAS, a Groundwater Management Plan will further the District's efforts to protect and provide a safe, sufficient, and reliable groundwater supply to citizens and businesses within the District's boundaries, will facilitate collection of information to further understand groundwater basin conditions and evaluate additional policies and programs for protection of the groundwater resources in the Plan area, and will assist in integrated regional water resources planning and monitoring efforts conducted in coordination with other public entities whose service areas also overly the Plan area; and

WHEREAS, the District adopted a Resolution of Intent to prepare a Groundwater Management Plan on June 28, 2006; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq. requires an entity to adopt a Groundwater Management Plan no later than two years after passing said Resolution of Intent; and

WHEREAS, a Public Hearing was held on May 23, 2007, to determine whether to adopt a Groundwater Management Plan; and

WHEREAS, prior to the Public Hearing a Notice of the Public Hearing was published in a newspaper of general circulation in Contra Costa County on May 4, 2007, and May 11, 2007; and

WHEREAS, less than 50% of the District's assessed property owners protested the draft Plan.

NOW, THEREFORE, BE IT RESOLVED that the District does hereby authorize the adoption of the District's Groundwater Management Plan.

RESOLVED FURTHER that this resolution shall be published in a paper of general circulation in Contra Costa County at least two times to give public notice of the adoption of the District's Groundwater Management Plan.

* * * * * *

The foregoing Resolution was duly and regularly adopted at a meeting held on this 23rd day of May 2007 by the Board of Directors of Diablo Water District by the following vote of the Board:

AYES: Crockett, de Fremery, Garcia, Head, and Hobbs

NOES: none

ABSENT: none

Dated: May 31, 2007

Mike Yeraka, Secretary

DIABLO
WATER
DISTRICT

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Acknowledgments

Diablo Water District would like to thank the five East County Water Management Association member agencies that formed an advisory group to guide the preparation of this plan. Representatives from these agencies participated in meetings on content of the Groundwater Management Plan and reviewed a draft Plan. The agencies represented include:

- City of Brentwood, Paul Elderdge
- Contra Costa Water District, Jerry Brown
- Town of Discovery Bay, Virgil Koehne
- East Contra Costa Water District, Larry Preston
- City of Pittsburg, Walter Pease

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Acronyms and Abbreviations

AB	Assembly Bill
BMO	basin management objectives
CCWD	Contra Costa Water District
CORS	Continuously Operating Reference Station
CSRC	California Spatial Reference Center
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CWC	California Water Code
DHS	Department of Health Services
District	Diablo Water District
DMM	demand management measure
DWD	Diablo Water District
DWR	California Department of Water Resources
DWSAP	Drinking Water Source Assessment Protection
e-logs	electrical geophysical logs
ECCID	East Contra Costa Irrigation District
ECWMA	East County Water Management Association
EDR	Environmental Data Resources Inc.
GPS	global positioning system
IRWMP	Integrated Regional Water Management Plan
ISD	Ironhouse Sanitary District
LSCE	Luhdorff & Scalmanini Consulting Engineers
MCL	Maximum Contaminant Level
mgd	million gallons per day
MOU	Memorandum of Understanding
NGS	National Geodetic Survey
PCA	Possible Contaminating Activities
Plan	District Groundwater Management Plan
RBWTP	Randall-Bold Water Treatment Plant
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SDWA	Safe Drinking Water Act
SOI	Sphere of Influence
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
UST	Underground Storage Tank
UWMP	Urban Water Management Plan
WPPs	Wellhead Protection Porgrams

1.0 INTRODUCTION

1.1 DISTRICT DESCRIPTION AND OVERVIEW

1.1.1 Diablo Water District

Diablo Water District (District), formed in 1953 as the Oakley County Water District and in 1993 changed its name to Diablo Water District, is located on the southern shore of the San Joaquin River Delta, midway between San Francisco and Sacramento in eastern Contra Costa County (**Figure 1-1**). The District's current service area encompasses approximately 17 square miles and includes the City of Oakley (incorporated on July 1, 1999) and other unincorporated areas, and provides service to over 28,000 people and approximately 8,500 water connections (CDM, 2005).

The District's primary objective is to provide a safe and reliable supply of water to the citizens and businesses of Oakley and the unincorporated portions of its service area. Most of the water delivered by the District is surface water supplied by Contra Costa Water District (CCWD), which is treated at the Randall-Bold Water Treatment Plant. Since 2006, the District's surface water source has been supplemented by groundwater from the Glen Park municipal well. Water from the well is conveyed and blended with treated surface water and then distributed through the main municipal system serving the City of Oakley. Expanded use of groundwater is an objective of the District under its Well Utilization Project in which it seeks to develop up to 6 – 7 million gallons per day of well capacity to supplement surface water and improve reliability, drought supply, and operating flexibility of its system. Outside of its main distribution system, in unincorporated areas, the District owns and/or operates a number of small community wells.

The District's current service area and Sphere of Influence (SOI) are shown on **Figure 1-2**, along with the boundaries of other public water agencies in northeastern Contra Costa County. The District's Urban Water Management Plan (UWMP) contains projections of population growth and water demand and supply from 2005 to 2040 (CDM, 2005). Water demand within the District's SOI is expected to increase significantly as the population increases from about 28,000 in 2005 to 75,000 in 2040. This includes about 50,000 residents within the existing City of Oakley limits, 18,000 within the City's expansion areas, and 7,000 in areas outside the City such as Knightsen and Bethel Island, portions of which are served by the District (CDM, 2005). The projected population growth corresponds to an annual growth rate of 4.8 percent.

1.1.2 Authority for Groundwater Management

The District is a local public agency that provides water service to customers within its service area. As a result of Assembly Bill (AB) 3030, the California Water Code (CWC), Section 10750

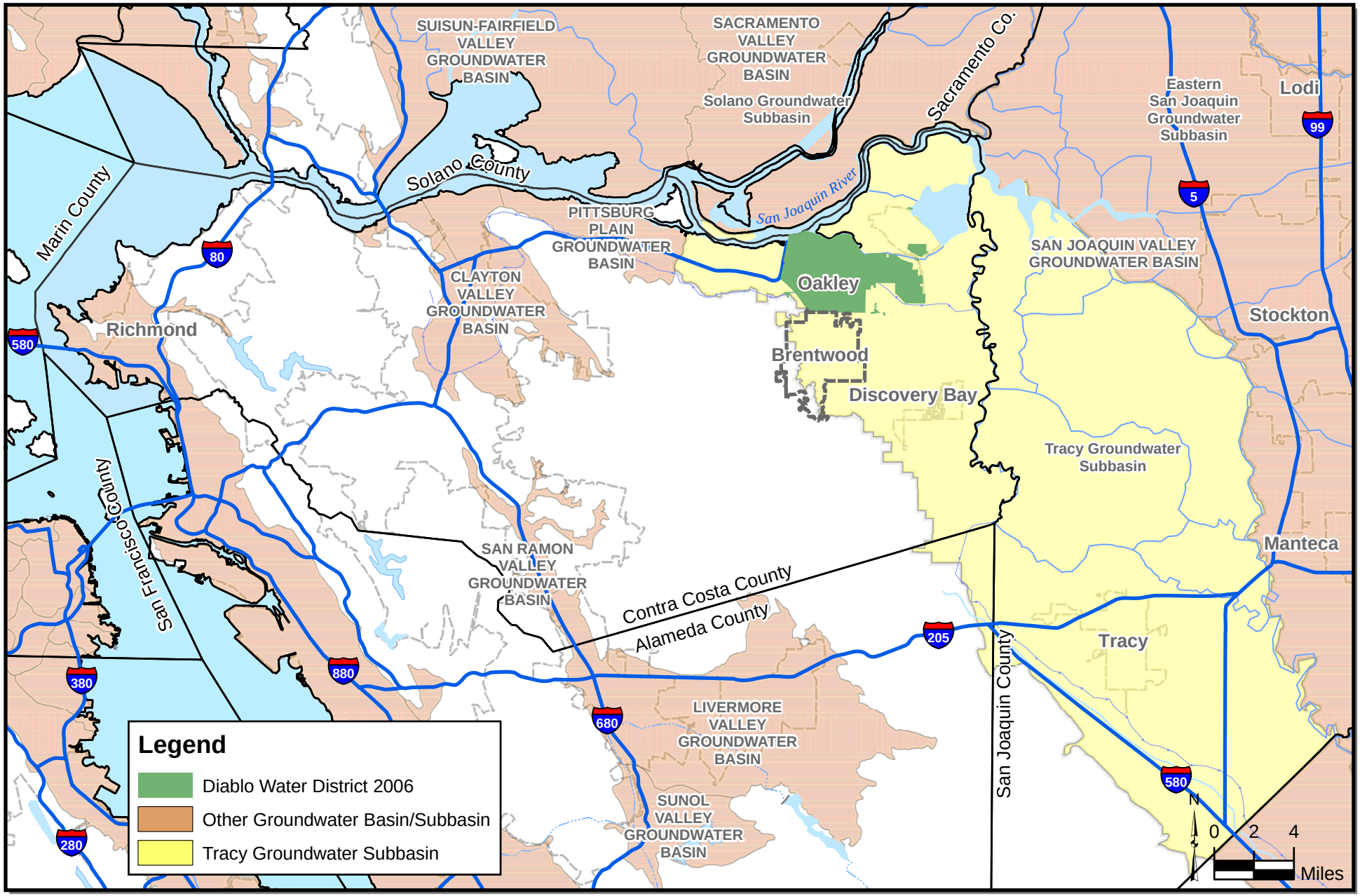

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Figure 1-1
Diablo Water District Location Map

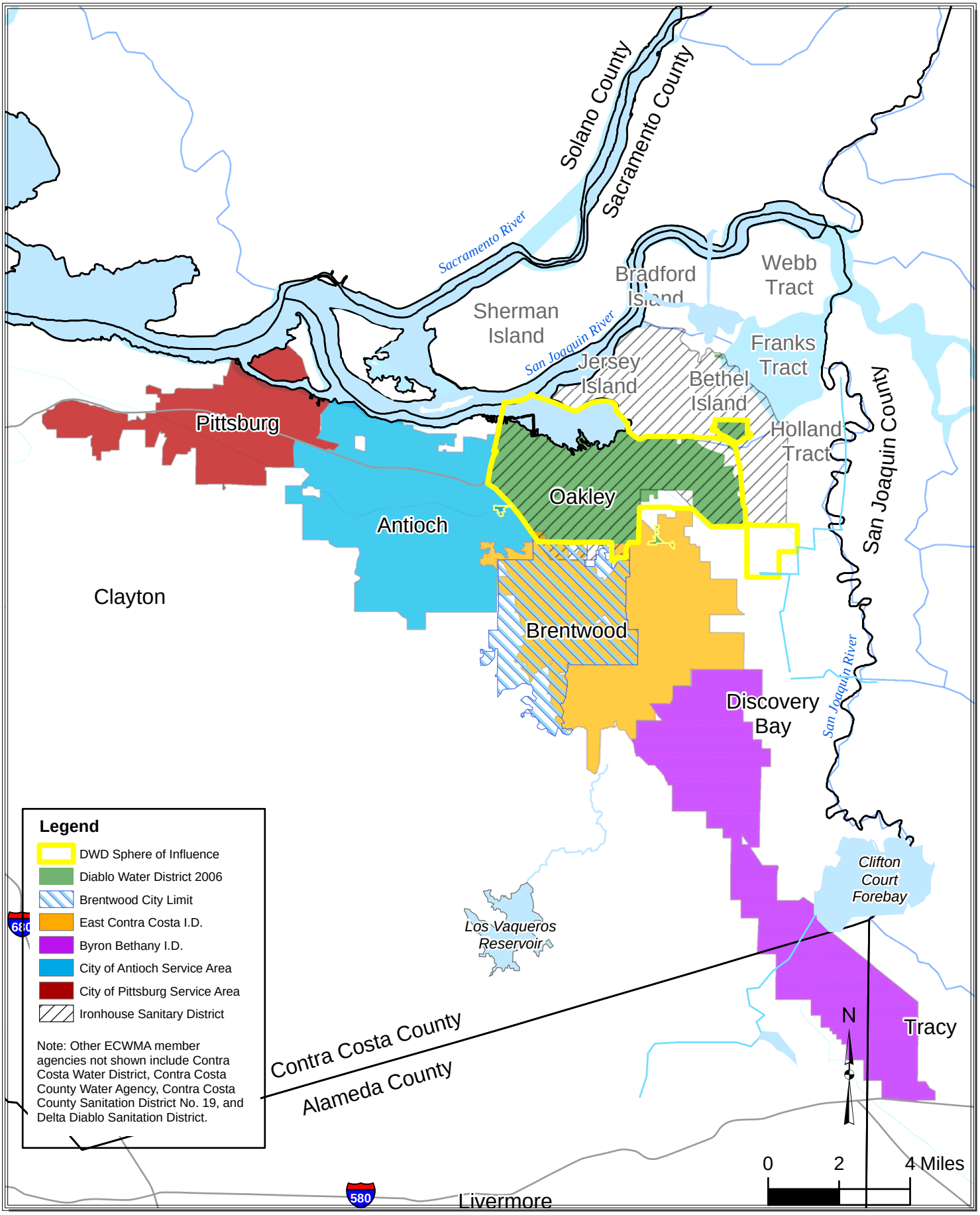

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Figure 1-2
Diablo Water District Sphere Influence

et. seq., provides local agencies with the authority to adopt and implement groundwater management plans. As described further below, the CWC was subsequently amended as a result of Senate Bill (SB) 1938 (Machado), effective January 2003. On June 28, 2006, the District Board of Directors voted to adopt a resolution of intention to prepare a groundwater management plan, in accordance with the requirements of the CWC. This document embodies the District's Groundwater Management Plan (Plan).

1.1.3 Plan Purpose

The purpose of the Plan is to provide a management framework for maintaining a high quality, reliable, and sustainable supply of groundwater within the District's sphere of influence. To accomplish this, the District intends to manage groundwater conjunctively with its surface water resources and support basin management objectives (BMOs) directed toward the sustainability of groundwater supplies on regional and local scales (e.g., groundwater basin and subbasin). Groundwater management involves coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects on other resources and the environment. This Plan sets forth the framework and related actions necessary to accomplish the District's purposes while satisfying regional BMOs.

1.2 OVERVIEW OF REGIONAL WATER RESOURCE PLANNING

The District participates in a variety of regional water management activities. Most notably, it is one of eleven public agencies that comprise the East County Water Management Association (ECWMA), which includes water purveyors in the eastern portion of Contra Costa County (**Figure 1-2**). The ECWMA was formed in 1995 to identify and evaluate potential water management strategies to meet future water needs in the area. In addition to the Diablo Water District, the member agencies include: City of Antioch, City of Brentwood, City of Pittsburg, Byron-Bethany Irrigation District, Town of Discovery Bay, Contra Costa County Water Agency, CCWD, Delta Diablo Sanitation District, East Contra Costa Irrigation District, and Ironhouse Sanitary District.

The ECWMA prepared a report entitled "Phase II East County Water Supply Management Study" (CH2M Hill, 1996) in response to projected growth in population and water demand in eastern Contra Costa County. The report focuses on the water resources, treatment, and infrastructure that will be required to respond to the increased water demand due to urbanization in the eastern portion of the County. Although a number of the ECWMA agencies use some groundwater, the primary source of water supply is surface water delivered by CCWD through Central Valley Project (CVP) contracts or an agreement with ECCID (City of Brentwood).

The ECWMA member agencies participated in the preparation of the East Contra Costa County Functionally Equivalent Integrated Regional Water Management Plan (IRWMP) consisting of

existing local and regional planning documents, which was completed in July 2005. Completion of the Functionally Equivalent IRWMP enabled the ECWMA members to apply for a Proposition 50, Chapter 8 regional grant (CCWD, 2005). Eight eastern Contra Costa County agencies, including Diablo Water District, have projects to be included in the grant application.

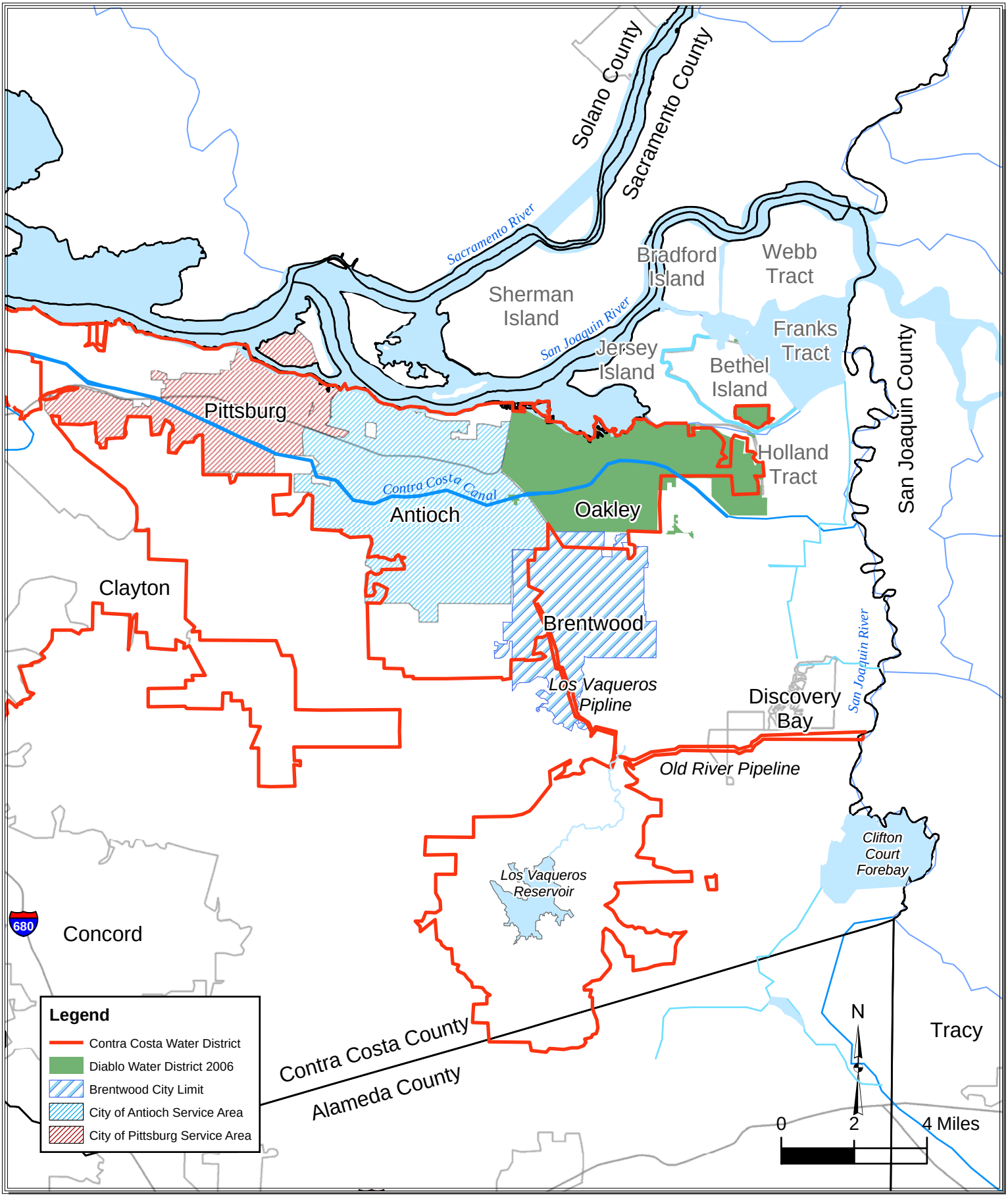
The District receives its surface water supplies from CCWD and most of its service area is located within the CCWD boundaries (**Figure 1-3**). Current and projected future water supplies available to the District are summarized in CCWD's 2005 UWMP (CCWD, 2005), in addition to Diablo Water District's 2005 UWMP.

1.3 DIABLO WATER DISTRICT WATER SUPPLIES

In 1953, the residents of Oakley formed the Oakley County Water District, an independent local government agency (City of Oakley web site, www.ci.oakley.ca.us, 2006). In 1993, the Oakley Water District became the Diablo Water District. The District's water system currently consists of transmission and distribution pipelines, two water storage reservoirs (2.5 and 5 million gallons) built in 1986 and 1990, respectively, one active municipal supply well, pumping facilities, and a water treatment facility. The Randall-Bold Water Treatment Plant (RBWTP), owned jointly by the District (37.5 percent) and Contra Costa Water District (62.5 percent), began service in 1992. Diablo Water District has an initial maximum treatment plant capacity allocation from the RBWTP of 15 million gallons per day (mgd) with a future maximum allocation of 33 mgd.

In 1998, the Los Vaqueros Reservoir was placed into service by Contra Costa Water District. The reservoir provides up to three months of emergency water storage for Diablo Water District. In addition to surface water from CCWD, the Diablo Water District's system also utilizes water from one municipal well (Glen Park Well) that began production in July 2006. The percentage of water used from each supply source will vary as a function of the District's planned management strategy for its water resources. The District also operates and/or owns several wells that serve small community water systems as regulated by Contra Costa County Environmental Health Division.

Prior to completion of the Glen Park Well, the sole water supply source for the District's municipal customers was provided by CCWD. The District receives untreated CCWD water through an agreement with CCWD. While the District does not have a written quantity guarantee of supply from CCWD, it does have the right to draw up to 30 mgd from the RBWTP during normal years to meet maximum day water demands within its system. CCWD has a full commitment from the Central Valley Project of 195,000 acre-feet per year and provides water to central and eastern Contra Costa County via the Contra Costa Canal.



FILE: \Public\Diablo WD 04-1-058\GIS\Figure 3.mxd

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Figure 1-3
Contra Costa Water District
(Eastern Portion)

In 2004, the District initiated the first phase of the Well Utilization Project (CDM, 2004) consisting of planning, construction, and testing of the Glen Park well, design of a blending facility at RBWTP, and a pipeline from the well to the blending facility. The purpose of the project is to construct wells to supplement the District's surface water supply with groundwater. The groundwater supply will replace a portion of the treated surface water and provide an emergency supply in the event of drought reductions of surface supplies or an outage of the RBWTP.

The first phase of the Well Utilization Project was completed in 2006 with the commissioning of the Glen Park well. Subsequent phases will add more wells and supply pipelines to the extent that groundwater quality is found to be favorable at prospective sites and increased pumping does not adversely affect local and regional groundwater resources. If these conditions were met, the project would provide a total groundwater supply for the District of up to 7,800 acre-feet per year at build-out. Thus, for maximum average day water use, the District would have available 15 mgd from the RBWTP and 7 mgd from wells installed under the Well Utilization Project.

1.4 LEGISLATION RELATED TO GROUNDWATER MANAGEMENT PLANS

The Legislature enacted legislation in 1992 (AB 3030) and 2002 (SB 1938), now incorporated in the CWC Section 10753, *et seq*. to encourage local public agencies to adopt plans to manage groundwater resources within their jurisdictions. The District has prepared this Groundwater Management Plan to be compliant with AB 3030 and revisions to the CWC that resulted from SB 1938.

SB 1938 provides that adoption of a groundwater management plan will be a prerequisite to obtaining funding assistance for groundwater projects from funds administered by California Department of Water Resources (DWR). To comply with SB 1938, a groundwater management plan must include components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping. SB 1938 specifies that groundwater management plans contain provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin. Provisions must also be made to allow participation by interested parties in development of the plan. The plan must include mapping of the groundwater basin, as defined in DWR's Bulletin 118, along with the boundaries of the local agencies that overlie the basin. In this case, the Plan focuses on that portion of the San Joaquin Groundwater Basin that underlies Diablo Water District's SOI. Finally, to comply with SB 1938, monitoring protocols must be designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of

surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

The potential components of groundwater management plans are listed in CWC Section 10753 and consist of:

- Control of saline water intrusion.
- Identification and management of wellhead protection areas and recharge areas.
- Regulation of the migration of contaminated groundwater.
- Administration of a well abandonment and well destruction program.
- Mitigation of conditions of overdraft.
- Replacement of groundwater extracted by water producers.
- Monitoring of groundwater levels and storage.
- Facilitating conjunctive use operations.
- Identification of well construction policies.
- Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
- Development of relationships with state and federal regulatory agencies.
- Review of land use plans and coordination with land use planning agencies to assess activities, which create a reasonable risk of groundwater contamination.

In 2002, SB 1938 was amended and added to CWC Section 10750 *et seq.* regarding the implementation of local groundwater management plans. While the provisions of SB 1938 did not alter the potential components of a local groundwater management plan, as listed above, it did add the following provisions:

- The local agency, in preparing a groundwater management plan, shall make available to the public a written statement describing how interested parties may participate in developing the plan. For that purpose, the local agency may appoint, and consult with, a technical advisory committee consisting of interested parties.

- In order to qualify for funding assistance for groundwater projects, for funds administered by DWR, a local agency must accomplish all the following relative to groundwater management (CWC 10753.7(a)):

- Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan.

- Include groundwater management components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping.

- Include provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin.

- Include mapping of the groundwater basin, as defined in DWR's Bulletin 118, and the boundaries of the local agency subject to the plan, plus the boundaries of other local agencies that overlie the basin.

- Adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

In summary, the District has prepared this Plan to be compliant with the AB 3030 and SB 1938 requirements as part of its interest in developing and sustaining reliable water supplies. To ensure the reliability of groundwater supplies to meet existing and projected demands, the components of local groundwater management planning already implemented include a monitoring program, analysis of groundwater conditions in the basin, conjunctive use of local groundwater and imported surface water supplies, and coordination with other agencies on the control of localized groundwater contamination.

1.5 PREPARATION AND ORGANIZATION OF GROUNDWATER MANAGEMENT PLAN

A resolution to prepare this Groundwater Management Plan was passed by the Diablo Water District Board of Directors in accordance with AB 3030 and SB 1938. Copies of the resolution and associated public notification are contained in **Appendix A**.

This Plan is organized to provide an overview of regional and local water supplies; to describe existing groundwater conditions; to discuss land subsidence in the context of groundwater use; identify areas of concern with respect to the groundwater system; to present a set of groundwater management objectives and components; and to present a set of management actions to be undertaken by the District; which collectively form the Plan.

2.0 SUMMARY OF WATER SUPPLIES

2.1 WATER SUPPLIERS IN EAST CONTRA COSTA COUNTY

As shown on **Figure 1-2**, other local agencies that supply or use water in the vicinity of Diablo Water District include the City of Antioch, Town of Discovery Bay, City of Pittsburg, City of Brentwood, Contra Costa Water District, and East Contra Costa Irrigation District, and Byron Bethany Irrigation District. A brief overview of the sources for each agency is presented below.

Antioch, Discovery Bay, Pittsburg

The City of Antioch currently does not use groundwater as a source of supply and does not plan to pump groundwater to meet its future needs (Brown and Caldwell, 2006). Antioch relies on purchases of raw water from CCWD, which it treats at the Antioch Treatment Plant, and wholesale treated water from CCWD, in addition to its own pre-1914 river diversion that is also treated at the Antioch Water Treatment Plant. The Town of Discovery Bay is located southeast of the District's SOI and relies entirely on groundwater for its water supply. Water is pumped from four groundwater wells with an average depth of 400 feet; total groundwater production was 2,800 AF in 2003. The City of Pittsburg currently meets about 90 percent of its water demand through raw surface water purchased from CCWD; the balance of the City's demand is met by groundwater supplied by two wells. Groundwater use is limited primarily by groundwater quality (hardness). The City has undertaken a groundwater exploration project and is seeking to construct one or more wells to supplement its surface water supply and increase reliability and operational flexibility.

City of Brentwood

The 2005 City of Brentwood Urban Water Management Plan states that the City uses a mix of groundwater and surface water. Groundwater pumpage ranged from about 6,300 to 9,000 acre-feet per year during 2000 to 2004 from eight public supply wells. Brentwood's northeast well field consists of six wells located about 1 to 1.5 miles south of the Glen Park Well. Future City pumpage is expected to remain at about 7,700 acre-feet per year until 2025. Surface water is supplied by CCWD and ranged from about 6,700 to 6,900 acre-feet per year for the years 2000 to 2004. Surface and other supplies are expected to increase to over 12,000 acre-feet per year after the new water treatment plant, located near the RBWTP, is completed in 2008.

CCWD

The Contra Costa Water District Urban Water Management Plan (2005) reports that CCWD supplies water to over 550,000 people (60,000 connections) throughout north, central, and east Contra Costa County covering an area of more than 130,000 acres. The source of this water is the Sacramento-San Joaquin Delta. The Contra Costa Canal, completed in 1948, is 48 miles long and is the primary conveyance facility for CCWD's water. It delivers water to the Randall-Bold Water Treatment Plant (current capacity of 40 mgd) located in the City of Oakley and jointly owned by Diablo Water District (37.5 percent) and CCWD (62.5 percent). The treatment process is sedimentation, intermediate ozonation, filtration, and chloramination for final disinfection. CCWD is planning a second treatment plant adjacent to the RBWTP with a capacity of 30 mgd for the City of Brentwood. The Los Vaqueros Reservoir, completed in 1998, is a 100,000 acre-foot reservoir located eleven miles south of the Diablo Water District. The water is used to improve CCWD water quality and provide for a three-month emergency supply as well as to protect fisheries.

ECCID and Byron Bethany Irrigation District

East Contra Costa Irrigation District and the Byron-Bethany Irrigation District are each cited in the Contra Costa Water District UWMP as having the ability to produce about 5,000 acre-feet of groundwater annually each. In 2000, CCWD and ECCID entered into an agreement allowing CCWD to purchase up to 8,200 acre-feet of surface water in drought years and deliver it to customers in areas where the service areas of the agencies overlap. The agreement also provides for purchase of an additional 4,000 acre-feet with no restrictions whereby ECCID would offset the amount through groundwater pumping. The United States Bureau of Reclamation (USBR) web site (www.usbr.gov) announced a contract renewal for about 20,600 acre-feet of CVP water over a 25-year term with the Byron-Bethany Irrigation District.

2.2 DIABLO WATER DISTRICT SOURCES OF SUPPLY

As summarized in the Diablo Water District Urban Water Management Plan (CDM, 2005), the District's water supply currently includes both surface water and groundwater sources. The primary water supply is treated surface water from the Central Valley Project purchased from Contra Costa Water District. CCWD contracts with the USBR for the Central Valley Project water. The CVP water is conveyed through the Contra Costa Canal and treated at the Randall-Bold Water Treatment Plant in Oakley (**Figure 2-1**). The remainder of the District's water supply is groundwater. Per the 2005 UWMP, current District water supplies are summarized in **Table 2-1** for normal, single-dry, and multiple-dry years. The availability of CVP water in the year 2030 is projected at approximately 100 percent of demand (14,000 acre-feet per year) for a

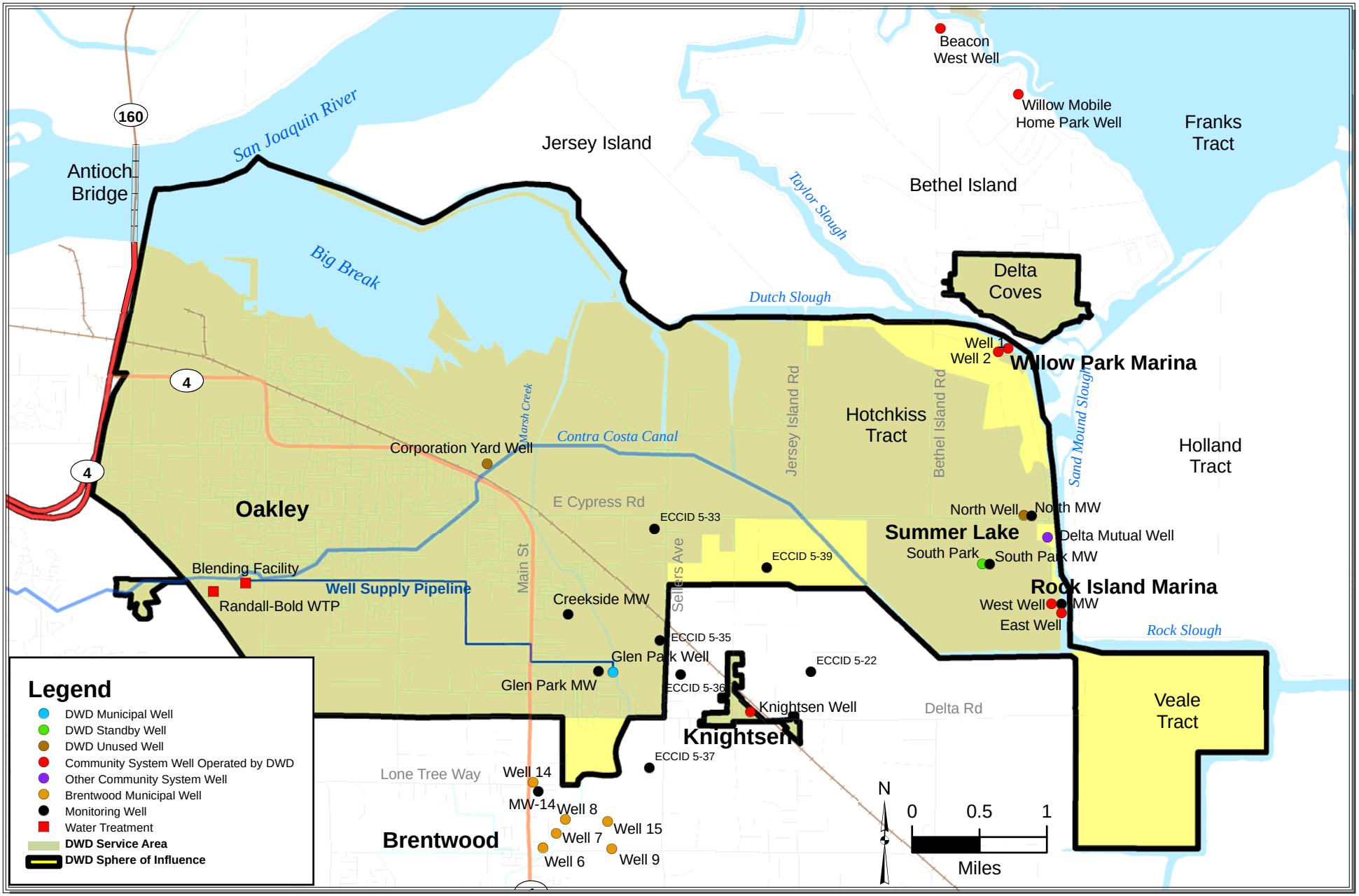

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Figure 2-1
Diablo Water District Service Area and Well Locations

Table 2-1
Supply for Normal, Single Dry and Multiple Dry Years[1]
2030

Source	Normal Year		Single-Dry Year		Multiple-Dry Year Years 2 and 3	
	% Available	acre-ft	% Available	acre-ft	% Available	acre-ft
Surface Water from CCWD	100%	14,000	100%	14,000	100% to 2010 85% after 2010	11,901
DWD Groundwater	100%	5,039	100%	5,039	100%	5,039
Total		19,039		19,039		16,940

1. Adapted from Diablo Water District Urban Water Management Plan Final Report, Camp Dresser & McKee Inc., December 2005.

normal and single-dry year. For a multiple dry-year period, the availability is projected to decrease to 85 percent of demand (11,900 acre-feet per year) after the year 2010.

Projected water supply sources for 2005 to 2040 in a normal year are summarized in **Table 2-2**, which is adapted from the District's 2005 UWMP. Availability of surface water is expected to increase from approximately 8,400 acre-feet per year through 2010 to 16,800 acre-feet per year by 2040. The District began pumping from the Glen Park Well in July 2006 and has increased pumpage from July (0.1 mgd) to October (1 mgd), or 10 to 190 acre-feet per month, respectively. Total groundwater pumpage by the District in normal years is projected to increase to approximately 6,700 acre-feet per year by 2040 as new well facilities under the Well Utilization Project are developed and commissioned over the next 30 to 35 year planning horizon.

2.2.1 Diablo Water District Groundwater Pumping

Prior to 2000, the District pumped from the Corporation Yard Well (500 acre feet in 1996). However, due to poor groundwater quality found at that site, the Corporation Well provides only standby emergency service (CDM, 2005). The Glen Park Well (**Figure 2-1**) came on line in 2006, and is equipped to pump at capacities of 1 to 2 mgd, and supplies the District's municipal water system.

Additional municipal wells, similar to the Glen Park facility, are planned out to year 2040, assuming feasibility criteria are met under the Well Utilization Project. Ultimately, groundwater may provide up to 20 percent of the District's supply with a well capacity of 6 to 7 mgd (CDM, 2005).

2.2.2 Other Groundwater Pumping

The Oakley General Plan (2002) states that over 30 small water companies or service districts serving less than 5,000 people are located in the eastern portion of the District's SOI. The District owns or operates a number of these wells. In the future, if any area is brought into the District's system, some of these wells would be de-commissioned and destroyed.

Also within the District's SOI are residences with individual domestic wells (wells serving one home). These are small capacity wells that are generally shallower than 200 feet and many are less than 100 feet. By contrast, the Glen Park Well targets groundwater from lower aquifer units (230 to 300 feet below ground surface) as a means to mitigate potential impacts to the existing wells and to satisfy source water protection requirements under the state Drinking Water Source Assessment and Protection Program, discussed further herein.

New and planned subdivisions in Oakley are anticipated to pump some groundwater to irrigate parks, other green areas, or to fill lake features. The District owns and operates a back-up emergency well within the Summer Lake subdivision off Cypress Road and Bethel Island Road

Table 2-2
Current and Projected Water Supply Sources in Normal Year[1]
(acre-feet)

Source	2005	2010	2015	2020	2025	2030	2035	2040
Surface Water Purchased from CCWD[2]	8,403	8,403	10,925	10,925	14,000	14,000	16,802	16,802
Groundwater[3]	0	1,679	1,679	3,360	3,360	5,039	5,039	6,718
Total Supply	8,403	10,081	12,604	14,286	17,361	19,039	21,841	23,520

1. Adapted from Diablo Water District Urban Water Management Plan Final Report, Camp Dresser & McKee Inc., December 2005.

2. DWD currently has 15 mgd treatment capacity for surface water with the ability to purchase an additional 15 mgd capacity in 5 mgd increments as needed to meet future peak demands. The 15 mgd available capacity will provide an average day supply of 7.5 mgd (8,403 ac-ft/yr). A total of 30 mgd ultimate capacity for maximum day will provide an average day supply of 15 mgd (16,802 ac-ft/yr). It is anticipated that DWD will purchase 5 mgd additional capacity in 2015, 2025, and 2035 in order to meet demands.

3. Ultimately, groundwater is projected to provide up to about 20% of the District's supply under the Well Utilization Project, with a total well capacity of about 6 to 7 mgd. This assumes that no adverse impacts arise as a result of the District's Project thereby allowing the ultimate capacity to be achieved.

(**Figure 2-1**). Besides serving as a standby source of supply, the well is used to fill the lake feature in the subdivision and provide irrigation for large turf areas.

Pumpage by industrial and domestic wells in the unincorporated portions of the District is un-metered, but the pumpage is assumed to represent a small component of overall extraction. Irrigation pumping within new subdivision areas is expected to represent a more significant component of the District's groundwater pumpage. The potential impacts of such pumping would be monitored under provisions of this Plan.

2.2.3 Conjunctive Water Use and Management

Implementation of the Well Utilization Project represents a step by the District to augment its surface water supplies with groundwater. As part of developing a groundwater supply, the District will seek to conjunctively manage its groundwater and surface water to most effectively use these resources during varying water years (i.e., normal, wet, and dry periods). Conjunctive water management is expected to enable the District to meet its future water demands for a 20-year horizon and beyond.

Under a conjunctive water management strategy involving groundwater and its contract surface water supply, the District will achieve diversification of its sources and gain flexibility and reliability in meeting future operational needs. Since surface water will remain its primary source, the District can more effectively manage groundwater resources as compared to an entity that relies exclusively on wells. This Plan encompasses a strategy and management actions to ensure sustained conjunctive use of the two subject sources of supply.

3.0 GROUNDWATER, LAND SUBSIDENCE, AND AREAS OF CONCERN

3.1 GROUNDWATER

3.1.1 Introduction

Most public supply, irrigation, and domestic wells in the Diablo Water District SOI are completed to depths shallower than 400 feet. While many domestic wells may be less than 100 feet in depth, municipal and large capacity irrigation wells are typically 200 to 400 feet deep, reflecting the extent of favorable aquifer materials for these types of wells. Borings associated with oil and gas exploration indicate a lack of sand and gravel aquifers and an occurrence of saline or brackish water at depths of 800 feet and greater. In some areas, evidence from well logs indicates possible brackish to saline conditions between depths of 400 and 800 feet.

A detailed study of the occurrence of groundwater was performed by Luhdorff & Scalmanini Consulting Engineers (LSCE, 1999) for several east Contra Costa County agencies, including Diablo Water District, with an interest in groundwater resources. The study produced a base map that delineated geologic and hydrogeologic features of the region, a well map showing available well logs with information useful in interpreting the geologic setting, and a series of geologic cross sections depicting the interpreted subsurface conditions. The study area encompassed the greater Brentwood area, the area around Discovery Bay, and the Delta region encompassing Oakley and vicinity. Elements of the LSCE study as it pertains to the subject Groundwater Management Plan are presented in this chapter along with an updated cross section depicting hydrogeologic conditions within Diablo Water District's SOI.

The following section cites the current state Department of Water Resources description of the regional groundwater basin encompassing the east Contra Costa County area, including Diablo Water District's SOI.

3.1.2 Groundwater Basin Description (DWR)

As shown on **Figure 1-1**, the Diablo Water District overlies a portion of the San Joaquin Valley Groundwater Basin as designated by the California Department of Water Resources (DWR). The District is located in the northwestern portion of the Tracy Subbasin, which is one of sixteen subbasins in the San Joaquin Valley Groundwater Basin. The District's existing and prospective new wells (e.g., under the Well Utilization Project) are located in the Tracy Subbasin. The description of the Tracy Subbasin provided below is partly based on the information contained in DWR Bulletin 118, Update 2003 (DWR, 2003b). A more detailed groundwater basin description is posted on the DWR web site (DWR, 2004).

San Joaquin Valley Groundwater Basin, Tracy Subbasin (Basin No.: 5-22.15)

The Tracy Subbasin includes the northwestern most portion of the San Joaquin Valley Groundwater Basin around the Sacramento-San Joaquin Delta and extending south into the central portion of the San Joaquin Valley. Overall, population density within the subbasin is relatively sparse, with the major cities being Tracy, Brentwood, and Oakley. Subbasin boundaries are defined by the Mokelumne and San Joaquin Rivers on the north; the San Joaquin River on the east; and the San Joaquin-Stanislaus County line on the south. The western subbasin boundary is defined by the contact between the unconsolidated sedimentary deposits and the rocks of the Diablo Range (DWR, 2004).

3.1.3 Geologic Setting

East Contra Costa County and Diablo Water District's SOI are situated on the western side of the northern San Joaquin Valley portion of the Great Valley province of California. West of the District lie the lower foothills of the Diablo Mountains of the Coast Range province. To the north, the Sacramento and San Joaquin Rivers combine in the Delta and drain westward into the San Francisco Bay region. Descriptions of rock formations that comprise the geologic setting are presented below in order of oldest-to-youngest. The youngest formations, Pleistocene to Holocene alluvium, are the target for potable groundwater supply wells in the District and the greater east County area.

Surficial geology of the east County area is depicted on the two regional geologic maps for the Sacramento and San Francisco-San Jose quadrangles (Wagner and others, 1981; Wagner and others, 1990). In the Coast Ranges, the geology consists of strongly deformed (faulted and folded) Mesozoic (pre-63 million years ago) marine sedimentary rocks of the Franciscan Complex and Great Valley Sequence. Along the northeastern edge of the Coast Range occur slightly less deformed, Tertiary (Eocene to Miocene, 55 to 5 million years) marine sedimentary rocks. The marine rocks of sandstones, shales, and mudstones trend northwest/southeast and dip, or slope, steeply to the north/northeast. These rocks are exposed in low hills from Deer Valley north to near Antioch, and southeast of Marsh Creek Reservoir. The Tertiary marine rocks extend east beneath the San Joaquin Valley with increasing depths to several thousand feet. These rocks contain saline water from their marine deposition as well as natural gas accumulations that are exploited in numerous gas fields in the area.

Detailed surface geologic maps of the Coast Range in this area include Davis and Goldman (1958), Brabb and others (1971), and Dibblee (1980 a, b, c). Subsurface characterization of the marine rocks beneath the San Joaquin Valley can be found in oil and gas field summaries produced by the California Division of Oil & Gas (1982), and Thesken and Adams (1995). General geologic descriptions and histories of these marine rocks are contained in Bartow

(1991), and Bertoldi and others (1991). Because of their marine origin, highly consolidated nature, and presence of saline water, the Mesozoic and Tertiary marine rocks are not a source of potable water supply in the region.

Overlying the Tertiary marine rocks is a sequence of late Tertiary (Pliocene 5.3 to 1.6 million years) and Quaternary (Pleistocene 1.6 to 0.6 million years) non-marine sedimentary deposits. Surface exposures of these Plio-Pleistocene deposits are limited to an area south of Antioch to Oakley, and a small area south of Brentwood. These beds dip moderately to the east to northeast and extend eastward below the San Joaquin Valley. The nature of these Plio-Pleistocene deposits is poorly known in the area. Subsurface data are limited to logs from a few deep water wells and oil and gas exploratory test holes. It is believed that these deposits occur below about 400 feet to depths of 1,500 to 2,000 feet below the San Joaquin River. Westward, the sequence thins and rises to near the surface overlying the Tertiary marine rocks of the Coast Range. These deposits seem to be dominated by fine-grained clays, silts, and mudstones with few sand beds. Water quality from electrical logs is difficult to interpret, but the quality appears to become brackish with depth in the few sands that are encountered in boreholes.

Pleistocene to Holocene (600,000 years to present) alluvium overlies all of the older geologic units. These deposits are largely unconsolidated beds of gravel, sand, silts, and clays becoming weakly consolidated with increasing age and burial depth. These units were deposited by surface stream systems (e.g., the present-day Marsh Creek) and contain fresh groundwater and represent targets for water wells. Surface geologic mapping of the youngest units have used various names and subdivisions, largely based on soil characteristics (Welch, 1977), topographic position (Helley and others, 1979), and depositional environments (Atwater, 1982).

Characterization of the alluvium in the subsurface is difficult because of lithologic similarities and lack of distinguishing stratification. Correlation of sand and gravel beds of the alluvium is locally possible based on relative elevation and lateral extent of the beds and the use of descriptions in water well drillers reports. The fine-grained silts and clay beds are generally so massive, thick, and homogenous that stratigraphic correlation is not possible (i.e., clear stratigraphic markers are not evident). The alluvium thickens from a few tens of feet in the western foothills of the Coast Range to about 300 feet beneath Brentwood, and then generally thickens to about 400 feet beneath Old River. Sand and gravel beds tend to be thin and discontinuous in the west, and thin to pinch-out east of Brentwood. Beneath the river floor to the east, is a sequence of thicker more laterally extensive beds of sand and gravel deposited by the river within floodplain silts and clays.

3.1.4 Hydrogeology

Hydrogeology refers to the interrelation of geologic features and the occurrence of groundwater. Hydrogeologic studies pertaining to the east Contra Costa County area are relatively limited. As

cited previously in Section 3.1.2, groundwater within the District's SOI is not characterized as a distinct subbasin, but only a portion of the larger Tracy Subbasin (DWR, 2004).

A regional study of the thickness of the Tertiary-Quaternary non-marine sedimentary deposits was made by Page (1974) and evaluations of the depth to base of fresh water by the California State Water Project Authority (1956) and Berkstresser (1973). Regional studies of the Sacramento-San Joaquin Valley groundwater basin were performed by Bertoldi and others (1991), Page (1986), and Williamson and others (1989). The United States Geological Survey (USGS) compiled water quality information that covers the area in a series of reports (Keeter 1980; Sorenson 1981; and Fogelman 1982). Beside information presented in these broad reference sources, there are no detailed hydrogeologic studies of east Contra Costa County that report on groundwater occurrence and aquifer characteristics.

LSCE (1999) conducted a search of water well driller's reports on file at DWR for the east Contra Costa County area from about two miles west of Oakley, through the Delta Islands to just east of the county line, and south through Brentwood to about two miles south of Byron. Between 400 and 500 well logs were collected and classified into depth zones of 100-foot intervals. The majority of these wells were found to be less than 300 feet deep and concentrated outside areas served by large municipal water supply systems. To the east, along the San Joaquin River flood plain, and outside of Byron to the south, very few well logs were found. The types of wells found in the survey included municipal supply wells in Brentwood, Oakley, and Discovery Bay, plus numerous small community systems and individual domestic wells in the unincorporated areas. Agricultural irrigation wells are also distributed throughout the region.

The LSCE study used lithologic descriptions from drillers' reports plus electric geophysical logs (e-logs) to assess the distribution and nature of aquifer materials tapped in water supply wells throughout the region. Because of the lack of deep well control (over 500 feet) over most of the east County study area, electrical logs from oil and gas exploratory test holes were also examined. About 200 oil and gas test hole files were reviewed from gas fields near Brentwood and north to the Delta plus scattered wildcat test holes (outside of the gas fields) elsewhere in the area. Most of the oil and gas electrical logs showed that the geologic material below 800 feet in the region is dominated by fine-grained (clay and shale) deposits and some sandy zones with indications of saline or brackish water present. Within Diablo Water District's SOI and south into Brentwood, the water well and oil and gas logs indicate a lack of aquifer materials (sand and gravels) below 800 feet that might be suitable for potable supply.

From the above, any sands and gravels that are present at depths below about 500 feet may be brackish to saline and, given the historical record of wells drilled in the region, it is concluded that the primary target for groundwater development is aquifer units that occur at depths less

than 500 feet below the surface. This conclusion applies to the District's SOI and some surrounding areas, including the City of Brentwood.

The study by LSCE in 1999, prepared for east County agencies, presented descriptions of the alluvium formation that serves as the primary source of groundwater supply in the region. Four subareas were described as having distinguishing characteristics and serve as a hydrogeologic model of alluvium based on depositional factors (e.g., alluvial, fluvial, etc.). The model assists in distinguishing potential groundwater interactions between different regions where groundwater represents a significant water supply component. A brief overview of these regions is presented below followed by a detailed discussion of the features of the alluvium in the Diablo Water District SOI.

3.1.4.1 Depositional Subdivisions of Alluvium

The model of alluvium in the east County area, as presented by LSCE (1999), consists of alluvium subdivisions, or subareas, which are interpreted as having distinguishing sedimentary characteristics because of depositional processes. The model is delineated as four subareas **(Figure 3-1)** as described below:

Fluvial Plain

This subarea is representative of the eastern portions of Diablo Water District's SOI and southward to Discovery Bay. It is characterized as a zone of well-defined, thick-bedded (20 to 30 feet) sands and gravels deposited along the floor of the San Joaquin Valley. The beds appear to occur at distinct levels or depths separated by intervening clay to silt beds, and extend northward in fairly well defined sequences. The sand and gravel beds were probably deposited in stream channels that migrated laterally through time and are confined within and overlain by flood-plain clay and silt deposits. The setting was probably similar to that which occurs today with northward flowing river channels, distributaries, and sloughs across floodplains of overbank areas. The deposits extend to depths of about 350 feet, below which occur largely fine-grained silts and clays.

Delta Islands

This subarea is representative of the northeastern portion of Diablo Water District's SOI and encompasses Bethel Island and vicinity. Sand and gravel beds may correlate to the Fluvial Plain, but net sand thicknesses and the number of beds appear to increase northward. Net sand thickness increases to 60 feet or more per hundred feet beneath much of the Delta Island areas. To the west where well control is limited, the nature of the Delta area is not well documented. The sand beds appear to be somewhat finer-grained than the Fluvial Plain, with fewer reports of gravel materials. As in all the other subareas, the sand beds exist primarily

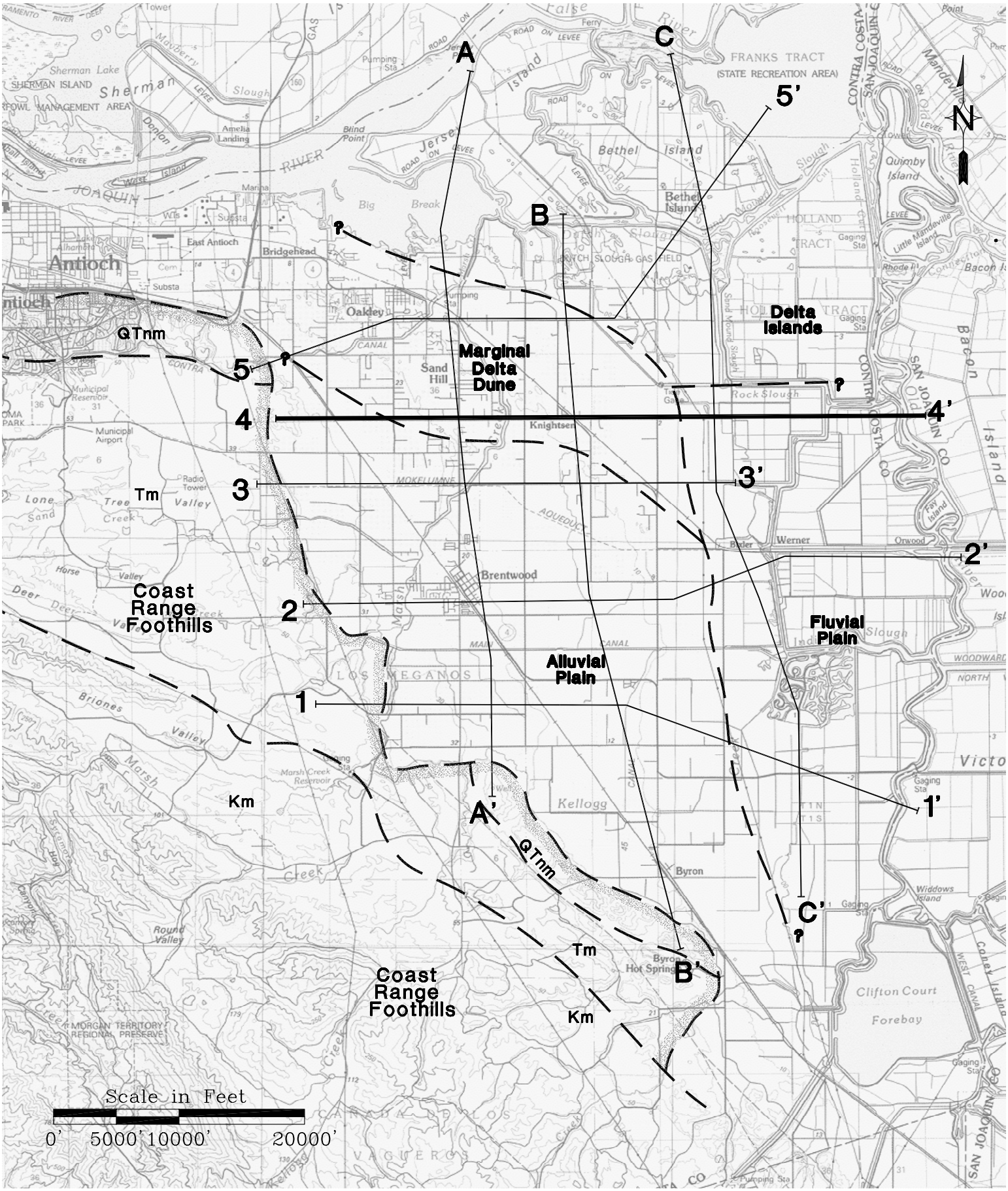

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Figure 3-1
Hydrogeologic Subareas
East Contra Costa County (LSCE, 1999)

to depths of about 300 to 350 feet, below which few sands are encountered. The depositional environment for the Delta Islands is interpreted as multiple stream channels meandering between islands. Channels would be active with through-flowing waters, then abandoned as new channels developed. Possibly slower stream flow and tidal fluctuations allowed thicker, fine-grained sand deposits to form.

Marginal Delta Dunes

This subarea is representative of the central to western portion of Diablo Water District's SOI and is defined by numerous thin to thick sand beds. Net sand thicknesses are generally greater than 30 feet of sand per hundred feet. The sand beds tend to be similar to the Delta Island area with generally finer-grained sands but thinner individual beds. Locally, areas of thicker sand beds occur. The depositional environment is envisioned to be a mixture of delta fluvial distributary channels and possibly aeolian dune fields. Between Oakley and northern Brentwood, a surface deposit of rolling gentle hills of relic sand dunes occur. These sand dunes are believed to have been generated by strong winds blowing sand off the delta margins. Some of the deeper sand beds across the Marginal Delta Dunes area may be older dune fields.

Alluvial Plain

This subarea is representative of greater Brentwood south of the Marginal Delta Dune and the City of Oakley, and west of the Fluvial Plain. The subarea is characterized by thin sand and gravel beds that correlate poorly between wells. Net sand thicknesses are generally low, less than 20 feet of sand per hundred feet, and generally occurring as several beds. Locally, pockets or bands of thicker sand and gravel beds occur where slightly thicker beds may occur. The depositional environment is one of small streams draining eastward from the Coast Range foothills to the west. Flood flows of these streams spread out from the hills depositing fine-grained materials, possibly as mudflows with high sediment content. Stream flows deposited thicker sand and gravel beds that tended to stack upon each other causing the thicker bands of sand beds. Distal alluvial plain deposits probably interbed with floodplain deposits from the adjacent Fluvial Plain region. The thicker stream deposited sand and gravel bands extend eastward until the sands either pinch out or have not been reached by wells. In the north, the stream deposits appear to reach into the Marginal Delta Dunes area, blending into the sand units that are present there.

3.1.4.2 Representative Cross Sections for Diablo Water District

East-West Cross Section 4-4' presented in LSCE (1999) was updated to reflect subsequent exploratory drilling performed by Diablo Water District under the Well Utilization Project and for wells installed as part of new subdivision construction in the eastern portions of Oakley.

Figure 3-2 shows the updated east-west cross section representing the District's SOI that encompasses the deeper oil and gas well logs. On this scale, the lack of aquifer materials below 400 to 500 feet is evident despite less well control than for shallower depth intervals. This cross section also reflects the two alluvium subareas that occur in the District's SOI, the Marginal Delta Dune, and the Fluvial Plain.

Figure 3-3 shows a detail of the alluvium interval from O'Hara Avenue to the eastern boundary of the Veale Tract. The District's initial groundwater development under the Well Utilization Project is represented by the Glen Park well log situated just east of Highway 4. At this location, aquifer materials with favorable water quality for municipal use were found to a depth of approximately 300 feet. Brentwood's Well 14 is projected north onto the cross section showing some correlation of sand units with Glen Park. While the Brentwood well is placed within the Alluvial Plain subarea, the alluvium model suggests some interfingering between subareas. Further, hydraulic response has been documented as measured during pumping of Brentwood's Well 14 and the Glen Park Well.

3.1.5 Groundwater Levels

Due to a lack of significant historic pumping and water level data within the District, there is limited ability to assess groundwater storage through examination of water levels. However, the District has recognized that groundwater level monitoring is a key requirement for ensuring that pumping under the Well Utilization Project and other uses does not induce adverse impacts either by degrading groundwater quality, by causing mutual interference, or adversely affecting sustainable yield in the area and region. Further, the District's explicit strategy for groundwater use under the Well Utilization Project is to develop new source capacity (wells) to the extent that no adverse impacts arise.

The Diablo Water District's strategy for groundwater development is reflected in the mitigated negative declaration approved by the District's Board for the first phase of the District's Well Utilization Project and the Glen Park Well facility (Diablo Water District, 2004). New wells are to be spaced and designed to avoid adverse mutual interference with existing wells and in accordance with standards for source protection as promulgated by the state Department of Health Services under the Drinking Water Source Assessment Protection Program. Potential influences on shallower wells are to be closely evaluated through a monitoring program involving existing wells of private owners. This Plan sets forth continued monitoring of the shallow and deep aquifer units present in the areas where the District is seeking to develop groundwater supply. **Figure 3-4** shows groundwater monitoring locations in the vicinity of the Glen Park Well and Appendix B includes a map of wells in both the shallow and deep monitoring well networks as well as select hydrographs. Results of groundwater level monitoring to date are discussed below.

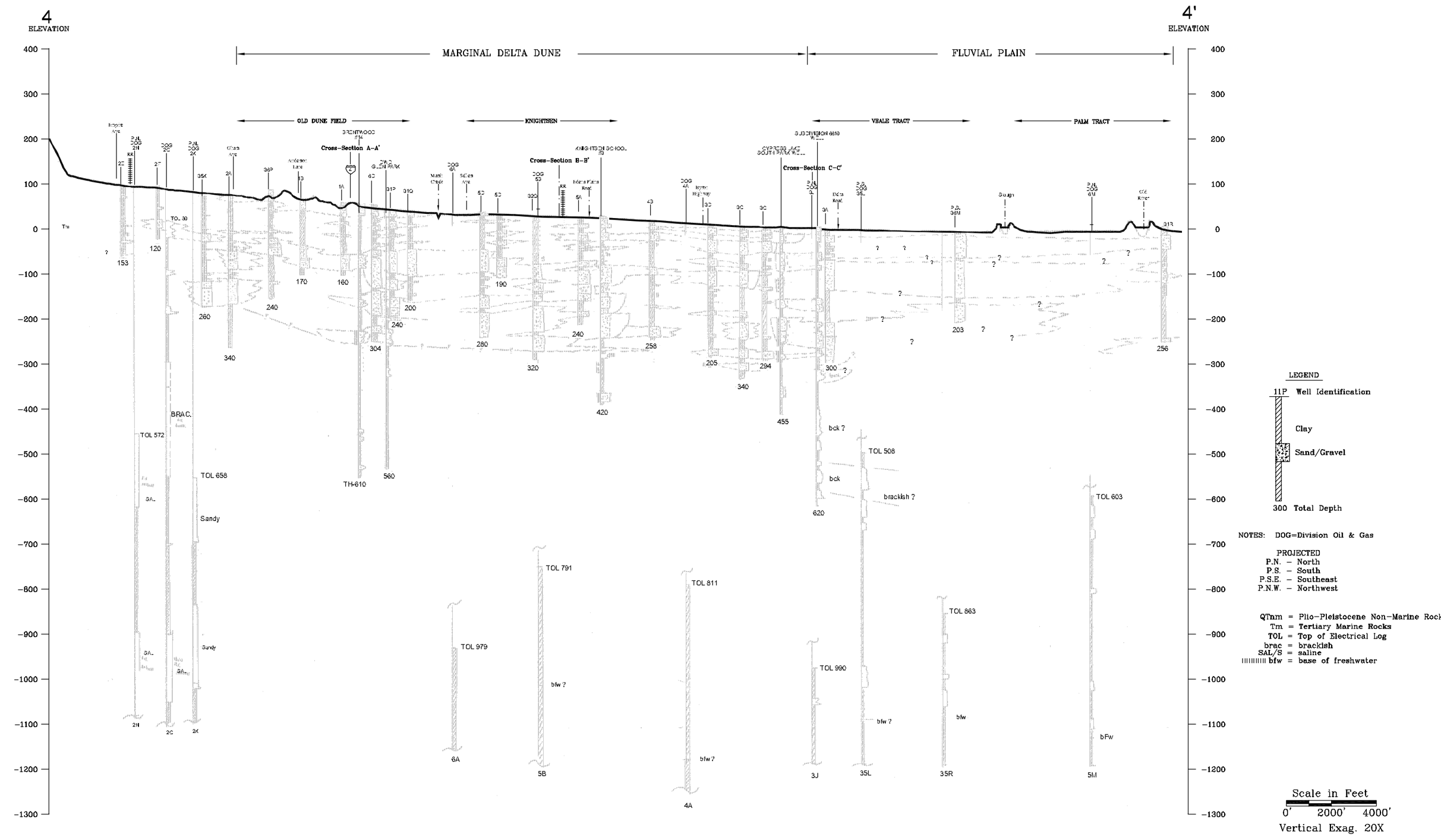

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Figure 3-2
Updated Geologic Cross Section 4-4'
Diablo Water District

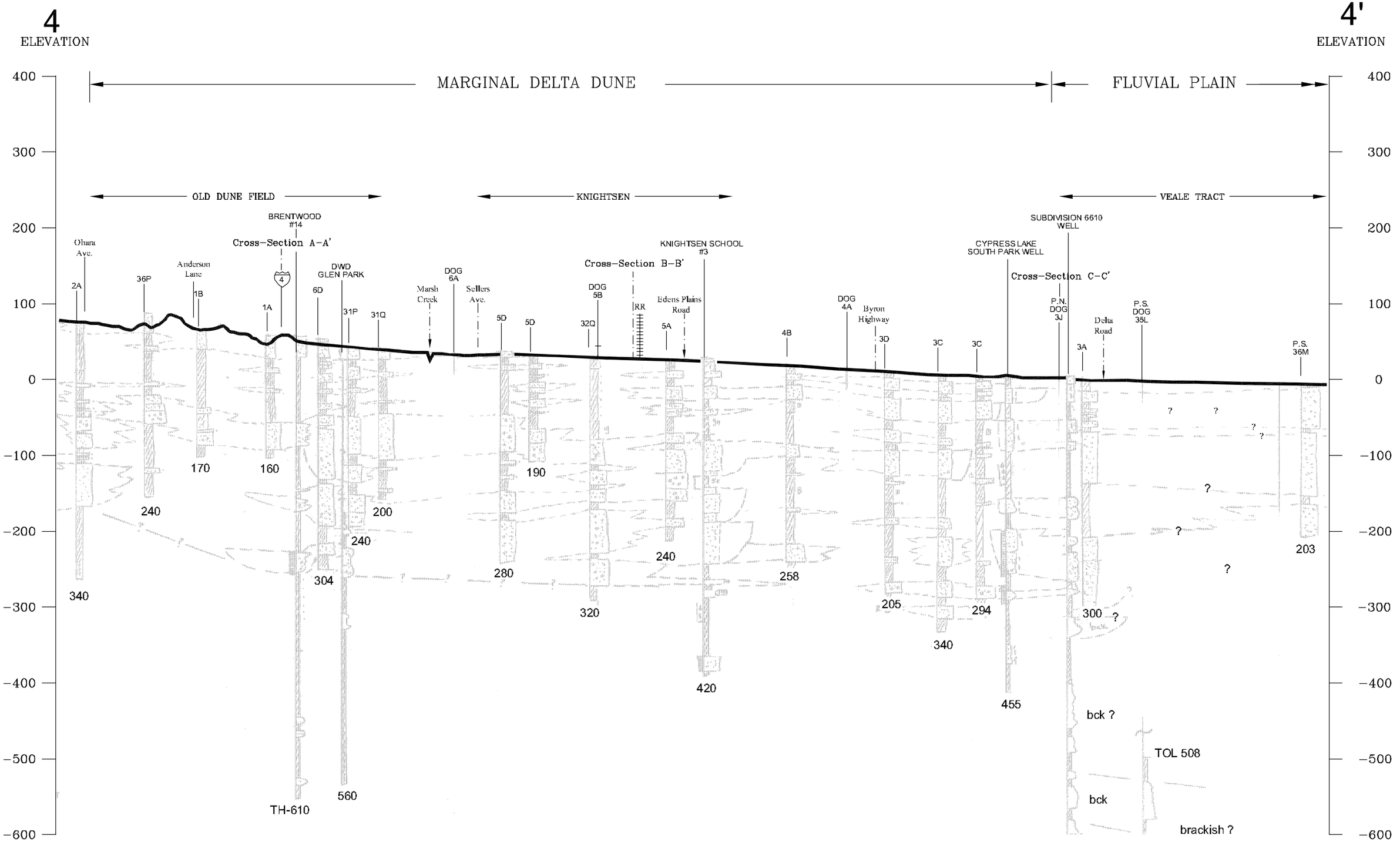

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Figure 3-3
Detail of Geologic Cross Section 4-4'
Diablo Water District

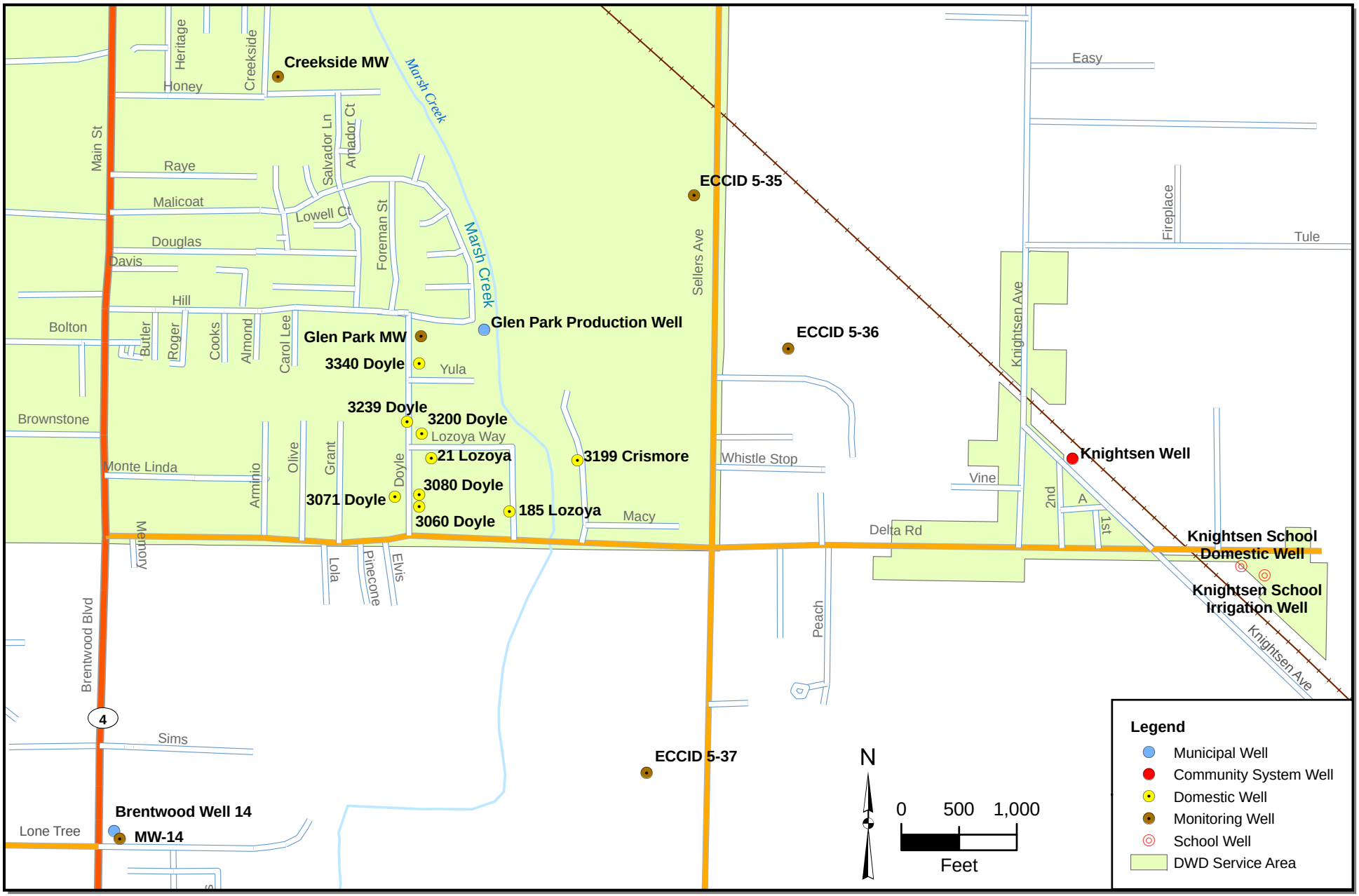

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Figure 3-4
Groundwater Monitoring Locations in Vicinity of Glen Park Well

Shallow Groundwater Levels

In portions of the Diablo Water District, domestic water supply is provided by individual house wells or small community wells, which are regulated by the Contra Costa County Environmental Health Division. A survey conducted of all wells within a one-half mile radius of the new Glen Park Well site indicated that the majority of these wells are shallow, typically less than 100 feet. By comparison, the Glen Park Well and other wells contemplated under the Well Utilization Project will be screened at depths of 200 feet or greater in order to mitigate potential pumping impacts on the shallow wells that exist in the area.

Locally, wells less than 200 feet, and often less than 100 feet deep, are considered to be completed in the "shallow" aquifer system. Water levels in numerous shallow domestic wells were incorporated into the District's monitoring program to develop baseline information three years prior to installation of the Glen Park Well. Many of these wells will be monitored on an ongoing basis, but at possibly less than the frequency performed initially. In addition, the District obtained historic water level data from shallow piezometers monitored by the East Contra Costa Irrigation District (ECCID). Three ECCID piezometers are situated in an area that provides a basis for assessing whether the District's pumping is affecting shallow groundwater levels. The ECCID data date to the 1950s and provide a basis for distinguishing seasonal and longer-term climatic influences.

The water level data from the District's shallow well network (**Appendix B**) indicate that no influence on shallow groundwater levels has occurred since the District commissioned the Glen Park Well. To ensure that impacts by District pumping do not influence shallow groundwater levels in the future, the District will maintain a shallow groundwater level monitoring network. For new well projects, the District's monitoring network will expand to encompass any shallow wells found in the vicinity of a proposed well site. The network will be modified periodically to monitor key indicator wells once it is determined that influences are not propagating to shallow groundwater. As part of its ongoing assessment of pumping influences, the District will continue to request and evaluate data from ECCID from the three key shallow piezometers cited previously.

Appendix B shows a map of the shallow well network surrounding Glen Park and hydrographs of groundwater levels. The hydrographs will be updated, as recommended in this Plan, for inclusion in annual reports on groundwater conditions in the District.

Deep Groundwater Levels

Based on the hydrogeology of the area, deep groundwater levels within the District are reflected in wells that are 200 feet or more in depth. As is the case with the Glen Park Well, the District will generally seek to employ deep annular seals that constrain pumping to primarily within the "deep" aquifer. Though there is little information on historic conditions in the deeper zones, the District is actively monitoring several wells it has identified as key wells in the area, including the Glen Park Well, the Knightsen community well, and wells in new subdivisions (South Park and 6610). Additionally, even though it is mapped in a separate hydrogeologic subarea, the District will incorporate data from the City of Brentwood's Wells 6, 7, 8 and 14 because some hydraulic connection has been documented with the Glen Park Well. The District will seek to maintain stable water levels in the deep aquifer system and avoid adverse mutual pumping interference with the City of Brentwood's water supply wells. **Appendix B** shows the location of deep wells proposed for groundwater monitoring and historical water level data.

Ultimately, the District recognizes that it is important that groundwater pumpage not exceed a sustainable yield for the system and to avoid water level declines that could lead to overdraft conditions, cause water quality degradation, or cause significant inelastic land subsidence. Through this Plan, these objectives can be met in the short term through ongoing evaluation of groundwater level and pumpage data collected as part of the recommended monitoring program. In the long term, estimates of sustainable yield within the District and on a larger (e.g., the Tracy Subbasin, DWR) scale can be used as a benchmark for overdraft avoidance, with groundwater levels representing the key monitoring parameter.

3.1.6 Groundwater Quality

Groundwater quality has constrained groundwater development for municipal supply in some parts of east Contra Costa County. Use of the District's production well at its Main Street corporation yard is limited by high TDS (approximately 1,000 mg/L). In the eastern portion of Oakley along the Cypress Road corridor, manganese is prevalent in groundwater and restricts groundwater use to small-scale domestic use, irrigation, or back-up municipal supply. As a result, groundwater quality has generally been classified as marginal to poor in the Diablo Water District SOI (CH2M Hill, 1996).

Under the District's Well Utilization Project, groundwater exploration activities have revealed that acceptable groundwater can be developed, particularly as a supplemental source to the surface water supply. Under this project, groundwater is blended with surface water for which the primary limitation is a hardness standard (140 mg/L) set by the District on blended surface water and groundwater to ensure that its customers experience no degradation in water quality from the standpoint of taste and domestic uses.

The District's exploration activities have focused on open areas such as parks and schools where public land may be available for siting a municipal well station. The first successful facility under the Well Utilization Project is the Glen Park Well completed in 2006. The District commenced a feasibility study for a second well in the early part of 2007. The groundwater quality at the Glen Park Well site was found to meet all primary and secondary Maximum Contaminant Levels (MCLs) for drinking water as regulated by the state Department of Health Services (DHS). A second site is anticipated to be located in the general vicinity of the Glen Park site as water quality data and experience suggests that this area is likely to be the most favorable with respect to meeting DHS drinking water standards and having acceptable hardness to satisfy the District's blending strategy.

Adjacent to the District, the City of Brentwood has been the most significant groundwater pumper historically and at present. While there are no historical data within the District's SOI indicating a degradation of groundwater quality, the City of Brentwood has experienced significant degradation of groundwater quality due to nitrate contamination. This degradation was primarily associated with shallow municipal wells. Over time, these wells have been replaced by deeper wells, which has mitigated the problem (personal communication, Paul Eldredge, May 8, 2007). The historical problems in Brentwood are taken as evidence that sound groundwater design and management is needed in the local hydrogeologic setting. Accordingly, the District seeks to target aquifers that are deeper than the shallow impacted zones seen in Brentwood; future wells will be designed with deep seals extending to confining zones to ensure source water protection. Also, by developing the project in increments, one well at a time, potential pumping influences can be evaluated and design criteria can be further assessed before committing to the next increment of project capacity.

Recognizing that the City of Brentwood has experienced problems with shallow water quality and that portions of the District have groundwater quality that does not meet DHS drinking water standards, the District's new well projects incorporate three important strategies:

1. Sites must have a degree of confinement that permits isolation from shallow aquifers with deep well seals. This requires exploratory drilling and evaluation at candidate sites and knowledge of local geology (i.e., as outlined in the previous section).

2. The target aquifers must contain groundwater quality that meets DHS primary and secondary MCLs and have a hardness level that permits achieving the District's blending goals.

3. Well spacing must permit operating at municipal pumping levels (e.g., on the order of 1 mgd for the District) without adverse pumping interference with existing wells and without adverse impacts on shallow wells.

Based on historical data, key groundwater quality constituents of concern in the District are summarized below. **Appendix C** presents water quality data obtained and compiled to date for production wells and dedicated monitoring wells within the District's SOI.

Total Hardness

As reflected in **Appendix C**, hardness of groundwater in the District ranges from as low as 100 mg/L at the small community well at Willow Park Marina to as high as 390 mg/L at the Creekside Monitoring Well, which was a previous candidate site for the Well Utilization Project. The Glen Park Well water has a hardness of 240 mg/L, which is suitable for blending to achieve a blended quality of 140 mg/L hardness. While there is no secondary MCL for hardness, water is generally considered very hard water at greater than 150 mg/L (Freeze & Cherry, 1979). At these levels, customers may notice change in water quality (e.g., taste and ability to form soap suds). However, the District will mitigate potential issues with respect to customer satisfaction through its blending strategy.

Manganese

Manganese has been found to exceed the secondary MCL in eastern areas of the District. For small community wells in that area, such as the Willow Park Marina Wells, plus the District's emergency back-up well at the Summer Lake subdivision (Shea Homes), manganese ranges up to 2 to 3 times the MCL of 0.050 mg/L. In contrast, the area surrounding Glen Park has proven to be acceptable with respect to this constituent. The Glen Park Well has less than half the MCL with manganese at approximately 0.020 mg/L concentration. In the short- to long-term, the District plans to avoid sites where manganese exceeds the MCL and will monitor this constituent to ensure the District's pumping does not induce migration or comingling of poor and good quality groundwater.

Nitrate

Nitrate concentrations in groundwater targeted by the District for municipal use are very low (e.g., 2.0 mg/L at Glen Park). This is likely due to the fact that the District has sought to develop deeper zones with distinct confining layers as well as because its service area is served by surface water and has experienced relatively little pumping other than for small water systems and irrigation. However, recognizing the historic effects of land use on shallow aquifers in Brentwood, the District will seek to monitor shallow zones for any

indication of pumping influences that might foretell of possible problems with nitrate contamination.

Arsenic

Arsenic appears to be of minor concern in the areas developed to date by the District for municipal supply. The Glen Park Well and the Summer Lake emergency well are below the MCL of 0.010 mg/L. The small community system served by the Willow Park Marina Wells, however, has arsenic at 0.013 mg/L. The District will seek to develop new municipal wells at sites for which arsenic is below the MCL.

Regulated Organics

Areas currently under consideration for new groundwater supply in the area do not currently have active contamination sites where regulated organic compounds are present. Through site screening and performing preliminary Drinking Water Source Assessment Protection (DWSAP) surveys, the District will seek to avoid groundwater development in areas that have the potential to mobilize organic contaminants in groundwater.

The District will expand its database through regular monitoring of its municipal wells and through proposed supplemental monitoring of other key wells under this Plan.

3.2 LAND SUBSIDENCE

Land subsidence in the context of this Plan is the lowering of the ground surface through compaction of compressible, fine-grained strata caused by pumping from unconsolidated, interbedded aquifer-aquitard systems. Compaction can be fully reversible (elastic) or permanent (inelastic). Elastic compaction and expansion generally occur in response to seasonal groundwater level fluctuations. Inelastic compaction is most likely to occur when groundwater levels reach new historical lows during the summer or do not recover fully during the winter. Subsidence avoidance is generally accomplished through management of groundwater pumping so that water levels do not decline on a long-term or permanent basis below either historic levels, or those levels that would cause dewatering of aquitards.

In east Contra Costa County and elsewhere in the Sacramento-San Joaquin Delta, there has been significant land subsidence (more than 20 feet in some areas) that was not related to extraction of groundwater or other fluids. Construction of levees around the Delta islands and the dewatering of soils for agricultural production increased the exposure of organic (peat) soils to oxygen, which caused subsidence due to microbial oxidation of the peat soils (Blodgett et al., 1990). Another factor is that the natural delivery of sediments from the upper watershed to the Delta has been interrupted by the construction of upstream dams and island levees, so there is less

sediment available to counteract the effect of peat soil dewatering. The rate of subsidence in the Delta has been 0.4 to 0.6 inches per year, and ground surface elevations in the central Delta islands are currently 10 to 25 feet below sea level (DWR, 2006).

Historically, land subsidence was monitored along transects using periodic spirit level surveys conducted by the USGS and the National Geodetic Survey (NGS). In the mid-1980s, a transition was made from spirit level surveys to global positioning system (GPS) surveys. Like spirit level transects, GPS monitoring of subsidence relies on periodic resurveying of a network of monuments. The accuracy of GPS surveys has gradually improved and is currently on the order of plus or minus 1 centimeter.

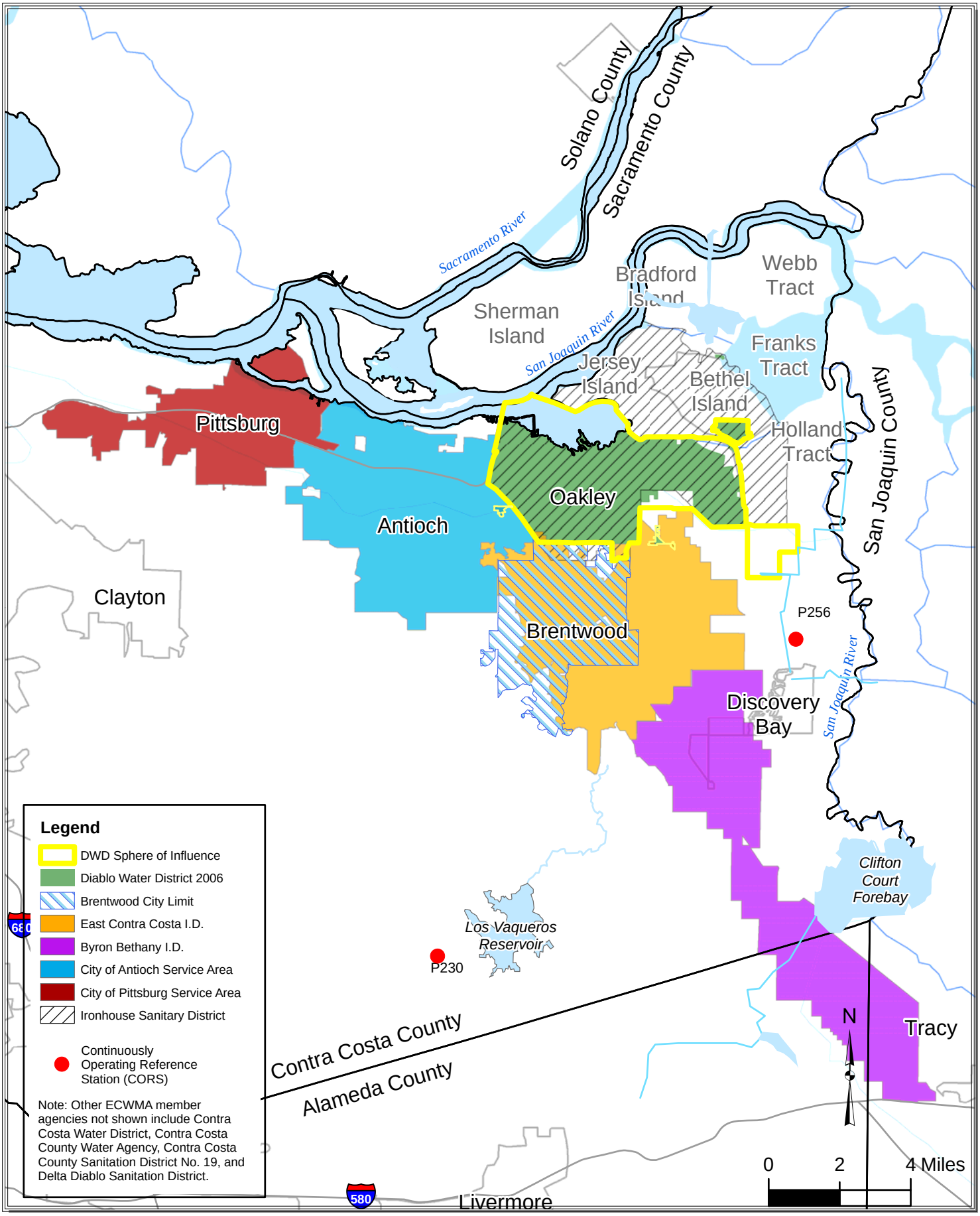
A non-instrumented GPS monitoring network was installed in the Delta in the mid-1990s, and surveys were conducted in 1997 and 2002. The Delta network currently consists of about 120 stations. The 2002 resurvey of the Delta network showed no subsidence because the GPS monuments have deep foundations (typically 25 feet). This means that subsidence due to compaction of peat soils would not be observed in the data.

Instrumented GPS monitoring stations are generally referred to as Continuously Operating Reference Station (CORS). Each CORS site includes a high-resolution GPS receiver and antenna with a solar collector and battery for power supply. The GPS receivers are attached to steel or concrete structures that are anchored deep into the soil. GPS positions are recorded at intervals of five to 30 seconds, and a daily average is calculated from all of the data to achieve maximum accuracy. CORS sites use some form of telemetry (typically a radio transceiver) to upload the data. After processing, the data are accessible on Internet sites operated by entities such as the NGS or the California Spatial Reference Center (CSRC).

At present, there are two CORS sites in east Contra Costa County. The closest site to the District, labeled P256, is located south of the Veale Tract and east of Brentwood (**Figure 3-5**) and is operated by the Plate Boundary Observatory. Historical data are limited for this station, which did not begin operation until March 2005. Data collected since that time show small seasonal fluctuations (elastic subsidence) but no significant inelastic subsidence. Data from this site will be useful to show subsidence resulting from any expanded groundwater pumping in the future.

3.3 AREAS OF CONCERN

Although groundwater conditions in the Diablo Water District are considered generally good, there are several areas of concern that may require changes in future groundwater management. These include:



FILE: \Public\Diablo WD 04-1-058\GIS\Figure 3-5.mxd

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Figure 3-5
Land Subsidence Monitoring Locations

- Sustainable pumpage from planned municipal wells.
- Preservation of groundwater quality.
- Prevention of significant future land subsidence.

3.3.1 Sustainable Pumpage

Due to a lack of significant historic pumping and data, the LSCE 1999 report on hydrogeology did not quantify sustainable pumpage within the District's SOI or that portion of the greater east County area overlying the Tracy Subbasin. The District's stated strategy for groundwater use is to develop new source capacity (wells) to the extent that no adverse impacts arise. New wells are to be spaced and designed to avoid adverse levels of mutual interference with existing wells and in accordance with standards for source protection as promulgated by DHS under the Drinking Water Source Assessment Protection (DWSAP) Program. This Plan will include a component to assess sustainable pumpage and to monitor and report on groundwater levels.

3.3.2 Preservation of Water Quality

It is recognized that groundwater quality varies throughout the District's SOI and that there may be contamination concerns as a result of municipal, industrial, or agricultural activities. The contamination concerns are addressed largely through meeting the DWSAP program requirements, while the issue of other naturally occurring constituents is a matter addressed through project design and monitoring of pumping influences. Some key native constituents of concern to the District that affect sustainability include hardness and manganese as they affect the ability of the District to achieve its blending objectives. Since there are no hydraulic barriers between areas of "poor" versus "good" groundwater quality, there is a risk that increased groundwater pumping will induce migration and comingling that results in water quality degradation. Due to this potential, the District designed the 315 foot deep Glen Park well with a 200 foot annular seal. The District will design future wells in a manner that avoids adverse and widespread pumping influences (through use of deep annular seals and proper well spacing, for example) and monitor key wells for indications of potential adverse conditions. Based on the hydrogeologic setting, it is anticipated that future wells will be greater than 200 feet in depth. This approach is embodied in this Plan.

3.3.3 Land Subsidence

As indicated in the previous section, land subsidence monitoring data are limited in the east Contra Costa County area. However, there are no data to indicate that subsidence has occurred to a significant degree due to groundwater extraction. In addition, the conditions that would lead to subsidence (i.e., permanent dewatering or decline in groundwater levels) are not evident within the District's SOI, or surrounding areas. With regard to future pumping envisioned under the District's Well Utilization Project, for example, ongoing groundwater level monitoring and

conjunctive use of surface water and groundwater resources provide a basis for impact avoidance. This strategy is embodied in the Plan components listed in Chapter 4.

4.0 GROUNDWATER MANAGEMENT PLAN OBJECTIVES AND COMPONENTS

4.1 GROUNDWATER MANAGEMENT PLAN OBJECTIVES

The overall purpose of this Plan is to maintain a high quality, reliable, and sustainable water supply for the customers in the Diablo Water District service area. To accomplish this, the District will support regional and local basin management objectives (BMOs) directed toward the sustainability of groundwater supplies. Groundwater management involves ongoing coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects on other resources. The Plan sets forth a framework and related actions to accomplish the regional and local BMOs.

4.1.1 Regional Basin Management Objectives

The regional BMOs addressed by this Plan can be expressed as follows:

1. **Assessment of Groundwater Basin Conditions.** Programs to monitor and report on groundwater levels, groundwater quality, and pumpage have been conducted by local agencies with an objective to expand the programs into a more cohesive program for the Tracy Subbasin. Land subsidence and surface flow and quality are considered of secondary concern to be developed in the future, as needed. Plans to expand the existing programs are in progress. These monitoring programs are necessary to ensure that undesirable effects such as long-term groundwater level declines, groundwater quality degradation, and significant inelastic land subsidence are avoided. Regional coordination of groundwater monitoring is important, and monitoring programs should be reevaluated periodically to determine whether the location, depth, and frequency are adequate. Data collected by the monitoring programs need to be evaluated on a regular basis to ensure that other BMOs are met. Currently, comprehensive regional evaluation is not conducted on a regular basis. However, results from individual monitoring programs are made available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.

2. **Avoidance of Overdraft.** It is important that groundwater pumpage in the Tracy Subbasin not exceed the sustainable yield of the subbasin in order to avoid chronic water level declines that could lead to overdraft conditions or cause significant inelastic land subsidence. This objective can be met in the short term through ongoing evaluation of groundwater level and pumpage data collected in the recommended monitoring program. In the long term, estimates of sustainable yield of the region will be targeted as a benchmark for overdraft avoidance.

3. **Preservation of Groundwater Quality.** This objective involves actions needed to sustain a supply of good quality groundwater for beneficial uses in the basin. It includes coordinated efforts that will be required to conduct a regional monitoring program that identifies short and longer-term water quality trends. Currently, comprehensive regional evaluation is not conducted on a regular basis. However, results from individual monitoring programs are made available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs. It also includes wellhead and recharge area protection and actions to avoid salt accumulation and/or mobility of naturally occurring constituents. Also included in this BMO will be the active characterization and solution of any groundwater contamination problems through cooperation with responsible parties or through independent action if timely response by responsible parties is not forthcoming and the preceding management objectives are thereby impacted or constrained.

4. **Preservation of Interrelated Surface Water and Groundwater Resources.** Several entities in the Tracy Subbasin, including Diablo Water District, use both surface water and groundwater. There are opportunities to expand these programs in the future and to increase the use of recycled water to meet existing and projected demands. Included in this management objective is the non-degradation of surface water flows or quality as a result of groundwater management practices. In addition to being classified as a separate BMO, conjunctive use is one of the primary means of accomplishing BMOs 2 and 3 above.

4.1.2 Local Basin Management Objectives

The local BMOs addressed by this Plan are listed below:

1. **Understanding Local Groundwater Conditions.** Programs to monitor and report on groundwater levels, groundwater quality, and pumpage have been implemented to assess groundwater conditions in the Diablo Water District service area. Plans to expand the existing programs are in progress. These monitoring programs are necessary to ensure that undesirable effects such as long-term groundwater level declines, groundwater quality degradation, and significant inelastic land subsidence are avoided. Regional coordination of groundwater monitoring is important, and monitoring programs should be reevaluated periodically to determine whether the location, depth, and frequency are adequate. Data collected by the monitoring programs need to be evaluated on a regular basis to ensure that other BMOs are met.

2. **Preservation of Groundwater Quality.** This objective involves actions needed to sustain a supply of good quality groundwater in the Diablo Water District service area. It

includes wellhead and recharge area protection and actions to avoid salt accumulation and/or mobility of naturally occurring constituents. Also included in this BMO will be the active characterization and solution of any groundwater contamination problems through cooperation with responsible parties or through independent action if timely response by responsible parties is not forthcoming and the preceding management objectives are thereby impacted or constrained.

3. **Avoid Impacts to Shallow Groundwater.** This objective involves actions needed to avoid deleterious impacts to shallow wells that exist throughout the District's SOI. These wells may serve individual households or small community systems. To achieve this BMO, the District shall include in development plans for new wells testing programs that demonstrate less-than-significant impacts from groundwater extraction by District wells. A monitoring program that includes shallow wells should be implemented to demonstrate continued compliance with this objective.

4. **Local Groundwater Monitoring and Coordination with Regional Monitoring Program.** Diablo Water District has conducted intermittent monitoring of groundwater levels and quality within its service area. Establishment of an ongoing program to routinely monitor local groundwater conditions is important to accomplishment of the other BMOs discussed above. Coordination of the Diablo Water District groundwater monitoring program with other regional monitoring programs will eliminate duplication and ensure that adequate monitoring is being conducted and enhance its own understanding of conditions in its area. Examples of the District's coordination of regional data sources include:

    - Use of water level data from the East Contra Costa Irrigation District to assess shallow groundwater conditions.
    - Use of data from the City of Brentwood's Wells 6, 7, 8, and 14 to assess conditions in the deep aquifer system.
    - Use of historic water quality data from City of Brentwood's municipal wells to assess historic and current groundwater conditions.

4.2 PLAN CATEGORIES AND COMPONENTS

To accomplish the BMOs discussed above, this Plan incorporates a number of components that are divided into five categories: 1) monitoring program, 2) water resource sustainability, 3) groundwater resource protection, 4) agency coordination and public outreach, and 5) plan implementation and updates. Each of the Plan components within each category are listed below and described in the following sections.

The Plan components reflect the focus on local groundwater management in the Tracy Subbasin by Diablo Water District and continuing cooperation with the members of the ECWMA and other stakeholders in the Subbasin. In summary, this Plan guides the District in the management of its own groundwater resources, and provides the foundation for the District and other entities in the basin to cooperatively manage and potentially expand the use of groundwater on a regional basis for municipal and emergency water supply purposes.

Category 1: Monitoring Program

1A. Elements of Monitoring Program
1B. Evaluation and Reporting of Monitoring Data

Category 2: Water Resource Sustainability

2A. Maintaining Stable Groundwater Levels
2B. Water Conservation
2C. Implementation of Conjunctive Water Management
2D. Integration of Recycled Water

Category 3: Groundwater Resource Protection

3A. Well Construction and Destruction Policies
3B. Management and Mitigation of Contaminated Groundwater
3C. Long-Term Salinity Management
3D. Identification and Management of Recharge Areas and Wellhead Protection Areas

Category 4: Agency Coordination and Public Outreach

4A. Continuation of Local, State, and Federal Agency Relationships
4B. Public Outreach
4C. Water Awareness Education

Category 5: Plan Implementation and Updates

5A. Plan Implementation and Reporting
5B. Provisions to Update the Groundwater Management Plan

The Plan components are summarized below. Following the summary of each component is a list of actions that the District will implement under the Plan. Implementation of these actions will ensure progress toward accomplishment of the regional and local BMOs discussed above. All of the action items are summarized in **Table 4-1**.

COMPONENT CATEGORY 1: MONITORING PROGRAM

The District has conducted monitoring of groundwater levels and quality in accordance with the requirements of Contra Costa County Environmental Health Division (small community wells) and the state DHS (Glen Park Well). In addition, the District has installed monitoring wells at various locations to assess groundwater conditions and has collected water level and quality data at those locations. A formal groundwater monitoring program has been developed for inclusion in this Plan and is provided in **Appendix D**. As summarized below, the District's local monitoring program includes three elements: 1) groundwater levels, 2) groundwater quality, and 3) groundwater pumpage. A fourth element, monitoring of land subsidence, is part of the regional monitoring program and will not be conducted directly by the District. Another element, monitoring of surface water flows and quality in the Delta, is conducted by various agencies, including DWR. Diablo Water District's pumping does not affect surface flows or quality and, accordingly, the District does not anticipate the need to directly or independently monitor surface water other than the quality of surface water delivered by CCWD to the District.

As discussed below, the District plans to coordinate its groundwater monitoring program with ECWMA and other stakeholders in the Subbasin to ensure completeness and avoid redundancies.

Component 1A: Elements of Monitoring Program

The District's current groundwater monitoring program is summarized in **Appendix D** (note: monitoring locations are shown in **Appendix B**). Well construction data for wells monitored under this Plan are contained in **Appendix E**.

Groundwater Levels

The primary focus of the District's current groundwater monitoring program is on monitoring groundwater levels in the vicinity of the Glen Park Well. As reflected in **Appendix D**, manual water level measurements are made monthly in 12 wells, including three District wells and nine private domestic wells. The District wells include monitoring wells at the Glen Park and Creekside sites, and the Glen Park and Knightsen production wells.

In addition to the wells monitored by the District for groundwater levels, the District also has integrated groundwater level data collected by other entities in the region. The wells in the groundwater level monitoring network are shown in **Appendix B**. These include shallow wells monitored by ECCID since the 1950s. Although most of the ECCID wells are located south of the District's boundaries, three ECCID wells are located favorably with respect to ongoing shallow groundwater monitoring objectives of the District. The

City of Brentwood's Wells 6, 7, 8 and 14 are of interest for deep aquifer monitoring and have been incorporated into the planned program.

Groundwater Quality

Groundwater quality sampling of production wells for general minerals, inorganic chemicals, and organic parameters is conducted every three years as required for all public water supply systems. The District also collects samples annually for nitrate analysis. Samples were collected quarterly for radionuclide analysis from May 2005 to January 2006, and the District has received a 9-year waiver from DHS for future radionuclide sampling because the gross alpha results were below the threshold of 3 pCi/L. The District's groundwater quality monitoring program is summarized in **Appendix D**.

Groundwater Pumpage

The District monitors pumpage from the Glen Park Well via a SCADA system. As new municipal wells are brought on-line, pumpage will continue to be a monitored parameter and reported at least annually as part of a groundwater report specified under this Plan.

Land Subsidence

As discussed in Section 3.2, significant land subsidence occurred historically in the Sacramento-San Joaquin Delta, including in east Contra Costa County. Most of this subsidence is the result of the reclamation of Delta islands by the construction of levees and the dewatering of soils for agricultural production. The exposed organic (peat) soils to oxygen, and the resulting microbial oxidation of the peat soils is the predominant cause of land subsidence in the Delta.

The District does not monitor land subsidence within its boundaries, but land subsidence in Contra Costa County is monitored by various agencies. Regional land subsidence monitoring has included non-instrumented GPS monuments and continuous GPS monitoring stations; there are no extensometers in Contra Costa County.

The Sacramento-San Joaquin Delta non-instrumented GPS network consists of about 120 monuments, including two monuments in eastern Contra Costa County. This network was initially surveyed in 1997 and resurveyed in 2002, but funding has not been available to process the data from the 2002 resurvey. GPS monitoring locations in eastern Contra Costa County are shown on **Figure 3-5**.

Surface Water Flows and Quality

Surface water flows and quality in the Delta are monitored by various agencies including DWR. The District has no plans to conduct additional monitoring at this time.

As required by DHS, the District monitors the quality of surface water delivered by CCWD on a quarterly basis. Both raw and treated surface water are sampled at the Randall-Bold WTP and analyzed for nitrate on a quarterly basis (except for the first quarter) and for general mineral, general physical, inorganic, and organic constituents annually.

Actions

- Implement the groundwater monitoring program detailed in **Appendix D**.
- Make available groundwater monitoring data to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.

Component 1B: Evaluation and Reporting of Monitoring Data

Groundwater level, quality, and production data collected as part of the District's monitoring program should be periodically entered into a database so that the data can be summarized on tables and plots in an efficient manner. The data should be routinely reviewed to check for any significant changes in groundwater conditions. An annual summary report that includes presentation and discussion of these monitoring data is recommended in this Plan.

Actions

- Maintain clear records from all monitoring activities.
- Prepare an annual monitoring report describing conditions as reflected by trends of monitored parameters.
- Make the annual report available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.

COMPONENT CATEGORY 2: WATER RESOURCE SUSTAINABILITY

Component 2A: Maintaining Stable Groundwater Levels

Accomplishment of the second BMO (avoidance of overdraft) requires that progressive groundwater level declines be avoided. Groundwater levels in the District area have historically been stable because the majority of the water demand is met by surface water. Although groundwater extraction will increase in the future, projected pumping increases are not expected to cause significant groundwater level declines. Seasonal water level fluctuations occur and will likely increase in magnitude as pumping increases, but full water level recovery is expected during the winter months except during dry years.

Year-to-year water level fluctuations are likely to occur because of future conjunctive water management. As discussed below, conjunctive use operations may involve pumping more groundwater from storage during dry years, and reducing pumping so that the storage is replenished during subsequent normal and wet years. This means that groundwater levels could decline during dry years but would recover during normal and wet years. Such fluctuations are normal and are not considered to be inconsistent with the goal of maintaining stable groundwater levels.

The District will continue to monitor groundwater levels and consult with other well operators to monitor effects on other wells in the region. In the event local wells were to be adversely affected (i.e., lowering of groundwater below existing pumps), decisions about mitigation actions would be made on a case-by-case basis. Mitigation measures may include, but would not be limited to, supplying the property with a different source of water, lowering or replacing pumps, or installing new wells.

Actions

- Continue monitoring of groundwater levels discussed under Component 1A to ensure that progressive groundwater level declines do not occur.
- District will employ mitigation measures as applicable to maintain stable groundwater levels.

Component 2B: Water Conservation

Water conservation and related public education measures have generally been developed in California to achieve the following goals:

- meet legal mandates,
- reduce average annual potable water demands,
- reduce sewer flows,
- reduce water demands during peak seasons, and
- meet drought restrictions.

Diablo Water District adopted Regulation No. 8, "Water Conservation" in 1986 and amended it in 1994. The purpose of the regulation is "to assure that all water furnished by the District is put to reasonable beneficial use, to prevent unreasonable use or waste of water and to promote efficient use and conservation of water"

The District's wholesale supplier of surface water, CCWD, is a signatory to the Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California developed by the California Urban Water Conservation Council (CUWCC). The MOU was

adopted in 1991 and has been amended 11 times, most recently in 2005, and identifies 14 demand management measures (DMMs). As summarized in the table below, all but one of these have been implemented by the District with assistance from CCWD (CDM, 2005). DMM #10 (Wholesale Agency Program) is not applicable because the District is not a water wholesaler.

Implementation of Demand Management Measures

Demand Management Measures	Status
1. Residential Water Audits	Implemented
2. Residential Plumbing Fixture Retrofits	Implemented
3. Water Delivery System Audits, Leak Detection, and Repair	Implemented
4. Metering with Commodity Rates	Implemented
5. Large Landscape Conservation	Implemented
6. High Efficiency Washing Machine Rebated	Implemented
7. Public Information	Implemented
8. School Education	Implemented
9. Commercial, Industrial, and Institutional Water Conservation	Implemented
10. Wholesale Agency Program	Not Applicable
11. Conservation Pricing	Implemented

Implementation of Demand Management Measures (cont.)

Demand Management Measures	Status
12. Conservation Coordinator	Implemented
13. Water Waste Prohibition	Implemented
14. Ultra-Low Flush Toilets	Implemented

Communication tools used by CCWD and the District to encourage water conservation are outlined in the UWMP (CDM, 2005) under public information (DMM-7) and school education (DMM-8). These DMMs are discussed below under Component 4B (Public Outreach) and Component 4C (Water Awareness Education).

Actions

- Continue to implement and promote water conservation programs within the District's service area.

Component 2C: Implementation of Conjunctive Water Management

Water purveyors such as Diablo Water District that use both surface water and groundwater can operate those supplies conjunctively to obtain maximum benefit from both sources of supply. In its simplest form, conjunctive water management involves increasing groundwater pumping during dry years when there are cutbacks in surface water supplies and reduce groundwater pumping during normal and wet years when surface water supplies are sufficient to meet demands. Historically, the District's ability to implement conjunctive management strategies has been limited due to the lack of a groundwater source of supply. Conjunctive water management was also not a priority because surface water supplies have

been sufficient to meet demands. Implementation of conjunctive use strategies may become more important in future years as water demands increase.

Commissioning of the Glen Park Well in 2006 allowed the District to implement conjunctive water management, and the installation of additional wells in future years will increase conjunctive use options. If the District uses more groundwater, during a dry year for example, reducing pumping during normal and wet years will allow groundwater levels to recover and prevent progressive water level declines. This would ensure that the second BMO, avoidance of overdraft, continues to be met.

In many areas of California, conjunctive water management has been demonstrated to be an effective and flexible management approach that allows optimum use of surface water and groundwater during different water year types. Increased groundwater pumping during dry years causes temporary groundwater level declines, but conjunctive use operations help to ensure that groundwater levels recover during normal and wet years.

As part of the conjunctive management of surface water and groundwater to meet the District's requirements, it is recognized that there will be variations in the amount of available surface water supplies from year to year, particularly since the supply consists of CVP water imported from outside the region. Similarly, there are expected to be variations in groundwater conditions as a function of the local hydrogeology that affect, among other things, the natural recharge to the groundwater basin from year to year.

Actions

- The District will continue to develop groundwater source capacity and identify possible conjunctive management strategies to optimize resource protection. This will likely require regional coordination with CCWD and other ECWMA agencies.

Component 2D: Integration of Recycled Water

The wastewater treatment and collection systems in the Diablo Water District service area are owned and operated by the Ironhouse Sanitary District (ISD). The UWMP states that wastewater flows averaged 2.3 mgd in 2005 and are projected to increase to 8.6 mgd at build-out (CDM, 2005). All treated wastewater is currently recycled in the form of irrigation water for agricultural lands; there is no direct discharge of treated effluent to the San Joaquin River. The irrigated crops consist primarily of rye grass grown for non-human consumption. The crops are grown on 162 acres adjacent to the wastewater treatment plant in Oakley and 396 acres on Jersey Island. The Jersey Island acreage can expand in the future as wastewater flows increase.

The Diablo Water District currently requires that large new turf landscape areas be supplied by non-District water. Water supplies for these areas are typically groundwater pumped by non-District wells, but recycled water could also be used. The UWMP states:

> "In the future, if DWD identifies large potential users of recycled water within its service area, it will coordinate with ISD to determine if an economic feasibility study may be warranted. For example, such users may include large industries requiring cooling water or other non-potable uses, or large landscape areas that would otherwise irrigate with potable water." (CDM, 2005)

As wastewater treatment increases in future years, the District will seek opportunities to use recycled water in lieu of non-District groundwater. This would have the dual benefit of reducing groundwater demand and reducing the additional acreage that ISD would need for irrigation with recycled water.

Actions

- As applicable, coordinate opportunities to use recycled water with ISD.

COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION

Component 3A: Well Construction and Destruction Policies

The third BMO, preservation of groundwater quality, requires that all wells be properly constructed and maintained during their operational lives and properly destroyed after their useful lives, so that they do not adversely affect groundwater quality by, for example, serving as conduits for movement of contaminants from the ground surface and/or from an aquifer with poor groundwater quality to one with good quality. Toward that end, this component is included in the Plan to support well construction and destruction policies, and to participate in their implementation, particularly with regard to surface and inter-aquifer well sealing and proper well destruction, which are critical in the management of a multiple aquifer system.

Contra Costa County adopted well construction ordinances in 1981 and 1985, and these are included in **Appendix F**. These ordinances establish requirements for well construction permits, specify minimum setbacks from septic tanks and other potential hazards, and reference specific requirements of the California State Well Standards summarized in DWR Bulletin 74-81 (DWR, 1981). The State Well Standards were updated in Bulletin 74-90 (DWR, 1990). Both the State Well Standards and the County's ordinances require a minimum 50-foot annular seal for drinking water wells to guard against exposure to contamination such as coliform bacteria and specify procedures for installation of the annular seal.

The State Well Standards and the County ordinances also establish requirements for destruction of unused wells. These procedures are intended to ensure that abandoned wells cannot act as conduits for infiltration of surface drainage to shallow aquifers or movement of groundwater from shallow to deeper zones.

The Environmental Health Division of the Contra Costa County Health Services is responsible for well construction and destruction permits in Contra Costa County, and the permit guidelines and application form are included in **Appendix F**. The well permit application includes a list of construction information to be verified by the County's Inspector.

Permitting of municipal supply wells is also within the purview of DHS. Each DHS district has specified procedures for siting and permitting new well sources, though all require a source assessment and protection survey under the Drinking Water Source Assessment and Protection Program.

This program assesses potential hazards to drinking water quality and encompasses the following steps that will be performed for each candidate well:

- Identify the proposed well point using coordinates derived from global positioning system equipment.

- Delineate Groundwater Protection Zones using proposed or actual well construction features and the Modified Calculated Fixed Radius method. This step requires input of anticipated or actual well capacity, which will range from 0.25 to 1.0 mgd.

- Complete Physical Barrier Effectiveness checklist using available information on local geology and surface features.

- Complete Well Data Sheet.

- Complete Possible Contaminating Activities (PCA) Inventory Form using information from a neighborhood survey, a database search from Environmental Data Resources Inc. (EDR), a review of data available on the State Water Resources Control Board's (SWRCB) GeoTracker website, and review of Regional Water Quality Control Board (RWQCB) agency files.

- Rank PCAs by vulnerability score.

- Create a zone delineation map showing the well location and protection zones based on average well discharge volumes and groundwater flow directions.

The DWSAP report lists results from database searches within the calculated wellhead protection zones including the Environmental Data Resources, Inc. database, the SWRCB GeoTracker website, and RWQCB agency files. A neighborhood survey is conducted to verify existing conditions (e.g., land use) and identify activities that may cause the groundwater source to be considered vulnerable, but which may not be associated with an existing contamination site.

Actions

- Comply with the County's well construction and destruction policies and state permitting requirements as stipulated by the DHS district engineer.

Component 3B: Management and Mitigation of Contaminated Groundwater

Groundwater quality problems have limited groundwater development in some parts of east Contra Costa County. Groundwater quality is generally classified as marginal to poor in the Diablo Water District SOI (CH2M Hill, 1996). As summarized in Section 3.1, there are areas of naturally occurring groundwater quality problems within the District (e.g., manganese and arsenic).

The Contra Costa County Environmental Health Division has local oversight for groundwater protection through the Underground Storage Tank (UST) and Hazardous Materials programs. The UST regulations provide groundwater protection through annual integrity testing and stringent tank requirements.

The District will consult with other well operators to monitor effects on other wells in the region. In the event local wells were to be adversely affected (i.e., degradation of water quality), decisions about mitigation actions would be made on a case-by-case basis. Mitigation measures may include, but would not be limited to, supplying the property with a different source of water, lowering or replacing pumps, or installing new wells.

Actions

- Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.
- Employ BMPs to limit potential sources of contamination in the environment.
- Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.

- Identify locations of point sources of contamination.
- Identify major non-point sources of contamination.
- Mitigate potential impacts on groundwater quality resulting from point or non-point sources of contamination.
- Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.
- Coordinate with other ECWMA members and the County Environmental Health Services Division to assess the quality of groundwater used by private well owners in the Tracy Subbasin.
- Any groundwater contamination induced by District pumping will be mitigated.

Component 3C: Identification and Management of Recharge Areas and Wellhead Protection Areas

The 1986 Amendments to the federal Safe Drinking Water Act (SDWA) established requirements for new Wellhead Protection Programs (WPPs) to protect groundwater that supplies drinking water wells for public water systems. Each state was required to prepare a WPP and submit it to the USEPA by June 19, 1989. However, California did not develop an active statewide WPP at that time. Subsequently, in 1996, reauthorization of the SDWA established a related program called the Source Water Assessment Program. In 1999, the DHS Division of Drinking Water and Environmental Management developed the DWSAP Program, which was approved by USEPA. The overall objective of the DWSAP Program is to ensure that the quality of drinking water sources is protected. The wellhead protection aspect of this groundwater management plan component is now essentially required as a result of the 1996 SDWA reauthorization.

In California, the DWSAP Program satisfies the mandates of both the 1986 and 1996 SDWA amendments. The California DWSAP Program includes delineation of Groundwater Protection Zones surrounding an existing or proposed drinking water source where contaminants have the potential to migrate and reach that source. The program includes preparation of an inventory of Possible Contaminating Activities (PCAs) that may lead to the release of contaminants within these zones as described above under Component 3B. The activities, referred to in the DWSAP Program as Potentially Contaminating Activities, include such land uses as gas stations and dry cleaners, as well as many other land uses. Known contaminant plumes regulated by local, state, and federal agencies are also included. The Groundwater Protection Zones, which are determined based on local hydrogeological conditions and also well operation and construction parameters, represent the approximate area from which groundwater would be withdrawn during 2, 5, and 10-year time periods. These zones also represent the area in which contaminants released to groundwater could migrate and potentially affect the groundwater extracted by wells located within the designated zones. The DWSAP Program evaluation also includes a risk or vulnerability

ranking based on a combined numerical score that results from points assigned to various evaluations conducted as part of the DWSAP process. This ranking provides a relative indication of the potential susceptibility of drinking water sources to contamination.

DHS is responsible for conducting DWSAP assessments for systems existing prior to the adoption of the California program but has encouraged purveyors to perform their own assessments. Assessments for existing systems were due to be completed by May 2003. The results of the DWSAP assessments can be used as a planning tool to assess land use development in the vicinity of water sources. The DWSAP analyses prepared for water sources in the basin should, in some fashion, be reviewed at least every five years and updated as appropriate. The collective DWSAP information can also be integrated with other management activities, including siting of new wells, land use policies, and the County's Code concerning well construction.

This Plan component is included to incorporate the DWSAP Program as a tool to assist in accomplishing BMOs identified in this Plan.

Actions

- Identify and employ wellhead protection measures to ensure long-term sustainability of good quality water.
- Use DWSAP information, including delineation of source area and protection zones.
- Require deep sanitary seal construction standards for municipal supply wells.
- Adopt a well destruction policy for abandoned District wells to prevent groundwater contamination.
- Coordinate with other ECWMA members, as applicable, regarding DWSAP analyses (and also other environmental assessments) to guide management decisions.
- Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.

COMPONENT CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH

Component 4A: Continuation of Local, State, and Federal Agency Relationships

The District has long-established working relationships with local and state agencies that will continue on an ongoing basis. The ECWMA is comprised of eleven local water and wastewater agencies in eastern Contra Costa County, including the District, and several other member agencies currently use groundwater or plan to use groundwater in the future. The District works closely with its wholesale supplier of CVP surface water, CCWD, which is also an ECWMA member. The availability of surface water resources is key to meeting the District's future water demands.

The ECWMA member agencies participated in the preparation of the East Contra Costa County Functionally Equivalent IRWMP consisting of existing local and regional planning documents, which was completed in July 2005. Completion of the Functionally Equivalent IRWMP enabled the ECWMA members to apply for a Proposition 50, Chapter 8 regional grant (CCWD, 2005). Eight eastern Contra Costa County agencies, including Diablo Water District, have projects to be included in the grant application.

The District has a historical and ongoing working relationship with local agencies, as well as with other local groundwater pumpers, to manage supplies to effectively meet water demands within the available yields of imported surface water and local groundwater. The District formally presented and solicited comment on its intent to prepare a groundwater management plan with ECWMA in May 2005.

ECWMA member agencies that received a draft Plan for review include:

- City of Brentwood
- Contra Costa Water District
- Town of Discovery Bay
- East Contra Costa Water District
- City of Pittsburg

The above agencies represent an advisory group to the District for this Plan and will continue to be solicited for input on Plan updates and to receive annual reports on groundwater conditions. Representatives from these agencies participated in three meetings on content of the Plan and reviewed the draft Plan.

This Plan component is included to formalize the historical local and state agency working relationships as part of comprehensively managing local groundwater, in concert with imported surface water and local recycled water, to accomplish all the management objectives for the basin.

Actions

- Continue working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.
- Pursue grant opportunities in cooperation with ECWMA to fund basin management activities and regional water projects.

Component 4B: Public Outreach

The purpose of the Plan is to maintain a high quality, reliable, and sustainable water supply for the citizens and businesses of Oakley and the unincorporated portions of its service area. To accomplish this, the Plan components describe how the District intends to manage its water resources in support of four regional and three local BMOs directed toward the sustainability of groundwater supplies. As the District is managing its water resources as a service to the local citizenry, it is committed to engaging the public in awareness of the Plan's purpose and objectives, and active involvement in Plan implementation. Accordingly, the District has prepared this Plan with the required public notices and hearings on its intention to prepare and adopt a plan per AB 3030 and SB 1938 (see **Appendix A**).

Public outreach tools used by CCWD and the District to encourage water conservation are outlined in the UWMP (CDM, 2005) under DMM-7. The District's public information program includes mailing a periodic newsletter to its customers to provide water conservation tips and other information about water conservation programs. CCWD and the District also sponsor media events related to conservation, produce public service announcements, and provide speakers for community groups and the media.

Actions

- Continue public involvement process with Board meetings that periodically include updates on water resources management activities by the District.
- Continue public outreach with bill inserts and printed media. These notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.
- Continue to engage the public in future Plan updates.

Component 4C: Water Awareness Education

The District is committed to implementing water awareness programs as discussed in the UWMP (CDM, 2005). School educational programs directed toward water conservation are handled primarily by CCWD, which provides an extensive Water Education Program to schools within the District's service area. The UWMP states that the current school education program reaches over 30,000 students, teachers, and parents each year.

Actions

- Continue water awareness education programs.

COMPONENT CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES

Component 5A: Plan Implementation and Reporting

Table 4-1 summarizes the action items discussed under each Plan component and the implementation schedule for each item. Action items planned to be completed within two years are labeled "short-term" actions, and items expected to require more than two years to complete are labeled "long-term" actions. Action items that represent on-going groundwater management activities conducted by the District are labeled "continuing" actions.

The Functionally Equivalent IRWMP adopted by ECWMA in 2005 identifies and prioritizes regional water-related actions for the eastern Contra Costa County agencies, including the District. Highest priority actions identified in the IRWMP include quantifying countywide water demand and supply, increasing opportunities for conjunctive use, increasing the use of groundwater as part of conjunctive use operations, and implementation of water use efficiency programs (CDM, 2005). The District supports implementation of the IRWMP.

The District's utilization of groundwater has historically been small, and it has not previously prepared reports to summarize groundwater conditions in its service area. A key component of this Plan is the preparation of annual groundwater management reports to describe the status of management actions performed and/or recommended, including monitoring and other cooperative activities with other entities in the County and state or federal agencies. These annual reports will include summaries of monitoring data collected during the previous year, including groundwater conditions (groundwater levels, quality, and production) and land subsidence data. The reports will include data collected through March 31 so that water level recovery during the winter months can be evaluated. The reports will also summarize current water requirements, use of local groundwater and imported surface water from CCWD to meet those requirements, and other appropriate details about water requirements and supplies.

Actions

- Make information and reports available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.
- Provide copies of adopted Plan, and related reports, to ECWMA members.
- Support the IRWMP, including implementation of priority objectives of the IRWMP.
- Prepare annual groundwater management reports.

Component 5B: Provisions to Update the Groundwater Management Plan

The components of this Plan reflect the current understanding of the occurrence of groundwater in eastern Contra Costa County and specific problems or areas of concern about that resource. The Plan components are designed to achieve specified objectives to utilize

local groundwater for regular water supply while both protecting and preserving groundwater quantity and quality. While the Plan provides a framework for present and future actions, new data will be developed as a result of Plan implementation. That new data could identify conditions which will require modifications to currently definable management actions. As a result, this Plan is intended to be a flexible document that can be updated to modify existing components and/or incorporate new components as appropriate in order to recognize and respond to future groundwater conditions.

Review and update of this Plan would initially occur in about five years, or sooner if necessary. Subsequent future updates would be similarly scheduled. ECWMA members would be apprised of future updates to the Plan to ensure that the Plan is consistent with BMOs and management actions being implemented by others utilizing water resources within the same basin. The District will also conduct outreach to encourage public participation in future Plan updates.

Actions

- Review and update Plan every five years or more often as needed.

Table 4-1
Summary of Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
CATEGORY 1: MONITORING PROGRAM			
1A. Elements of Monitoring Program			
• Implement the groundwater monitoring program detailed in Appendix D.	X		X
1B. Evaluation and Reporting of Monitoring			
• Maintain clear records from all monitoring activities.	X		
• Prepare an annual monitoring report describing conditions as reflected by trends of monitored parameters.	X		
• Make the annual report available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.	X		
CATEGORY 2: WATER RESOURCE SUSTAINABILITY			
2A. Maintaining Stable Groundwater Levels			
• Continue monitoring of groundwater levels discussed under Component 1A to ensure that progressive groundwater level declines do not occur.	X		X
2B. Water Conservation			
• Continue to implement and promote water conservation programs within the District's service area.			X
2C. Implementation of Conjunctive Water Management			
• The District will continue to develop groundwater source capacity and identify possible conjunctive management strategies to optimize resource protection. This will likely require regional coordination with CCWD and other ECWMA agencies.			X
2D. Integration of Recycled Water			
• As applicable, coordinate opportunities to use recycled water with Ironhouse Sanitation District.			X
CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3A. Well Construction and Destruction Policies			
• Comply with the County's well construction and destruction policies and state permitting requirements as stipulated by the DHS district engineer.	X		
3B. Management and Mitigation of Contaminated Groundwater			
• Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.		X	
• Employ BMPs to limit potential sources of contamination in the environment.	X		
• Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.		X	
• Identify locations of point sources of contamination.			X

Table 4-1 (continued)
Summary of Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
• Identify major non-point sources of contamination.		X	
• Mitigate potential impacts on groundwater quality resulting from point or non-point sources of contamination.		X	
• Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.			X
• Coordinate with other ECWMA members and the County Environmental Health Services Division to assess the quality of groundwater used by private well owners in the subbasin.		X	
3C. Identification and Management of Recharge Areas and Wellhead Protection Areas			
• Identify short and longer-term water quality trends and actions needed to sustain supply of good quality groundwater		X	
• Use DWSAP information, including delineation of source area and protection zones.	X		
• Require deep sanitary seal construction standards for municipal supply wells.	X		
• Adopt a well destruction policy for abandoned District wells to prevent groundwater contamination.	X		
• Coordinate with other ECWMA members, as applicable, regarding DWSAP analyses (and also other environmental assessments) to guide management decisions.		X	
• Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.		X	
CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH			
4A. Continuation of Local, State, and Federal Agency Relationships			
• Continue working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.			X
• Pursue grant opportunities in cooperation with ECWMA to fund basin management activities and regional water projects.			X
4B. Public Outreach			
• Continue public involvement process with Board meetings that periodically include updates on water resources management activities by the District.			X
• Continue public outreach with bill inserts and printed media. These notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.			X
• Continue to engage the public in future Plan updates.			X
4C. Water Awareness Education			
• Continue water awareness education programs.			X

Table 4-1 (continued)
Summary of Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES			
5A. Plan Implementation and Reporting			
• Make information and reports available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.			X
• Provide copies of adopted Plan, and related reports, to ECWMA members.	X		
• Support the IRWMP, including implementation of priority objectives of the IRWMP.		X	
• Prepare annual groundwater management reports.			X
5B. Provisions to Update the Groundwater Management Plan			
• Review and update plan every five years or more often as needed.			X

1. Short-term actions are items to be completed within two years.
2. Long-term actions are items expected to require more than two years.
3. Continuing are items that are ongoing groundwater management activities.

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Appendix A

Resolution No. 2006-6, Public Notices, and Resolution No. 2007-4

RESOLUTION NO. 2006 - 6

A RESOLUTION OF THE BOARD OF DIRECTORS OF DIABLO WATER DISTRICT SETTING FORTH ITS INTENTION TO PREPARE A GROUNDWATER MANAGEMENT PLAN

The Board of the Directors of the Diablo Water District (District) does hereby find that:

WHEREAS, the District was formed in 1953 by a vote of the citizens of Oakley for the purpose of serving a safe, adequate, and reliable supply of water to the residents and businesses within the District; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq., permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District is an authorized local agency and may therefore adopt and implement such a Groundwater Management Plan; and

WHEREAS, a Groundwater Management Plan will further efforts to protect and provide a safe, sufficient, and reliable groundwater supply to citizens and businesses within the District's boundaries, will facilitate collection of information to further understand groundwater basin conditions and evaluate additional policies and programs for protection of the groundwater resources in the designated plan area, and will assist in integrated regional water resources planning and monitoring efforts conducted in coordination with other public entities whose service areas also overlie the designated Plan area; and

WHEREAS, there has been no public objection to the District preparing a Groundwater Management Plan for approval by the District's Board of Directors.

NOW, THERFORE, be it resolved that the District intends to prepare a Groundwater Management Plan for the purpose of implementing the plan and establishing a groundwater management program, in accordance with California Water Code, Part 2.75 of Division 6, subject to final approval by the District's Board of Directors and the public hearing and notification provisions of Water Code Section 10753, et seq. A copy of this resolution shall be published in a paper of general circulation in Contra Costa County at least two times to give public notice of its adoption and the intent to prepare a Groundwater Management Plan.

* * * * *

I certify that the foregoing is a true and complete copy of a resolution duly and regularly adopted by the Board of Directors of Diablo Water District at a meeting thereof regularly held on June 28, 2006, by the following vote:

AYES: de Fremery, Crockett, Hobbs, Head, and Garcia

NOES: none

ABSENT: none

Dated: June 29, 2006

Mike Yeraka, Secretary

Oakley News June 9 and 16, 2006

Legal Notice

NOTICE OF A PUBLIC HEARING

Notice is hereby given that the Board of Directors of the Diablo Water District will hold a public hearing regarding the adoption of a Resolution of Intention to Prepare a Groundwater Management Plan pursuant to California Water Code, Part 2.75 of Division 6, Section 10750, et seq. The hearing is intended for review, explanation, and public input on a proposed Groundwater Management Plan. A Resolution of Intention may be adopted after the Public Hearing to be held on June 28, 2006. All interested persons, including all persons owning property in the District, may appear and be heard. **HEARING DATE:** June 28, 2006. 7:30 pm at the District's office, 2107 Main Street Oakley, CA. Additional information, together with a copy of the proposed resolution, may be obtained by contacting the District at 925-625-6159.

Legal EC 6939
Publish: June 9, 16, 2006

East County Times May 4 and May 11, 2007

Legal Notice

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Board of Directors of the Diablo Water District will hold a public hearing on May 23, 2007 to consider adopting a Groundwater Management Plan (GMP) for the groundwater basin underlying the District's boundaries. The District is a local public agency that provides water service to customers within its service area; the California Water Code (CWC), Section 10750 et. seq., provides local agencies with the authority to adopt and implement groundwater management plans.

The purpose of the GMP is to maintain a reliable and sustainable water supply for the District and other groundwater users in and around the District's service area. The GMP describes regional and local groundwater basin management objectives directed toward the sustainability of groundwater and surface water supplies. To accomplish these objectives, the GMP sets forth five categories that identify actions to implement the GMP. Included among the actions is continued local groundwater monitoring and also coordination with other regional monitoring programs to track overall groundwater conditions in the District and the basin.

HEARING DATE: May 23, 2007, 7:30 pm at the District's office, 2107 Main Street, Oakley, CA. Any protests by landowners in the area covered under the plan must be provided to the District, in writing, prior to completion of the hearing. Copies of the plan are available at the District's office for public review. Additional information may be obtained by contacting the District at 925-625-6159.

Legal EC 9715
Publish: May 4, 11, 2007

RESOLUTION No. 2007-4

RESOLUTION OF THE BOARD OF DIRECTORS OF DIABLO WATER DISTRICT AUTHORIZING ADOPTION OF GROUNDWATER MANAGEMENT PLAN

The Board of the Directors of the Diablo Water District (District) does hereby find that:

WHEREAS, the District was formed in 1953 by a vote of the citizens of Oakley for the purpose of serving a safe, adequate, and reliable supply of water to the residents and businesses within the District; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq., permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District is an authorized local agency and may therefore adopt and implement such a Groundwater Management Plan; and

WHEREAS, a Groundwater Management Plan will further the District's efforts to protect and provide a safe, sufficient, and reliable groundwater supply to citizens and businesses within the District's boundaries, will facilitate collection of information to further understand groundwater basin conditions and evaluate additional policies and programs for protection of the groundwater resources in the Plan area, and will assist in integrated regional water resources planning and monitoring efforts conducted in coordination with other public entities whose service areas also overly the Plan area; and

WHEREAS, the District adopted a Resolution of Intent to prepare a Groundwater Management Plan on June 28, 2006; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq. requires an entity to adopt a Groundwater Management Plan no later than two years after passing said Resolution of Intent; and

WHEREAS, a Public Hearing was held on May 23, 2007, to determine whether to adopt a Groundwater Management Plan; and

WHEREAS, prior to the Public Hearing a Notice of the Public Hearing was published in a newspaper of general circulation in Contra Costa County on May 4, 2007, and May 11, 2007; and

WHEREAS, less than 50% of the District's assessed property owners protested the draft Plan.

NOW, THEREFORE, BE IT RESOLVED that the District does hereby authorize the adoption of the District's Groundwater Management Plan.

RESOLVED FURTHER that this resolution shall be published in a paper of general circulation in Contra Costa County at least two times to give public notice of the adoption of the District's Groundwater Management Plan.

* * * * * *

The foregoing Resolution was duly and regularly adopted at a meeting held on this 23rd day of May 2007 by the Board of Directors of Diablo Water District by the following vote of the Board:

AYES: Crockett, de Fremery, Garcia, Head, and Hobbs

NOES: none

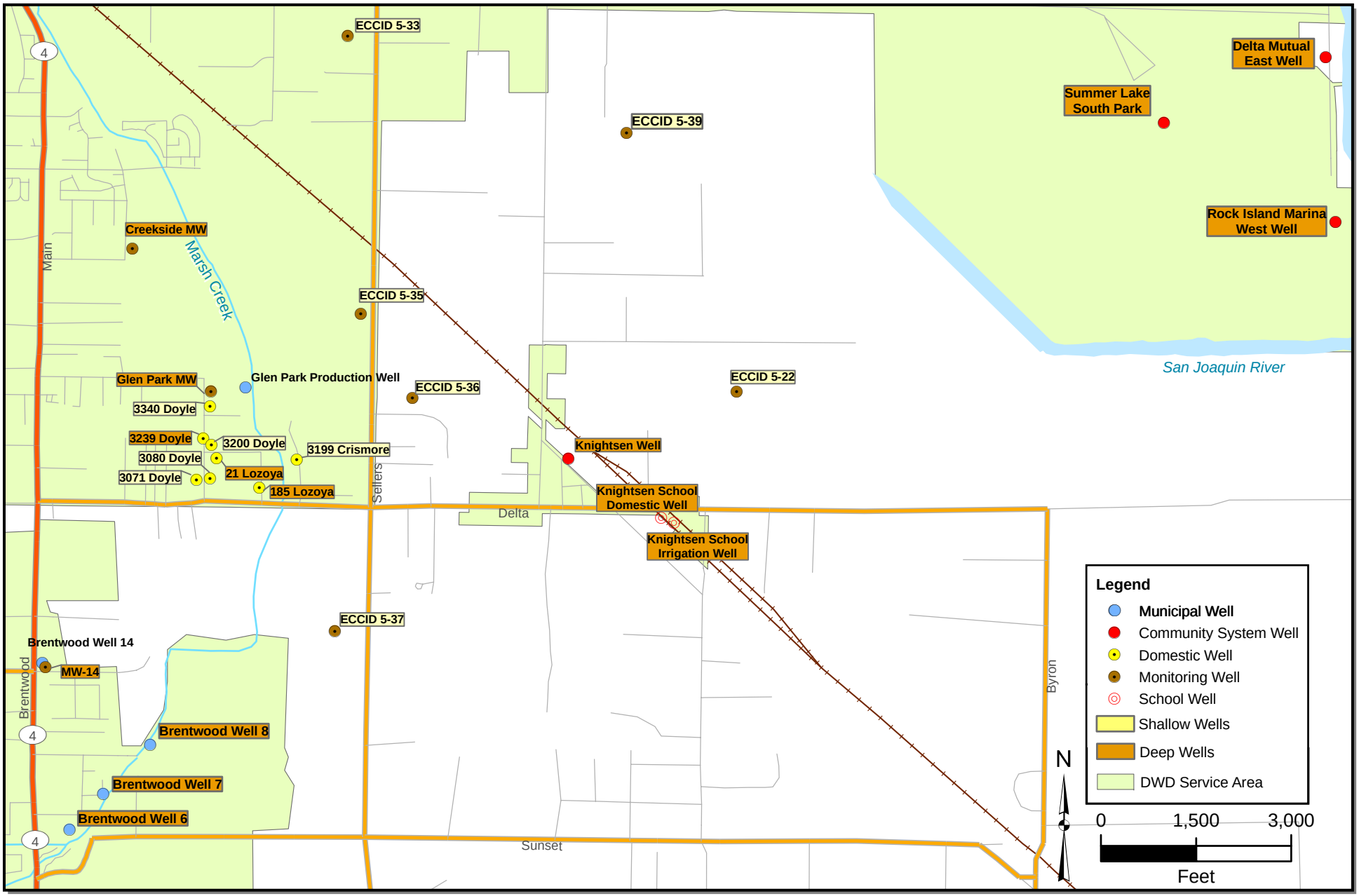
ABSENT: none

Dated: May 31, 2007

Mike Yeraka, Secretary

Appendix B

Groundwater Monitoring Networks



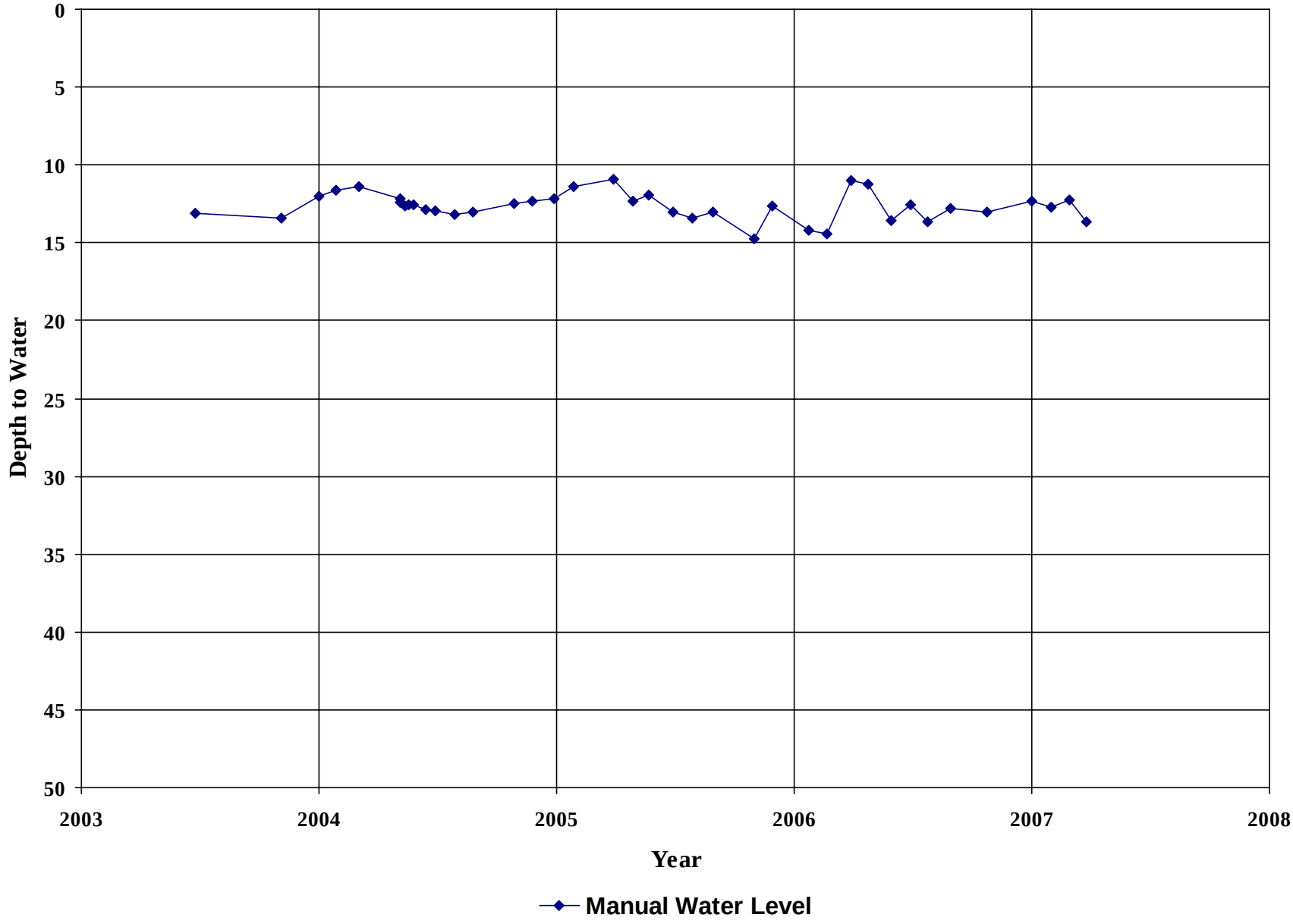
FILE: \Public\Diablo WD 04-1-058\GIS\Basemap1_V1.mxd DATE: 5/17/2007 1:03:38 PM

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Appendix B
Groundwater Monitoring Locations in Vicinity of Glen Park Well

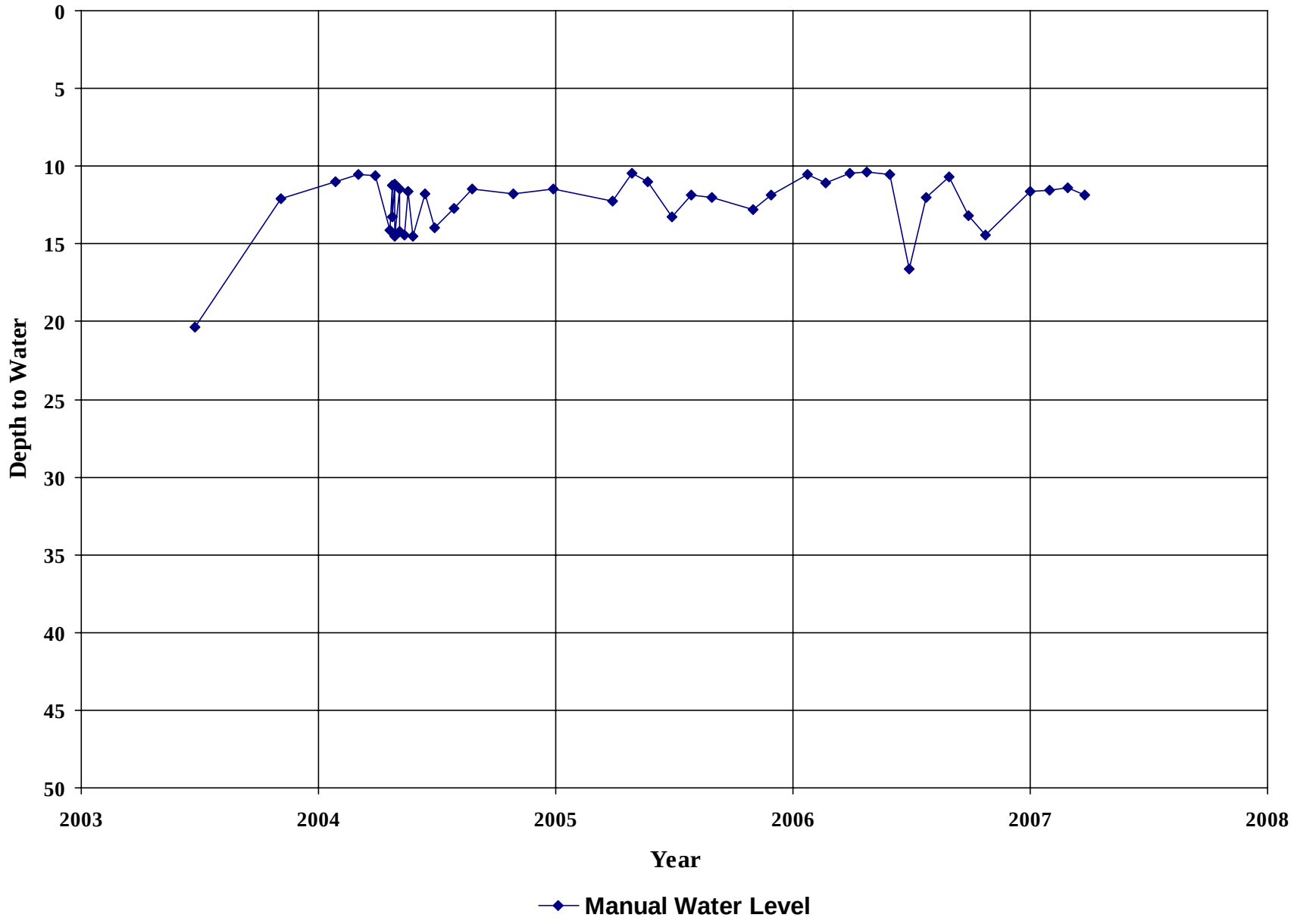
Shallow Monitoring Well Network

Water Level in 3071 Doyle

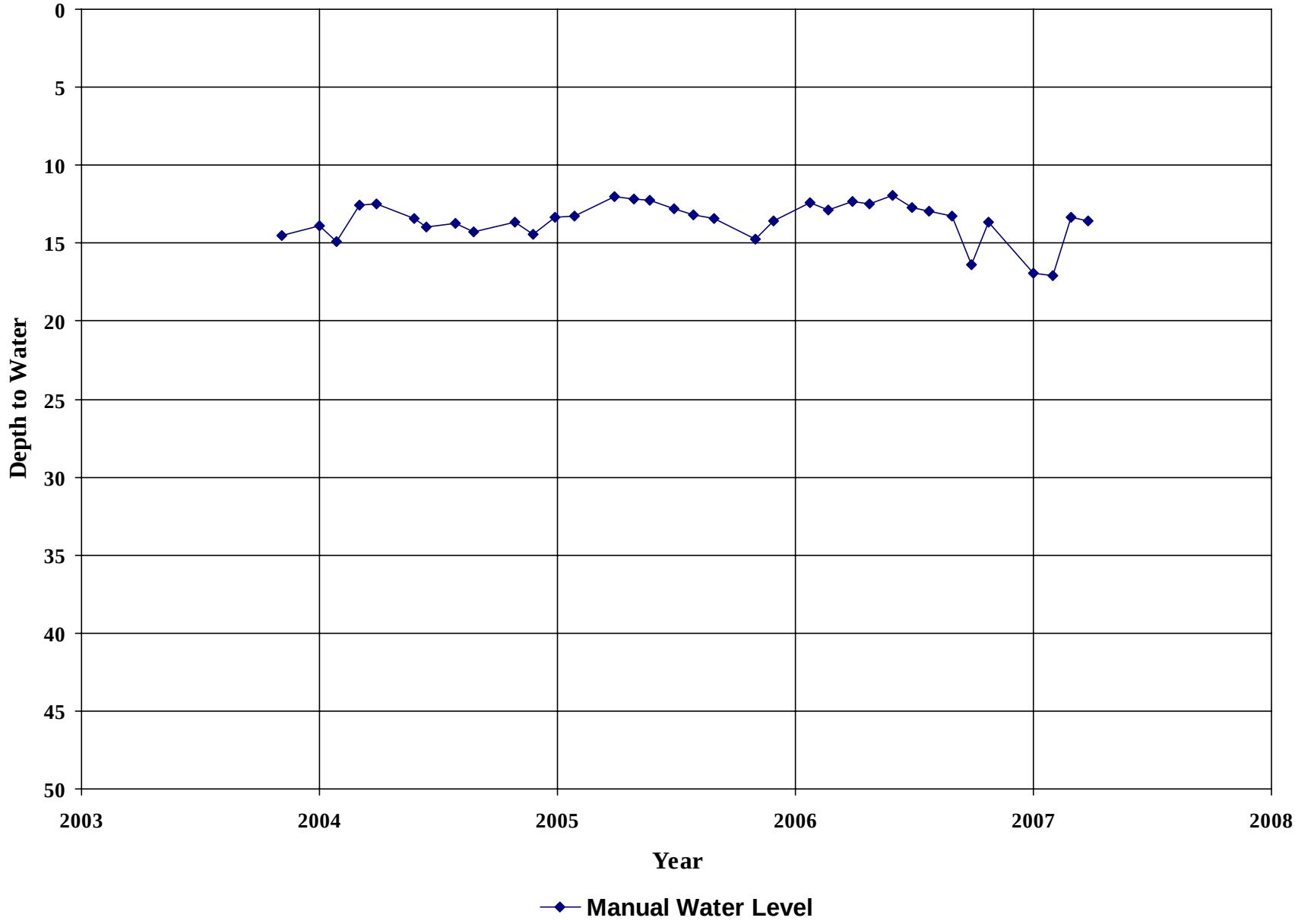


Water Level in 3080 Doyle

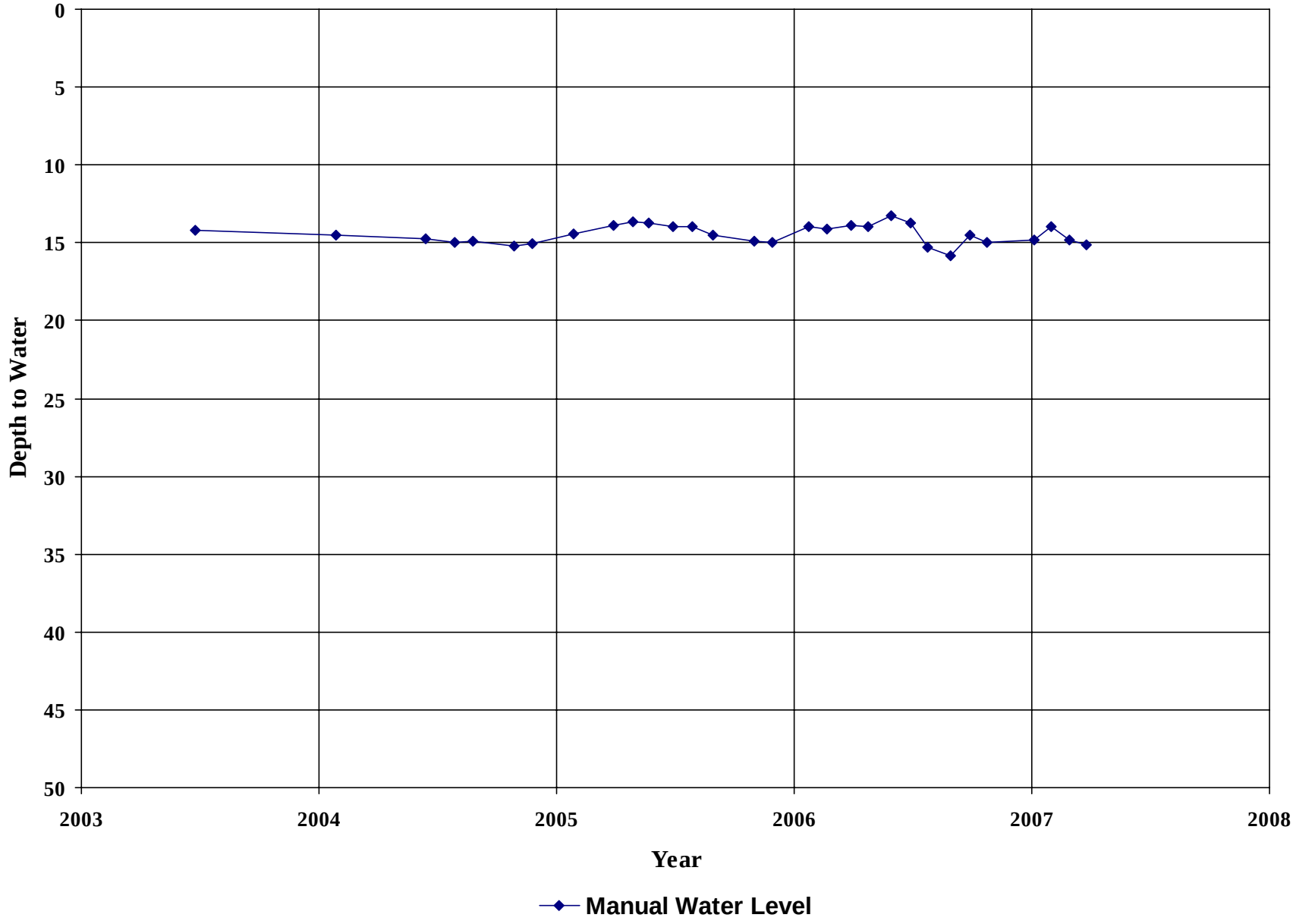
Well Depth: 60 ft



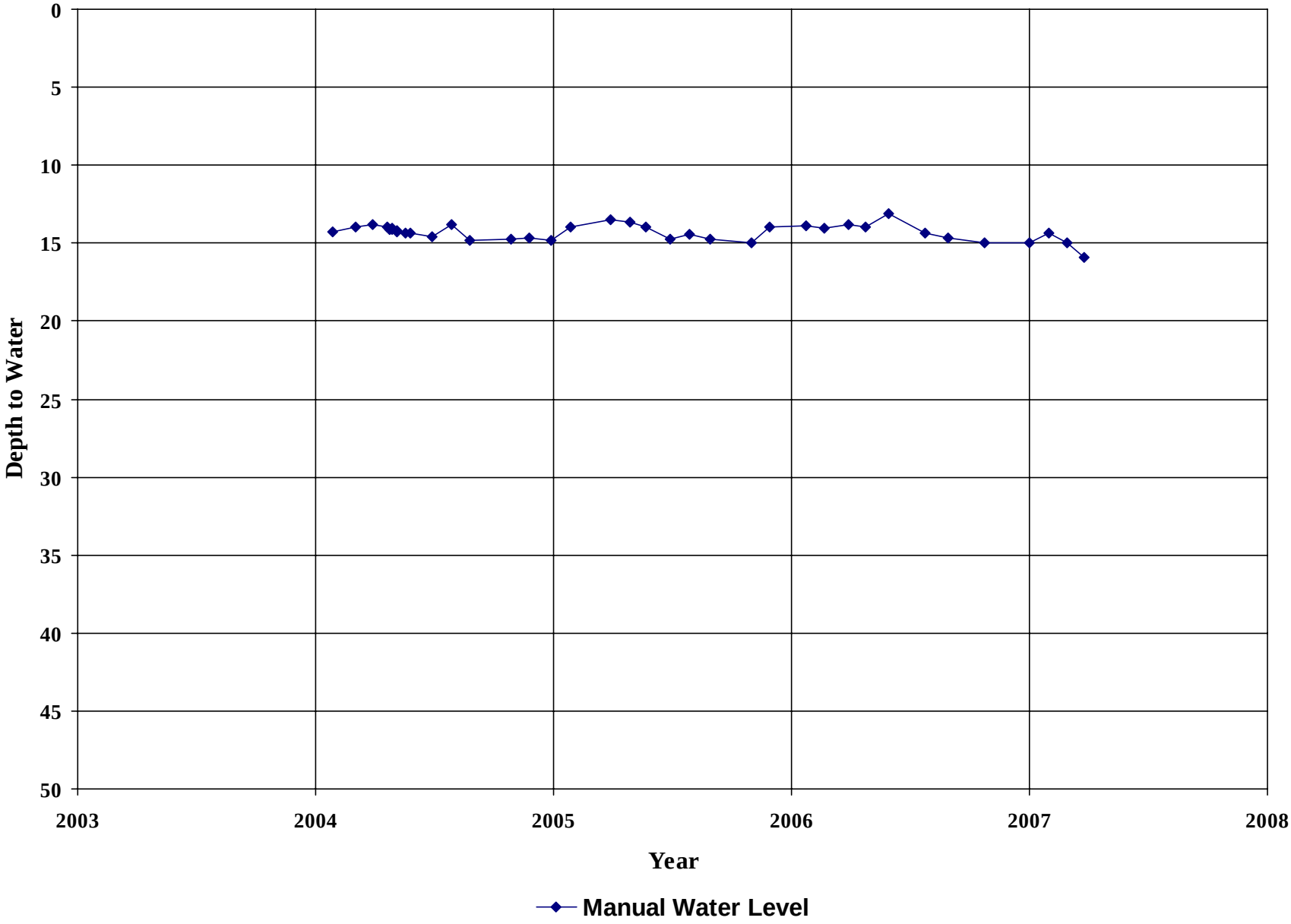
Water Level in 3200 Doyle



Water Level in 3340 Doyle

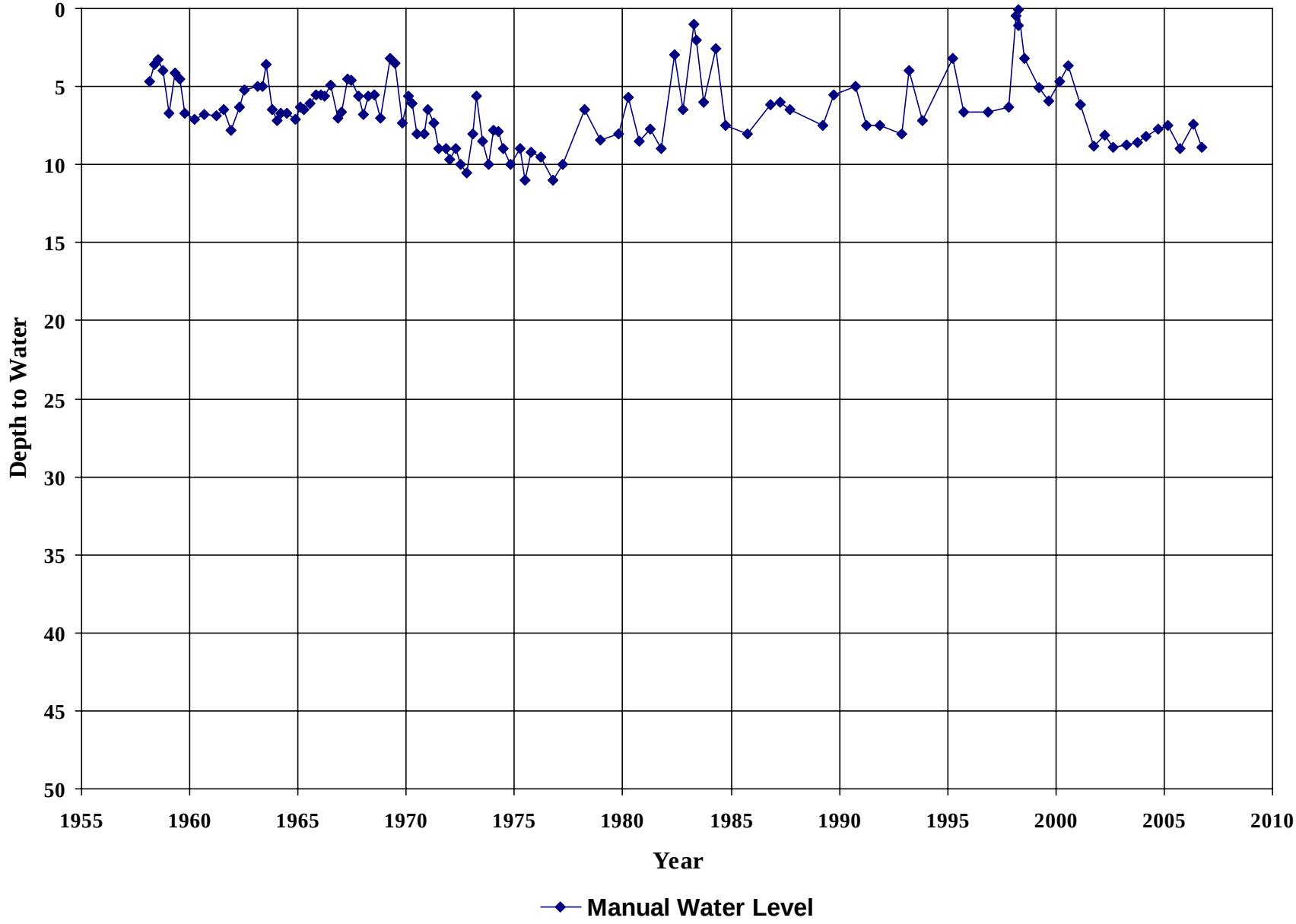


Water Level in 3199 Crismore



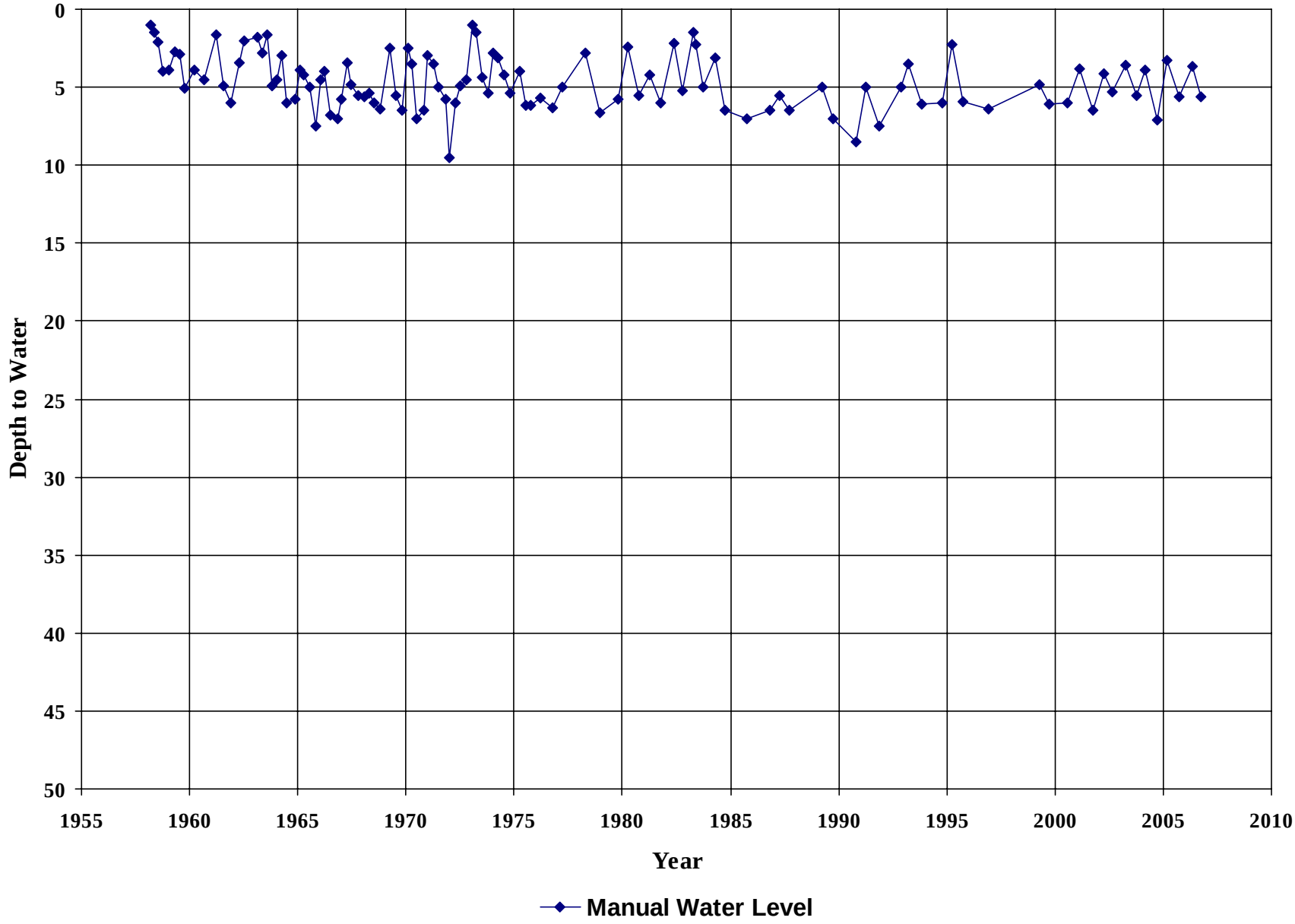
Water Level in ECCID 5-22

Well Depth: 20 ft



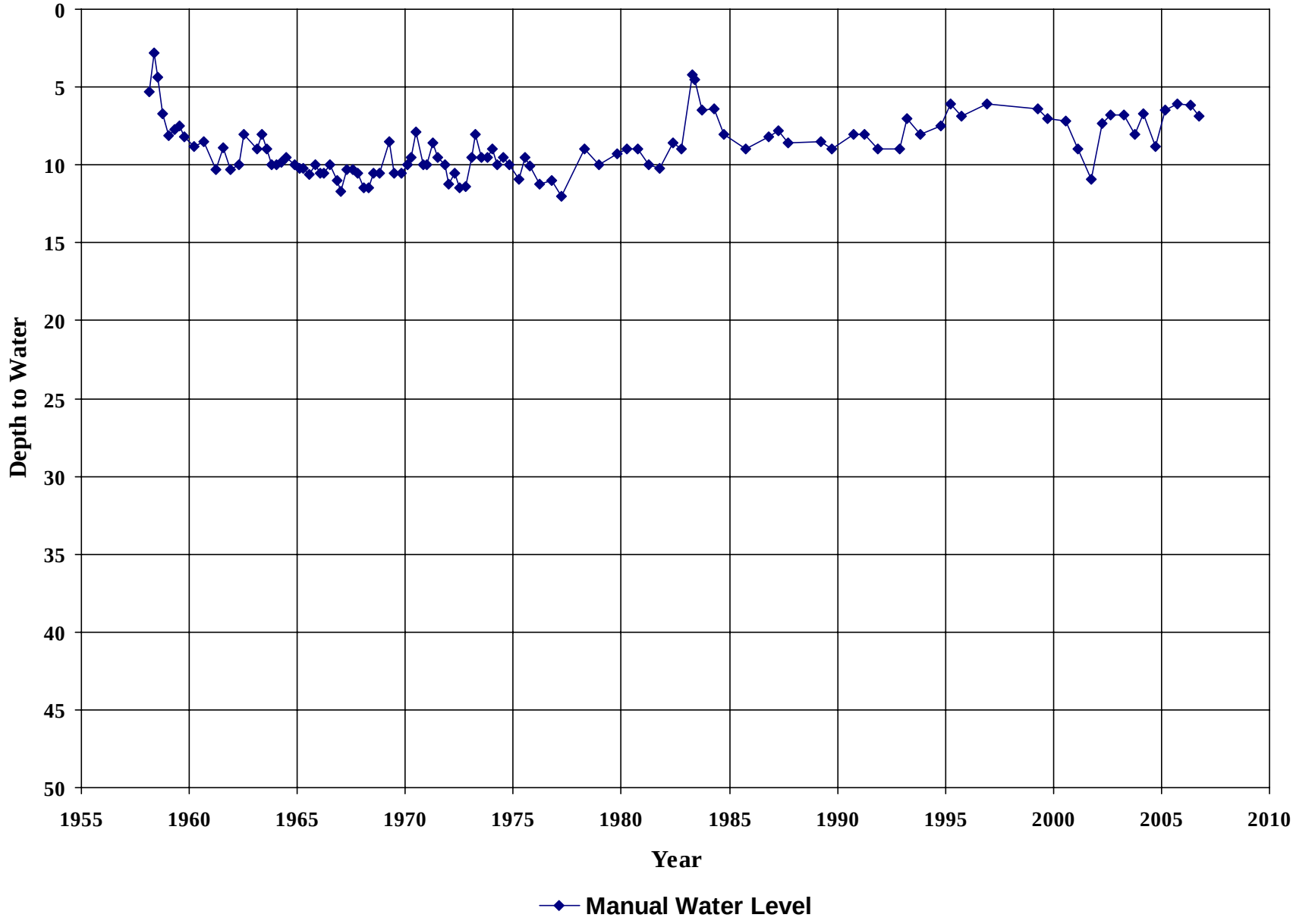
Water Level in ECCID 5-33

Well Depth: 20 ft



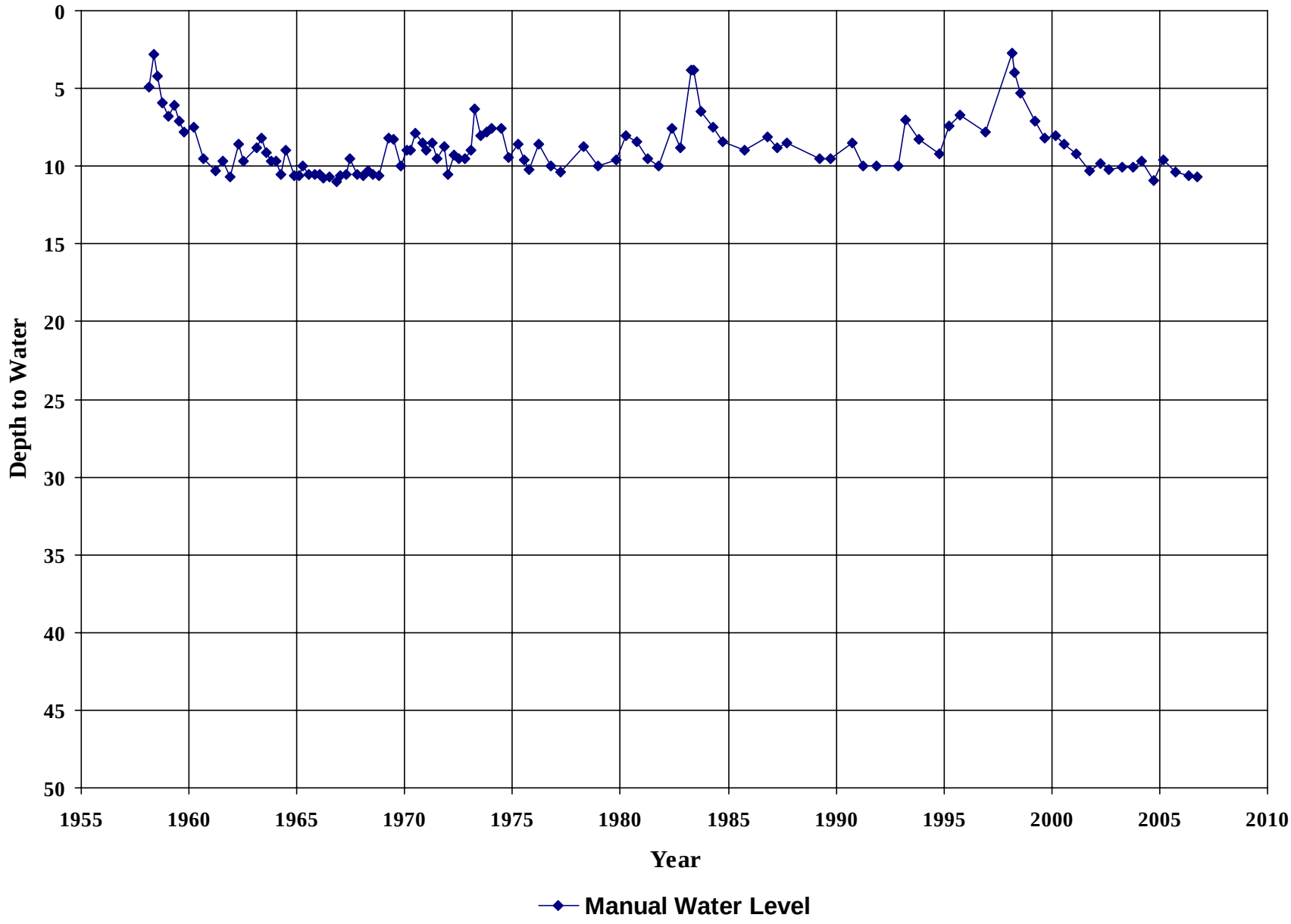
Water Level in ECCID 5-35

Well Depth: 20 ft



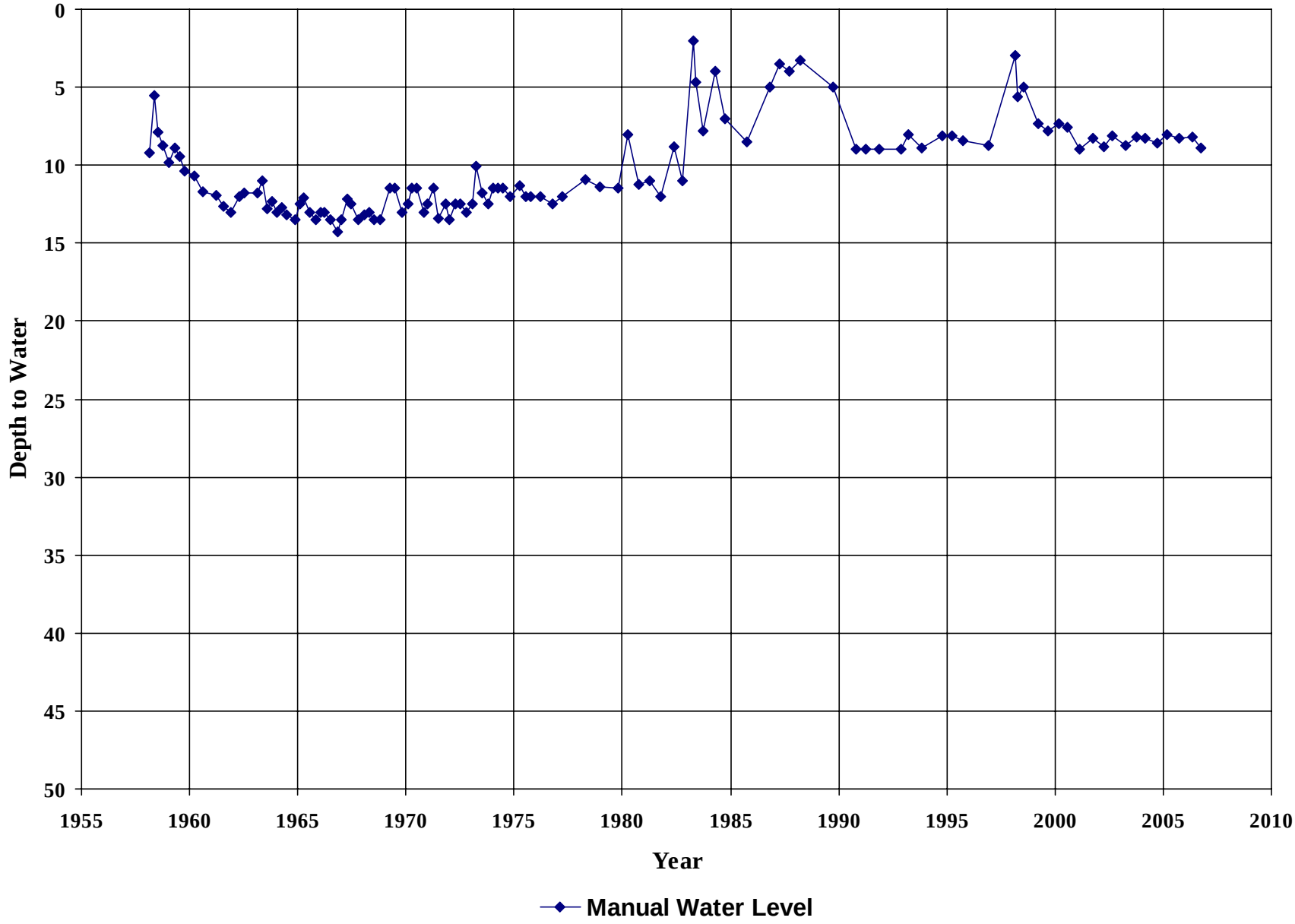
Water Level in ECCID 5-36

Well Depth: 20 ft



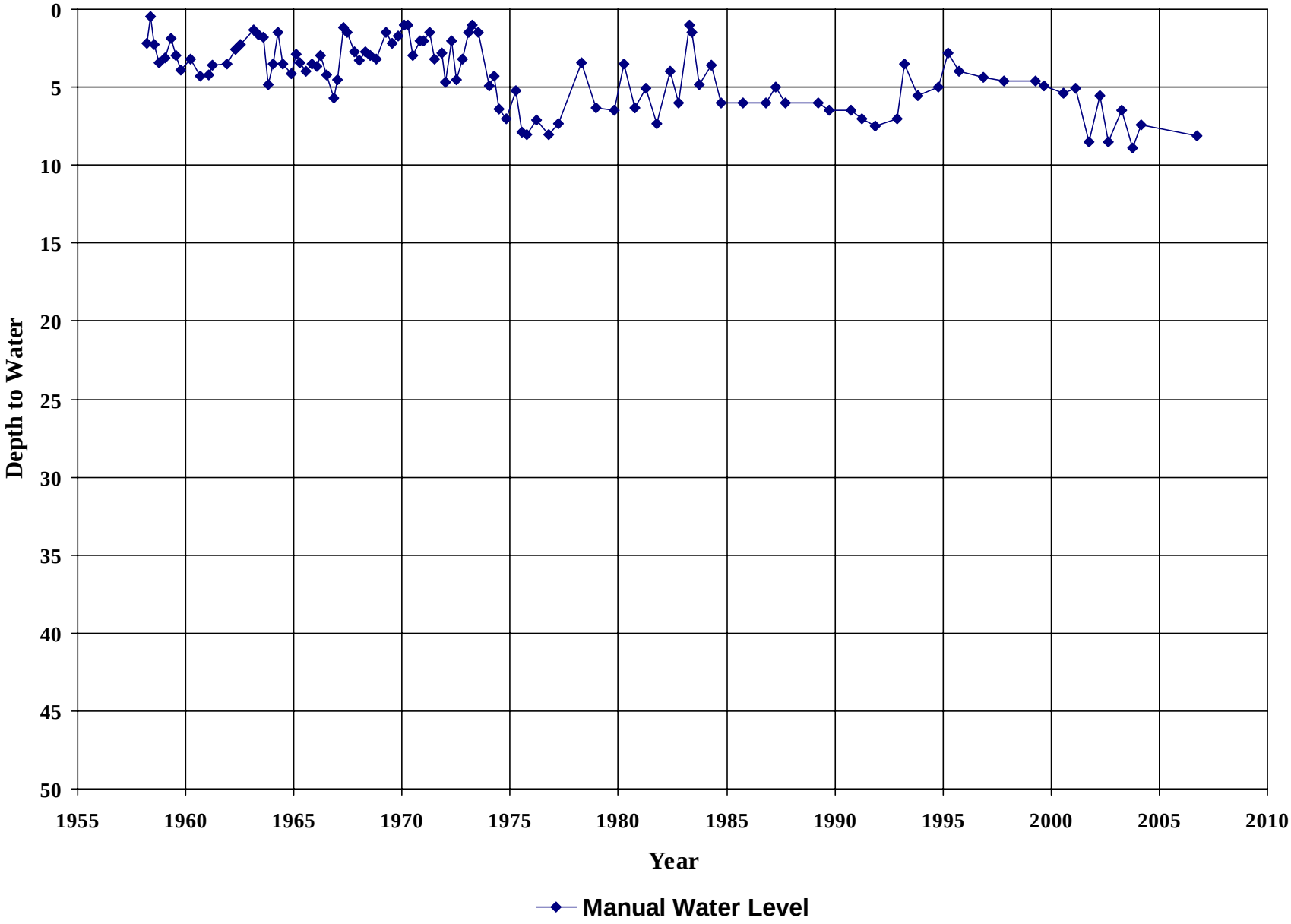
Water Level in ECCID 5-37

Well Depth: 20 ft



Water Level in ECCID 5-39

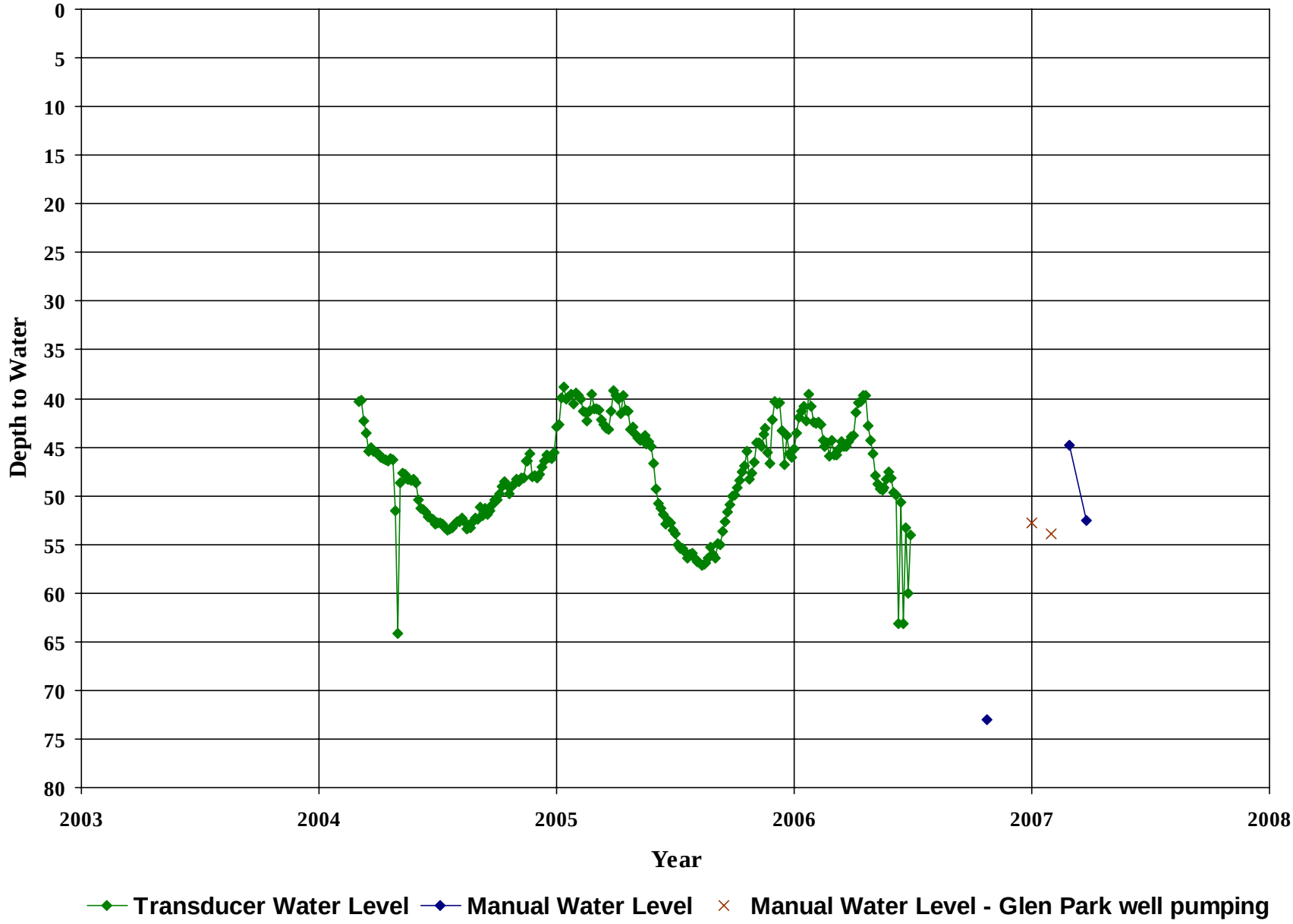
Well Depth: 20 ft



Deep Monitoring Well Network

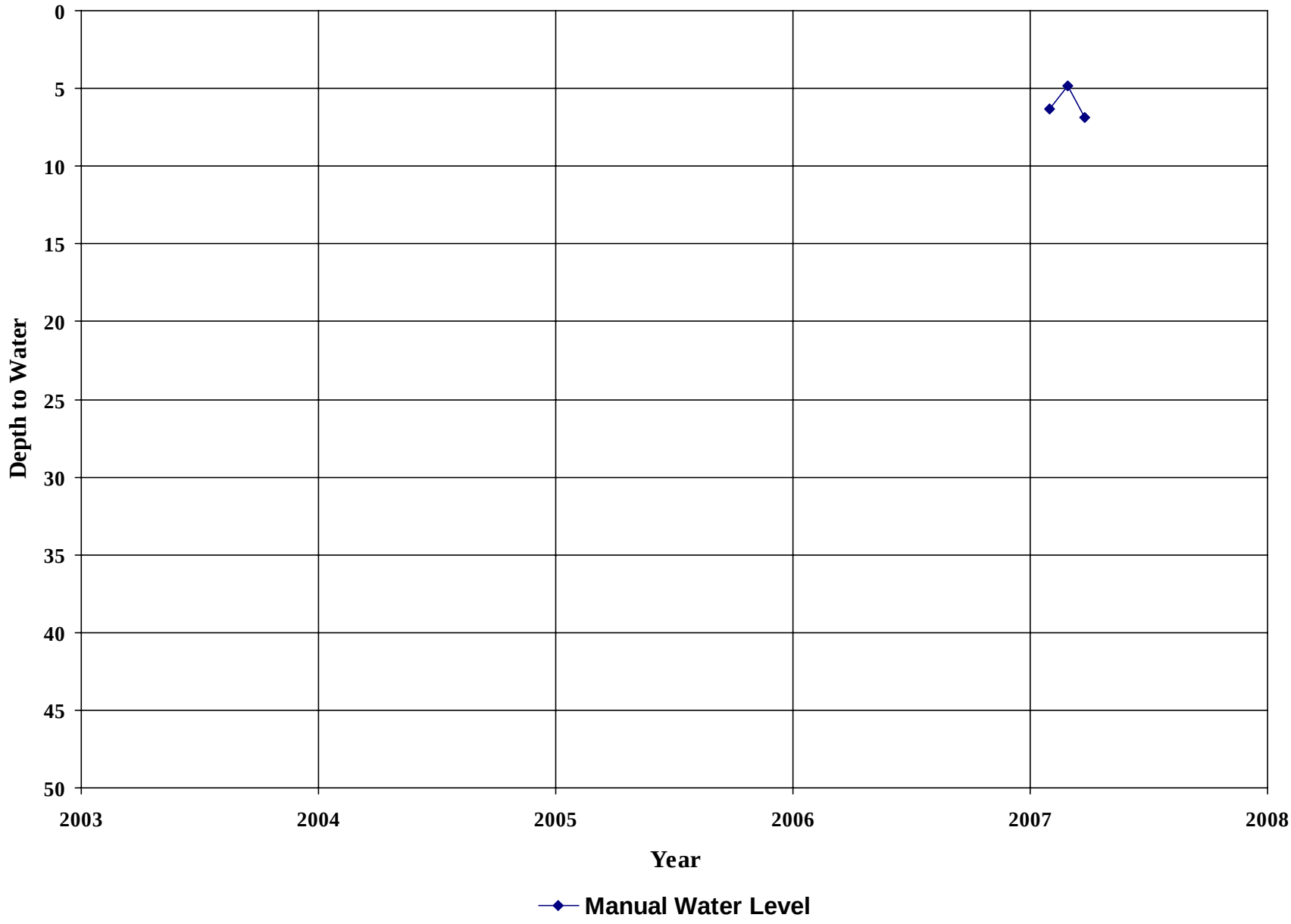
Water Level in DWD Glen Park MW

Perforation: 220-230, 260-290 ft
Well Depth: 560 ft



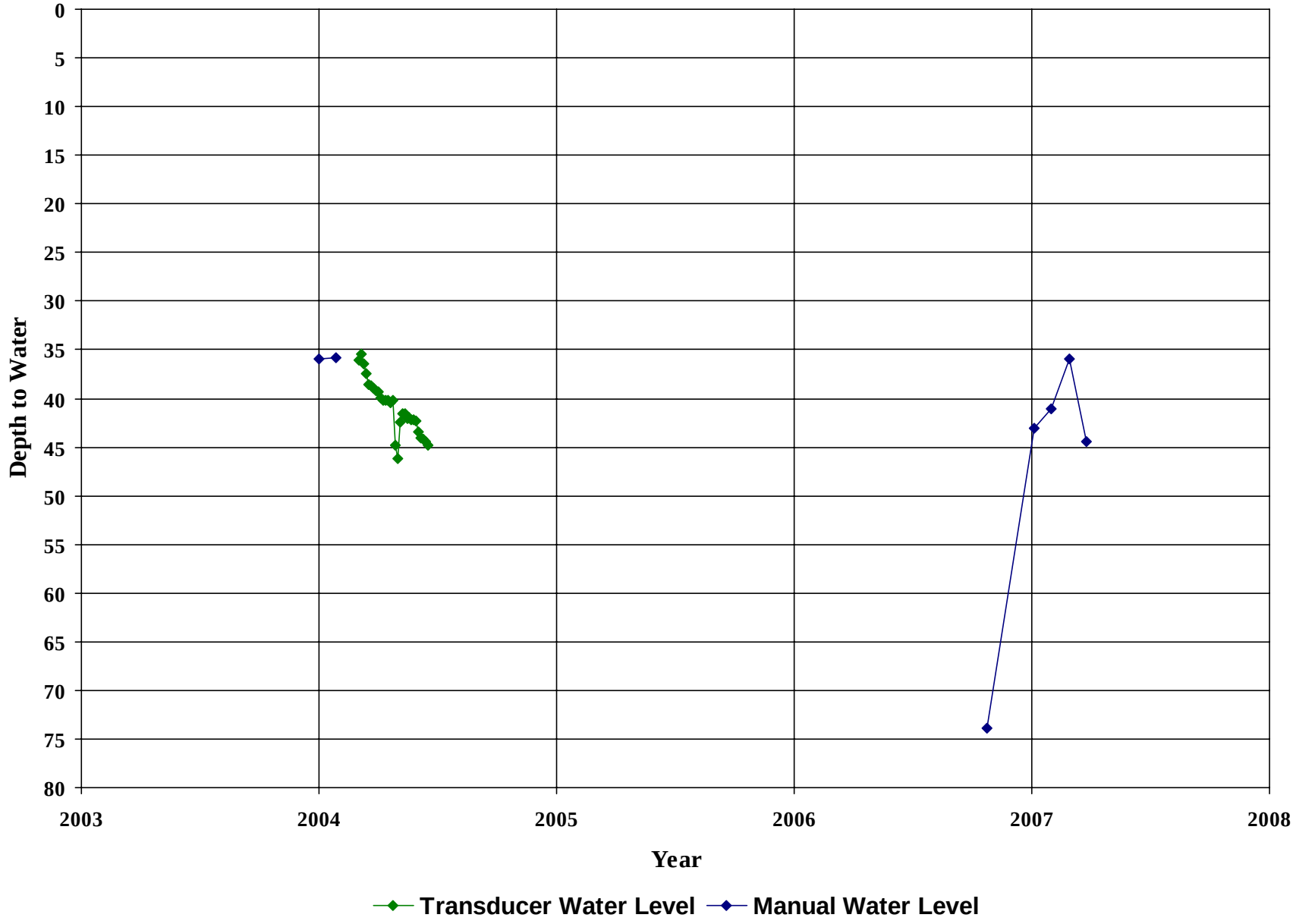
Water Level in South Park

Perforation: 204-264, 284-299 ft
Well Depth: 323 ft



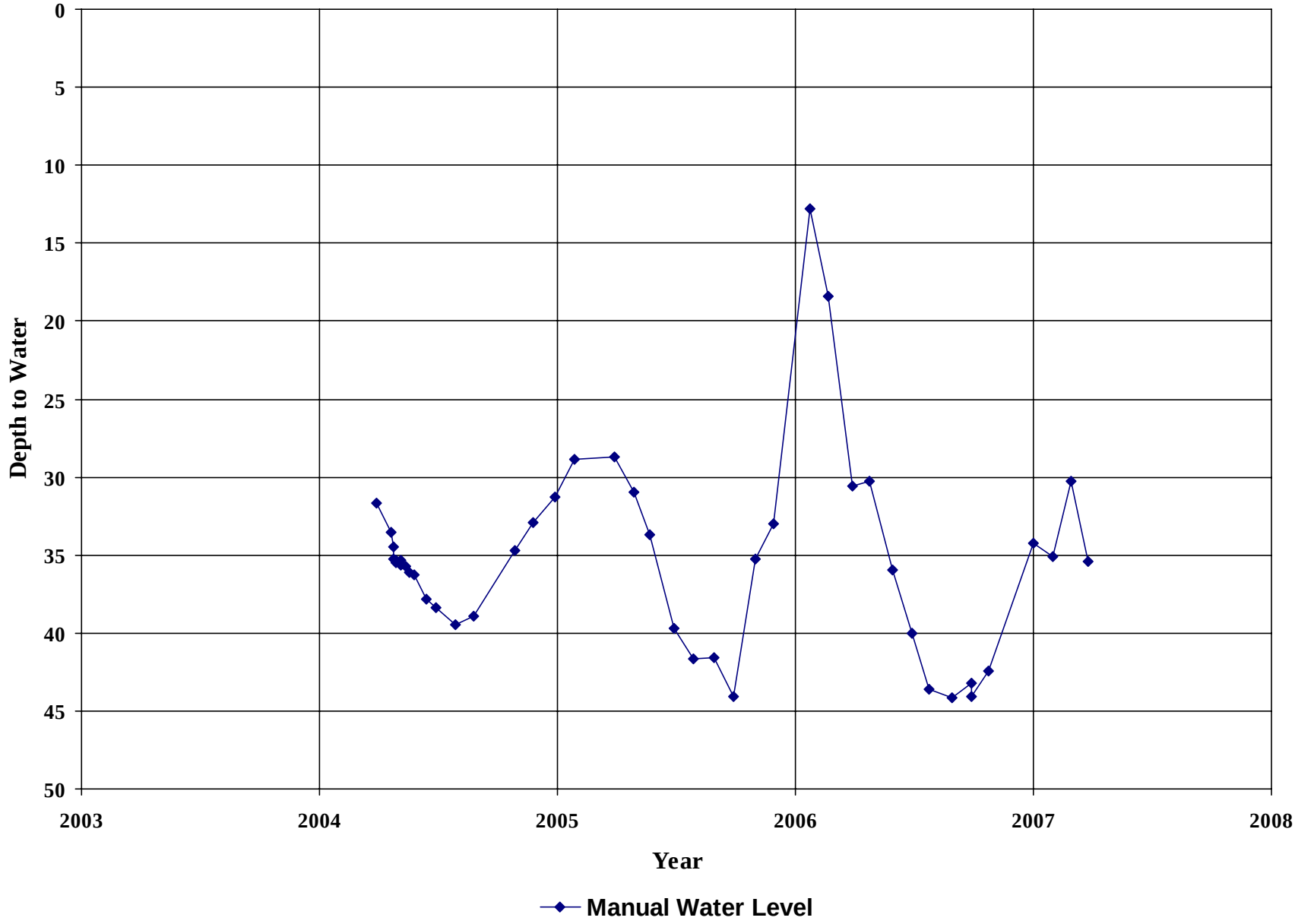
Water Level in DWD Creekside MW

Perforation: 230-240 ft
Well Depth: 380 ft



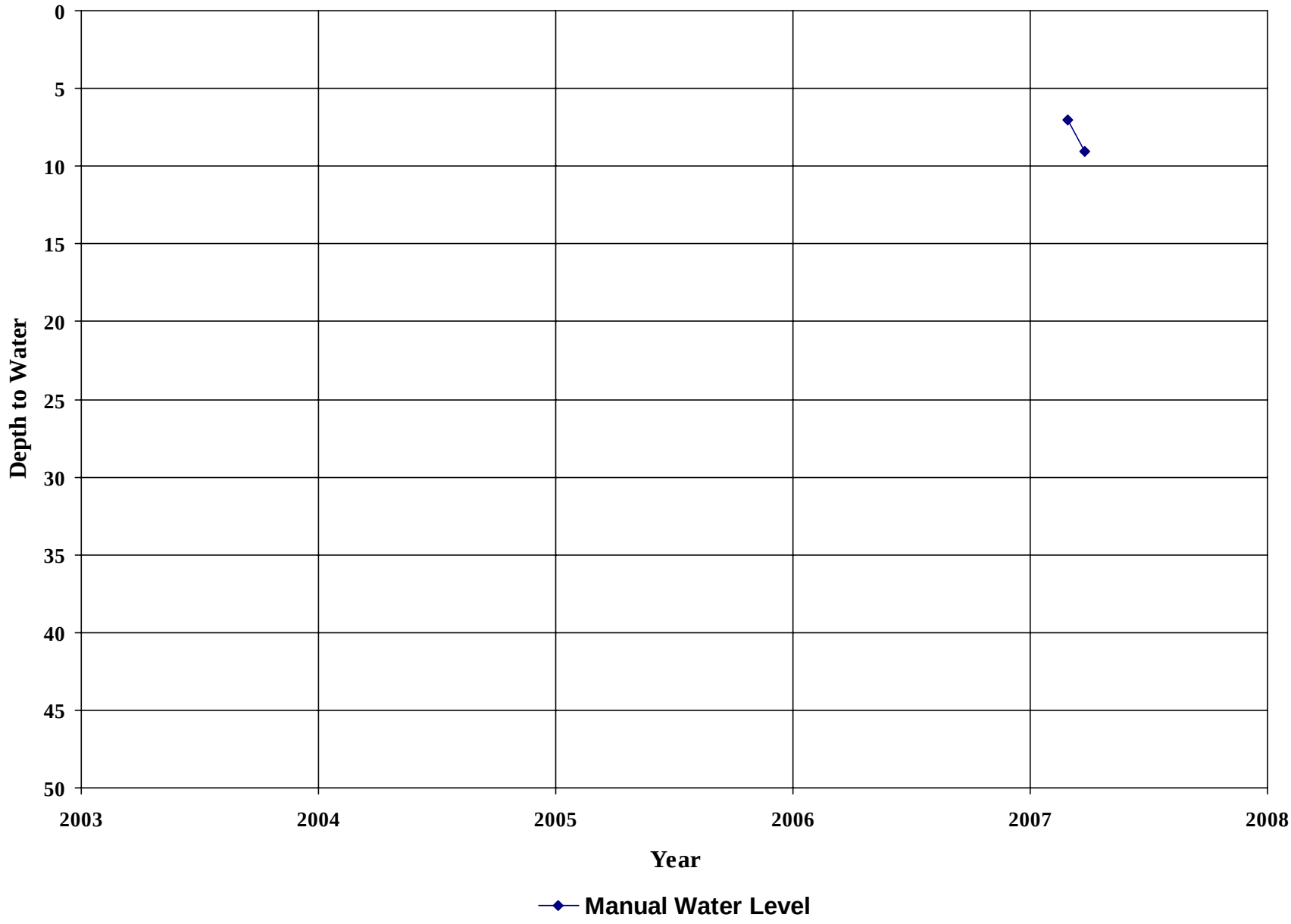
Water Level in DWD Knightsen Well

Perforation: 265-305 ft
Well Depth: 305 ft

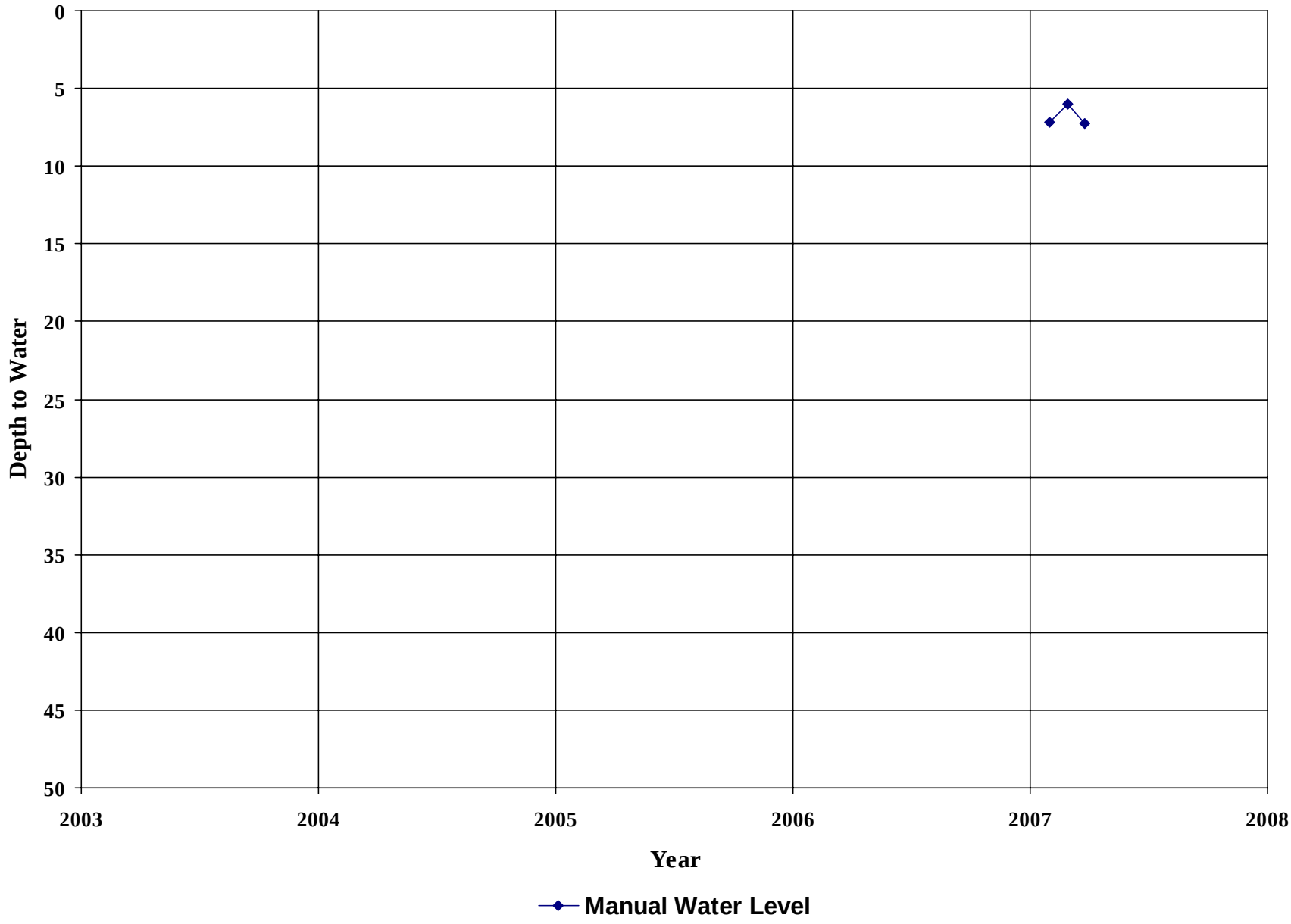


Water Level in Rock Island West Well

Perforation: 240-270, 284-292 ft
Well Depth: 320 ft

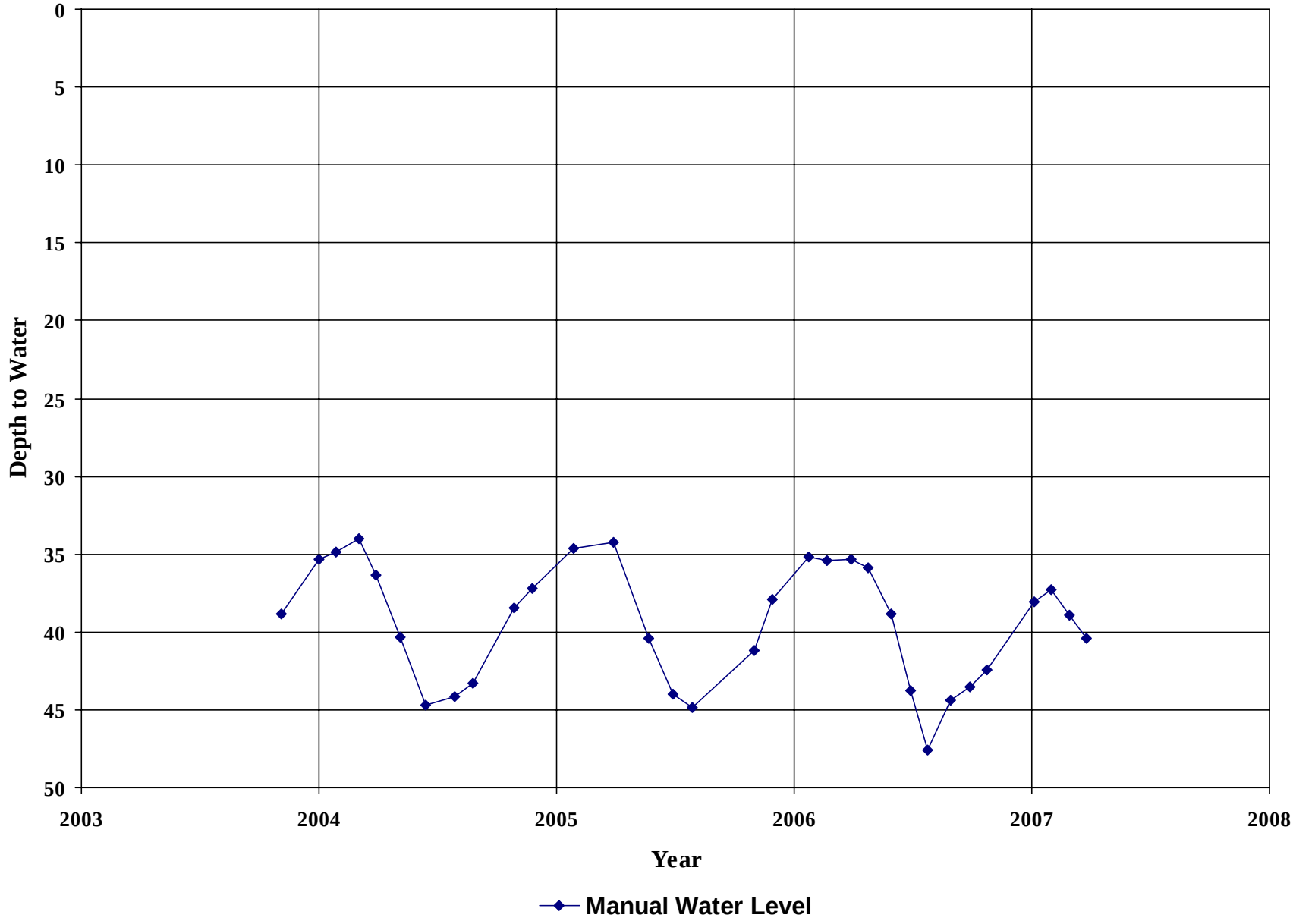


Water Level in Delta Mutual East Well

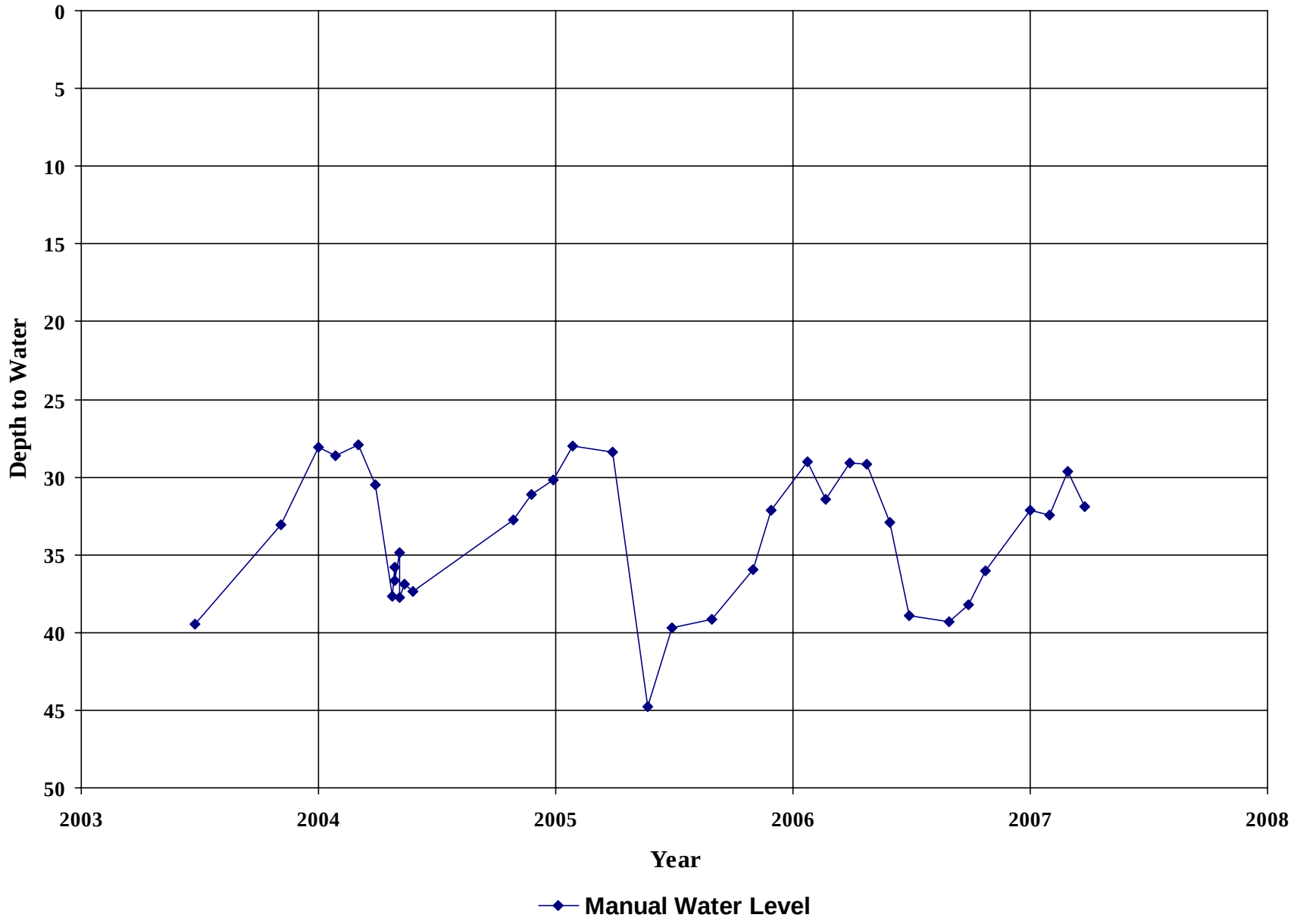


Water Level in 3239 Doyle

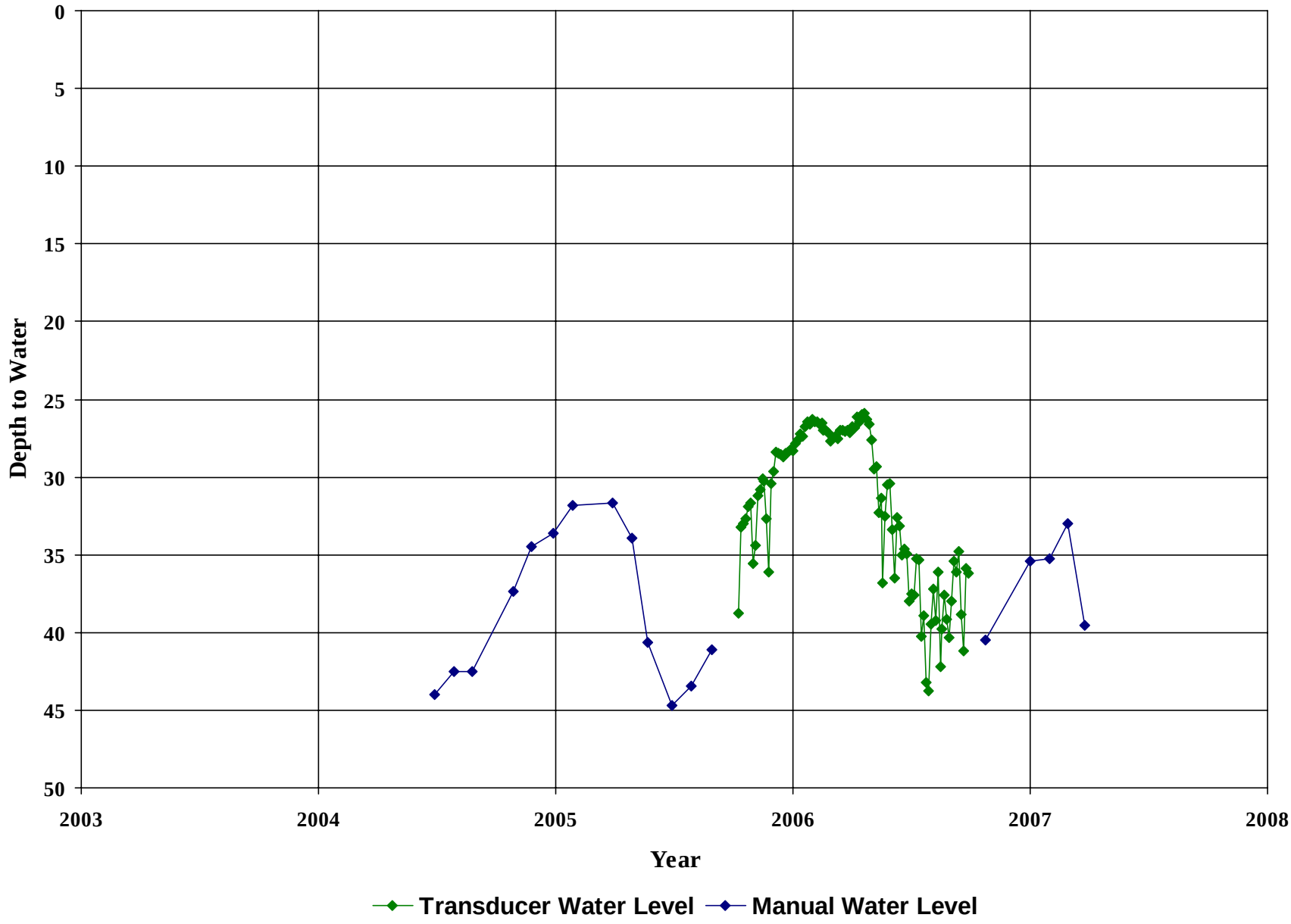
Well Depth: 125 ft



Water Level in 21 Lozoya

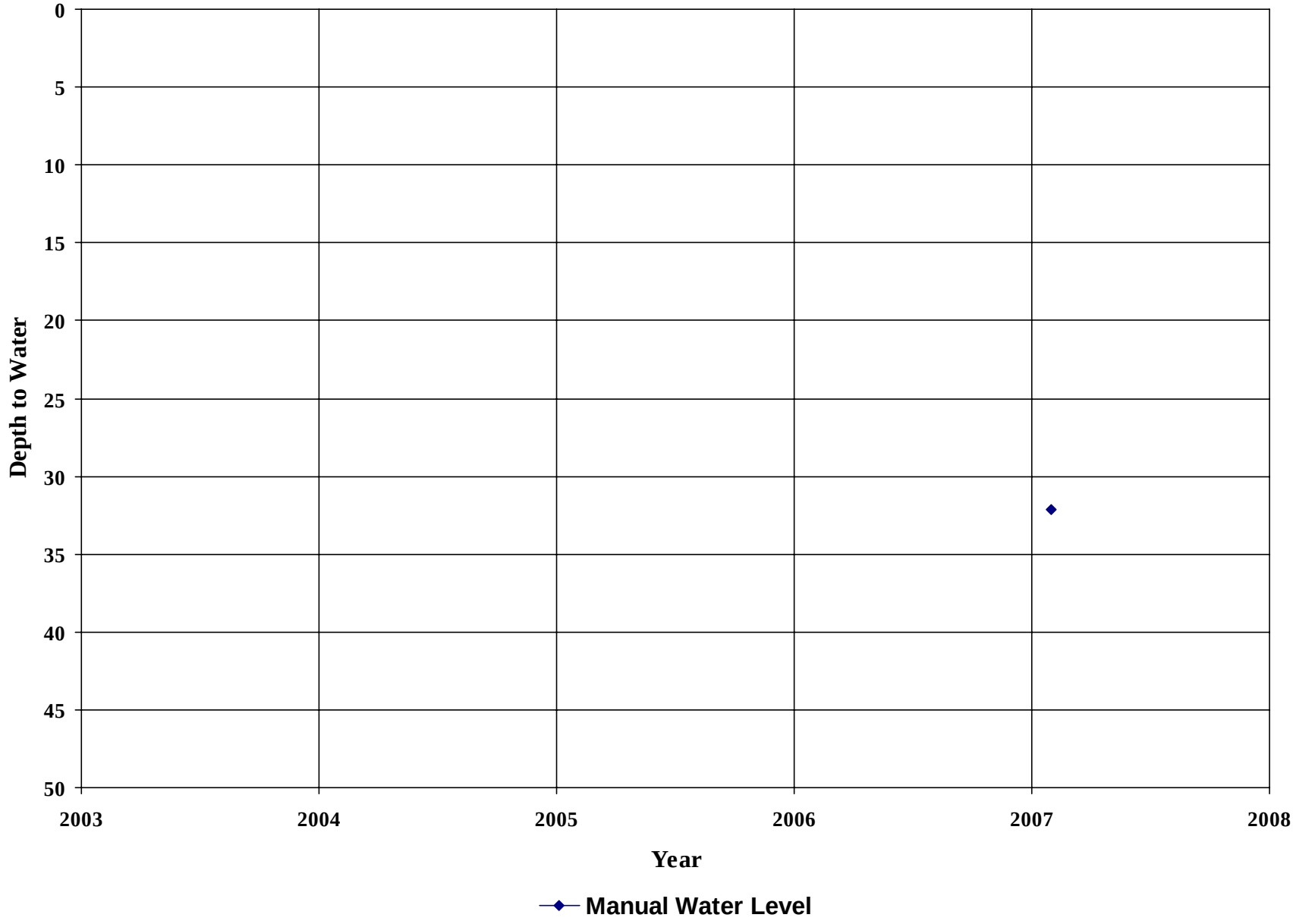


Water Level in 185 Lozoya



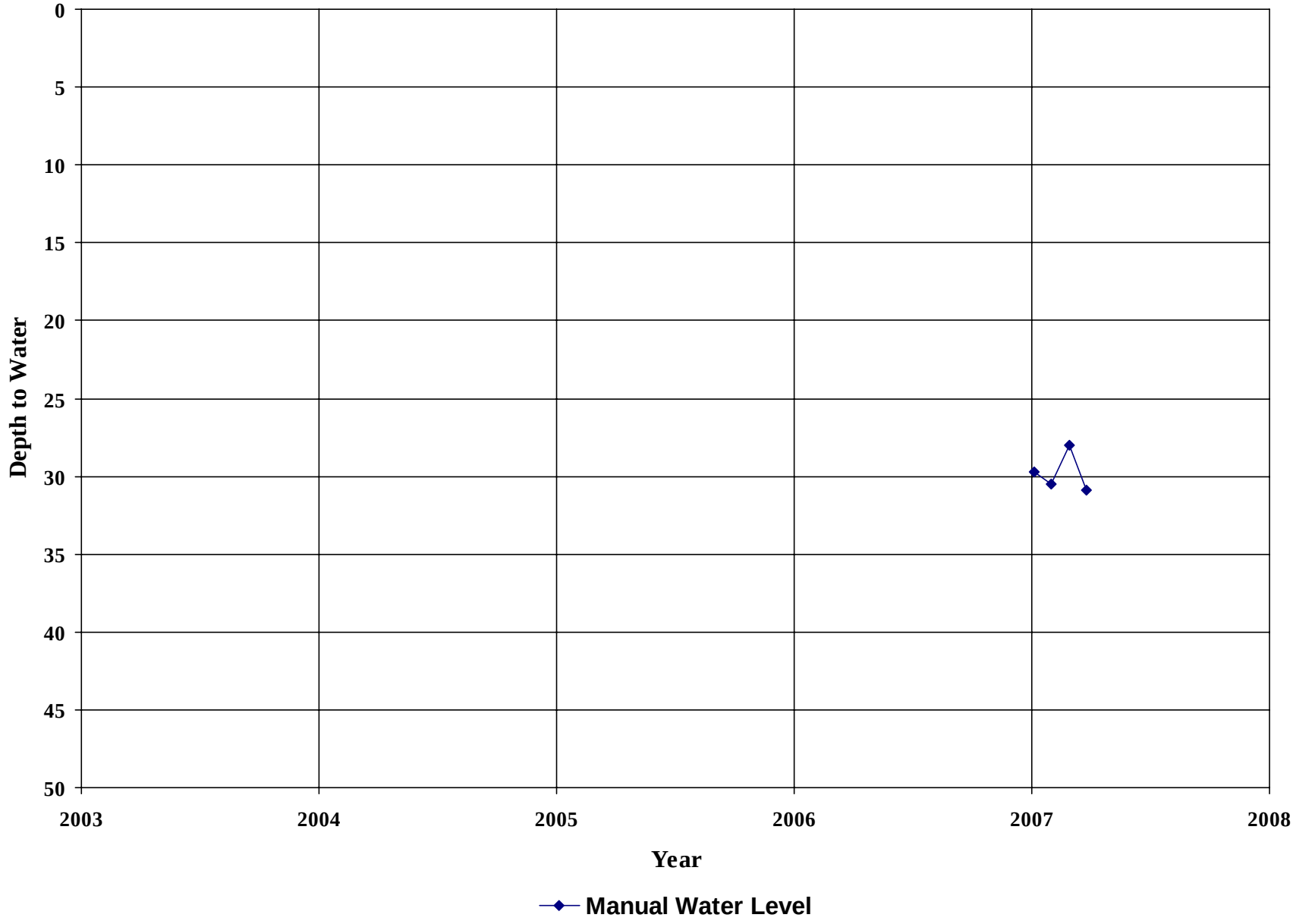
Water Level in Knightsen School District (#3)

Perforation: 395-415 ft
Well Depth: 415 ft



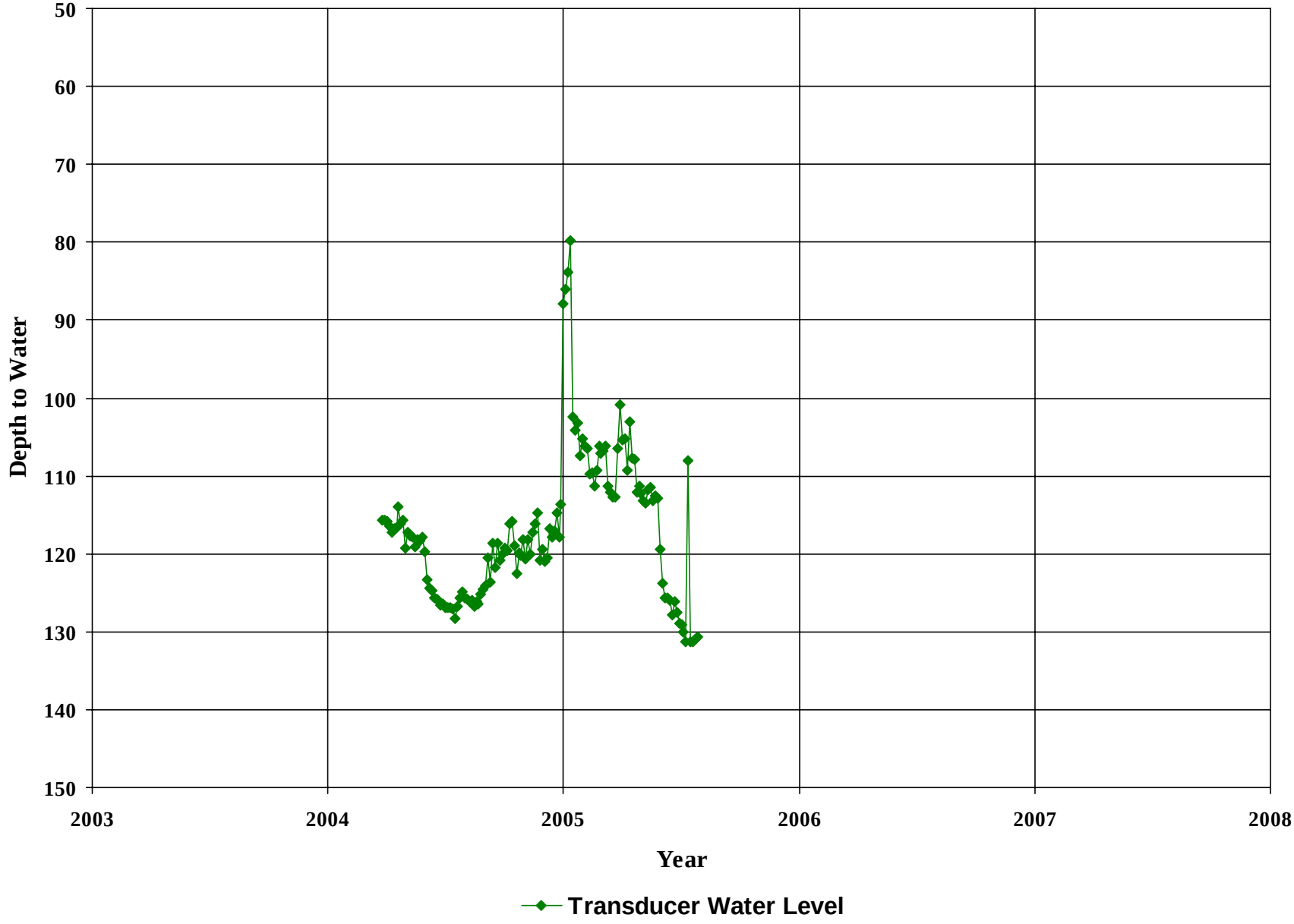
Water Level in Knightsen School Irrigation (#2)

Perforation: 167-191, 210-230 ft
Well Depth: 230 ft



Water Level in Brentwood MW-14 Deep

Perforation: 284-315 ft
Well Depth: 324 ft



Appendix C

Water Quality Data for
Diablo Water District and Vicinity

Table C
Groundwater Quality Data for Diablo Water District

Well Owner and Name	Date	EC[1] (µmhos/cm)	TDS (mg/L)	pH	Total Alkalinity[2] (mg/L)	Cations				Anions					Trace Elements							
						Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	SO_4 (mg/L)	Cl (mg/L)	HCO_3[2] (mg/L)	NO_3[2] (mg/L)	F (mg/L)	As (µg/L)	Ba (ug/L)	B (ugL)	Cu (ug/L)	Fe (ug/L)	Mn (ug/L)	Se (µg/L)	Zn (ug/L)
		900/1600[a]	500/1000[a]	6.5-8.5[b]	--	--	--	--	--	250/500[a]	250[a]	--	45[c]	2[c]	10[d]	1000[c]	1000[e]	1300[c]	300[a]	50[a]	50[c]	5000[a]
GLEN PARK WELL	05/04/04	930	-	8	240	60	31	100	<2	160	72	-	<2	0.3	3	<100	-	<50	<100	<20	<5	<50
GLEN PARK WELL	07/05/06	993	620		-	-	-	-	-	-	-	-	-	-	-	-	1200	-	-	-	-	-
GLEN PARK WELL	10/19/06	-	-		-	-	-	-	-	-	-	-	-	-	-	-	1400	-	-	-	-	-
SOUTH PARK WELL STANDBY	06/06/06	940	560	7.7	270	56	24	100	1.4	110	88	330	<2	0.3	<2	<63	1800	<50	210	140	<5	<50
WELL 01 - STANDBY	01/07/92	1400	940	7.7	240	70	43	140	4.4	350	130	240	4.5	1.1	2.2	ND	800	2	52	145.4	2.4	ND
WELL 01 - STANDBY	07/13/92	1750	1090	7.8	240	110	57	170	5.1	430	160	240	15	0.3	ND	ND	900	ND	ND	76	ND	20
WELL 01 - STANDBY	10/06/92	-	1040	7.6	243	69	51	180	5.2	420	150	243	14	0.32	3.3	ND	900	ND	ND	58	ND	ND
WELL 01 - STANDBY	04/05/93	1440	920	7.8	230	88	43	140	4.7	360	140	230	6.5	ND	2.1	ND	ND	ND	ND	71	ND	34
WELL 01 - STANDBY	07/20/93	1550	1030	7.7	247	74	46	178	4.8	420	150	247	6.8	ND	3.9	ND	700	ND	25	180	ND	23
WELL 01 - STANDBY	10/05/93	1490	970	7.8	239	85	60	140	4.6	390	140	239	5.8	ND	3.1	ND	740	2.8	ND	150	ND	ND
WELL 01 - STANDBY	01/04/94	1460	930	7.7	236	82	37	160	4.7	360	140	236	3.3	0.21	5.2	ND	860	ND	ND	270	ND	ND
WELL 01 - STANDBY	04/05/94	1470	890	7.8	240	81	48	150	4.4	320	140	240	5.4	0.26	3.7	ND	650	8	ND	240	ND	ND
WELL 01 - STANDBY	12/08/97	1780	1020	7.64	245	85	53	150	4	390	180	245	10.3	0.34	<2	<100	920	<4	<100	62	<5	<50
WELL 01 - STANDBY	07/13/99	1730	1120	7.73	240	130	55	180	5	400	190	240	13	ND	-	ND	780	-	ND	-	-	ND
WELL 01 - STANDBY	08/08/00	1680	1080	7.55	234	119	58	184	6	360	200	234	6.6	0.33	4.2	<100	900	<50	<100	62	<5	<50

1. Electrical conductivity at 25 C

2. Total alkalinity reported as $CaCO_3$.

Water Qualily Limits

a) California Secondary MCL (recommended/upper level)
b) US EPA Secondary MCL
c) California Primary MCL
d) US EPA Primary MCL
e) California DHS Action Level for Drinking Water

SUMMARY OF WATER QUALITY DATA
DIABLO WATER DISTRICT AREA

ANALYTE	UNITS	MCL	Willow Park Marina		Knightsen[b]	Delta Coves			Rock Island Marina 6610			Brentwood Well 14				Glen Park	Creekside
			No. 1[a]	No. 2[a]		MW So.203[c]	MW So.328[c]	MW No.605[c]	Prod Well[d]	MW278[e]	MW630[e]	Production[f]	MW154[g]	MW240[g]	MW324[g]	MW[h]	MW250[i]
CATIONS																	
Calcium	mg/L		17	15	63.3	59	43	14	48	53	26	75	61	64	73	58	80
Magnesium	mg/L		13	11	27	35	21	5.5	20	21	14	38	21	24	34	34	46
Potassium	mg/L		3	2.8	1.5	3.6	3	2.1	1.7	1.5	3.4	3.5	1	2	4	2.3	3.9
Sodium	mg/L		260	230	88.7	130	320	240	110	99	330	180	54	62	140	100	170
Total Hardness	mg/L		120	100	264	290	190	59	140	250	150	340	240	260	320	290	390
ANIONS																	
Bicarbonate Alkalinity	mg/L		260	265	229	350	300	220	330	260	220						
Chloride	mg/L	250/500[2]	230	190	67	150	320	170	72	82	360	120	68	77	87	74	210
Fluoride	mg/L	2.0[1]	0.73	0.69	0.36			<0.1	0.3	0.28	<0.10	.4	.4	.4	.3	.3	0.4
Nitrate (as NO3)	mg/L	45[1]	<0.1	<0.1	5.5	<1.0	<1.0	<1.0	<2.0	<0.10	<0.10	5.3	9.2	9.5	9.2	3.3	4.2
Sulfate (as SO4)	mg/L	250/500[2]	150	130	130	89	200	190	92	100	240	300	39	56	230	160	270
Total Alkalinity	mg/L		260	265	229	280	240	180	270	260	220	210	210	220	230		199
PHYSICAL PARAMETERS																	
pH	pH units	6.5/8.5[4]	8.15	8.19	7.61	7.8	7.9	8.1	7.7	7.96	8.04					7.8	7.9
Specific Conductivity	µmhos/cm	900/1600[2]	1,460	1,310	890	1,200	1,800	1,300	890	900	1,800	1400	680	740	1200	920	1,500
Total Dissolved Solids	mg/L	500/1000[2]	874	778	520	690	1,100	770	560	560	1,100	880	390	460	740	570	910
Turbidity	NTU	5[2]	0.36	0.86	0.27		0.88		0.38	<0.16	<0.16						
INORGANICS																	
Aluminum	mg/L	1[1]/0.2[3]	0.055	0.066	<0.010		<0.05		<0.050	<0.050	<0.050						
Antimony	mg/L	0.006[1]	<0.003	<0.003	<0.001		<0.006		<0.006	<0.005	<0.005						
Arsenic	mg/L	0.05[1]	0.013	0.013	<0.003		0.01		<0.002	<0.005	<0.005						
Barium	mg/L	1[1]	<0.1	<0.1	0.0351		<0.1		<0.1	0.079	0.069						
Beryllium	mg/L	0.004[1]	<0.0002	<0.0002	<0.0005		<0.001		<0.001	<0.004	<0.004						
Boron	mg/L	1[3]	4	3.6	1.6					2.6	5.2	1.4	.4	.5	1.3		
Cadmium	mg/L	0.005[1]	<0.0001	<0.0001	<0.0005		<0.001		<0.001	<0.0005	<0.0005						
Chromium	mg/L	0.05[1]	0.016	<0.001	0.012		<0.01		<0.001	0.035	<0.010						
Copper	mg/L	1.0[2]	0.091	0.007	0.006	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010						<0.050
Cyanide	mg/L	0.2[1]			<0.1		<0.005			<0.010	<0.010						
Iron	mg/L	0.3[2]	0.14	0.14	0.0112		<0.1	<0.1	0.23	0.074	<0.010	<0.100	<0.050	<0.050	0.090		<0.1
Lead	mg/L	0.015[3]	0.0053	<0.002	<0.001		<0.005		<0.005	0.003	0.003						
Manganese	mg/L	0.05[2]	0.11	0.1	0.037		0.2	0.088	0.15	0.13	0.13	<0.030	0.14	0.15	0.100		0.064
Mercury	mg/L	0.002[1]	<0.0002	<0.0002	<0.0002		<0.001		<0.001	<0.0002	<0.0002						
Nickel	mg/L	0.1[1]	0.039	<0.002	<0.005		0.015		0.011	<0.010	<0.010						
Selenium	mg/L	0.05[1]	<0.005	.0054	0.0050		<0.005		<0.005	<0.005	<0.005						
Silver	mg/L	0.1[2]	<0.0005	<0.0005	<0.0005	<0.010	<0.010	<0.010	<0.010	<0.001	<0.001						
Thallium	mg/L	0.002[1]	<0.001	<0.001	<0.0005		<0.001		<0.001	<0.001	<0.001						
Zinc	mg/L	5.0[2]	0.27	<0.050	0.0118	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020						

[1] - *Primary MCL*
[2] - *Secondary MCL (recommended/upper range)*
[3] - *Action Level*
[4] - *Suggested lower/upper acceptable range*
< = ND at DLR

a - Contra Costa Water District (10/6/97 - sample date)
b - Contra Costa Water District (10/23/00 - sample date)
c - LSCE (8/19/03 - report date)
d - Diablo Water District (01/18/03 - report date)
e - Diablo Water District (01/30/02 - report date)
f - City of Brentwood (11/03/00 - report date)
g - City of Brentwood (04/26/99 - report date)
h - Diablo Water District (11/20/01 - report date)
i - Diablo Water District (4/25/03 - report date)

Appendix D

Current Groundwater Monitoring Program

Appendix D
Current Groundwater Monitoring Program[1]
Diablo Water District

Wells				Aquifer	Water Levels		Water Quality[2]		Production Metered
Type	Location	ID	Use		Manual	Transducer	General Mineral, Physical, Inorganics, Organics	Nitrate	SCADA[3]
DWD Wells	Glen Park	Glen Park Well	Production		-	-	Triennial	Annual	Yes
		Glen Park MW	Monitoring	Deep	Monthly	-	-	-	-
	Rose Avenue	Corporation Yard	Unused Production		-	-	every nine years	every nine years	-
	Summer Lake	North Well	Non-operational		-	-	-	-	-
		South Park	Stand-by Production	Deep	Monthly	-	Triennial	Annual	Yes
	Creekside	Creekside MW	Monitoring	Deep	Monthly	-	-	-	-
Community Water System Wells	Knightsen	Knightsen Well	Production	Deep	Monthly	-	Triennial	Annual	No
	Beacon West	Beacon West Well	Production		-	-	Triennial	Annual	No
	Rock Island Marina	East Well	Production		-	-	Triennial	Annual	Yes
		West Well	Production	Deep	Monthly	-	Triennial	Annual	Yes
	Willow Park Marina	Well 1	Production		-	-	Triennial	Annual	No
		Well 2	Production		-	-	Triennial	Annual	No
	Willow Mobile Home Park	Willow Mobile Home Park Well	Production		-	-	Triennial	Annual	No
	Delta Mutual	East Well	Production	Deep?	Monthly	-	Triennial	Annual	No
		West Well	Production			-	Triennial	Annual	No
Private	Private Domestic	3071 Doyle	Domestic	Shallow	Monthly	-	-	-	-
		3080 Doyle	Domestic	Shallow	Monthly	-	-	-	-
		3200 Doyle	Domestic	Shallow	Monthly	-	-	-	-
		3239 Doyle	Domestic	Deep?	Monthly	-	-	-	-
		3340 Doyle	Domestic	Shallow	Monthly	-	-	-	-
		21 Lozoya	Domestic	Deep?	Monthly	-	-	-	-
		185 Lozoya	Domestic	Deep?	Monthly	Yes	-	-	-
		3199 Crismore	Domestic	Shallow	Monthly	-	-	-	-
	Knightsen Elementary School	Knightsen School District (#3)	Domestic	Deep	Monthly	-	-	-	-
		Knightsen School Irrigation (#2)	Irrigation	Deep	Monthly	-	-	-	-

1. The water level Monitoring Program includes seven wells monitored by others; six shallow ECCID piezometers (5-22, 5-33, 5-35, 5-36, 5-37, and 5-39), and one deep well Brentwood MW-14.
2. Does not include weekly monitoring of the distribution system for coliform bacteria, chloride residual, etc..
3. SCADA: Supervisory Control and Data Acquisition

Appendix E

Well Construction Information, Diablo Water District and Vicinity

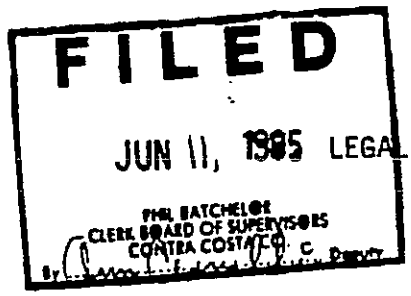
Appendix E
Well Construction Information
Diablo Water District and Vicinity

Well Type	Location Name(s) (ownership)	Well ID	Use/ Status	Owned by DWD	Operated by DWD	Well log No.	Year Drilled	Total Depth (feet)	Casing (in)	Perf-oration (feet bgs)	Seal ft bgs	Cap-acity (gpm)	Specific Capacity gpm/ft	No. of Connec-tions	Metered	Future Inter-tie with Main Water System?	Notes
DWD Wells	Glen Park	Glen Park Well	Primary Supply for DWD	Yes	Yes		5/1/2004	315	16	230-245 260-300	200	700-1,400	10-15		yes	yes	
		Glen Park MW	Monitoring Well				2001	560	8	220-230 260-290	190			-	-	-	
	Rose Avenue Corporation Yard	Corporation Yard Well	Standby Production				7/11/77	170	12	100-		1,100					
	Summer Lake (previously Cyprus Lakes)	North Well	Non-Operation Production				6/30/2005	308	16	206-246 266-281	135		30	n/a			Used as stand-by well only due to high Fe-Mn.
		South Park Well	Stand-by Production				6/15/2005	323	16	204-264 284-299	140		27.5	n/a		yes	Mn=140 ug/L (6/05), 2ndary MCL=50 ug/L
		South Park MW	190			E013881	6/9/2004	190		170-180	160			-	-	-	Mn=250 ug/L (6/04), 2ndary MCL=50 ug/L
			260					260		215-255							Mn=200 ug/L (6/04), 2ndary MCL=50 ug/L
			380					380		360-370							Mn=150 ug/L (6/04), 2ndary MCL=50 ug/L As=12 ug/L (6/04), MCL=10 ug/L
		North MW	165			E013882	5/27/04	165	2	150-160	130						Mn=330 ug/L (6/04), 2ndary MCL=50 ug/L
			235					235	2	220-230							Mn=220 ug/L (6/04), 2ndary MCL=50 ug/L
			290					290	2	270-280							Mn=220 ug/L (6/04), 2ndary MCL=50 ug/L
	Creekside	Creekside MW	Monitoring			E002337	4/8/2003	380	2	230-240	188						
Community Water System	Knightsen M-25	Knightsen Well	Production	Yes	Yes		11/15/1990	305	10	235-55 275-95	150			13	no	no	
	Beacon West M-26	Beacon West Well	Production	Yes	Yes	327495	1991	260	8	230-260	225			22	no	no	
	Rock Island Marina Subdivision 6610	East Well (#1)	Production	Undetermined at this time	Undetermined at this time	802087	12/20/02	324	12	240-270 284-292	208		30	70	yes	no	Has current Fe-Mn treatment system.
		West Well (#2)	Production			802086	12/20/02	320	12	240-270 284-292	203		30		yes		
		MW-shallow	Monitoring				12/2001	278	2	248-268	205			NA	NA	NA	
		MW-deep	Monitoring				12/2001	630	2	555-565 610-620							
	Willow Park Marina M-27 Subdivision 4490	Well 1	Production	Yes	Yes	323222	9/13/1989	400	8	250-310	240			100	no	no	No current treatment system. Possible future As treatment.
		Well 2	Production			323223	9/21/1989	340	8	250-310	240						Wells located within about 50' of each other.
	Willow Mobile Home Park M-28	Willow Mobile Home Park Well	Production	No	Yes	413188	10/6/1992	410	8	292-332	200						
	Delta Mutual	West	Production	No	Yes									100			
		East	Production														DWD contracted for maintenance
Brentwood Wells	Well 6		Production	No	No		1987	305	16	250-300	222	750	30				
	Well 7		Production				1988	300	16	265-295	178	750	10				
	Well 8		Production				1993	325	16	225-315	210	1,000	20				
	Well 9		Emerg. & Park Irrigation				4/22/1993	230	8	210-230	200	300					Domestic well for park irrigation, high nitrates, blend to use in emergency.
	Well 14	Well 14	Production			716526	11/3/2000	340	16	285-315	245	1,000	13				
		MW-1 (deep)	Monitoring				1999?	324	2	284-314	98						
		MW-2 (int.)	Monitoring					240	2	200-210 220-230							
		MW-3 (shallow)	Monitoring					154	2	114-144							
	Well 15	Well 15	Production			804384	8/2004	345	12	239-259 289-324	188		3.1				
Private Wells Monitored by DWD	Knightsen Elementary School	Knightsen School Domestic (#3)	Production			725554	03/29/05	415	6	395-415	350						Supply for school
		Knightsen School Irrigation (#2)	Irrigation			427852	4/9/92	230	8	167-191 210-230	165						
	Private	3080 Doyle	Domestic			no		60									Well depth from field notes
		3239 Doyle	Domestic			no		(PSD 125)									Well depth from field notes
ECCID Monitoring Wells	East Contra Costa Irrigation District	ECCID 5-22	Monitoring	No	No			20									Shallow wells monitored by ECCID twice a year, spring and fall.
		ECCID 5-33	Monitoring					20									
		ECCID 5-35	Monitoring					20									
		ECCID 5-36	Monitoring					20									
		ECCID 5-37	Monitoring					20									
		ECCID 5-39	Monitoring					20									

Appendix F

Contra Costa County Well Construction Ordinance and Permit Guidelines

LEGAL NOTICE



LEGAL NOTICE LEGAL NOTICE

Proposed regulations of the Contra Costa County Health Officer governing installation of a small water system, and an individual water system, for domestic use pursuant to Chapter 414-4 of the Ordinance Code of Contra Costa County.

Adopted by: William Walker MD
William Walker, M.D.
Health Officer
Contra Costa County

June 12, 1985
Date

June 26, 1985
Effective Date

These regulations were filed with the Clerk of the Board of Supervisors and posted in the Department of Health Services on June 12, 1985.

These regulations are to make more certain specific sections of the Contra Costa County Ordinance Code. Not all of the ordinance sections are described in these regulations as parts of the ordinance require no further explanation. Ordinance text is not reprinted herein.

414-4.20 GENERAL

1. Application for all proposed Subdivisions (Major and/or Minor) must comply with the following:

   a. Each parcel must have an "on site" producing well having a minimum yield of three (3) gallons per minute with a bacterial and chemical quality in compliance with the State standards for a pure, wholesome and potable water supply. (Title 22, Section 64433). If the chemical analysis exceeds the State standards for "maximum contaminant

levels" for water potability, a statement must be attached and "run with the property deed" advising of these levels

-or-

b. Have verifiable water availability data from adjacent parcels presented by the applicant or knowledge of the same, known by this Division concerning water quality and quantity per (a) above

-and-

Have a statement that "attaches and runs with the deed" indicating that a water well shall be installed on the subject parcel complying with the general requirements stated above prior to obtaining a Building Department permit for construction.

c. In addition to the above, a hydro-geological evaluation may be required in known or suspected water short areas. This will include seasonal as well as yearly variations.

(1) The purpose for requesting hydrogeological evaluations is to determine the total projected numbers of dwelling units that can be supplied with drinking water from existing aquifers. The two primary circumstances that would generally require hydrogeological evaluations are:

(1.1) Where a proposed major subdivision contemplating the addition of large numbers of dwelling units on individual wells would substantially increase the density within an existing drainage basin. Hydrogeological data relevant to recharge of aquifers and projected yield

would become essential not only to support approval of large major subdivisions under these circumstances, but also to ensure that the water supplies serving existing structures would not be depleted by the proposed increased demand.

(1.2) In those cases where density is increasing in particular drainage basins due to the build out of previously approved subdivisions using individual wells for water supplies and existing well yields begin to evidence declines due to the increased demand. In these circumstances, or in water short basins, hydrogeological studies would be appropriate as a condition for subsequent development to provide sufficient data to protect existing uses and assure sufficient yield for proposed uses. Specific reasons will be stated in support of requested hydrogeological evaluations in each case.

414-1.202 APPROVED WATER SUPPLY SYSTEM

The requirements of Titles 17 and 22 of the California Administrative Code apply to small water systems and individual systems are not subject to these requirements.

414-1.204 LICENSED WELL DRILLER

The class of license required shall be determined by the State of California licensing agency. The Health Officer shall refer any inquiries regarding the licensing requirements to the licensing agency in writing. The decision of the licensing agency shall be the sole criteria for the Health Officer's acceptance or rejection of any license.

414-1.206 ABANDONED WELL

The Health Officer shall maintain a log of all known abandoned or inactive wells. The owner of the well shall be required annually to declare his intentions to use the well again or the well shall be permanently abandoned.

414-1.208 SMALL WATER SYSTEMS

Fees for applications to construct a small water system are an amount equal to three times the annual license fee for the proposed system plus individual permit fees for any new well(s) included as part of the proposed system. The charge that is based on the annual license fee shall be considered as a deposit to cover the Health Officer's costs of plan checking and making construction inspections. Any money remaining in the deposit fund on completion of construction shall be refunded to the applicant.

414-1.210 SMALL WATER SYSTEM - APPROVED SOURCES

The Health Officer's approval or denial of the water source shall be based on laboratory analysis of the water. If the water does not meet the requirements for domestic water, the applicant or operator shall provide water from an alternate source meeting the requirements or install treatment facilities acceptable to the Health Officer.

414-1.212 SMALL WATER SYSTEM - DISTRIBUTION

(d) Backflow protection. Backflow protection devices shall be installed when the property has an auxiliary source of water. Any other sources of real or potential backflow from auxiliary water sources or other contaminants shall be eliminated as directed by the Health Officer.

(f) Location of pipes. Water mains shall not be installed in the same trench as sanitary sewers. Water lines from buildings to the water meter or street main may be installed in the same trench as the house sewer when the sewer is constructed of material approved for use under the building. The standards adopted by the State Department of Health Services for separation of water mains and sewers, and the Uniform Plumbing Code Regulations for building sewer and water lines are adopted as a part of these regulations.

414-1.214 INDIVIDUAL WATER SYSTEMS

Chemical - physical analysis of the water may be required when there is evidence the water may not be suitable for domestic use. If tests indicate the water contains contaminants that pose a direct and immediate hazard to health, the water will not be approved for domestic use. When the water contains secondary constituents in excess of recommended standards, the Health Officer shall notify the property owner in writing but use of the water as a source of supply for an individual system may not be disapproved.

414-1.216 QUANTITY

Yield tests shall be required when there is no historical evidence to document well yield. Yield tests shall include the rate of water discharged and measurements of drawdown in the well.

On low yield wells where recharge and discharge reach equilibrium within thirty minutes of the beginning of the test, the rate of discharge shall be measured for four hours and be accompanied by hourly measurements of drawdown to verify the static or dynamic level of water in the well column does not fluctuate.

High yield wells are defined as those wells that will sustain a yield of at least twice the minimum quantity required for the proposed property development. On high yield wells, where recharge and discharge do not reach equilibrium until one hour after the beginning of the test, measurement of pump discharge may be limited to one hour after equilibrium is reached with a minimum of two measurements of drawdown at 30 minute intervals. Yield tests shall be reported on a form provided by the Health Officer. See attached Exhibit "B". Other methods of determining well yield may be accepted when the production requirements for the well are signifcantly less than the probable yield of the well as determined by a bailer test or historical data of the area where the well is located. The historical data must be acceptable to the Health Officer. The data must also be supported by a pump test for the specific well being evaluated. The pump test shall be for a minimum of two hours and the volume discharged shall be reported to the Health Officer.

414-1.218 WELLS - PERMIT REQUIRED

(a) The applicant for a permit shall specify who will perform the basic well construction which includes drilling, casing, sealing the annular space and providing a secure cover or cap for the well. The applicant shall also specify the party responsible for well development which includes yield tests and water quality analysis if required by the Health Officer and installation of the pump, sanitary seal, and concrete platform.

(b) The Health Officer shall provide permit cards that will allow for signoff or approval of the two phases of well installation described in the preceding. The Health Officer shall maintain a log of permits issued and investigate each application 12 months after issuance of a permit if the party responsible for Phase 2 has not requested a final inspection during the 12 months following permit issuance. See the attached Exhibit "A".

(c) A copy of the Department of Water Resources reporting form will be acceptable to meet the requirement for certification of the protection of the aquifers penetrated during construction of the well. The DWR form is required prior to the signoff of Phase I - Construction. The Department of Health Services shall submit copies of yield tests (pump tests) when completed prior to final approval of well permit (Phase II) upon receipt to DWR, when required by that state agency.

414-1.220 WELLS-SITE

No well shall be located any closer to the areas identified below except on written approval of the Health Officer. Other hazards will be evaluated and well setback requirements will be established by the Health Officer as needed.

With the exception of property lines, all distances are upslope from the well:	Private Wells	Public Wells
Property Line (unsewered area)	50 feet	50 feet
Septic Tank	100 feet	100 feet
Sewer Lines	50 feet	50 feet
Stream, Ditch, or Drainage Channel	50 feet	50 feet
Subsurface Leaching Device	100 feet	100 feet
Livestock Area	25 feet	25 feet

414-1.222 WELLS - PROTECTION

1. No additives shall be used in drilling mud that have not been approved by the State Department of Health Services. Chlorination of wells shall be done as described in Appendix C, Department of Water Resources Bulletin 74-81.
2. All well casings shall be new and meet the following requirements:
   a. Well casing shall be strong enough to resist the forces imposed on it during installation and service life.

b. Additives to accelerate the curing of cement shall not be used when thermoplastic casing is used.

c. Bentonite (up to 8 percent) shall be added to cement seals to reduce the heat of hydration when thermoplastic casing is used.

d. All casing shall meet the conditions described in Section 12, State of California, Department of Water Resources, Bulletin 74-81.

3. Sealing of the annular space shall be performed in strict compliance with the requirements described in Section 9, California Department of Resources Bulletin 74-81. The Health Officer shall be notified at least 24 hours in advance of the installation of the seal. The seal shall be placed in one continuous mass starting from the bottom of the space to be grouted and continuing upward. The depth of the seal shall be as described below:

a. All wells shall be sealed to prevent contamination from surface sources. The minimum depth of the seal for this purpose shall be fifty (50) feet. For wells drilled to a shallow depth, where a (50) foot seal is not possible, the Health Officer shall determine the depth of the seal after consultation with the driller and a review of all pertinent information.

b. All wells shall be sealed to prevent the interchange of water between aquifers when this interchange would result in degradation of the quality of water in one or more aquifers. One example is where high nitrate levels have been identified in the more shallow aquifers.

c. Wells installed in areas where the producing aquifer or strata is not overlain with impervious material, shall be sealed to the producing aquifer. This requirement is particularly applicable to, but may not be limited to, delta peat/sand formations.

4. A completed copy of the latest revision of DWR Form 188, submitted to the Health Officer, shall serve as the driller's certification of the protection of the aquifers penetrated during drilling and completion of the well.

414-1.224 ABANDONMENT OF WELLS

a. Temporary abandonment (inactive).

The well must have no defects which will allow the degradation or contamination of the water quality in the well or in the water bearing formations penetrated by the well.

The top of the casing shall be securely capped.

The well shall be marked so it can be clearly seen.

The area around the well shall be kept clear of brush or debris.

b. Permanent abandonment.

All wells shall be destroyed in such a way that they will not act as a conduit for the infiltration of surface drainage or shallow depth groundwaters into groundwater aquifers. Shallow depth groundwater is water that is found above the first usable aquifer.

1. Obstructions shall be removed, if possible, prior to filling the hole. If the obstruction is hardware, and cannot be removed, a tremie pipe will have to be passed below the obstruction to place sealing material to the full depth of the well.
2. The casing shall be perforated, as necessary, to seal any annular space or voids.
3. In dug wells, as much of the lining as possible shall be removed prior to filling the well.
4. Wells shall be filled from the bottom up. The method used shall not allow for free fall, dilution or separation of the sealing material.

5. All wells shall be filled so as to prevent interaquifer flow through the well or around the outside of the casing. The casing shall be perforated to its full depth.

6. Special care must be exercised in wells having a significant producing flow. In such cases, the casing must be perforated opposite the area to be sealed and the sealing material forced into the surrounding formation under pressure.

7. Gravel packed wells shall be sealed so as to force the sealing material into the gravel pack under pressure.

8. The person sealing the well shall verify that the volume of material placed in the hole is at least equal to the volume of the empty hole.

9. Sealing materials used shall be impervious. Acceptable materials include:

   a. Bentonite

   b. Neat cement- one bag of cement to 5 to 7 gallons of water.

   c. Cement grout - two parts of sand and one part of Portland cement to 5 to 7 gallons of water.

   d. Concrete - the mixture shall contain a minimum five sacks of Portland cement per cubic yard.

10. Native soils shall not be used as sealing material.

11. Materials containing organic matter shall not be used.

12. All abandoned wells shall have a hole excavated around the well casing to a depth of six feet. The well casing shall be removed to this depth and the sealing material shall be allowed to spill over and provide a cap at least one foot thick over the cut end of the casing.

13. If there is an annular space between the casing and the hole, the upper 50 feet of casing must be removed. If this is not possible, the casing must be ripped from a depth of 50 feet for a distance of five feet upward. The ripped portion shall then be filled by pressure grouting to form a grout plug in the annular space. The casing shall then be ripped above the grout plug and pressure grouting repeated until grout returns to the surface in the area between the drilled hole and the well casing.

414-1.226 ENFORCEMENT - PUBLICATION OF REGULATIONS

The Health Officer shall distribute copies of proposed changes in regulations to the drilling industry and other interested parties requesting notification in writing. Copies of proposed regulations shall be mailed to the requesting parties thirty (30) days prior to filing the regulations with the Clerk of the Board of Supervisors. The letter transmitting the proposed regulations to the well drilling industry shall indicate the date the regulations will be filed with the Clerk of the Board.

414-1.228 WATER WELL DRILLERS - REPORTING FORM

The Health Officer shall provide the well drilling industry with reporting forms that may be used to report violations of the water supply ordinance and Health Officer's regulations. The use of these forms is not mandated by these regulations. See the attached Exhibit "C".

EXHIBIT "A"

WELL PERMIT

Contra Costa County Health Services Department

Date of Permit: _____ Permit Expires: _____

Basic Well Construction (Phase 1)

Drilling _____

Casing _____

Sealing _____

Capping _____

DWR _____

Well Development (Phase 2)

Yield Test _____

Water Quality Analysis _____

Pump Installation _____

Sanitary Seal _____

Concrete Platform _____

The inspector shall note N.A. (not applicable) for items not required for this installation.

EXHIBIT "C"

To: WELL DRILLERS

Re: Groundwater Sources

The Contra Costa County Water Supply Ordinance strongly emphasizes the need for protection of the County's groundwater sources from degradation that could result from inadequately constructed, defective, or improperly abandoned wells. To assure appropriate surveillance of the construction and abandonment of water wells requires the support of the well drilling industry and other concerned citizens. The lower portion of this form can be used to report your concerns and any incidents involving wells that you feel should be investigated by Health Services staff to assure protection of groundwater supplies.

East-Central County
To: Contra Costa County Health Services
Environmental Health Division
1111 Ward Street
Martinez, CA 94553

West County
To: Richmond Health Center
Environmental Health Division
100 - 38th Street
Richmond, CA 94805

1. Date and nature of problem observed:

_____

_____

_____

2. Exact location of incident:

_____

_____

3. Your name, address and phone number:

_____

_____

(It is not necessary that you complete Item 3. This information is necessary if you desire a report describing the results of the staff investigation.)

EXHIBIT "B"

WATER WELL PUMP TEST REPORT

Contra Costa County Health Services Department

Name of Well Permit Applicant: _____

Name of Property Owner: _____

Parcel Number: _____

Mailing Address: _____

Date of Test: _____

Time Test Was Started: _____

Time Required to Reach Equilibrium Between Recharge and Discharge: _____

Total Time Pump Test Was Continued After Equilibrium Was Reached: _____

Drawdown Measurements Including Distance to Water Level and Time of Day:

	Time	Drawdown
1.		
2.		
3.		
4.		
5.		
6.		

Ordinance Code of Contra Costa County, California

Title 4. Division 414

Approved Water Supply Systems

Effective Date: August 1981

CHAPTER 414-4 APPROVED WATER SUPPLY SYSTEMS

ARTICLE 414-4.2 GENERAL

414-4.201 GENERAL. WATER SUPPLY SYSTEM – APPROVAL REQUIRED. Any person proposing to subdivide or develop any property needing water for domestic purposes shall demonstrate an approved water supply and obtain written approval from the health officer for such development.

414-4.202 PURPOSE AND DISCLAIMER. This chapter is enacted to provide for the protection of the County's groundwater sources from degradation that could result from inadequately constructed, defective, or improperly abandoned wells, to provide for regulation of small water systems in accordance with federal standards as mandated by the State, and to require submission of tentative subdivision maps and building permit applications to the Health officer for him to review the availability of an approved water supply prior to the recordation of final maps and issuance of building permits. Notwithstanding the foregoing, by enacting this chapter, the County of Contra Costa neither assumes or undertakes any obligations or responsibilities of any kind to assure, guarantee, preserve, or otherwise guard the adequacy, potability, or any other qualitative or quantitative feature of the County's groundwater sources in any manner whatsoever, and no cause of action against the County, its agents, directors, or employees shall be deemed to accrue under any theory whatsoever on the basis of the enactment of this chapter or any subsequent amendment thereto.

414-4.203 DEFINITIONS. As used in this chapter, the following words and phrases shall have the meanings given in this chapter:

414-4.205 APPROVED WATER SUPPLY SYSTEM means any system, approved by the health officer, or the California Department of Health Services, as meeting the requirements of Titles 17 and 22, the California Administrative Code.

414-4.207 CROSS-CONNECTION means any actual or potential unprotected connection as defined in Title 17, California Administrative Code.

414-4.209 CUSTOMER SYSTEM includes those parts of the facilities beyond the termination of the utility system which are used to convey water to points of use.

414-4.211 DISTRIBUTION SYSTEM includes the facilities and conduits used for the delivery of water from the source to the customer's system.

414-4.213 FURNISH OR SUPPLY has its usual meaning, except that it does not include furnishing or supplying water to a user for domestic purposes other than for human consumption if the user receives the water, by pipe or otherwise, directly from an open irrigation canal system; nevertheless, it does include furnishing or supplying water to any small water system, connected by an integrated pipe system owned and operated by the supplier.

414-4.215 HEALTH OFFICER, unless otherwise modified, means the health officer of this County, his/her medical deputies, his/her Environmental Health Inspectors, and his/her other duly authorized representatives.

414-4.217 INDIVIDUAL WATER SYSTEM means an approved water source and system of piping designed to provide water for domestic use and which serves (a) one single family residence; or (b) two single family residences on one parcel; or (c) one structure serving less than 25 persons more than 60 calendar days per year.

414-4.219 SITE EVALUATION means the investigation of a lot or subdivision to determine the feasibility of using an individual water system or a small water system.

414-4.221 SMALL WATER SYSTEM means a system which furnishes water for domestic purposes to from two through one hundred ninety-nine service connections and shall include "Public Water Systems" as defined in California Health and Safety Code Section 4010.1 and its applicable regulations under Title 22 of the California Administrative Code. Two single family residences on one parcel shall not be considered a small water system.

414-4.223 SOURCE FACILITIES include all components of the facilities used in the production, treatment, storage, and delivery of water to the distribution system.

414-4.225 WATER SOURCE means a source of water supply for any water system, including, without limitation, wells, springs, ponds, lakes, surface streams, irrigation ditches or canals, and potable water obtained from other sources including large public water systems.

414-4.227 USER means any person using water for domestic purposes, except any person processing water or selling, serving, hauling, furnishing, or supplying water to the public in any manner.

414-4.229 UTILITY SYSTEM means a water system consisting of source facilities, treatment facilities, and distribution system, and includes all other facilities of the water system under the complete control of the supplier, up to the point where the customer's system begins.

414-4.231 WELL means any well, public or private, including without limitation, wells serving County and State small water systems, individual domestic use wells, industrial wells, agricultural wells, recharge or injection wells, air conditioning wells, horizontal wells, permanent test wells, dewatering wells and cathodic protection wells.

414-4.233 LICENSED WELL DRILLER means a person licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professional Code) to drill water wells.

414-4.235 WELL DRILLING means the act(s) by any person, including without limitation, the property owner and/or licensed well driller, to dig, drill, bore, excavate, or drive a well.

414-4.237 DOMESTIC USE means water that is intended for human consumption. The terms *domestic purposes* and *human consumption* mean the same as domestic use when they appear in this chapter.

414-4.239 ABANDONED WELL means a well which has not been used for a period of one year, unless the owner has declared his intention to use the well again. Wells that are to be used again shall be adequately protected, and marked, and the area around the well shall be kept clear.

414-4.241 SUBDIVISION MAPS

(a) *Tentative Maps.* Pursuant to Title 9, a copy of any submitted tentative subdivision map shall be forwarded to, and filed with the health officer for investigation of domestic water supply. The tentative map shall show proposed provisions for sewage disposal, source of approved water supply, number of lots, the size of each lot, and contour lines at intervals of five (5) feet or less.

(b) *Health Officer Approval.* The health officer shall review the filed tentative map for compliance with this chapter and in a timely manner report his conclusions thereon, together with any conditions recommended to insure such compliance, to the planning department and advisory agency.

(c) *Final and Parcel Maps.* Final and parcel maps shall not be recorded unless the conditions recommended by the health officer and established by the advisory agency on approval of the tentative map have been satisfied.

ARTICLE 414-4.4 SMALL WATER SYSTEMS

414-4.401 SMALL WATER SYSTEMS – PERMIT REQUIRED

(a) Every person proposing to install, construct, and/or operate a small water system shall first apply to the health officer for approval of the water source and utility system. The application shall be accompanied by complete plans and specifications with appropriate fees.

(b) The health officer shall approve, conditionally approve, or deny the application on the basis of compliance with this chapter and the health officer's regulations.

(c) Upon approval of the completed installation of the water system by the health officer, he shall issue a water supply permit and a public health license to operate the system.

414-4.403 SMALL WATER SYSTEM – INVESTIGATION, SITE EVALUATION. Upon receipt of an application for the construction or operation of a small water system the health officer shall make the necessary investigation and/or site evaluation of the proposed or existing system and all other circumstances and conditions the health officer deems material. The health officer may order repairs, alterations, or additions to the proposed or existing system to insure that the water furnished or supplied shall at all times meet the requirements of Sections 414-4.413, 414-4.415 and 414-4.417 herein. The health officer may require any permit holder or applicant to make a complete report on the condition and operation of the small water system owned, operated, or contracted for by the permit holder or applicant.

414-4.405 SMALL WATER SYSTEM – BACK-FLOW PREVENTION. Every person furnishing or supplying water to users shall prevent water from unapproved sources, or any substance, from entering the small water system.

414-4.407 SMALL WATER SYSTEM – DESIGN AND CONSTRUCTION. All small water systems shall be designed and constructed so as to comply with applicable A.W.W.A. Standards and generally accepted engineering practices.

414-4.409 SMALL WATER SYSTEM – APPROVED SOURCES REQUIRED. All water sources for small water systems shall comply with the requirements of Title 22, the California Administrative Code and may be used only after approval of the health officer.

414-4.411 SMALL WATER SYSTEM – DISTRIBUTION RESERVOIRS. Distribution reservoirs shall be adequately protected against contamination. Adequately ventilated housing may be required by the health officer to protect the facilities from the elements and unauthorized entry.

414-4.413 SMALL WATER SYSTEM – DISTRIBUTION SYSTEM.

(a) *Pressure-Quantity.* The distribution system shall be of adequate size and designed in conjunction with related facilities to maintain a minimum water pressure of twenty (20) pounds per square inch at every point during periods of maximum normal demand. The quantity of water delivered to the distribution system shall be sufficient to supply adequately, dependably, and safely the total requirements of all users under maximum consumption.

(b) *Flushing.* Dead-end runs shall be provided with means of flushing, and shall be flushed frequently enough to assure that the water will be kept safe, wholesome, and potable for human consumption. The design of the small water systems shall provide for elimination of dead-end runs wherever practicable.

(c) *Materials.* Materials used in the distribution system shall be able to withstand with ample safety factors, all internal and external forces to which they may be subjected.

(d) *Back-flow protection.* Each service connection from an approved water supply system shall be protected against backflow of water from a non-approved system.

(e) *Fire hydrants.* Fire hydrants shall conform to requirements of local authority.

(f) *Location of pipes.* No water pipe shall be laid in the same trench with sanitary sewers.

(g) *Disinfection of pipes.* All pipes or conduits, or parts, newly constructed or repaired before being placed in service, shall be completely disinfected in accordance with American Water Works Association Procedures for Disinfecting Water Mains.

(h) *Marking of pipes.* Where the premises contain dual or multiple water systems and piping, the exposed portions of pipes shall be painted, branded, or marked at sufficient intervals to distinguish the pipes which carry water safe for human consumption.

414-4.415 SMALL WATER SYSTEM – OPERATION AND MAINTENANCE.

(a) *Personnel.* All personnel responsible for operation and maintenance shall have sufficient experience and training to qualify them properly their duties. When water is treated the water system shall be operated by personnel having special skills in the appropriate areas and acceptable to the health officer.

(b) *Maps and Records.* Complete and current maps of the utility system shall be maintained. Complete and current records shall be kept showing results of bacteriological and chemical analyses of water and other data required by the health officer.

(c) *Maintenance.* Facilities and equipment of the utility shall be kept clean and in good working condition. Leaks shall be repaired as soon as practicable. Proper equipment, tools, and repair parts shall be available in good condition for all types of emergency repairs.

414-4.417 SMALL WATER SYSTEMS – QUALITY, QUANTITY.

(a) *Quality.* All water systems shall meet the primary Drinking Water Standards contained in Title 22 of the California Administrative Code. The secondary Drinking Water Standards contained in Title 22 of the California Administrative Code shall be met by all public water systems, subject to any current waivers or other authorized exception. All examinations of water required by this ordinance shall be performed by a laboratory approved by the California Department of Health Services.

(b) *Quantity.* Sufficient water shall be available from the water sources and distribution reservoirs to supply adequately, dependably and safely the total requirements of all users under maximum daily demand conditions. Requirements for a small water system shall be determined from the total source capacity, total storage volume and the total number of service connections. The procedures for determining quantity shall be in accordance with the specifications contained in Division 4, Chapter 16, Article 2, Title 22 of the California Administrative Code.

ARTICLE 414-4.6 INDIVIDUAL WATER SYSTEMS

414-4.601 INDIVIDUAL WATER SYSTEM – QUALITY, QUANTITY.

A. Quality:

1. *Bacteriological.* The water from an individual system, installed for domestic use, shall be examined by the health officer on completion of the system. Subsequent testing shall be performed by a laboratory approved by the California Department of Health Services and at the expense of the owner of the individual water system. The water tested shall be bacteriologically acceptable for domestic use.

2. *Chemical.* An analysis for specific organic or inorganic chemical constituents in the water may be required when there is evidence that such constituents may be present and which are considered by the health officer to be a risk to human health.

3. *Physical.* Tests for odor, color, turbidity, pH or other physical properties of the water may be required when there is evidence the water may not be acceptable or potable for human consumption.

B. Quantity:

Applications for building permits or certificates of occupancy for a structure requiring an individual water supply system, shall prior to their issuance be submitted to the health officer for review to determine if the water supply source will provide minimum of quantities in accordance with the following:

1. *Wells.* Sustained yield or pumping tests may be required by the health officer. The well yield shall be determined from pumping tests or historical data acceptable to the health officer. The well or wells shall yield a minimum three (3) gallons per minute and minimum storage capacity of one thousand (1000) gallons in a storage tank shall be provided. No storage is required if the well yield is five (5) gallons per minute or greater. Sustained yield tests, when required, shall be conducted in accordance with the procedures described in Title 22, Section 64563 of the California Administrative Code.

2. *Other surface sources.* Yields and required storage capacity shall meet the same minimum requirements as for wells. Adequate documentation that the surface sources are perennial shall be provided.

C. Director of Building Inspection:

When the building inspection director is advised by the health officer that it has not been demonstrated that a water source exists complying with this chapter and that such lack is a danger to or likely to cause public health problems, he may withhold issuance of the requested building permit or certificate for a structure.

414-4.603 INDIVIDUAL WATER SYSTEM – LOT AREA, VARIANCES.

(a) *Lot Area.* The health officer shall require each structure that needs both an individual water system and an individual sewage disposal system to be on a lot whose area, exclusive of natural impediment and surface and underground easements, is at least forty-thousand (40,000) square feet.

(b) *Variances.* The health officer may grant variances from Subsection (a) when he finds the following conditions to be met:

1. The lot otherwise will comply with the requirements of this Division and the health officer's regulations; and

2. The variance will neither create, nor contribute to the creation of a public nuisance.

414-4.605 INDIVIDUAL WATER SYSTEM – INVESTIGATION, SITE EVALUATION. The health officer shall make the necessary investigation and/or site evaluation of the proposed development and all other circumstances and approve, or deny the proposed development on the basis of compliance with this chapter and corresponding regulations.

ARTICLE 414-4.8 WELLS

414-4.801 WELLS – PERMIT REQUIRED.

(a) Every person proposed to dig, drill, bore, or drive any water well, or rebore, deepen, cut new perforations in, or seal the aquifers of any existing well, before commencing work, shall apply to the health officer for approval of the well site and method of installation and construction and for a permit to do the work. If a well driller is hired it is his responsibility to see that a permit is obtained. The application shall be on forms furnished by the health officer and shall contain the information he may require.

(b) The permit shall expire on the one hundred eightieth (180) calendar day after date of issuance if the work has not been started and reasonable progress toward completion is not maintained, but the health officer may extend the expiration date when delay is warranted.

(c) The health officer shall approve, conditionally approve, or deny the application and issue or withhold the permit accordingly, on the basis of compliance with this chapter and his regulations.

(d) Upon completion of the drilling, repairs, alterations, or additions of the well and before a final approval of the well for use, a log of the well shall be submitted to the health officer. Where minor or insignificant repairs, alterations or additions are made, the health officer may waive the requirement for a log.

414-4.803 WELLS – REPAIRS, ALTERATIONS OR ADDITIONS. The health officer may order repairs, alterations, or additions to the existing source or system to insure that the water furnished or supplied shall at all times be pure, wholesome and potable and without danger to human health.

414-4.805 WELLS – SITE. The site of every well shall be adequately drained and located a safe distance from any sources of pollution or contamination; this distance is dependent upon the character of the soil, location of pollution sources, and slope of the ground.

414-4.807 WELLS – PROTECTION.

(a) Adequate means shall be provided to protect the well from contamination during construction, reconstruction, or alteration. Newly constructed or repaired wells and necessary distribution systems shall be adequately chlorinated following construction or repair work.

(b) Surface construction which protect the well from contamination shall be provided when determined necessary by the health officer.

(c) The health officer shall be notified at least twenty-four (24) hours in advance of the installation of the seal of the annular space between the casing and excavation. All wells shall be sealed in accordance with the procedures outlined in Part 2, Section Nine of California Department of Resources Bulletin Number 74. All wells shall be sealed to the depth of the first impervious soil formation in addition to all other requirements of Bulletin Number 74.

(d) The well driller shall complete a certification of the protection of the underground aquifers he has penetrated during drilling and competition of the well. The certification shall be made on a form provided by the health officer and shall be signed by the well driller under penalty of perjury and shall indicate the contractor or driller license number. The work performed in the protection of the underground aquifers shall be done in conformance with California Department of Water Resources Bulletin Number 74, found well drilling practice, current published data or other references documented with the certification.

414-4.809 WELLS – ABANDONED. To prevent the contamination of ground waters and other dangers, every person wholly or partially responsible for abandoning a well or having entire or partial right of ownership or possession of the land or premises on which an abandoned well is situated shall destroy the well as specified in Part III, Section 23 of the State of California, Department of Water Resources, Bulletin Number 74.

ARTICLE 414-4.10 ENFORCEMENT

414-4.1001 ENFORCEMENT – PROHIBITIONS.

(a) No person subdividing and/or developing any property needing water for domestic use shall so use the property until he has demonstrated an approved water supply.

(b) No person shall drill a water well whether for domestic use, irrigation, agricultural or other purposes, without first applying for and receiving a valid, unrevoked, unsuspended permit to do so from the health officer.

(c) No person shall drill, reconstruct, repair or destroy a well for hire unless he is licensed well driller.

(d) No person shall operate a small water system without filing a written application with the health officer and receiving and possessing a valid, unrevoked, unsuspended water supply permit and public health license.

(e) No person shall maintain a cross-connection with a small water system operated for domestic use.

(f) No person shall supply water for domestic use until the results of the tests required by the health officer of bacteriological, chemical and physical analyses, performed by a laboratory certified by the State Department of Health Services, are submitted to the health officer and show that the water meets state safe drinking water quality standards and all other criteria established by the health officer through his regulations.

(g) No person shall modify, add to, or change an approved water supply system without the prior written approval of the health officer.

414-4.1003 ENFORCEMENT – PUBLICATION OF REGULATIONS. The health officer may make and publish regulations to make more detailed or specific the provisions of the chapter. These regulations shall become effective two (2) weeks after filing with the clerk of the Board of Supervisors and posting in the County Health Department. The health officer shall be responsible for the execution of this chapter.

414-5.1005 ENFORCEMENT – RIGHT OF ENTRY. To enforce this chapter, the health officer may enter and inspect any premises, operations or work regulated hereby, at reasonable times and with such notice to the owner, occupant, operator, applicant, licensee, or permittee, as is reasonable and practicable under the circumstances. In conducting such inspections the health officer is authorized to proceed pursuant to the Code of Civil Procedure Sections 1822.50 and following.

414-4.1007 ENFORCEMENT – NUISANCE ABATEMENT. Any installation made or condition existing in violation or this chapter or of standards or regulations established under Section 414-4.1003 is declared to be a public nuisance, and its maintenance, operation, and existence may be abated in a civil action.

(a) *Notice; Hearing.* Except in instances of necessity or emergency, when the health officer declares a public nuisance, he shall promptly so notify the owner of the property by certified mail to the owner's address on the assessment roll. The notice shall state the condition and reason for the declaration, and shall also state that the owner of the property has thirty (30) days after the mailing of the notice within which to abate the nuisance, failing which the health officer may have the nuisance abated and the owner shall be liable for the cost thereof. The notice shall also state that if owner objects to the health officer's declaration, the owner may request a hearing before the health officer to determine whether a public nuisance exists. The notice shall further indicate that the request for the hearing must be received by the health officer prior to the expiration of the time set for abatement, and the hearing shall be held within thirty (30) days after the request is received by the health officer. County abatement is suspended by the filing of a request for hearing, pending the final decision of the health officer.

(b) *Costs.* If the health officer has a nuisance abated, the health officer shall promptly so notify the property owner, including a statement of costs and of the owner's rights to a hearing thereon. The notice mailing and the time period for hearing requests and hearing shall be those in subsection (a). Upon fixing the costs (after hearing or in absence of request therefore), the health officer shall proceed according to law to impose the costs on and collect them from the property

owner and/or the property. These procedures do not affect the county's right to collect these costs from any other person responsible therefore under law.

414-4.1009 ENFORCEMENT – EMERGENCY ACTION. Where the health officer, makes a written finding that the public health is endangered by some act, omission, or condition regulated by this chapter, in connection with any premises or operation licensed under this chapter, the health officer may order the immediate cessation of the act, abatement of the condition, or action to correct the condition. The health officer may order the temporary emergency suspension of the applicable permit and its removal from the person or premises, and the health officer may post notice of this action in a conspicuous place. Emergency suspension, as distinct from any other action authorized by law, is effective for a period of five days, including the first day on which the permit is suspended. During that period, any activity regulated by this chapter is unlawful. At the end of that period, or sooner if a finding is made that the public health is no longer endangered, the permit becomes valid again unless a hearing is ordered.

414-4.1011 ENFORCEMENT – PERMIT SUSPENSION. Where a written complaint is filed with the health officer that some applicable law or regulation is being violated by any person, premises or operation required to be licensed under this chapter, the health officer may order a hearing, and after hearing may suspend the permit for not more than ninety (90) days, or until the health officer is assured of compliance with applicable laws or regulations, whichever is less, and the health officer may post notice of this action in a conspicuous place. At the end of the period, or when the health officer is satisfied of compliance, the permit becomes valid again. During that period any activity regulated by this chapter is unlawful.

414-4.1013 ENFORCEMENT – PERMIT REVOCATION. A permit maybe revoked and confiscated if it has been suspended once and if violations of this chapter or other applicable laws or regulations or acts or omissions endangering the public health continue, or if the health officer or one of the health officer's medical deputies makes a written finding that correction of the situation is impracticable and that public health is endangered thereby. The health officer may post notice of this action in a conspicuous place.

414-4.1015 ENFORCEMENT – HEARINGS. In cases of hearings under Section 414-4.1011, notice must be written and delivered to the person involved or in charge of the premises or operation at least forty-eight (48) hours before the hearing. Other hearings ordered by the health officer must be preceded by written notice, personally delivered or mailed to the person to whom the permit was issued at the latest address on file with the health officer not less than five (5) nor more than fifteen (15) days before the hearing date. These hearing shall be in the main office of the County Health Department, unless some other location is specified in the notice. These hearings shall be conducted by the health officer or one of the health officer's medical deputies, and may not be continued or postponed for longer than ten (10) days from the original date without consent of the permittee.

414-4.1017 ENFORCEMENT – APPEALS.

(a) A person objecting to or disagreeing with any decision made pursuant to Sections 414-4.403 and 414-4.605, and /or the pertinent regulations thereto, may appeal the decision to the health officer. All requests for this appeal hearing shall be in writing and must received by the health officer within ten (10) days after notice of the decision was mailed. All requests for the appeal hearing must be accompanied by the appropriate fee. A hearing on the appeal shall be held within fifteen (15) days after the request for appeal is received by the health officer.

(b) Appeals may be taken from the results of any hearing held pursuant to Sections 414-4.109, 414-4.1011, 414-4.1013, 414-4.1015 and Subsection (a) to the Board of Supervisors by a written notice of appeal stating fully the matters or action appealed from and the grounds for the appeal. The notice shall be filed with the clerk of the Board within fifteen (15) days of the action appealed from. The Board shall then schedule the appeal for a hearing within thirty (30) days of the filing of the notice of appeal.

414-4.1019 ENFORCEMENT – PENALTIES. Any person violating this chapter or regulations issued hereunder, by failing to submit plans, obtain necessary inspections and approvals, or pay fees, or by commencing or continuing construction or remodeling in violation hereof, shall pay triple the appropriate fee as a penalty and remain subject to other applicable penalties and enforcement procedures authorized by the state law and/or this code.

414-4.1021 ENFORCEMENT – OTHER REQUIREMENTS. A permit or license issued under this chapter does not relieve the permittee or licensee from compliance with applicable federal, state, or local laws and regulations or other required permits or licenses.

414-4.1023 GUARANTEE OF PERFORMANCE.

(a) *Performance Bond.* Prior to the issuance of a permit, the applicant shall post with the health officer a cash deposit or bond guaranteeing compliance with the terms of this Chapter and the applicable permit, such bond to be in an amount deemed necessary by the health officer to remedy improper work but not in excess of five thousand dollars ($5,000.00).

(b) *Continuous Performance Bond.* In lieu of furnishing a separate bond for each permit as provided above, a licensed contractor may deposit with the health officer a surety bond or cash deposit in the amount of five thousand dollars ($5,000.00), which bond or cash deposit shall be available to the county to remedy any improper work done by the contractor pursuant to any permit issued under this chapter.

ARTICLE 414-4.12 FEES

414-4.1201 GENERAL. The following non-refundable fees shall be paid to health officer at the time of filing for or requesting an investigation, test, inspection or permit required by this Chapter. No fees are required when the health officer receives from the applicant a written statement by a district or city governing body indicating that an approved domestic water supply is available and adequate to handle the additional volume of water required for the proposed improvement.

CONTRA COSTA
HEALTH SERVICES

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ENVIRONMENTAL AND GEOTECHNICAL WELLS AND SOIL BORINGS

Introduction

This handout is intended as a general guideline for processing permits for environmental and geotechnical wells and soil borings. This includes, but is not limited to, cone penetrometers, inclinometers, piezometers, extraction wells, recovery wells, monitoring wells, temporary wells, hydropunch soil borings and soil borings drilled for geotechnical purposes (whether or not groundwater is encountered). It is not intended as a substitute for familiarity with applicable laws and regulations.

Well Permits

A permit is required to construct or destroy an environmental or geotechnical well or soil boring. Each well or boring requires a separate permit. Permit applications are available from Contra Costa Environmental Health. Permits are non-transferable and valid for six months.

Well Drillers

Contra Costa County requires that any well work be performed by a licensed well contractor (C-57 licensee) who has proof of Worker's Compensation Insurance and a $5,000 performance bond on file with the Environmental Health office.

Permit Processing

1. Well permit applications should be filled out as completely as possible to facilitate permit processing. The applications should include proposed well construction, a detailed map or plot plan and be accompanied with the appropriate permit fees. The information provided will be used to determine the suitability of the well site(s) and proposed method of work. If necessary, a site visit may be conducted to verify that the well locations are acceptable. The map or plot plan should indicate distances between the proposed wells/borings from structures and/or known or potential sources of contamination.

2. Applications for well destructions should include a copy of the Well Completion Report for the well construction, if available.

Construction and Destruction

Once the permit has been issued the authorized work can begin. A copy of the approved permit and map should be kept at the job site for reference.

Upon the setting of the well, Contra Costa Environmental Health will inspect the installation of the annular seal. Generally, annular seal depths should be a minimum of 10 feet to 50 feet, depending on the depth of the well. The seal material must be cement or concrete in accordance with Bulletin 74-81 or an approved bentonite that is specifically formulated as an annular sealing material and mixed to the manufacturer's specifications. If bentonite is used, the final two feet must be an approved cement or concrete mixture. Contact this office for a list of approved materials.

The seal material must be tremmied when using bentonite or sealing annular spaces or cavities 30 feet or greater in depth or in the presence of water. The placement of sealing material for borings, hydropunch sampling, cone penetrometer testing and well destructions will be inspected. For well destructions the top fifty (50) feet of casing must first be removed.

The geologist and/or the well contractor are responsible for contacting Contra Costa Environmental Health to schedule inspection appointments. The greater the advance notice the more likely a mutually convenient appointment time can be arranged. 24 hours notice with confirmation verbally or in writing with the respective specialist is necessary to schedule field inspections.

Final Approval

After Contra Costa Environmental Health has approved the installation of an annular seal or the destruction of a well, a Well Completion Report (DWR form 188) signed by the responsible geologist or well driller must be submitted to this office. A boring log is required for borings, hydropunch sampling and cone penetrometer testing.

Upon satisfactory inspection of work and approval of the reports, final approval of the wells/borings will be granted.

INITIAL APPROVED _____
☐ CONDITIONS

Well System

CONTRA COSTA
HEALTH SERVICES

CONTRA COSTA
ENVIRONMENTAL HEALTH DIVISION
2120 DIAMOND BOULEVARD, SUITE 200
CONCORD, CA 94520
(925) 646-5225
www.cocoeh.org

WELL PERMIT APPLICATION

Type of Work:
- ☐ New Well (69) _____
- ☐ Repair (69)
- ☐ Abandonment (68)
- ☐ CPT / Inclinometer (01)
- ☐ Soil Boring (01)
- ☐ Piezometer w/ casing (67)
- ☐ Piezometer w/o casing (66)
- ☐ Flow Test (99)

Proposed Use:
- ☐ Domestic
- ☐ Public / Small Water System
- ☐ Agricultural
- ☐ Industrial
- ☐ Monitoring
- ☐ Other _____

Sewage Disposal (off-site):
- ☐ Septic System
- ☐ Sewer System _____

(ATTACH PLOT PLAN – For instructions see "The Well Permit Process" handout)

PLEASE PRINT CLEARLY. *REQUIRED FIELDS MUST BE COMPLETED.

*Legal Owner's Name		
*Owner Address		
*City/ State/ Zip	Country	Owner Telephone
*Owner Billing Address (if different from above)		
*Site Name (if different from owner address)	*Assessor's Parcel #	Subdivision/Minor Subdivision #
*Site Address (if different from owner address)		Lot/Parcel #
*Contractor's Name	*License #	*Site Telephone
*Contractor's Mailing Address		*Contact Person's Telephone
*Consultant/Mailing Address		*Consultant's Telephone

*Construction/Destruction Specifications

Diameter of well casing _____ Casing Material _____ Gauge _____ Annular seal depth (50 feet minimum) _____

# of Soil Borings _____ Borehole Diameter _____ Boring Depth (b.g.s.*) _____

Gravel/Sand packed ☐ Yes ☐ No Conductor casing ☐ Yes ☐ No Depth _____ Diameter_____

Type of material for annular seal/destruction (specify mix or product): ☐ Bentonite ☐ Concrete ☐ Cement

Method of drilling/destruction/Other: _____

Variance ☐ Yes ☐ No (Required for water well seals less than 50 feet b.g.s./monitoring well seals less than 10 feet b.g.s.)
*b.g.s. = below ground surface

Performance Bond Requirement. (Contra Costa County Ordinance, Title 4 Health and Safety, Article 414-4.10; Section 414-4.1023 (a))
Prior to the issuance of a permit, the applicant shall post with the health officer a cash deposit or bond guaranteeing compliance with the terms of this chapter and the applicable permit, such bond to be in an amount deemed necessary by the health officer to remedy improper work but not in excess of five thousand dollars.

I hereby certify that the above information and submitted plans are true and correct and that the proposed work will comply with all permit conditions and applicable laws and regulations. I agree to obtain all required inspections, maintain a copy of the approved permit and plans at the job site until final approval, and obtain written authorization prior to deviating from the approved permit or plans, or placing the well in service. The issuance of this permit by Contra Costa Environmental Health Division does not guarantee a satisfactory and an indefinite operation of any well system.

_____ _____
Signature of Contractor (C–57 Licensee) Date

FOR OFFICE USE ONLY

Facility ID#:	PR#:	P/E#: 43 ____	Census Tract:	REHS:
Amount Due: $ _____ Amount Paid: $ _____		Receipt #:	Received By:	
Check #: / CASH / Credit Card: ☐ MC ☐ VISA		Date Received:	Supervisor:	

FOR OFFICIAL USE ONLY

WELL WORKBOOK

APN: _____/_____/_____ SUBDIVISION/MINOR SUBDIVISION #: _____ LOT/PARCEL #: _____

Type of Work: ❑ New Well ❑ Repair ❑ Abandonment ❑ Soil Boring ❑ Piezometer ❑ Inclinometer
❑ Cone Penetrometer (CPT) ❑ Other _____

Proposed Use: ❑ Domestic ❑ Public ❑ Agriculture ❑ Industrial ❑ Monitoring
❑ Small Water System* ❑ Cathodic ❑ Dewatering
❑ Other _____

***Small Water System Type:** ❑ Well ❑ Reservoir ❑ Distribution System ❑ Treatment Facility

GPS: Longitude _____ Latitude _____

Well Variance Granted: ❑ Approved ❑ Denied ❑ Not Applicable

❑ WELL CONSTRUCTION INSPECTION _____ (Inspector's Initial)

Total Depth _____ feet Bore Hole Diameter _____inches Well Casing Diameter _____inches
Gravel/Sand Pack Depth _____feet Annular Seal Depth _____feet
Conductor Casing Depth _____feet Conductor Casing Diameter _____feet
Static Water Level _____feet ❑ Unknown Static Water Level
Annular Seal Material _____
All "Depths" are below ground surface (bgs).

❑ WELL DESTRUCTION INSPECTION _____ (Inspector's Initial)

Number of Wells _____ Method of Destruction: ❑ Overdrilling ❑ Perforation
Type of Casing: ❑ PVC ❑ Steel ❑ Other _____
Type of Well: ❑ Cable Driven ❑ Gravel/Sand With Annular Seal ❑ Monitoring ❑ Cathodic
❑ Other _____
Well Diameter _____feet Depth of Well _____feet
Depth of Seal _____feet Sealing Material _____
Well Casing (bgs) _____feet Casing Diameter _____feet
Seal Material Quantity/Mix _____
All "Depths" are below ground surface (bgs).

❑ SOIL BORINGS INSPECTION _____ (Inspector's Initial)

Parcel Use: ❑ Vacant ❑ Contaminated ❑ Industrial ❑ Commercial ❑ Other _____
Number of Borings _____ Diameter of Boreholes _____inches Boring Depth _____feet
Depth of Seal _____feet Static Water Level _____feet
Seal Material Quantity/Mix _____
All "Depths" are below ground surface (bgs).

❑ MONITORING WELL INSPECTION _____ (Inspector's Initial)

Number of Monitoring Wells on Parcel: _____ Duration of Wells: _____Months or _____years
Depth of Well: _____feet Depth of Gravel/Sand Pack _____feet Depth of Seal _____feet
If more than one well, give the number of wells with in each depth range:
Number of Wells _____ at Well Depth _____feet Number of Wells _____ at Well Depth _____feet
Number of Wells _____ at Well Depth _____feet Number of Wells _____ at Well Depth _____feet
Conductor Casing Depth _____feet Conductor Casing Diameter _____feet
Static Water Level _____feet ❑ Unknown Static Water Level
Seal Material Quantity/Mix _____
All "Depths" are below ground surface (bgs).

❑ WELL FLOW TEST OBSERVATION _____ (Inspector's Initial)

Well Depth _____feet Water Level (Before Test) _____feet
Flow Test Start Time _____ a.m./p.m. Stabilized Water Level _____feet at _____ a.m./p.m. start time
End of Flow Test _____ a.m./p.m. Final Water Level _____feet Recovery Time _____
Flow Rate (Last hour average) _____g.p.m.

❑ WATER QUALITY _____ (Inspector's Initial)

Bacteriological Test: ❑ Positive ❑ Negative

Chemical Analysis: Specify _____ ❑ Acceptable ❑ Not Acceptable

Well Final Approval by: _____ Date: _____

PLACE OR ATTACH
PLOT PLAN
HEALTH AND SAFETY PLAN

CONDITIONS

FIELD NOTES

ILLUSTRATION

CONTRA COSTA
HEALTH SERVICES

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ANNULAR SEAL AND WELL DESTRUCTION MATERIALS

BENTONITE

Material/Manufacturer	Mixture (Ration)	Notes on Usage
BENSEAL/Baroid Drilling Products	50 lbs/20 gallons water	Must be used with Aqua-Grout Catalyst. Amount of catalyst depends on desired set time. Do not use a centrifugal pump for mixing.
VOLCLAY GROUT/CETCO, Inc.	50 lbs/23 gallons water	No initiator necessary. Mix with Venturi type jet hopper or commercial grout mixer.
ENVIROPLUG GROUT/WYO-BEN, Inc.	50 lbs/14 gallons water	Slurry will resemble "pancake batter" with small lumps. Double diaphragm pump recommended for mixing.

BENTONITE CHIPS – currently only authorized for use below the interval to be sealed.

Bentonite Notes:

1. The bentonite slurry must be mixed on-site from the original manufacturer's packaging.
2. Bentonite slurries must be pumped from the bottom up through a tremie pipe or hose.
3. Water used to mix bentonite slurry must be of potable quality.
4. Allow seal to settle for at least 24 hours before installing well slab.
5. Cannot be used in areas of heavy petroleum product contamination or high salt concentration.

CONCRETE/CEMENT

Neat Cement	94 lbs Portland cement/ 4 ½ - 6 ½ gal water	Will be fairly thick mixture.
Sand Cement	188 lbs (max) sand/94 lbs Portland Cement/7gallons water	Equivalent to "10.3 sack" mix.
Concrete	6 sacks Portland cement per cubic yard (Class A concrete) 5 sacks Portland cement per cubic yard (Class B concrete) 8 sacks Portland cement per cubic yard with 3/8" aggregate. Note: May require special cement pumping equipment.	

Concrete/Cement Notes:

1. Additives may be used in cement/concrete if approved by Contra Costa Environmental Health. Additives include bentonite (up to 5% by volume) and hydrated lime (up to 10% by volume). Additives must meet ASTM C494: "Standard Specification for Chemical Admixtures for Concrete". Mix bentonite in water before adding cement/concrete.
2. Cement must meet ASTM C150, "Standard Specification for Portland Cement".
3. Cement or concrete must be from "Ready-Mix" Company with weight slip or mixed on-site from original manufacturer's packaging.
4. Water used to mix cement/concrete must be of potable quality.
5. The size of any aggregate must be less than 1/5 the radial thickness of the annular seal. Aggregate must meet ASTM C33 "Standard Specification for Concrete Aggregate".

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THE WELL PERMIT PROCESS

In order to protect our groundwater resources state and local governments have established minimum standards for well constructions and destructions. These standards are necessary for public health protection and to preserve the quality of underground waters for current and future users.

A permit from the Environmental Health Division is required to construct, reconstruct or destroy a well within Contra Costa County. Wells include water wells, monitoring wells, cathodic protection wells and soil borings. State and local regulations require that any well work be performed by a licensed well contractor(C-57 license) who has proof of worker's compensation insurance and a performance bond on file with the Division.

The following is a chronological summary of the permit process:

I. Application, Plot Plan and Permit Fee

To apply for a well permit, submit a completed application, plot plan and permit fee to Contra Costa Environmental Health. Application forms are available at the Environmental Health office. If you have any questions about completing the application or preparing an acceptable plot plan, please contact our office for assistance.

The application and plot plan are used to determine the suitability of the well site and proposed method of work. Of special concern is the location of the well in relation to the possible sources of contamination and items a minimum setback distance. Both the subject and surrounding properties are considered when reviewing items requiring setbacks.

The plot plan must show the well location, property lines, sewer lines, septic systems, animal enclosures, fuel tanks, other potential contamination sources and features associated with a minimum separation distance (see attachment).

NOTE: For well destruction permit applications, the plot plan only needs to show the well location in relation to some fixed reference points (i.e. property lines or structures). If the well log is available, please submit it with the destruction permit application.

II. Site Review

If deemed necessary, Environmental Health will conduct a site visit to verify that the well location is acceptable.

III. Permit Processing

After sufficient information has been provided, Environmental Health will review the proposal to determine if it complies with applicable laws and regulations. Based on this review a permit will be issued, denied, or modification requested. If approved, a copy of the permit will be sent to the well contractor and property owner.

IV. Construction and Destruction

Once the permit has been issued the authorized work can begin. A copy of the approved permit and plot plan must be kept somewhere on the job site. This is to ensure that it is available for reference by the work crew should questions arise.

Upon completion of the well Contra Costa Environmental Health will inspect the installation of the annular seal. For well destructions the placement of sealing material will be inspected. The well contractor is responsible for contacting this Division to schedule inspection appointments. The greater the advance notice the more likely a mutually convenient appointment time can be arranged.

V. Final Construction Approval

After the annular seal has been installed the following must be completed prior to receiving final construction approval and placing the well into service:

1. Inspection of the well slab and surface construction features. After these have been installed contact Environmental Health arrange for an inspection.

2. Water analysis for coliform bacteria by a state certified laboratory. The laboratory performing the analysis must collect and transport the sample and verify that raw untreated well water was collected. Arrange for the laboratory to submit copies of all analyses results to Contra Costa Environmental Health. A list of state certified laboratories is available from our office.

   NOTE: This requirement is not necessary for monitoring wells.

3. Other water analyses if required by Contra Costa Environmental Health. You will be notified in writing of any additional water testing requirements other than for coliform bacteria.

4. Pump test if required by Contra Costa Environmental Health. You will be notified in writing if a test for sustained yield of the well is necessary.

5. Submittal of Well Driller's Report. The well contractor must submit a copy of the report to Contra Costa Environmental Health, the well owner, and the State Department of Water Resources.

VI. Final Destruction Approval

After the well has been destroyed the well contractor must submit a copy of the Well Driller's Report to Contra Costa Environmental Health, the well owner and the State Department of Water Resources prior to receiving final destruction approval.

CONTRA COSTA
HEALTH SERVICES

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WELL DESTRUCTION GUIDELINES

In order to protect groundwater resources for current and future users, the elimination of abandoned, unused or defective wells is necessary. State and local regulations govern the procedure for eliminating these wells. These requirements are applicable to abandoned wells, test holes, dry holes, cone petronometers, hydropunches and soil borings. A permit from Contra Costa Environmental Health is required to destroy a well in Contra Costa County. The law requires that such work be performed by a licensed, insured and bonded well contractor (C-57 license). **NOTE:** There is no permit fee required to destroy an existing water well if a new well is drilled. The following is a chronological summary of the destruction process:

1. Application, Plot Plan and Permit Fee
   To apply for a well destruction permit, submit a completed application, plot plan, and permit fee to Contra Costa Environmental Health. Application forms are available at the Division's office. Instructions for preparing the plot plan are on the reverse side of the application. If you have any questions about completing the application or preparing any acceptable plot plan, please contact this office for assistance.

2. Permit Processing
   Environmental Health staff will review the permit application and if acceptable a permit will be issued.

3. Destruction Procedure
   Once the permit has been issued the authorized work can begin. A copy of the approved permit must be kept somewhere on the job site. This is to ensure that it is available for reference by the work crew should questions arise:

   A general outline of the process is as follows:

   a. Remove any obstructions from the well.
   b. Perforate or remove the well casing to the bottom of the well.
   c. Excavate around the casing to a depth of 6 feet.
   d. Place approved sealing material in the well extending from the bottom to the surface. Environmental Health staff will inspect this stage of the work. The well contractor is responsible for contacting Contra Costa Environmental Health to schedule inspection appointments. The greater the advance notice, the more likely a mutually convenient inspection appointment can be arranged.

   NOTE: Some well destructions will require deeper perforations and depth of sealing material.

4. Final Approval
   Upon satisfactory completion of the work permitted and submittal of a Well Completion Report (DWR 188 form) a final destruction approval will be given.

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