COUNTY OF SAN DIEGO

GUIDELINES FOR DETERMINING SIGNIFICANCE
AND
REPORT FORMAT AND CONTENT REQUIREMENTS

GROUNDWATER RESOURCES

LAND USE AND ENVIRONMENT GROUP

Department of Planning & Development Services
Department of Public Works

First Revision
September 27, 2023

EXPLANATION

These Guidelines for Determining Significance for Groundwater Resources and information presented herein shall be used by County staff for the review of discretionary projects and environmental documents pursuant to the California Environmental Quality Act (CEQA). These Guidelines present a range of quantitative, qualitative, and performance levels for particular environmental effects. Normally, (in the absence of substantial evidence to the contrary), an affirmative response to any one Guideline will mean the project will result in a significant effect, whereas effects that do not meet any of the Guidelines will normally be determined to be “less than significant.” Section 15064(b) of the State CEQA Guidelines states:

> “The determination whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting.”

The intent of these Guidelines is to provide a consistent, objective and predictable evaluation of significant effects. These Guidelines are not binding on any decision-maker and do not substitute for the use of independent judgment to determine significance or the evaluation of evidence in the record. The County reserves the right to modify these Guidelines in the event of scientific discovery or alterations in factual data that may alter the common application of a Guideline.

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BIA	Bureau of Indian Affairs
CDHS	California Department of Health Services
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
CWA	San Diego County Water Authority
DEHQ	County of San Diego Department of Environmental Health & Quality (formerly DEH)
gpm	gallons per minute
MCLs	Maximum Contaminant Levels
NEPA	National Environmental Policy Act
PDS	Planning & Development Services (formerly DPLU)
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency

INTRODUCTION

This document provides guidance for evaluating adverse environmental effects that a proposed project may have related to groundwater resources. If a proposed project is not proposing to utilize or impact groundwater resources for any use, these guidelines would not be applied.

Specifically, this document addresses the following questions listed in the California Environmental Quality Act (CEQA) Guidelines, Appendix G, X. Hydrology and Water Quality:

a) Would the proposed project violate any water quality standards or waste discharge requirements or otherwise substantially degrade groundwater quality?

b) Would the proposed project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

e) Would the proposed project conflict with or obstruct implementation of a sustainable groundwater management plan?

1.0 GENERAL PRINCIPLES AND EXISTING CONDITIONS

San Diego County has a variety of aquifer types and geologic environments, which have different associated groundwater issues. The coastal zone is mostly supplied with imported water from the member agencies of the San Diego County Water Authority (CWA). The remaining portion of the County (approximately 65% by area) is totally dependent on groundwater resources, which provide the only source of water for over 41,000 residents (U.S. Census Bureau, 2000). For all lands to the east of the San Diego CWA boundary, water resources are limited to naturally-occurring surface and groundwater resources. In this area, no imported water is, or will likely become, available in the foreseeable future. This is due to the lack of infrastructure, the limited availability of water within the desert southwest, the cost of providing these services, and the political approval needed to extend the CWA boundaries. The County of San Diego assumes, for long term-planning, that development in groundwater-dependent areas will not have access to supplemental imported water, and therefore must prove long-term groundwater adequacy independent of imported water.

Some general hydrogeologic principles related to the origin, occurrence, physical properties, movement, quantity and quality of groundwater are discussed in the following sections to familiarize the reader with the fundamental principles of groundwater as a resource. In addition, specific hydrogeologic conditions and water quality issues within San Diego County are discussed.

1.1 <u>Hydrologic Cycle</u>

The term hydrologic cycle refers to the constant movement of water above, on, and below the Earth's surface (Heath, 1991). Groundwater is one component of this hydrologic cycle. The cycle does not have a beginning or an end, but rather is a continuous cycle that is powered by solar energy (Figure 1). The following description of the hydrological cycle begins with evaporation.

As a part of the cycle, water evaporates from surface water bodies and from moist soil. Additionally, evaporation from plants, called transpiration, occurs and is an important process by which water from the ground is transferred to moisture in the air. Moisture in the air forms clouds and eventually returns to the earth surface as precipitation, typically rain or snow.

Rain or snowmelt either infiltrates into the ground or runs off of the ground surface under the influence of gravity towards places such as rivers, lakes, or the ocean. Water that infiltrates into the ground, will either be transpired by plants and return to the atmosphere, infiltrate into the shallow soil and cling to the soil particles as soil moisture in the unsaturated zone, or will be drawn deeper by gravity into the saturated zone. The unsaturated zone is the shallower portion of the subsurface where air and water in varying ratios occupy the pore space or fractures of the subsurface rock. The saturated zone is the deeper portion of the subsurface where the pores or fractures of the rock are completely filled with water. The division between the saturated and unsaturated zone is typically called the water table. Water within the saturated zone is defined as groundwater.

Precipitation that infiltrates to the saturated zone is called groundwater recharge. Groundwater in the saturated zone generally flows under the influence of gravity from areas of recharge to areas of discharge such as rivers, lakes, or the ocean (Figure 2). The hydrologic cycle then repeats itself as water evaporates once again.

1.2 Groundwater Occurrence

As discussed previously, water beneath the earth's surface fills the pore space of rocks or sediments which can be present in the unsaturated and saturated zone of the subsurface, and water within the saturated zone is defined as groundwater. Because sediments and essentially all rocks have some amount of pore or fracture space, groundwater can be found beneath the surface in nearly every location within the County of San Diego. However, several properties determine whether the groundwater will be a usable resource at any specific location.

Groundwater typically occurs within a basin, which is defined as a hydrologic unit of groundwater storage more or less separate from neighboring groundwater storage areas. For sedimentary deposits, the edges and bottom of a basin are usually defined as contacts with relatively impermeable materials such as crystalline bedrock, clay, or other geologic structures that impede groundwater flow such as faults. For fractured rock, the edges of the basin are typically presumed to be the topographic divides or watershed boundaries. The bottom of a fractured rock groundwater basin is rarely well defined, but is assumed to occur at the depth where the fractures are not capable of producing significant amounts of water, typically at depths greater than about 1,000 feet. Although the term basin is generally used in conjunction with basins containing sediments, it will be used interchangeably in this document for defining the lateral extent of either sedimentary deposits, or water bearing fractured rock. In San Diego County, groundwater generally occurs in either sedimentary deposits or fractured bedrock.

The terms aquifer and aquitard are frequently used when discussing groundwater resources. The following provides definitions of these relative terms.

An aquifer is a body of rock or sediments that will yield water in a useable quantity to a well or spring (Heath, 1991). While there may be debate about the definition of "useable", for the purposes of this document, it will be considered relative to the proposed use. For example, 0.5 acre-feet per year may be considered useable for the needs of a single-family home, whereas it would not be considered useable for irrigation purposes on a large farm or golf course.

Saturated coarse-grained sediments such as sands and gravels are typically considered to be aquifers. Fractured crystalline rock may also be considered an aquifer if it contains a sufficient number of interconnected fractures where groundwater may reside and flow through.

An aquitard is a body of rock or sediments that is typically capable of storing groundwater but does not yield it in significant quantities. Fine-grained sediments such as silts and clays typically act as aquitards. It is not unusual that in one geologic setting, a body of rock, capable of yielding a given rate of groundwater, could be considered an aquifer and in another setting could be considered an aquitard.

1.3 Groundwater Recharge

As discussed briefly above, precipitation or surface water that infiltrates to the saturated zone is called groundwater recharge. Only some of the precipitation that falls on the ground actually infiltrates into the ground and into the saturated zone to become recharge. The fraction of precipitation that actually infiltrates into the ground is dependent on a number of factors including the slope of the land, the soil type, vegetation, the rate of evapotranspiration, and the rate and duration of precipitation. Infiltration occurs more readily in coarse soils than in fine soils. Small rainfall events may only moisten the surface and near surface of the ground and the water will subsequently evaporate and/or transpire before it can infiltrate into the ground. Conversely, if precipitation is accumulating at a rate faster than it can infiltrate into the ground, the excess water will pond or flow along the ground surface as runoff.

Recharge to aquifers can occur by means other than precipitation. Infiltration in the beds of streams, lakes, or other surface water bodies can occur and may be the dominant form of recharge in some areas. The amount of recharge entering the groundwater system from surface water bodies is dependent on a number of factors including, the size of the water bodies, length of time that water is standing (streams), the permeability of the bottom sediments of the water bodies, the depth of the water bodies, and the groundwater levels in the surrounding aquifer.

1.4 Groundwater Storage

Groundwater storage capacity is simply the volume of groundwater that can be stored in the subsurface.

Groundwater storage is an important parameter when considering the usable water resources of a groundwater basin. While recharge replenishes an aquifer, it is a parameter that varies widely from year to year.

During droughts, recharge to a basin may be small or negligible. Groundwater pumped or naturally discharged from a basin, when there is little or no recharge, is removed from storage in the basin. If the storage capacity of the basin is not large enough to supply the water demands of all the users (human and environmental) in the basin for the duration of the drought, then critical shortages of water may occur. Following a drought, when recharge rates increase, the depleted basin is recharged and the groundwater that was removed from storage is replaced. Once a basin is filled to the limit of its storage capacity, any excess recharge flows out of the basin either by surface or subsurface flow.

Storage values for basins are typically measured by performing pumping tests on wells and measuring drawdown of water levels in the pumping well and at least one monitoring well. However, it is not always possible to obtain values of storage from well tests. Additionally, calculated storage values for fractured rock aquifers can be inaccurate.

1.5 Physical Properties

Many properties affect how fractured rock, alluvium, or sediments may function as a groundwater resource. Some of the most important physical properties to understand include porosity and hydraulic conductivity. These properties are discussed below.

1.5.1 Porosity

Essentially all rocks and sediments contain pore and fracture space. The ratio of pores in a rock or sediment to the total volume of the material is known as porosity and is usually expressed as a percentage. Porosity also delineates the amount of water that could be stored in a saturated volume of rock or sediment. However, in an aquifer some of the water in the pore spaces is tightly held to the surfaces of the particles by surface tension and also in small pores, thus not all of the pore space contains water that is available for flow.

The porosity of sediments generally ranges from approximately 10% to 50%. Specific yield (roughly equivalent to effective porosity), which is the fractional amount of water that could actually be available for extraction ranges in sediments from approximately 1% to 30%.

For fractured crystalline rock, the greater the number and the wider the aperture of the fractures, the greater the porosity. It has been traditionally understood that the number of fractures decreases with depth and therefore the porosity also decreases with depth. However, statistical analysis of fractures from a series of borings advanced in granitic terrain in San Diego County indicates that the number of fractures is fairly constant with depth down to approximately 1,750 feet (McClain, 2006). This suggests that the traditional understanding of decreasing porosity with depth may not apply to fractured rock in San Diego County. The porosity of fractured rocks is typically much smaller than the porosity of sediments and ranges from 0% to approximately 10%. Specific yield typically ranges from 0.001% to 1%.

1.5.2 Hydraulic Conductivity

The parameter that describes the ability of sediments or rock to transmit water is referred to as its hydraulic conductivity. Typically sands and gravels have a high hydraulic conductivity whereas silts and clays have a low hydraulic conductivity.

The hydraulic conductivity of fractured rock depends not only on the number and size of fractures, but also on the degree to which the fractures are connected and thus capable of transmitting water from one fracture to another.

Hydraulic conductivity is typically measured by performing aquifer tests or slug tests on wells. For aquifer tests, the wells are pumped for a period of time and the water level in the pumping well and/or nearby wells are measured periodically. Slug tests are performed by pouring (or removing) an instantaneous charge of water into a well and measuring the water level in the well periodically after the water is introduced to the well. The data collected from the test is then analyzed using hand calculations or more commonly by computer. Hydraulic conductivity can also be measured in the laboratory with permeameters which require field collection of undisturbed sedimentary samples in sampling tubes from test borings. In general, aquifer tests are preferred to slug tests since they represent a more significant portion of the aquifer.

The amount of water that can be transmitted (known as transmissivity) to a well is dependent on the hydraulic conductivity of the aquifer material and the saturated thickness of the aquifer. For example, a thin sand aquifer may not be able to transmit as much water to a well as a thick silt aquifer, even though the hydraulic conductivity of the sand is much larger than that of the silt.

1.6 Groundwater Movement

Due to the fact that groundwater is not visible to the naked eye, the movement of groundwater through the subsurface is difficult to visualize and is often misunderstood. Many people mistakenly believe that the majority of groundwater flows in “underground rivers". While large subsurface openings where water could flow and be conceived as an underground river do occur in some rock types such as carbonates and volcanics, these rock types are rare in San Diego County. In San Diego County, most groundwater flows through the pore space of alluvial sediments and weathered rock, and within fractures in crystalline rock.

Groundwater, like surface water, flows from areas of higher elevation (head) to areas of lower elevation (head) under the influence of gravity, and follows the path of least resistance to flow. The slope of the water table surface determines the direction that groundwater will flow. This is analogous to the slope of land surface determining the direction in which water will flow on the surface. Water flows towards a pumping well because pumping in the well causes a depression in the watertable surface (and pressure head) and thus a gradient towards the well. The rate at which groundwater flows depends on the gradient, hydraulic conductivity and the saturated thickness. In most cases, the rate of groundwater flow is significantly less than the rate of surface water flow. While surface water may flow several miles in a day, groundwater travels as little as a few inches to hundreds of feet in a day.

1.7 Well Yield

Well yield is defined as the maximum pumping rate that can be supplied by a well without lowering the water level in the well below the pump intake (Heath, 1991). For an individual well owner, this is an important parameter because it defines the amount of water that the well will supply. Since drawdown is a function of pumping rate and pumping duration, well yield is a function of pumping duration, as well as other factors such as initial water depth and interference from other pumped wells.

1.8 Sustainable Yield

As was discussed above, if one is interested in the amount of water that can be extracted from a single well, then well yield is an important concept. For larger studies where an entire basin is considered, sustainable yield for the basin may be more important as it considers the cumulative effect of all the wells at maximum buildout within the basin.

The concept of sustainable yield (often referred to as safe yield) for a groundwater basin has been heavily debated. In general, the County assumes that sustainable yield is the amount of groundwater that can be withdrawn from it annually without producing an undesirable result (Todd, 1959). The controversy over sustainable yield is related to the definition of an undesirable result. It is generally recognized that undesirable results include not only the depletion of the groundwater reserves, but also the intrusion of water of undesirable quality, the contravention of existing water rights, the deterioration of the economic advantages of pumping, excessive depletion of streamflow, impacts to groundwater-dependent vegetation, and land subsidence (Heath, 1991; Domenico, 1972; Kazmann, 1972). With the passage of the Sustainable Groundwater Management

Act (SGMA) [California Water Code 10720 *et seq.*], the State of California has defined undesirable results as one or more of the following:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable seawater intrusion.
- Significant and unreasonable degradation of water quality.
- Significant and unreasonable land subsidence.
- Groundwater-related surface water depletions that have significant and unreasonable adverse impacts on beneficial uses of surface water.

1.9 Aquifer Characteristics in Unincorporated San Diego County

Within unincorporated San Diego County, several hydrogeologic environments exist. These different environments can be grouped into two generalized categories: fractured rock aquifers, and alluvial and sedimentary aquifers (Figure 3).

1.9.1 Fractured Rock Aquifers

Fractured rock underlies approximately 73% of the unincorporated area of the County. These rocks are typically crystalline or metavolcanics associated with the Peninsular Ranges batholith of southern California and Baja California. The majority of the mountainous region of the County consists of these fractured rocks. The characteristics of fractured rock aquifers vary significantly. Wells drilled only a few tens of feet from one another may have significantly different water production rates. This is because water-producing fracture locations and orientations are difficult to identify and predict, and fractures intersected by one well may not be intersected by nearby wells.

Recharge

Fractured rock aquifers are often present in mountainous regions where precipitation is higher than in the lower elevation regions of the County. As a result, recharge rates to fractured rock aquifers can be greater than in the lower elevation alluvial or sedimentary aquifers. Additionally, due to the low storage capacity, recharge to fractured rock aquifers can cause relatively fast rises to the water table, which conversely can have relatively fast declines to the water table in years without significant recharge. In some areas of the County with particularly low storage, the static groundwater levels have risen or declined in excess of 100 feet in particularly rainy seasons or dry seasons, respectively.

Storage

Fractured rock aquifers typically have much less storage capacity than aquifers comprised of unconsolidated sediments. As a result, pumping from wells completed in fractured rock typically produces a greater decline in water levels than a similar pumping rate for wells completed in sediments. Additionally, because less water is typically stored in fractured rock, seasonal variations in precipitation and drought conditions result in greater variations in water levels than in similar conditions where aquifers comprise sediments. Figure 4 shows a typical hydrograph from a well in fractured rock. Storage in fractured rock within the County spans over several orders of magnitude from essentially zero and up to 1 percent of the total volume of the aquifer. The lowest storage values generally are located in steep sloped upland areas and the highest storage values are generally in valley areas. Typical specific yield values in San Diego County fractured rock are estimated to range from about 0.001% to 1%.

In many cases, fractured rock aquifers are overlain by a layer of weathered bedrock (residuum) and/or a layer of alluvium. The presence of residuum or alluvium may provide additional storage capacity if the water levels extend up into these layers. Water stored in these layers may drain into the fractured rock beneath them as water is pumped from the fractured rock. The additional storage in these surficial units may significantly enhance the usability of groundwater resources in some areas relying on groundwater from fractured rock.

Well Yield

Wells in a fractured rock aquifer typically yield relatively low volumes of water. In some instances wells may derive water from only one or a few water-bearing fractures. As a result, the rate of water production is typically limited in fractured rock aquifers. Many fractured rock wells have been drilled in the County to depths of over 1,000 feet. In some cases, wells have not been able to produce enough water to meet the needs of a single-family residence. In other cases, wells have intersected individual fractures or fracture zones and produce tens of gallons per minute. Also, along some fault zones, wells have produced over 100 gallons per minute.

1.9.2 Alluvial and Sedimentary Aquifers

Alluvial and sedimentary aquifers, which includes desert basins, account for approximately 27% of the unincorporated area of the County. These aquifers are typically found in river and stream valleys, around lagoons, near the coastline, in the intermountain valleys, and in deserts located in the extreme eastern portion of the County. Sediments in these aquifers are comprised of mostly consolidated (defined as sedimentary rock) or unconsolidated (defined as alluvium or colluvium) gravel, sand, silt, and clay. Most of these aquifers have relatively high hydraulic conductivity, porosity, and storage and in general would be considered good aquifers on the basis of their hydrogeologic characteristics. It should be noted that some alluvial and sedimentary aquifers in the County have relatively thin saturated thickness and therefore limited storage. Alluvial and sedimentary aquifers can be underlain by fractured rock aquifers, which potentially provide additional storage. In contrast to aquifers found in river and stream valleys, desert basins often have large storage capacities and are typically characterized by extremely limited recharge.

Recharge
Surface water bodies within an alluvial or sedimentary aquifer may increase the recharge due to leakage from the water body into the subsurface. Because alluvial basins generally occur in low-lying areas of a watershed, surface water runoff may accumulate in streams, lakes, or other surface depressions within alluvial basins and provide an additional recharge source to these basins. For desert basins in the extreme eastern portion of the County, precipitation is typically only a few inches per year in the valley of the basins. Precipitation rates in the surrounding mountainous areas are significantly higher and most recharge to these basins is derived from precipitation occurring at higher elevations and along the base of mountains in alluvial fans as well as stream courses. Runoff and streamflow from the highlands typically run into the basins and recharges mostly along the margins of the basins.

Storage
Alluvial and sedimentary aquifers typically have significant storage capacity, which generally range from 1 to 30 percent of the total aquifer volume (Freeze and Cherry, 1979).

Well Yield
Wells in an alluvial or sedimentary aquifer typically yield relatively high volumes of water. Coarse-grained sediments such as sand or gravel typically produce higher volumes of water than finer-grained sediments such as silts or clays. In coarse-grained sediments, well yields may be hundreds of gallons per minute (gpm) and limited by inefficiencies in the well itself rather than by limitations in the aquifers ability to produce water.

1.10 Groundwater Quality

1.10.1 General Principles

Deterioration in water quality may result from changes in the chemical, biological, or physical quality of the water. Changes in the physical quality of the water are usually related to well problems such as collapsed well screens resulting in the presence of sediment or rock particles in the pumped water. Deterioration of water quality due to chemical or biological changes, usually result from conditions within the aquifer. Biological contamination in the form of bacteria, viruses, or protozoa associated with human or animal wastes typically results from a connection between the land surface or the near surface zone and the open portion of the well (Heath, 1991). Chemical contamination can result from man-made activities (e.g., farming, septic systems, pesticide usage, landfills, or fuel storage tank leaks) or be naturally occurring (e.g., arsenic, iron, manganese, radon, or uranium).

1.10.2 Water Quality Regulations

The United States Environmental Protection Agency (USEPA) has set primary and secondary drinking water standards known as maximum contaminant levels (MCLs) for many known contaminants that occur in groundwater. The primary standards are legally enforceable to public water systems and protect public human health by limiting the levels of contamination of a particular constituent in drinking water. Secondary standards are non-enforceable guidelines regulating contaminants that may cause aesthetic (such as taste, odor, or color) or cosmetic effects (such as skin or tooth discoloration) in drinking water (USEPA, 2003). The California Department of Health Services (CDHS) has also set primary and secondary drinking water standards, which in some cases are more stringent than the national drinking water standards. New private drinking water wells in the County are required to receive a permit from the County Department of Environmental Health & Quality (DEHQ). At a minimum, DEHQ requires testing for bacteria and nitrates by an owner or applicant of a private drinking water well to verify a potable water supply prior to County issuance of a building or septic system permit. Community water systems, water companies, and water districts in the County are subject to local and/or state regulations, which have more comprehensive and stringent water quality requirements than for private water wells.

1.10.3 Existing Conditions

The most common contaminants in groundwater within San Diego County include nitrate, total dissolved solids, and bacteria. In addition, elevated levels of naturally occurring radioactive elements have been detected in a number of areas of the County. There are other contaminants of potential concern, which may occur in localized areas including: herbicides, pesticides and other complex organics, petroleum products, MTBE, volatile organic compounds, and metals. DEHQ compiled maps which depict areas of the County where nitrate and naturally-occurring radioactive elements are known to impact groundwater (Figures 5 and 6). These maps are regional scale and should only be used as a screening tool for potential impacts.

Below, basic information is provided on common contaminants in San Diego County including potential source(s) of contamination, its MCL, and potential health effects.

Nitrate
Nitrate occurs naturally in soil and water. Nitrate is an important constituent in fertilizers used for agricultural purposes and is present in human and animal wastes. Typical sources of elevated nitrates in groundwater are septic tanks, feed lots, or excess nitrates used in farming operations (Heath, 1991).

The USEPA primary MCL for nitrate (measured as nitrogen) is 10 milligrams per liter (mg/L). Infants, young livestock, and pets are extremely susceptible to potential health effects from drinking water with nitrates above the MCL and could become seriously ill. If untreated, the condition can be fatal. Symptoms include shortness of breath and blue-baby syndrome (USEPA, 2003).

Total Dissolved Solids
Total dissolved solids (TDS) refer to the total concentration of all minerals, salts, metals, cations or anions that are dissolved in water. TDS is comprised of inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonate, carbonate, chloride and sulfate), and some small amounts of organic matter that are dissolved in water. Sources of TDS in groundwater originates naturally from the dissolution of rocks and minerals, and can also be from septic tanks, agricultural runoff, and storm water runoff. In deep desert basins like those found underlying Borrego Valley, groundwater in the deeper portions of the basin typically contains older water than the shallower zones. This older water may contain high concentrations of salt and other dissolved minerals making it unsuitable for human consumption. Pumping shallow wells may draw deeper poor quality deep water into the wells.

The USEPA secondary MCL for TDS is 500 mg/L. An elevated TDS concentration is not a health hazard, however it can cause the water to have a salty or brackish taste, it can cause the water to be corrosive, and results in scale formation on pipes, pumps, water heaters, etc. If groundwater has TDS above the MCL, there may also be elevated levels of ions that are above the primary or secondary MCLs, such as nitrates, arsenic, copper, lead, iron, etc.

Bacteria
Elevated bacteria in groundwater occur primarily from human and animal wastes. Sources of bacteriological contamination include septic tanks, natural soil/plant bacteria, feed lots, pastures, and other land areas where animal wastes are deposited. Old wells with large openings including hand dug wells and wells with inadequate seals are most susceptible to bacteriological contamination from insects, rodents, or animals entering the well. The USEPA primary MCL Goal for total coliform bacteria in drinking water is non-detection. For large public water systems no more than five percent of the water samples collected shall have detected total coliform. Most coliform bacteria are not a health threat. However, it is a useful indicator for the presence of specific harmful coliform strains and other potentially harmful bacteria (USEPA, 2003). If other harmful bacteria are present, they may cause intestinal infections, dysentery, or other illnesses.

Radioactive Elements
Naturally-occurring radioactive elements are present to some extent in nearly all rocks and soil throughout the world and leach into groundwater from natural mineral deposits. Radioactivity in groundwater is not a new phenomenon, having been present in some form since the earth was formed. Elevated levels of naturally-occurring radioactive elements including uranium have been detected in groundwater in various areas throughout San Diego County. Several community water systems have had ongoing problems with radioactive elements and have relatively expensive treatment systems to reduce levels of various contaminants to levels below the MCL.

The USEPA primary MCL for gross alpha particles (gross alpha is used as a primary screening tool for radioactive elements) is 15 picocuries per Liter (pCi/L). The State of

California primary MCL for uranium is 20 pCi/L. Potential health effects of various radioactive elements include an increased risk of various cancers and kidney toxicity (USEPA, 2003).

1.11 Specific Groundwater Problem Areas

1.11.1 Borrego Valley (Borrego Springs Groundwater Subbasin)

The 98-square mile Borrego Springs Groundwater Subbasin is located in the northeast portion of the County and is a groundwater-dependent basin without an imported water supply. The Subbasin is in an overdraft condition, where recent historical groundwater demand has been in excess of 20,000 afy which far exceeds the sustainable yield of 5,700 afy (Borrego Springs Groundwater Sustainability Agency, 2019). Water levels have been declining for decades as a result of the overdraft condition. An approximately 75 percent reduction in groundwater use is anticipated in order to bring the basin into sustainability. To address the overdraft conditions, the basin is being regulated under the Sustainable Groundwater Management Act (SGMA), which is discussed in subsequent sections of these Guidelines.

1.11.2 Large Quantity Groundwater Users in Fractured Rock

Fractured rock aquifers that have limited groundwater recharge and large groundwater users, such as agricultural or other large operations, may experience groundwater shortages. Ballena Valley, east of Ramona is an example of an area that has had very wide fluctuations in groundwater levels due largely to agricultural uses in the valley. In the drought that occurred from 1998-2004, water levels in a well monitored by the County dropped over 300 feet (Figure 7). Water levels rose and completely recovered in the well from the heavy rainfall that occurred in the 2004-2005 season and again dropped over 300 feet between a measurement taken in 2005 and the summer of 2006. Due to the fact that wells used for agricultural purposes are not metered or regulated for water quantity by the County, future localized groundwater problems caused by agricultural uses could occur in fractured rock aquifers and in areas with other aquifer types.

Private residential users of groundwater in San Diego County on average are estimated to have a consumptive use of approximately 0.5 acre-feet of groundwater per year per residence. However, there have been isolated reports through the years of single-family homes that have used far greater quantities.

Due to the low storage capacity of fractured rock aquifers, excessive use of groundwater in fractured rock by a single user can cause localized impacts to neighboring properties. Impacts would be greatest after several years of sustained drought. Due to the fact that private residential wells and wells used for agricultural purposes are not metered or regulated for water quantity, future localized problems could occur to users in fractured rock aquifers as well as other aquifer types.

1.11.3 Steep Slope Areas

As was discussed in the aquifer characteristics section above, fractured rock aquifers characteristics vary significantly. While the majority of wells drilled in fractured rock in the County have adequate well yield to meet the needs of a typical single-family home, there are wells with very low yields located sporadically throughout the County in fractured rock. In general, wells drilled in steep slope areas above the valley floor are particularly prone to having lower well yield and there are examples throughout the County of very poor producing wells in steep slope areas. This is largely due to storage values in the steep slope areas often being an order of magnitude lower than in valley areas and having a smaller tributary watershed than wells located in valley areas.

1.11.4 Areas Not in Compliance or Subject to the Groundwater Ordinance

Areas that were developed prior to the implementation of the Groundwater Ordinance may have been developed at densities higher than would be currently allowed. Some examples of specific areas include communities in Julian (including Harrison Park), Morena Village, Guatay, Descanso, Pine Valley, and Old Barona Road. Areas where projects are not subject to County regulations, such as the Barona golf course and casino, have been built in areas that do not have adequate groundwater resources for the developments that were built. In all of these cases, groundwater shortages may occur because the groundwater demand in these areas may exceed the natural recharge of the aquifers, especially in drought years.

1.11.5 Groundwater Quality Impacts

As was discussed in the groundwater quality section above, the most common contaminants that occur in groundwater within the unincorporated portion of the County are nitrate, bacteria, and TDS. Naturally-occurring radioactive elements have also been detected above their MCL in several areas of the County. Each of these constituents if detected at elevated concentrations above their respective MCLs, can limit the availability of potable groundwater.

Two specific examples of contamination of groundwater in the unincorporated portion of the County are outlined below. In Julian and Pine Valley, several wells which were being used as community water supply wells were forced to be inactivated due to contamination from leaking underground storage tanks. In parts of Valley Center, Rainbow, and Ramona, a combination of shallow groundwater and septic tank failures have led to nitrate contamination of groundwater. In both circumstances, the contaminated groundwater has limited the availability of potable groundwater.

2.0 EXISTING REGULATIONS AND STANDARDS

This section gives a generalized summary of Federal, State, and local regulations related to groundwater use.

2.1 Federal Regulations and Standards

San Diego County has a significant portion of lands under Federal jurisdiction. These include military properties such as the Marine Corps Base Camp Pendleton and lands under the Bureau of Land Management. Other lands outside of County jurisdiction include a number of Indian Reservations that fall under the jurisdiction of the Bureau of Indian Affairs (BIA).

Overall direction regarding the use of groundwater for these lands lies within the USEPA and National Environmental Policy Act (NEPA) requirements. In some instances, tribal governments have entered into agreements that allow for state regulatory involvement.

The Campo-Cottonwood Sole Source Aquifer, which was designated by the USEPA as a sole-source aquifer (SSA), is subject to Federal Regulations for any project which is financially assisted by federal grants or federal loan guarantees. These projects are evaluated to determine whether they have the potential to contaminate the SSA (USEPA, 2001).

2.2 State Regulations and Standards

California created a system of appropriating surface water rights through a permitting process in 1913, but groundwater has never had any statewide regulation. Though the regulation of groundwater has been considered on several occasions since 1913, the California Legislature has repeatedly determined that groundwater management should remain a local responsibility (Sax, 2002). The right to use groundwater in California has evolved through a series of court decisions dating back to the late 1800s.

Groundwater rights are usufructuary, meaning the right is not one of absolute ownership, but of the opportunity of use on the overlying land. This use must be “reasonable and beneficial”.

In 1903, a court ruling established that for landowners overlying an aquifer, each property had a “correlative” or co-equal right to a “just and fair proportion” of the resource (CDWR, 2003). These correlative rights only require that all property owners share equally in the resource until it is exhausted – irrespective of the consequences (WEF, 1998). In general, each overlying landowner is entitled to make reasonable and beneficial use of groundwater with a priority equal to all other overlying users. If excess water is available, this excess water can be appropriated and used on non-overlying lands on a first-in-time, first-in-right basis. However, these appropriative rights are extinguished when overlying users make full use of available supplies. When there is not sufficient water to meet the needs of the overlying owners, the courts have applied the principle of "correlative rights" to apportion the water among the overlying landowners.

When the consequences of over-pumping are severe, groundwater users can ask the court to "adjudicate", or define, the rights that overlying users have to groundwater resources. In January 2015, at the time of SGMA's passage, 27 groundwater areas located mostly in Southern California, were treated as adjudicated by SGMA. Since passage of SGMA, two areas submitted court decrees adjudicating water right (CDWR, 2022). The majority of the adjudications were undertaken in State Superior court and at least one in Federal Court. In each case, the court appoints a Watermaster to oversee the court judgment. Typically, the court judgment limits the amount of groundwater that can be extracted by all parties based on a court-determined safe yield of the basin. The Santa Margarita Basin, which is partially in San Diego County, was adjudicated in Federal Court and requires that water users report the amount of surface and groundwater they use, but groundwater extraction is not restricted (CDWR, 2003). In April 2021, the Superior Court of California approved a Stipulated Judgment for the Borrego Springs Subbasin and appointed the Borrego Springs Watermaster as the entity responsible for carrying out the terms of the Judgment and complying with SGMA.

California Environmental Quality Act (CEQA) [Public Resources Code 21000-21178; California Code of Regulations, Guidelines for Implementation of CEQA, Appendix G, Title 14, Chapter 3, §15000-15387https://opr.ca.gov/ceqa/guidelines/]
Under the California Environmental Quality Act (CEQA), lead agencies are required to consider impacts to groundwater and water quality when considering discretionary actions. As provided below, there are three questions related to groundwater resources listed in Appendix G of the State CEQA Guidelines.

- Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade groundwater quality?

- Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

- Would the project conflict with or obstruct implementation of a sustainable groundwater management plan?

2.3 Local Regulations and Standards

At least twenty-eight counties in California have adopted groundwater ordinances to manage groundwater resources. The authority of counties to regulate groundwater was challenged in the case of Baldwin v. County of Tehama, 31.App.4th 166 (1994). The Tehama County ordinance prohibited groundwater extraction unless the Board of Supervisors found that the withdrawal would not:

1. Exceed the amount of replenishment;
2. Result in saltwater intrusion;

3. Adversely affect rate of flow through the aquifer;
4. Adversely affect the water table; or
5. Result in an overdraft, based on preexisting and reasonably foreseeable beneficial uses on lands within the County overlying the aquifer.

Landowners sued, claiming that the ordinance was preempted by state law. The Court of Appeal ruled that the ordinance was within the "police power" of a county, and was not preempted. That power is the grant of authority in the California Constitution to cities and counties, to enact and enforce within their limits all local, police, sanitary and other ordinances and regulations not in conflict with general laws. (Cal. Constitution, Art. XI, Sec. 7.).

2.4 Groundwater Management in California

There are four basic methods of managing local groundwater resources in California, which include: 1) local water agencies, 2) local groundwater ordinances, 3) basins subject to the Sustainable Groundwater Management Act (SGMA) and 4) basin adjudication, in which a court determines allocation of groundwater resources (CDWR, 2003). Management is often instituted after local agencies or landowners recognize a specific groundwater problem.

2.4.1 Local Water Agencies

In the California Water Code there are several districts or local agencies with specific statutory provisions to manage surface water. Many of these agencies have statutory authority to exercise some forms of groundwater management. For example, a Water Replenishment District (Water Code Section 60000 et seq.) is authorized to establish groundwater replenishment programs and collect fees for that service, while a Water Conservation District (Water Code Section 75500 et seq.) can levy groundwater extraction fees (CDWR, 2003; CDWR, 2000). Through special act of the Legislature, thirteen local agencies have been granted greater authority to manage groundwater. Most of these agencies, formed since 1980, have the authority to limit export and even control some in-basin extraction upon evidence of overdraft or the threat of overdraft. These agencies can also generally levy fees for groundwater management activities and for water supply replenishment.

In 1992, legislation (AB 3030) was passed which greatly increased the number of local agencies authorized to develop a groundwater management plan and set forth a common framework for management by local agencies throughout California. These agencies could possess the same authority as a water replenishment district to "fix and collect fees and assessments for groundwater management" (Water Code Section 10754), provided they receive a majority of votes in favor of the proposal in a local election (Water Code Section 10754.3) (CDWR, 2003).

2.4.2 Local Groundwater Ordinances

As discussed previously, groundwater in California may also be managed through the use of groundwater ordinances. In the late 1970s, Groundwater Policy I-77 was adopted by the County of San Diego Board of Supervisors, which was replaced by the San Diego County Groundwater Ordinance in 1991.

San Diego County Groundwater Ordinance. The County of San Diego currently manages anticipated future groundwater demand through the County Groundwater Ordinance. This Ordinance does not limit the number of wells nor the amount of groundwater extraction of existing landowners. However, the Ordinance does identify specific measures to mitigate potential groundwater impacts of projects requiring specified discretionary permits. Existing land uses are not subject to the Ordinance unless a listed discretionary permit is required. Additionally, Major Use Permits or Major Use Permit Modifications which involve construction of agricultural and ranch support facilities or those involving new or expanded agricultural land uses are among the exemptions from the Ordinance. However, the agricultural exemption does not supersede or limit the application of any law or regulation including CEQA.

The Groundwater Ordinance separates the County into three areas of regulations, Borrego Valley, Groundwater Impacted Basins, and All Other Projects.

Section 67.720 (Borrego Valley) imposes requirements on projects that propose to use groundwater. The Groundwater Ordinance requires that the application be accompanied by proof of sufficient water rights (i.e., Baseline Pumping Allocation) for the project.

Section 67.721 (Groundwater Impacted Basins) regulates identified areas within the County that have restricted groundwater resources. Proposed projects in groundwater impacted basins that are subject to the Groundwater Ordinance would require a basin-wide groundwater investigation and pumping tests for each lot included within the project. However the Board of Supervisors has formally adopted no such areas and therefore the requirements of this section of the Ordinance do not currently apply to any areas in the County.

Section 67.722 (All Other Projects) regulates all areas within the County outside Borrego Valley and any future groundwater impacted basins. Specifically, single-family subdivision proiects are required to conform to certain minimum parcel sizes. For other discretionary permit applications, the following findings must be made: 1) For projects using greater than 20 acre-feet per year or 20,000 gallons per day, that groundwater resources are adequate to meet the groundwater demands both of the project and the groundwater basin if the basin were developed to the maximum density and intensity permitted by the General Plan, and 2) for all other projects, that groundwater resources are adequate to meet the groundwater demands of the project.

In the case of certain subdivisions and Specific Plans, well testing is required for approximately 10% of residential lots proposed (at least one well test and up to five well tests). Residential well tests must meet or exceed the following four requirements:

(1) Well production during the residential well test must be maintained at a rate of no less than three gallons per minute;

(2) The well test must be conducted for at least 24 hours, unless after eight hours of pumping, the measured specific capacity is equal to or greater than 0.5 gallons per minute per foot of drawdown, at which time pumping can be terminated;

(3) The analysis of the Residential Well Test must indicate that no residual drawdown is projected (taking into account minor inaccuracies inherent in collecting and analyzing well test data); and

(4) The analysis of the Residential Well Test must also indicate that the amount of drawdown predicted to occur in the well after five years of continual pumping at the rate of projected water demand, will not interfere with the continued production of sufficient water to meet the needs of the anticipated residential use(s).

If any well tested does not meet the above four requirements, the County may require additional well tests be conducted beyond the initial requirement of one to five well tests.

2.4.3 Sustainable Groundwater Management Act (SGMA)

Of the 33 basins or subbasins in San Diego County identified in *Bulletin 118*, three have been designated by CDWR as either medium- or high-priority and subject to management in accordance with SGMA (CDWR, 2020). Those basins include San Luis Rey Valley (Upper San Luis Rey Valley Subbasin), San Pasqual Valley, and Borrego Valley (Borrego Springs Subbasin). Each of these basins have adopted Sustainability Plans and are being sustainably managed under SGMA. In addition to the Guidelines for Determining Significance discussed in Section 4.0, proposed groundwater extraction in a SGMA-mandated basin must not be inconsistent with any sustainable groundwater management program established in any applicable Sustainability Plan adopted by that GSA. Since a GSA may exercise any of the powers described in SGMA to provide the maximum degree of local control and flexibility to achieve sustainability goals, the implementing rules and regulations for each Sustainability Plan for every groundwater basin are different.

2.4.4 Adjudicated Basins

In several groundwater basins in California, landowners and other parties have turned to the courts to allocate quantities of groundwater that can be extracted by each user. The process of adjudication of a basin can be costly and take several years to complete. Typically, the court will determine a safe yield for the basin and divide this safe yield amongst the users in the basin. The determination and allocation of the safe yield means that for basins experiencing overdraft conditions, overall water use in the basin will be restricted. The court typically appoints a Watermaster to oversee the court judgment. There are two adjudicated basins/ subbasins in San Diego County.

In April 2021, the Superior Court of California approved a Stipulated Judgment for the Borrego Springs Subbasin. Water rights in the basin are comprehensively adjudicated and governed by the five member Borrego Springs Watermaster Board (https://borregospringswatermaster.com/). The Borrego Springs Watermaster is responsible for managing groundwater resources and implementing SGMA in the Borrego Springs Subbasin.

Since 1989, the Santa Margarita River Watershed Watermaster has been responsible for administering and enforcing the provisions of the 1966 Modified Final Judgment for the Santa Margarita Valley Basin and surrounding watershed. Although located within San Diego County, the Santa Margarita Valley Basin is entirely situated on Marine Corps Base Camp Pendleton.

3.0 TYPICAL ADVERSE EFFECTS

3.1 Groundwater Overdraft

Groundwater overdraft has been defined as the condition of a groundwater basin or sub-basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions (CDWR, 1998). It is important to note that groundwater can also be removed from a basin by other means than just pumping, such as groundwater discharge to wetlands or streams. If the amount of groundwater that is removed from the basin exceeds the amount that is replenished, additional groundwater extracted from the basin would be derived from storage in the basin. Observed long-term (through wet and dry cycles) declines in water levels are indicative of overdraft conditions. While overdraft conditions in a particular basin may not pose an immediate threat to the supply of water, the condition is not sustainable and will inevitably result in adverse effects. Overdraft conditions may result from over-development of a basin, or from a single high demand user in a basin with limited water resources, and can be exacerbated by a sustained drought condition.

Adverse effects of overdraft may include: the dewatering of wells necessitating deepening or drilling of new wells; degradation of water quality; increased pumping costs; and lower well production rates.

3.2 Low Well Yield

The ability of a well to produce water is a separate issue from whether adequate groundwater resources are available specific to a particular property. In an overdraft situation such as in Borrego Valley, there is a relatively large amount of groundwater in storage and wells are capable of extracting more groundwater than the recharge going into the aquifer. While well yields in Borrego Valley may be adequate, this doesn't address the continual decline of groundwater in storage which is occurring and is not sustainable over the long-term. Conversely, in some areas of the County, wells may not be able to produce an adequate volume of water to supply the needs of the project, even though adequate groundwater resources are present in storage. In areas that derive groundwater from fractured bedrock, wells that do not penetrate enough water-bearing fractures may produce minimal amounts of water. In alluvial basins, if an individual well penetrates lower permeability materials such as silt or clay and does not encounter higher permeability materials such as sand or gravels, this may result in limited productivity of a well, even though the storage capacity of the basin may be large.

3.3 Well Interference

When a well is pumped, groundwater elevations in both the well and the aquifer decline. This is referred to as drawdown. This drawdown forms a cone of depression in the aquifer in the vicinity of the pumping well. When two or more pumping wells are spaced relatively close together, pumping of one of the wells may cause drawdown to occur in the other wells. The drawdown in pumping wells caused by withdrawals from other pumping wells is referred to as well interference (Heath, 1991). Well interference reduces the well yield in affected wells by reducing the available drawdown in the well.

The magnitude of well interference is dependent on the spacing of the wells, pumping rate, properties of the aquifer, and the duration over which pumping has occurred. As such, prediction of well interference must be considered on a well-by-well basis.

3.4 Poor Groundwater Quality

Deterioration in water quality can result from a variety of natural and anthropogenic sources which cause changes in the chemical, biological, or physical quality of the water. When contaminants exceed their respective primary MCLs, the water is non-potable and should not be used for human consumption unless the water is treated prior to use.

As was discussed in the groundwater quality section above (Section 1.10), the most common contaminants in groundwater within San Diego County include nitrate, TDS, and bacteria. Typical adverse effects of poor groundwater quality can include: an undrinkable water supply, potential risks to human or animal health from ingesting contaminated water, and aesthetic impacts such as a brackish or salty taste.

3.5 Limitation of Recharge Due to Hardscape

A decrease in the amount of water that infiltrates into the ground may occur as a result of the construction of impermeable structures or materials (such as parking lots, stormwater systems, roads, or buildings). While the effect of a single project on recharge to a basin or watershed may not be significant, the cumulative effects of development can result in a decrease in groundwater recharge.

For typical projects within the unincorporated area of the County, the hardscaping associated with the projects is unlikely to have a significant impact on groundwater recharge unless a significant portion of the rainfall within the watershed is diverted outside of the watershed due to engineered structures or conveyance systems proposed as part of the projects. Most projects located within groundwater dependent areas of the County are rural and do not have stormwater systems. Impacts are most likely to occur in urbanized areas, which do not rely upon groundwater as their primary water source.

As an example, driveways, rooftops, and roads will not significantly decrease the amount of recharge to the groundwater system unless the water is diverted into a stormwater system and removed from the basin. Water running off of these hardscapes will flow into low-lying areas where it will either infiltrate, run off, or evaporate. The presence of the hardscape may even increase recharge by concentrating runoff into smaller localized areas. Due to the physics of water flow through unsaturated soil, concentrating recharge in fewer smaller areas would likely increase recharge. This is because the soil moisture capacity is satisfied much more quickly, and any subsequent infiltration over and above evapotranspirative demand goes to groundwater recharge.

4.0 GUIDELINES FOR DETERMINING SIGNIFICANCE

This section provides guidance for evaluating adverse environmental effects a project may have on groundwater resources. These Guidelines are based on the State CEQA Guidelines, and address groundwater quantity and groundwater quality. The primary goal of these guidelines is to establish measurable standards for determining when an impact will be considered significant pursuant to CEQA. For each potential impact to groundwater, levels of significance are defined.

Sustainable Yield

The guidelines below were designed to work together to provide a tiered evaluation of groundwater resources, which ultimately determine the sustainable yield for a given project. The final estimated sustainable yield for a project or basin takes into consideration water quantity, quality, and potential impacts to biological resources (groundwater-dependent habitat). It should be noted that the groundwater dependent habitat guideline, while it is used in evaluation of sustainable yield, is a biological issue and was established in a separate County document, Guidelines for Determining Significance – Biological Resources. A water balance analysis provides a first level evaluation of determining sustainable yield. Potential further constraints to sustainable yield come by combining the findings of the water balance analysis, assessment of well interference and assessment of drawdown at groundwater-dependent habitat. Additional potential constraints are determined through well testing (low well yield guideline) to evaluate whether each well tested indicates that it will be capable of providing an adequate quantity of groundwater for the intended residential use(s). Water quality, a critical component in determining sustainable yield for a given project, is addressed in the poor groundwater quality guideline. If analytical results from groundwater samples collected indicate any constituents tested exceed its primary MCL (and the water is intended for potable use without any ability to treat the contaminated water to safe drinking water standards below the primary MCL), the project would effectively have no potable water for use. Lastly, additional guidance is provided in the groundwater overdraft conditions guideline for projects located in basins with overdraft conditions.

An affirmative response to or confirmation of any one of the following Guidelines will generally be considered a significant impact to groundwater resources as a result of project implementation, in the absence of scientific evidence to the contrary:

4.1 SGMA Basins (if applicable)

Applicants for projects using groundwater resources in a basin subject to the Sustainable Groundwater Management Act (SGMA) with an adopted Groundwater Sustainability Plan are required to confirm the Project will not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin; or conflict with or obstruct implementation of a Sustainable Groundwater Management Plan. Proposed projects that cannot meet this guideline will be considered to have a significant impact.

A typical Sustainability Plan includes a groundwater technical analysis that has an estimate of sustainable yield and a framework for how groundwater is to be sustainably managed. Since each GSA has authority to adopt rules, regulations, ordinances, and resolutions to implement the Sustainability Plan for a basin, the implementing rules and requirements are different for each basin. Therefore, the Sustainability Plan results, findings, and implementing tools should be reviewed and compared to the project's proposed groundwater use and conclude whether the project will impede sustainable groundwater management of the basin or conflict with or obstruct implementation of the GSP.

4.2 <u>50% Reduction of Groundwater in Storage (Water Balance Analysis)</u>

For proposed projects in fractured rock basins, a soil moisture balance, or equivalent analysis, conducted using a minimum of 30 years of precipitation data, including drought periods, concludes that at any time groundwater in storage is reduced to a level of 50% or less as a result of groundwater extraction.

Since 1991, with the adoption of the Groundwater Ordinance and associated DPLU policy "County Standards for Site Specific Hydrogeologic Investigations," projects in fractured rock basins have been required to meet this 50% criterion. The 50% criterion was established to address the unique characteristics of the County fractured rock aquifers which are characterized by limited storage capacity and very limited groundwater recharge during droughts and excess recharge during wet periods. These unique characteristics typically cause large fluctuations of groundwater levels over the short-term which are generally not observed in aquifers with large storage capacity.

Site specific investigations perform a water balance analysis which involves the following:

1. Calculate groundwater recharge on a yearly basis over a minimum 30 year time period, typically the past 30-year period of record. Because drought conditions cannot be accurately predicted, the utilization of 30 years of historical precipitation data ensures that a reasonably foreseeable drought condition will be evaluated. Additionally, the National Weather Service typically uses a 30-year time frame for determining average rainfall;
2. Compare yearly recharge with proposed extraction for each of those years and calculate the depletion of storage during those years when extraction exceeds recharge;
3. Track cumulative depletion of storage during successive years of storage depletion; and
4. Determine if extraction is in excess of sustained yield if the cumulative depletion of storage exceeds the 50% capacity of the given basin.

Such an analysis incorporates the reality of climate variability and provides assurance that groundwater use, even during periods of limited recharge during extended drought periods, does not produce a significant impact to groundwater users dependent on groundwater. During drought years, recharge may be negligible, and water extracted from the aquifer may be derived solely from storage. The available storage in the aquifer must be large enough to supply water throughout the duration of the drought. To assure sustainable groundwater use through drought conditions, the resulting sustainable yield for a basin as calculated from the water balance analysis is a fraction of average annual groundwater recharge.

Since groundwater is the sole source of water in many of these areas, it is essential to be conservative with respect to available water resources. To illustrate the conservative nature of this criterion, Figure 8 depicts a graph of groundwater in storage over time for a typical aquifer in fractured rock, which indicates groundwater in storage falling to 50% once in a 30 year period. This is considered to be a significant impact. The groundwater recharge and storage data was obtained from Lee Valley, a fractured rock aquifer located east of Jamul. Groundwater recharge was calculated on a yearly basis using the computer program Recharg2 (Huntley, 1990). While groundwater in storage dropped to 50% in storage once during the entire 30 year period, at all other times, groundwater in storage is modeled as being above 50% and in 15 of the 30 years groundwater in storage is shown to recharge to 100% of capacity. Average groundwater in storage was estimated to be approximately 92% of full capacity through the 30 year period, which indicates that annual groundwater recharge on average far exceeds annual demand, and extraction is only a fraction of average annual recharge. This graph is typical of an aquifer in fractured rock.

Most projects will need to include the entire groundwater basin depending on the specifics of the proposed project. They will need to consider basin-wide recharge and groundwater use at maximum buildout of the basin. This approach considers cumulative impacts on the entire basin. On a case-by-case basis, it may be determined that a very small project needs only to consider the project site and whether recharge on the project site is sufficient to provide for the expected water use associated with the proposed project. However, consideration must be given to basins where large groundwater users are known to exist, such as existing agricultural operations that are not subject to the Groundwater Ordinance or CEQA. Special consideration must also be given to basins that have been developed at densities greater than would be allowed by the Groundwater Ordinance.

4.3 <u>Groundwater Overdraft Conditions</u>

4.3.1 Overdraft Conditions in Fractured Rock Basins

For fractured rock basins that have been demonstrated to be in an overdraft condition, any additional groundwater use will be considered a significant impact.

Due to the limited storage capacity of fractured rock basins, the use of additional water without mitigation could have a significant impact on the groundwater resources of the basin.

4.3.2 Overdraft Conditions in Alluvial and Sedimentary Basins

Currently, Borrego Springs Subbasin in Borrego Valley is the only alluvial or sedimentary basin in the County with a documented overdraft condition.

Applicants for projects using groundwater resources in the Borrego Springs Subbasin are required to obtain the necessary water rights (i.e., Baseline Pumping Allocations) prior to extracting groundwater. Prior to approval of a Project, the Applicant shall demonstrate to the satisfaction of the Director the ability to obtain necessary BPA.

If groundwater overdraft conditions develop in other alluvial or sedimentary basins, policies will be developed which will likely require mitigation to address potentially significant cumulative impacts.

4.4 <u>Well Interference</u>

4.4.1 Well Interference for Wells in Fractured Rock Basins

Impacts on well production, on and off property, may result from a proposed project's groundwater production. The impact to well production may be considered significant if the resultant drawdown at other wells prevents those wells from meeting their land use objectives. In the case of residential wells, the County Groundwater Ordinance has a well performance criterion of 3 gallons per minute of groundwater production. A proposed project's groundwater production would be considered to be a significant impact if it would result in decreasing other residential wells performance from above this criterion to below it. Because it will be difficult to assess whether this impact will occur, particularly in offsite wells, the following screening criteria to define significant impact to well production has been developed.

As an initial screening tool, offsite well interference will be considered a significant impact if after a five year projection of drawdown, the results indicate a decrease in water level of 20 feet or more in the offsite wells. If site-specific data indicates water bearing fractures exist which substantiate an interval of more than 400 feet between the static water level in each offsite well and the deepest major water bearing fracture in the well(s), a decrease in saturated thickness of 5% or more in the offsite wells would be considered a significant impact.

Offsite

Well interference reduces the well yield in affected wells by reducing the available drawdown in the well. The magnitude of well interference is dependent on the number and spacing of the wells, pumping rate, properties of the aquifer, and the duration over which pumping has occurred. If multiple wells will be utilized on the proposed project site, the cumulative effect of these wells must be considered when evaluating offsite well interference. This significance guideline is based on a 5 year projection of drawdown using standard hydrologic methods which takes into account the rate of projected demand for the proposed project. This conservatively assumes that no recharge occurs within the 5 year period, which would be similar to a worst-case drought scenario where little or no recharge would occur for five years.

For fractured rock wells, seasonal variations in static water levels are larger than in alluvial wells due to the lower storage capacity of fractured rock. Seasonal variations in static water levels in these wells are typically several feet to tens of feet (Figure 4). Additionally, due to the lower storage capacity and the lower production rates of fractured rock wells, these wells are typically drilled deeper than wells in alluvial aquifers. Fractured rock wells in the County of San Diego are often drilled to several hundred feet and many are in excess of 1,000 feet.

While seasonal variations in static water levels are typically several tens of feet, it should be understood that this significance guideline only takes into account what the proposed project's impact will be on offsite wells. Because of the lower storage capacity of fractured aquifers relative to alluvial ones, as an initial screening tool, well interference will be considered significant if it results in a decrease of 20 feet or more in the offsite wells. For a fractured rock well that has 400 feet of saturated thickness, the 20-foot level of significance will limit loss of available drawdown to approximately 5% and ensure that excessive drawdown in areas between the wells will not occur. If offsite wells in a given area have data to indicate major water bearing fractures which would substantiate greater than 400 feet of saturated thickness, the level of significance would be 5% or more of the total saturated thickness. For example, if offsite wells are shown to have an interval of 800 feet between static water level and the deepest major water bearing fracture, then the level of significance would be a decrease in water levels of 40 feet or more.

Onsite
For most residential projects, onsite well interference is less than significant when the wells are adequately spaced on lot sizes in conformance with the Groundwater Ordinance. For residential projects proposing to cluster its wells or lots and wells are not adequately spaced, analysis of onsite well interference may be required to ensure that well production on new lots being proposed will not be adversely affected by other proposed wells on onsite lots. As an example, a proposed project may be constrained by steep slopes or other constraints which forces house pads and wells to be placed in close proximity of one another. Another example would be using Lot Area Averaging as part of a project which could potentially reduce some lot sizes to be 33% smaller than the minimum lot sizes stated within the Groundwater Ordinance. The thresholds for determining significance to onsite wells is identical to the criterion for offsite interference as explained above.

For non-residential projects not proposing subdivision of land where there would be multiple property owners with individual wells, onsite well interference does not need to be analyzed. Since all wells would be owned by the same property owner, onsite impacts would be limited only to the property owner's wells and not to other property owners.

4.4.2 Well Interference for Wells in Alluvial or Sedimentary Basins

As an initial screening tool, offsite well interference will be considered a significant impact if after a five year projection of drawdown, the results indicate a decrease in water level of 5 feet or more in the offsite wells. If site-specific data indicates alluvium or sedimentary rocks exist which substantiate a saturated thickness greater than 100 feet in offsite wells, a decrease in saturated thickness of 5% or more in the offsite wells would be considered a significant impact.

Offsite

In addition to the assumptions described above relating to fractured rock basins, this guideline for alluvial or sedimentary basins assumes that the aquifer is unconfined. The majority of alluvial and sedimentary basins in the County are unconfined, however in the rare instance that a project is overlying a confined aquifer, a different set of guidelines will need to be used to determine significance.

Static water levels in wells vary seasonally. For typical wells in an unconfined aquifer with alluvial sediments, the yearly variations may be a few feet per year. Therefore, well interference effects that would result in a similar drawdown are not considered significant. Additionally, the amount of water that can be produced from a well is dependent on the depth of water that is present above the pump. Therefore it is advantageous to place the pump as deep as is reasonable in a well. The depth to which pumps are placed below the static water level varies from well to well, but in general, pumps are usually placed at a depth of greater than 100 feet below the water table in alluvial or sedimentary basins.

While seasonal variation in static water levels is typically a few feet per year, it should be understood that this significance guideline only takes into account what the proposed project's impact will be on offsite wells. When a well is pumped, the water table is drawn down in the vicinity of the well in the shape of a cone. This drawdown cone can be represented mathematically by a fundamental hydrogeologic equation known as the Theis equation. Based on the typical shape of drawdown cones, a well interference effect of 5 feet or more in an offsite well would be significant because the offsite well would be considerably within the radius of influence of the pumping well. Pumping from both the onsite and offsite well simultaneously would produce drawdown of much greater than 5 feet in the area between the wells. Additionally, for a typical offsite well with the pump placed 100 feet below the static water level, an interference of greater than 5% would result in an increase in the drawdown of the well in excess of 5%. If offsite wells in a given area have data to indicate alluvium or sedimentary rocks which would substantiate greater than 100 feet of saturated thickness, the level of significance would be 5% or more of the total saturated thickness. For example, if offsite wells are shown to have alluvium which substantiates a saturated thickness of 200 feet, then the level of significance would be a decrease in water levels of 10 feet or more.

Onsite
The thresholds for determining significance to onsite wells is identical to the criterion for offsite interference as explained above. For most residential projects, onsite well interference is less than significant when the wells are adequately spaced on lot sizes in conformance with the Groundwater Ordinance. Analysis of onsite well interference may be required to ensure that well production on new lots being proposed will not be adversely affected by other proposed wells on onsite lots. The rationale is explained in the Onsite discussion under Section 4.3.1.

4.5 Low Well Yield

4.5.1 Three Gallons per Minute Guideline

Proposed projects requiring groundwater resources for uses associated with single-family residences require well production during the well test to be no less than 3 gallons per minute (gpm) for each well tested. Proposed projects that cannot meet this requirement will be considered to have a significant impact.

Well yield and storage infrastructure must be capable of providing the water demand (including fire suppression) for the project. For single-family residences, well yields of less than 3 gpm are considered significant. Typical single-family residences use approximately 0.5 acre-feet of water per year. This converts to approximately 0.3 gpm if pumping occurred 24 hours per day, every day of the year. Because residential water demands fluctuate significantly during the day, a pumping rate of 0.3 gpm would not meet the peak water demands of a residential home. The required well yield has been set at a factor of 10 times higher than the average 0.3 gpm rate to meet the peak demands for a typical home resulting in the 3 gpm significance level for well yield. That is why the County of San Diego Groundwater Ordinance requires this 3 gpm guideline.

For discretionary permit projects involving single-family residences, well testing is required on approximately 10% of the lots (a minimum of one well test and up to a maximum of five well tests) to ensure that the 3 gpm minimum requirement can be obtained at these locations. If any well tested does not meet the above guidelines, the County may require additional well tests to be conducted beyond the initial requirement of approximately 10% of the lots. The lots where testing is required are chosen, in part, based on areas of the project site where the County Groundwater Geologist determines that wells are least likely to produce the required 3 gpm pumping rate. The 3 gpm requirement in the Groundwater Ordinance exceeds the 1 gpm pumping rate required to obtain a building permit in the County. If 10% of the lots are required to obtain 3 gpm wells, the remaining lots should be able to obtain 1 gpm so lots are not created that would not be able to meet the minimum requirements necessary to build on the property.

The County does not and can not guarantee future well yields for any wells. The testing above only projects the likelihood of adequate yielding wells. It is possible that even with the testing of 10% of the lots that low yielding wells could still be encountered.

4.5.2 Residual Drawdown Guideline

Where analysis of a residential well test indicates that greater than 0.5 feet of residual drawdown is projected, the project will be considered to have a significant impact.

Residual drawdown is the difference between the initial (static) water levels before a well test is conducted and the water level after recovery. A consequential amount, which has been set as 0.5 feet or greater of projected residual drawdown, would indicate an aquifer of limited extent and the long-term well yield may be lower than what is indicated in a well test. In reality, any amount of residual drawdown would be considered significant, but due to the potential for minor inaccuracies inherent in collecting the well test data, 0.5 feet was selected rather than zero feet which takes into account potential minor inaccuracies.

4.5.3 Five-Year Projection of Drawdown Guideline

The analysis of the residential well test must indicate that the amount of drawdown predicted to occur in the well after five years of continual pumping at the rate of projected water demand (a) will not interfere with the continued production of sufficient water to meet the needs of the anticipated residential use(s), and (b) must be less than the saturated depth of water above the pump intake or 100 feet, whichever is less. (The pump intake is assumed to be 50 feet above the bottom of the well). Proposed projects that cannot meet this guideline will be considered to have a significant impact.

This significance guideline is based on a 5 year projection of drawdown using standard hydrologic methods which takes into account the rate of projected demand for the proposed well. This conservatively assumes that no recharge occurs within the 5 year period, which would be similar to a worst-case drought scenario where little or no recharge would occur for five years. As an initial screening standard, after five years of continual pumping at the rate of projected water demand, predicted drawdown must be less than the saturated depth of water above the pump intake or 100 feet, whichever is less. (The pump intake is assumed to be 50 feet above the bottom of the well.)

To set the threshold for predicted drawdown after five years of continual pumping, an analysis was performed of 25 well tests that were turned into the County from residential discretionary projects over the past few years. As part of the analysis, the amount of drawdown of a given well test was plotted on the x-axis of a scatter plot and the predicted amount of drawdown after 5 years of continual pumping on the y-axis (Figure 9). In general, a well that has drawdown of 400 to 500 feet or more during a 24 hour well test may struggle to meet the needs of a single-family residence, especially in cases where wells have water bearing fractures spanning an interval of 500 feet or less. Based on the available data set, drawdown estimates after five-years of continual pumping at 0.3 gpm (0.5 af/y) indicate that wells that had a drawdown of 400 feet or more during the initial well test generally had approximately 100 feet or more of predicted long term drawdown). Since the assumptions that are used in the projected drawdown analysis are sometimes prone to error in fractured rock aquifers and do not take into consideration well inefficiency, the threshold has been conservatively set at 100 feet.

4.6 Poor Groundwater Quality

Groundwater resources for proposed projects requiring a potable water source must not exceed the Primary State or Federal Maximum Contaminant Levels (MCLs) for applicable contaminants. Proposed projects that cannot demonstrate compliance with applicable MCLs will be considered to have a significant impact. In general, projects will be required to sample water supply wells for nitrate, bacteria (fecal and total coliform), and radioactive elements. Projects may be required to sample other contaminants of potential concern depending on the geographical location within the County.

While the majority of this document addresses groundwater quantity, it is imperative that the water be potable. If groundwater in an area is not potable, then any discussion of available groundwater resources is moot. Any groundwater that has contaminants that exceed the Federal or State primary MCLs is not potable. Therefore, any project dependent on this contaminated groundwater does not have a viable source of water.

At a minimum, all wells must be sampled for nitrate (as nitrogen) and bacteria, and it is recommended that wells also be sampled for TDS. All wells installed in areas potentially impacted by naturally occurring radioactive elements (Figure 5) must at a minimum be sampled for gross alpha particles and uranium. Since the County cannot possibly know all of the areas where water quality impacts from radioactive elements may occur, it is recommended that gross alpha be included in the suite of analyses as a screening tool for at least some of the wells for all projects.

Additionally, there are areas of the County with natural or anthropogenic contaminants from leaking underground fuel tanks, hazardous waste sites, certain geological formations, etc., in which new wells or existing wells must be sampled for other applicable contaminants if the water is to be used for potable use. For water companies and community water systems regulated by the County or State, sampling and analyses requirements are generally more stringent. If any regulated compound detected in groundwater exceeds Federal or State primary MCLs, the impact will be considered significant and the groundwater resource would not be considered potable.

5.0 STANDARD MITIGATION AND DESIGN CONSIDERATIONS

Standard mitigation measures for impacts to groundwater resources are dependent on the type of project being proposed and whether the project will have any associated on-going conditions.

5.1 Projects without On-Going Conditions

For projects that do not have on-going conditions or requirements, such as Tentative Maps and Tentative Parcel Maps, mitigation measures may have to be substituted by project design considerations to modify the project. Design modifications could include reducing the lot density for the project or modifying the location and/or number of wells to be utilized.

5.2 Projects with On-Going Conditions

For projects having on-going conditions or requirements, such as Major Use Permits, a mitigation-monitoring plan may be required. The plan could include such items as monitoring water levels and demand and limiting flow or setting water level thresholds. Additionally, submittal to the County of an annual or semiannual groundwater monitoring report could be required. Project shutdown requirements could also be applied, if certain conditions are not met.

5.4 Groundwater Quality Impacts

For projects with contaminants that exceed their respective MCL, mitigation could be implemented by providing a water treatment system that reduces impacts to below the MCL. Treatment for most contaminants is often too expensive and difficult for an individual homeowner to operate and maintain. While the County will allow point-of-use or point-of-entry treatment for contaminants in wells on existing legal lots, it will not approve discretionary permits dependent on water treatment. To ensure proper water treatment, water treatment will only be allowed by a water company or community water system regulated by the County or State, which may be able to provide an affordable mechanism to treat significant water quality impacts.

5.5 Imported Water

In areas of the County where imported water is available, the primary mitigation measure would be to use imported water. In the area of the County that lie east of the CWA line (with the exception of lands directly adjacent to the CWA line where annexation may be possible), imported water is not available and thus reliance of importation of water is not a reasonable mitigation measure.

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Figure 1
The Hydrologic Cycle

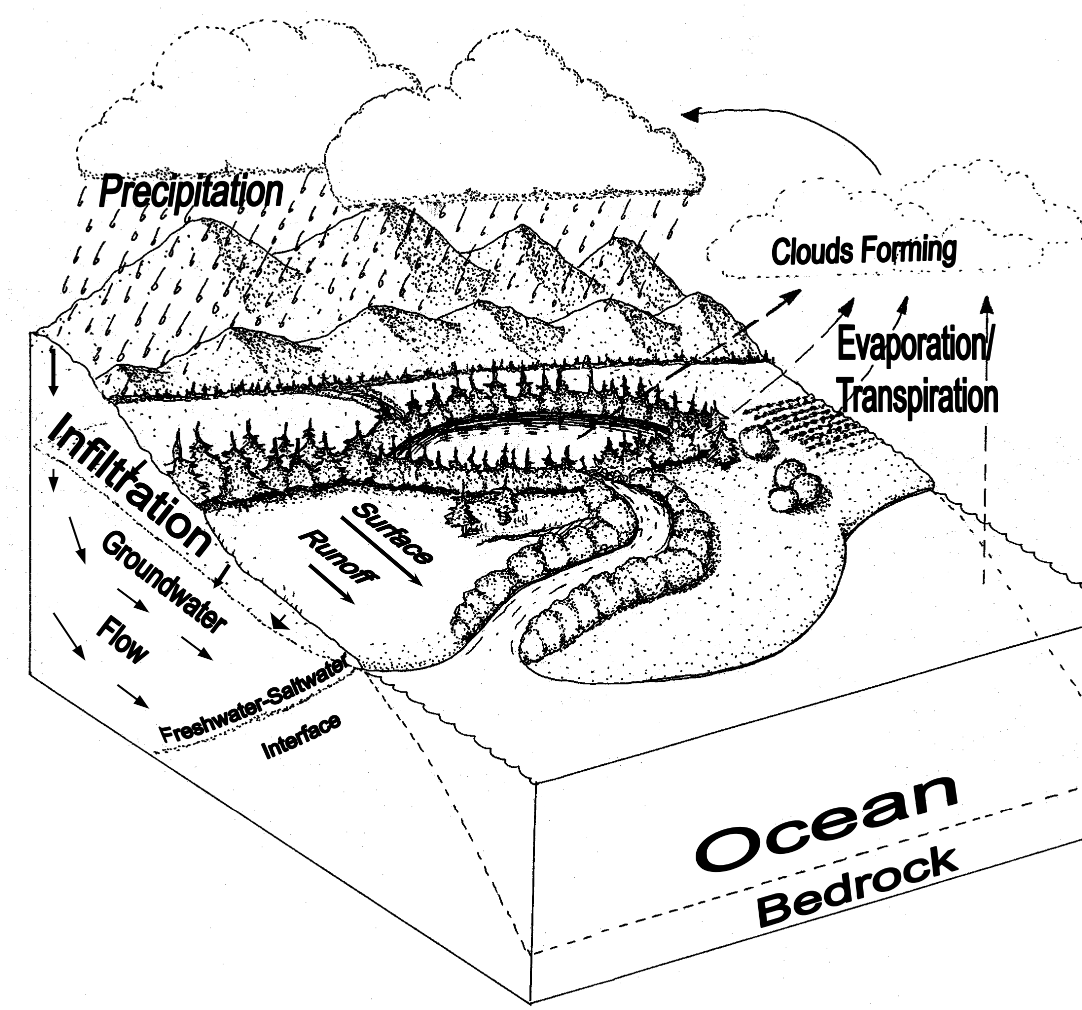


Figure 2
Groundwater Recharge / Discharge Areas

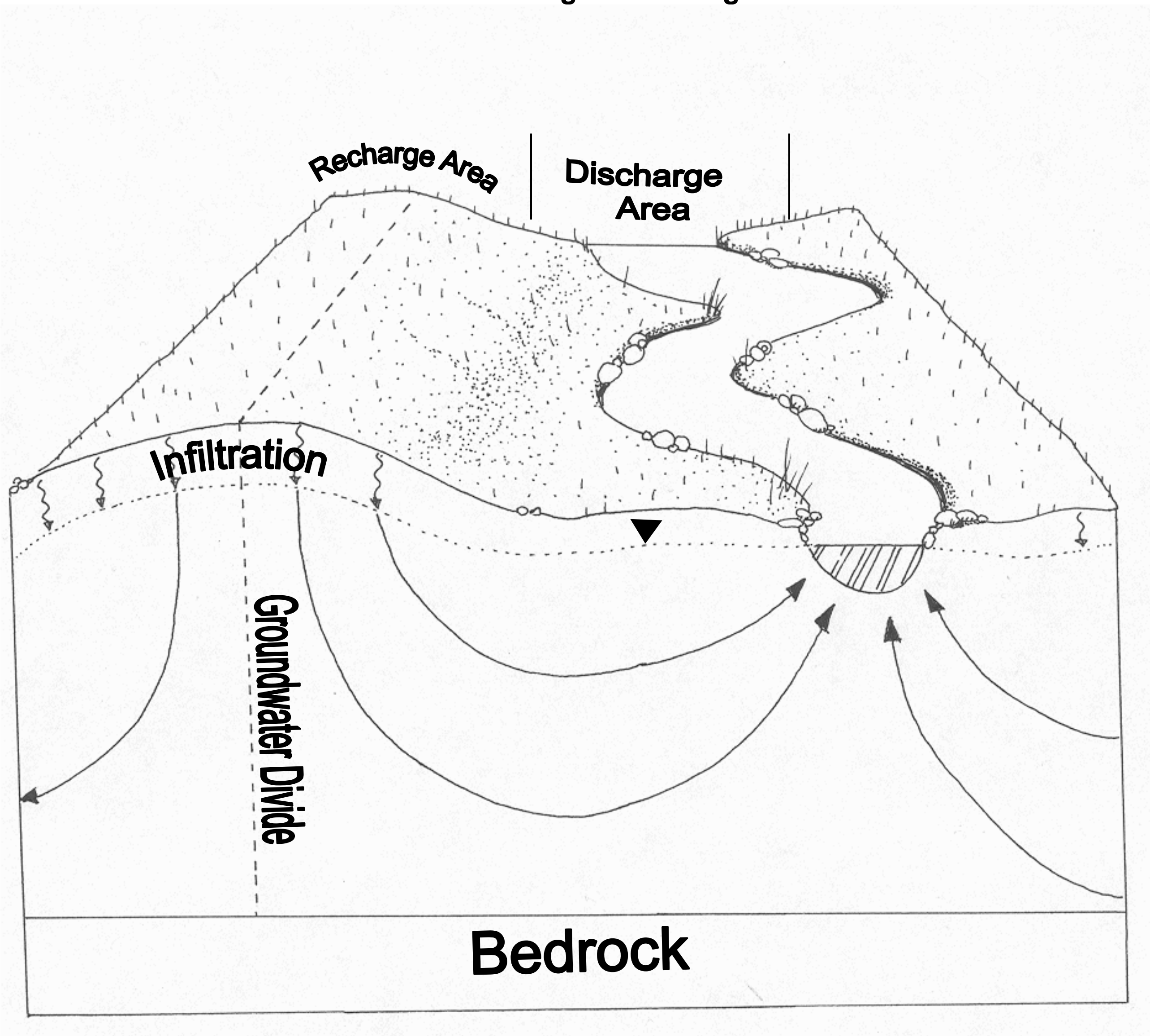


Figure 3
County Aquifer Types

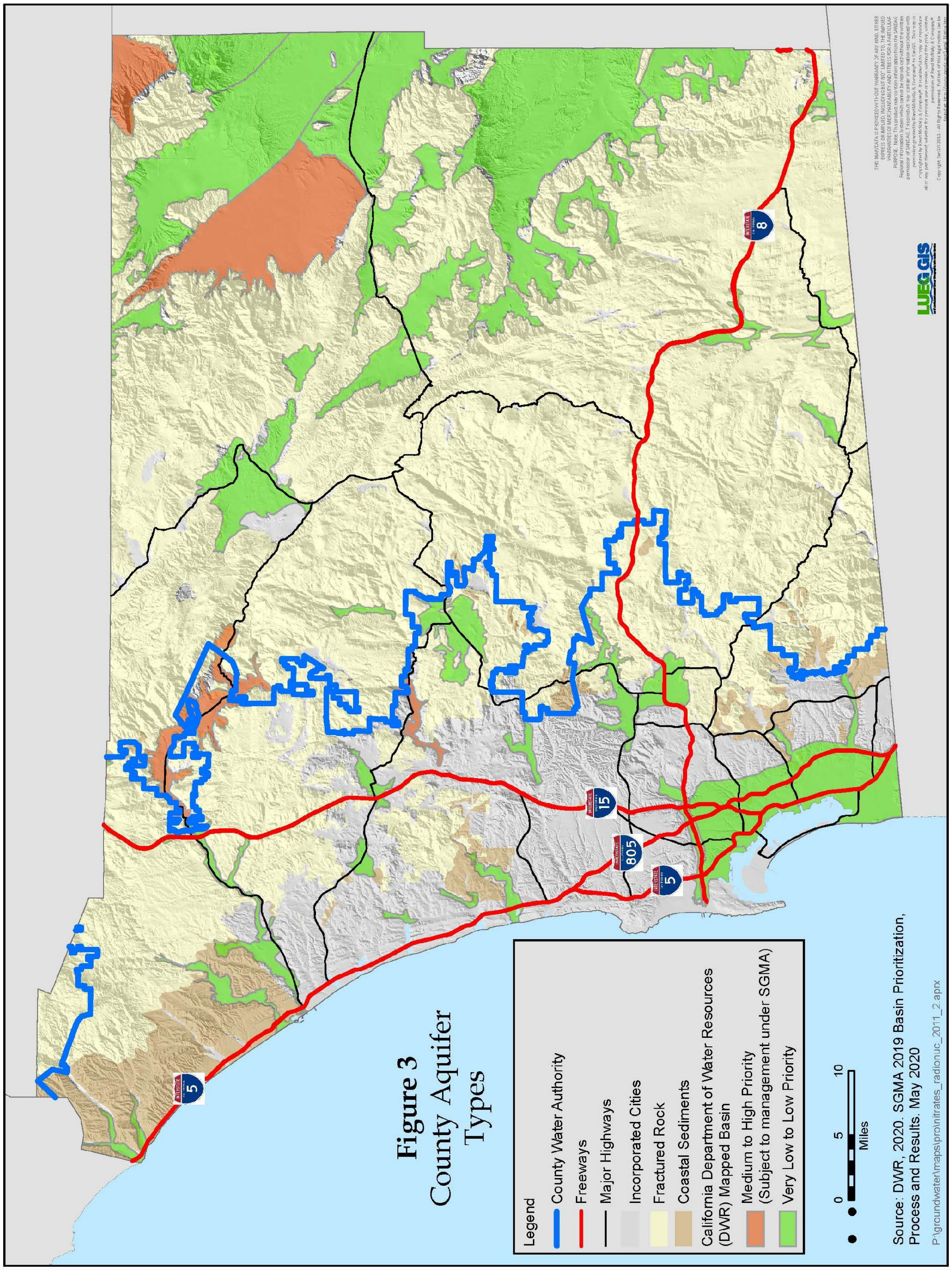


Figure 4 -Typical Seasonal Water Level Variations - Fractured Rock Well

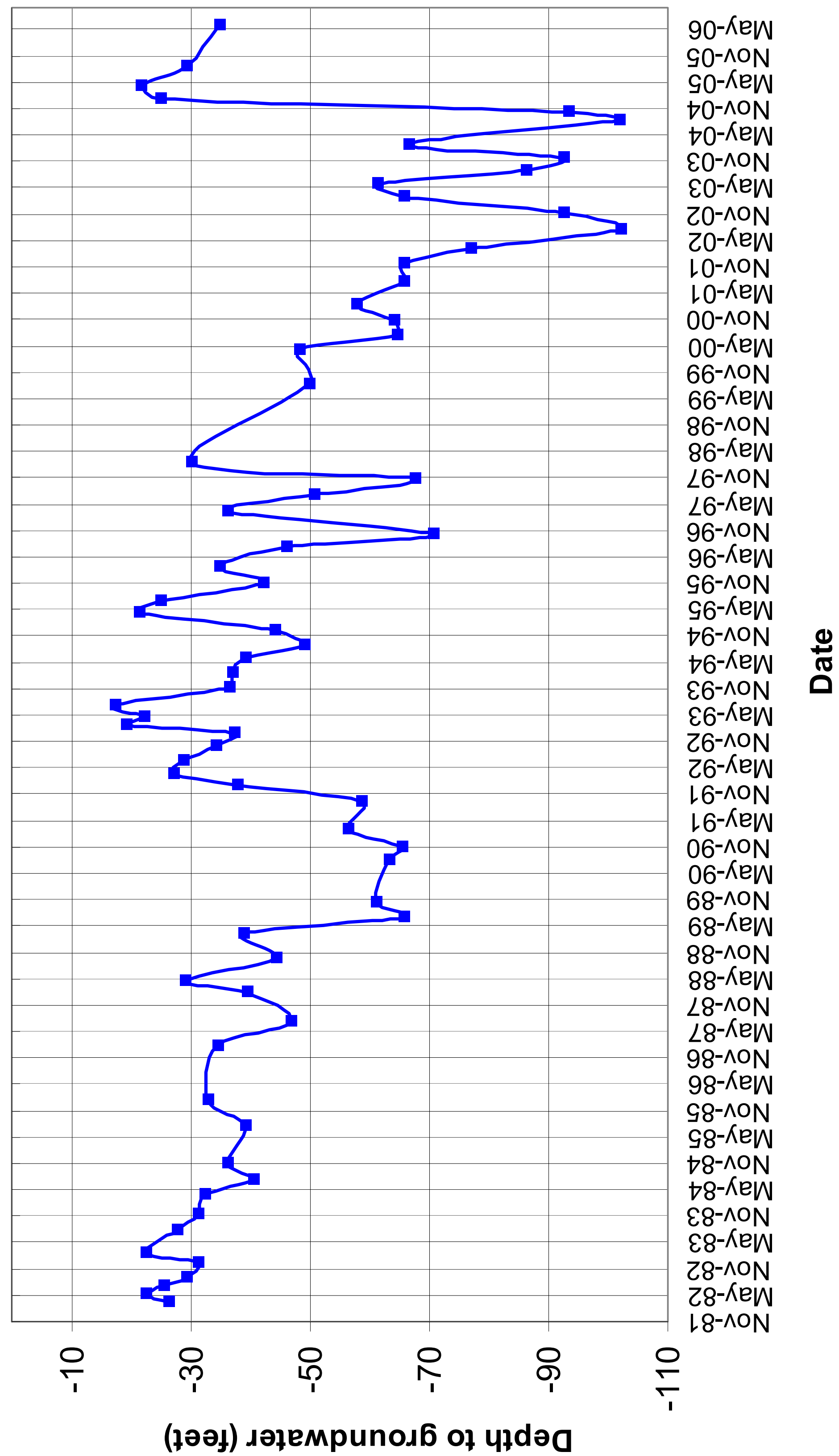


Figure 5
Potential Areas of Impact from Nitrate

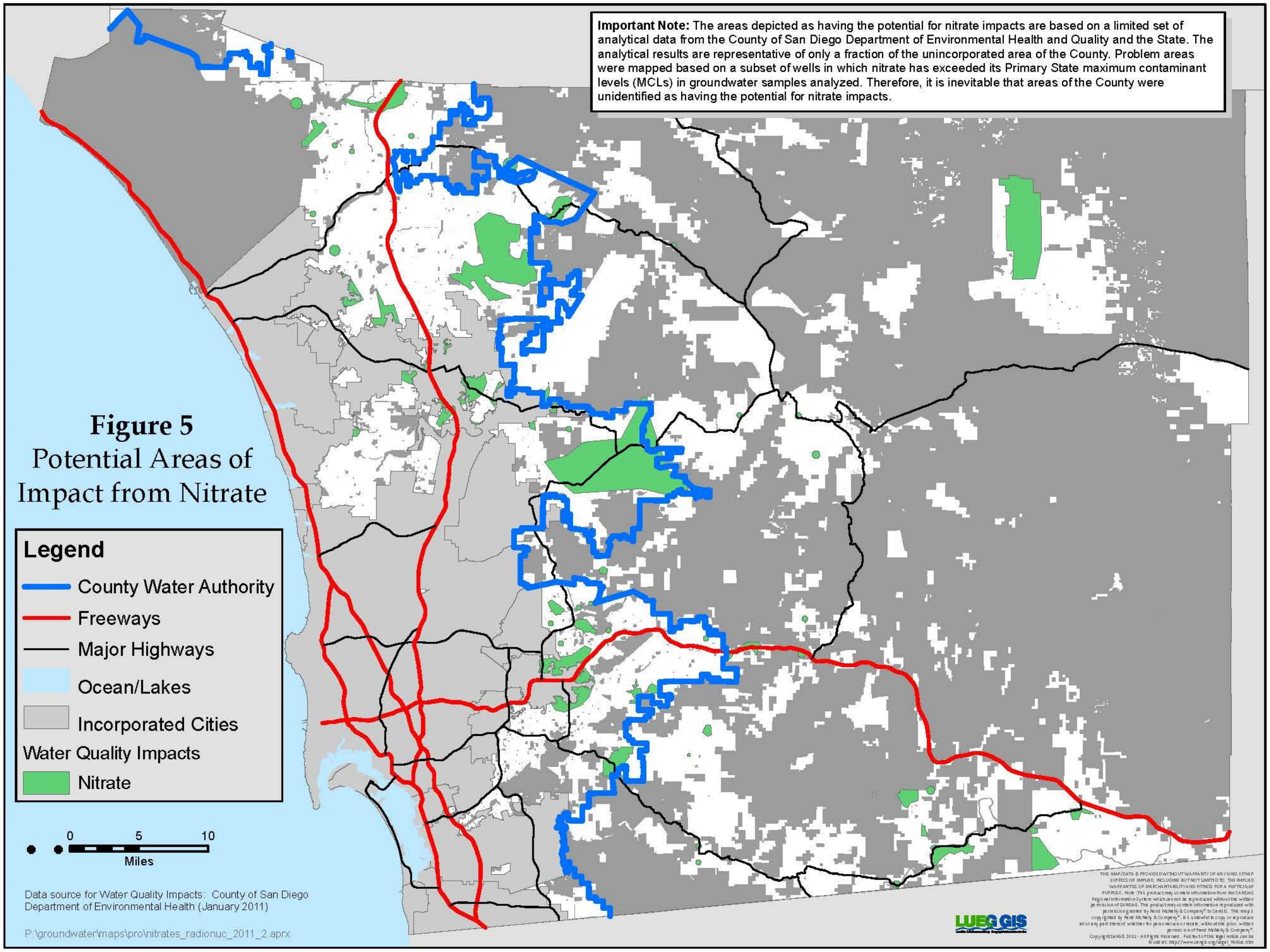


Figure 6
Potential Areas of Impact from Radionuclides

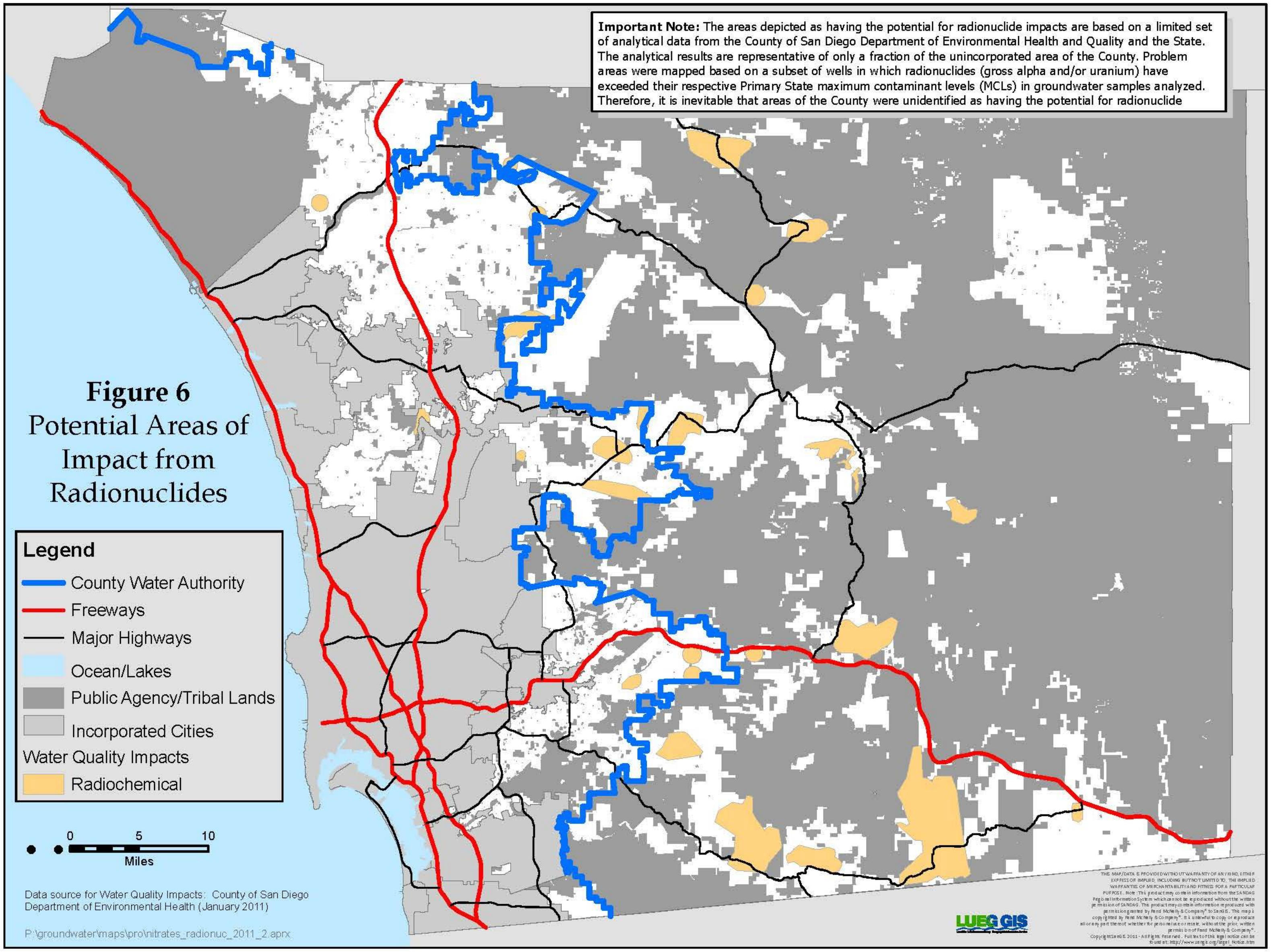


Figure 7 - Ballena Valley Water Level Variations

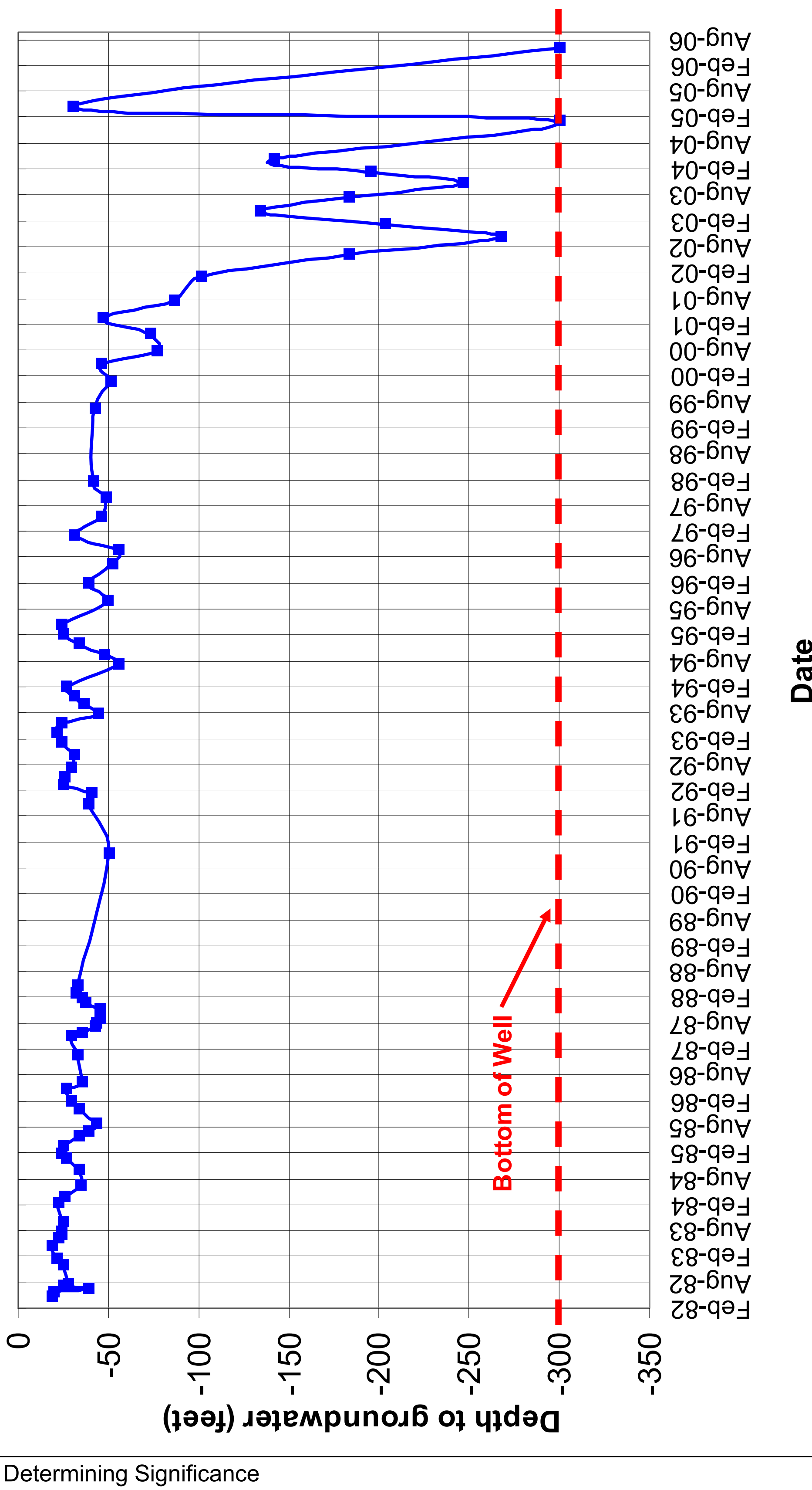
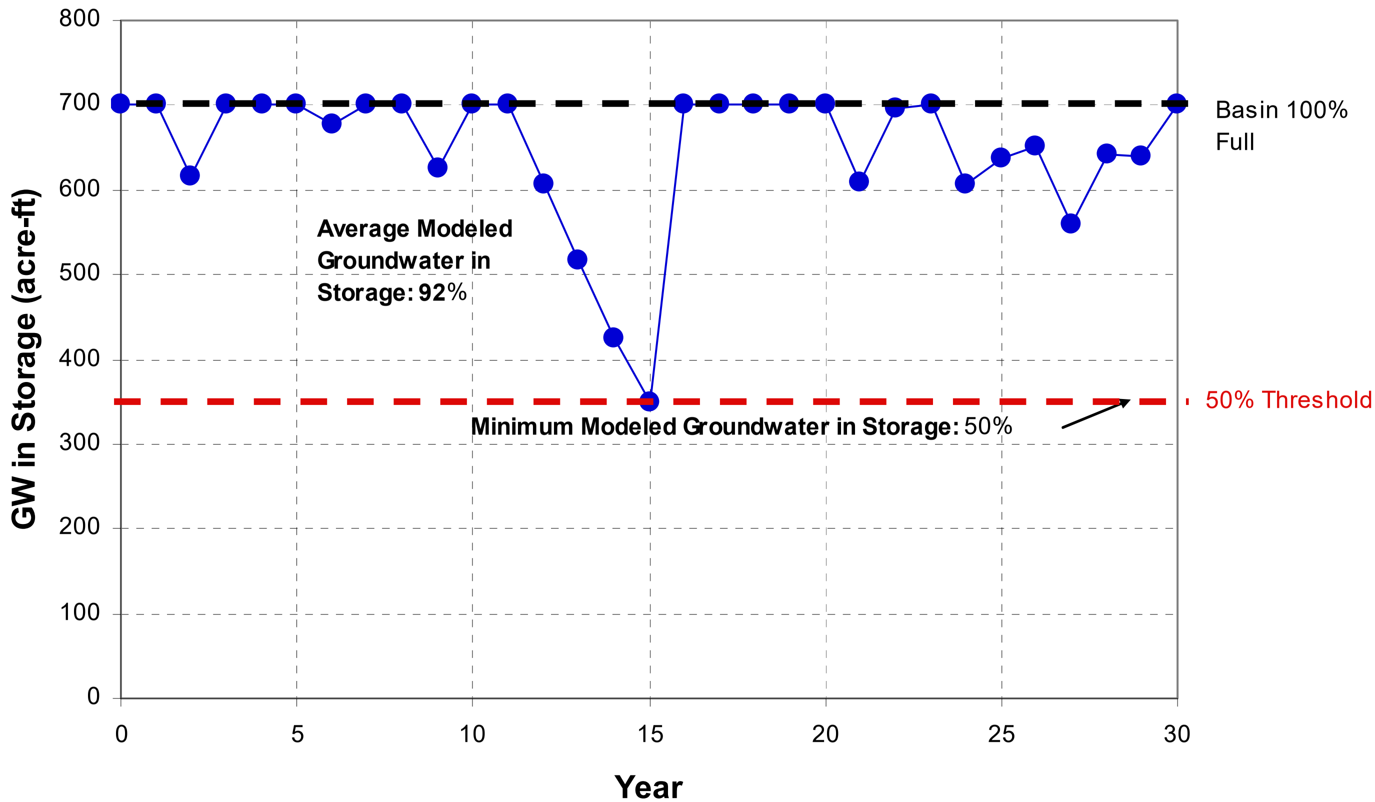


Figure 8 - Example Graph of 30 Year Modeled Groundwater in Storage Typical Fractured Rock Aquifer



Note: Future groundwater in storage is modeled using the past 30 years of monthly precipitation for a given project location.

Figure 9 - Scatter Plot of Drawdown from Well Test Versus Predicted Drawdown after Five Years