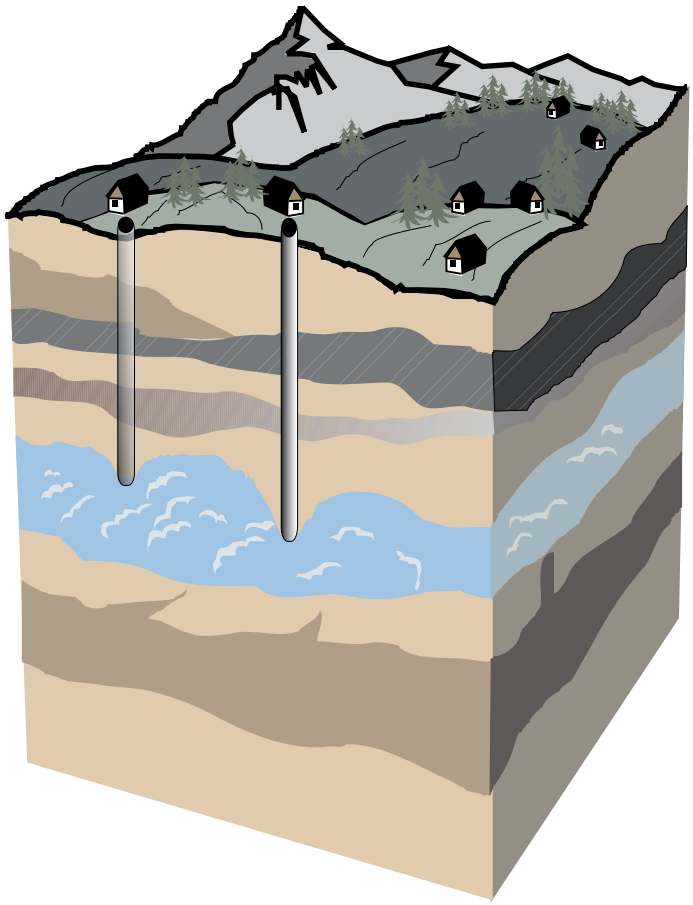

Municipality of Anchorage
Dept. of Health and Human Services
Environmental Services Division

Local Wellhead and Aquifer Protection Study Phase II

JUNE 2000

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in association with GeoNorth, Inc.
GEONORTH
GIS • DATABASE • CAD

LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY PHASE II

June 2000

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

%	percent
3-D	three dimensional
ADEC	Alaska Department of Environmental Conservation
AMC	Anchorage Municipal Code
AWWU	Anchorage Water and Wastewater Utility
BESC	Bristol Environmental Services Corporation
CAMA	Computer Assisted Mass Appraisal
CFC	chlorofluorocarbon
Code	Anchorage Municipal Code
CT&E	Commercial Testing and Engineering Environmental Services
DEM	digital terrain model
DHHS	Department of Health and Human Services
DNR	Department of Natural Resources
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
GPS	Global Positioning System
HAA	Health Authority Approval
ID	identification
mg/L	milligrams per liter
MOA	Municipality of Anchorage
MW	Montgomery Watson
NH_4+	ammonium
NO_3	nitrate
OWTA	On-Site Wastewater Technical Advisory Board
Study	Local Wellhead and Aquifer Protection Study
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The Local Wellhead and Aquifer Protection Study (Study) is a joint effort by the Municipality of Anchorage (MOA) Department of Health and Human Services (DHHS) and Anchorage Water and Wastewater Utility (AWWU), with additional funding from the U.S. Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC).

Conclusions from this study are:

1) Nitrate levels can vary from lot-to-lot, depending on the site-specific conditions. Aquifers are typically very localized and can be distinct even if in close proximity.
2) Accurate projection of nitrate levels cannot be predicted by statistical analysis of historic data.
3) Increased nitrate levels may result from poor well construction, shallow wells, dense neighborhoods, or other adverse conditions; however, these conditions do not necessarily result in nitrate occurrence.
4) In Scimitar Subdivision, new field data showed that nitrate occurrence is probably linked to the influence of on-site wastewater disposal.
5) In some local aquifers, nitrate levels are increasing but data are insufficient to document a general trend throughout Anchorage.
6) Additional field study is necessary to understand vulnerability of local groundwater systems to nitrate occurrence.

Based on these findings, the MOA should:

1) Encourage development of deep aquifers. A 40-foot minimum well depth as currently required by AMC 15.55 Water Wells may be insufficient protection.
2) Reconsider separation distances between on-site water and wastewater systems. Current code required setback distances may not be protective in certain geologic conditions.
3) Control well construction to ensure isolation of clean, deep aquifers from potentially tainted near-surface aquifers.

Community understanding of rural residential groundwater supplies is still lacking important information that would help promote and protect public health. Additional study is necessary to:

1) Identify trends in nitrate concentration over time in local areas of significant nitrate occurrence.

2) Demonstrate water quality differences between shallow and deep aquifers in neighborhoods where on-site wastewater disposal is prevalent.

3) Identify the deepest extent of shallow aquifers influenced by wastewater discharges.

4) Evaluate the effectiveness of well construction and remediation techniques to assure isolation of water supply aquifers from contaminant sources.

The DHHS initiated this study in response to community concern regarding elevated levels of nitrate in groundwater in several areas of Anchorage, including a few sporadic occurrences of concentrations exceeding the state Drinking Water Standard (Maximum Contaminant Level) of 10 milligrams per liter (mg/L as Nitrogen). The DHHS is addressing nitrate occurrence through a phased approach. To date, two phases of the study have been completed. Phase I compiled nitrate data from the Anchorage Hillside area in a report prepared by Bristol Environmental Services (BESC) in 1997. BESC mapped nitrate levels; reported summary statistics; discussed nitrate sources, aquifer susceptibility, and the public health significance of nitrate; and suggested possible approaches to groundwater protection.

The DHHS contracted with Montgomery Watson for the current Phase II study and report. Phase II has included a review of data from all over the MOA and a more intensive look at factors which may make an individual well more prone to elevated nitrate concentrations. Phase II also included field studies in Scimitar Subdivision in the Peters Creek area north and east of the Anchorage Bowl. Field activities were conducted with the intent of identifying possible factors that may influence the presence of nitrate at a particular wellhead.

Historical nitrate data from various locations and information sources throughout the MOA were compiled into a database and mapped. Fewer than 20 percent (%) of the records indicated nitrate concentrations in excess of 3 mg/L, while the majority of records (>60%) showed nitrate levels at or below 1 mg/L. Fewer than 2% of the records in the database exceeded the State of Alaska Drinking Water Standard (Maximum Contaminant Level) of 10 mg/L nitrate-nitrogen. This data may be skewed. The principal means of reporting data to the DHHS is through application for an Health Authority Approval (HAA) certificate. Since an HAA cannot be granted when the nitrate level in a well exceeds 10 mg/L, data in excess of 10 mg/L may go unreported.

Over 12,000 records of nitrate analysis in groundwater throughout the MOA were collected and compiled into a geographic database. Findings from these data are mapped on Figure 1. The mapped data indicate that instances of elevated nitrate levels tend to be limited to localized areas.

For purposes of quantifying and illustrating trends, data were compiled from public water systems with multiple nitrate occurrence records. The results of this analysis can be found in Appendix H. Twenty-nine public water supply systems provided data sufficient to build reliable time series of nitrate occurrence. The majority of these systems suggest increasing trends in nitrate concentrations, in 22 out of the 29 public water systems investigated. However, low correlation coefficients for the linear regressions reflect limited statistical reliability in the trends for most of the systems. Four systems have trends with correlation coefficients greater than 0.75. This means that only 4 out of the 29 public water systems investigated showed clear trends of increasing nitrate occurrence over a period of years. Although a general trend of nitrate increase is not evident across the MOA, certain localized aquifers have definitely been subject to changes in nitrate concentration over the last decade.

Following compilation and mapping of the nitrate database, Phase II efforts focused on attempts to link nitrate occurrence with causative factors. Three main categories of factors were proposed: geologic, well construction, and land use. Data quantifying these factors were not readily available for the entire MOA. Therefore, the project team selected a pilot study area to research and compile information from various sources, applying statistical analysis to link prospective factors to nitrate occurrence. The project team envisioned that successful determination of causative factors for the pilot study area would lead to a vulnerability model for confirmation and subsequent application in other areas of the MOA.

A 118-acre area near the intersection of DeArmoun Road and Hillside Drive was selected as a pilot study area due to the existing level of development, variety of hydrogeologic conditions, and range of nitrate values. Intensive analysis of this DeArmoun pilot study area was undertaken using existing data. Ten factors were considered, including well depth, casing depth, distance between well and septic field within a lot, well yield, lot bedroom count, soil absorption rating, sum of bedrooms within a 1,000-foot radius of a well, bedrock depth, static water level, and terrain units (as an expansion of surface geology). Statistical correlations between nitrate concentrations from the database and individual factors or groups of factors were poor. Linear and multivariate regression analyses did not link factors with nitrate levels.

Grouping of data into nitrate ranges (<1, 1-2, 2-4, and >4 mg/L) was attempted to discern trends using less rigorous statistical assumptions. There was some indication that some wells with nitrate in the >4 mg/L range tended to have shallower static water levels than other wells, but this tendency could not be extended to the entire pilot study area. A conceptual model of bedrock slope and aspect, water table, and well depth was developed for pilot area wells. Similarly, this combination of factors provided no insight into reasons for nitrate occurrence.

Scimitar Subdivision was then selected for field study based on the high variability of nitrate levels within a small local area, a reasonably well-documented hydrogeologic regime, and anticipated strong public support for the study. By taking a "snap shot" or gathering data over a short duration, the field study attempted to identify and confirm factors influencing nitrate occurrence. This field study was performed in conjunction with the U.S. Geological Survey (USGS), which provided specialized chemical analysis of the groundwater samples.

New field data from the Scimitar pilot study area indicated that higher nitrate levels were associated with relatively shallow static water levels below the ground surface. Nitrates in excess of 10 mg/L were found in three wells, each drawing water from near-surface aquifers. In one case, perforations in the well casing at only 30 feet below the ground surface provided a steady trickle of water into the well which was documented to be over 75 feet deep. Wells farther upslope, with no upgradient residential development, were found to tap deep bedrock aquifers that were free of nitrates.

USGS results show two distinct water types in eight wells sampled in the Scimitar Subdivision. Four wells had nitrate-nitrogen levels less than 1.0 mg/L, while the remaining wells ranged from 3 to 11 mg/L nitrate-nitrogen. This may indicate that two water sources are being tapped by wells in the area. Nitrate and chloride content was strongly correlated in the USGS data, and chloride data from high nitrate wells showed higher levels than typical of background water quality in the Peters Creek area. Chlorides are thought to be derived from human activities, such as road salting or domestic wastewater. Additionally, other ions, including magnesium, sodium, sulfate, and boron were shown to linked to the presence or absence of nitrate. Boron isotope ratios from high nitrate wells are consistent with detergent sources. Chlorofluorocarbon (CFC) concentrations are higher than would be expected from atmospheric sources, indicating a potential wastewater origin. Furthermore, nitrate analyses suggest that nitrogen is not changing from one form to another within the groundwater system, therefore, little natural mitigation of the nitrate occurs. The USGS findings suggest a strong link between nitrate occurrence and wastewater discharges. The results are detailed in a separate USGS publication, currently in press.

The findings of this study suggest several questions concerning future management of shallow groundwater aquifers and private on-site water supply well systems:

- *How deep does a well need to be to assure nitrate-free water?* Use of deeper aquifers may provide water less prone to septic system influence, especially if well construction provides for adequate isolation of individual aquifers. The existing 40-foot minimum well depth required by the Anchorage Municipal Code may not provide protection from elevated nitrates. The lower boundary of shallow groundwater influence on private wells is poorly understood and probably varies considerably from place to place.

- *Is the 100-foot setback requirement between wells and septic systems justifiable?* Our analysis suggests that nitrate levels may be independent of the distance from nearby septic systems. Although the setback also serves to minimize potential for exposure to wastewater-borne pathogens, certain hydrogeologic conditions may favor increased or reduced mobility of nitrates and other septic system wastewater components.

- *Can nitrate occurrence be reduced or reversed through appropriate well construction and/or remediation techniques?* Well integrity was clearly an issue with wells in the Scimitar field study. Remediation of wells to provide improved isolation of clean water aquifers should be investigated further.

Each of the above questions leads to suggestions for additional study in future phases of the Municipal Wellhead and Aquifer Protection program. Prospective approaches to additional data collection efforts are outlined in the body of this Phase II report.

Additional questions remain concerning the philosophy that the MOA will carry into management of future on-site water and wastewater development, including:

- *Should the MOA regulatory focus be limited to nitrate occurrence in an individual on-site well?*

- *Are we doing all that is necessary to prevent nitrate contamination in private wells?*
- *Does the MOA have a duty to prevent further human-induced nitrate occurrence in all shallow water aquifers?*
- *Should we encourage nitrate-reducing on-site wastewater treatment systems in areas of elevated nitrates?*
- *Given a probable link between septic system discharge and nitrate occurrence, do we need to retain nitrate as a precursor or indicator of sewage borne pathogens?*
- *What is the limit of MOA responsibility in providing assurance of adequate drinking water quality in rural residential areas?*

1 INTRODUCTION

The MOA DHHS is responsible for administering portions of the Anchorage Municipal Code (Code) which regulate individual on-site wastewater disposal systems and development of private on-site water supplies for individual residences. These residences, located within the MOA, are generally outside the AWWU Utility service area. The Code contains general provisions for protection of wellheads and aquifers; however, a growing concern of the DHHS and the public is the occurrence of nitrate in private water supplies. This concern is supported by the progressive growth of the community and an increasing number of residents with private drinking water wells. Currently, over 14,000 developed residential parcels within the MOA do not have access to public water and sewerage, and are served by on-site water and wastewater systems. Developmental pressure is increasing within and around the MOA's margins.

The DHHS sought and obtained funds from the EPA, ADEC, and AWWU to undertake a comprehensive assessment of nitrate occurrence in aquifers used for private residential wells, and to formulate a plan to protect existing and future private wells from sources of contamination.

The DHHS Environmental Health Division, On-Site Services Section conducted this study in two phases. Phase I of the study was limited to the Anchorage Hillside area. BESC prepared a report documenting the Phase I findings in 1997. Phase II of the Study involves all of the MOA. Montgomery Watson prepared this Phase II report in accordance with a Notice to Proceed from the DHHS dated September 25, 1998.

1.1 BACKGROUND OF STUDY

This section discusses the occurrence of nitrate, results of the Phase I portion of the study and Phase II objectives and problem statements. Members of the steering committee and organization of the report are also presented.

1.1.1 Nitrate

Nitrate is a mobile constituent common in many aquifer systems, and is the most common contaminant identified in groundwater (Freeze and Cherry, 1979). Nitrate in groundwater is becoming widespread in many rural areas of the U.S. due to agricultural activities and disposal of sewage on or beneath the land surface. Nitrate contamination also has implications for public health, due to the possibility of *methemoglobinemia*, or "blue baby syndrome" in infants, and is one of the most frequently reported contaminants from septic systems (Freeze and Cherry, 1979). The current State of Alaska Drinking Water Standard for nitrate is 10 mg/L.

Nitrate (NO_3-) can enter groundwater directly, through wastes or fertilizers applied on land surfaces, or by chemical processes, and is the main form of nitrogen found in groundwater. Organic nitrogen, nitrogen that is incorporated in organic substances, can convert to nitrate through biochemical processes. Organic nitrogen is first converted to ammonium (NH_4^+); a conversion process called *ammonification*. Ammonium is then converted to nitrate by oxidation,

a process called *nitrification*. Nitrate is not usually limited by solubility constraints in groundwater and is anionic, resulting in high mobility in groundwater (Freeze and Cherry, 1979).

1.1.2 Phase I Study Findings

Phase I of the protection study evaluated nitrates along the Anchorage Hillside area and developed a conceptual groundwater protection program. Figure 2a illustrates the Hillside area evaluated in Phase I. The Hillside area was chosen because it contained many individual wells and septic systems and has experienced significant growth.

In Phase I, historical nitrate data was collected on 1,817 wells in the Hillside area. Approximately 18 percent of the wells showed nitrate concentrations above 3 mg/L, and 0.4% of the wells were reported to exceed the drinking water standard of 10 mg/L nitrate-nitrogen. This data may be skewed because samples with levels exceeding the 10 mg/L criterion do not receive an HAA certificate. The principal means of reporting data to the DHHS is through application for an HAA certificate from the DHHS. Since an HAA certificate cannot be granted when the nitrate level in a well exceeds 10 mg/L; therefore data in excess of 10 mg/L may go unreported. Nitrate occurrence was also found to be concentrated in certain parts of the Hillside area. Attempts were made to discern long-term trends in nitrate occurrence throughout the study area; however, the results were inconclusive due to sparseness of data (BESC, 1997).

BESC recommended formation of a groundwater protection program, with the intent of increasing public awareness and education, providing a means of coordination among stakeholders, and developing and maintaining technical information. The Phase I study also recommended additional analysis, including:

- Statistical analysis of nitrate data.
- Temporal analysis of nitrate data.
- Background nitrate concentrations.
- Groundwater vulnerability mapping.

1.2 PHASE II STUDY OBJECTIVES

Following suggestions from Phase I, the objectives of Phase II concentrated on establishing a database of historic nitrate occurrence throughout the MOA and determining key factors that influence the presence or absence of nitrate in drinking water wells. Specific objectives are:

- Formation of a historic nitrate database consisting of all available information.
- Mapping nitrate occurrence.
- Determination of key factors in nitrate occurrence by statistical operations.
- Use of key factors in nitrate occurrence to form a nitrate vulnerability model for existing and future developments.
- Presentation of data and analysis to the public.

In relation to the Phase II study goals, this report is intended to present information and provide answers to the following five questions:

1) *Does historic nitrate data reliably represent the occurrence of nitrate in groundwater throughout the MOA?*

2) *Does historic nitrate data suggest increasing nitrate levels through time?*

3) *Can historic data be used to statistically link key factors to nitrate occurrence in drinking water wells?*

4) *Does a connection exist between nitrate values and septic systems?*

5) *Can existing and historic data be used to construct a reliable model of the vulnerability of existing and future development to groundwater nitrate contamination?*

1.3 STEERING COMMITTEE

In developing a scope of work for Phase II of the study, DHHS called for assistance from the MOA's On-Site Wastewater Technical Advisory (OWTA) Board, a volunteer group of professional engineers and interested citizens appointed by the Mayor to provide the DHHS with technical guidance and assistance in conflict resolution. The OWTA Board recommended establishment of a Steering Committee for the study to guide information collection and analysis efforts during Phase II. This group was composed of individuals from the USGS, AWWU, DHHS, and the OWTA Board. The members, their positions, and the group which they represent are as follows:

- Gordon Nelson, District Chief of Water Resources, USGS.
- Bronwen Wang, Ph.D., Hydrologist (Water Quality Specialist), USGS.
- Don Keefer, PE, Planning Section Supervisor, AWWU.
- Bruce Chandler, MD, Chief Medical Officer for MOA, DHHS.
- Jim Cross, PE, On-site Wastewater Services Supervisor, DHHS.
- Sharon Minsch, Chairman, OWTA Board.
- Craig Woolard, Ph.D., PE, OWTA Board.

The Steering Committee met with the Montgomery Watson Project Team on the following dates to review findings and confirm the direction of the study:

- October 21, 1998
- December 16, 1998
- February 19, 1999
- March 26, 1999
- May 5, 1999
- June 28, 1999
- October 20, 1999
- December 7, 1999

1.4 ORGANIZATION OF REPORT

This document has been organized in the following manner to address the study objectives and answer the following problem statements:

Introduction. Summarizes the content of the Phase II report, presents the problem statements to be addressed, and describes the report organization.

Data Collection. Briefly describes the structure of the compiled nitrate databases, and the methods, and logic used in the data collection effort.

Nitrate Mapping. Describes the results of nitrate data collection and mapping.

Analysis of Factors. Describes and documents causative factor selection, formation of pilot study areas, and initial statistical treatment of the data.

Hydrogeologic Incorporation. Describes and documents subsequent interpretations and statistical treatment of available data incorporating hydrogeologic assumptions.

Scimitar Field Investigation. Describes the objectives and methods of the 1999 field investigation, documents findings, summarizes the results, and presents the conclusions.

Phase II Conclusions and Recommendations. Summarizes the conclusions and recommendations gained from the Phase II study.

2 DATA COLLECTION

Data collection was expanded from Phase I to encompass the entire MOA. This section documents the types of data selected, data sources, and methods of data quality and validation used in formation of Phase II databases. Four databases were established: the Nitrate Database (encompassing the entire MOA), and three separate, smaller databases for two pilot study areas. These three smaller databases contained detailed information regarding well logs and septic systems for the pilot study areas that were used in determining factors of nitrate occurrence. All four databases are subsequently described in terms of structure and organization. Selection of information other than nitrate, which was obtained for incorporation into the databases, is explained in greater detail in Section 4.0.

2.1 DATABASES

Four databases were structured for the project: the Nitrate Database, which encompassed the entire MOA, and the DeArmoun, DeArmoun Modified, and Scimitar Databases, which encompassed specific pilot study areas. These pilot study areas are illustrated on Figures 2a and 2b. Assumptions used to form these databases are discussed in Appendices A through D.

The Nitrate Database was incorporated into Microsoft Access 97, and the tables that make up its structure are illustrated in Table 1. Five tables compose the database, with links between them and an access structure diagram as shown on Figure 3. A nitrate database dictionary is presented in Appendix A. This database represents the most complete historical nitrate record for the MOA, and has been incorporated on compact disk at the back of this report.

The DeArmoun and DeArmoun Modified Databases encompass much smaller areas than the Nitrate Database. The DeArmoun pilot study area was selected to represent an area of current and future development that also had a more complete historic nitrate record. The DeArmoun Database was created to quickly evaluate trends, correlation, and normality in the data. The DeArmoun Modified Database was formed to represent well logs in greater detail and include septic system information to establish further correlation in the data available. The general structure of these databases is illustrated in Table 1. Appendices B and C contain the DeArmoun and DeArmoun Modified Databases, respectively.

The Scimitar Database includes data from the Scimitar Subdivision near Peters Creek. The Scimitar Database was created to compare and verify historic nitrate trends, correlation, and normality results from the DeArmoun Databases. The general structure of this database is illustrated in Table 1. Appendix D contains this database.

2.2 DATA TYPES

Three main types of data were obtained from various sources. These data types were nitrate, well log, and septic system data. Septic system data was formed only for the DeArmoun Modified

Database. This data was combined to discern relationships among variables. Table 2 contains a listing of general information obtained and used within each data type.

2.3 DATA SOURCES

Many sources were used to establish the Phase II databases and perform statistical analyses. These sources included existing literature, the DHHS, ADEC, and Alaska Department of Natural Resources (DNR). A complete list of sources and the data obtained from them is presented in Table 3. Information obtained from these sources consisted of nitrate data, well log data and septic data for database incorporation.

2.3.1 Nitrate Data

As indicated on Table 3, nitrate data can come from many sources. Within the Nitrate Database, these sources remained distinct, and considerable duplication of nitrate values existed due to the same value being reported from different sources. The two main sources of nitrate information were from ADEC and the DHHS. In databases used for statistical evaluation, (included as Appendix B, C, and D), nitrate data was combined and duplication was eliminated. Sources of the nitrate data are described in the following sections.

2.3.1.1 ADEC Data

ADEC is the regulatory authority that controls drinking water quality. Periodic testing of community and public water supplies allows ADEC to monitor the water for bacteria, nitrates, and other potential health risk agents. Three separate nitrate source designations were given to ADEC data, to differentiate between sources within the agency. The three different nitrate source designations were: ADEC, ADECMult, and ADECPublic.

ADEC and ADECMult nitrate data were collected from grid maps supplied by ADEC (ADEC, 1996). The data was comprised of community well information from a nitrate study performed by the state for their internal review. The grid maps were composed of sections of property, colored to represent a nitrate range, with symbols representing the well as a community or public well, and a two digit number designating the year of sampling (exact sampling dates were not provided). A numerical system was developed for inputting the nitrate ranges and well classes into a database format (Appendix A). ADECMult data indicated that the parcel or single lot had multiple wells present. Approximately 2,399 records were combined under ADEC and 337 records were combined under ADECMult.

ADECPublic nitrate data was gathered from periodic testing of nitrate levels in public drinking water systems for health purposes between 1980 and 1999. Approximately 1,251 records were collected.

2.3.1.2 DHHS Data

DHHS enforces the Code for water quality standards. When located on private property, the Environmental Services Section of the DHHS regulates water and wastewater on-site systems.

Currently, an HAA certification is required for private wells, and nitrate data is logged into the database. A registered engineer must approve any well construction and water quality prior to resale of a home. Currently, data within the database mainly dates from 1989 to the present. DHHS nitrate values from the HAA were designated three ways: DHHS1993, DHHS1999A, and DHHS1999B.

DHHS1993 nitrate values were compiled from a DHHS file that included nitrate values and sampling dates of private wells from 1980 into June 1993. Approximately 2,833 records were collected.

DHHS1999A were nitrate values compiled from the HAA database as of March 1999. This database replaced an earlier version that encompassed only a small portion of the HAA data. Approximately 4,821 records were collected from the HAA database.

DHHS1999B were nitrate values compiled from DHHS file searches through hardcopy HAA sheets and well logs in March 1999. This file search was necessary to recover the sampling date of all the DHHS1999A database nitrate values, as only the HAA received date had been recorded. Many of the new nitrate values found in this search were dated prior to the formation of the HAA database and hence, their values were not included. Approximately 177 records were collected.

2.3.1.3 Other Sources

Although many literature sources were found, most had used information already documented within the DHHS or ADEC databases. Two reports, however, did contain limited additional information and were included in the database (BESC, 1997; Terrasat, 1997). These are denoted sources in the database as Bristol1997 and Terrasat1997. These reports contributed approximately 67 records between the years 1987 and 1995.

Sharon Minsch, Chairperson of the OWTA Board, often provided recently drilled well logs and nitrate results. This information was added to the database, since it had not reached ADEC or DHHS files. These records are denoted as Minsch1999. Approximately three records were added from her efforts to obtain current information in select pilot study areas.

Commercial Testing and Engineering Environmental Services (CT&E) Laboratory results were also made available through Sharon Minsch. Laboratory analysis reports included data that would not otherwise have been used in the study. These records are denoted as CTE1999. Approximately 185 records between the years 1988 and 1998 were included from these results.

2.3.2 Well Log Data

As indicated on Table 3, well log information can come from many sources. Within the Nitrate Database, these sources remained distinct. Within the three smaller databases, well log information or data from different sources were not duplicated. Since well log information does not change temporally and the duplicate well logs were easily detected, the primary well log source was the DNR, as well as the DHHS.

2.3.2.1 DNR Data

Water well drillers are required to send their original well logs to the DNR. The well logs help the agency develop their water resources and geological knowledge of the Anchorage area. The majority of the well logs obtained for this study originated from the DNR and are listed as DNR1999. Approximately 148 well logs were obtained, with at least the date the well was drilled and the depth of drilling.

2.3.2.2 DHHS Data

DHHS nitrate values from the HAA database and subsequent file searches were designated as DHHS1999AB. Approximately 4,887 well logs were obtained with at least the date the well was drilled and the depth of drilling.

2.3.2.3 Other Sources

Sharon Minsch often provided recently drilled well logs and nitrates results. This information was added to the database before it would reach ADEC or DHHS files. These records are denoted as Minsch1999. Approximately one well log was obtained with at least the date the well was drilled and the depth of drilling.

2.3.3 Septic Data

Septic data was obtained from the DHHS1999AB database for inclusion into the DeArmoun Modified Database. Approximately 247 parcels were logged with septic data. Other databases did not incorporate this information.

2.3.4 Other Data

Three other data sources were used for various purposes in formation of the Phase II database. These consisted of data from the MOA's Computer Assisted Mass Appraisal System (CAMA), with processing by GeoNorth, Inc., for lot information and locations, terrain units from Montgomery Watson, and USGS geologic data.

GeoNorth, Inc. developed an Anchorage Map in GIS for the MOA. The database parts are distinguished by parcel identification (ID) number, which describes the property for tax purposes. Each parcel ID has a matching tax ID, location description, owner, owner address, and other property legal descriptions. Coordinates were also determined based on USGS data for incorporation into the Phase II databases. Where actual well coordinates and elevations existed for the pilot study area databases, they were used instead of generated data.

Montgomery Watson developed Terrain Unit Mapping during a previous study for the MOA (MW, 1998). This map included terrain units, or surficial geology, of the Hillside Study area. Each unit was classified according to the existing landform for that section, such as colluvial deposits, glaciolacustrine deposits, or bedrock. These units were incorporated into the DeArmoun Database.

USGS maps and digital terrain models (DEM) were used to help interpolate and verify specific bedrock depths in the DeArmoun pilot study area. USGS maps themselves interpolate bedrock depths of the Anchorage area based on bedrock depths indicated in public and private water well logs (Glass, 1988). These interpolations were not included in the Phase II databases, because of the high local variability of bedrock encountered in well logs, but were used to initiate discussions on possible groundwater mechanisms in different areas.

2.4 DATA QUALITY AND VALIDATION

Laboratory results of nitrate analysis of well water were assumed to be accurate and representative of the aquifer supplying water to the well, although values were back-checked for input errors. Duplicate records from different sources were left within the Nitrate Database. For the three smaller databases included as Appendix B, C, and D, data was double-checked against existing hard-copy records and duplicates deleted. Where multiple wells existed for a lot, the well with the most information was retained within the database.

For the three smaller databases, variations in well log or septic data deferred to the original or photocopied well log when deviations were noted. The well log depth took precedence over HAA well depth when a conflict was detected. Absorption soil rating was only used if the HAA rating matched the hardcopy as-built rating. Nitrate levels and distances to absorption fields with zero values were omitted from the database. Due to unverifiable values, cells with a blank or zero value were not used when studying specific attributes of a well. In the Nitrate Database, nitrate does not include sample date for nitrate analysis. Most information for sample dates came from file searches for the specific pilot study areas that were intensively researched. The date an agency received the information was much more commonly recorded, and was used to determine gross, yearly comparisons.

3 NITRATE MAPPING

Results of the Nitrate Database compilation resulted in over 12,000 records. These results were subsequently mapped. Including some duplicated data between data sources; the figures indicated few instances of significant nitrate contamination. The instances of elevated nitrate levels occurred primarily in localized areas. Although only 154 records (<2%) exceeded the State of Alaska Drinking Water Standard of 10 mg/L nitrate, it is likely that this data is skewed toward limits below the Drinking Water Standard. Since a homeowner will not receive an HAA certificate when nitrate levels exceed the 10 mg/L, it is probable that elevated nitrate occurrences go unreported during the sale of residential real estate with on-site water and wastewater systems. Many of these areas that experienced localized pockets of elevated nitrates, such as Schroeder Subdivision, have subsequently been provided with public water supply from the AWWU. A total of 2,147 records (<20%) indicated nitrate values greater than 3 mg/L, while the majority of records (61%) show nitrate levels at or below 1 mg/L.

The Nitrate Database was used to map nitrates across the MOA. A point plot was developed by GeoNorth, Inc. that showed the most recent nitrate values found over time for each well that had a nitrate value (Figure 1). As can be seen on Figure 1, areas that had higher concentrations of data tended to have higher diversity in nitrate values; however, data is spatially sparse for correlation purposes across the MOA.

Additional mapping also was used to detect possible trends in nitrate areawide. Trends were difficult to observe due to scarcity of data for individual wells over time and, as discussed in Section 2.0, most nitrate values only had an agency-received date associated with them, or no date at all, which severely limited the resolution of trend mapping over time.

4 ANALYSIS OF FACTORS

Based on nitrate mapping results and the compiled Nitrate Database, efforts were focused on attempts to link nitrate occurrence with causative factors. The initial approach consisted of factor determination, focusing efforts on specific pilot study areas, and statistical analysis. Conclusions gained from this initial approach shaped and determined further analysis.

4.1 FACTOR DETERMINATION

Initial work on this Phase II study centered on establishing select physical features that could influence nitrate concentrations in drinking water wells. Literature review and professional judgement were used in factor selection. After factors were selected, data collection and analysis was performed. Three main classifications of factors were selected; geologic, well construction, and land use. Table 4 contains a breakdown of these three main classifications and the factors within them.

4.1.1 Geologic Factors

Historical literature suggests that geologic factors were generally considered a primary factor in the presence or absence of nitrate, due to the fact that groundwater movement through the subsurface regulates nitrate mobility. Numerous studies have documented the importance of geologic factors; however, many studies have been statistically indeterminate in relating geologic factors to the presence or absence of nitrate (Clawges and Vowindel, 1996; Nuckols et al., 1999). These results may have occurred due to the quality of data; the relationships of factors to each other or from other, confounding factors were not accounted for.

For purposes of this Phase II study, common geologic factors used to assess nitrate occurrence in similar studies were used. Soil type and permeability, depth to bedrock, lithologic features, slope, water table depths, yield, and aquifer determinations were evaluated for preferential pathways of nitrate movement. Geomorphic terrain types were also compared for surficial similarities of soil (Figure 4). Data from these factors were used to create a framework for understanding nitrate mobility.

4.1.2 Well Construction

Improperly constructed wells can result in groundwater contamination from the introduction of contaminated surface or groundwater. Wells improperly abandoned can act as a conduit for contamination, allowing a direct link between surface sources and groundwater. Active drinking water supply wells can also have faulty casings or inadequate seals, allowing contamination from other sources (USEPA, 1993).

Well logs were evaluated for information regarding the depth of the well and casing, whether the casing extended to bedrock, perforation data, types of casing, and surface conditions. Data from these factors were used to understand possible travel paths for nitrate mobility.

4.1.3 Land Use

Although some studies have documented contributions of nitrate from the surrounding bedrock formations, the presence of significant nitrate concentrations are usually attributed to human activity (i.e., septic sources, fertilizers) (Freeze and Cherry, 1997). A nitrate study performed in New Jersey especially illustrated this concept, where median concentrations of nitrate in water from wells in predominately urban and agricultural areas were greater than the median concentrations of nitrates in predominately undeveloped areas (Clawges and Vowinkel, 1996).

For the MOA, more development of residential homes with drinking water wells and septic systems could increase nitrate levels in drinking water aquifers. Land use and urban density were evaluated in selected areas of the MOA to determine whether significant differences existed between different urban densities. Septic system ages and type were also evaluated.

Phase I of the study compared nitrate concentrations with the size of the lot upon which the well was located. No significant correlation was found to exist, perhaps because the density of development in the neighborhood was not sufficiently described by the size of the lot containing the well.

The Phase II study evaluated residential density in two ways: by a summation of bedrooms and by the DHHS method of leach field sizing, which involves calculation by the number of bedrooms on a single lot. Two methods of summation were utilized in determining a "summation of bedrooms" value (Figure 5). The first "meatball" method involved summing up the number of existing bedrooms on lots that fell within a 1,000-foot radius around an individual wellhead. The second "hotdog" method involved using a 1,000-foot line upslope to form an almost elliptical pattern from the wellhead approximately 1,000 feet long by 250 feet wide, and summing the number of bedrooms within it. The hotdog method was intended to provide for slope considerations. In statistical operations, the circular pattern was used, as it was easier to determine density patterns. Analysis of the number of bedrooms on a lot was also used to provide a rough determination of household density that might affect the amount of septic leachate from a given septic field.

Both of these analyses assume that a bedroom consists of a living quarter for two human beings. Many bedrooms, however, are used for office space or other uses, while other bedrooms are occupied more than one individual. The use of a bedroom designation for population density is necessarily limited by using the assumption that each bedroom represents one individual.

4.1.4 Use of Factors

The various components of these three main factor groupings were collected from many sources, organized into various databases, and analyzed. These components were used individually and in different combinations to determine which components could most influence nitrate concentrations at a given wellhead. Assumptions made in determining factor selection were considered reasonable in quantifying aspects of lithology and population density for statistical consideration.

4.2 PILOT STUDY AREA DETERMINATION

From mapping of nitrate values, focus of the study shifted to determining pilot study areas. Concentrating further work into pilot study areas was necessary to effectively relate available data to nitrate occurrence factors. The following criteria were established to assist in determining selection of a pilot study area:

- Highly concentrated historical data to maximize statistical representation.
- Areas representative of likely future developments.
- Areas where homeowners are likely to be reasonably cooperative of the study.

Initially, four areas in the MOA were selected for possible investigation. Based on these criteria, one area was retained for further study. This area, shown on Figure 2a, was named DeArmoun, located in a portion of the originally studied Hillside Area of Phase I. The DeArmoun area contained a good representation of nitrate values relative to the whole MOA, with topographic relief and homeowners that had previously been aware of the Phase I study conducted in the same area. The DeArmoun pilot study area encompassed approximately 118 acres on the Hillside area of Anchorage. Upper Huffman Road bounds the area to the north, Upper DeArmoun Road to the south, and Langman Circle on the west (Figure 2a). The eastern boundary runs from Upper DeArmoun Road to Upper Huffman Road at the point where Toilsome Hill Drive becomes Glenn Alps Road.

4.3 DEARMOUN PILOT STUDY AREA

DeArmoun data is composed of the ten data fields presented in Table 5. The DeArmoun Database used is presented in Appendix B. Cross-sections were made across the area and interpreted based on the data. Data was then statistically analyzed to determine any factors that may influence the presence or non-presence of nitrates in area wells. These analyses consisted of correlation and regression techniques. Based on the results from the DeArmoun Database, the Modified DeArmoun Database was used to analyze other combinations of data.

4.3.1 DeArmoun Cross-Sectional Mapping

Cross-sectional mapping was used with available data to make initial determinations of controlling factors influencing nitrate levels in the subsurface. USGS bedrock data was used to interpolate bedrock depths between well logs. Well log data was used to determine bedrock depths where available, and although data was sparse, mapping indicated that bedrock slope and up-gradient dwellings may have accounted for nitrate presence in down-gradient wells; however, this was not true in all cases. These initial cross-sections are presented in Appendix E.

4.3.2 Correlation Analysis

Correlations, which are a measure of the strength of association between two variables, were made between data groups using SyStat 7.0, a statistical software package (SyStat Inc., 1997). The Pearson correlation was used, with a resultant coefficient between –1 and +1. A Pearson correlation of "0" indicates that neither variable can be predicted by the other, and a "-1" or "+1" indicates that one variable can be predicted perfectly by the other using a linear function. Correlations were also displayed graphically and their data displayed as histograms. To characterize the relation in each plot, a 75% ellipse that assumes a Gaussian (normal) bivariate distribution was also plotted. The center of the ellipse formed by the distribution is the sample mean of both variables being plotted and the ellipse represents assumed boundaries of 75% of the data. If data distributions looked nonlinear and a transformation was necessary, the data was transformed and correlations run again to verify the strength of association (SyStat Inc., 1997).

Available nitrate values in 105 wells comprised the DeArmoun Database, in association with the original ten factors outlined in Table 5. Of these factors, terrain units were deleted from consideration. Although results indicated most of the surface was mainly glacial till deposits overlain by lacustrine deposits, as illustrated on Figure 6, no reasonable comparisons could be made because most of the data was only of one terrain type. Of the 105 wells used in the study, only 23 wells had values for all of the remaining nine factors. As illustrated in histograms on Figures 7a and 7b, nitrate values for these 23 wells and for individual factor comparisons were skewed distinctly towards lower values. None of the nine factors were very normally distributed, nor does the scatter plots show distinct trends among comparisons. Nonlinear trends were also not apparent within the scatter plots.

Figure 7a illustrates the correlation analysis associated with each of the factors, with correlation coefficients ranging from –0.507 to 0.349. These coefficients represent the most linear combinations in the data set, which were casing depth and nitrate, and sum of bedrooms and nitrate.

Each of the nine factors were then compared to the 105 well data set to evaluate whether larger sets of data would generate similar results. Appendix F contains a scatter plot for each factor against nitrate. Figure 7b shows that most correlations decreased or stayed the same. Correlation coefficients for the larger data set ranged from –0.12 to 0.305, and these extremes were represented by nitrate with well depth and bedrock, respectfully.

4.3.3 Regression Analysis

Correlation analysis of the data did not indicate good linear correlation or highly normal data. Despite the results, regression techniques were used in SyStat to analyze combinations of interactions between factors at an exploratory level. These analyses were performed on combinations of factors from the 23 well data set, then the factors that produced the highest R-squared value were re-evaluated using all available data containing those factors. Stepwise backward regression techniques were used to consider factor combinations. This method performs regression on all combinations of factors at once, deleting the factor with the least association to the other factors, and continues until all factors remaining produce the highest

squared correlation coefficient value (R-square). The R-square value is a value from 0.0 to 1.0 that indicates the proportion of variability in nitrate values that is accounted for by the factors associated with them (Ott, 1993). Stepwise backward regression on the 23 well data set indicated that interactions that produced the highest R-square values were well depth, casing depth, yield, soil absorption rating, and bedroom summation (R-square = 0.396). The equation formed was:

[Nitrate Value] = 0.005[WellDepth] + 0.008[Casing Depth] + 0.551[Yield (gpm)] – 0.007[Soil Absorption Rating] – 0.128[Sum of Bedrooms]

Using the same technique, these factors were then extracted from the 105-data set and analyzed together. The larger database had 41 nitrate values with all factors, and produced a slightly lower R-square value (R-square = 0.337).

4.3.4 Nitrate Grouping and Box Plots

Nitrates were grouped into four concentration categories and compared by box plots to each of the individual factors for the DeArmoun pilot study area. Two sub-sets were also compared: the Mountain Park Estates and Aspen Highlands Subdivision, both located within the pilot study area. These sub-sets were extracted from the database to indicate whether box plots could detect trends with smaller data sets. Nitrate grouping was determined by nitrate concentration limits; the DeArmoun pilot study area nitrate groups with their corresponding concentration limits are shown in Table 5. Table 5 also shows the data populations associated with each factor and nitrate grouping.

For the DeArmoun pilot study area, there was little variation between nitrate groups and the individual factors (Figures 8a and 8b). Well yield appeared to have a small increase in relation to higher nitrate groups, but one quartile above and below the mean still encompassed similar ranges of well yield. The Mountain Park Estates and Aspen Highlands subsets (Figures 9a through 9d) indicated slightly higher variability with certain factors, but no definite trends between low and high nitrate occurrences.

4.3.5 Conclusions

Results from exploratory analysis indicated a lack of definitive trends, both linear and non-linear. Correlation analysis and histograms on Figures 7a and 7b indicated coefficients less than $\pm$ 0.4 when a perfectly linear result would be +1 or –1. Histograms indicated most data as left-skewed with many low values, and large ranges of nitrates for each value. Results of regression analysis also indicated very low predictability of nitrate values from the factors used, even accounting for interactions between factors. R-square values less than 0.75 are not considered to have enough correlation to make a strong statistical statement. Box plots of factors on Figures 8 through 9, based on nitrate groupings, also did not indicate significant variations between low or high nitrate groups within each factor. These findings suggest that, while site-specific factors may affect localized aquifers and private wells, the way they are linked to nitrate occurrence is not apparent when considered in a group. Based on the lack of any trends with these initial attempts, other methods were then explored to link factors to nitrate occurrence in wells.

5 ENHANCED HYDROGEOLOGIC INTERPRETATION

As discussed in Section 4, statistical analysis of the available nitrate data alone was insufficient to link specific factors to nitrate occurrence. Therefore, hydrogeologic interpretation was added to the analysis. Available nitrate and geologic data were plotted in a three dimensional (3-D) representation of the DeArmoun pilot study area subsurface. 3-D representations were intended to promote further constructs related to factors influencing nitrate occurrence in a given well. Nitrate concentrations were also grouped and statistically analyzed based on hypotheses formed viewing the 3-D model.

In addition to the DeArmoun pilot study area, a second pilot study area was also viewed in 3-D. The Scimitar pilot study area is located near Peter's Creek, and consists of the Scimitar Subdivision. The Scimitar Subdivision was selected as a second pilot study area due to the area having a wide range of nitrate values. Like the DeArmoun pilot study area, Scimitar represented Hillside development and homeowners interested in study participation.

5.1 DATABASE MODIFICATION

To compose the 3-D model and analyze other attributes, the DeArmoun Database was enhanced by further data collection, to form the DeArmoun Modified Database. Data representing well construction and geologic factors, such as bedrock slope, aquifer location, and hydraulic gradient, were added.

Further attempts at quantifying population density were not performed, as the results from bedroom counts did not indicate definitive trends. There are numerous ways to represent density information; however, problems with representation and available data indicated that a large effort would be necessary to obtain relevant information. Other factors that did not indicate definitive trends were soil absorption rating and distance from the well to the septic leach field. Absorption ratings were deleted from further analysis because they may not be representative of the subsurface between the leach field and aquifer in glacial terrain, as there may be diverse variation in the subsurface. In addition, this rating was based solely on the square footage of residential housing on a given lot, which may or may not reflect the amount of septic use. Distance from the well to the septic field is set by Code to be at least 100 feet, and very few results existed which were different than the minimum 100 foot offset.

The DeArmoun Modified Database was composed of primarily geologic factors that could also be used to check wellhead integrity. These factors included: nitrate sampling with dates, well yields, additional static water levels and bedrock depths, lithologic descriptions, notations of case screening depths, and seepage depths when available (Appendix C). The type of septic system and installation date were also recorded, to analyze whether the age of the septic system or presence of a holding tank was influencing nitrate values.

The Scimitar Database was formed similar to the DeArmoun Modified Database, except that septic data was not incorporated (Appendix D).

5.2 THREE-DIMENSIONAL (3-D) MODEL

Data from the DeArmoun Modified and Scimitar Databases were plotted using the SURFER computer program. SURFER allows development of a three dimensional (3-D) representation of the data (SURFER, 1999). The program interpolated a bedrock grid surface and gave various shading to represent the amount of overburden over the bedrock.

Figures 10 and 11 show 3-D results of compiled well data over the DeArmoun and Scimitar pilot study areas. The nitrate levels are labeled with a colored dot at the centroid of each lot and are represented by a range of values from 'no detect' to 10 mg/L. Any lot with a nitrate value is shown, and multiple nitrate values on one lot are shown with the most recent nitrate value. A circle outline illustrates where well log information was available.

5.3 TIME SERIES 3-D MODEL

A time series sequence was formed for the DeArmoun pilot study area to observe the amount of yearly data generated and how nitrate levels fluctuated in focused areas. Figures 12, 13 and 14 show 3-D models created for the years 1992, 1993 and 1994, respectfully. These years contained the most abundant nitrate data available. As indicated, only a small amount of data is generated yearly across the DeArmoun pilot study area. Rarely were multiple nitrate results for a given well available over a period of years, unless problems were experienced with the nitrate occurrence for a lot, requiring additional testing. The Scimitar pilot study area had similar results when viewed as a time series (Appendix D).

5.4 WELL CLASSIFICATION BY BEDROCK DEPTH AND SLOPE

Results from the 3-D modeling suggested that wells with higher nitrate levels might be concentrated along bedrock slope breaks or bedrock depressions. These areas were analyzed further by classifying wells based on casing and bedrock depth and slope.

Within the DeArmoun pilot study area, wells were sorted into four groups with different classes within each group (Figure 15). The lettered groups (A, B, C, and D) were separated based on the observed bedrock slope around a specific well in the 3-D model. These letters were then numbered (1, 2, and 3) based on the depth of casing with respect to bedrock. These two classifications are further defined in Table 6.

Each well was then grouped into one of the 12 possible combinations of classifications. A box plot was generated that showed the range of values within each group. Figure 15 illustrates a cross-sectional view of the different combination types and the results of the box plot analysis. These class distinctions did not produce significant variations between classifications. To increase sample sizes between well classes, the data was then merged into a broader range of classifications. The six classes combined groups 'A' and 'B' into a single group 'A', while groups 'C' and 'D' joined to make group 'B', as shown on Figure 16 with a corresponding box plot analysis. Aggregating groups did not improve the ability to differentiate nitrate occurrence among the classifications.

5.5 CONCLUSIONS

Hydrogeologic interpretation of the available data did not result in significant trends between historical nitrate concentrations. Although the 3-D models offered a new approach for viewing and analyzing the data, several limitations of the data prevented the method from being successful. First, the analysis was forced to assume all water entered the well through the bottom of the casing. Because of inadequate or missing well log data, perforations or bedrock seepage could not be considered. In addition, the models used all the historical data, ignoring potential variability between years, due to the small quantity of total nitrate records available for a given year.

Based primarily on the inconclusive results presented in Sections 4.0 and 5.0, there was little expectation that a similar extensive analysis using similar and occasionally occurring historical data would provide definitive results. Therefore, further extensive statistical analysis was abandoned and the study's objective focused toward developing data for a single event. Instead, the investigation would focus on establishing a temporally similar database of nitrate along potential groundwater gradients and obtain well construction information within a specific pilot study area. Scimitar Subdivision was selected to perform a field investigation for its localized concentrations of both high and low nitrates.

6 SCIMITAR SUBDIVISION FIELD INVESTIGATION

The Scimitar Subdivision field investigation attempted to quantify key factors that contribute to the presence or absence of nitrate concentrations in a given well. The Scimitar pilot study area was selected for a detailed field investigation for the following reasons:

- The subdivision is indicative of future developments on mountainside areas.
- Various wells have experienced a range of nitrate concentration through the years.
- Database and graphical reproductions had been previously established.
- Strong public support and involvement was anticipated for the field study.

The DHHS, Montgomery Watson, and the USGS, under separate contact with DHHS, all participated in the field study. The primary objectives of the study were to analyze nitrate concentrations spatially within the same time period for determination of key factors affecting transport paths between wells and nitrate sources, and to evaluate methods to determine groundwater influenced by septic systems.

Data collection was performed by: the DHHS, which supplied an operator and video recording devices, the USGS, which performed constituent analysis and geographical well locations in conjunction with their own well study; and Montgomery Watson, who coordinated the study, performed public contact, and took nitrate samples for analysis.

6.1 METHODS AND DATA COLLECTION

A 3-D analysis and public contact were the first steps in the field investigation preparations. Utilizing the same surface generating software as the previous historical data analysis (Section 5.0), detailed 3-D images with available data were generated of the Scimitar pilot study area. Figure 17 shows a generated map of the ground surface and general well locations, with exaggerated topographic relief. Figure 18 shows a generated bedrock surface based on available bedrock data. From analysis of this topographical information, local homeowners were contacted along probable transects across the subdivision. These transects were made across areas that had displayed a range of historical nitrate values between various lots, and followed assumed groundwater gradients, which generally followed bedrock contours.

An information flyer and questionnaire was developed informing the homeowners of the reconnaissance procedures and a request for permission to perform the study on their property. A copy of the questionnaire can be found in Appendix G. Select data was obtained from each well of the wells that had a positive public response. Nitrate and other constituent sampling, well video recording for well construction verification, static water elevations, and coordinates and elevations were obtained. Global Positioning System (GPS) geographical locating of the wells analyzed was performed by USGS. Vertical and horizontal locations, as well as elevation data, were also obtained from the survey.

6.2 SAMPLING DATA

Data was collected from 26 households within the subdivision, and nitrate data was obtained from 18 households. The USGS analyzed eight wells, consisting of field and laboratory analysis. Field parameters consisted of temperature, conductivity, pH, hardness, and alkalinity. The USGS analysis also included other constituents, such as major cations and anions, barium, and selected isotopes.

Table 7 includes nitrate data gathered from the study and Figure 19 illustrates nitrate data results spatially across the subdivision. USGS results are reported in a USGS open file report (Wang, Strelakos, and Jokela; in press).

6.3 OTHER DATA

Other results from the analyses included coordinates and elevations, static water level and yield determinations, video recording of well casings and bedrock elevations. Table 7 contains the results of each of these parameters, and Figure 19 illustrates static water levels. The north and east coordinates and elevations were a result of the GPS survey conducted by the USGS. Static water level readings were attempted on the primary well of every homeowner participating in the field study. Static water levels were determined by a water-sensitive probe attached to a graduated cable; however, several difficulties were encountered that reduced the projected number of static water level readings. Due to deep water levels (<400 feet), the probe would often tangle in the well electrical wiring, resulting in no readings. Several wells also had slow well recharge rates and never reached an equilibrium state. Static water table levels were obtained for 22 wells.

Well yield determinations were made on three wells, and roughly matched the well log yields. To facilitate the investigation, yields were not calculated on all wells; therefore, the primary sources of the yield results were derived from the well logs and yields were assumed to not have changed significantly for statistical purposes.

Seventeen of the wells that were sampled for nitrates were inspected and conditions documented with a specialized video inspection camera. Video taping only occurred in the top 200 feet of each well, as this was the limit of video cable available. One well was not video taped because the well was lined with plastic pipe, which effectively shielded the well from observations. The plastic pipe had been installed to prevent wall failure from blocking the well. Casing depth and any seeps or other notable characteristics that define well integrity were noted and logged. Overall, most wells were similar to their existing well logs. Appendix G contains the results of the video taping and also contains associated well logs. Video camera observations took precedence over the well logs in observations of casing depth and seeps; however, for statistical purposes, in three instances casing data from the well logs were required when the end of casing was too deep to observe by video. Because bedrock and hard soils could not accurately be distinguished from the black and white video observations, the well log record dictated bedrock data. In two instances, where bedrock data was not provided in the well logs, it was assumed to commence where the casing stopped. Seepage data was reported where water was identified

entering the well casing either through perforations, the bottom of casing, or through a bedrock fracture.

6.4 DATA ANALYSIS

As illustrated by Figure 19, nitrate results experienced a wide range of values. These values were significant, since they were essentially taken within the same time period and could be used to relate other parameters to nitrate occurrence assuming temporal consistency. Cross-sections were formed for each of the transects shown in Figure 19. As Figures 20a and 20b illustrate, these cross-sections generally show two levels of static water, possibly indicating two different aquifers. Other trends concerning nitrate levels were difficult to visually discern.

Scatter plots were formed to observe any trends in the data. Five scatter plots were formed, consisting of bedrock, static water level, and casing depth, the depth difference between casing and bedrock, and the type of aquifer present (aquifer type definitions is shown in Appendix C). As illustrated in Figures 21a and 21b, only one slight trend is noted, a trend between nitrate and static water levels. This observation indicates a slight trend of shallow static water levels below ground surface related to higher nitrate values. This slight trend is also illustrated by a comparison of nitrate values to observed seeps. Comparisons of static water elevations did not produce the same trend.

USGS results show two distinct water types in eight wells sampled in the Scimitar Subdivision. Four wells had nitrate-nitrogen levels less than 1.0 mg/L, while the remaining wells ranged from 3 to 11 mg/L nitrate-nitrogen. This may indicate that two water sources are being tapped by wells in the area. Nitrate and chloride content were strongly correlated in the USGS data, and chloride data from high nitrate wells tends to exceed levels typical of background water quality in the Peters Creek area. Chlorides are thought to be derived from human activities, such as road salting or domestic wastewater. Additionally, concentrations of other ions, including magnesium, sodium, sulfate, and boron were shown to be indicative of the presence or absence of nitrate. Boron isotope ratios from high nitrate wells are consistent with detergent sources. Chlorofluorocarbon (CFC) concentrations are higher than would be expected from atmospheric sources, a finding consistent with wastewater discharge. Furthermore, nitrate analyses suggest that nitrogen is not changing from one form to another within the groundwater system, therefore, little natural mitigation of the nitrate occurs once it is released. The USGS findings suggest a strong link between nitrate occurrence and wastewater discharges. The results are detailed in a separate USGS publication, currently in press.

6.5 CONCLUSIONS

Not including results from the USGS, one slight trend was apparent from the investigation. Observation of scatter plots indicated a slight trend that the shallower the static water level in a well compared to the ground surface, the more likely it was to contain elevated nitrate concentrations, if present. No conclusions could be formulated from comparisons to bedrock depth, casing, well construction, or water yield.

The USGS investigation used a combination of aqueous chemistry, isotopic and *in situ* tracer methods to evaluate the well water samples. Two distinct water types were identified in the wells and their sources explained the nitrate spatial distribution. One evaluation method determined that nitrates were consistently found in water with lower sodium, sulfate, and boron concentrations, and higher magnesium and chloride concentrations. Canter and Knox (1985) note that septic tank discharges of chloride can be useful as a tracer or indicator of septic tank system pollution. Additionally, the water type with higher nitrates experienced boron isotopic ratios and CFC concentrations typical of septic contamination. The USGS results indicated that the presence of nitrates was likely attributed to septic system effluent in shallow groundwater. Findings are detailed in a separate USGS publication (Wang, Strelakos, and Jokela, in press).

7 PHASE II CONCLUSIONS AND RECOMMENDATIONS

The bulk of effort in Phase II centered on nitrate data collection. Data was analyzed statistically and with modeling. Conclusions gained were used to answer the management questions posed in Section 1.0. Recommendations for platting and development were also considered.

7.1 CONCLUSIONS

Answers to the five questions posed in the beginning of the study are presented below:

1) *Does historic nitrate data reliably represent the occurrence of nitrate in groundwater throughout the MOA?*

   No.

   As discussed in Sections 3.0 and 4.0, historical nitrate data was found to be sparse. Temporal problems existed in the data, as the HAA database only incorporated the date the DHHS received the nitrate data, and this is where the bulk of the nitrate data originated. Additionally, ADEC data was entered as a nitrate range, instead of the value. Nitrate data itself is also only generated when an HAA is required from the DHHS. Analysis of historical data suggests that nitrate values fluctuate; however, data is too sparse across the MOA from individual wells to describe the fluctuation. Variance of nitrate in a single well cannot be accurately determined by random nitrate data from different lots and different years.

2) *Does historic nitrate data suggest increasing nitrate levels through time?*

   Unknown.

   As discussed in Section 4.0, historic nitrate data does not contain enough appropriate data to be statistically useful in answering this question.

   Nitrate occurrence tends to be limited to localized aquifers, which may be isolated hydrologically from neighboring wells, thus obscuring any regional trends. Furthermore, long-term trends may be obscured by seasonal variability. The number of repeat observations from any single well is too small to discern longer term variability.

3) *Can historic data be used to statistically link key factors to nitrate occurrence in drinking water wells?*

   No.

   Data analysis in Sections 4.0 and 5.0 indicates that the common factors used in other nitrate studies could not be statistically or observationally related to differentiation

between nitrate concentrations. Historic nitrate data is too sporadic to provide a robust statistical population for factor determination.

4) *Does a connection exist between nitrate values and septic systems?*

   Yes.

   The Scimitar Subdivision field investigation provided results that linked nitrate values to septic systems. Scatter plot analysis indicated that higher nitrate values were associated with shallow static water levels. The more detailed USGS investigation chemically linked the presence of nitrate to septic sources by other constituents, and indicated a link between the presence of nitrate and shallow aquifers.

5) *Can existing and historic data be used to construct a reliable model of the vulnerability of existing and future development to groundwater nitrate contamination?*

   No.

   Various analyses of the data have been made, with little success in discerning plausible and reasonable trends in the data useful for creating vulnerability models for existing and future developments. We suspect that site-specific factors may affect small, localized aquifers and private wells in a variety of ways that are not apparent when considered as a group.

7.2 CONSIDERATIONS FOR PLATTING AND DEVELOPMENT

The findings of Phase II suggest that a well tapping an aquifer above bedrock tends to be more susceptible to septic influences in a developed area than a well completed deep in a bedrock aquifer. Additionally, a well could still be susceptible if the well construction does not adequately seal off shallow aquifers while tapping a bedrock aquifer. Mixing of nitrate-rich shallow groundwater with bedrock aquifers may be responsible for some occurrences of nitrate in deep wells.

In developing areas that do not have access to public water supply and sewerage, it may be prudent to encourage development of deep bedrock aquifers rather than near-surface aquifers for private wells. Well construction should be carefully controlled to ensure that deep wells are not influenced by shallow groundwater aquifers subject to septic leachfield discharges.

In newly platted areas, community water supply wells may be preferred over private wells due to a higher standard of design and construction, with ongoing monitoring in conformance with state drinking water regulations.

Wastewater disposal should take into account site-specific soil and terrain conditions to minimize potential interference with downgradient drinking water supply aquifers. An arbitrary setback distance between a well and septic system may not be sufficient to ensure protection of the downgradient well. This analysis suggests that nitrate levels may be independent of the

distance from nearby septic systems. Although the setback also serves to minimize potential for exposure to wastewater-borne pathogens, certain hydrogeologic conditions may favor increased or reduced mobility of nitrates and other septic system wastewater constituents.

7.3 ADDITIONAL ON-SITE WATER AND WASTEWATER DEVELOPMENT CONCERNS

Additional questions remain concerning the philosophy that the MOA will carry into management of future on-site water and wastewater development, including:

- *Should the MOA regulatory focus be limited to nitrate occurrence in an individual on-site well?*
- *Are we doing all that is necessary to prevent nitrate contamination in private wells?*
- *Does the MOA have a duty to prevent proliferation of human-induced nitrate occurrence in all shallow water aquifers?*
- *Should we encourage nitrate-reducing on-site wastewater treatment systems in areas of elevated nitrates?*
- *Given a probable link between septic system discharge and nitrate occurrence, do we need to retain nitrate as a precursor or indicator of sewage borne pathogens?*
- *What is the limit of MOA responsibility in providing assurance of adequate drinking water quality in rural residential areas?*

8 RECOMMENDATIONS FOR MONITORING

Future data collection efforts are necessarily dependent on articulation of very specific information needs and monitoring objectives. This section contains types of objectives that could be further pursued, their advantages and disadvantages, and a conceptual monitoring approach.

Results of the Phase II study, in conjunction with the USGS study results, correlated the presence of nitrate to septic influences in a Hillside development. Results also suggest that the presence of nitrate in a Hillside development is dependent on the hydrogeologic conditions associated with a given well. These results were not obtained by analysis of historical data, but through a field study that gave a single event "snap shot" of data across a small area.

8.1 INFORMATION NEEDS

The results of the Phase II study suggest several ongoing information needs concerning future wellhead and resource protection. The implementation of a monitoring program could provide results necessary to address the following issues:

1) *Are nitrate 'hotspots' a reflection of an increasing trend?*

2) *Can high nitrate/septic influenced aquifers be differentiated from nearby "clean" aquifer?*

3) *How deep should a well be cased to ensure safe water in an on-site wastewater areas (i.e., where are shallow aquifer boundaries)?*

4) *Will improved well construction solve existing and/or prevent future nitrate problems?*

A conceptual monitoring approach has been developed that addresses each of these specific issues. The disadvantages and advantages of each approach are described below.

8.1.1 Are Nitrate Hotspots a Reflection of an Increasing Trend?

Localized areas of high nitrates are a growing concern in the MOA. Addressing this issue involves developing general knowledge of trends in nitrate occurrence across the MOA by systematically blanketing portions of the MOA with a sampling program. By systematic sampling through the years, possible increasing trends in nitrate occurrence would become readily apparent.

Advantages

The advantage to this type of monitoring would be to analyze whether nitrates are increasing or not in the MOA and pinpoint new areas with localized hotspots. Yearly and spatial effects could be calculated.

Disadvantages

The disadvantage with this type of monitoring is that there are currently no set factors in which to base well selection. This report has found that nitrate concentrations are highly variable on a lot-by-lot basis, indicating that site-specific factors have a significant impact on nitrate occurrence. The other disadvantage is that proving nitrates are increasing within the MOA would not assist the MOA in determining what to do about it. However, systematic documentation can indicate which wells are subject to nitrate fluctuations and which are not.

Monitoring Approach

The MOA would be divided into sections, with one section sampled per year. Each section would have approximately 150 wells sampled, to obtain a reasonable spatial distribution and sample size. Specific information on the hydrologic regimes present would be developed from existing well logs and literature. Well selection criteria would be discussed and standardized, and may include volunteer homeowner wells in addition to ongoing data collection for public water supply wells. Sampling frequency for nitrates could be as little as once a year per section. Data would be analyzed by standard procedures. Costs associated with this approach are likely to be on the order of $75,000 per year for the sampling effort. Enhancing the historic database with additional sampling would be based on determination of areas where nitrate contamination may be a concern. After these areas have been delineated, an initial sampling effort would be performed. Areas of no monitoring, maintenance monitoring, or intensive monitoring would be established as a tiered system, depending on the nitrate range encountered.

8.1.2 Is There Generally a Distinction in Nitrate/Septic Influence Between Various Aquifers, Similar to Those Found at the Scimitar Subdivision?

The results of the Scimitar Subdivision field study indicated that elevated nitrate levels and septic influences were distinctly related to shallow static water levels. Determining if such a correlation exists in other areas of the MOA is possible through a site-specific monitoring program; similar to the study executed in Scimitar Subdivision. Monitoring of these sites would involve additional nitrate sampling and the selection of a factor criterion for each specific area. As attempted in the Phase II study, data obtained could be used to link site-specific factors to nitrate concentrations in private wells. Existing and historic nitrate data is too sparse and incomplete for reliable determinations.

Advantages

This method could assess risk to current wellheads from adjacent lots or future development. Risk could be assessed based on a systematic approach in determining site-specific factors and applying them to other, similar areas in current or future developments. Spatial, temporal, and seasonal effects on nitrate occurrence would also be documented.

Disadvantages

Due to the complexity of subsurface conditions, this method would still be limited in predicting nitrate occurrence. Additionally, well site selection would be difficult, as little prior knowledge of nitrate levels would be known in the individual wells. Attempts in quantifying nitrate occurrence from site-specific factors, however, could set boundaries from which informed and substantiated decisions could be made concerning issues of nitrate contamination.

Monitoring Approach

The approach to addressing this issue would most likely consist of groups of dual well comparisons. Well selection would be based on specific hydrogeologic characterization and selection of factors for control. Adequate pairing of wells may require new construction. Each set of dual wells would be used to monitor variation in one or many site-specific factors, and sampling frequency would quantify seasonal and yearly trends in nitrate levels. At least 20 dual well comparisons could be made using the factors such as the ones analyzed in Phase II and other selected combinations of factors. Data would be analyzed by standard procedures. Costs associated with this approach are likely to be on the order of $40,000 per year for the sampling effort. Well selection and a well construction might require an additional $20,000.

8.1.3 How Deep Should a Well Be Cased To Ensure Safe Water in On-Site Wastewater Areas?

Addressing this issue would require developing extensive geologic and hydrogeologic profiles of specific areas. By gathering information of an areas' geologic condition, it is possible to determine shallow aquifer boundaries. Knowledge of aquifer boundary locations could potentially indicate the necessary well casing depth to reduce surface water influence. This approach would be very similar to the previously discussed site-specific factor determination monitoring plan (Section 8.1.2), with a primary focus on geological and hydrogeological data gathering.

Advantages

This method would provide knowledge of flow patterns through the geologic strata of specific areas by developing hydrogeologic and geologic information of specific sites. The development of a subsurface map would aid in predicting nitrate occurrence and establishing aquifer boundaries. As described in Section 8.1.2, this process would also assess risk to current wellheads from adjacent lots or future development. Risk could be assessed based on a systematic approach in determining site-specific factors and applying them to other, similar areas in current or future developments. Spatial, temporal, and seasonal effects on nitrate occurrence would also be documented.

Disadvantages

Attempting to unravel complex subsurface conditions would be costly and require extensive research and visual observations of well interiors. Similar to Section 8.1.2, well site selection

would be difficult, as little prior knowledge of nitrate levels in the individual wells would be known. Attempts in quantifying nitrate occurrence from site-specific factors, however, could set boundaries from which informed and substantiated decisions could be made concerning issues of nitrate contamination.

Monitoring Approach

The approach to this issue would most likely consist of groups of dual well comparisons. Each set of dual wells would be based on known or projected vertical separations between aquifers. Well pairs would be chosen to represent various residential areas within the MOA, potentially to include future areas of development. Sampling frequency would quantify seasonal and yearly trends in nitrate levels. At least 20 dual well comparisons could be made using the factors such as the ones analyzed in Phase II and selected combinations of factors. Data would be analyzed by standard procedures. Costs associated with this approach are likely to be on the order of $40,000 per year for the sampling effort, plus perhaps an additional $20,000 for well construction.

8.1.4 Will Improved Well Construction Solve Existing and/or Prevent Future Nitrate Problems?

Well construction is another situation possibly influencing nitrate occurrence. This issue could be addressed by a monitoring program that determines the effectiveness of various well treatments which experience significant nitrate contamination. Monitoring could be performed after treatment for a set amount of time to ensure the treatment has been effective in reducing nitrate levels within the wellhead. A few possible treatments include sealing off specific depths along the well length, hydrofracturing wells for higher volumes, or installation of different septic systems in the surrounding area.

Advantages

Advantages with this approach are that with monitoring, the effectiveness of various treatments for contaminated wells are quantified, and ideally would be coupled with the unique factors present for the studied well. Comparisons of these factors with select treatments would help develop a design for administering effective treatment for a range of conditions. Temporal and seasonal assessments could be made; however, spatial effects would not be monitored.

Disadvantages

One disadvantage to this method is that the treatment and assessment of nitrates takes place after the well is already contaminated. Another disadvantage is that a basis for factor selection must be established before being able to develop a range of applicable conditions for a specific treatment.

Monitoring Approach

The monitoring approach would depend on potential solutions to particular well construction or remediation issues. Wells would be selected based on interpretation of local hydrogeology, availability of well construction data, and the existence of potential surface water nitrate contamination. Volunteer participation could be solicited through advertising, community council, and real estate contacts. The number of wells sampled would depend on the number of reported contaminated wells. Sampling frequency would be quarterly to obtain seasonal results and data analyzed by standard procedures. Costs associated with this approach are likely to be on the order of $15,000 per site or well treatment investigated, with four to five well treatments studied per year.

9 REFERENCES

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TABLES

Table 1
Local Wellhead and Aquifer Protection Study - Phase II
Database ID and Description

Database Table	ID Descriptions
Nitrate Database	
[Parcels]	Parcel ID and Legal Description
[Wells]	Well and Geological Characteristics
[Wellsxyz]	Well Northing and Easting Coordinates and Elevation
[All_NO3]	Test Date, Value, and Source
[1999Field Study]	1999 Scimitar Subdivision Field Study
Dearmoun Database	
[Wells]	Well Characteristics
[Nitrates]	Nitrate Values and Sample Dates
[Septic]	Adsorption ratings, distance from well
[Density]	Bedroom, lot, and dwelling densities
Dearmoun Modified Database	
[Wells]	Well Characteristics
[Lithology]	Drilling Log Geologic Notes
[Nitrates]	Nitrate Values and Sample Dates
[Septic]	Date installed and Type of Septic System
Scimitar Database	
[Wells]	Well Characteristics
[Lithology]	Drilling Log Geologic Notes
[Nitrates]	Nitrate Values and Sample Dates

Table 2
Local Wellhead and Aquifer Protection Study - Phase II
General Data Fields Used for Project

Data Type	General Data Fields	Database
Nitrate	Value	Nitrate, Dearmoun, Scimitar
	Detection Limit	Nitrate
	Sample Date	Nitrate, Dearmoun, Scimitar
	Data Source	Nitrate
	Parcel ID	Nitrate, Dearmoun, Scimitar
	Coordinates	Nitrate, Dearmoun, Scimitar
	Elevation	Nitrate, Dearmoun, Scimitar
Well Logs	Date Drilled	Nitrate, Dearmoun, Scimitar
	Drill Depth	Nitrate, Dearmoun, Scimitar
	Water Level	Nitrate, Dearmoun, Scimitar
	Water Yield	Nitrate, Dearmoun, Scimitar
	Depth of Bedrock	Nitrate, Dearmoun, Scimitar
	Depth of Casing	Nitrate, Dearmoun, Scimitar
	Depth of Seeps	Dearmoun, Scimitar
	Lithology	Dearmoun, Scimitar
Septic	Soil Absorption Rating	Dearmoun, Scimitar
	Distance From Well to Septic	Dearmoun, Scimitar
	Lot Bedroom Count	Dearmoun, Scimitar
	Sum of Bedrooms	Dearmoun, Scimitar

Table 3
Local Wellhead and Aquifer Protection Study - Phase II

A. Nitrate Tables Information Sources (All Databases)

Data Source	Database ID NO3DataSource	Description
ADEC	ADEC	ADEC Grid Maps compiled by ADEC
	ADECMult	ADEC Grid Maps compiled by ADEC
	ADECPublic	ADEC Public Well Sampling 1980 to 1999.
DHHS	DHHS1993	Sampling of private wells from 1989 into June 1993.
	DHHS1999A	HAAC database as of March 1999
	DHHS1999B	DHHS hardcopy file search March 1999
Bristol	Bristol1997	Bristol Environmental Services Corporation (BESC), 1997
Terrasat	Terrasat1997	Terrasat, 1997
CT&E Laboratory	CTE1999	CT&E Laboratory Nitrate Analysis Sheets, 1999
Sharon Minsch	Minsch1999	Sharon Minsch: President of Chugiak Community Council

B. Well Log Tables Information Sources (All Databases)

Data Source	Database ID WellDataSource	Data Obtained
DHHS	DHHS1999AB	DHHS hardcopy file search March 1999
DNR	DNR1999	DNR Well Log Search, 1999
Sharon Minsch	Minsch1999	Sharon Minsch: OWTR Board Member

C. Septic Table Information Sources (Dearmoun Modified Database Only)

Data Source	Database ID SepticSource	Data Obtained
DHHS	DHHS1999AB	DHHS database and file search March 1999

Table 4
Local Wellhead and Aquifer Protection Study - Phase II
Factor Groups

Data Type	General Data Evaluated
Geology	Terrain Units
	Septic Adsorption Rating
	Lithologic Type
	Slope
	Water Table Depths
	Water Yield
	Elevation
	Aquifer Type
	Depth of Bedrock
	Depth of Seeps
	Date Drilled
Well Construction	Depth of Casing
	Drill Depth
	Perforation Data
	Types of Casing
	Surface Conditions
	Casing Integrity
Land Use	Distance Between Septic and Well
	Dwelling Density
	Lot Density
	Bedroom Density
	Vegetation Occurrence
	Type of Septic System
	Age of Septic System
	Livestock

Note: Please refer to Appendices A, B, C, and D for more detailed information regarding these factors.

Table 5
Local Wellhead and Aquifer Protection Study - Phase II
Populations for Nitrate Groupings

FACTORS	FACTOR ID	NITRATE GROUPING				Total Wells
		1 (<1 mg/L)	2 (1-2 mg/L)	3 (2-4 mg/L)	4 (>4 mg/L)	
Well Depth (ft. bgs.)	WDEPTH	25	22	24	30	101
Casing Depth (ft. bgs.)	CASING	20	15	23	22	80
Distance between well and septic field (ft.)	DISTSEP	25	21	27	31	104
Well Yield (gpm)	WYIELD	20	18	18	28	84
Lot bedroom count	HBRCOUNT	25	21	27	30	103
Soil Absorption Rating (sq. ft./bedroom)	SOILR	10	10	11	12	43
Sum of bedrooms within a 1,000 foot radius of parcel centroid.	SUMBR	24	21	27	31	103
Bedrock depth (ft. bgs.)	BEDROCK	18	12	9	15	54
Static water level from well logs (ft. bgs.)	STATIC	16	13	13	20	62

Note: The tenth factor considered was terrain units. These were not used in the statistical analysis.

ft - feet
bgs - below ground surface
sq. ft. - square feet
gpm - gallons per minute
mg/L - milligrams per liter
ID - identification

Table 6
Local Wellhead and Aquifer Protection Study - Phase II
Well Class and Definitions

Well Class	Definition
A	A – A well located at the top of a slope
B	B – A well located in the middle of a slope
C	C – A well located at the toe of a slope in a basin area
D	D – A well on a flat bedrock out of basin or toe of slope influence
1	1 – Well casing to a depth of 10 + feet above the bedrock surface
2	2 – Well casing to a depth of 10 feet above to 5 feet below bedrock surface
3	3 – Well casing to a depth of 5 + feet below the bedrock surface

Table 7
Local Wellhead and Aquifer Protection Study - Phase II
Scimitar Study Area Field Invesigation Results

Parcel Name	Parcel Block/Lot	Parcel ID	Northing	Easting	Elevation (ft)	Sample Date	Nitrate (mg/L)	Yield (gpm)	Static Water (Elev. ft.)	Bedrock (Elev. ft.)	Casing (Elev. ft.)	Seepage Areas (Elev. ft.)	USGS Designation
SCIMITAR #1	BLK 1 LT 1	05113208	2,704,924	599,487	520.3	08/09/99	5.13	8.2	453.3	**442.3**	**442.3**		
SCIMITAR #1	BLK 2 LT 2	05113210	2,705,052	599,701	521.1	08/18/99	0.68	3	440.2	361.1	429.1	364.1	612409149254901
SCIMITAR #1	BLK 2 LT 3	05113211	2,705,258	599,722	523.6	08/20/99	5.65 - 5.42	2	428.3	412.6	416.6		612411149254201
SCIMITAR #1	BLK 2 LT 4	05113212	2,705,231	599,969	527.1	08/12/99	1.07		418.5	468.1	465.6		
SCIMITAR #1	BLK 2 LT 5	05113213	2,705,761	600,022	524.6	08/13/99	2.93	0.2		444.1	**443.6**	444.1	
SCIMITAR #1	BLK 2 LT 8	05113216	2,705,722	600,668	580.3					486.3	**485.3**		
SCIMITAR #1	BLK 2 LT 9	05113217	2,705,586	600,675	590.1	08/18/99	5.71-5.63	5	483.7	502.1	502.1		612417149253303
SCIMITAR #1	BLK 2 LT 10	05113218	2,705,490	600,732	606.4	08/13/99	4.27	2	482.6	467.4	566.4	470.4	
SCIMITAR #1	BLK 3 LT 7	05113233	2,704,505	600,091	653.5	08/18/99	3.37	3	622.1	561.5	561.5		612404149254301
SCIMITAR #1	BLK 3 LT 8	05113232	2,704,422	599,952	652.0	08/09/99	12.7	2.8	623.3	506.0	536.0	621.0	
SCIMITAR #1	BLK 3 LT 10	05113230	2,704,215	599,702	653.9				491.2	532.9	**530.9**		
SCIMITAR #2	BLK 2 LT 24	05113242	2,703,367	599,525	654.2			2	604.8	497.2			
SCIMITAR #2	BLK 2 LT 25	05113243	2,703,506	599,673	651.9			5	589.5	**571.9**	**571.9**		
SCIMITAR #2	BLK 3 LT 14	05113264	2,704,422	600,291	657.9	08/09/99	5.95		594.2	**588.9**	588.9		
SCIMITAR #2	BLK 3 LT 15	05113263	2,704,678	600,338	655.9	08/18/99	12.2	0.2		556.9			612404149253402
SCIMITAR #2	BLK 3 LT 16	05113262	2,704,823	600,508	661.1	08/12/99	13.2	0.9	588.5	574.1	571.1	571.1	
SCIMITAR #2	BLK 3 LT 18	05113260	2,705,022	600,819	661.6	08/20/99	0.775	0.2	442.4	567.6	586.6		612411149252601
SCIMITAR #3	BLK 1 LT 1	05113268	2,704,785	600,902	796.1	08/20/99	0.617	1	634.6	703.1	704.1		612408149252001
SCIMITAR #3	BLK 1 LT 2	05113269	2,704,735	601,120	796.4	08/11/99	0.723	0.19	371.4	704.4	**704.4**	421.4	
SCIMITAR #3	BLK 1 LT 3	05113270	2,704,440	600,924	795.0				640.2	712.0	**713.0**		
SCIMITAR #3	BLK 1 LT 6	05113273	2,704,079	600,722	797.7	08/18/99	0.634	<0.5	431.2	722.7	722.7		612359149253201
SCIMITAR #3	BLK 1 LT 7	05113274	2,703,866	600,644	795.5				507.1	720.5	**720.5**		
SCIMITAR #3	BLK 1 LT 8	05113275	2,703,652	600,509	807.3					649.3	**649.3**		
SCIMITAR #3	BLK 1 LT 16	05113283	2,703,938	600,771	798.0	08/11/99	0.713	0.05	425.2	765.0	765.0	598.0	
SCIMITAR #3	BLK 2 LT 1	05113401	2,704,506	601,204	806.0				797.3	778.0	**790.0**		
SCIMITAR #3	BLK 2 LT 2	05113402	2,704,316	601,017	805.6	08/11/99	0.702	1	662.4	789.6	790.6		

Note:
1) Bold casing elevations are from well logs.
2) Bold bedrock elevations are assumed to be the same as the casing elevation.
3) Yields are extracted from well logs.
4) Abbreviations are as follows:
BLK - block
Elev. - Elevation
ft. - feet
gpm - gallons per minute
ID - identification
LT - lot
mg/l - milligrams per liter
USGS - United States Geological Survey

FIGURES

N

0 0.5 1 Miles

Girdwood

0.5 0 0.5 Miles

Anchorage Bowl

1 0 1 2 Miles

Eagle River/Chugiak

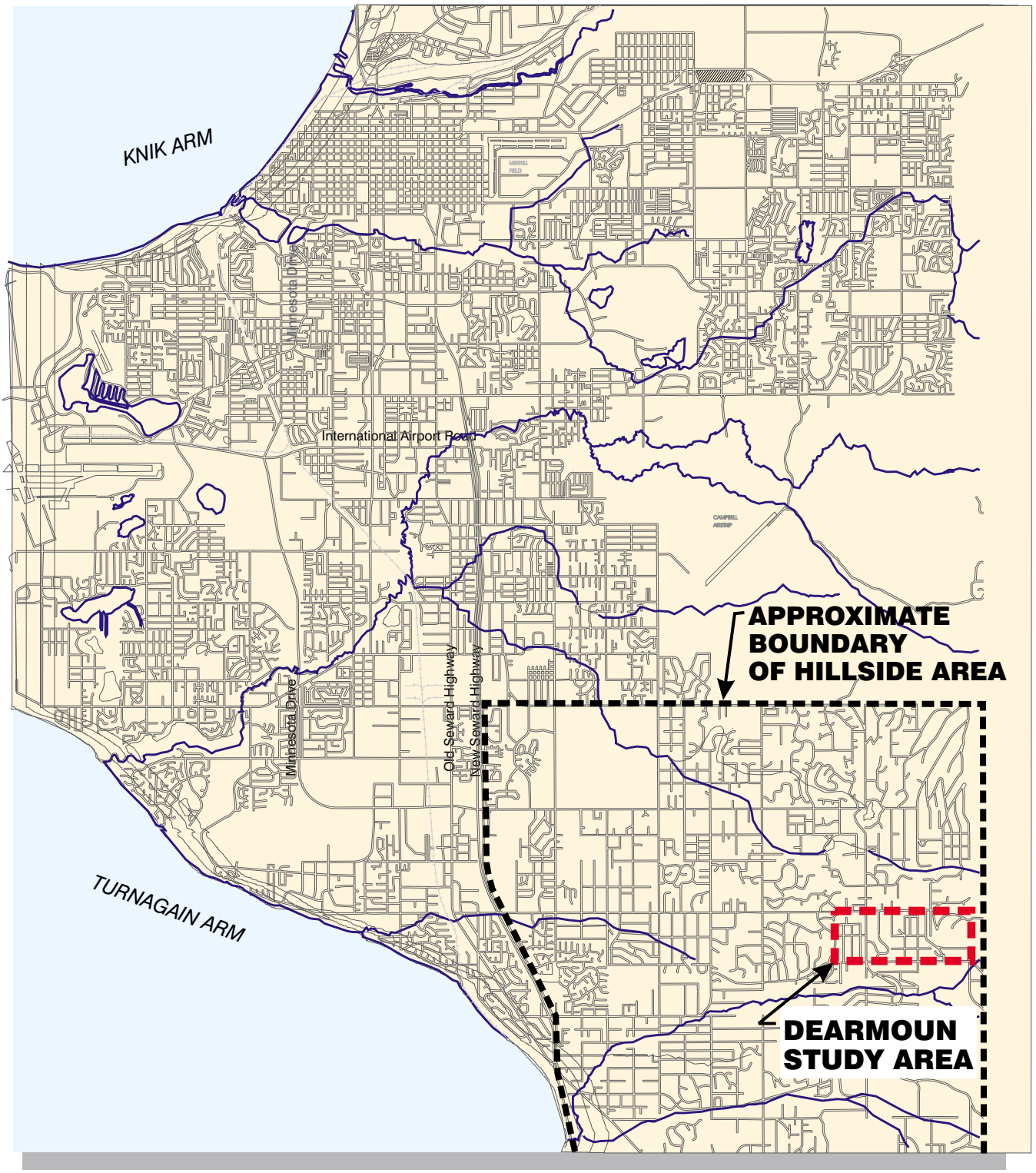
Highest Nitrate Sample
- over 10 mg/L
- 7-10 mg/L
- 3-7 mg/L
- 1-3 mg/L
- 0-1 mg/L
- Roads

Map Produced By

MONTGOMERY WATSON
Anchorage, Alaska

GEONORTH
GIS • DATABASE • CAD

Figure 1
Municipality of Anchorage
Dept. of Health and Human Services
Local Wellhead and Aquifer Protection - Phase 2
Most Recent Nitrate Value per Lot



JOB No.1189104.010101 dhhs\aquifer\draft\fig2a.cdr

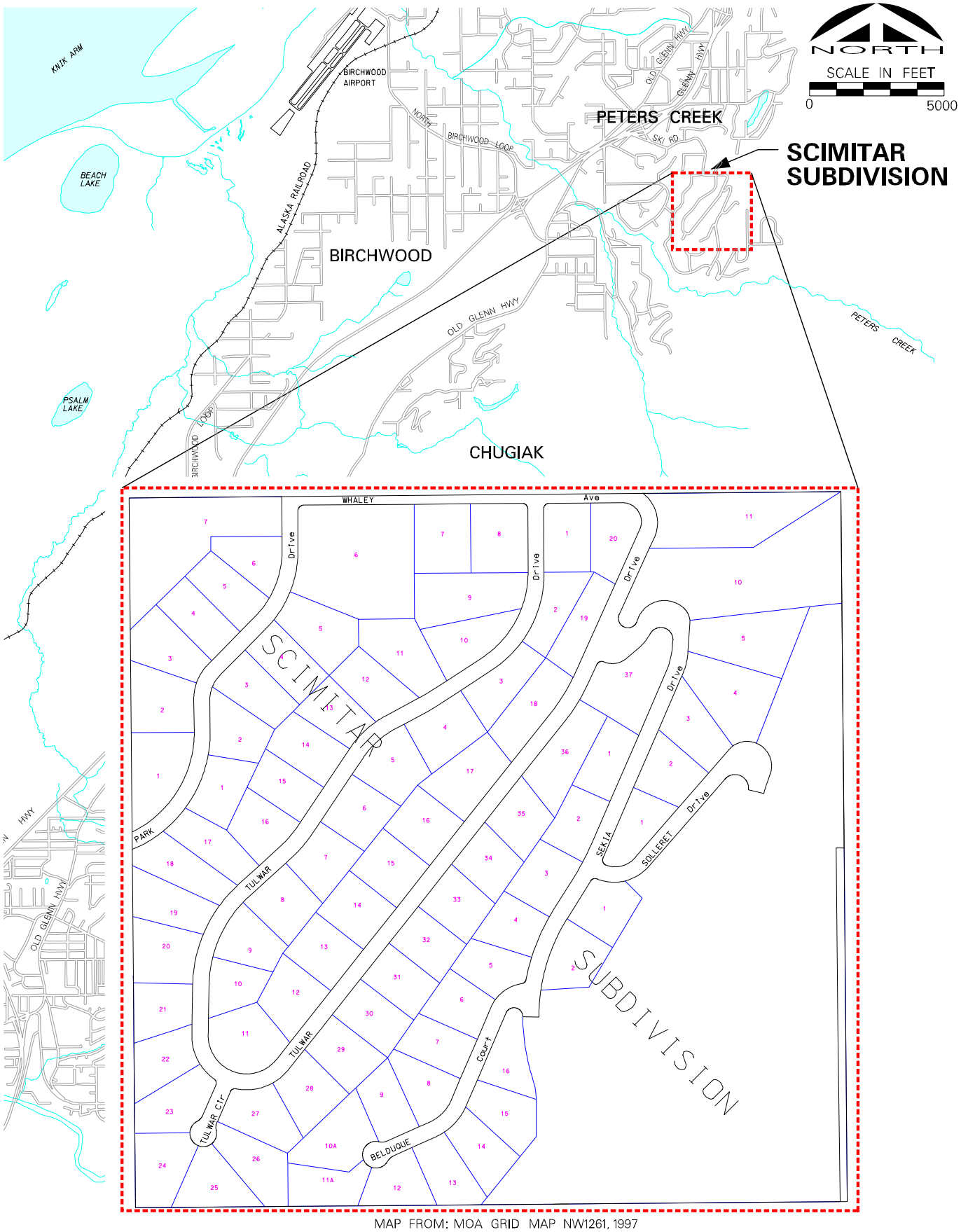
MONTGOMERY WATSON

Anchorage, Alaska

FIGURE 2a

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

DEARMOUN STUDY AREA
NITRATE STUDY SITE LOCATIONS



MAP FROM: MOA GRID MAP NW1261, 1997

MONTGOMERY WATSON

Anchorage, Alaska

FIGURE 2b

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM – PHASE II

SCIMITAR SUBDIVISION NITRATE STUDY SITE LOCATIONS

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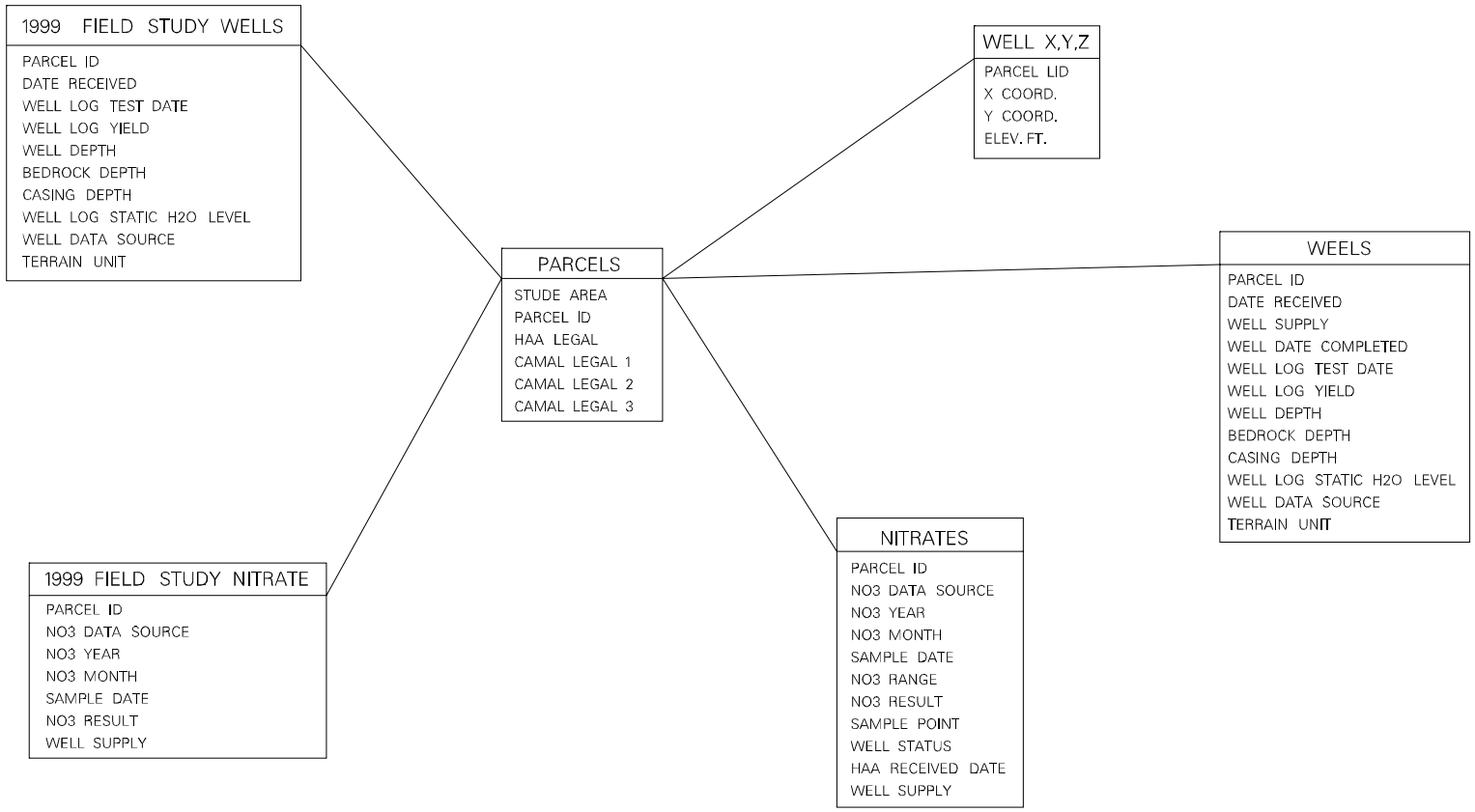

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Anchorage, Alaska

FIGURE 3

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM – PHASE II

NITRATE DATABASE ACCESS STRUCTURE DIAGRAM

LEGEND:

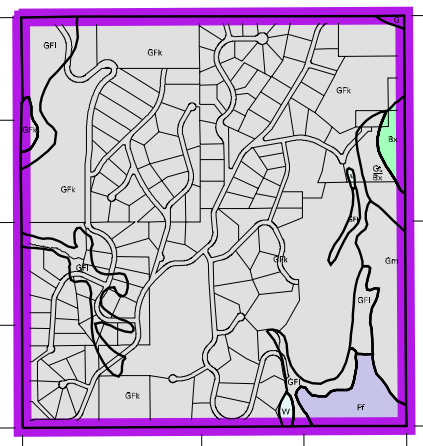
- STUDY BOUNDARY
- PERENNIAL DRAINAGE WAYS
- INTERMITTENT DRAINAGE WAYS

Bx	BEDROCK
C	COLLUVIAL DEPOSITS
Ca	AVALANCHE DEPOSITS
Cl	LANDSLIDE DEPOSITS
Ct	TALUS DEPOSITS
Ctc	TALUS CONE
F	FLUVIAL DEPOSITS
Fd	DELTA DEPOSITS
Fds	SANDY DELTA DEPOSITS
Ff	ALLUVIAL FAN DEPOSITS
Fp	FLOODPLAIN DEPOSITS
Fpg	GRAVELLY FLOODPLAIN DEPOSITS
Ft	FLUVIAL TERRACE DEPOSITS
Ftg	GRAVELLY FLUVIAL TERRACE DEPOSITS
G	GLACIAL DEPOSITS
GF	GLACIOFLUVIAL DEPOSITS
GFe	ESKER (ICE-CONTACT) DEPOSITS
GFk	KAME (ICE-CONTACT) DEPOSITS
GFl	LOWLAND GLACIOFLUVIAL DEPOSITS
GL	GLACIOLACUSTRINE DEPOSITS
Gm	GLACIAL MORAINE DEPOSITS
Gt	GLACIAL TILL DEPOSITS
Gtl	LOWLAND GLACIAL TILL DEPOSITS
Hf	TILL AND EMBANKMENTS
L	LACUSTRINE DEPOSITS
M	MARINE DEPOSITS
MG	GLACIOMARINE DEPOSITS
MGl	LOWLAND GLACIOMARINE DEPOSITS
Mt	TIDAL FLAT DEPOSITS
Mte	EMERGED TIDAL FLAT DEPOSITS
O	ORGANIC DEPOSITS
W	WATERBODY

CONNECTING (RELATIONAL) SYMBOLS

THE TERRAIN UNITS ON THIS MAP DEPICT THREE-DIMENSIONAL COMPLEXES OF ONE OR MORE LANDFORM TYPES. THE LANDFORM SYMBOLS PROVIDE AN INTERPRETIVE IDENTIFICATION OF SOILS CHARACTERISTICS TO A DEPTH OF 15 TO 25 FEET. EACH MAPPED TERRAIN UNIT MAY BE REPRESENTED BY A SINGLE LANDFORM TYPE, OR A COMPLEX WITH SEVERAL LANDFORM TYPES ALL EXPOSED AT THE GROUND SURFACE, OR BY A COMPLEX OF LANDFORM TYPES WITH SOME EXPOSED AT THE SURFACE AND SOME BURIED FROM VIEW. CONNECTING SYMBOLS ARE USED TO INDICATE SPATIAL RELATIONSHIPS (BOTH HORIZONTALLY AND VERTICALLY) BETWEEN DIFFERENT LANDFORM TYPES PRESENT WITHIN INDIVIDUAL TERRAIN UNIT POLYGONS. THESE SYMBOLS INCLUDE +, –, AND ?. EXAMPLES OF THE USE OF THESE SYMBOLS ARE GIVEN BELOW:

- X — A MAP AREA (TERRAIN UNIT) COMPRISED OF THE SINGLE LANDFORM TYPE, X, INTERPRETED TO BE PRESENT FROM THE SURFACE TO DEPTHS OF AT LEAST 15 TO 25 FEET.
- X + Y — A TERRAIN UNIT COMPRISED OF A COMPLEX OF LANDFORM TYPES X AND Y BEING PREDOMINANT.
- X / Y — A TERRAIN UNIT WHERE ONLY LANDFORM TYPE X IS EXPOSED AT THE SURFACE, BUT IS UNDERLAIN EVERYWHERE BY LANDFORM TYPE Y AT DEPTHS OF LESS THAN 15 TO 25 FEET.
- ? — A TERRAIN UNIT WHERE ONE OR MORE LANDFORMS ARE OF UNCERTAIN IDENTIFICATION.



NORTH

SCALE IN FEET

800 0 500 1000 1500

DEARMOUN STUDY AREA

MONTGOMERY WATSON

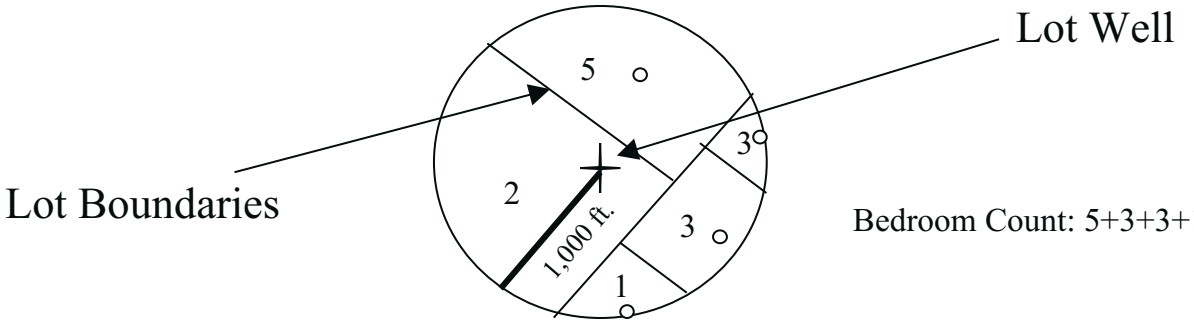
Anchorage, Alaska

FIGURE 4

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

HILLSIDE TERRAIN UNIT MAP

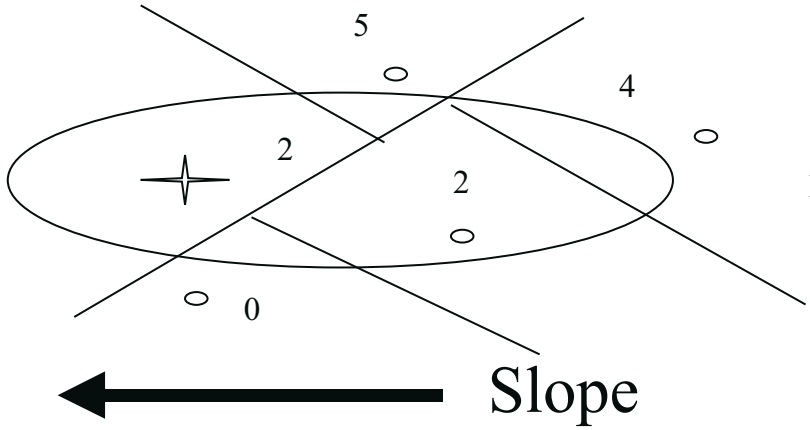
dhhs\aquifer\draft\fig5.cdr



Bedroom Count: 5+3+3+1+2 = 14

Circular Bedroom Count

(with 1,000 ft. radius from well)



Bedroom Count: 5+4+2+0+2=13

Elliptical Bedroom Count

(1,000 ft. longitudinal axis upslope)

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FIGURE 5

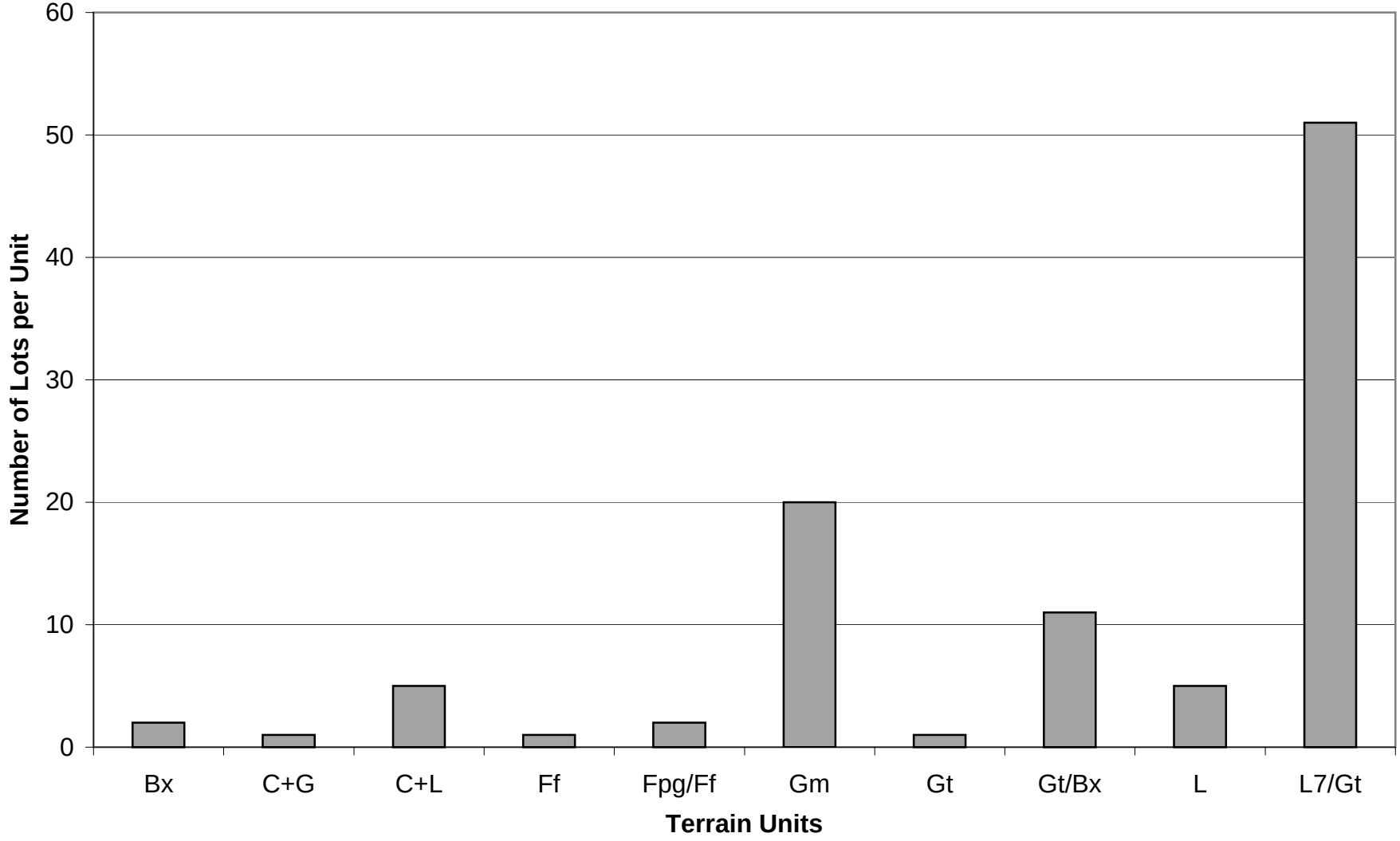
MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

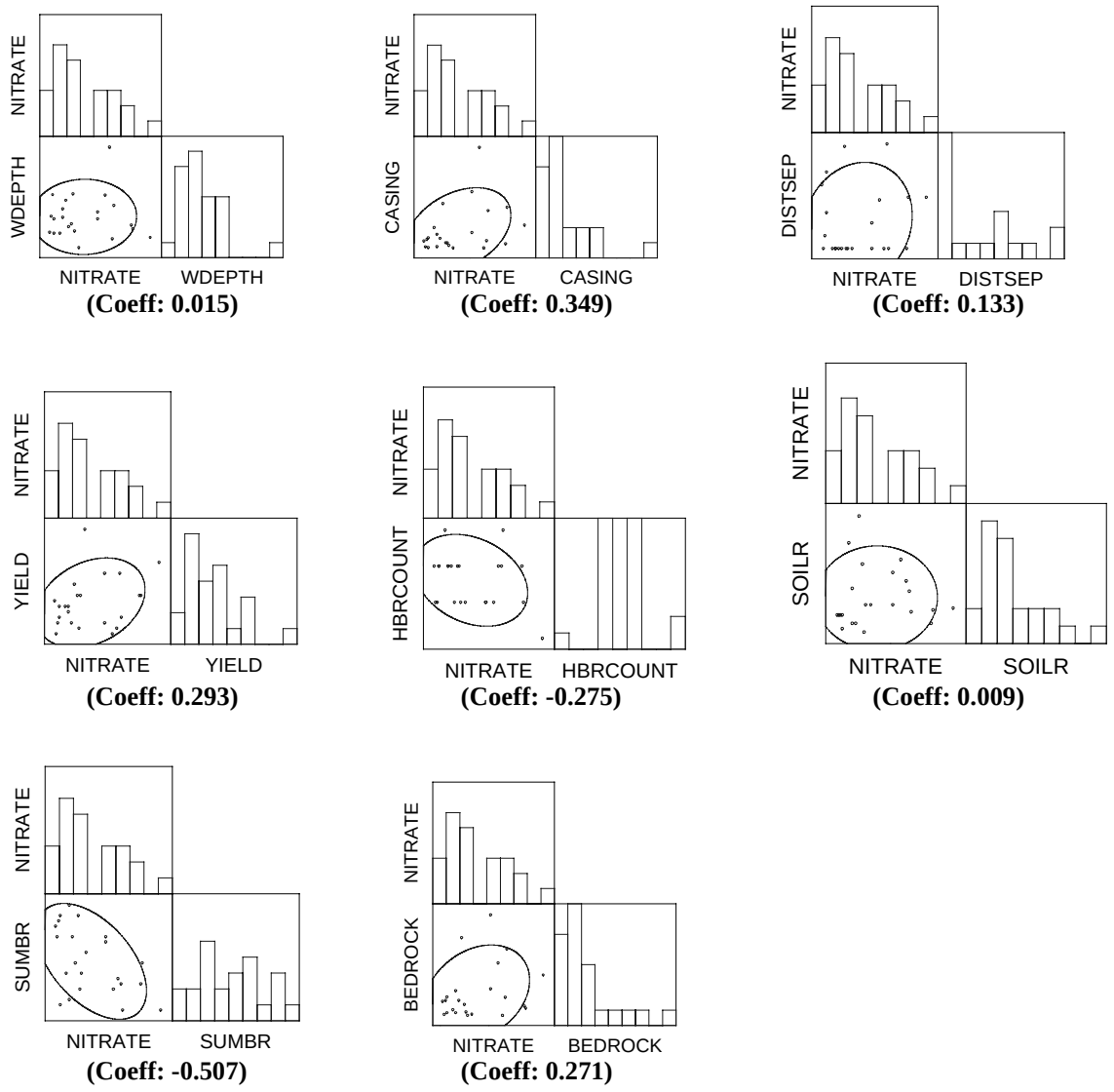
TWO WAYS TO QUANTIFY POPULATION DENSITY

Figure 6

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Terrain Units per Lot

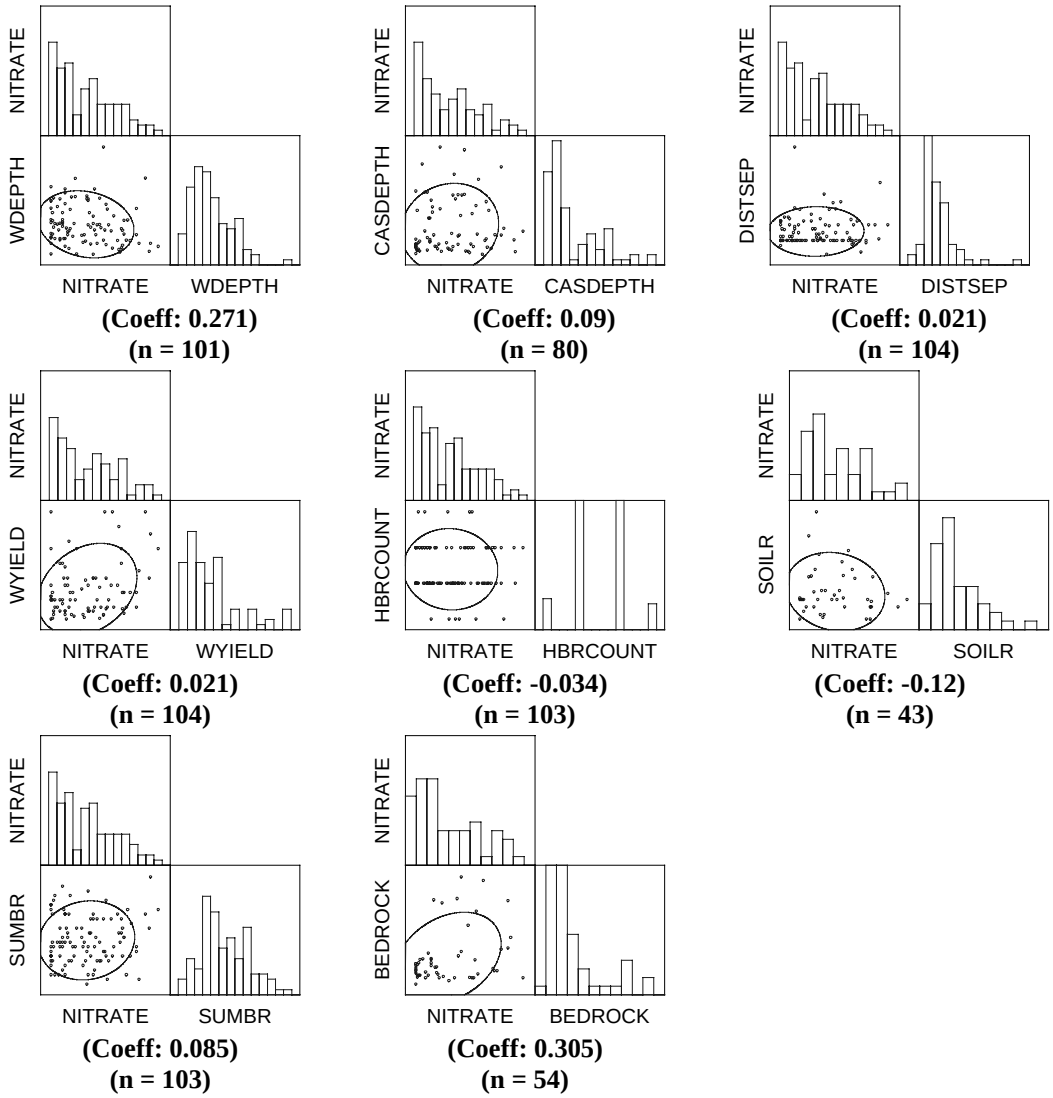




Legend:

Designation	Description
NITRATE	Concentration (milligrams per liter)
WDEPTH	Well Depth (feet below ground surface)
CASING	Casing Depth (feet below ground surface)
DISTSEP	Well to Septic Field Distance (feet)
YIELD	Water Yield (gallons per minute)
HBRCOUNT	Bedroom Count
SOILR	Soil Absorption Rating (square feet per bedroom)
SUMBR	Number of bedrooms within a 1000-foot radius of well
BEDROCK	Bedrock Depth (feet below ground surface)

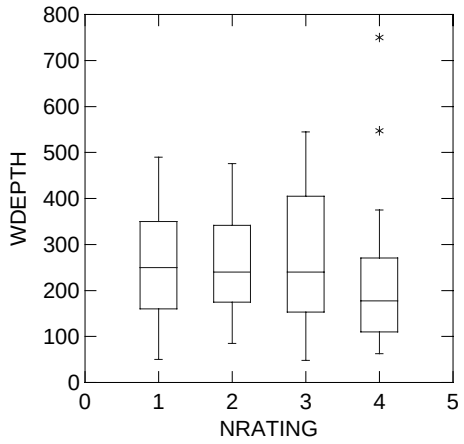
Figure 7a. Factor Correlation Diagram with Histograms for 23 Wells. Dearmoun Study Area.



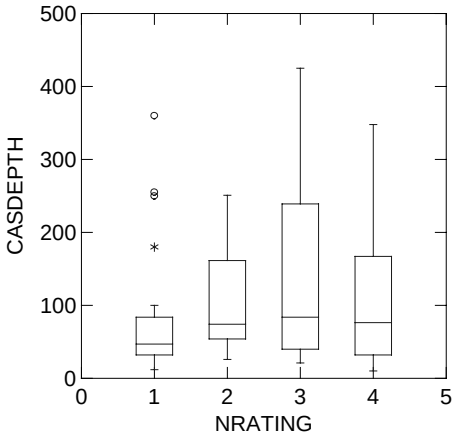
Legend:

Designation	Description
NITRATE	Concentration (milligrams per liter)
WDEPTH	Well Depth (feet below ground surface)
CASING	Casing Depth (feet below ground surface)
DISTSEP	Well to Septic Field Distance (feet)
YIELD	Water Yield (gallons per minute)
HBRCOUNT	Bedroom Count
SOILR	Soil Absorption Rating (square feet per bedroom)
SUMBR	Number of bedrooms within a 1000-foot radius of well
BEDROCK	Bedrock Depth (feet below ground surface)

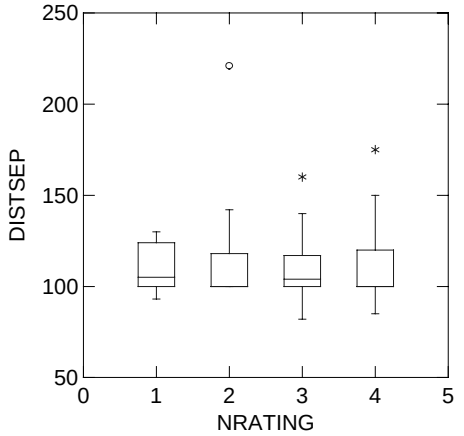
Figure 7b. Factor Correlation Diagram for Individual Factors.
Dearmoun Study Area



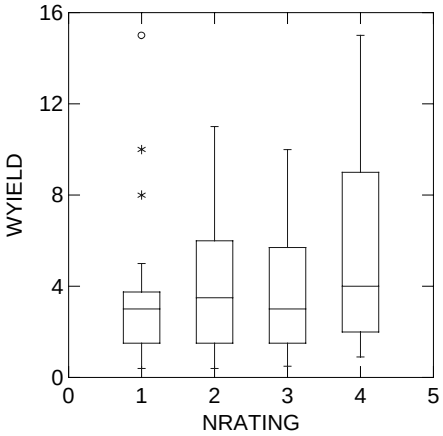
(N = 101)



(N = 80)



(N = 104)

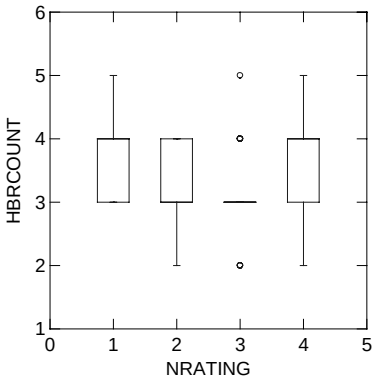


(N = 84)

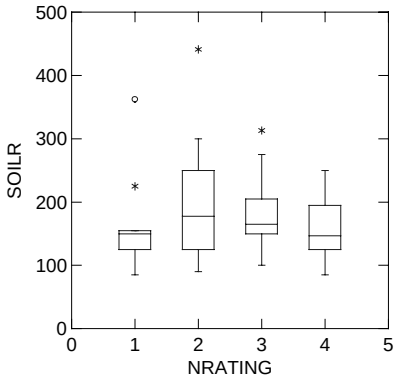
Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/L (2) 1-2 mg/L (3) 2-4 mg/L (4) >4 mg/L
WDEPTH	Well Depth (feet below ground surface)
CASDEPTH	Casing Depth (feet below ground surface)
DISTSEP	Well to Septic Field Distance (feet)
WYIELD	Water Yield (gallons per minute)

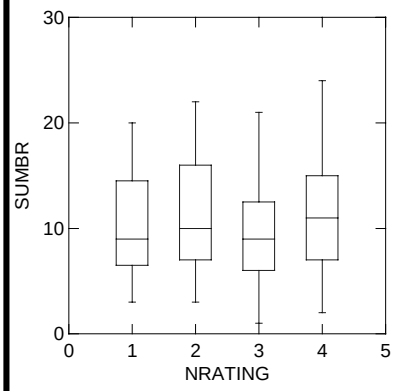
Figure 8a. Box Plots of Nitrate Rating Classifications.
Dearmoun Study Area.



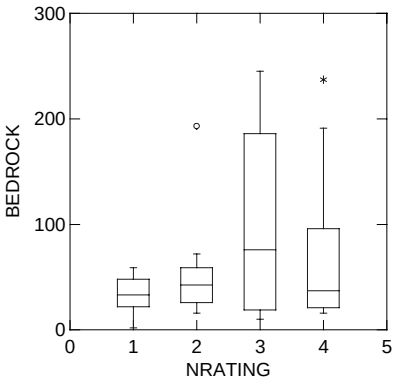
(N = 103)

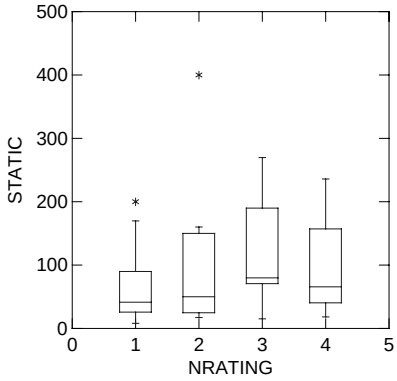


(N = 43)



(N = 103)



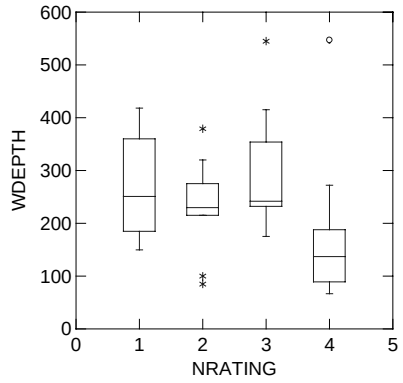


(N = 62)

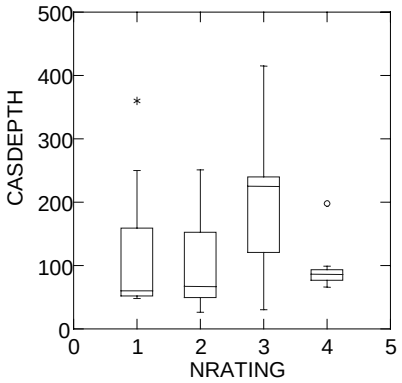
Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/l (2) 1-2 mg/l (3) 2-4 mg/l (4) >4 mg/l
HBRCOUNT	Number of Bedrooms on Lot
SOILR	Soil Absorption Rating (square feet/bedroom)
SUMBR	Number of bedrooms within 1000 feet radius of well
BEDROCK	Bedrock Depth (Feet below ground surface)
STATIC	Static Water Depth from Well Logs (feet below ground surface)

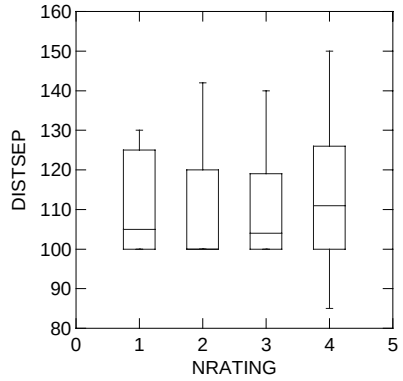
Figure 8b. Box Plots of Nitrate Rating Classifications.
Dearmoun Study Area.



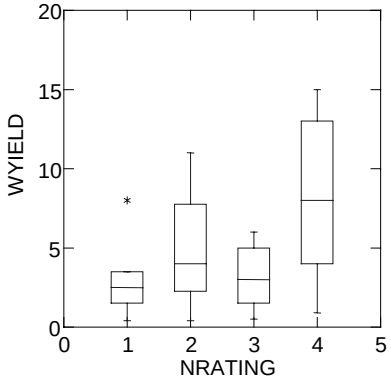
(N = 40)



(N = 32)



(N = 40)

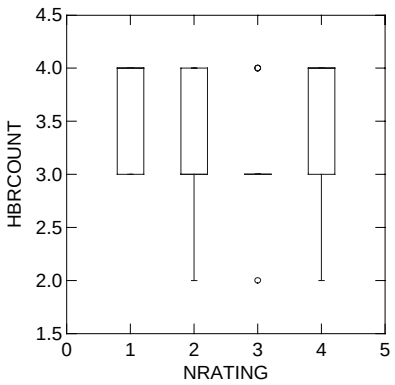


(N = 32)

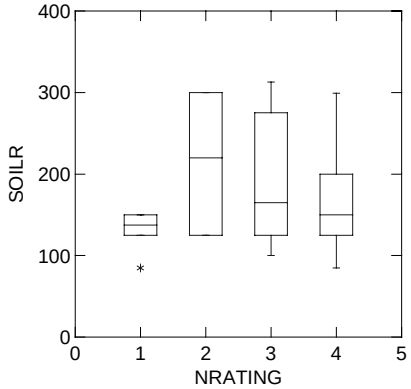
Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/L (2) 1-2 mg/L (3) 2-4 mg/L (4) >4 mg/L
WDEPTH	Well Depth (feet below ground surface)
CASDEPTH	Casing Depth (feet below ground surface)
DISTSEP	Well to Septic Field Distance (feet)
WYIELD	Water Yield (gallons per minute)

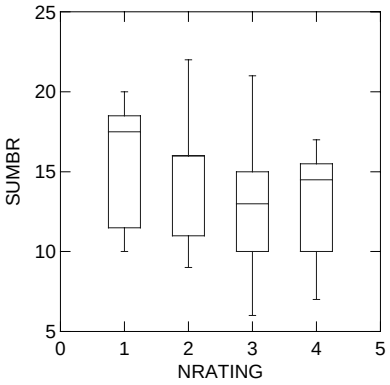
Figure 9a. Box Plots of Nitrate Rating Classifications.
Dearmoun Study Area. – Mountain Park Estates



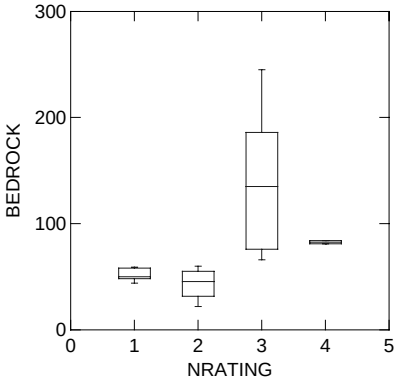
(N = 40)



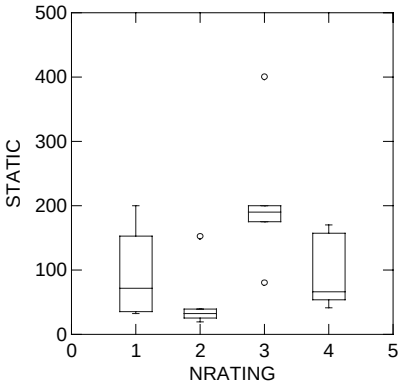
(N = 24)



(N = 39)



(N = 16)

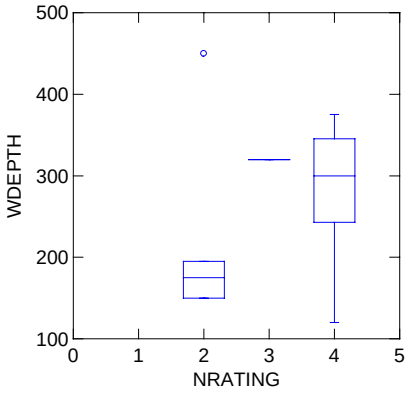


(N = 24)

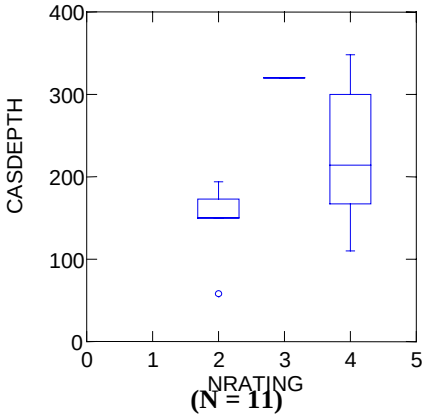
Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/L (2) 1-2 mg/L (3) 2-4 mg/L (4) >4 mg/L
HBRCOUNT	Number of Bedrooms on Lot
SOILR	Soil Absorption Rating (square feet/bedroom)
SUMBR	Number of bedrooms within a 1000-foot radius of well
BEDROCK	Bedrock Depth (feet below ground surface)
STATIC	Static Water Depth from Well Logs (feet below ground surface)

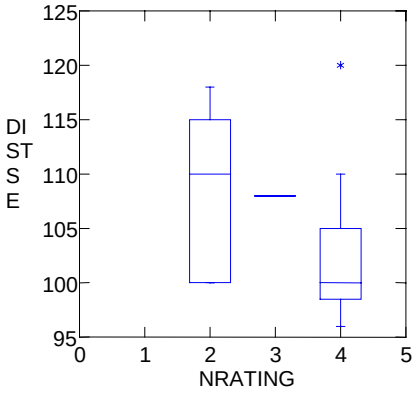
Figure 9b. Box Plots of Nitrate Rating Classifications.
Dearmoun Study Area – Mountain Park Estates



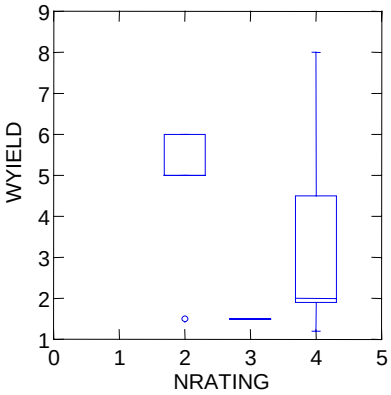
(N = 13)



(N = 11)



(N = 13)

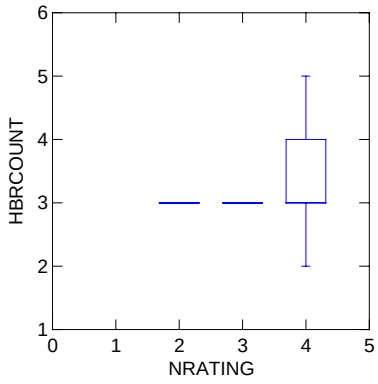


(N = 13)

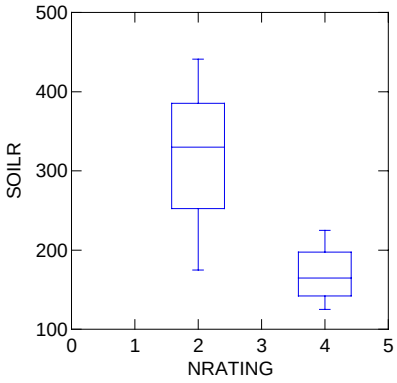
Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/L (2) 1-2 mg/L (3) 2-4 mg/L (4) >4 mg/L
WDEPTH	Well Depth (feet below ground surface)
CASDEPTH	Casing Depth (feet below ground surface)
DISTSEP	Well to Septic Field Distance (feet)
WYIELD	Water Yield (gpm)

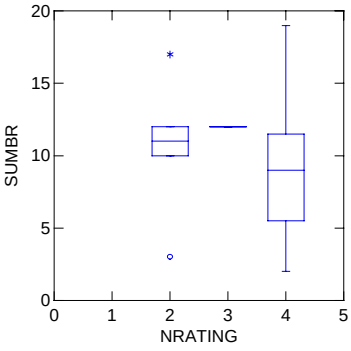
Figure 9c. Box Plots of Nitrate Rating Classifications.
Aspen Highlands Study Area.



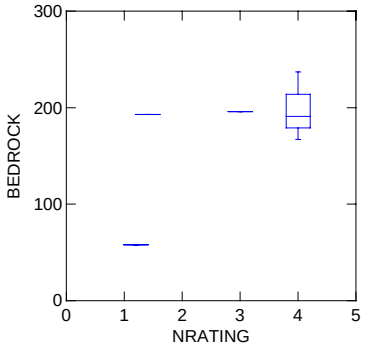
(N = 13)



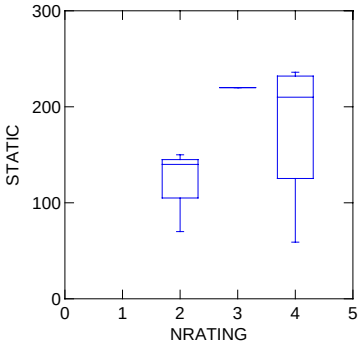
(N = 7)



(N = 13)



(N = 7)

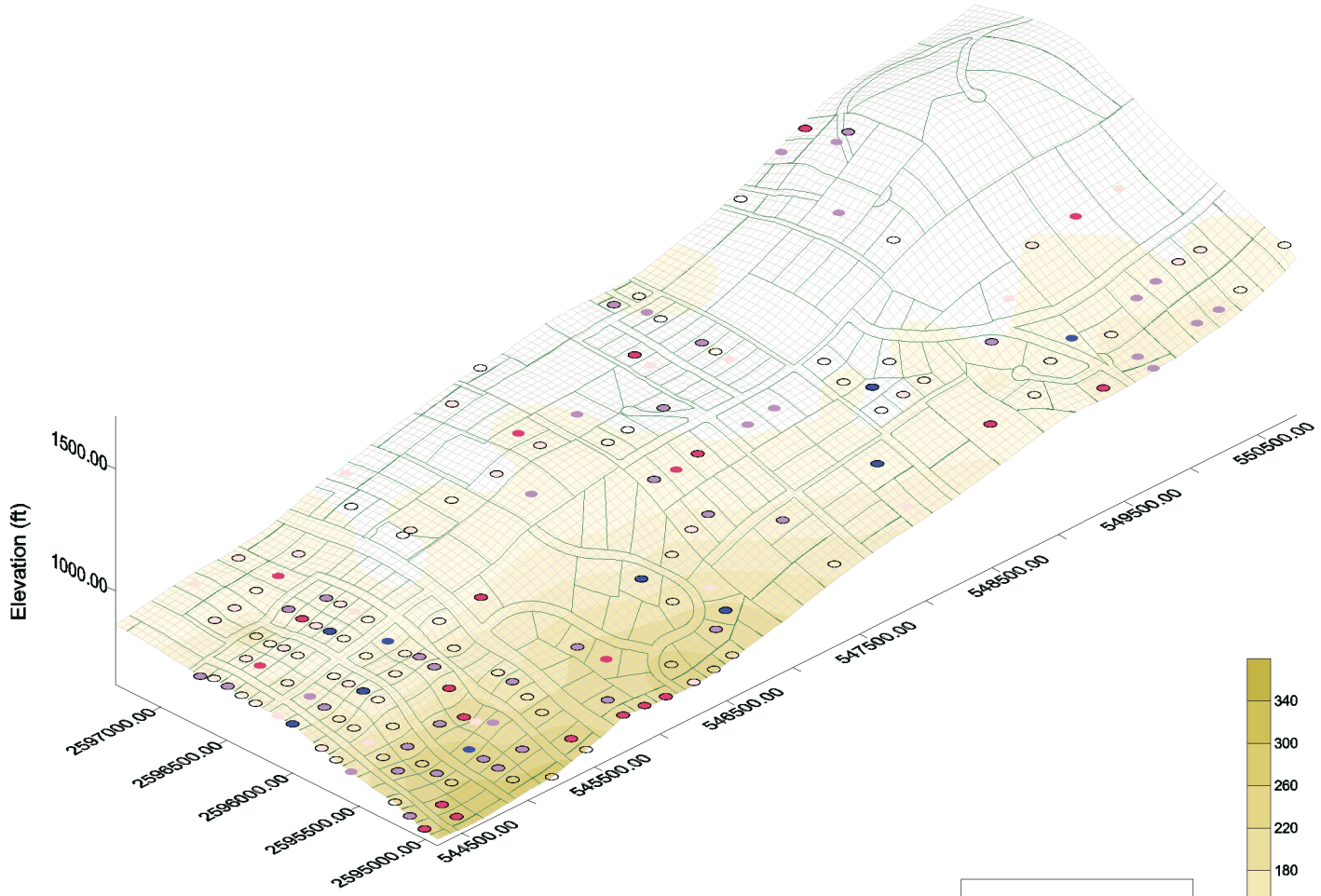


(N = 8)

Legend:

Designation	Description
NRATING	Nitrate Concentration Rating in milligrams per liter (mg/l) (1) <1 mg/L (2) 1-2 mg/L (3) 2-4 mg/L (4) >4 mg/L
HBRCOUNT	Number of Bedrooms on Lot
SOILR	Soil Absorption Rating (square feet per bedroom)
SUMBR	Number of bedrooms within a 1000-foot radius of well
BEDROCK	Bedrock Depth (feet below ground surface)
STATIC	Static Water Depth from Well Logs (feet below ground surface)

Figure 9d. Box Plots of Nitrate Rating Classifications.
Aspen Highlands Study Area.



Notes:
1. This figure is a composite of all available nitrate and well log data from 1987 to 1998, compiled from DHHS files.
2. The vertical elevation shown is 2 x the actual elevation
3. All coordinates are in Alaska State Plane, Zone 4
4. Circular outlines indicate where well log data was available

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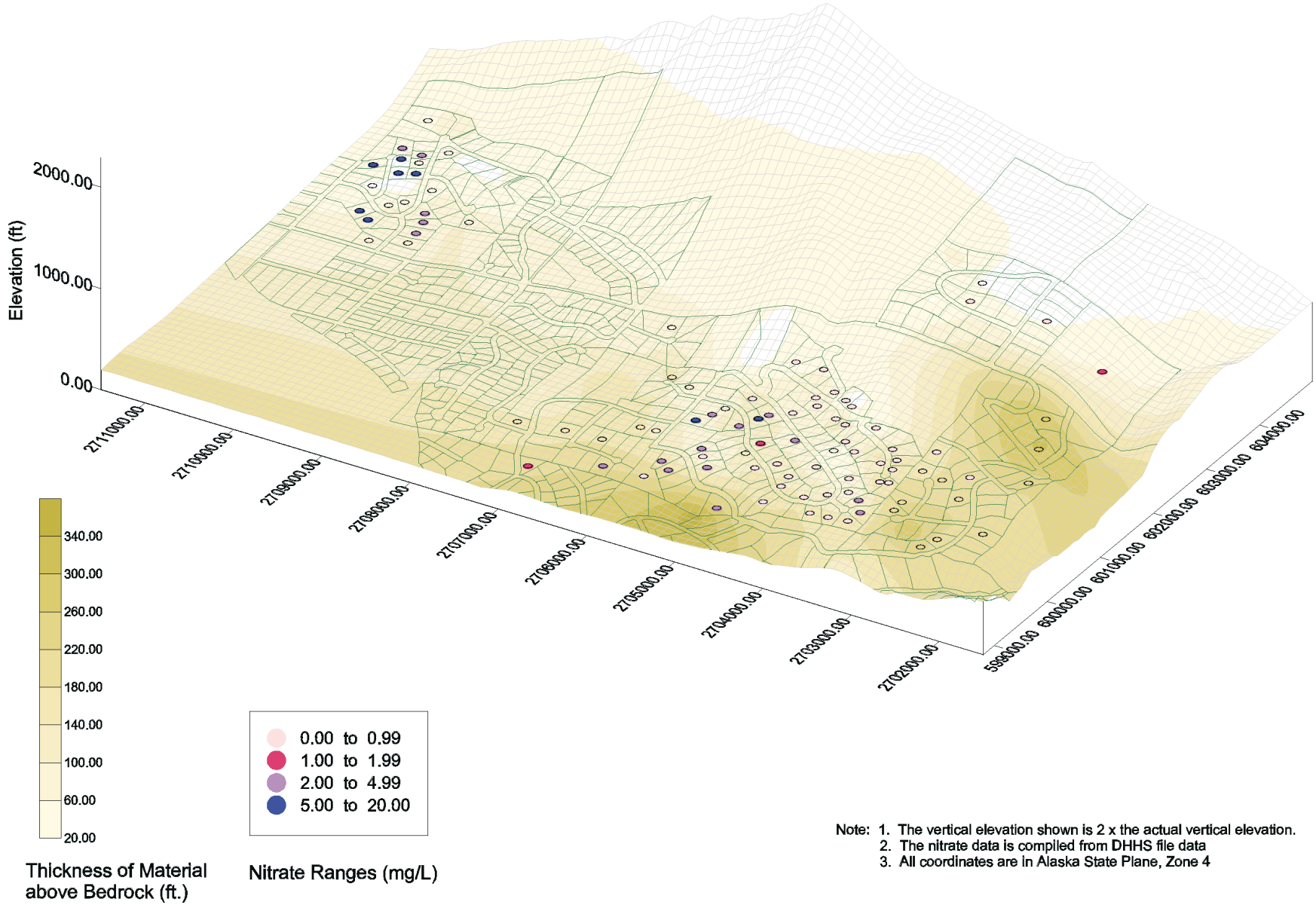
FIGURE 10

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D DEARMOUN PILOT STUDY AREA PLOT COMPOSITE NITRATE DATA

JOB No. 1189061.150109 DHHS/aquifer/fnl/fig11.cdr



Note: 1. The vertical elevation shown is 2 x the actual vertical elevation.
2. The nitrate data is compiled from DHHS file data
3. All coordinates are in Alaska State Plane, Zone 4

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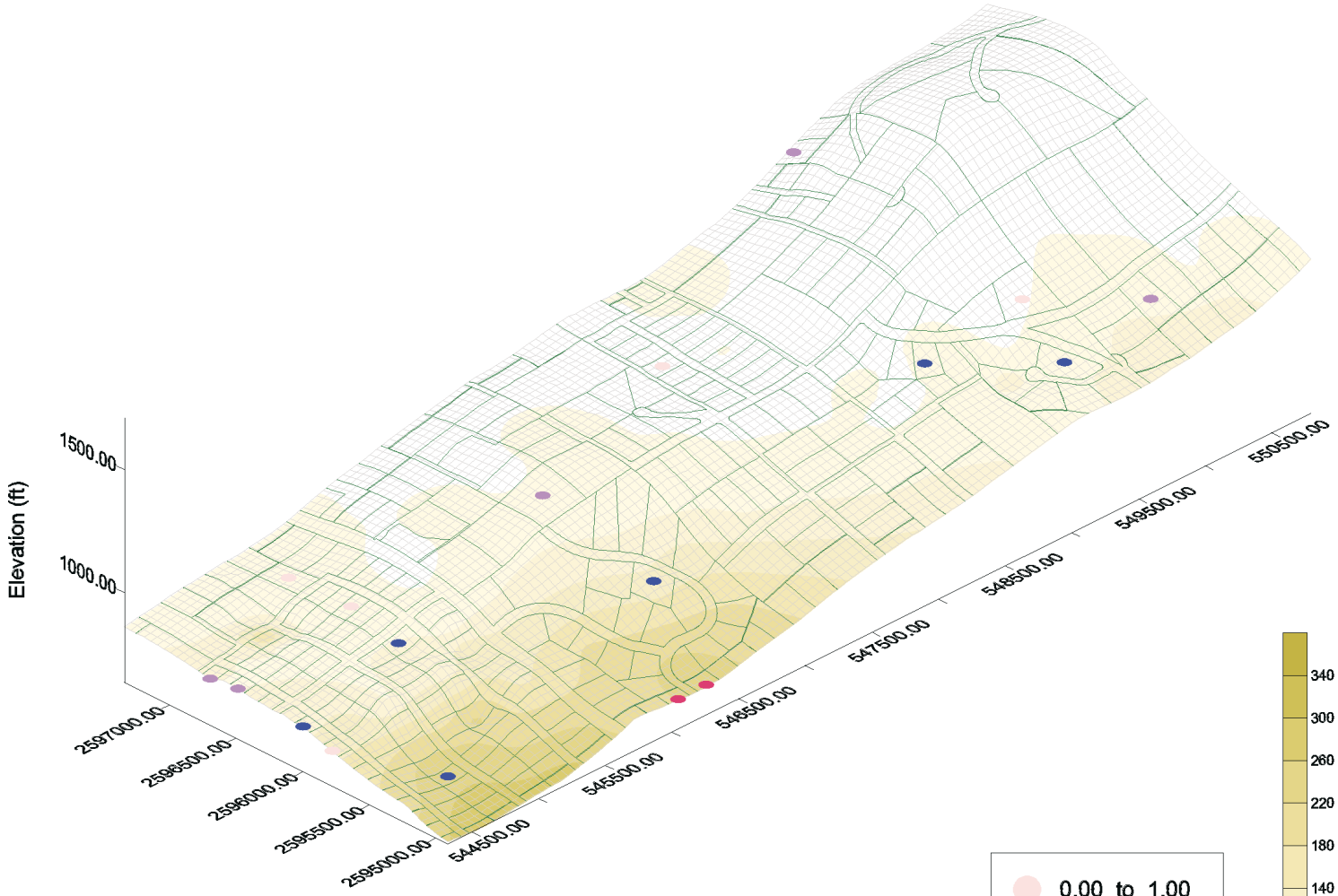
FIGURE 11

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D SCIMITAR PILOT STUDY AREA PLOT COMPOSITE NITRATE DATA

JOB No. 1189061.150109 DHHS/aquifer/fnl/fig12.cdr



Note: 1. All nitrate data is from DHHS 1992 files Dearmoun Study Area
2. The vertical elevation shown in 2 x the actual vertical elevation.
3. All coordinates are in Alaska State Plane, Zone 4

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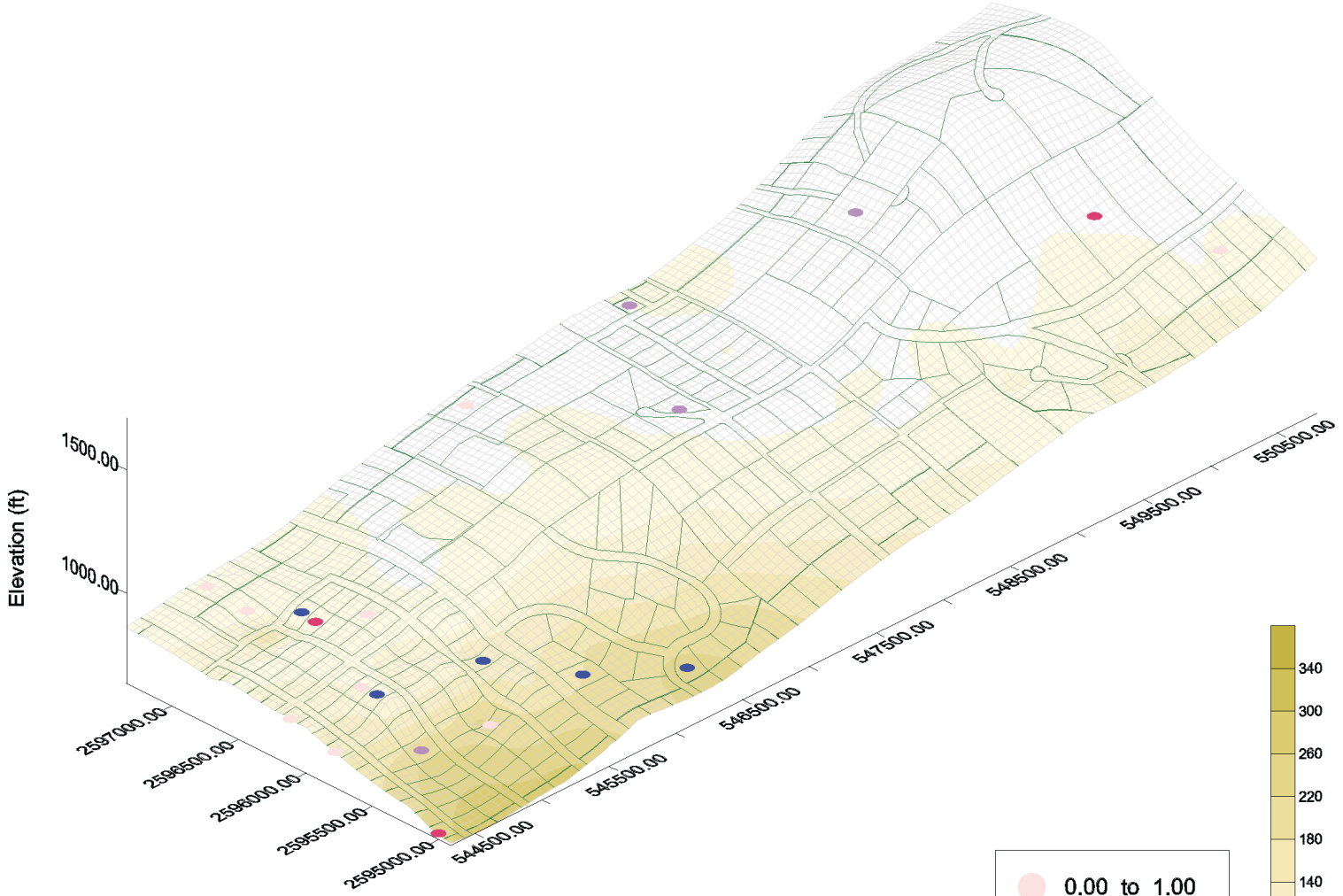
FIGURE 12

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D DEARMOUN PILOT STUDY AREA PLOT 1992 NITRATE DATA

JOB No. 1189061.150109 DHHS/aquifer/fnl/fig13.cdr



Note: 1. All nitrate data is from DHHS 1993 files Dearmoun Study Area
2. The vertical elevation shown in 2 x the actual vertical elevation
3. All coordinates are in Alaska State Plane, Zone 4

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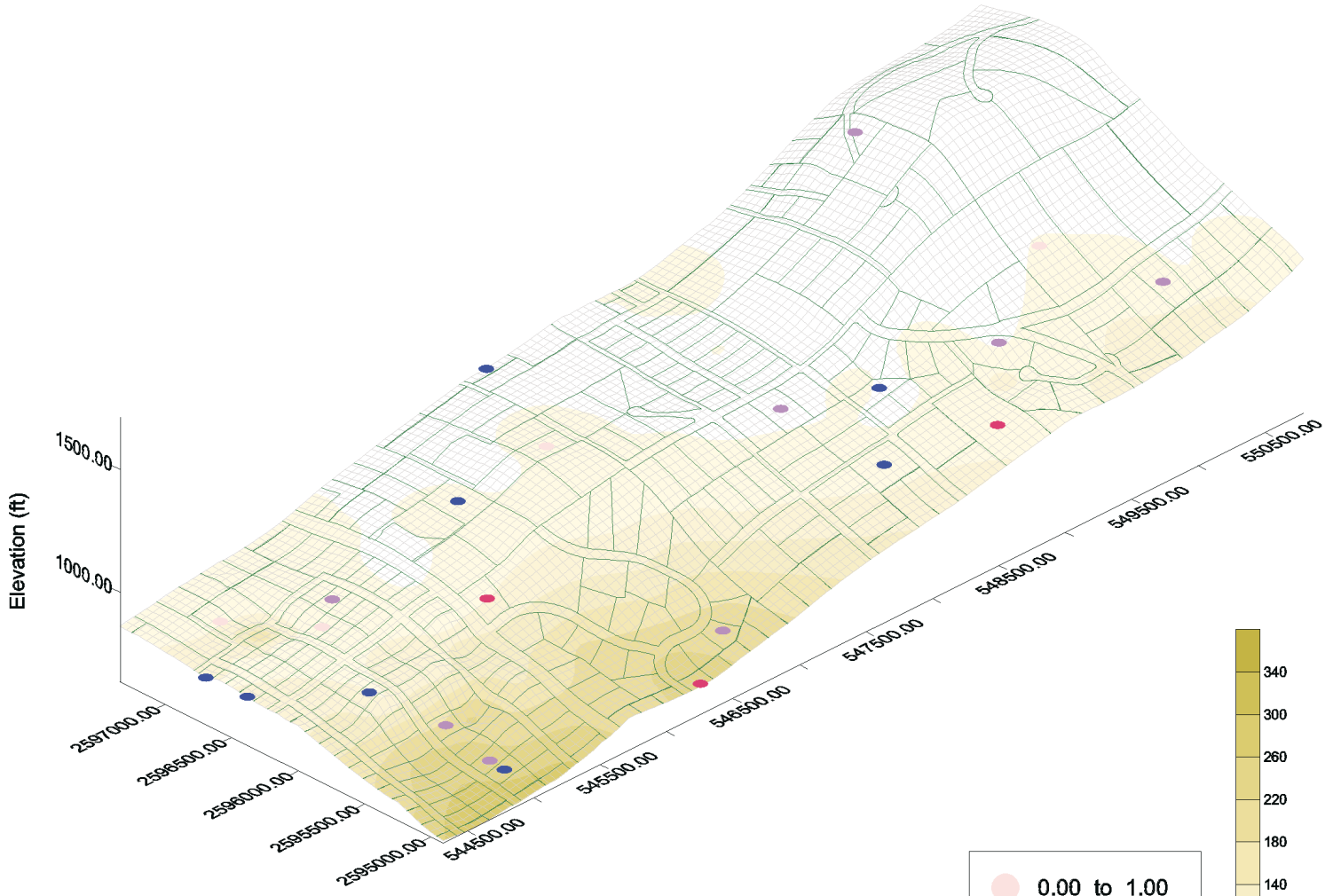
Anchorage, Alaska

FIGURE 13

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D DEARMOUN PILOT STUDY AREA PLOT 1993 NITRATE DATA

JOB No. 1189061.150109 DHHS/aquifer/fnl/fig14.cdr



Note: 1. All nitrate data is from DHHS 1994 files Dearmoun Study Area
2. The vertical elevation shown in 2 x the actual vertical elevation
3. All coordinates are in Alaska State Plane, Zone 4

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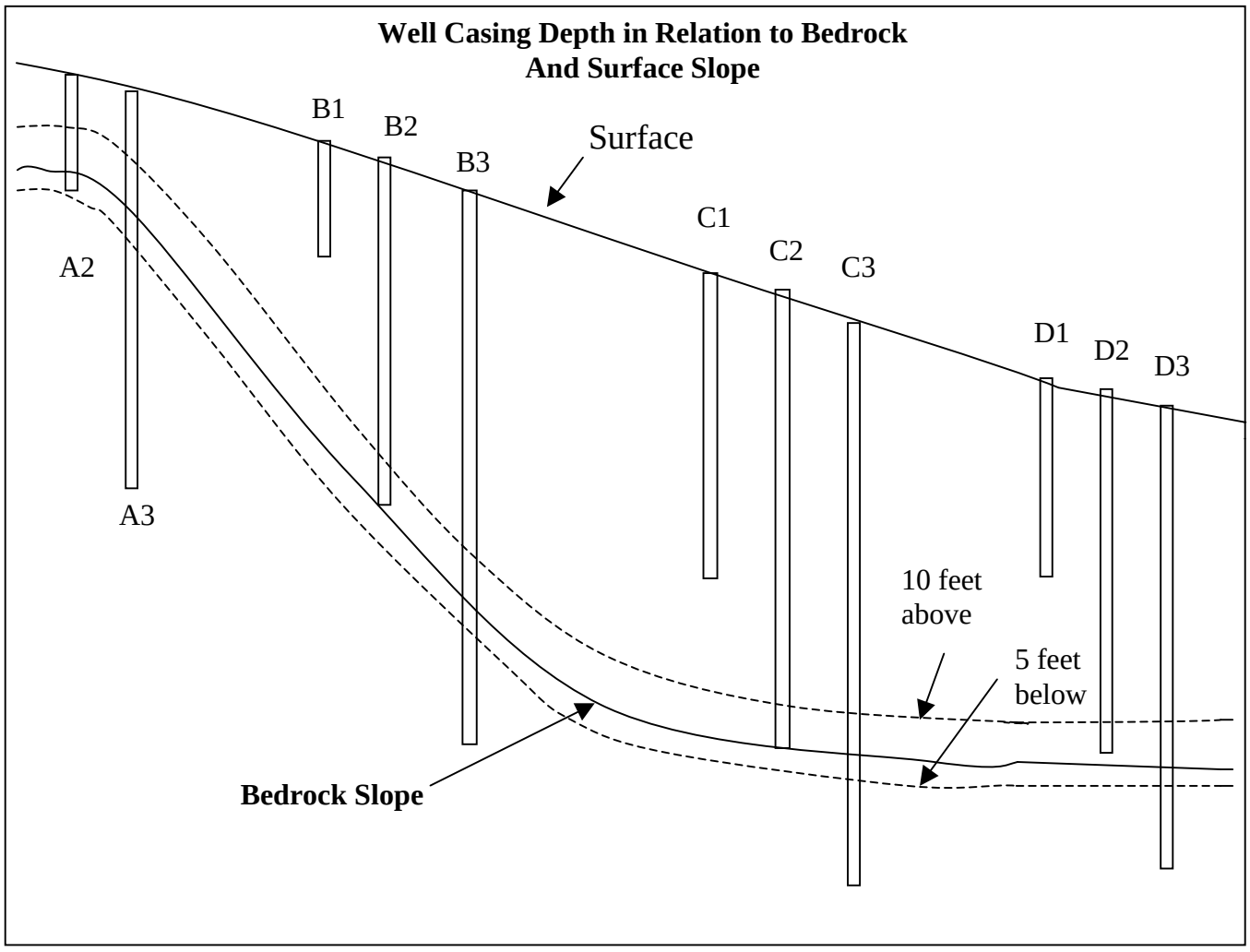
Anchorage, Alaska

FIGURE 14

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D DEARMOUN PILOT STUDY AREA PLOT 1994 NITRATE DATA



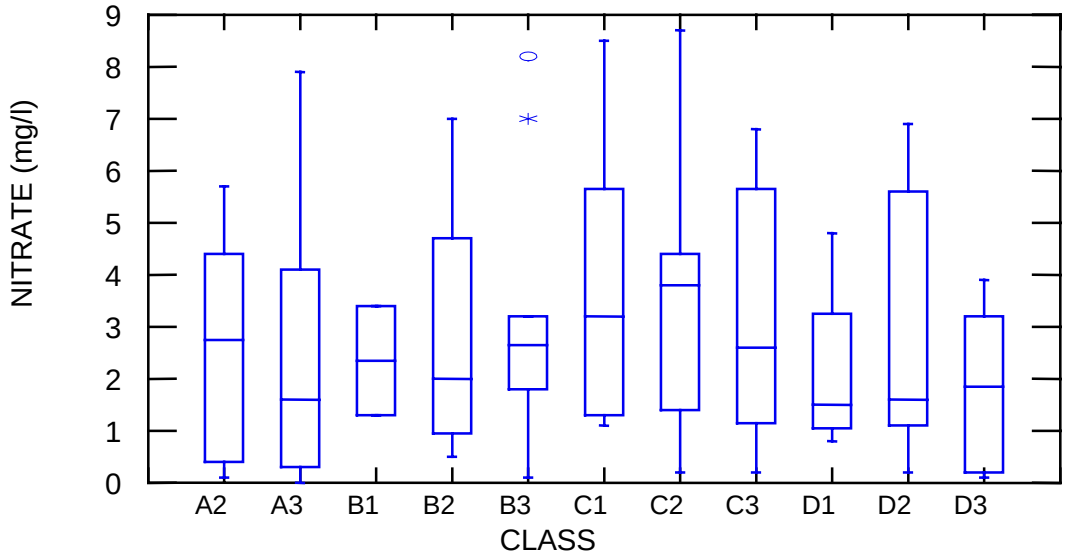
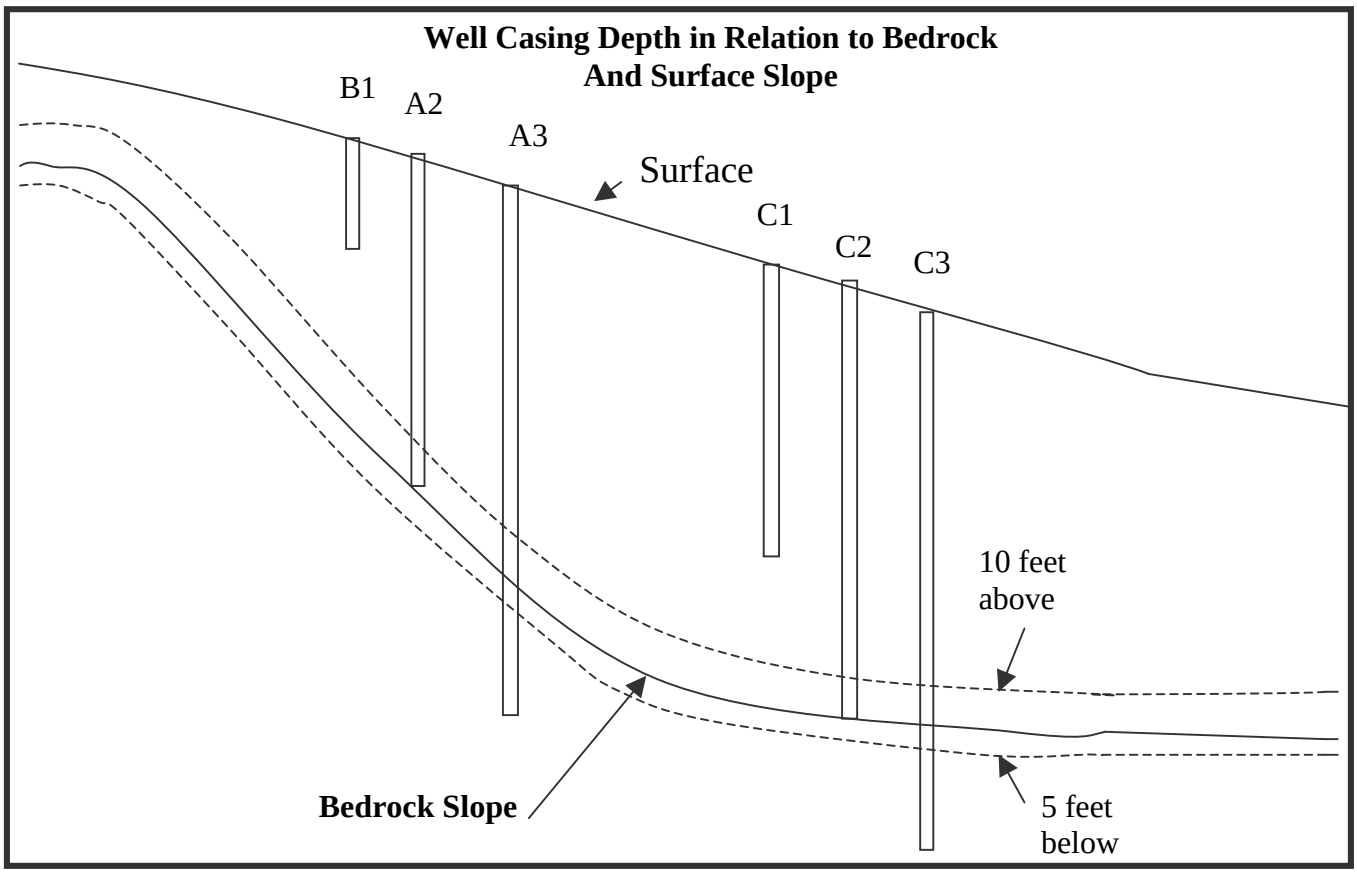


Figure 15. Diagram and Box Plot of Eleven Well Classifications. Dearmoun Study Area.



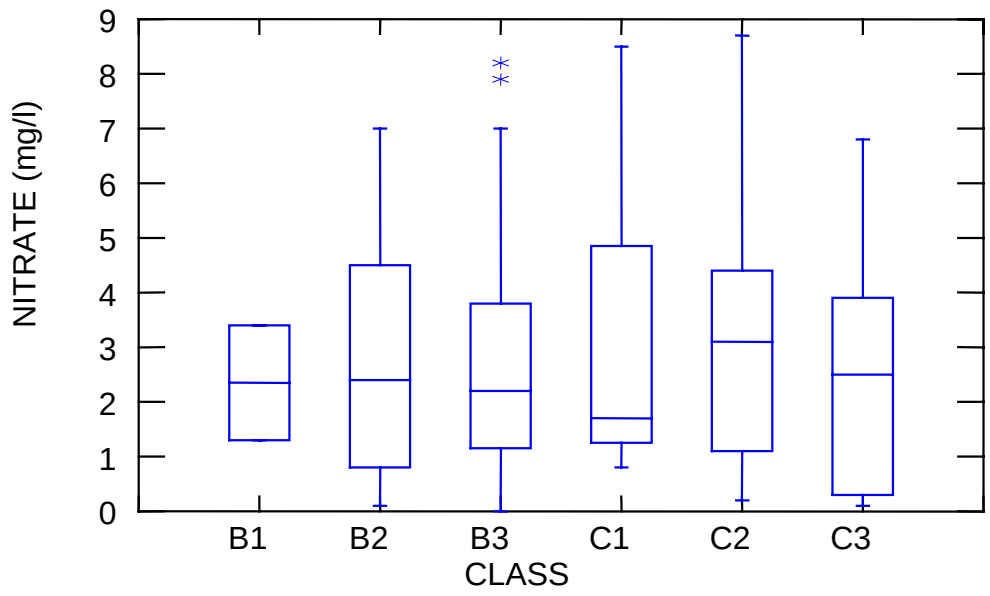
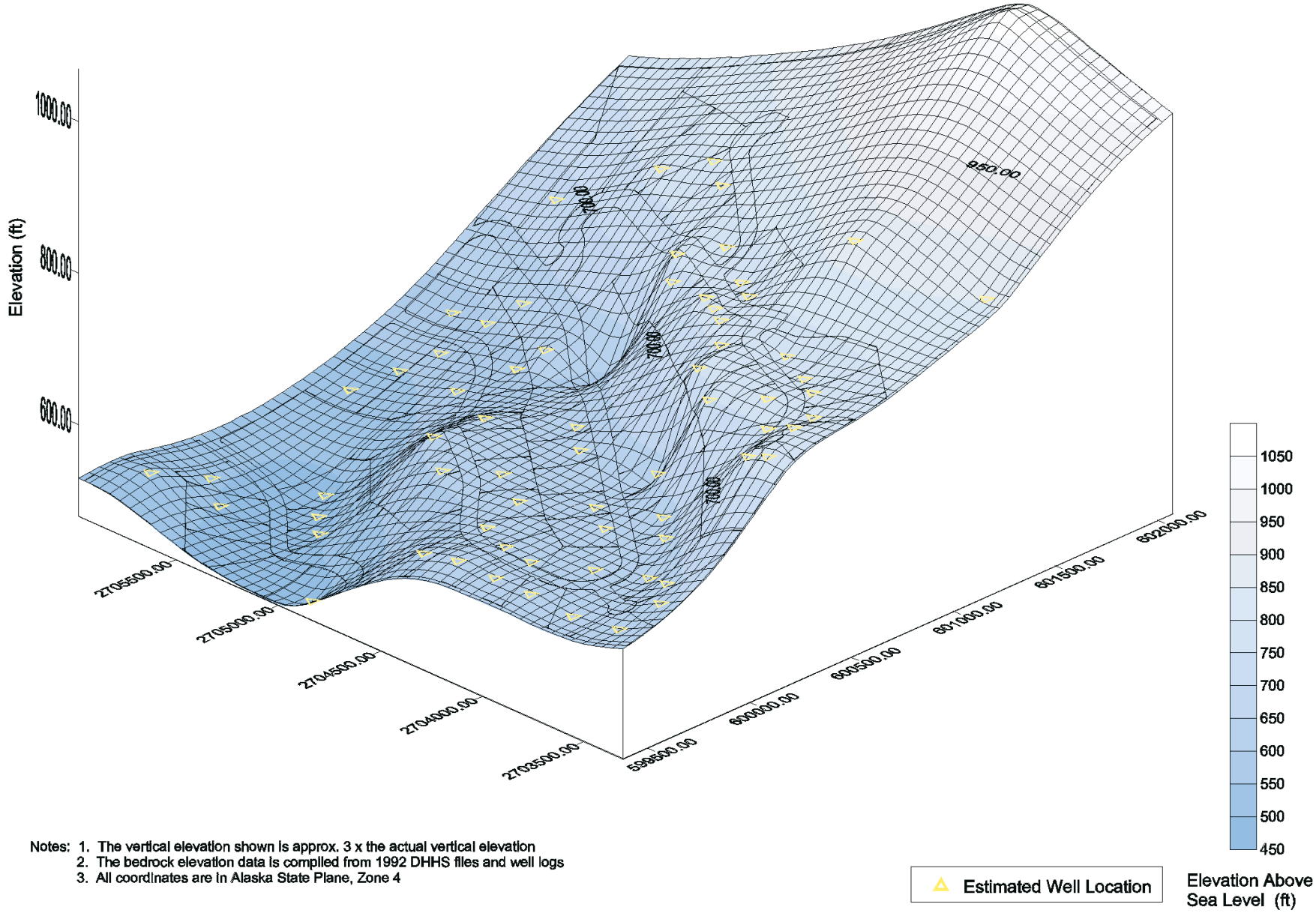


Figure 16. Diagram and Box Plot of Six Well Classifications. Dearmoun Study Area.

dhhs\aquifer\draft\fig17.cdr



Notes:
1. The vertical elevation shown is approx. 3 x the actual vertical elevation
2. The bedrock elevation data is compiled from 1992 DHHS files and well logs
3. All coordinates are in Alaska State Plane, Zone 4

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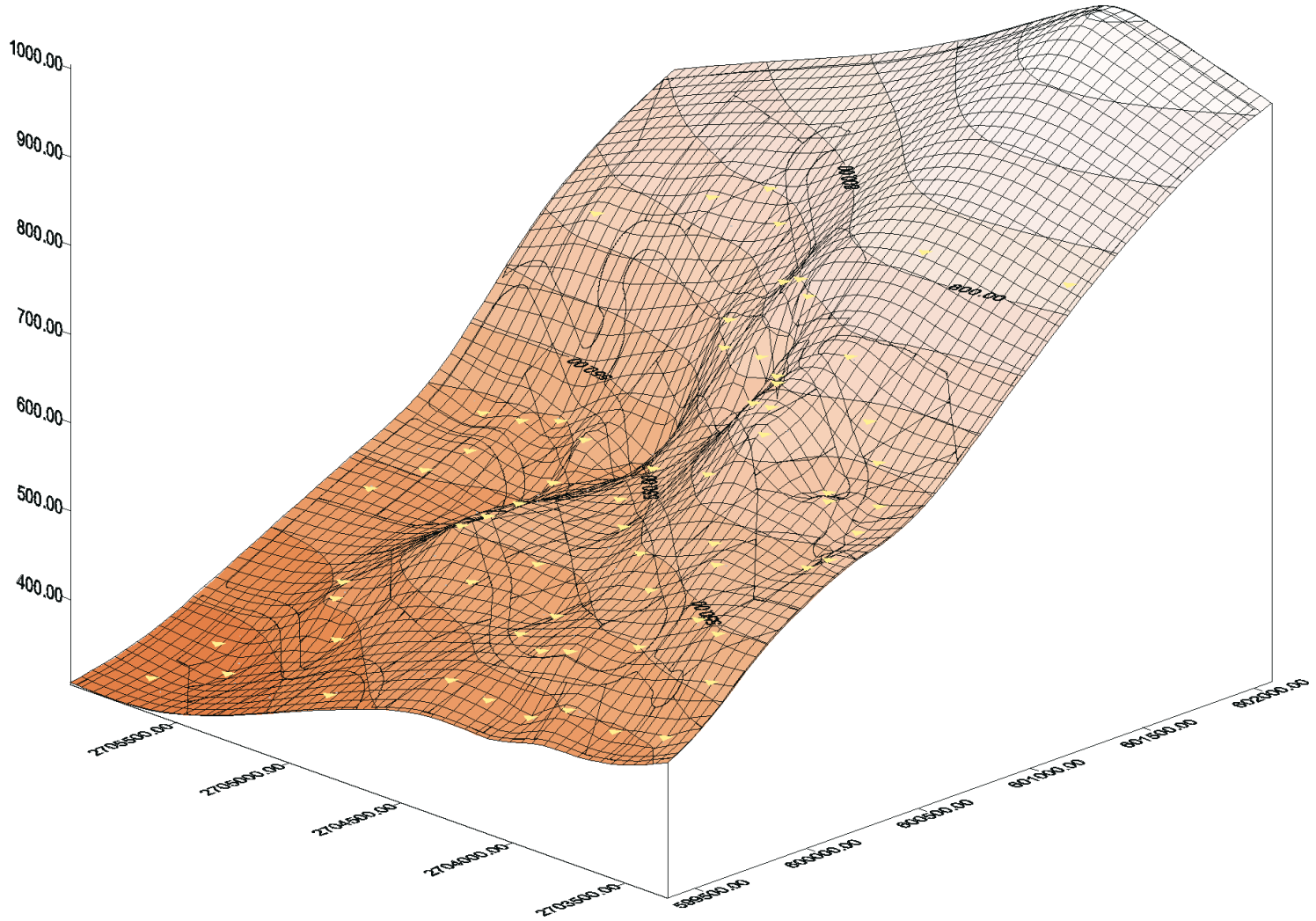
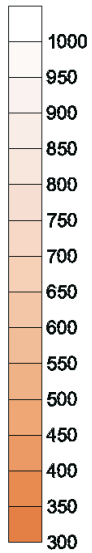
FIGURE 17

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D SCIMITAR STUDY AREA PLOT SURFACE CONTOURS

dhhs\aquifer\draft\fig18cdr





Elevation Above Sea Level (ft.)

Notes:
1. The vertical elevation shown is approx. 3 x the actual vertical elevation
2. The nitrate data is compile from DHHS files and well logs
3. All coordinates are in Alaska State Plane, Zone 4

▲ Estimated Well Location

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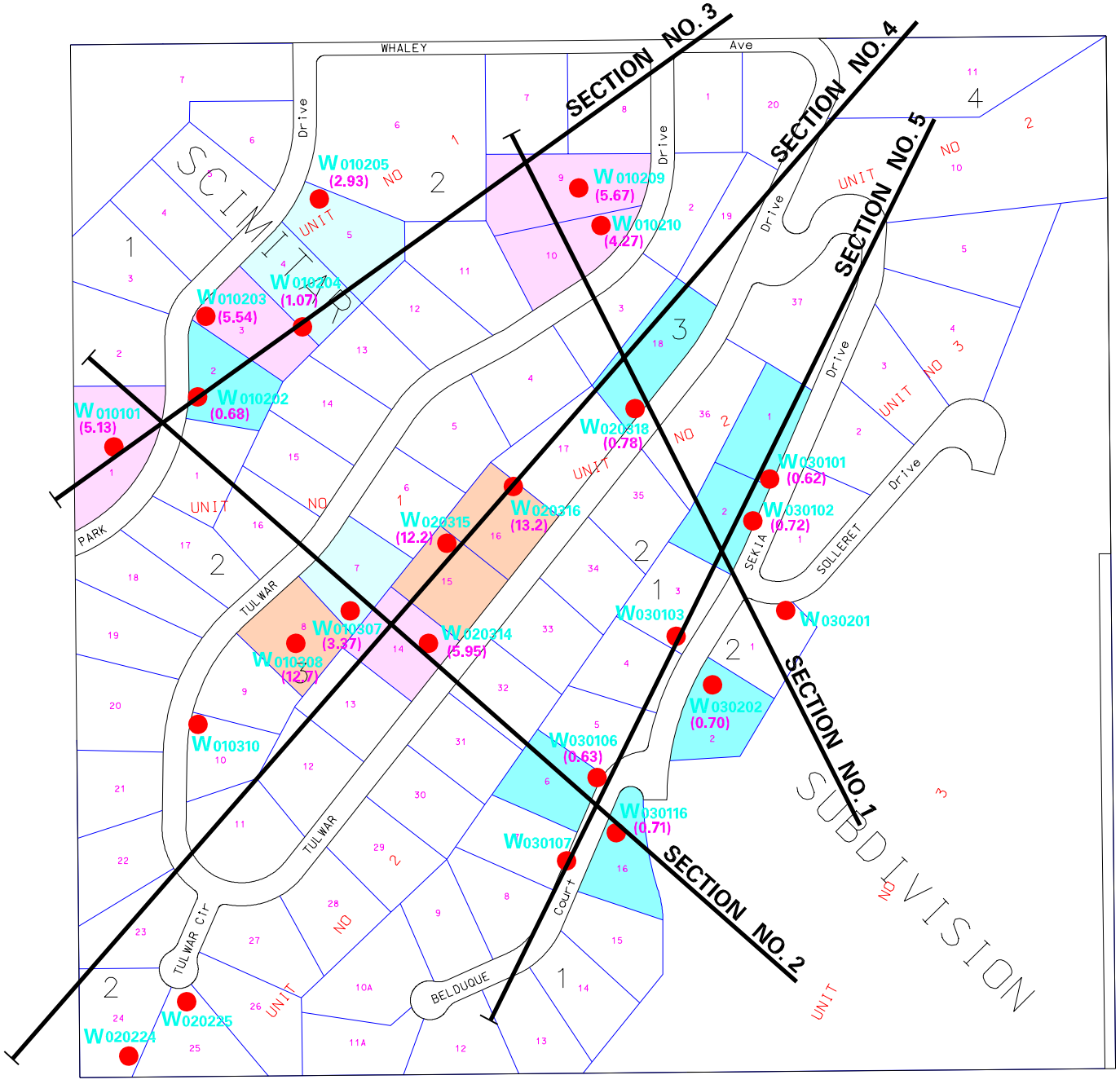
Anchorage, Alaska

FIGURE 18

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM - PHASE II

3-D SCIMITAR STUDY AREA PLOT BEDROCK CONTOURS



LEGEND:

- W (0.71) WATER TABLE TAKEN; NITRATE LEVEL IN mg /l
- < 1 mg /l
- 1–4
- 4–6
- >10

NOTES:

1. RESULTS OF FIELD STUDY PERFORMED IN AUGUST, 1999.
2. WELL LOCATIONS BASED ON USGS COORDINATES AND ELEVATIONS, EXCEPT FOR 010205, WHICH HAS ASSUMED COORDINATES.

NORTH

SCALE IN FEET

0 400

MONTGOMERY WATSON

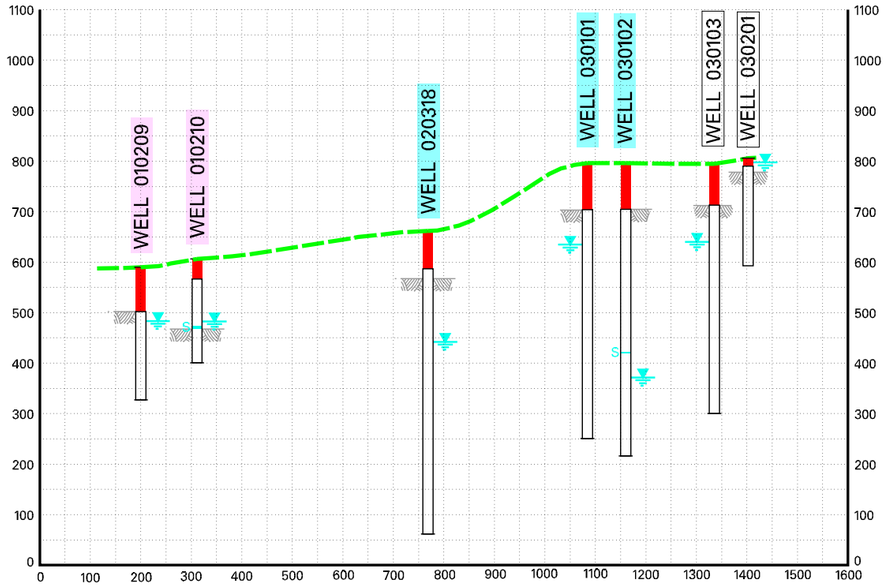
Anchorage, Alaska

FIGURE 19

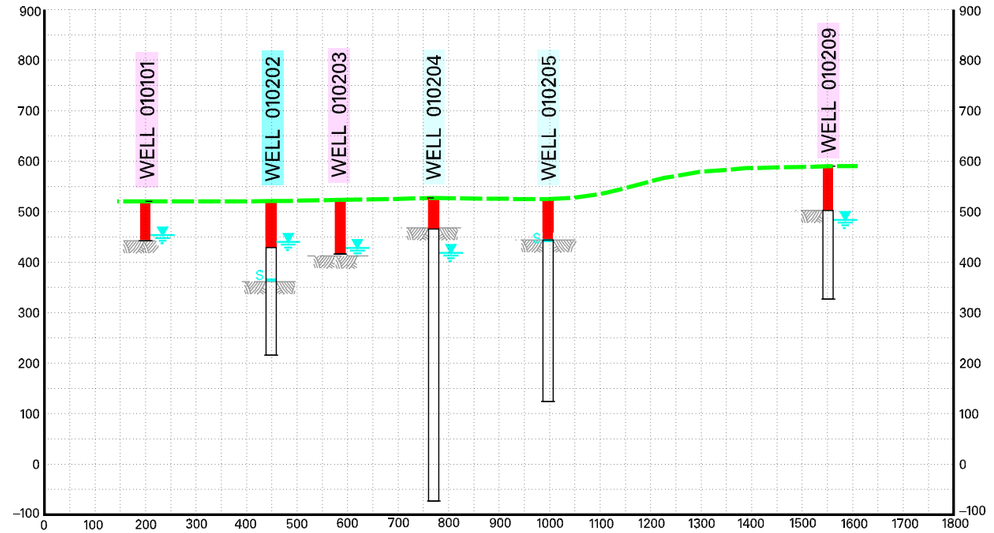
MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM – PHASE II

FIELD STUDY REPRESENTATION

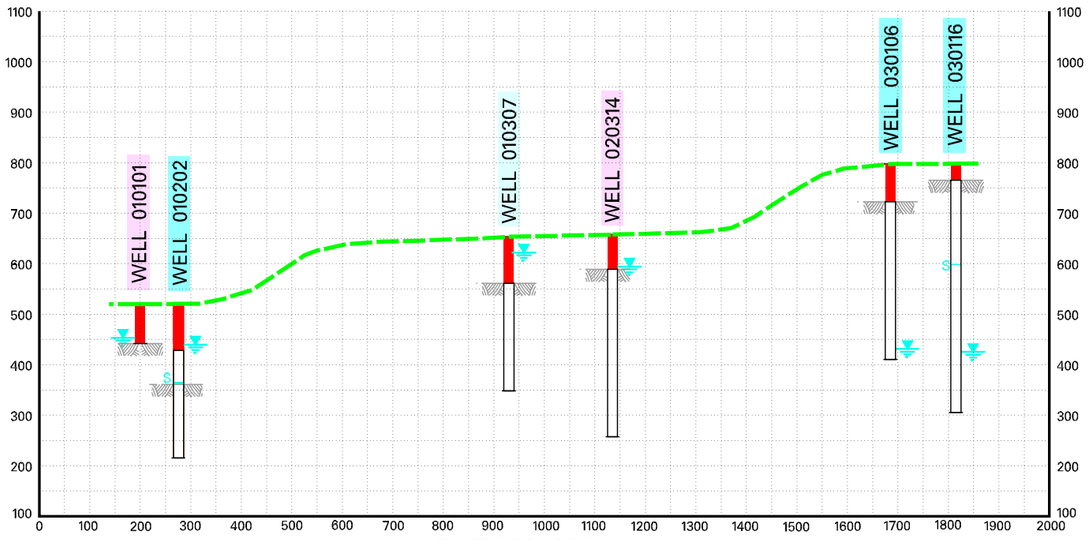
JOB No. 180.0000 TIME: 20-JUN-2000 16:38 FILE: S:\Cad\Proj\dnhs\aquifer\VNL\fig19.dgn



SECTION NO. 1



SECTION NO. 3



SECTION NO. 2

NOTES:

1. EXISTING GROUND SURFACE BETWEEN WELLS ASSUMED BASED ON INTERPOLATION BETWEEN WELL ELEVATIONS.
2. WELL LOCATIONS BASED ON USGS COORDINATES AND ELEVATIONS, EXCEPT FOR 010205, WHICH HAS ASSUMED COORDINATES.

LEGEND:

- STATIC WATER
- WELL CASING
- UNCASED WELL
- BEDROCK
- EXIST. GROUND
- S– SEEPAGE ELEV.
- P– PERFORATION ELEV.

NITRATE LEVEL IN mg / l

- < 1 mg / l
- 1–4
- 4–6
- >10
- NITRATE SAMPLE NOT TAKEN

MONTGOMERY WATSON

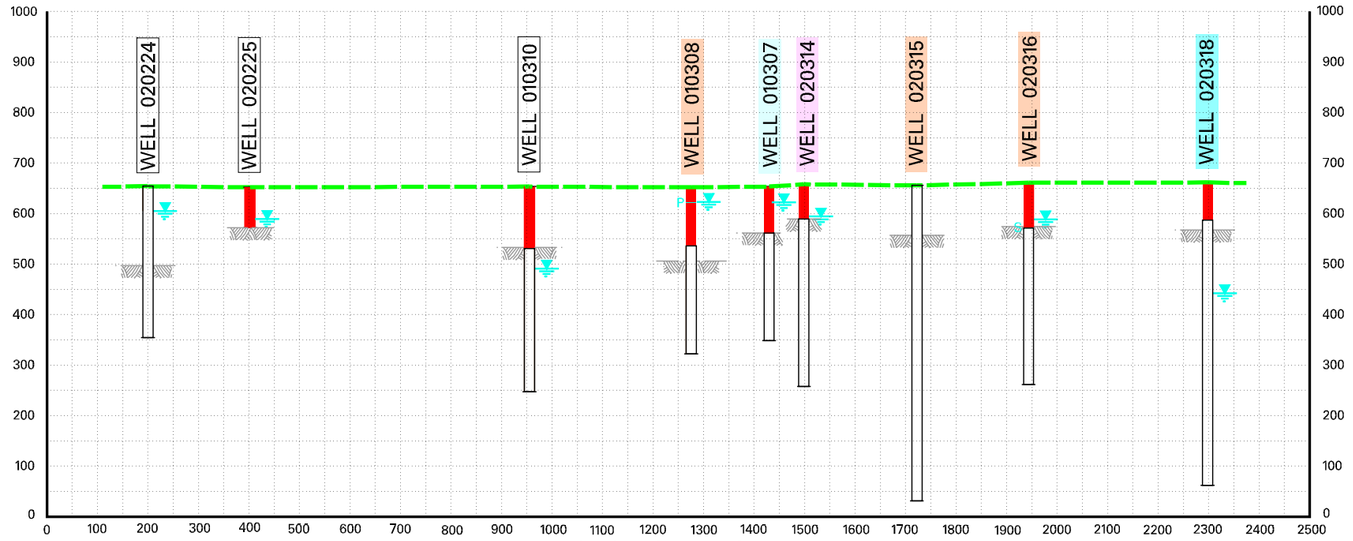
Anchorage, Alaska

FIGURE 20a

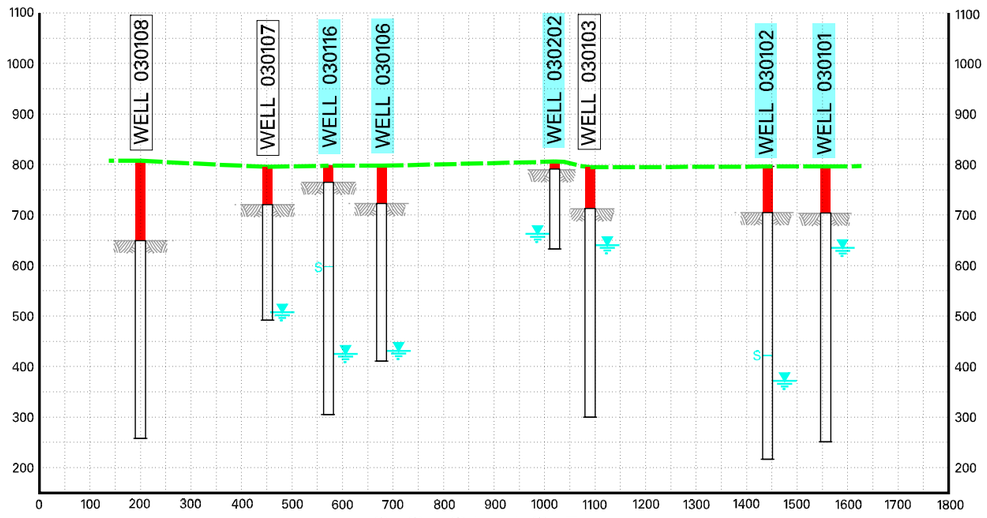
MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM – PHASE II

SCIMITAR STUDY AREA TRANSECT CROSS–SECTIONS

JOB No. .
TIME: 20-JUN-2000 16:40
FILE: s:\cad\proj\dnhs\aquifer\fnl\fig20a.dgn



SECTION NO. 4



SECTION NO. 5

NOTES:

1. EXISTING GROUND SURFACE BETWEEN WELLS ASSUMED BASED ON INTERPOLATION BETWEEN WELL ELEVATIONS.
2. WELL LOCATIONS BASED ON USGS COORDINATES AND ELEVATIONS, EXCEPT FOR 010205, WHICH HAS ASSUMED COORDINATES.

LEGEND:

- STATIC WATER
- WELL CASING
- UNCASED WELL
- BEDROCK
- EXIST. GROUND
- S– SEEPAGE ELEV.
- P– PERFORATION ELEV.

NITRATE LEVEL IN mg/l

- < 1 mg/l
- 1–4
- 4–6
- >10
- NITRATE SAMPLE NOT TAKEN

MONTGOMERY WATSON
Anchorage, Alaska

FIGURE 20b

MUNICIPALITY OF ANCHORAGE
1999 LOCAL WELLHEAD AND AQUIFER PROTECTION PROGRAM – PHASE II

SCIMITAR STUDY AREA TRANSECT CROSS–SECTIONS

JOB No. .
TIME: 20-JUN-2000 16:41
FILE: s:\cad\proj\dnhs\aquifer\fnl\fig20b.dgn

APPENDIX A

Nitrate Database Assumptions and Data Dictionary

Nitrate Database Assumptions

Several assumptions were prompted as a result of conflicting information and ambiguities. To eliminate duplicates and generally clean up the data, assumptions were made regarding the organization of provided information and the nitrate database.

1. DHHS data: Sample dates were not always provided for nitrate results. If the sample date was indicated or found in hardcopy, this was used. If the HAA Receive Date only was provided, this was used to generate a sample date year only, with no month.

2. Many properties have more than one well. It was not possible to tell which well generated a particular nitrate result, so all nitrate records were stored with the assumption that each parcel had just one well.

3. DHHS data: The March, 1999 well log search at DHHS within the Dearmoun and Scimitar study areas resulted in a number of new well records that were not found in the HAAC database. These records are marked as DateReceived = "3/1/1999" and incorporated into the database. If the well record existed in the DHHS database, its field was updated with data from the paper well log.

4. There are 53 parcels in the areawide NO3 database that did not exist in the CAMA database. These parcels were found in the HAAC database and stored in the nitrate database with their legal description in the HAAC database.

5. In HAAC database well logs, only month and year were often reported for well completion dates. In such cases, the date was entered as the first of the month.

6. GeoNorth initially created Northing and Easting coordinates and elevations for wells at the centerpoint of each parcel. This data was updated if actual values were found.

7. Well types (public, private, community) were often assumed based on the source of the data. ADEC data was easily distinguished between public and private. DHHS data was considered all private (PR), except those designated public (C) in the report. All other data was considered private except for data from CT&E Laboratory were given a well type based on how the well was listed in DHHS well logs.

8. Screening of DHHS database: The well log depth took precedence over HAAC well depth when a conflict was in evidence. The absorption soil rating was only presented if the HAA rating matched the as-built ratings. The nitrate levels and distances to absorption fields with zero values were omitted from the database. Due to unverifiable values, cells with a blank or zero value were not used when studying specific attributes of a well.

Montgomery Watson Nitrates Database Metadata

As of 12/17/99

No. of non-distinct NO3 records per source			
	1999FieldStudy	18	
	ADEC	2339	
	ADECMult	337	
	ADECPublic	1251	
	Bristol1997	49	
	CTE1999	185	
	DHHS1993	2833	
	DHHS1999A	4821	
	DHHS1999B	177	
	Minsch1999	3	
	Terrasat1997	18	
	Total	12031	

No. of non-distinct NO3 records per study area	Dearmoun	583	NO3 records exist for 159 distinct parcels
	Scimitar	677	NO3 records exist for 179 distinct parcels

No. of non-distinct NO3 records with date information	No sample date	611	
	Year only	6914	If sample year was unknown, this was filled in using HAAReceiveDate.
	Sample date known	4506	good for seasonal studies (see below)
	Total	12031	
	Jan - Mar	971	(monthly counts are non-distinct per parcel)
	Apr - Jun	1123	
	Jul - Sep	1121	
	Oct - Dec	1291	

No. of well log records			
	Total	5062	Most well data came from Scimitar & Dearmoun well log search
	Details:		
	Known well depth	294	
	Known bedrock depth	211	
	Known casing depth	4954	516 of these are depth=0 from DHHS database. These were not verified.
	Known static water level	437	
	Known yield, gpm	4824	Value of 0 indicates <.5 gpm.
	Terrain unit identified	146	Established for Dearmoun wells only.

No. of well log records per study area	For Dearmoun	316
	Scimitar	224

No. of Tax Parcel records				
	Parcels with CAMA legal description		78356	
	Parcels witth no CAMA legal. HAA description only.		50	There are 74 nitrates records for these parcels.
	With legal description	Total	78406	
	No legal description at all		1419	We have 73 nitrates records for undescribed parcels. These records were not used in any studies.
		Total	79825	

Appendix A: Nitrates Database Data Dictionary

Field	Data Format	Data Definition	Data Rules	Metadata
BedrockDepth	integer	Depth to bedrock when drilling well. (units=feet)		
CAMALegal1	char 30	Subdivision a property is in. Equivalent to the LEGAL1 field in the CAMA database.	Upper case.	
CAMALegal2	char 30	Block and Lot identification of a property, or the tract. Equivalent to the LEGAL2 field in the CAMA database.	Upper case.	
CAMALegal3	char 30	Additional legal description of a property, if needed. Equivalent to the LEGAL3 field in the CAMA database.	Upper case.	
CasingDepth	integer	Depth of well casing (units = feet).		
DateReceived	date mm/dd/yyyy	Date the well log was received.		For well logs found in DHHS paper files in March, 1999, this date is set at 3/1/99. These records did not exist in the DHHS database.
Elev_ft	Real number	Elevation (in feet) estimated for the center of a property.		
HAALegal	char 60	Legal description for a property maintained from the DHHS database in case CAMA did not have a legal description.	Upper case.	53 properties have this data from DHHS, but weren't found in CAMA.
HAAReceivedDate	date mm/dd/yyyy	From the DHHS HAA 1999 database only. Used to create NO3Year for a nitrate record if no sample date was provided in the DHHS database.		4507 DHHS1999 records have NO3Year generated from this date field.

Appendix A: Nitrates Database Data Dictionary

Field	Data Format	Data Definition	Data Rules	Metadata
NO3DataSource	char20	Source of nitrate measurement. Usually names an agency (ADEC, DHHS) or a person who has provided the data.	Mixed case. 1999FieldStudy = Data from MWA/USGS Scimitar field study, Aug. 1999 ADEC = Derived from ADEC grid map, early 1999 ADECMult = Derived from ADEC grid map, early 1999. Multiple no3 values for a property. ADECPublic = from April 1999 Public wells in ADEC database Bristol1997 = Bristol Environmental Report 1997 CTE1999 = CTE lab files collected by Montgomery Watson DHHS1993 = 1993 Nitrate Concentration Report from DHHS for mostly private wells. DHHS1999A = data provided by DHHS from their database in March, 1999. DHHS1999B = Data from DHHS paper file search, March - April 1999 Minsch1999 = data provided by Sharon Minsch Terrasat1997 = Terrasat Environmental Report March, 1997	Records that provided additional data to the DHHS database.
NO3MapRange	integer	A coded value representing a range of nitrate result, base on NO3Range or NO3Result. Used to create maps.	1 = 0 -1 mg/L NO3 3 = 1-3 mg/L 7 = 3-7 mg/L 10 = 7 - 10 mg/L 20 = >10 mg/L	
NO3Month	integer	Numeric month in which nitrate sample was taken.	1-12, representing Jan-Dec.	Filled in via SampleDate if known.
NO3Range	integer	Nitrate concentration in a sample as reported by ADEC.	100 = no data available 101 = < 1 mg/L 102 = 1-2 mg/L 103 = 2-3 mg/L etc 110 = 9-10 mg/L 111 = 10-20 mg/L 112 = 20-30 mg/L 113 = > 30 mg/L	Exists only for some ADEC data.
NO3Result	Real number	Nitrate concentration in a sample as reported by a data source. Units is mg/L.	0 = non-detect	

Appendix A: Nitrates Database Data Dictionary

Field	Data Format	Data Definition	Data Rules	Metadata
NO3Year	integer	Numeric year in which nitrate sample was taken.	4 digits to include century.	Might be filled in via SampleDate if available. Some data from ADEC reported only the year of the sample and no other date information. If DHHS sampledate not known, NO3Year is filled in with year of HAAReceiveDate (DHHS1999 data).
ParcelID	char 7	MOA-assigned numeric parcelid for a property.	Leading zero(s) required as placeholder where necessary.	Range is from 0102102 to 9808102.
SampleDate	date mm/dd/yyyy	Date that nitrate sample was taken, if known.		Usually not available for ADEC private well data.
SamplePoint	char 75	Property name and location where a nitrate sample was taken, specifying an exact source of water (such as 'kitchen sink') to distinguish between multiple water sources for a given property.	Mixed case.	Usually populated for ADEC Public wells only.
StudyArea	char 10	Flags a property to be included in a given study area for analysis and modeling.	Upper case. If populated, has values 'DEARMOUN' or 'SCIMITAR'.	
TerrainUnit	char 12	Geological description of terrain.	Bx = Bedrock C+G = Colluvial deposits and Glacial deposits predominant C+L = Colluvial deposits and Lacustrine deposits predominant Ff = Alluvial fan deposits FPG/Ff = Gravelly floodplain deposits over Alluvial fan deposits GF/Gt = Glaciofluvial deposits over Glacial till deposits GFl/Gt = Lowland glaciofluvial deposits over Glacial till deposits Gm = Glacial moraine deposits Gt = Glacial till deposits Gt/Bx = Glacial till deposits over Bedrock L = Lacustrine deposits L7/Gt = Lacustrine deposits over Glacial till deposits	Generated only for Dearmoun study area.
WellDataSource	char 20	Source of the well data.	1999FieldStudy = Data from MWA/USGS Scimitar field study, Aug. 1999 DHHS1999A = data provided by DHHS in Feb. 1999 and sometimes updated when verified by paper well logs. DHHS1999AB = data from DHHS database in Feb. 1999 and updated from DHHS paper files.	

Appendix A: Nitrates Database Data Dictionary

Field	Data Format	Data Definition	Data Rules	Metadata
			DHHS1999B = Data found only in DHHS paper file search March 1999 Minsch1999 = Sharon Minsch	If dates incomplete, assumed 1st day of the month.
WellDateCompleted	date mm/dd/yyyy	Date the well was completed.		In DHHS well logs, only month and year were often reported. In such cases, date is entered as first of the month.
WellDepth	integer	Total depth of drilled well (units = feet).		
WellLogStaticH2OLevel	integer	Static water level of the well.		
WellLogTestDate	date mm/dd/yyyy	Date the well was tested.		
WellLogYield	integer	Yield of the well (units = gallons/minute).		Many records from DHHS database report yield as 0, which seems unlikely. These records were verified for Scimitar.
WellStatus	char 2	Status of public water well.	A = active I = inactive	Exists only for ADECPublic data. Found in All_NO3 table now as we have no well log data for it.
WellSupply	char 2	Classification of well per the source of the nitrate or well log data.	(Code depends on source of data. See footnote.)	Some properties have conflicting wellsupply values between multiple nitrate records or between nitrate and well log data. Some CTE nitrate records were filled in with WellSupply based on DHHSFiles data, since this is a reliable source.
X_coord	Real number	X coordinate calculated for the center of a property.		Initially created by GeoNorth as centerpoint of parcel; altered where actual data is found
Y_coord	Real number	Y coordinate calculated at the center of a property.		Initially created by GeoNorth as centerpoint of parcel; altered where actual data is found

Footnote: WellSupply codes depending on DataSource

ADEC WellSupply Codes	A = Class A public water system B = Class B public water system C = Class C public water system PR = private, individual well U = Unlabeled (ADEC data; may be private wells)

Field	Data Format	Data Definition	Data Rules	Metadata
DHHS / HAA WellSupply Codes		1 = Community well 2 = Individual well 3 = Public well		

APPENDIX B

DeArmoun Database

DEFINITIONS AND ASSUMPTIONS FOR DEARMOUN DATABASE

The Dearmoun Database is comprised of data that describes the property and the well on the property. The Parcel Name, Parcel Block/Lot, and parcel ID describe where the lot is located. The depth of well and casing, distance to well absorption field, distance to septic, water yield, leach field sizing, soil absorption rating, depth to static water level, sum of bedrooms, depth to bedrock, and terrain units data further illustrates various well and property parameters.

All of the parameters provided were based on the Department of Health and Human Services database download in November 1998, with the exception of two; Sum of Bedrooms and Terrain Units. The description of each field is described below.

The following fields are defined as:

Dist. Well to Absorption Field – The Asbuilt distance of the well to the absorption field.

Distance Well to Septic – The Asbuilt distance of the well to the septic.

Soil Absorption Rating - A unit per lot that describes the septic field's ability to absorb liquid based on the square feet of home living area divided by the number of bedrooms present within the home, as per the Municipality database.

Terrain Units – A surficial geology classification developed for a terrain unit map for the Phase II - Hillside Drainage Study. Each unit represents the top +/- 20 feet of known surficial geology. The terrain units are defined as:

Terrain Unit	Description
L7/Gt	Lacustrine deposits underlain by glacial till
L	Lacustrine deposits
GM	Glacial moraine deposits
Gt	Glacial till deposits
Gt/Bx	Glacial till deposits underlain by bedrock
Gf/Gt	Glaciofluvial deposits underlain by glacial till deposits
Ff	Alluvial fan deposits
Fpg/Ff	Gravelly floodplain deposits overlain by alluvial fan deposits
C+L	Colluvial and lacustrine deposits
C+T	Colluvial and glacial deposits
Bx	Bedrock

Number of Bedrooms – The total number of bedrooms found on the lot. The Health Authority Approval (HAA) is a Municipal approval process required to sell all residential real estate with independent water and wastewater systems. The HAA uses the number of bedrooms on the lot to determine the required size of the septic leach field.

Sum of Bedrooms - A calculated value that represents the population density surrounding a specific lot. The first step in determining the sum of bedrooms required locating the centroid of each lot. All of the lots with centroids that encompassed a 1000 ft. range around the centroid of the lot in question were identified on the map. The number of bedrooms for each lot within the range was summed together, to create a grand total of bedrooms influencing the specific lot.

Where discrepancies or ambiguities existed between different fields within the DHHS database, the following assumptions were made:

a) Two fields, Health Authority Approval (HAA) and CT&E, each contained nitrate results (mg/L) within the database. If ever two conflicting values were indicated, the HAA nitrate value took precedence. All the nitrate values were received from the DHHS with "0" values in all cells without a reading of > 0.1 mg/L. Because these values could not be distinguished as '0 mg/L' from 'No data available', all the "0" values were left out of this database.

b) If well log records were available, the well depth and casing depth information was compared against the HAA well and casing depth values in the DHHS database. If the values were in conflict, the well log values took precedence. The HAA record for well depth and casing depth was left out of the database if a "0" value was recorded.

c) All the "0" values for the distance of well to the absorption field was left out of the database.

d) Soil absorption rating data was reported in the DHHS database by the HAA and Asbuilt Drawings. Soil rating data was left out of this database if HAA and Asbuilt information was in conflict.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Database

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Dist. Well to Absorption Field (ft.)	Distance Well to Septic (ft.)	Water Yield (gpm)	Leach Field Sizing (bdrm. count)	Soil Absorption Rating (sq. ft./bedroom)	Static Water Level (ft. bgs.)	Number of Bedrooms (bdrm. count)	Bedrock Depth (ft. bgs.)	Terrain Units
ALPENBLICK	LT 1A	01701404	3.4	48	48	100		6	3	227		3		Ff
ASPEN HIGHLANDS #1	BLK 1 LT 2	01701326	5.8	271		96	100	1.2	4	225		11		L7/Gt
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	1.4	175	173	100	82	6	3		140	12		L
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	1.1	150	150	110		6	3	330		17		L
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	1.4	195	194	100		5	3	441	150	11	193	L
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	5.6	215	214	100	124	8	4	125		12		L
ASPEN HIGHLANDS #1	BLK 1 LT 12	01701323	4.4	375		110	94	1.8	3		228	19		L7/Gt
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	1.2	450	58	118		1.5	3		70	3	58	Gm
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	7	120	110	120		7	2	170	59	2	108	Gm
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	4.5	343	167	100	100	2	5	159		2	167	Gm
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	6.8	348	348	97	100	2	3		192	9	191	L7/Gt
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	3.1	320	320	108	104	1.5	3		220	12	196	L7/Gt
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	5	300	300	100	100	2	3		236	9	237	L7/Gt
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	1.2	150	150	115		5	3	175		10		L
BONNIE VIEW	LT 1	01742210	2.9	412	90	104	107		3			8		Gm
BONNIE VIEW	LT 5	01742214	2	425	425	100		3	3	100		9		Gm
BONNIE VIEW	LT 14	01742223	0.8	142		128		1.5	4	225		7	16	Gm
BONNIE VIEW	LT 15	01742224	1.9	250	50	125		0.8	3	90	50	7		Gm
ENGLE	LT 1	01701350	6	140	32	100		2	3		30	3	32	Fpg/Ff
ENGLE	LT 2	01701348	0.1	400		100			4			3		Fpg/Ff
FORELAND VIEW	BLK 1 LT 1	01740140	1	260	74	100	100	2.5	4	228	60	4	72	C+L
FORELAND VIEW	BLK 1 LT 3	01740143	4.3	208	16	100	100	15	5		145	8	16	C+L
FORELAND VIEW	BLK 1 LT 5	01740146	2.5	172	54	125		4.5	3		75	11	10	Gt/Bx
FORELAND VIEW	BLK 1 LT 6	01740147	4.4	110	49	141		6	4	220		7	57	C+L
FORELAND VIEW	BLK 2 LT 1	01740148	5.7	205	37	100		4	4	125		7	37	Gt/Bx
FORELAND VIEW	BLK 3 LT 1	01740149	0.7	208		130	106		3			3		Gt/Bx
FROSTAD	LT 2	01742128	0.8	150	100	100	100	3	5	362	38	9	29	Gm
FROSTAD	LT 3	01742129	4.6	240	40	120	101	3	4		40	6	25	Gm
GARRETSON	LT 1	01743238	0.1	120	46	124	118	10	3			9		L7/Gt
GARRETSON	LT 3	01743240	0.1	50	39	100	100	5	4		27	8	34	L7/Gt
GARRETSON	LT 4	01743241	1.6	342		100	108	3	4	190	17	10	28	L7/Gt
GARRETSON	LT 5	01743242	5.8	180	180	120	101	4	3	165	40	11	32	L7/Gt
GARRETSON	LT 6	01743243	0.2	180	180	115	101	4	4		50	10	46	L7/Gt
GARRETSON	LT 7	01743244	0.1	255	255	93	120	3	3		45	7	48	L7/Gt
HAROLD MILLER	LT 2	01743246	0.1	397	38	120	102	15	3		170	7	38	Gm
KEMP	LT 2	01701392	3	400		100	103	1.9	3		270	3		Gm
LOFTY HEIGHTS	LT 1A1	01741134	5.7	107		95		1.8	3	143	18	13		Bx
MORINO	LT 2	01742125	0.1	490	46	100	101	3.5	3		20	5	32	Gm
MTN. PARK ESTATES #2	BLK 2 LT 4	01702204	4.2	140		149	104	0.9	4		64	15		L7/Gt
MTN. PARK ESTATES #2	BLK 2 LT 7	01702207	3.9	415	415	119		0.5	3	313		6	135	L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 1	01702213	6.4			85	101		3	200		14		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 3	01702215	3.2	225	225	103	101		3		175	15	66	L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 4	01702216	3.4	298	81	110	105	1.5	3	180	80	16	76	L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 7	01702219	0.8	410		105	112		4			13		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 10	01702222	3	240	239	100	101	5	3		190	9		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 12	01702224	0.8	251	250	120		8	3		200	10		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 13	01702225	0.6	245		100			4	125				L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 15	01702227	3.4	250	241	100		6	3	275	190	15	245	L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 16	01702228	3.7	240	239	105	100	3	3		200	15		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 17	01702229	6.1	272		125	105		4			17		L7/Gt
MTN. PARK ESTATES #2	BLK 3 LT 19	01702231	2	545	186						400		186	L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 2	01702302	0.6	360	360	100	100	2	4		105	10	59	
MTN. PARK ESTATES #2	BLK 4 LT 3	01702303	7.8	67	66	102		6	4	125	41	13		L7/Gt

Note:
1) Information based on DHHS files and electronic database download, March, 1999.
2) (ft. bgs.) is feet below ground surface.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Database

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Dist. Well to Absorption Field (ft.)	Distance Well to Septic (ft.)	Water Yield (gpm)	Leach Field Sizing (bdrm. count)	Soil Absorption Rating (sq. ft./bedroom)	Static Water Level (ft. bgs.)	Number of Bedrooms (bdrm. count)	Bedrock Depth (ft. bgs.)	Terrain Units
MTN. PARK ESTATES #2	BLK 4 LT 6	01702306	3.6	175	160	120		6	4	125		11		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 8	01702308	8.5	99	99	120		10	4	150		17		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 15	01702315	1.3	220	220	100		0.4	2	250	152	13		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 18	01702318	4.8	201	198	150		5	2	299	170	15		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 20	01702320	7.5	547		120		15			147	16		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 21	01702321	1.5	85	85	120		11	3		19	16		L7/Gt
MTN. PARK ESTATES #2	BLK 4 LT 24	01702324	1	230		100			3	300		11		L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 1	01702325	1	275		105	88		3	190		9		L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 2	01702326	6.8	175	84	100	105	4	4		68	8	84	L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 4	01702328	4.9	88	88	100	105	15	3		62	7		L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 6	01702330	5.4	78		100		13	3	150	167	12		L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 10	01702334	3.9	242	242	140	101	4.7	4			10		L7/Gt
MTN. PARK ESTATES #2	BLK 5 LT 11	01702335	1	252	251	100		8	3		32	10		L7/Gt
MTN. PARK ESTATES #2	BLK 6 LT 1	01743205	6.3	137	86	100		4	4		45	7	81	L7/Gt
MTN. PARK ESTATES #2	BLK 6 LT 3	01743203	1.2	100	67	142	106	7.5	4			16	60	L7/Gt
MTN. PARK ESTATES #2	BLK 6 LT 4	01743202	5.6	90	69	127		10	4	85		15		L7/Gt
MTN. PARK ESTATES #2	BLK 7 LT 3	01743213	0.1	155	48	125		3.5	4	150		18	48	L7/Gt
MTN. PARK ESTATES #2	BLK 7 LT 4	01743212	0.1	185	50	100			3	85		17	44	L7/Gt
MTN. PARK ESTATES #2	BLK 7 LT 7	01743209	0.1	350	68	125		0.4	3	125		18		L7/Gt
MTN. PARK ESTATES #2	BLK 7 LT 8	01743208	1	320	26	100	100	3	4	125	25	22	22	L7/Gt
MTN. PARK ESTATES #2	BLK 7 LT 9	01743207	0.4	150	60	130		3	4	150	32	20	58	L7/Gt
MTN. PARK ESTATES #2	BLK 8 LT 2	01743224	3	410	40	100		1.5	3	150		21		L7/Gt
MTN. PARK ESTATES #2	BLK 8 LT 7	01743219	1.6	215	41	140		4	4	300	39	20	41	L7/Gt
MTN. PARK ESTATES #2	BLK 8 LT 8	01743218	0.3	418	54	105		1.5	3	150	38	19	50	L7/Gt
MTN. PARK ESTATES #2	BLK 8 LT 9	01743217	1.2	379	58	100		1.5	4	125		16	50	L7/Gt
MTN. PARK ESTATES #2	BLK 8 LT 10	01743216	2.7	175	30	100		0.6	2	100		10		L7/Gt
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	7.9	120	20	175	120	12	3		100	24	16	Gt
MOUNTAIN SHADOWS	BLK 1 LT 10	01740108	0.2	268	25	100		0.5	3	150	15	16	18	C+L
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	5.3	139	10	110		5	3	85		16		Gt/Bx
NULUKATAK	LT 5	01701341	3.5	475	84	100		2	3	155		9		Gm
SPENDLOVE VW. HTS. #2	BLK 4 LT 1	01740126	3.2	115		128			3	180	71	12		C+G
SPENDLOVE VW. HTS. #2	BLK 4 LT 2	01740133	2.6			115			3	150		9		Gt/Bx
SPENDLOVE VW. HTS. #2	BLK 4 LT 3	01740132	2.8	134		115		5.7	3	165	57	6		Gt/Bx
SPENDLOVE VW. HTS. #2	BLK 4 LT 6	01740129	2.5			134	105		4			13		Gt/Bx
SPENDLOVE VW. HTS. #2	BLK 4 LT 7	01740128	3.2			102	102		2			7		C+L
SPENDLOVE VW. HTS. #2	BLK 5 LT 1	01740152	1.8	165	31	100		4	3	180		9	16	Gt/Bx
SPENDLOVE VW. HTS. #2	BLK 5 LT 2	01740153	0.1	160	35	105			3	155		6	27	Gt/Bx
STELIOES	LT 4	01742235	2.9	430	26	108	131		4		80	1	16	Gm
STELIOES	TR A	01742230	3.5	207		160			2	230		4		Gm
STEVAHN	BLK 1 LT 1A	01742208	0.2	320	26	100	96	3	3		25	6	22	Gm
STEVAHN	BLK 1 LT 2A	01742209	2.1	49	21	100		10	3	180	15	13	19	Gm
STRUEMPLER	LT 2	01742115	0.3	225	29	100		1	5		8	9	22	Gt/Bx
SUN SHINE ACRES	LT 1	01740135	0.4	250	22	114		2	4	110	120	3	22	Gt/Bx
T12N R3W SEC 25	E2NE4NW4NW4NW4	01742110	5.5	63	63	103	101		3			10		
T12N R3W SEC 25	E2SW4SW4NE4	01740104	1.2	476	60	221		1	4		51	5	44	
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	4.2	750	21	100		1	4	250	100	8	16	
T12N R3W SEC 25	SW4 SE4 NW4 NW4	01742120	2.6	125	33	100		1	5	150		5		
T12N R3W SEC 25	W2NE4NW4NW4NW4	01742107	0.1	275	12	125	110	3	4		75	7	2	
TALISMAN HEIGHTS	LT 2	01701389	1.5	200		110		2	3	150	20	6	40	Gm
TALISMAN HEIGHTS	LT 3	01701388	1.7	424	40	100		1	4	100	160	6	24	Gm
TOILSOME HILL	LT 1	01741120	3.7	120		82			3	125		6		Bx
WALLNER	LT 3	01742104	4	221	22	100		2	4		25	6	17	Gm

Note:
1) Information based on DHHS files and electronic database download, March, 1999.
2) (ft. bgs.) is feet below ground surface.

APPENDIX C

DeArmoun Modified Database

ASSUMPTIONS FOR DEARMOUN MODIFIED DATABASE

Wells in the database include all well logs found at DNR and DHHS databases. It further includes parcels that have a nitrate value but no well log for purposes of obtaining a northing, easting and elevations for these parcels.

1) Well Data

Well data indicated x,y,z coordinates, well construction date, depth of well and casing, depth to bedrock, aquifer type and gpm at the time the well was constructed.

X,Y,Z coordinates were listed as the centroid of the lot, unless there was other information that would make the determination more accurate. Elevations came from the centroid in Geonorth's database – for Scimitar study areas, most of the elevations came from aerial topographic interpretation.

Aquifer Type were numerical numbers that correspond to the interpreted main aquifer a well is obtaining water from, based on existing well log data. These numbers correspond as follows in the lithologic data section.

Where more than one well was located on a lot the following was performed:

a) if the wells had similar lithologies, they were assumed to be one well and the youngest well was used to correspond to any nitrate data for the lot.

b) If the wells were far apart and not similar in lithology, or had different nitrate values associated with them, they were kept separate and the parcel ID's were given a "A" or "B" for either well with different coordinates. These coordinates came from better information that showed where each well was on a lot.

c) If the wells were close together and not of similar lithology, the youngest well was used if the older wells had no nitrate values associated with them.

Lithologic Data

Lithologic data indicated all pertinent lithologic information and any aquifers that were encountered. Aquifers were listed if they were noted – dampness did not constitute an aquifer. "Heavy weeping", "seepage", "wet", "w", were all noted as an aquifer, as well as perforation distances.

Lithology was interpreted as:

1) Fractured Bedrock
2) Gravel
3) Gravel and sand
4) Gravel, sand and silt (also till, hardpan, clayey gravel, silty gravel)
5) Sandy

6) Sandy-silty
7) Silty
8) Clayey

Notations of perforations were too inconsistent to be of any use and were dropped from consideration.

Nitrate Data

Nitrate data were all available nitrate data, with sample date, and nitrate value. A range value was used in subsequent approaches to analyzing the data. The range values were:

1) <1.0 to ≥ 0 mg/L
2) ≥ 1.0 to ≤ 2.9 mg/L
3) ≥ 3.0 to ≤ 5.9 mg/L
4) ≥ 6.0 to ≤ 9.9 mg/L
5) ≥ 10 mg/L

Samples where nitrate was analyzed but not detected were given values of zero.

Septic Type is a numerical number that corresponds to the type of septic system a parcel has. "1" is designated as a holding tank and "2" is designated as a leach field system.

OTHER ASSUMPTIONS

1) Well logs not inputted into this database had inconsistencies in their notation of location, PID number, or lithologic descriptions. Other wells were simply replaced by newer wells, whose logs were inputted into the final database. The well database is composed of the best combination of wells that is thought to be representative of the geologic conditions under the two study areas.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01701318	2594921	546051	969.0	Sep-73	175	173	140	4		6
01701319	2594921	545891	961.9	Oct-84	150	150	128	3		6
01701320	2594920	545728	956.0	Feb-82	195	194	150	3	193	5
01701321	2595078	545770	969.2	Feb-82	215	214	180	2		8
01701322	2595229	545768	973.9							
01701323	2595378	545767	977.7	May-72	375		228			1.8
01701326	2595665	545917	995.7	Jan-70	271		60			1.2
01701327	2595494	545958	995.9	Dec-85	247	191	189	1	188	4
01701328	2595332	546012	992.5				230			
01701333	2596008	545744	1005.1	Mar-74	450	58	70	1	58	1.5
01701334	2595230	546093	990.7							
01701337	2595392	546572	1041.7	Jan-97	345	167	159	1	167	2
01701341	2595649	546972	1070.8	Jun-71	475	84	79	4		0.8
01701342	2595649	547098	1086.2	Jun-80	310	77	13	1	68	1
01701343	2595649	547224	1090.9	Jun-70	185		18	1	42	5.8
01701348	2595026	547974	1062.8							
01701349	2595026	548123	1070.2	Sep-83	204			1	85	1
01701350	2595322	548046	1085.1	Jan-83	140	32	30	1	32	2
01701373	2594928	546559	989.5	Feb-82	196	196	141	3		4.5
01701374	2594928	546420	982.3	Aug-83	200	191	140	3		6
01701375	2594928	546269	976.2	Oct-81	150	150	150	3		4.3
01701376	2595115	546286	993.2	Oct-79	300	300	236	1	237	2
01701377	2595113	546443	1003.5	Aug-76	180		130	3		4
01701378	2595120	546629	1006.0	Sep-82	320	320	220	1	196	1.5
01701379	2595193	546773	1021.2	May-79	348	348	192	1	191	2
01701380	2595356	546816	1037.7	Feb-81	190		158	1	162	6
01701381	2595618	546793	1060.4	May-79	198	121	110	1	118	1.5
01701382	2595788	546740	1094.4							
01701384	2595960	546584	1097.8	Mar-79	105		29	1	45	3.5
01701388	2595949	547319	1147.8	Sep-82	424	40	160	1	24	1
01701389	2595949	547156	1136.1	Jun-78	200		20	1	40	2
01701390	2595949	546990	1127.4	Aug-96	324	25	37	1	25	3
01701391	2595951	547697	1162.6							
01701392	2595951	547897	1162.2		400		270			1.9
01701395	2595470	546271	1025.1							
01701396	2595550	546497	1044.1	Sep-86	120	110	59	1	108	7
01701397	2595705	546345	1038.2							
01701401	2594989	546994	1012.0							
01701403	2594988	547389	1040.1		57	57		2		6.5
01701404	2595369	547381	1058.9	Jul-83	48	48	12	2		6

Note:
1) Well Log information from DNR and DHHS database and file search, Spring, 1999.
2) Coordinates and elevations are from centroid of parcels, based on interpolations from GeoNorth, Inc.
3) (ft. bgs.) is feet below ground surface.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01701405	2595219	547381	1051.3							
01702201	2596122	545433	982.5							
01702202	2596012	545434	978.9	Jul-80	405	385	136	1		1
01702203	2595902	545435	977.6	Aug-75		225	185	3	130	
01702204	2595792	545435	973.2		140		64			0.9
01702205	2595679	545193	969.0							
01702206	2595571	545436	961.8	Jul-82	200	183	103	1	130	
01702207	2595462	545437	959.9	Feb-87	530	135	265	1	135	0.33
01702208	2595352	545437	958.7	Jun-85	410	40	80	1	38	1.5
01702209	2595241	545438	955.7	Nov-76	290	290	255	4		5
01702211	2595022	545439	952.7	May-80	225	225	185	3		6
01702212	2594911	545439	952.0	Aug-77	225	221	180	3		10
01702214	2596011	545174	958.0	Apr-96	325	325	285	1	93	1
01702213	2596124	545156	962.0							
01702215	2595902	545175	956.2	Aug-75	225	225	175	1	66	
01702216	2595791	545175	953.2	Jul-78	298	81	80	1	76	1.5
01702217	2595680	545176	952.7	Aug-78	305	135	130	2	131	
01702218	2595569	545177	951.8	Oct-78	340	152	250	1	240	2
01702219	2595471	545168	949.5							
01702220	2595352	545178	948.8	Aug-82	280		200	1	180	2.5
01702222	2595131	545179	951.9	Nov-79	240	239	190	3		5
01702223	2595013	545155	950.0							
01702224	2594910	545181	949.3	Oct-76	251	250	200	3		8
01702226	2595020	544997	942.2	Jul-78	200	200	183	3		7
01702227	2595130	544996	941.7	Sep-76	250	241	190	2	245	6
01702228	2595240	544995	940.5	Oct-76	240	239	200	3		3
01702229	2595346	544992	940.0							
01702230	2595465	544998	936.0							
01702231	2595568	544993	933.2	Nov-78	545	186	400	1	186	4
01702232	2595679	544986	933.0							
01702234	2595901	544991	937.2	Aug-81	300	82		1	76	1
01702236	2596120	544990	945.1	Apr-81	158	61	54	1	65	1.5
01702301	2596119	544747	924.0	Jul-77	360	360	105	1	56	
01702302	2596009	544748	918.6	Feb-85	360	360	105	1	59	2
01702303	2595899	544748	919.3	Dec-78	65	66	41	2		6
01702304	2595789	544749	920.4	May-78	62	57	45	1	54	2.5
01702305	2595678	544750	919.3	Aug-78	140	135	109	3		6.5
01702306	2595568	544750	919.6	Jun-78	175	160		2		6
01702307	2595458	544751	923.5	Sep-79	260	247	194	1	245	5
01702308	2595348	544751	926.0	Dec-77	99	99	67	3		10

Note:
1) Well Log information from DNR and DHHS database and file search, Spring, 1999.
2) Coordinates and elevations are from centroid of parcels, based on interpolations from GeoNorth, Inc.
3) (ft. bgs.) is feet below ground surface.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01702309	2595238	544752	926.8	Dec-77	98	98	58	3		10
01702310	2595133	544741	926.8							
01702313	2594906	544570	912.7				166			3.5
01702314	2595016	544570	910.5			200	183	3		
01702315	2595127	544569	909.9		225	225	152	3		0.45
01702318	2595457	544567	907.1	Jul-82	201	198	170	3		5
01702319	2595566	544567	909.9	Aug-78	83	83	67	2		12
01702320	2595677	544566	910.3	Aug-78	547		147	1		
01702321	2595787	544566	911.3	Sep-78	85	85	**19**	2		11
01702322	2595898	544565	911.1	Jul-83	400	121		1	115	0.25
01702323	2596007	544564	909.9	Feb-79	220	100	105	1	95	2
01702324	2596117	544564	910.4				62			3
01702325	2596118	544320	930.0							
01702326	2596005	544321	900.9			84	20	1	84	
01702328	2595786	544322	898.5	Jun-84	88	88	68	2		15
01702329	2595675	544322	896.0	Oct-76	84	84	68	2		6.1
01702330	2595566	544323	891.1	Jul-81	78		62	3		13
01702331	2595456	544324	893.1	May-81	72		60	2		15
01702333	2595236	544325	895.2	May-81	215	86	60	3	195	
01702334	2595125	544325	893.4	Oct-78	242	242	167	3		5
01702335	2595015	544326	891.2	Jul-81	252	251	170	1	248	8
01702336	2594905	544327	890.0	Nov-84	72	72	58	3		6
01740104	2595146	548723	1115.4	Oct-93	476	60	51	1	44	1
01740107	2595584	548660	1141.3	Jul-83	243	26	31	1	21	0.5
01740108	2595584	548503	1134.2	Jul-83	268	25	15	1	18	0.5
01740109	2595583	548338	1128.7	Jul-83	304	20	23	1	15	2.5
01740110	2595733	548421	1146.4	Oct-80	120	20	100	1	16	12
01740111	2595877	548347	1174.4	Oct-78	110	36	35	1	36	5
01740112	2596025	548348	1192.4	Oct-94	330	12	30	1	2	0.8
01740114	2595885	548555	1200.8							
01740115	2595786	548601	1190.4	Jun-76	88	19	40	1	14	4
01740116	2595725	548706	1190.4	May-72	165		41	1	40	5.6
01740117	2595867	548904	1250.0							
01740122	2595000	550794	1277.1	Dec-81	200	200	25	1	21	5
01740124	2594998	550460	1244.4	Jul-78	240	60	50	1	52	2
01740125	2594998	550295	1228.7	Aug-83	137		18	1	76	3.1
01740126	2594997	550130	1212.8		115		71			5
01740128	2594928	549731	1160.6							
01740129	2595045	549730	1185.8							
01740130	2595228	549715	1213.4	Dec-75	101	74	10	1	71	4

Note:
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3) (ft. bgs.) is feet below ground surface.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01740132	2595296	549973	1252.5		134		57			5.7
01740133	2595297	550120	1269.8							
01740135	2595821	549712	1378.1	May-82	250	22	120	1	22	2
01740136	2595823	550042	1414.2	Jul-93	530		45	1	16	4
01740137	2595824	550373	1436.2	Aug-81	350		50	1	17	2
01740138	2595826	550705	1474.4	Jun-85	465		38	1	18	3
01740140	2594978	549405	1150.6	Mar-91	260	74	60	3	72	2.5
01740141	2595031	549165	1134.9							
01740143	2595115	549023	1135.9	Jan-92	208	16	145	1	16	15
01740144	2595385	549003	1153.0	Nov-84	140		45	1	79	5
01740146	2595516	549102	1192.5	Mar-85	172	54	75	1	10	4.5
01740147	2595277	549307	1168.3	Jun-83	110	49	40	3	57	6
01740148	2595302	549491	1212.0	Jun-83	205		25	1	37	4
01740149	2595658	549372	1285.6							
01740152	2595298	550293	1290.6	Sep-83	165	31	8	1	16	4
01740153	2595299	550458	1305.9	Sep-83	160	35		1	27	3
01741107	2596217	549065	1382.5	04-Jun-75	275	12	75	1	2	3
01741108	2596382	549064	1395.4	03-May-76	125		71	1	17	5
01741109	2596631	549063	1403.1				20.5			0.8
01741110	2596879	548991	1373.6							
01741111	2597043	548979	1356.0							
01741112	2597275	548970	1330.8	Jul-72	135	20		1	10	0.3
01741114	2597178	549136	1380.2							
01741115	2596946	549137	1421.1							
01741119	2596935	549439	1549.7	Jun-84	186	12	40	1	6	3.5
01741120	2596962	549376	1479.1							
01741122	2597276	549458	1449.7	May-95	209	24	26	1	9	6
01741127	2596765	549881	1665.0		202				7	
01741132	2597298	549972	1562.1						7	
01741134	2597295	549293	1397.2	May-89	107		18	1		1.8
01742104	2597018	545777	1032.8	Aug-75	221	22	25	1	17	2
01742107	2597284	545997	1051.6	May-71	250		44			0.8
01742110	2597285	546162	1069.3							
01742115	2597204	546724	1158.2	Oct-77	175	26	20	1	17	2
01742120	2596296	546410	1115.2							
01742125	2596544	546726	1172.4	Sep-79	490	46	20	1	32	3.5
01742126	2596709	546726	1172.1	Jul-86	265		120	1	24	1.5
01742127	2596616	545763	1026.4	Aug-94	500	20	100	1	10	2.8
01742128	2596628	545833	1019.0	Jul-72	500	32	38	2	29	3
01742129	2596624	546140	1086.0	Aug-92	240	40	40	1	25	3

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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01742131	2596545	546399	1120.0	Oct-90	266	21	35	1	14	2.5
01742205	2597339	547070	1183.8	Jul-79	750	21	100	1	16	1
01742208	2597341	547955	1244.0	Jul-78	320	26	25	1	22	3
01742209	2597216	547955	1246.1	May-81	49	21	15	1	19	10
01742210	2597041	548027	1241.6							
01742211	2596937	548027	1240.6	Sep-83	180	180	20	1	18	
01742212	2596834	548027	1237.5							
01742214	2596627	548028	1230.2	Apr-76	425	425	18	1	19	3
01742215	2596523	548028	1219.6	Sep-82	225	29	8	1	22	1
01742216	2596420	548028	1212.3	Jun-84	440			1	12	0.5
01742223	2596685	547698	1237.5	Jul-82	142			1	16	1.5
01742224	2596803	547698	1244.0	Jun-87	250	50	74			0.8
01742227	2597192	548120	926.0	20-Sep-84	255	255		1	34	5.5
01742230	2596627	547085	1203.1							
01742232	2596310	547003	1180.3	Oct-80	348	360	8	1	24	
01742233	2596310	547153	1177.4	Jun-83	225	225	25	1	19	
01742235	2596341	547453	1208.8	Aug-91	430	26	80	1	16	
01743201	2596283	544320	901.4	May-82	98	72	59	1	71	10
01743202	2596387	544320	901.0	Apr-82	90	69	58	1	68	10
01743203	2596492	544319	900.8	May-82	100	67	45	1	60	7.5
01743204	2596595	544319	902.4	May-82	104	62	49	1	58	7.5
01743205	2596699	544318	904.2	Jun-82	137	86	32	1	81	4
01743206	2596700	544562	921.0	Sep-78	170		35	2	61	4
01743207	2596597	544562	921.8	Sep-78	150	60	32	1	58	3
01743208	2596493	544562	918.2	Sep-78	184		112			5
01743210	2596285	544563	915.3	Jun-81	160	160	50	1	67	4
01743211	2596287	544746	927.7							
01743212	2596390	544746	930.9	May-83	185	185	35	1	44	3
01743213	2596494	544745	934.4	Jun-78	128	48	52	1	48	3.5
01743214	2596598	544745	935.5	Jul-78	140	80	110	1	46	5
01743215	2596701	544744	937.1	Aug-79	358	205	150	1	200	2
01743216	2596703	544988	952.1	Oct-75	175	30	33	1	30	0.6
01743217	2596600	544989	952.2	Oct-77	379	58	32	1	50	1.5
01743218	2596495	544989	954.2	Oct-77	418	54	38	1	50	1.5
01743219	2596392	544989	950.2	Jun-78	215	41	39	1	41	4
01743220	2596287	544990	948.2	Feb-76	273	44	30	1	38	2
01743221	2596288	545173	962.6	Jul-81	400	400	200	1	210	1
01743222	2596393	545173	969.9							
01743223	2596496	545172	976.2	Jul-81	400	400	63			1
01743224	2596601	545172	973.0	Jun-85	410	40	38			1.5

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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Well Log Data

Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
01743230	2596290	545433	982.3							
01743238	2597264	544842	942.3							
01743239	2597265	545007	952.6							
01743240	2597265	545173	960.0	Oct-86	50	39	27	1	34	5
01743241	2596968	545175	960.0	May-81	342		17	1	28	30
01743242	2596967	545009	953.0	May-81	180	180	40	1	32	4
01743243	2596966	544844	940.8	Aug-81	180	180	50	1	46	4
01743244	2596965	544694	929.7	Apr-81	255	255	45	1	48	3
01743246	2597036	545397	999.1	Jul-96	397	38	170	1	38	15

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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
ALPENBLICK	LT 1A	01701404	0	25	3	
ALPENBLICK	LT 1A	01701404	25	30	4	4
ALPENBLICK	LT 1A	01701404	30	35	2	
ALPENBLICK	LT 1A	01701404	35	38	7	
ALPENBLICK	LT 1A	01701404	38	40	2	
ALPENBLICK	LT 1A	01701404	40	46	7	
ALPENBLICK	LT 1A	01701404	46	47	2	
ALPENBLICK	LT 1A	01701404	47	48	2	2
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	0	57	4	
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	57	61	2	
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	61	107	4	
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	107	120	4	4
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	120	172	4	
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	172	188	4	4
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	188	191	1	1
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	191	247	1	
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	0	30	4	
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	30	42	3	
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	42	170	4	
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	170	175	4	4
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	0	41	4	
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	41	72	8	
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	72	74	5	5
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	74	146	4	
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	146	148	5	
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	148	150	3	3
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	0	55	2	
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	55	70	4	
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	70	110	2	
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	110	113	3	3
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	113	155	2	
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	155	165	2	2
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	165	192	2	
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	192	193	3	3
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	193	195	1	
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	0	102	4	
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	102	106	2	2
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	106	210	4	
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	210	215	2	2
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	0	58	4	
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	58	180	1	
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	180	190	1	1
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	190	300	1	
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	300	310	1	1
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	310	350	1	
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	0	72	4	
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	72	79	3	3
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	79	83	4	
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	83	85	4	4
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	85	108	4	
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	108	118	1	1
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	118	120	1	
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	0	128	4	
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	128	136	7	
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	136	167	4	
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	167	345	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 2	01701384	0	45	4	
ASPEN HIGHLANDS #3	BLK 3 LT 2	01701384	45	105	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	0	61	4	
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	61	63	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	63	78	4	
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	78	79	8	
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	79	118	4	
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	118	200	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	0	76	4	
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	76	129	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	129	140	4	
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	140	146	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	146	162	4	

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	162	175	1	
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	175	190	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	0	39	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	39	40	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	40	98	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	98	100	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	100	119	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	119	120	3	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	120	145	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	145	172	3	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	172	175	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	175	181	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	181	187	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	187	191	4	
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	191	348	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	0	196	4	
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	196	295	1	
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	295	300	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	0	78	4	
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	78	79	5	5
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	79	111	4	
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	111	113	5	5
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	113	126	4	
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	126	128	5	5
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	128	160	4	
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	160	162	5	5
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	162	168	4	
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	168	172	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	172	180	4	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	0	22	4	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	22	24	5	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	24	75	4	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	75	77	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	77	85	3	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	85	98	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	98	104	3	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	104	116	4	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	116	121	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	121	237	4	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	237	263	1	
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	263	300	1	1
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	0	55	8	
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	55	95	3	
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	95	135	4	
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	135	150	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	0	17	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	17	29	6	6
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	29	87	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	87	102	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	102	120	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	120	125	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	125	127	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	127	128	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	128	138	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	138	141	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	141	175	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	175	182	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	182	189	4	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	189	191	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	191	197	2	
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	197	200	3	3
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	0	20	4	
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	20	30	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	30	96	4	
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	96	108	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	108	129	4	
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	129	132	4	4
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	132	156	4	
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	156	185	4	4

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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	185	189	4	
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	189	196	4	4
BONNIE VIEW	LT 2	01742211	0	18	4	
BONNIE VIEW	LT 2	01742211	18	180	1	1
BONNIE VIEW	LT 5	01742214	0	19	4	
BONNIE VIEW	LT 5	01742214	19	425	1	1
BONNIE VIEW	LT 6	01742215	0	20	4	
BONNIE VIEW	LT 6	01742215	20	21.5	3	
BONNIE VIEW	LT 6	01742215	21.5	227	1	1
BONNIE VIEW	LT 7	01742216	0	12	4	
BONNIE VIEW	LT 7	01742216	14	440	1	1
BONNIE VIEW	LT 14	01742223	0	16	4	
BONNIE VIEW	LT 14	01742223	16	95	1	
BONNIE VIEW	LT 14	01742223	95	142	1	1
ENGLE	LT 1	01701350	0	32	4	
ENGLE	LT 1	01701350	32	140	1	1
ENGLE	LT 3	01701349	0	30	4	
ENGLE	LT 3	01701349	30	41	3	3
ENGLE	LT 3	01701349	41	70	2	
ENGLE	LT 3	01701349	70	83	4	
ENGLE	LT 3	01701349	83	85	7	7
ENGLE	LT 3	01701349	85	204	1	1
FORELAND VIEW	BLK 1 LT 1	01740140	0	56	4	
FORELAND VIEW	BLK 1 LT 1	01740140	56	61	3	3
FORELAND VIEW	BLK 1 LT 1	01740140	61	72	4	
FORELAND VIEW	BLK 1 LT 1	01740140	72	260	1	1
FORELAND VIEW	BLK 1 LT 3	01740143	0	16	4	
FORELAND VIEW	BLK 1 LT 3	01740143	16	208	1	1
FORELAND VIEW	BLK 1 LT 4	01740144	0	79	4	
FORELAND VIEW	BLK 1 LT 4	01740144	79	140	1	1
FORELAND VIEW	BLK 1 LT 5	01740146	0	10	4	
FORELAND VIEW	BLK 1 LT 5	01740146	10	170	1	1
FORELAND VIEW	BLK 1 LT 6	01740147	0	45	3	
FORELAND VIEW	BLK 1 LT 6	01740147	45	57	3	3
FORELAND VIEW	BLK 1 LT 6	01740147	57	109	1	
FORELAND VIEW	BLK 1 LT 6	01740147	109	110	1	1
FORELAND VIEW	BLK 2 LT 1	01740148	0	19	4	
FORELAND VIEW	BLK 2 LT 1	01740148	19	37	2	
FORELAND VIEW	BLK 2 LT 1	01740148	37	185	1	
FORELAND VIEW	BLK 2 LT 1	01740148	185	205	1	1
FROSTAD	LT 1	01742127	0	10	4	
FROSTAD	LT 1	01742127	10	500	1	1
FROSTAD	LT 2	01742128	0	29	4	
FROSTAD	LT 2	01742128	29	60	1	
FROSTAD	LT 2	01742128	60	75	1	1
FROSTAD	LT 2	01742128	75	206	1	
FROSTAD	LT 2	01742128	206	225	1	1
FROSTAD	LT 2	01742128	225	278	1	
FROSTAD	LT 2	01742128	278	279	1	1
FROSTAD	LT 2	01742128	279	415	1	
FROSTAD	LT 2	01742128	415	425	1	1
FROSTAD	LT 2	01742128	425	458	1	
FROSTAD	LT 2	01742128	458	459	1	1
FROSTAD	LT 2	01742128	459	500	1	
FROSTAD	LT 3	01742129	0	25	4	
FROSTAD	LT 3	01742129	25	40	1	1
FROSTAD	LT 3	01742129	40	180	1	
FROSTAD	LT 3	01742129	180	240	1	1
GARRETSON	LT 3	01743240	0	28	4	
GARRETSON	LT 3	01743240	28	34	3	3
GARRETSON	LT 3	01743240	34	50	1	1
GARRETSON	LT 4	01743241	0	28	4	
GARRETSON	LT 4	01743241	133	234	1	
GARRETSON	LT 4	01743241	234	241	1	1
GARRETSON	LT 4	01743241	241	320	1	
GARRETSON	LT 4	01743241	320	342	1	1
GARRETSON	LT 5	01743242	0	32	4	
GARRETSON	LT 5	01743242	32	167	1	
GARRETSON	LT 5	01743242	167	174	1	1

Note:
1) Lithologic Interpretations from DNR and DHHS database and file well logs - March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
GARRETSON	LT 5	01743242	174	180	1	
GARRETSON	LT 6	01743243	0	19	4	
GARRETSON	LT 6	01743243	19	46	3	
GARRETSON	LT 6	01743243	46	167	1	
GARRETSON	LT 6	01743243	167	174	1	1
GARRETSON	LT 6	01743243	174	180	1	
GARRETSON	LT 7	01743244	0	48	4	
GARRETSON	LT 7	01743244	48	185	1	
GARRETSON	LT 7	01743244	185	188	1	1
GARRETSON	LT 7	01743244	188	220	1	
GARRETSON	LT 7	01743244	220	223	1	1
GARRETSON	LT 7	01743244	223	247	1	
GARRETSON	LT 7	01743244	247	253	1	1
GARRETSON	LT 7	01743244	253	255	1	
GOMBART	LT 1	01740125	0	76	4	
GOMBART	LT 1	01740125	76	137	1	1
GOMBART	LT 2	01740124	0	52	4	
GOMBART	LT 2	01740124	52	240	1	1
GOMBART	LT 3 and 4	01740122	0	21	4	
GOMBART	LT 3 and 4	01740122	21	185	1	
GOMBART	LT 3 and 4	01740122	185	200	1	1
HAROLD MILLER	LT 2	01743246	0	22	4	
HAROLD MILLER	LT 2	01743246	22	38	3	
HAROLD MILLER	LT 2	01743246	38	74	1	1
HAROLD MILLER	LT 2	01743246	74	269	1	
HAROLD MILLER	LT 2	01743246	269	397	1	1
LOFTY HEIGHTS	LT 1A1	01741134	0	10	4	
LOFTY HEIGHTS	LT 1A1	01741134	10	107	1	1
LOFTY HEIGHTS	LT 2A	01741122	0	7	4	
LOFTY HEIGHTS	LT 2A	01741122	7	209	1	1
MORINO	LT 1	01742126	0	8	3	
MORINO	LT 1	01742126	8	24	7	
MORINO	LT 1	01742126	24	125	1	
MORINO	LT 1	01742126	125	130	1	1
MORINO	LT 1	01742126	130	235	1	
MORINO	LT 1	01742126	235	241	1	1
MORINO	LT 1	01742126	241	265	1	
MORINO	LT 2	01742125	0	16	4	
MORINO	LT 2	01742125	16	32	2	
MORINO	LT 2	01742125	32	285	1	
MORINO	LT 2	01742125	285	286	1	1
MORINO	LT 2	01742125	286	479	1	
MORINO	LT 2	01742125	479	490	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	0	30	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	30	240	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	240	325	1	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	325	345	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	345	385	1	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	385	405	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	0	30	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	30	35	2	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	35	55	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	55	61	2	2
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	61	76	2	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	76	175	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 6	01702206	0	90	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 6	01702206	90	130	1	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 6	01702206	130	200	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 7	01702207	0	135	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 7	01702207	135	530	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 8	01702208	0	11	2	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 8	01702208	11	28	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 8	01702208	28	38	2	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 8	01702208	38	410	1	1
MOUNTAIN PARK ESTATES #2	BLK 2 LT 9	01702209	0	285	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 9	01702209	285	290	2	2
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	0	209	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	209	210	3	3
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	210	215	4	

Note:
1) Lithologic Interpretations from DNR and DHHS database and file well logs - March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	215	216	3	3
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	216	224	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	224	225	3	3
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	0	15	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	15	22	5	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	22	35	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	35	50	2	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	50	75	3	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	75	95	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	95	109	3	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	109	189	4	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	189	220	3	
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	220	225	3	3
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	0	63	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	63	64	4	4
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	64	93	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	93	318	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	318	322	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	322	325	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	0	42	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	42	44	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	65	66	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	66	90	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	90	125	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	215	225	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	0	74	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	74	118	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	118	298	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	0	20	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	20	30	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	31	63	8	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	63	70	6	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	70	85	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	86	120	5	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	121	130	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	131	305	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	0	98	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	98	145	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	145	149	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	149	238	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	238	340	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	0	24	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	24	78	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	78	130	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	130	180	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	180	240	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	240	280	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	0	231	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	231	236	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	236	240	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	0	33	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	33	90	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	90	155	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	155	220	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	220	249	3	3
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	249	251	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	0	15	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	15	65	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	65	192	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	192	196	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	196	200	3	3
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	0	15	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	15	40	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	40	45	5	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	45	70	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	70	238	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	238	245	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	245	250	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	0	18	4	

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	18	82	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	82	118	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	118	119	5	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	119	200	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	200	240	3	3
MOUNTAIN PARK ESTATES #2	BLK 3 LT 19	01702231	0	186	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 19	01702231	186	545	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	0	51	3	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	51	79	5	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	79	112	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	112	124	4	4
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	124	137	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	137	151	4	4
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	151	547	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 22	01702234	0	44	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 22	01702234	44	47	2	2
MOUNTAIN PARK ESTATES #2	BLK 3 LT 22	01702234	47	100	2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 22	01702234	100	300	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	0	47	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	47	65	4	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	65	77	1	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	77	98	1	1
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	98	158	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	0	24	6	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	24	56	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	56	185	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	185	190	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	190	225	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	225	230	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	230	240	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	240	250	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	250	270	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	270	280	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	280	360	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	0	12	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	12	14	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	14	52	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	52	57	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	57	185	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	185	190	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	190	225	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	225	230	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	230	240	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	240	250	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	250	270	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	270	280	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	280	360	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	2	25	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	25	35	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	35	43	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	43	56	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	56	65	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	0	22	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	22	41	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	42	53	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	53	62	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	0	20	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	21	33	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	33	60	8	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	60	72	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	72	88	8	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	88	110	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	110	128	6	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	128	140	3	3
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	0	11	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	11	20	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	20	25	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	25	83	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	83	125	7	

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	125	155	6	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	155	175	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	0	24	8	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	24	119	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	119	120	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	120	122	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	122	123	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	123	171	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	171	178	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	178	190	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	190	221	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	221	245	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	245	260	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	0	25	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	25	50	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	50	75	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	75	92	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	92	99	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	0	25	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	25	50	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	50	75	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	75	90	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	90	98	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	0	6	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	6	8	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	8	16	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	16	36	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	36	54	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	54	65	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	65	74	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	74	75	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	75	100	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	100	101	3	3
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	101	120	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	120	125	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	125	131	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	131	140	3	3
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	140	150	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	150	156	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	156	175	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	175	186	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	186	204	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	204	214	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	214	218	3	3
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	218	225	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	0	45	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	45	58	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	58	135	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	135	155	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	155	195	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	195	198	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	198	201	3	3
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	0	15	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	15	23	5	5
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	24	30	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	30	60	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	60	75	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	76	81	5	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	81	83	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	0	21	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	21	26	4	4
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	26	35	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	35	65	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	65	78	7	7
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	78	81	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	0	21	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	21	25	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	25	34	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	34	64	3	

Note:
1) Lithologic Interpretations from DNR and DHHS database and file well logs - March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	64	80	7	7
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	80	85	2	2
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	0	78	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	78	80	7	7
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	80	95	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	95	113	2	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	113	120	1	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	120	300	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	300	400	1	1
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	0	12	6	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	12	55	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	55	73	3	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	73	93	4	
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	93	220	1	1
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	0	79	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	79	83	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	83	88	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	0	16	3	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	16	39	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	39	63	2	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	63	81	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	81	83	5	5
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	83	84	2	2
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	0	8	2	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	8	42	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	42	69	3	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	69	72	6	6
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	72	76	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	76	78	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 7	01702331	0	69	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 7	01702331	69	72	2	2
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	0	15	7	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	15	67	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	67	70	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	70	74	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	74	75	5	5
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	75	81	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	81	86	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	86	195	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	195	215	1	1
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	0	70	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	70	71	5	5
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	71	230	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	230	231	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	231	240	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	240	242	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	0	74.6	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	74.6	75	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	75	94	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	94	100	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	100	106	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	106	108	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	108	114	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	114	114.6	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	114.6	194	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	194	215	4	4
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	215	225	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	225	238	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	238	248	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	248	252	1	1
MOUNTAIN PARK ESTATES #2	BLK 5 LT 12	01702336	0	60	4	
MOUNTAIN PARK ESTATES #2	BLK 5 LT 12	01702336	60	63	5	5
MOUNTAIN PARK ESTATES #2	BLK 5 LT 12	01702336	63	65	3	3
MOUNTAIN PARK ESTATES #2	BLK 5 LT 12	01702336	65	72	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	0	40	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	40	42	5	5
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	42	58	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	58	63	4	4
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	63	70	4	

Note:
1) Lithologic Interpretations from DNR and DHHS database and file well logs - March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	70	73	8	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	73	91	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	91	137	1	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	0	36	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	36	38	5	5
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	38	42	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	42	47	3	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	47	48	6	6
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	48	57	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	57	53	1	1
MOUNTAIN PARK ESTATES #2	BLK 6 LT 2	01743204	58	104	1	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	0	60	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	60	62	1	1
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	62	100	1	1
MOUNTAIN PARK ESTATES #2	BLK 6 LT 4	01743202	0	67	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 4	01743202	67	68	5	5
MOUNTAIN PARK ESTATES #2	BLK 6 LT 4	01743202	68	90	1	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 5	01743201	0	70	4	
MOUNTAIN PARK ESTATES #2	BLK 6 LT 5	01743201	70	71	5	5
MOUNTAIN PARK ESTATES #2	BLK 6 LT 5	01743201	71	98	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	0	34	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	34	145	3	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	145	171	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	171	196	2	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	196	199	2	2
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	199	239	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	239	358	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	0	8	8	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	8	24	3	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	24	27	5	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	27	41	2	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	41	46	8	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	46	123	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	123	125	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	125	140	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	0	8	6	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	8	32	3	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	32	35	5	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	35	43	2	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	43	128	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 4	01743212	0	44	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 4	01743212	44	165	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 4	01743212	165	177	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 4	01743212	177	185		
MOUNTAIN PARK ESTATES #2	BLK 7 LT 6	01743210	0	27	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 6	01743210	27	67	2	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 6	01743210	67	115	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 6	01743210	115	160	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	0	59	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	59	60	4	4
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	60	65	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	65	68	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	68	184	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	0	58	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	58	64	1	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	64	150	1	1
MOUNTAIN PARK ESTATES #2	BLK 7 LT 10	01743206	0	54	4	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 10	01743206	54	56	7	
MOUNTAIN PARK ESTATES #2	BLK 7 LT 10	01743206	56	59	2	2
MOUNTAIN PARK ESTATES #2	BLK 7 LT 10	01743206	59	170	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	0	100	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	100	110	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	110	113	7	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	113	123	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	123	130	6	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	130	137	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	137	158	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	158	210	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	210	215	1	1

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	215	230	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	230	400	1	1
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	0	13	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	13	18	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	18	38	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	38	273	1	1
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	0	10	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	10	23	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	23	25	6	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	25	41	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	41	215	1	1
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	0	20	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	20	45	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	45	50	3	3
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	50	364	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	364	365	1	1
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	365	418	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	0	18	3	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	18	50	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	50	320	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	320	321	1	1
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	320	379	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	0	28	4	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	28	165	1	
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	165	175	1	1
MOUNTAIN SHADOWS	BLK 1 LT 2	01740116	0	40	4	
MOUNTAIN SHADOWS	BLK 1 LT 2	01740116	40	165	1	1
MOUNTAIN SHADOWS	BLK 1 LT 3	01740115	0	14	4	
MOUNTAIN SHADOWS	BLK 1 LT 3	01740115	14	73	1	
MOUNTAIN SHADOWS	BLK 1 LT 3	01740115	73	88	1	1
MOUNTAIN SHADOWS	BLK 1 LT 6	01740112	0	2	4	
MOUNTAIN SHADOWS	BLK 1 LT 6	01740112	2	330	1	1
MOUNTAIN SHADOWS	BLK 1 LT 7	01740111	0	36	4	
MOUNTAIN SHADOWS	BLK 1 LT 7	01740111	36	110	1	1
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	0	16	3	
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	16	120	1	1
MOUNTAIN SHADOWS	BLK 1 LT 9	01740109	0	13	4	
MOUNTAIN SHADOWS	BLK 1 LT 9	01740109	13	304	1	1
MOUNTAIN SHADOWS	BLK 1 LT 10	01740108	0	18	4	
MOUNTAIN SHADOWS	BLK 1 LT 10	01740108	18	268	1	1
MOUNTAIN SHADOWS	BLK 1 LT 11	01740107	0	19	4	
MOUNTAIN SHADOWS	BLK 1 LT 11	01740107	19	243	1	1
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	0	7	4	
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	7	132	1	1
MOUNTAIN SHADOWS	BLK 2 LT 3	01740118	0	5	2	
MOUNTAIN SHADOWS	BLK 2 LT 3	01740118	5	125	1	1
NULUKATAK	LT 3	01701343	0	42	4	
NULUKATAK	LT 3	01701343	42	185	1	1
NULUKATAK	LT 4	01701342	0	66	4	
NULUKATAK	LT 4	01701342	66	68	3	3
NULUKATAK	LT 4	01701342	68	310	1	1
NULUKATAK	LT 5	01701341	0	110	3	
NULUKATAK	LT 5	01701341	110	475	4	4
RANDOM HEIGHTS	LT 3	01741107	0	1	2	
RANDOM HEIGHTS	LT 3	01741107	1	275	1	1
RANDOM HEIGHTS	LT 4	01741108	0	17	3	
RANDOM HEIGHTS	LT 4	01741108	17	125	1	1
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	0	23	3	
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	23	70	2	
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	70	71	6	
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	71	101	1	1
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 1	01740152	0	16	4	
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 1	01740152	16	165	1	1
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 2	01740153	0	27	4	
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 2	01740153	27	160	1	1
STELIOES	LT 1	01742232	0	24	4	
STELIOES	LT 1	01742232	24	348	1	1
STELIOES	LT 2	01742233	0	19	4	
STELIOES	LT 2	01742233	19	225	1	1

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
STELIOES	LT 4	01742235	0	16	4	
STELIOES	LT 4	01742235	16	430	1	1
STEVAHN	BLK 1 LT 1A	01742208	0	20	4	
STEVAHN	BLK 1 LT 1A	01742208	20	320	1	1
STEVAHN	BLK 1 LT 2A	01742209	0	19	4	
STEVAHN	BLK 1 LT 2A	01742209	19	40	1	1
STEVAHN	BLK 1 LT 2A	01742209	40	49	1	
STEVAHN	BLK 2 LT 3	01742227	0	34	4	
STEVAHN	BLK 2 LT 3	01742227	34	188	1	
STEVAHN	BLK 2 LT 3	01742227	188	194	1	1
STEVAHN	BLK 2 LT 3	01742227	194	242	1	
STEVAHN	BLK 2 LT 3	01742227	242	248	1	1
STEVAHN	BLK 2 LT 3	01742227	248	255	1	
STRUEMPLER	LT 2	01742115	0	17	4	
STRUEMPLER	LT 2	01742115	17	175	1	1
SUN SHINE ACRES	LT 1	01740135	0	22	4	
SUN SHINE ACRES	LT 1	01740135	22	250	1	1
SUN SHINE ACRES	LT 2	01740136	0	16	4	
SUN SHINE ACRES	LT 2	01740136	16	234	1	
SUN SHINE ACRES	LT 2	01740136	234	382	1	
SUN SHINE ACRES	LT 2	01740136	382	530	1	1
SUN SHINE ACRES	LT 3	01740137	0	17	4	
SUN SHINE ACRES	LT 3	01740137	17	320	1	
SUN SHINE ACRES	LT 3	01740137	320	326	1	1
SUN SHINE ACRES	LT 3	01740137	326	338	1	
SUN SHINE ACRES	LT 3	01740137	338	342	1	1
SUN SHINE ACRES	LT 3	01740137	342	350	1	
SUN SHINE ACRES	LT 4	01740138	0	18	4	
SUN SHINE ACRES	LT 4	01740138	18	331	1	
SUN SHINE ACRES	LT 4	01740138	331	350	1	1
SUN SHINE ACRES	LT 4	01740138	350	415	1	
SUN SHINE ACRES	LT 4	01740138	415	435	1	1
SUN SHINE ACRES	LT 4	01740138	435	446	1	
SUN SHINE ACRES	LT 4	01740138	446	459	1	1
T12N R3W SEC 25	E2SW4SW4NE4	01740104	0	42	4	
T12N R3W SEC 25	E2SW4SW4NE4	01740104	42	476	1	1
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	0	5	4	
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	5	10	5	
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	10	16	4	
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	16	750	1	1
TALISMAN HEIGHTS	LT 1	01701390	0	16	4	
TALISMAN HEIGHTS	LT 1	01701390	16	25	3	
TALISMAN HEIGHTS	LT 1	01701390	25	324	1	1
TALISMAN HEIGHTS	LT 2	01701389	0	40	4	
TALISMAN HEIGHTS	LT 2	01701389	40	200	1	1
TALISMAN HEIGHTS	LT 3	01701388	0	24	4	
TALISMAN HEIGHTS	LT 3	01701388	20	424	1	1
TOILSOME HILL	LT 2	01741119	0	6	4	
TOILSOME HILL	LT 2	01741119	6	120	1	
TOILSOME HILL	LT 2	01741119	120	122	1	1
TOILSOME HILL	LT 2	01741119	122	180	1	
TOILSOME HILL	LT 2	01741119	180	186	1	1
TOILSOME HILL	LT 2	01741119	186	204	1	
WALLNER	LT 3	01742104	0	17	4	
WALLNER	LT 3	01742104	17	221	1	1
WINDCHIMES	LT 3	01701403	0	20	2	
WINDCHIMES	LT 3	01701403	20	25	5	5
WINDCHIMES	LT 3	01701403	25	51	6	
WINDCHIMES	LT 3	01701403	51	57	2	2
WOOLEVER	BLK 1 LT 1	01741112	0	10	4	
WOOLEVER	BLK 1 LT 1	01741112	10	135	1	1
ZIRKEL	LT 3	01742131	0	14	4	
ZIRKEL	LT 3	01742131	14	110	1	
ZIRKEL	LT 3	01742131	110	112	1	1
ZIRKEL	LT 3	01742131	112	268	1	

Note:
1) Lithologic Interpretations from DNR and DHHS database and file well logs - March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
ALPENBLICK	LT 1A	01701404	3.4	Jun-90
ASPEN HIGHLANDS #1	BLK 1 LT 2	01701326	5.8	Jul-90
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	2.1	Apr-88
ASPEN HIGHLANDS #1	BLK 1 LT 4	01701328	1.5	May-88
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	1.4	Feb-92
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	1.1	Dec-88
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	1.4	Aug-91
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	2.9	Oct-95
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	4.3	Mar-91
ASPEN HIGHLANDS #1	BLK 1 LT 12	01701323	4.7	Oct-98
ASPEN HIGHLANDS #1	BLK 1 LT 12	01701323	4.5	Jun-93
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	1.2	Aug-94
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	7	Jan-92
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	4.6	Oct-87
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	4.5	Apr-97
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	0	Jul-91
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	6.8	Sep-96
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	3.2	Aug-94
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	5	Dec-96
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	4.8	Oct-93
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	1.2	Aug-97
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	1	Aug-94
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	1	Nov-92
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	0.75	Oct-87
BONNIE VIEW	LT 1	01742210	3	Jul-96
BONNIE VIEW	LT 5	01742214	2	May-89
BONNIE VIEW	LT 7	01742216	0.4	Apr-88
BONNIE VIEW	LT 14	01742223	0.8	Jan-92
BONNIE VIEW	LT 15	01742224	2	May-90
BONNIE VIEW	LT 15	01742224	1.9	Feb-90
ENGLE	LT 1	01701350	6	Apr-94
ENGLE	LT 2	01701348	0	Aug-96
FORELAND VIEW	BLK 1 LT 1	01740140	1	Mar-91
FORELAND VIEW	BLK 1 LT 3	01740143	4.3	Nov-95
FORELAND VIEW	BLK 1 LT 5	01740146	2.5	Jul-94
FORELAND VIEW	BLK 1 LT 6	01740147	4.4	Sep-92
FORELAND VIEW	BLK 2 LT 1	01740148	5.8	Jun-96
FORELAND VIEW	BLK 2 LT 1	01740148	9.1	Apr-88
FORELAND VIEW	BLK 3 LT 1	01740149	0.8	Jun-92
FROSTAD	LT 2	01742128	0.8	Mar-89
FROSTAD	LT 3	01742129	4.7	May-94
GARRETSON	LT 1	01743238	0.2	Jun-93
GARRETSON	LT 3	01743240	0	Jul-91
GARRETSON	LT 4	01743241	0.1	Apr-92
GARRETSON	LT 4	01743241	1.6	Jan-89
GARRETSON	LT 5	01743242	5.9	Sep-95
GARRETSON	LT 5	01743242	5.6	Jan-91
GARRETSON	LT 6	01743243	0.3	Jul-93
GARRETSON	LT 7	01743244	0	Nov-94
GOMBART	LT 1	01740125	3.3	Jun-87
HAROLD MILLER	LT 2	01743246	0.2	Oct-96

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
KEMP	LT 1	01701391	3.6	Jun-96
KEMP	LT 2	01701392	3	Mar-96
KEMP	LT 2	01701392	3.2	Jan-94
LOFTY HEIGHTS	LT 1A1	01741134	5.7	Jun-97
LOFTY HEIGHTS	LT 1A1	01741134	3.3	Dec-92
LOFTY HEIGHTS	LT 1A1	01741134	2.5	Oct-89
LOFTY HEIGHTS	LT 1A1	01741134	2.6	May-88
LOFTY HEIGHTS	LT 2A	01741122	1.6	Dec-95
MORINO	LT 1	01742126	1.6	Aug-89
MORINO	LT 2	01742125	0.1	Nov-94
MOUNTAIN PARK ESTATES #2	BLK 2 LT 4	01702204	4.2	Oct-93
MOUNTAIN PARK ESTATES #2	BLK 2 LT 7	01702207	3.9	Aug-90
MOUNTAIN PARK ESTATES #2	BLK 2 LT 7	01702207	4.4	Feb-88
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	1.3	Jul-98
MOUNTAIN PARK ESTATES #2	BLK 3 LT 1	01702213	6.4	Sep-92
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	3.2	
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	3.45	Jan-95
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	1.1	Dec-98
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	1.7	Nov-87
MOUNTAIN PARK ESTATES #2	BLK 3 LT 7	01702219	0.85	Oct-93
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	3.1	May-88
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	3.01	Jul-97
MOUNTAIN PARK ESTATES #2	BLK 3 LT 13	01702225	1	Jun-96
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	3.5	Jul-97
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	4.2	Apr-94
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	3.8	Feb-94
MOUNTAIN PARK ESTATES #2	BLK 3 LT 17	01702229	6.2	Sep-95
MOUNTAIN PARK ESTATES #2	BLK 3 LT 19	01702231	2	Jun-94
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	0.7	Oct-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	7.9	Feb-94
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	4	May-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	5.7	Feb-88
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	6.4	Jan-99
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	3.7	Jan-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	8.5	Mar-92
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	2	Oct-87
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	4.7	Dec-88
MOUNTAIN PARK ESTATES #2	BLK 4 LT 13	01702313	1.8	Aug-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 14	01702314	1.7	Jun-98
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	1.3	Nov-90
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	4.9	Feb-97
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	4.4	May-95
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	2.6	Feb-88
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	7.5	Jul-95
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	0.9	Sep-88
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	2	Apr-90
MOUNTAIN PARK ESTATES #2	BLK 4 LT 24	01702324	2	Apr-90
MOUNTAIN PARK ESTATES #2	BLK 5 LT 1	01702325	0	Mar-93
MOUNTAIN PARK ESTATES #2	BLK 5 LT 2	01702326	6.9	Jun-97
MOUNTAIN PARK ESTATES #2	BLK 5 LT 2	01702326	5.8	Sep-92
MOUNTAIN PARK ESTATES #2	BLK 5 LT 2	01702326	5.8	Sep-92

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	0	Dec-93
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	0.8	Oct-92
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	4.8	Apr-88
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	4.4	Jan-90
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	2.9	Apr-88
MOUNTAIN PARK ESTATES #2	BLK 5 LT 8	01702332	4.8	Jan-99
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	3.9	Jan-95
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	1.1	Nov-93
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	6.3	Sep-94
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	3.8	Feb-92
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	1.3	May-97
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	2.2	Jun-92
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	3.2	Feb-92
MOUNTAIN PARK ESTATES #2	BLK 6 LT 4	01743202	5.6	Sep-94
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	0	Feb-97
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	0.1	Sep-91
MOUNTAIN PARK ESTATES #2	BLK 7 LT 5	01743211		Nov-93
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	1	Nov-95
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	0.4	Oct-96
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	0.3	Apr-95
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	0.3	Jun-89
MOUNTAIN PARK ESTATES #2	BLK 8 LT 2	01743224	3.1	Mar-94
MOUNTAIN PARK ESTATES #2	BLK 8 LT 3	01743223	0	Apr-92
MOUNTAIN PARK ESTATES #2	BLK 8 LT 4	01743222	0.1	Aug-97
MOUNTAIN PARK ESTATES #2	BLK 8 LT 4	01743222	0.1	Mar-93
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	4.4	Jan-89
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	6.2	Jul-88
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	0.4	Mar-94
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	1.3	May-96
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	1	Sep-93
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	2.75	Feb-97
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	4.9	May-93
MOUNTAIN SHADOWS	BLK 1 LT 2	01740116	4.4	Sep-92
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	7.9	Jul-94
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	8.4	Feb-94
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	8.7	May-90
MOUNTAIN SHADOWS	BLK 1 LT 10	01740108	0.2	Feb-90
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	5.3	Jul-95
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	7	Oct-87
MOUNTAIN SHADOWS	BLK 2 LT 3	01740118	8.2	Apr-88
NULUKATAK	LT 4	01701342	2.8	Sep-87
NULUKATAK	LT 5	01701341	0.5	Jul-96
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 1	01740126	3.2	Apr-91
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 1	01740126	2.8	Sep-89
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 1	01740126	3.3	Oct-88
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 2	01740133	2.6	Nov-94
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 3	01740132	2.8	Feb-92
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 6	01740129	2.5	Nov-95
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 7	01740128	3.2	Nov-95
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 1	01740152	1.8	Aug-95
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 1	01740152	0.6	Aug-89

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 2	01740153	0.1	Feb-93
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 2	01740153	0.1	Feb-91
STELIOES	LT 4	01742235	3	Sep-93
STELIOES	TR A	01742230	3.5	May-90
STEVAHN	BLK 1 LT 1A	01742208	0.2	Jun-94
STEVAHN	BLK 1 LT 1A	01742208	0	Jan-93
STEVAHN	BLK 1 LT 2A	01742209	2.2	Aug-93
STEVAHN	BLK 1 LT 2A	01742209	2.4	Nov-88
STRUEMPLER	LT 2	01742115	0.3	Jul-93
SUN SHINE ACRES	LT 1	01740135	0.4	Mar-94
SUN SHINE ACRES	LT 1	01740135	0.7	Apr-91
SUN SHINE ACRES	LT 2	01740136	1.1	Jul-93
SUN SHINE ACRES	LT 3	01740137	0.9	Feb-89
T12N R3W SEC 25	E2NE4NW4NW4NW4	01742110	5.5	Jun-91
T12N R3W SEC 25	E2SW4SW4NE4	01740104	1.3	Feb-94
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	4.2	Feb-94
T12N R3W SEC 25	NW4SE4NW4NE4	01741109	3.5	Jul-93
T12N R3W SEC 25	SW4 SE4 NW4 NW4	01742120	2.6	Jan-92
T12N R3W SEC 25	W2NE4NW4NW4NW4	01742107	0.1	Oct-96
TALISMAN HEIGHTS	LT 1	01701390	2.4	Sep-98
TALISMAN HEIGHTS	LT 2	01701389	1.5	Jan-90
TALISMAN HEIGHTS	LT 3	01701388	1.6	May-89
TOILSOME HILL	LT 1	01741120	4.8	Nov-89
TOILSOME HILL	LT 1	01741120	3.7	Oct-89
TOILSOME HILL	LT 2	01741119	2.2	Jun-94
WALLNER	LT 3	01742104	4.1	Feb-95
ZIRKEL	LT 3	01742131	0.2	Jun-91

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data.

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Septic Data

Parcel Name	Parcel Block/Lot	Parcel ID	Septic Type	Installation Date
ALPENBLICK	LT 1A	01701404	2	May-83
ALPENBLICK	LT 1B	01701405	2	Mar-74
ASPEN HIGHLANDS #1	BLK 1 LT 2	01701326	2	Jul-90
ASPEN HIGHLANDS #1	BLK 1 LT 3	01701327	2	Jul-85
ASPEN HIGHLANDS #1	BLK 1 LT 4	01701328	2	Jun-88
ASPEN HIGHLANDS #1	BLK 1 LT 5	01701334	2	Jul-74
ASPEN HIGHLANDS #1	BLK 1 LT 6	01701328	2	Sep-81
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	1	Jun-92
ASPEN HIGHLANDS #1	BLK 1 LT 7	01701318	2	Aug-73
ASPEN HIGHLANDS #1	BLK 1 LT 8	01701319	2	Aug-84
ASPEN HIGHLANDS #1	BLK 1 LT 9	01701320	2	Sep-81
ASPEN HIGHLANDS #1	BLK 1 LT 10	01701321	2	Jul-75
ASPEN HIGHLANDS #1	BLK 1 LT 11	01701322	2	Jul-77
ASPEN HIGHLANDS #1	BLK 1 LT 12	01701323	2	Dec-92
ASPEN HIGHLANDS #1	BLK 1 LT 13	01701324	2	May-74
ASPEN HIGHLANDS #2	BLK 2 LT 1	01701333	2	Jun-74
ASPEN HIGHLANDS #2	BLK 2 LT 5A	01701397	2	Oct-73
ASPEN HIGHLANDS #2	BLK 2 LT 6A	01701396	2	Dec-86
ASPEN HIGHLANDS #2	BLK 2 LT 8	01701337	2	Nov-96
ASPEN HIGHLANDS #2	BLK 2 LT 10	01701395	2	Oct-70
ASPEN HIGHLANDS #2	BLK 2 LT 12	01701374	2	Aug-83
ASPEN HIGHLANDS #3	BLK 3 LT 2	01701384	2	Sep-78
ASPEN HIGHLANDS #3	BLK 3 LT 4	01701382	2	Jun-78
ASPEN HIGHLANDS #3	BLK 3 LT 4	01701382	2	Jun-90
ASPEN HIGHLANDS #3	BLK 3 LT 5	01701381	2	Mar-79
ASPEN HIGHLANDS #3	BLK 3 LT 6	01701380	2	Jun-88
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	2	Sep-96
ASPEN HIGHLANDS #3	BLK 3 LT 7	01701379	2	May-79
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	2	Aug-94
ASPEN HIGHLANDS #3	BLK 3 LT 8	01701378	2	Nov-96
ASPEN HIGHLANDS #3	BLK 3 LT 9	01701377	2	Oct-78
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	2	Dec-96
ASPEN HIGHLANDS #3	BLK 3 LT 10	01701376	2	Oct-79
ASPEN HIGHLANDS #3	BLK 3 LT 11	01701375	2	Aug-87
ASPEN HIGHLANDS #3	BLK 3 LT 12	01701374	2	Jun-83
ASPEN HIGHLANDS #3	BLK 3 LT 13	01701373	2	Nov-83
BONNIE VIEW	LT 1	01742210	2	Jun-96
BONNIE VIEW	LT 1	01742210	2	Aug-71
BONNIE VIEW	LT 2	01742211	2	Sep-83
BONNIE VIEW	LT 3	01742212	2	Sep-78
BONNIE VIEW	LT 5	01742214	2	Oct-76
BONNIE VIEW	LT 7	01742216	2	Jun-84
BONNIE VIEW	LT 14	01742223	2	Jul-82
BONNIE VIEW	LT 15	01742224	2	May-83
ENGLE	LT 1	01701350	1	Apr-94
ENGLE	LT 1	01701350	2	Jul-83
ENGLE	LT 2	01701348	1	Sep-96
ENGLE	LT 2	01701348	2	May-81
ENGLE	LT 3	01701349	2	Jun-82
ENGLE	LT 3	01701349	2	Apr-78
FORELAND VIEW	BLK 1 LT 1	01740140	2	Feb-91
FORELAND VIEW	BLK 1 LT 2	01740141	2	Aug-85
FORELAND VIEW	BLK 1 LT 3	01740143	2	Sep-84
FORELAND VIEW	BLK 1 LT 4	01740144	2	Nov-84
FORELAND VIEW	BLK 1 LT 5	01740146	2	Feb-85
FORELAND VIEW	BLK 1 LT 6	01740147	2	Jul-83
FORELAND VIEW	BLK 2 LT 1	01740148	2	Jun-83
FORELAND VIEW	BLK 3 LT 1	01740149	2	Nov-91
FROSTAD	LT 1	01742127	2	Aug-94
FROSTAD	LT 2	01742128	2	Oct-88
FROSTAD	LT 3	01742129	2	Sep-92
GARRETSON	LT 1	01743238	2	May-93
GARRETSON	LT 1	01743238	2	Jul-80

Note:
1) Septic data taken from DHHS files March, 1999.
2) Septic type is either holding tank (1) or leach field (2).

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Septic Data

Parcel Name	Parcel Block/Lot	Parcel ID	Septic Type	Installation Date
GARRETSON	LT 2	01743239	2	Jul-80
GARRETSON	LT 2	01743239	2	Jun-95
GARRETSON	LT 3	01743240	2	Sep-80
GARRETSON	LT 3	01743240	2	Jun-91
GARRETSON	LT 4	01743241	2	Sep-81
GARRETSON	LT 5	01743242	2	May-81
GARRETSON	LT 6	01743243	2	Oct-92
GARRETSON	LT 6	01743243	2	Sep-81
GARRETSON	LT 7	01743244	2	Nov-94
GARRETSON	LT 7	01743244	2	Sep-81
GOMBART	LT 1	01740125	2	Aug-83
GOMBART	LT 2	01740124	2	Apr-78
GOMBART	LT 3 and 4	01740122	2	Jul-81
HAROLD MILLER	LT 2	01743246	2	Oct-96
KEMP	LT 1	01701391	2	Oct-70
KEMP	LT 2	01701392	2	Oct-71
KEMP	LT 3	01701392	2	Oct-70
LOFTY HEIGHTS	LT 1A1	01741134	2	Jul-71
LOFTY HEIGHTS	LT 2A	01741122	2	Sep-81
LOFTY HEIGHTS	LT 2A	01741122	2	May-92
MORINO	LT 1	01742126	2	Aug-89
MORINO	LT 2	01742125	2	Nov-94
MORINO	LT 2	01742125	2	Aug-79
MOUNTAIN PARK ESTATES #2	BLK 1 LT 5	01743230	2	Jul-83
MOUNTAIN PARK ESTATES #2	BLK 2 LT 1	01702201	2	Jul-74
MOUNTAIN PARK ESTATES #2	BLK 2 LT 2	01702202	2	Jul-80
MOUNTAIN PARK ESTATES #2	BLK 2 LT 3	01702203	2	Sep-72
MOUNTAIN PARK ESTATES #2	BLK 2 LT 4	01702204	2	Oct-93
MOUNTAIN PARK ESTATES #2	BLK 2 LT 4	01702204	2	Sep-71
MOUNTAIN PARK ESTATES #2	BLK 2 LT 5	01702205	2	Dec-68
MOUNTAIN PARK ESTATES #2	BLK 2 LT 7	01702207	2	Jul-82
MOUNTAIN PARK ESTATES #2	BLK 2 LT 9	01702209	2	Dec-72
MOUNTAIN PARK ESTATES #2	BLK 2 LT 11	01702211	2	Jun-80
MOUNTAIN PARK ESTATES #2	BLK 2 LT 12	01702212	2	Aug-77
MOUNTAIN PARK ESTATES #2	BLK 3 LT 1	01702213	2	Oct-72
MOUNTAIN PARK ESTATES #2	BLK 3 LT 1	01702213	2	Oct-91
MOUNTAIN PARK ESTATES #2	BLK 3 LT 2	01702214	2	Oct-75
MOUNTAIN PARK ESTATES #2	BLK 3 LT 3	01702215	2	Jul-75
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 3 LT 4	01702216	2	Sep-77
MOUNTAIN PARK ESTATES #2	BLK 3 LT 5	01702217	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 3 LT 6	01702218	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 3 LT 7	01702219	2	Dec-93
MOUNTAIN PARK ESTATES #2	BLK 3 LT 7	01702219	2	Aug-72
MOUNTAIN PARK ESTATES #2	BLK 3 LT 8	01702220	2	Jun-88
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	2	Jul-95
MOUNTAIN PARK ESTATES #2	BLK 3 LT 10	01702222	2	Jun-80
MOUNTAIN PARK ESTATES #2	BLK 3 LT 11	01702223	2	May-74
MOUNTAIN PARK ESTATES #2	BLK 3 LT 12	01702224	2	Sep-76
MOUNTAIN PARK ESTATES #2	BLK 3 LT 13	01702225	2	Sep-82
MOUNTAIN PARK ESTATES #2	BLK 3 LT 14	01702226	2	Jul-78
MOUNTAIN PARK ESTATES #2	BLK 3 LT 15	01702227	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	2	Oct-76
MOUNTAIN PARK ESTATES #2	BLK 3 LT 16	01702228	2	May-94
MOUNTAIN PARK ESTATES #2	BLK 3 LT 17	01702229	2	Sep-95
MOUNTAIN PARK ESTATES #2	BLK 3 LT 18	01702230	2	Aug-76
MOUNTAIN PARK ESTATES #2	BLK 3 LT 19	01702231	1	Jun-94
MOUNTAIN PARK ESTATES #2	BLK 3 LT 19	01702231	2	Nov-85
MOUNTAIN PARK ESTATES #2	BLK 3 LT 20	01702232	2	Nov-85
MOUNTAIN PARK ESTATES #2	BLK 3 LT 21	01702233	2	Nov-85
MOUNTAIN PARK ESTATES #2	BLK 3 LT 22	01702234	2	Sep-81
MOUNTAIN PARK ESTATES #2	BLK 3 LT 24	01702236	2	Apr-81
MOUNTAIN PARK ESTATES #2	BLK 4 LT 1	1702301	2	Aug-77

Note:
1) Septic data taken from DHHS files March, 1999.
2) Septic type is either holding tank (1) or leach field (2).

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Septic Data

Parcel Name	Parcel Block/Lot	Parcel ID	Septic Type	Installation Date
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	2	Sep-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 2	01702302	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 3	01702303	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	2	Oct-77
MOUNTAIN PARK ESTATES #2	BLK 4 LT 4	01702304	2	Oct-77
MOUNTAIN PARK ESTATES #2	BLK 4 LT 5	01702305	2	Oct-97
MOUNTAIN PARK ESTATES #2	BLK 4 LT 6	01702306	2	Oct-77
MOUNTAIN PARK ESTATES #2	BLK 4 LT 7	01702307	2	Jul-79
MOUNTAIN PARK ESTATES #2	BLK 4 LT 8	01702308	2	May-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 9	01702309	2	Nov-77
MOUNTAIN PARK ESTATES #2	BLK 4 LT 10	01702310	2	Jul-75
MOUNTAIN PARK ESTATES #2	BLK 4 LT 13	01702313	1	Aug-93
MOUNTAIN PARK ESTATES #2	BLK 4 LT 13	01702313	2	May-74
MOUNTAIN PARK ESTATES #2	BLK 4 LT 14	01702314	2	Nov-75
MOUNTAIN PARK ESTATES #2	BLK 4 LT 15	01702315	2	May-83
MOUNTAIN PARK ESTATES #2	BLK 4 LT 18	01702318	2	Mar-88
MOUNTAIN PARK ESTATES #2	BLK 4 LT 19	01702319	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 20	01702320	2	Jun-95
MOUNTAIN PARK ESTATES #2	BLK 4 LT 21	01702321	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 22	01702322	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 23	01702323	2	May-78
MOUNTAIN PARK ESTATES #2	BLK 4 LT 24	01702324	2	Aug-82
MOUNTAIN PARK ESTATES #2	BLK 4 LT 24	01702324	2	Aug-76
MOUNTAIN PARK ESTATES #2	BLK 5 LT 1	01702325	2	Jul-72
MOUNTAIN PARK ESTATES #2	BLK 5 LT 2	01702326	2	Sep-92
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	2	Oct-80
MOUNTAIN PARK ESTATES #2	BLK 5 LT 4	01702328	2	May-94
MOUNTAIN PARK ESTATES #2	BLK 5 LT 5	01702329	2	Oct-85
MOUNTAIN PARK ESTATES #2	BLK 5 LT 6	01702330	2	Jul-81
MOUNTAIN PARK ESTATES #2	BLK 5 LT 9	01702333	2	Apr-81
MOUNTAIN PARK ESTATES #2	BLK 5 LT 10	01702334	2	Jul-78
MOUNTAIN PARK ESTATES #2	BLK 5 LT 11	01702335	1	Jul-93
MOUNTAIN PARK ESTATES #2	BLK 5 LT 12	01702336	2	Aug-83
MOUNTAIN PARK ESTATES #2	BLK 6 LT 1	01743205	2	Sep-82
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	2	May-97
MOUNTAIN PARK ESTATES #2	BLK 6 LT 3	01743203	2	Apr-82
MOUNTAIN PARK ESTATES #2	BLK 6 LT 4	01743202	2	Apr-82
MOUNTAIN PARK ESTATES #2	BLK 6 LT 5	01743201	2	Sep-82
MOUNTAIN PARK ESTATES #2	BLK 7 LT 1	01743215	2	Jul-87
MOUNTAIN PARK ESTATES #2	BLK 7 LT 2	01743214	2	Jul-78
MOUNTAIN PARK ESTATES #2	BLK 7 LT 3	01743213	2	May-78
MOUNTAIN PARK ESTATES #2	BLK 7 LT 4	01743212	2	Apr-83
MOUNTAIN PARK ESTATES #2	BLK 7 LT 5	01743211	2	Nov-93
MOUNTAIN PARK ESTATES #2	BLK 7 LT 6	01743210	2	May-81
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	2	Nov-95
MOUNTAIN PARK ESTATES #2	BLK 7 LT 8	01743208	2	Aug-78
MOUNTAIN PARK ESTATES #2	BLK 7 LT 9	01743207	2	Jun-78
MOUNTAIN PARK ESTATES #2	BLK 7 LT 10	01743206	2	Aug-70
MOUNTAIN PARK ESTATES #2	BLK 8 LT 2	01743224	2	Jun-85
MOUNTAIN PARK ESTATES #2	BLK 8 LT 3	01743223	1	Jan-92
MOUNTAIN PARK ESTATES #2	BLK 8 LT 4	01743222	1	Mar-93
MOUNTAIN PARK ESTATES #2	BLK 8 LT 4	01743222	2	May-85
MOUNTAIN PARK ESTATES #2	BLK 8 LT 5	01743221	2	Aug-71
MOUNTAIN PARK ESTATES #2	BLK 8 LT 6	01743220	2	Oct-76
MOUNTAIN PARK ESTATES #2	BLK 8 LT 7	01743219	2	Jun-78
MOUNTAIN PARK ESTATES #2	BLK 8 LT 8	01743218	2	Oct-77
MOUNTAIN PARK ESTATES #2	BLK 8 LT 9	01743217	2	Oct-77
MOUNTAIN PARK ESTATES #2	BLK 8 LT 10	01743216	2	Sep-75
MOUNTAIN SHADOWS	BLK 1 LT 1	01740117	2	Nov-71
MOUNTAIN SHADOWS	BLK 1 LT 2	01740116	2	Sep-92
MOUNTAIN SHADOWS	BLK 1 LT 2	01740116	2	Jun-72
MOUNTAIN SHADOWS	BLK 1 LT 3	01740115	2	Sep-75

Note:
1) Septic data taken from DHHS files March, 1999.
2) Septic type is either holding tank (1) or leach field (2).

Phase II Local Wellhead and Aquifer Protection Program
Dearmoun Study Area Septic Data

Parcel Name	Parcel Block/Lot	Parcel ID	Septic Type	Installation Date
MOUNTAIN SHADOWS	BLK 1 LT 5	01740113	2	Jun-75
MOUNTAIN SHADOWS	BLK 1 LT 6	01740112	2	Jan-73
MOUNTAIN SHADOWS	BLK 1 LT 7	01740111	2	Aug-78
MOUNTAIN SHADOWS	BLK 1 LT 8	01740110	2	Oct-80
MOUNTAIN SHADOWS	BLK 1 LT 9	01740109	2	Jul-83
MOUNTAIN SHADOWS	BLK 1 LT 10	01740108	2	Jul-83
MOUNTAIN SHADOWS	BLK 1 LT 11	01740107	2	Jun-83
MOUNTAIN SHADOWS	BLK 2 LT 2	01740119	2	May-87
MOUNTAIN SHADOWS	BLK 2 LT 3	01740118	2	Jun-85
NULUKATAK	LT 3	01701343	2	Jun-71
NULUKATAK	LT 4	01701342	2	Jun-80
NULUKATAK	LT 5	01701341	2	Sep-71
RANDOM HEIGHTS	LT 3	01741107	1	Aug-84
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 1	01740126	1	Dec-88
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 2	01740133	2	Sep-76
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 3	01740132	2	Oct-76
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	2	Mar-79
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 5	01740130	2	Jul-75
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 6	01740129	2	Nov-95
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 7	01740128	2	Nov-95
SPENDLOVE VIEW HEIGHTS #2	BLK 4 LT 7	01740128	2	Jul-85
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 1	01740152	2	Nov-83
SPENDLOVE VIEW HEIGHTS #3	BLK 5 LT 2	01740153	2	Nov-83
STELIOES	LT 1	01742232	2	Oct-80
STELIOES	LT 2	01742233	2	Jun-84
STELIOES	LT 4	01742235	2	Aug-91
STELIOES	TR A	01742230	2	Sep-83
STEVAHN	BLK 1 LT 1A	01742208	2	Jan-93
STEVAHN	BLK 1 LT 1A	01742208	2	Jun-79
STEVAHN	BLK 1 LT 2A	01742209	2	Feb-81
STRUEMPLER	LT 2	01742115	2	Jun-77
SUN SHINE ACRES	LT 1	01740135	2	Jun-82
SUN SHINE ACRES	LT 2	01740136	2	May-95
SUN SHINE ACRES	LT 3	01740137	2	Aug-81
SUN SHINE ACRES	LT 4	01740138	2	Apr-85
T12N R3W SEC 25	E2NE4NW4NW4NW4	01742110	2	Jun-91
T12N R3W SEC 25	E2NE4NW4NW4NW4	01742110	2	Aug-70
T12N R3W SEC 25	E2SW4SW4NE4	01740104	2	Oct-94
T12N R3W SEC 25	N2NW4NW4NE4NW4	01742205	2	Jul-78
T12N R3W SEC 25	NW4SE4NW4NE4	01741109	2	Sep-93
T12N R3W SEC 25	SW4 SE4 NW4 NW4	01742120	2	Sep-75
T12N R3W SEC 25	SW4 SE4 NW4 NW4	01742120	2	Sep-78
T12N R3W SEC 25	W2NE4NW4NW4NW4	01742107	2	Oct-95
T12N R3W SEC 25	W2NE4NW4NW4NW4	01742107	2	Apr-85
TALISMAN HEIGHTS	LT 1	01701390	2	Jul-96
TALISMAN HEIGHTS	LT 2	01701389	2	Aug-78
TALISMAN HEIGHTS	LT 3	01701388	2	Jul-76
TOILSOME HILL	LT 1	01741120	2	May-68
TOILSOME HILL	LT 2	01741119	2	May-72
TOWER ESTATES	BLK 1 LT 2	01741127	2	May-94
WALLNER	LT 3	01742104	2	Jun-75
WINDCHIMES	LT 1	01701401	2	May-82
WINDCHIMES	LT 3	01701403	2	Oct-78
WOOLEVER	BLK 1 LT 1	01741112	2	Jun-71
WOOLEVER	BLK 1 LT 2	01741111	2	May-71
WOOLEVER	BLK 1 LT 3	01741110	2	Oct-80
WOOLEVER	BLK 2 LT 2	01741114	2	May-78
ZIRKEL	LT 3	01742131	2	Oct-90

Note:
1) Septic data taken from DHHS files March, 1999.
2) Septic type is either holding tank (1) or leach field (2).

APPENDIX D

Scimitar Database

ASSUMPTIONS FOR SCIMITAR DATABASE

1) Well Data

Well data indicated x,y,z coordinates, well construction date, depth of well and casing, depth to bedrock, aquifer type and gpm at the time the well was constructed.

X,Y,Z coordinates were listed as the centroid of the lot, unless there was other information that would make the determination more accurate. Elevations came from the centroid in Geonorth's database – for Scimitar study areas, most of the elevations came from aerial topographic interpretation.

Aquifer Type were numerical numbers that correspond to the interpreted main aquifer a well is obtaining water from, based on existing well log data. These numbers correspond as follows in the lithologic data section.

Where more than one well was located on a lot the following was performed:

a) if the wells had similar lithologies, they were assumed to be one well and the youngest well was used to correspond to any nitrate data for the lot.

b) If the wells were far apart and not similar in lithology, or had different nitrate values associated with them, they were kept separate and the parcel ID's were given a "A" or "B" for either well with different coordinates. These coordinates came from better information that showed where each well was on a lot.

c) If the wells were close together and not of similar lithology, the youngest well was used if the older wells had no nitrate values associated with them.

Lithologic Data

Lithologic data indicated all pertinent lithologic information and any aquifers that were encountered. Aquifers were listed if they were noted – dampness did not constitute an aquifer. "Heavy weeping", "seepage", "wet", "w", were all noted as an aquifer, as well as perforation distances.

Lithology was interpreted as:

1) Fractured Bedrock
2) Gravel
3) Gravel and sand
4) Gravel, sand and silt (also till, hardpan, clayey gravel, silty gravel)
5) Sandy
6) Sandy-silty
7) Silty
8) Clayey

Notations of perforations were too inconsistent to be of any use and were dropped from consideration.

Nitrate Data

Nitrate data were all available nitrate data, with sample date, and nitrate value. A range value was used in subsequent approaches to analyzing the data. The range values were:

1) <1.0 to ≥ 0 mg/L
2) ≥ 1.0 to ≤ 2.9 mg/L
3) ≥ 3.0 to ≤ 5.9 mg/L
4) ≥ 6.0 to ≤ 9.9 mg/L
5) ≥ 10 mg/L

Samples where nitrate was analyzed but not detected were given values of zero. Nitrate values were not given for other subdivisions besides Scimitar as other surrounding areas are served by community wells. Data from these wells was lacking and only consisted of a single point over the subdivision area, therefore, these values were determined to not be meaningful values for the study.

Septic Type is a numerical number that corresponds to the type of septic system a parcel has. "1" is designated as a holding tank and "2" is designated as a leach field system.

OTHER ASSUMPTIONS

1) Scimitar study area Dawn water and Troll Knoll were assumed to be located on the lot/blocks written on their well logs and that these logs were correct for their coordinates. For nitrate values, the range of nitrate values given for these subdivision areas from various houses served by the wells were treated in one of two ways:

    a) Dawn water – only used ADEC well listing with a "C" designation on them for community well.
    b) Troll Knoll – only used the Earl Grey subdivision values – this is the subdivision the community well is located. There were no explanations of where the samples were taken, so all were assumed to be representative of the well water.

2) Well logs not inputted into this database had inconsistencies in their notation of location, PID number, or lithologic descriptions. Other wells were simply replaced by newer wells, whose logs were inputted into the final database. The well database is composed of the best combination of wells that is thought to be representative of the geologic conditions under the two study areas.

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Well Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	2702596	599434	728.5	May-78	530	234	215	1	233	0.3
CHUGACH PARK ESTATES	BLK 1 LT 5	05148150	2702495	599577	743.3	Jun-92	584	200	360	1	199	1
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	2702726	599690	747.1	Feb-78	288		148	3		50
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	2703167	599885	730.5	Dec-76	278		164	3		50
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	2703168	600036	746.5	Jun-76	360	223	170	1	218	2
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	2703169	600269	755.6	Dec-76	320		142	1	195	1.5
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	2703211	600497	787.2	Dec-76	520	168		1	164	0.4
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	2702988	600492	787.0	Dec-76	300	190	132	1	193	2
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	2702864	600268	772.0	May-76	360	205	140	1	203	1
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	2702671	600280	786.0	May-92	222		150	5		3
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	2702726	600581	824.8	Mar-77	290	207	138	1	201	5
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	2703234	600799	829.6	Oct-93	500	153	120	1		6
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	2702914	599673	741.4	Feb-78	302		149	4	302	50
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	2703021	599609	730.9	May-75	286		170	3		30
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	2703064	598780	522.7	Apr-91	400	117	110	1	114	0.6
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	2702146	599860	768.0	Apr-81	190		158	3		4
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	2702243	600184	845.4	Mar-79	263		221	3		10
CHUGACH PARK ESTATES	BLK 2 LT 14	05148109	2702081	600614	800.0	Sep-76	400	22	210	1	220	1
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	2702186	600786	888.2	Oct-83	280		220	3		10
CHUGACH PARK ESTATES	BLK 2 LT 20	5148115	2702219	601862	836.1	Jun-82	215		188	3		7
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	2703221	601840	1115.2	Oct-92	698		256	3	241	0.2
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	2702375	601296	1004.8	Apr-84	570	305	460	1	305	1
CHUGACH PARK ESTATES	BLK 4 LT 5	5148117	2702555	601727	1042.8	May-79	600	295	295	1	291	0.5
EARL RAY	BLK 3 LT 31	05111317	2706933	599246	450.0	Jul-73	165	144	118	2		1.1
MARIE ESTATES	LT 1	05111134	2706624	600258	524.8	Feb-83	225		170	3		15
MARIE ESTATES	LT 3	05111136	2706248	600229	524.8	May-90	207	207	161	2		8
MARIE ESTATES	LT 4	05111137	2706067	600221	524.8	May-82	178		150	3		5
MARIE ESTATES	LT 5	05111133	2706619	599884	524.8	Aug-85	240	240		2		2
MARIE ESTATES	LT 6	05111132	2706477	599885	524.8	Aug-83	80		45	2		3
MARIE ESTATES	LT 7	05111131	2706336	599877	524.8	Nov-81	239		189	2		25
MARIE ESTATES	LT 8	05111130	2706197	599873	524.8	Aug-97	272	272	220	3		4
MARIE ESTATES	LT 9	05111129	2706041	599840	524.8	May-82	238		205	3		12
MARIE ESTATES	LT 12B	05111171	2706243	599513	524.8	Dec-78	243		210	3		12
OUR MOUNTAIN	BLK 1 LT 2	05111141	2706299	601191	541.2	Aug-78	405	80	67	1	74	0.33
OUR MOUNTAIN	BLK 1 LT 3	05111142	2706487	601222	534.5	Jul-96	226	185	183	1	183	6
OUR MOUNTAIN	BLK 1 LT 4	05111143	2706575	601119	510.0	Jan-83	305		105	1	94	10
OUR MOUNTAIN	BLK 1 LT 10A	05111168	2706579	600569	524.8	Sep-96	320	170	165	1	169	7
OUR MOUNTAIN	BLK 1 LT 12	05111144	2706501	600841	522.4	Sep-83	460	95	100	1	95	10
OUR MOUNTAIN	BLK 1 LT 13	05111145	2706427	600807	513.0	Jun-84	410	157	145	4	156	1.1
OUR MOUNTAIN	BLK 1 LT 14	05111146	2706312	600792	524.8	Jun-96	250	102	102	1	101	0.4
OUR MOUNTAIN	BLK 1 LT 15	05111140	2706162	601008	550.1	May-79	320	140	180	1	89	25
OUR MOUNTAIN	BLK 1 TR 3	05111169	2706828	600897	498.8	Jul-96	226	186	183	1	183	6
OUR MOUNTAIN	BLK 2 LT 2	05111164	2707103	601885	530.0	Sep-82	128		105	3		20
OUR MOUNTAIN	BLK 2 LT 3	05111163	2706869	601853	571.7	May-89	128		113	3		8
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	2706605	601841	626.0	Aug-95	285	80		1	78	1.5
OUR MOUNTAIN	BLK 2 LT 6	05111160	2706587	601548	569.4	May-84	135	35		4		7
OUR MOUNTAIN	BLK 2 LT 10	05111155	2707160	601411	520.0	Jul-98	300	91	83	1	90	1.5
OUR MOUNTAIN	BLK 2 LT 7	05111159	2706625	601471	520.0	Mar-84	117		83	3		5
OUR MOUNTAIN	BLK 2 LT 8	05111158	2706804	601505	520.0	Sep-88	111	111		2		
OUR MOUNTAIN	BLK 2 LT 9	05111157	2706935	601525	520.0	Oct-82	620			1	90	0.5
PETERS GATE	BLK 1 LT 3	05154123	2704040	602184	1136.1	Jul-93	480	480		1	75	10

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Well Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
PETERS GATE	BLK 1 LT 5	05154121	2703546	602189	1115.2		220			3	120	1
PETERS GATE	BLK 1 LT 7	5154110	2703768	602418	1152.0	Mar-77	400	380	95	1	68	1
PETERS GATE	BLK 1 LT 9	05154108	2704261	602430	1206.7	Jul-83	85	78		1	14	50
PETERS GATE	BLK 1 LT 11A	05154128	2704484	602617	1246.4	Jun-85	160	45	107	1	43	8
PETERS GATE	BLK 1 LT 12	05154105	2704519	602988	1266.5	Jul-83	105	21	90	1	20	5
PETERS GATE	BLK 1 LT 13	05154104	2704467	603171	1295.6	Oct-86	143	81	15	1	76	25
PETERS GATE	BLK 1 LT 16	05154101	2703634	603341	1267.2	Aug-84	440	27	105	1	8	1.1
PETERS GATE	BLK 2 LT 2	05154114	2704003	602712	1197.8	Oct-94	112		25	1	58	4
PETERS GATE	BLK 2 LT 3	05154113	2703773	602715	1169.0	Apr-85	192	190	60	1	38	
PETERS GATE	BLK 2 LT 4	05154112	2703543	602717	1155.7	Sep-84	90	29		1	28	0.5
PETERS GATE	BLK 2 LT 5	5154120	2703546	602952	1186.9	Jul-83	140		13	1	7	2
PETERS GATE	BLK 2 LT 6	05154118	2703776	603008	1226.8	Aug-82	200	21	20	1	3	1.5
PETERS GATE	BLK 2 LT 7	05154117	2704007	602948	1235.1	Jul-83	280	21		1	15	1
PETERS GATE	BLK 3 LT 2	05155103	2703274	602245	1103.9	Jun-85	81	61	54	4		4.8
PETERS GATE	BLK 3 LT 3	05155104	2703191	602494	1084.4	Mar-97	500	65	138	1	62	1.6
PETERS GATE	BLK 3 LT 5	05155106	2703196	602815	1115.0	Jan-76	550	21		1	16	
PETERS GATE	TR 1A	05155111	2702483	602180	976.4	Apr-83	580	144	159	1	142	0.3
PETERS GATE	TR 1B	05155110	2702520	602732	877.0	Jul-84	200	62	70	1	58	2.5
SCIMITAR #1	BLK 1 LT 1	05113208	2704930	599473	480.0	May-82	78	78	67	2		10
SCIMITAR #1	BLK 1 LT 2	05113207	2705119	599376	481.0	Mar-84	580	92		1	365	
SCIMITAR #1	BLK 1 LT 5	05113204	2705623	599714	495.0	Jan-75	180	176	164	3	179	
SCIMITAR #1	BLK 1 LT 6	05113203	2705752	599800	500.0	Oct-82	162	162	130	2		5
SCIMITAR #1	BLK 1 LT 7	05113202	2705808	599559	540.0		246		25	2		5.8
SCIMITAR #1	BLK 2 LT 2	05113210	2705052	599701	521.1	Feb-77	305		105	1	160	2
SCIMITAR #1	BLK 2 LT 3	05113211	2705257	599835	486.0	Dec-82	111		80	3	111	13
SCIMITAR #1	BLK 2 LT 4	05113212	2705365	599937	485.0	Dec-88	600	62	115	1	59	0.2
SCIMITAR #1	BLK 2 LT 5	05113213	2705457	600063	485.0	Apr-98	400	81	78	1	80	0.2
SCIMITAR #1	BLK 2 LT 7	05113215	2705804	600531	528.0	Mar-77	200	94	72	1	90	2
SCIMITAR #1	BLK 2 LT 8	05113216	2705705	600677	548.0	Mar-74	200	95	97	1	94	2.5
SCIMITAR #1	BLK 2 LT 9	05113217	2705631	600802	565.0	Aug-78	263	92		1	92	0.1
SCIMITAR #1	BLK 2 LT 10	05113218	2705365	600617	570.0	Jun-75	205	40	123	1	134	1.5
SCIMITAR #1	BLK 2 LT 14	05113222	2705003	600140	615.0	Jun-85	180	108	95	1	107	1
SCIMITAR #1	BLK 2 LT 15	05113223	2704805	599985	610.0	Jan-84	900	160	90	1	139	0.5
SCIMITAR #1	BLK 2 LT 19	05113227	2704435	599524	600.0	Sep-83	840	163	240	1	163	1
SCIMITAR #1	BLK 2 LT 20	05113228	2704250	599507	615.0	Jul-76	212		180	3		5
SCIMITAR #1	BLK 2 LT 21	05113229	2704074	599516	610.0	Mar-77	285		135	1	187	3.5
SCIMITAR #1	BLK 3 LT 1	05113239	2705756	600987	580.0	Jun-85	150	101	97	3	99	5
SCIMITAR #1	BLK 3 LT 2	05113238	2705567	600970	592.0	Apr-77	600	96		1	94	
SCIMITAR #1	BLK 3 LT 3	05113237	2705257	600802	585.0	Aug-78	124	81	76	3	124	15
SCIMITAR #1	BLK 3 LT 5	05113235	2704965	600355	615.0	Aug-73	271	104	78	1	101	4
SCIMITAR #1	BLK 3 LT 7	05113233	2704620	600097	612.0	Apr-81	305			1	112	
SCIMITAR #1	BLK 3 LT 8	05113232	2704418	599976	615.0	Sep-80	330	116		4	146	
SCIMITAR #1	BLK 3 LT 9	05113231	2704392	599791	605.0	Sep-91	370	136	128	1	136	2.5
SCIMITAR #1	BLK 3 LT 10	05113230A	2704074	599692	610.0	Aug-84	740	123	500	1	121	0.3
SCIMITAR #1	BLK 3 LT 10	05113230B	2704216	599709	610.0	May-94	407	154	142	1	154	
SCIMITAR #2	BLK 2 LT 22	05113240	2703898	599512	612.0	Feb-77	284	154	109	1	157	0.1
SCIMITAR #2	BLK 2 LT 23	05113241	2703695	599516	605.0	May-84	200	165	155	1	162	5
SCIMITAR #2	BLK 2 LT 24	05113242	2703476	599524	613.0	Sep-81	300		120	1	157	2
SCIMITAR #2	BLK 2 LT 25	05113243	2703429	599679	635.0	Nov-83	80	80		2		5
SCIMITAR #2	BLK 2 LT 26	05113244	2703519	599800	635.0	Nov-81	180	100		1	85	5
SCIMITAR #2	BLK 2 LT 27	05113245	2703678	599873	612.0	Jul-81	61		20	3		15

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Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Well Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
SCIMITAR #2	BLK 2 LT 28	05113246	2703786	600062	630.0	Sep-78	440	53	27	1	50	0.4
SCIMITAR #2	BLK 2 LT 29	05113247	2703898	600165	630.0	Sep-83	655		15	1	51	1
SCIMITAR #2	BLK 2 LT 31	05113249	2704160	600398	637.0	Apr-83	440	40	9	1	34	0.5
SCIMITAR #2	BLK 2 LT 33	05113251	2704160	600398	620.0	May-93	400	362		1	8	0.8
SCIMITAR #2	BLK 2 LT 36	05113254	2704952	600944	585.0	Oct-81	364	108	64	1	101	5
SCIMITAR #2	BLK 3 LT 11	05113267	2703872	599800	612.0	Aug-93	600	116		1	115	0.1
SCIMITAR #2	BLK 3 LT 12	05113266	2704048	600028	618.0	Aug-82	682	94	122	1	93	0.2
SCIMITAR #2	BLK 3 LT 13	05113265	2704199	600135	615.0	Aug-91	400	370	40	1	68	0.6
SCIMITAR #2	BLK 3 LT 14	05113264	2704422	600291	657.9		400	69				
SCIMITAR #2	BLK 3 LT 15	05113263	2704526	600385	620.0	Mar-77	625		25	1	99	
SCIMITAR #2	BLK 3 LT 16	05113262	2704663	600505	618.0	Jul-81	400	91	100	1	87	0.1
SCIMITAR #2	BLK 3 LT 18	05113260	2705172	600858	623.0	Aug-97	600	75	100	1	94	13
SCIMITAR #2	BLK 3 LT 19	05113259	2705474	601051	620.0	May-82	185	120	145	2	130	2
SCIMITAR #2	BLK 4 LT 10	05113256	2705709	601448	680.0	Feb-81	180	21	60	1	2	40
SCIMITAR #3	BLK 3 LT 1	05113284	2704646	601220	770.0	Apr-84	126	60		1	60	2
SCIMITAR #3	BLK 3 LT 2	05113285	2704922	601478	790.0	May-84	266	61	35	1	60	2
SCIMITAR #3	BLK 3 LT 4	05113287	2705257	601512	770.0	May-85	285	44	50	1	40	1
SCIMITAR #3	TRACT 1B	05113333B	2703936	601142	1070.0	May-97	500	500		1	66	6
SCIMITAR #3	BLK 1 LT 1	05113268	2704810	601142	760.0	Mar-84	545	93		1	93	0.3
SCIMITAR #3	BLK 1 LT 2	05113269	2704737	601047	740.0	Mar-84	580	92		1	92	0.3
SCIMITAR #3	BLK 1 LT 3	05113270	2704453	600927	770.0	Mar-84	495	82		1	83	2
SCIMITAR #3	BLK 1 LT 4	05113271A	2704298	600845	765.0	Oct-83	408	81		1	80	1.5
SCIMITAR #3	BLK 1 LT 4	05113271B	2704384	600901	760.0	Sep-88	605		280	1	180	0.5
SCIMITAR #3	BLK 1 LT 5	05113272	2704182	600729	758.0	Oct-83	308	75		1	74	2
SCIMITAR #3	BLK 1 LT 6	05113273	2704134	600574	760.0	Jul-83	387	75		1	75	1.5
SCIMITAR #3	BLK 1 LT 7	05113274	2703958	600448	755.0	Nov-82	304	75		1	75	5
SCIMITAR #3	BLK 1 LT 8	05113275	2703743	600518	768.0	Jul-82	550	158		1	158	0.5
SCIMITAR #3	BLK 1 LT 9	05113276	2703635	600411	750.0	May-83	587	117		1	112	3
SCIMITAR #3	BLK 1 LT 10A	05113289	2703515	600196	760.0	Aug-83	767	180		1	178	1
SCIMITAR #3	BLK 1 LT 11A	05113290	2703416	600196	770.0	Jan-83	465	170		1	164	1
SCIMITAR #3	BLK 1 LT 12	05113279	2703493	600398	774.0	Jun-82	680	170		1	170	
SCIMITAR #3	BLK 1 LT 13	05113280	2703515	600515	767.0	Jun-82	285	143		1	143	15
SCIMITAR #3	BLK 1 LT 14	05113281	2703631	600630	774.0	May-82	265	116	70	1	120	2
SCIMITAR #3	BLK 1 LT 15	05113282	2703741	600699	768.0	Jun-82	265	84		1	84	15
SCIMITAR #3	BLK 1 LT 16	05113283	2703910	600781	769.0	Jul-82	280	33		1	33	5
SCIMITAR #3	BLK 2 LT 1	05113401	2704436	601084	765.0	Jul-85	213	28	14	1	16	
SCIMITAR #3	BLK 2 LT 2	05113402	2704323	601009	770.0	Apr-85	173		60	1	16	1
SCIMITAR #3	BLK 3 LT 3	05113286	2705055	601568	795.0	Jun-84	500	73	34	1	45	0.3
SCIMITAR #3	TRACT 1A	05113333A	2703390	601241	850.0	May-97	112		75	3		7
TONJESS ESTATES	BLK 1 LT 3	05183115	2710810	602522	382.5	Nov-82	45		25	3		25
TONJESS ESTATES	BLK 1 LT 4	05183114	2710660	602428	384.6	Nov-82	78		45	3		25
TONJESS ESTATES	BLK 1 LT 5	05183113	2710457	602478	390.0	Jun-82	81		59	3		20
TONJESS ESTATES	BLK 1 LT 6	05183112	2710426	602283	380.0	Jun-82	81		59	3		20
TONJESS ESTATES	BLK 1 LT 7	05183111	2710460	602116	380.4	Jul-82	127		50	3		40
TONJESS ESTATES	BLK 2 LT 1	05183101	2711143	602969	340.0	Feb-83	400	27	22	1	23	0.3
TONJESS ESTATES	BLK 2 LT 2	05183102	2710906	602924	340.0	May-84	280	16	30	1	13	1.2
TONJESS ESTATES	BLK 2 LT 3	05183226	2711027	603165	360.0	Oct-83	140	42		1	40	10
TONJESS ESTATES	BLK 2 LT 4	05183225	2711116	603287	398.8	Jul-83	199	38		1	38	3
TONJESS ESTATES	BLK 2 LT 6	05183223	2711001	603646	437.2	Jul-84	185	185	85	1	38	2
TONJESS ESTATES	BLK 2 LT 7	05183222	2710875	603415	400.0	May-98	146	20	27	1	3	2.5
TONJESS ESTATES	BLK 2 LT 8	05183221	2710776	603197	427.3	Apr-84	72	32	20	1	18	1

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Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Well Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Northing	Easting	Elevation (ft)	Drill Date	Well Depth (ft. bgs.)	Casing Depth (ft. bgs.)	Static Water Level (ft. bgs.)	Aquifer Type	Bedrock Depth (ft. bgs.)	Well Yield (gpm)
TONJESS ESTATES	BLK 2 LT 9	05183220	2710615	603015	411.7	Oct-93	245	245	60	1	5	0.1
TONJESS ESTATES	BLK 2 LT 10	05183103	2710609	602737	391.1	Oct-82	180	62	58	1	59	1.5
TONJESS ESTATES	BLK 2 LT 11	05183104	2710483	602830	390.0		189			1	53	1.7
TONJESS ESTATES	BLK 2 LT 12	05183219	2710605	603245	454.7	Oct-84	240	32	38	1	30	0.5
TONJESS ESTATES	BLK 2 LT 13	05183218	2710678	603423	459.5	Nov-82	240	37	50	1	33	6
TONJESS ESTATES	BLK 2 LT 14	05183217	2710753	603601	461.8	Mar-83	148	58		1	56	1
TONJESS ESTATES	BLK 2 LT 17A	05183228	2711002	604132	523.5	Dec-91	200	56		1	56	0.5
TONJESS ESTATES	BLK 2 LT 18A	05183227	2710652	604120	542.6	Jun-83	84	71	69	1	71	10
TONJESS ESTATES	BLK 2 LT 19	05183211	2710495	603975	490.0	Oct-84	108		92	1	60	7
TONJESS ESTATES	BLK 2 LT 23	05153211	2709432	603710	578.0	May-96	504	47	21	1	41	0.8
TONJESS ESTATES	BLK 3 LT 10	05183202	2709708	602753	475.0	Jul-85	600	103	250	1	99	5
TONJESS ESTATES	BLK 3 LT 12	05183204	2709749	603042	482.0	Jun-84	280	37	52	1	31	0.4
TONJESS ESTATES	BLK 3 LT 2	05183109	2710105	602260	392.5	May-83	101		63	3		30
TONJESS ESTATES	BLK 3 LT 3	05183108	2710116	602432	409.4	Jul-83	101		63	3		30
TONJESS ESTATES	BLK 3 LT 4	05183107	2710143	602614	439.9	May-82	82		72	2		5
TONJESS ESTATES	BLK 3 LT 5	05183106	2710204	602747	433.4	May-82	405		85	1	80	25
TONJESS ESTATES	BLK 3 LT 6	05183105	2710309	603055	456.7	Jun-82	260	37	48	1	32	0.6
TONJESS ESTATES	BLK 3 LT 7	05183202	2710144	602975	468.9	Feb-92	260	84	80	1	83	1
TONJESS ESTATES	BLK 3 LT 8	05183201	2710027	602860	465.0	Sep-84	181	88	85	1	86	0.7
TONJESS ESTATES	BLK 3 LT 13	05153205	2709930	603176	516.5	Jun-84	300	51	52	1	48	0.3
TONJESS ESTATES	BLK 3 LT 16	05153205	2710430	603428	470.0	Mar-83	515	29		1	29	0.5
TONJESS ESTATES	BLK 3 LT 17	05183206	2710496	603679	505.0	Jan-84	100	43	38	1	39	3
TONJESS ESTATES	BLK 3 LT 18	05183207	2710268	603593	524.8	May-96	124	17	27	1	10	3.5
TONJESS ESTATES	BLK 3 LT 20	05183206	2709873	603449	520.0	Jul-85	235	20		1	14	2.5
TONJESS ESTATES	BLK 3 LT 21	05183209	2709737	603397	530.0	May-84	191	20	32	1	20	0.7
TONJESS ESTATES	BLK 3 LT 24	05183210	2709430	603401	580.0	Oct-84	200	40		1	40	1
WHALEY	TR 1A	05111170	2706952	599473	463.6	Jun-96	205		158	3		7
WHALEY	TR 6	05111110	2707424	600378	480.0	Feb-76	277	98		1	97	1
WHALEY #	TRACT 1	05111154	2707167	600727	518.0	Jan-62	246			5		
WHALEY #3	BLK 1 LT 1	05149250	2707398	599822	459.2	Jul-82	152		118	3		15
WHALEY #5	BLK 1B LT 1	05111123	2706877	599856	509.2	Feb-79	241		141	2		35
WHALEY #5	BLK 1B LT 3	05111121	2706880	600333	513.9	Aug-96	224	224	186	2		10
WHALEY #5	BLK 2A LT 6	05111122	2706898	600084	505.0	Mar-82	221		175	3		20
Wynter Park	BLK 2 LT 22	05149223	5149223	601363	437.0	Jul-73	148		103			48

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Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	0	37	3	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	37	135	4	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	135	165	7	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	165	190	4	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	190	200	7	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	200	233	4	
CHUGACH PARK ESTATES	BLK 1 LT 4	05147101	233	530	1	1
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	0	21	3	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	21	35	4	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	35	58	7	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	58	61	4	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	61	77	7	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	77	90	4	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	90	100	7	7
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	100	114	4	
CHUGACH PARK ESTATES	BLK 2 LT 1	05147105	114	400	1	1
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	0	6	5	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	6	19	3	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	19	25	4	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	25	32	3	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	32	78	4	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	78	87	3	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	87	103	5	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	103	182	4	
CHUGACH PARK ESTATES	BLK 2 LT 8	05148103	182	190	3	3
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	0	12	3	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	12	15	7	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	15	65	4	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	65	72	5	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	72	125	4	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	125	140	3	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	140	155	5	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	155	257	4	
CHUGACH PARK ESTATES	BLK 2 LT 10	05148105	257	263	3	3
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	0	154	3	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	154	179	8	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	179	183	5	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	183	242	8	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	242	249	3	3
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	249	280	8	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	0	10	5	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	10	16	4	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	16	20	3	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	20	43	4	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	43	90	3	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	90	95	7	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	95	150	3	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	150	220	4	
CHUGACH PARK ESTATES	BLK 2 LT 15	05148110	220	400	1	1
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	0	110	3	
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	110	131	5	
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	131	175	3	
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	175	190	5	
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	190	211	4	
CHUGACH PARK ESTATES	BLK 2 LT 20	05148115	211	215	3	3
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	0	30	3	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	30	66	3	3
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	66	73	5	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	73	84	4	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	84	97	5	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	97	138	2	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	138	232	4	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	232	273	2	
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	273	305	3	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
CHUGACH PARK ESTATES	BLK 4 LT 3	05148119	305	570	1	1
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	0	73	4	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	73	77	3	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	77	118	4	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	118	122	7	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	122	140	8	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	140	241	4	
CHUGACH PARK ESTATES	BLK 3 LT 8	05148124	241	698	1	1
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	0	18	4	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	18	24	5	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	24	56	3	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	56	85	4	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	85	118	3	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	118	145	4	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	145	291	3	
CHUGACH PARK ESTATES	BLK 4 LT 5	05148117	291	600	1	1
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	0	25	3	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	25	30	4	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	30	41	3	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	41	88	4	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	88	95	3	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	95	145	4	
CHUGACH PARK ESTATES	BLK 1 LT 23	05148132	145	500	1	1
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	0	20	3	
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	20	39	5	
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	39	55	4	
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	55	116	3	
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	116	123	3	3
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	123	201	4	
CHUGACH PARK ESTATES	BLK 1 LT 20	05148135	201	290	1	1
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	0	8	5	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	8	35	3	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	35	85	4	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	85	148	3	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	148	175	7	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	175	211	4	
CHUGACH PARK ESTATES	BLK 1 LT 19	05148136	211	222	5	5
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	0	16	3	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	16	21	5	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	21	68	3	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	68	95	4	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	95	105	3	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	105	137	5	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	137	150	3	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	150	203	4	
CHUGACH PARK ESTATES	BLK 1 LT 16	05148139	203	360	1	1
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	0	75	3	
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	75	90	4	
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	90	130	3	
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	130	170	4	
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	170	185	4	4
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	185	193	4	
CHUGACH PARK ESTATES	BLK 1 LT 15	05148140	193	300	1	1
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	0	65	3	
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	65	155	4	
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	155	161	4	4
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	161	164	4	
CHUGACH PARK ESTATES	BLK 1 LT 14	05148141	164	520	1	1
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	0	84	3	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	84	90	5	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	90	115	8	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	115	148	3	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	148	173	4	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	173	180	4	4

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	180	195	4	
CHUGACH PARK ESTATES	BLK 1 LT 13	05148142	195	320	1	1
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	0	155	3	
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	155	194	4	
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	194	200	3	3
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	200	213	4	
CHUGACH PARK ESTATES	BLK 1 LT 12	05148143	213	360	1	1
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	0	70	3	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	70	81	4	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	81	84	5	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	84	155	4	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	155	190	3	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	190	192	8	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	192	215	3	3
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	215	265	4	
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	265	273	3	3
CHUGACH PARK ESTATES	BLK 1 LT 11	05148144	273	278	5	5
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	0	45	4	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	45	68	3	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	68	98	4	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	98	118	8	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	118	196	3	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	196	275	4	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	275	280	3	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	280	281	8	
CHUGACH PARK ESTATES	BLK 1 LT 9	05148146	281	286	3	3
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	0	88	3	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	88	101	4	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	101	170	3	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	170	190	5	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	190	201	3	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	201	254	4	
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	254	281	3	3
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	281	289	5	5
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	289	301	4	4
CHUGACH PARK ESTATES	BLK 1 LT 8	05148147	301	302	1	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	0	50	3	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	50	65	4	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	65	110	3	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	110	135	4	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	135	168	3	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	168	182	5	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	182	256	4	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	256	276	3	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	276	278	8	
CHUGACH PARK ESTATES	BLK 1 LT 7	05148148	278	288	3	3
CHUGACH PARK ESTATES	BLK 1 LT 5	05148150	0	160	3	
CHUGACH PARK ESTATES	BLK 1 LT 5	05148150	160	185	6	6
CHUGACH PARK ESTATES	BLK 1 LT 5	05148150	185	199	4	
CHUGACH PARK ESTATES	BLK 1 LT 5	05148150	199	584	1	1
MARIE ESTATES	LT 1	05111134	0	9	3	
MARIE ESTATES	LT 1	05111134	9	90	4	
MARIE ESTATES	LT 1	05111134	90	190	3	
MARIE ESTATES	LT 1	05111134	190	226	3	3
MARIE ESTATES	LT 3	05111136	0	100	2	
MARIE ESTATES	LT 3	05111136	100	160	4	
MARIE ESTATES	LT 3	05111136	160	183	2	
MARIE ESTATES	LT 3	05111136	183	207	2	2
MARIE ESTATES	LT 4	05111137	0	15	3	
MARIE ESTATES	LT 4	05111137	15	170	4	
MARIE ESTATES	LT 4	05111137	170	178	3	3
MARIE ESTATES	LT 5	05111133	0	127	3	
MARIE ESTATES	LT 5	05111133	127	134	3	3
MARIE ESTATES	LT 5	05111133	134	230	3	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
MARIE ESTATES	LT 5	05111133	230	240	2	2
MARIE ESTATES	LT 6	05111132	0	33	3	
MARIE ESTATES	LT 6	05111132	33	37	2	
MARIE ESTATES	LT 6	05111132	37	48	4	
MARIE ESTATES	LT 6	05111132	48	80	2	2
MARIE ESTATES	LT 7	05111131	0	231	3	
MARIE ESTATES	LT 7	05111131	231	239	2	2
MARIE ESTATES	LT 8	05111130	0	226	4	
MARIE ESTATES	LT 8	05111130	226	227	4	4
MARIE ESTATES	LT 8	05111130	227	250	2	
MARIE ESTATES	LT 8	05111130	250	268	4	
MARIE ESTATES	LT 8	05111130	268	272	3	3
MARIE ESTATES	LT 9	05111129	0	90	4	
MARIE ESTATES	LT 9	05111129	90	121	3	
MARIE ESTATES	LT 9	05111129	121	232	4	
MARIE ESTATES	LT 9	05111129	232	238	3	3
MARIE ESTATES	LT 12B	05111171	0	234	3	
MARIE ESTATES	LT 12B	05111171	234	243	3	3
OUR MOUNTAIN	BLK 1 LT 2	05111141	0	65	3	
OUR MOUNTAIN	BLK 1 LT 2	05111141	65	74	4	
OUR MOUNTAIN	BLK 1 LT 2	05111141	74	405	1	1
OUR MOUNTAIN	BLK 1 LT 3	05111142	0	133	4	
OUR MOUNTAIN	BLK 1 LT 3	05111142	133	179	6	
OUR MOUNTAIN	BLK 1 LT 3	05111142	179	181	5	
OUR MOUNTAIN	BLK 1 LT 3	05111142	181	224	1	1
OUR MOUNTAIN	BLK 1 LT 10A	05111168	0	135	4	
OUR MOUNTAIN	BLK 1 LT 10A	05111168	135	153	3	
OUR MOUNTAIN	BLK 1 LT 10A	05111168	153	169	4	
OUR MOUNTAIN	BLK 1 LT 10A	05111168	169	320	1	1
OUR MOUNTAIN	BLK 1 LT 12	05111144	0	162	4	
OUR MOUNTAIN	BLK 1 LT 12	05111144	162	460	1	1
OUR MOUNTAIN	BLK 1 LT 13	05111145	0	150	4	
OUR MOUNTAIN	BLK 1 LT 13	05111145	150	156	4	4
OUR MOUNTAIN	BLK 1 LT 13	05111145	156	410	1	1
OUR MOUNTAIN	BLK 1 LT 13	05111145	0	156	4	
OUR MOUNTAIN	BLK 1 LT 13	05111145	156	410	1	1
OUR MOUNTAIN	BLK 1 LT 14	05111146	0	47	4	
OUR MOUNTAIN	BLK 1 LT 14	05111146	47	51	5	
OUR MOUNTAIN	BLK 1 LT 14	05111146	51	58	2	2
OUR MOUNTAIN	BLK 1 LT 14	05111146	58	99	3	3
OUR MOUNTAIN	BLK 1 LT 14	05111146	99	250	1	1
OUR MOUNTAIN	BLK 1 LT 15	05111140	0	16	7	
OUR MOUNTAIN	BLK 1 LT 15	05111140	16	49	3	
OUR MOUNTAIN	BLK 1 LT 15	05111140	49	50	7	
OUR MOUNTAIN	BLK 1 LT 15	05111140	50	82	4	
OUR MOUNTAIN	BLK 1 LT 15	05111140	82	89	3	3
OUR MOUNTAIN	BLK 1 LT 15	05111140	89	320	1	1
OUR MOUNTAIN	BLK 1 TR 3	05111169	0	132	5	
OUR MOUNTAIN	BLK 1 TR 3	05111169	132	179	6	
OUR MOUNTAIN	BLK 1 TR 3	05111169	179	181	5	
OUR MOUNTAIN	BLK 1 TR 3	05111169	181	224	1	1
OUR MOUNTAIN	BLK 1 LT 4	05111143	0	94	3	
OUR MOUNTAIN	BLK 1 LT 4	05111143	94	305	1	1
OUR MOUNTAIN	BLK 2 LT 2	05111164	0	28	4	
OUR MOUNTAIN	BLK 2 LT 2	05111164	28	66	7	
OUR MOUNTAIN	BLK 2 LT 2	05111164	66	124	4	
OUR MOUNTAIN	BLK 2 LT 2	05111164	124	128	4	4
OUR MOUNTAIN	BLK 2 LT 3	05111163	0	19	4	
OUR MOUNTAIN	BLK 2 LT 3	05111163	19	46	6	
OUR MOUNTAIN	BLK 2 LT 3	05111163	46	55	7	
OUR MOUNTAIN	BLK 2 LT 3	05111163	55	60	4	
OUR MOUNTAIN	BLK 2 LT 3	05111163	60	71	8	
OUR MOUNTAIN	BLK 2 LT 3	05111163	71	121	4	
OUR MOUNTAIN	BLK 2 LT 3	05111163	121	128	4	4

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	0	30	4	
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	30	50	7	
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	50	75	4	
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	75	78	4	4
OUR MOUNTAIN	BLK 2 LT 4/5	05111162	78	285	1	1
OUR MOUNTAIN	BLK 2 LT 6	05111160	0	21	4	
OUR MOUNTAIN	BLK 2 LT 6	05111160	21	53	7	
OUR MOUNTAIN	BLK 2 LT 6	05111160	53	57	4	4
OUR MOUNTAIN	BLK 2 LT 6	05111160	57	85	4	
OUR MOUNTAIN	BLK 2 LT 6	05111160	85	95	6	
OUR MOUNTAIN	BLK 2 LT 6	05111160	95	98	4	
OUR MOUNTAIN	BLK 2 LT 6	05111160	98	108	6	
OUR MOUNTAIN	BLK 2 LT 6	05111160	108	130	4	
OUR MOUNTAIN	BLK 2 LT 6	05111160	130	135	4	4
OUR MOUNTAIN	BLK 2 LT 8	05111158	0	21	3	
OUR MOUNTAIN	BLK 2 LT 8	05111158	21	34	2	
OUR MOUNTAIN	BLK 2 LT 8	05111158	34	80	4	
OUR MOUNTAIN	BLK 2 LT 8	05111158	80	82	2	
OUR MOUNTAIN	BLK 2 LT 8	05111158	82	99	8	
OUR MOUNTAIN	BLK 2 LT 8	05111158	99	103	4	
OUR MOUNTAIN	BLK 2 LT 8	05111158	103	111	8	
OUR MOUNTAIN	BLK 2 LT 8	05111158	111	112	2	
OUR MOUNTAIN	BLK 2 LT 10	0511155	0	19	4	
OUR MOUNTAIN	BLK 2 LT 10	0511155	19	26	8	
OUR MOUNTAIN	BLK 2 LT 10	0511155	26	41	4	
OUR MOUNTAIN	BLK 2 LT 10	0511155	41	53	3	
OUR MOUNTAIN	BLK 2 LT 10	0511155	53	88	4	
OUR MOUNTAIN	BLK 2 LT 10	0511155	88	300	1	1
OUR MOUNTAIN	BLK 2 LT 7	05111159	0	35	3	
OUR MOUNTAIN	BLK 2 LT 7	05111159	35	61	4	
OUR MOUNTAIN	BLK 2 LT 7	05111159	61	89	8	
OUR MOUNTAIN	BLK 2 LT 7	05111159	89	94	7	
OUR MOUNTAIN	BLK 2 LT 7	05111159	94	98	4	
OUR MOUNTAIN	BLK 2 LT 7	05111159	98	112	7	
OUR MOUNTAIN	BLK 2 LT 7	05111159	112	117	3	3
PETERS GATE	BLK 1 LT 3	05154123	0	75	3	
PETERS GATE	BLK 1 LT 3	05154123	75	480	1	1
PETERS GATE	BLK 1 LT 11A	05154128	0	43	3	
PETERS GATE	BLK 1 LT 11A	05154128	43	160	1	1
PETERS GATE	BLK 1 LT 13	05154104	0	45	6	
PETERS GATE	BLK 1 LT 13	05154104	45	76	4	
PETERS GATE	BLK 1 LT 13	05154104	76	143	1	1
PETERS GATE	BLK 1 LT 5	05154121	0	25	3	
PETERS GATE	BLK 1 LT 5	05154121	25	32	4	
PETERS GATE	BLK 1 LT 5	05154121	32	37	5	
PETERS GATE	BLK 1 LT 5	05154121	37	49	4	
PETERS GATE	BLK 1 LT 5	05154121	49	55	3	
PETERS GATE	BLK 1 LT 5	05154121	55	81	5	
PETERS GATE	BLK 1 LT 5	05154121	81	92	3	
PETERS GATE	BLK 1 LT 5	05154121	92	105	4	
PETERS GATE	BLK 1 LT 5	05154121	105	117	3	
PETERS GATE	BLK 1 LT 5	05154121	117	120	4	
PETERS GATE	BLK 1 LT 5	05154121	120	220	1	1
PETERS GATE	BLK 1 LT 7	05154110	0	68	3	
PETERS GATE	BLK 1 LT 7	05154110	68	400	1	1
PETERS GATE	BLK 1 LT 9	05154108	0	14	4	
PETERS GATE	BLK 1 LT 9	05154108	14	85	1	1
PETERS GATE	BLK 1 LT 12	05154105	0	12	3	
PETERS GATE	BLK 1 LT 12	05154105	12	16	5	
PETERS GATE	BLK 1 LT 12	05154105	16	105	1	1
PETERS GATE	BLK 1 LT 16	05154101	0	8	4	
PETERS GATE	BLK 1 LT 16	05154101	8	440	1	1
PETERS GATE	BLK 2 LT 2	05154114	0	105	4	
PETERS GATE	BLK 2 LT 2	05154114	105	112	1	1

Note:
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Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
PETERS GATE	BLK 2 LT 3	05154113	0	6	3	
PETERS GATE	BLK 2 LT 3	05154113	6	192	1	1
PETERS GATE	BLK 2 LT 4	05154112	0	28	4	
PETERS GATE	BLK 2 LT 4	05154112	28	90	1	1
PETERS GATE	BLK 2 LT 5	05154120	0	7	4	
PETERS GATE	BLK 2 LT 5	05154120	7	140	1	1
PETERS GATE	BLK 2 LT 6	05154118	0	3	4	
PETERS GATE	BLK 2 LT 6	05154118	3	200	1	1
PETERS GATE	BLK 2 LT 7	05154117	0	15	4	
PETERS GATE	BLK 2 LT 7	05154117	15	280	1	1
PETERS GATE	BLK 3 LT 2	05155103	0	41	3	
PETERS GATE	BLK 3 LT 2	05155103	41	45	3	
PETERS GATE	BLK 3 LT 2	05155103	45	54	4	4
PETERS GATE	BLK 3 LT 2	05155103	54	61	3	3
PETERS GATE	BLK 3 LT 2	05155103	61	81	4	4
PETERS GATE	BLK 3 LT 3	05155104	0	23	3	
PETERS GATE	BLK 3 LT 3	05155104	23	26	4	
PETERS GATE	BLK 3 LT 3	05155104	26	41	3	
PETERS GATE	BLK 3 LT 3	05155104	41	60	4	
PETERS GATE	BLK 3 LT 3	05155104	60	500	1	1
PETERS GATE	BLK 3 LT 5	05155106	0	16	4	
PETERS GATE	BLK 3 LT 5	05155106	16	550	1	1
PETERS GATE	TR 1A	05155111	0	31	3	
PETERS GATE	TR 1A	05155111	31	55	5	
PETERS GATE	TR 1A	05155111	55	62	3	
PETERS GATE	TR 1A	05155111	62	68	4	
PETERS GATE	TR 1A	05155111	68	80	8	
PETERS GATE	TR 1A	05155111	80	83	3	
PETERS GATE	TR 1A	05155111	83	109	8	
PETERS GATE	TR 1A	05155111	109	119	7	
PETERS GATE	TR 1A	05155111	119	132	5	
PETERS GATE	TR 1A	05155111	132	142	4	
PETERS GATE	TR 1A	05155111	142	580	1	1
PETERS GATE	TR 1B	05155110	0	13	3	
PETERS GATE	TR 1B	05155110	13	58	4	
PETERS GATE	TR 1B	05155110	58	200	1	1
TONJESS ESTATES	BLK 1 LT 3	05183115	0	14	3	
TONJESS ESTATES	BLK 1 LT 3	05183115	14	42	4	
TONJESS ESTATES	BLK 1 LT 3	05183115	42	45	3	3
TONJESS ESTATES	BLK 1 LT 4	05183114	0	70	4	
TONJESS ESTATES	BLK 1 LT 4	05183114	70	78	3	3
TONJESS ESTATES	BLK 1 LT 5	05183113	0	36	4	
TONJESS ESTATES	BLK 1 LT 5	05183113	36	39	5	
TONJESS ESTATES	BLK 1 LT 5	05183113	39	77	8	
TONJESS ESTATES	BLK 1 LT 5	05183113	77	81	3	3
TONJESS ESTATES	BLK 1 LT 6	05183112	0	36	4	
TONJESS ESTATES	BLK 1 LT 6	05183112	36	39	5	
TONJESS ESTATES	BLK 1 LT 6	05183112	39	77	8	
TONJESS ESTATES	BLK 1 LT 6	05183112	77	81	3	3
TONJESS ESTATES	BLK 1 LT 7	05183111	0	10	3	
TONJESS ESTATES	BLK 1 LT 7	05183111	10	40	4	
TONJESS ESTATES	BLK 1 LT 7	05183111	40	119	8	
TONJESS ESTATES	BLK 1 LT 7	05183111	119	123	3	
TONJESS ESTATES	BLK 1 LT 7	05183111	123	127	3	3
TONJESS ESTATES	BLK 2 LT 1	05183101	0	23	4	
TONJESS ESTATES	BLK 2 LT 1	05183101	23	400	1	1
TONJESS ESTATES	BLK 2 LT 2	05183102	0	11	3	
TONJESS ESTATES	BLK 2 LT 2	05183102	11	13	4	
TONJESS ESTATES	BLK 2 LT 2	05183102	13	280	1	1
TONJESS ESTATES	BLK 2 LT 3	05183226	0	40	4	
TONJESS ESTATES	BLK 2 LT 3	05183226	40	140	1	1
TONJESS ESTATES	BLK 2 LT 4	05183225	0	38	4	
TONJESS ESTATES	BLK 2 LT 4	05183225	38	199	1	1
TONJESS ESTATES	BLK 2 LT 6	05183223	0	38	4	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
TONJESS ESTATES	BLK 2 LT 6	05183223	38	185	1	1
TONJESS ESTATES	BLK 2 LT 7	05183222	0	3		
TONJESS ESTATES	BLK 2 LT 7	05183222	3	144	1	
TONJESS ESTATES	BLK 2 LT 8	05183221	0	18	4	
TONJESS ESTATES	BLK 2 LT 8	05183221	18	72	1	1
TONJESS ESTATES	BLK 2 LT 9	05183220	0	5	4	
TONJESS ESTATES	BLK 2 LT 9	05183220	5	245	1	1
TONJESS ESTATES	BLK 2 LT 10	05183103	0	18	3	
TONJESS ESTATES	BLK 2 LT 10	05183103	18	59	4	
TONJESS ESTATES	BLK 2 LT 10	05183103	59	180	1	1
TONJESS ESTATES	BLK 2 LT 11	05183104	0	46	3	
TONJESS ESTATES	BLK 2 LT 11	05183104	46	53	4	
TONJESS ESTATES	BLK 2 LT 11	05183104	53	189	1	1
TONJESS ESTATES	BLK 2 LT 12	05183219	0	30	4	
TONJESS ESTATES	BLK 2 LT 12	05183219	30	240	1	1
TONJESS ESTATES	BLK 2 LT 13	05183218	0	26	3	
TONJESS ESTATES	BLK 2 LT 13	05183218	26	32	4	
TONJESS ESTATES	BLK 2 LT 13	05183218	32	33	3	
TONJESS ESTATES	BLK 2 LT 13	05183218	33	240	1	1
TONJESS ESTATES	BLK 2 LT 14	05183217	0	55	3	
TONJESS ESTATES	BLK 2 LT 14	05183217	55	56	8	
TONJESS ESTATES	BLK 2 LT 14	05183217	56	148	1	1
TONJESS ESTATES	BLK 2 LT 17A	05183228	0	56	3	
TONJESS ESTATES	BLK 2 LT 17A	05183228	56	200	1	1
TONJESS ESTATES	BLK 2 LT 18A	05183227	0	69	4	
TONJESS ESTATES	BLK 2 LT 18A	05183227	69	71	3	3
TONJESS ESTATES	BLK 2 LT 18A	05183227	71	84	1	1
TONJESS ESTATES	BLK 2 LT 19	05183211	0	45	2	
TONJESS ESTATES	BLK 2 LT 19	05183211	45	54	2	2
TONJESS ESTATES	BLK 2 LT 19	05183211	54	60	4	
TONJESS ESTATES	BLK 2 LT 19	05183211	60	108	1	1
TONJESS ESTATES	BLK 2 LT 23	05153211	0	41	4	
TONJESS ESTATES	BLK 2 LT 23	05153211	41	504	1	1
TONJESS ESTATES	BLK 3 LT 2	05183109	0	30	3	
TONJESS ESTATES	BLK 3 LT 2	05183109	30	86	8	
TONJESS ESTATES	BLK 3 LT 2	05183109	86	96	5	5
TONJESS ESTATES	BLK 3 LT 2	05183109	96	101	3	3
TONJESS ESTATES	BLK 3 LT 3	05183108	0	30	3	
TONJESS ESTATES	BLK 3 LT 3	05183108	30	86	8	
TONJESS ESTATES	BLK 3 LT 3	05183108	86	96	5	5
TONJESS ESTATES	BLK 3 LT 3	05183108	96	101	3	3
TONJESS ESTATES	BLK 3 LT 4	05183107	0	40	3	
TONJESS ESTATES	BLK 3 LT 4	05183107	40	62	8	
TONJESS ESTATES	BLK 3 LT 4	05183107	62	75	3	
TONJESS ESTATES	BLK 3 LT 4	05183107	75	82	2	2
TONJESS ESTATES	BLK 3 LT 5	05183106	0	55	3	
TONJESS ESTATES	BLK 3 LT 5	05183106	55	80	5	
TONJESS ESTATES	BLK 3 LT 5	05183106	80	405	1	1
TONJESS ESTATES	BLK 3 LT 6	05183105	0	14	3	
TONJESS ESTATES	BLK 3 LT 6	05183105	14	32	4	
TONJESS ESTATES	BLK 3 LT 6	05183105	32	260	1	1
TONJESS ESTATES	BLK 3 LT 7	05183202	0	78	4	
TONJESS ESTATES	BLK 3 LT 7	05183202	78	83	3	3
TONJESS ESTATES	BLK 3 LT 7	05183202	83	260	1	1
TONJESS ESTATES	BLK 3 LT 8	05183201	0	86	4	
TONJESS ESTATES	BLK 3 LT 8	05183201	86	181	1	1
TONJESS ESTATES	BLK 3 LT 10	05183202	0	97	3	
TONJESS ESTATES	BLK 3 LT 10	05183202	97	99	8	
TONJESS ESTATES	BLK 3 LT 10	05183202	99	600	1	1
TONJESS ESTATES	BLK 3 LT 12	05183204	0	24	3	
TONJESS ESTATES	BLK 3 LT 12	05183204	24	31	4	
TONJESS ESTATES	BLK 3 LT 12	05183204	31	280	1	1
TONJESS ESTATES	BLK 3 LT 13	05153205	0	25	3	
TONJESS ESTATES	BLK 3 LT 13	05153205	25	48	4	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
TONJESS ESTATES	BLK 3 LT 13	05153205	48	300	1	1
TONJESS ESTATES	BLK 3 LT 16	05153205	0	29	2	
TONJESS ESTATES	BLK 3 LT 16	05153205	29	515	1	1
TONJESS ESTATES	BLK 3 LT 17	05183206	0	26	3	
TONJESS ESTATES	BLK 3 LT 17	05183206	26	39	4	
TONJESS ESTATES	BLK 3 LT 17	05183206	39	100	1	1
TONJESS ESTATES	BLK 3 LT 18	05183207	0	12	4	
TONJESS ESTATES	BLK 3 LT 18	05183207	12	126	1	1
TONJESS ESTATES	BLK 3 LT 20	05183206	0	14	2	
TONJESS ESTATES	BLK 3 LT 20	05183206	14	235	1	1
TONJESS ESTATES	BLK 3 LT 21	05183209	0	20	4	
TONJESS ESTATES	BLK 3 LT 21	05183209	20	191	1	1
TONJESS ESTATES	BLK 3 LT 24	05183210	0	40	3	
TONJESS ESTATES	BLK 3 LT 24	05183210	40	200	1	1
WHALEY	TR 1A	05111170	0	73	4	
WHALEY	TR 1A	05111170	73	158	3	
WHALEY	TR 1A	05111170	158	198	4	
WHALEY	TR 1A	05111170	198	203	3	3
WHALEY #	TRACT 1	05111154	0	13	5	5
WHALEY #	TRACT 1	05111154	13	58	4	
WHALEY #	TRACT 1	05111154	58	61	5	
WHALEY #	TRACT 1	05111154	61	122	4	
WHALEY #	TRACT 1	05111154	122	124	3	
WHALEY #	TRACT 1	05111154	124	168	4	
WHALEY #	TRACT 1	05111154	168	199	5	
WHALEY #	TRACT 1	05111154	199	230	4	
WHALEY #	TRACT 1	05111154	230	243	7	
WHALEY #	TRACT 1	05111154	243	246	5	5
WHALEY	TR 6	05111110	0	15	4	
WHALEY	TR 6	05111110	15	34	3	
WHALEY	TR 6	05111110	34	62	4	
WHALEY	TR 6	05111110	62	72	3	3
WHALEY	TR 6	05111110	72	97	2	
WHALEY	TR 6	05111110	97	277	1	1
WHALEY #3	BLK 1 LT 1	05149250	0	8	3	
WHALEY #3	BLK 1 LT 1	05149250	8	25	4	
WHALEY #3	BLK 1 LT 1	05149250	25	105	3	
WHALEY #3	BLK 1 LT 1	05149250	105	125	4	
WHALEY #3	BLK 1 LT 1	05149250	125	130	3	
WHALEY #3	BLK 1 LT 1	05149250	130	145	5	
WHALEY #3	BLK 1 LT 1	05149250	145	152	3	3
WHALEY #5	BLK 1B LT 1	05111123	0	175	4	
WHALEY #5	BLK 1B LT 1	05111123	175	187	5	
WHALEY #5	BLK 1B LT 1	05111123	187	190	3	
WHALEY #5	BLK 1B LT 1	05111123	190	205	3	3
WHALEY #5	BLK 1B LT 1	05111123	205	229	3	
WHALEY #5	BLK 1B LT 1	05111123	229	230	8	
WHALEY #5	BLK 1B LT 1	05111123	230	241	2	2
WHALEY #5	BLK 2A LT 6	05111122	0	135	4	
WHALEY #5	BLK 2A LT 6	05111122	135	185	3	
WHALEY #5	BLK 2A LT 6	05111122	185	201	4	
WHALEY #5	BLK 2A LT 6	05111122	201	218	3	
WHALEY #5	BLK 2A LT 6	05111122	218	221	3	3
WHALEY #5	BLK 1B LT 3	05111121	0	39	3	
WHALEY #5	BLK 1B LT 3	05111121	39	83	5	
WHALEY #5	BLK 1B LT 3	05111121	83	147	2	
WHALEY #5	BLK 1B LT 3	05111121	147	179	6	
WHALEY #5	BLK 1B LT 3	05111121	179	203	4	
WHALEY #5	BLK 1B LT 3	05111121	203	224	2	2
EARL RAY	BLK 3 LT 31	05111317	0	83	2	
EARL RAY	BLK 3 LT 31	05111317	83	144	4	
EARL RAY	BLK 3 LT 31	05111317	144	150	3	3
EARL RAY	BLK 3 LT 31	05111317	150	165	4	
SCIMITAR #1	BLK 1 LT 1	05113208	0	2	4	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
SCIMITAR #1	BLK 1 LT 1	05113208	2	40	2	2
SCIMITAR #1	BLK 1 LT 1	05113208	40	43	2	2
SCIMITAR #1	BLK 1 LT 1	05113208	43	74	2	2
SCIMITAR #1	BLK 1 LT 1	05113208	74	76	2	2
SCIMITAR #1	BLK 1 LT 2	05113207	0	20	3	
SCIMITAR #1	BLK 1 LT 2	05113207	20	30	2	
SCIMITAR #1	BLK 1 LT 2	05113207	30	92	4	
SCIMITAR #1	BLK 1 LT 2	05113207	92	580	1	1
SCIMITAR #1	BLK 1 LT 5	05113204	0	15	4	
SCIMITAR #1	BLK 1 LT 5	05113204	15	16	5	5
SCIMITAR #1	BLK 1 LT 5	05113204	16	50	4	
SCIMITAR #1	BLK 1 LT 5	05113204	50	107	2	
SCIMITAR #1	BLK 1 LT 5	05113204	107	170	4	
SCIMITAR #1	BLK 1 LT 5	05113204	170	179	3	3
SCIMITAR #1	BLK 1 LT 5	05113204	179	180	1	
SCIMITAR #1	BLK 1 LT 6	05113203	0	112	2	
SCIMITAR #1	BLK 1 LT 6	05113203	112	162	2	2
SCIMITAR #1	BLK 1 LT 7	05113202	0	222	2	
SCIMITAR #1	BLK 1 LT 7	05113202	222	230	5	
SCIMITAR #1	BLK 1 LT 7	05113202	230	235	2	
SCIMITAR #1	BLK 1 LT 7	05113202	235	230	2	2
SCIMITAR #1	BLK 2 LT 2	05113210	0	160	4	
SCIMITAR #1	BLK 2 LT 2	05113210	160	305	1	1
SCIMITAR #1	BLK 2 LT 3	05113211	0	14	3	
SCIMITAR #1	BLK 2 LT 3	05113211	14	92	4	
SCIMITAR #1	BLK 2 LT 3	05113211	92	99	4	4
SCIMITAR #1	BLK 2 LT 3	05113211	99	107	4	
SCIMITAR #1	BLK 2 LT 3	05113211	107	110	4	4
SCIMITAR #1	BLK 2 LT 3	05113211	110	111	1	1
SCIMITAR #1	BLK 2 LT 4	05113212	0	59	4	
SCIMITAR #1	BLK 2 LT 4	05113212	59	600	1	1
SCIMITAR #1	BLK 2 LT 5	05113213	0	80	3	
SCIMITAR #1	BLK 2 LT 5	05113213	80	400	1	1
SCIMITAR #1	BLK 2 LT 7	05113215	0	15	4	
SCIMITAR #1	BLK 2 LT 7	05113215	15	31	8	
SCIMITAR #1	BLK 2 LT 7	05113215	31	55	3	
SCIMITAR #1	BLK 2 LT 7	05113215	55	76	3	3
SCIMITAR #1	BLK 2 LT 7	05113215	76	90	4	
SCIMITAR #1	BLK 2 LT 7	05113215	90	200	1	1
SCIMITAR #1	BLK 2 LT 8	05113216	0	9	4	
SCIMITAR #1	BLK 2 LT 8	05113216	9	31	3	
SCIMITAR #1	BLK 2 LT 8	05113216	31	42	8	
SCIMITAR #1	BLK 2 LT 8	05113216	42	90	4	
SCIMITAR #1	BLK 2 LT 8	05113216	90	94	4	4
SCIMITAR #1	BLK 2 LT 8	05113216	94	135	1	
SCIMITAR #1	BLK 2 LT 8	05113216	135	137	1	1
SCIMITAR #1	BLK 2 LT 8	05113216	137	184	1	
SCIMITAR #1	BLK 2 LT 8	05113216	184	188	1	1
SCIMITAR #1	BLK 2 LT 8	05113216	188	200	1	
SCIMITAR #1	BLK 2 LT 9	05113217	0	92	4	
SCIMITAR #1	BLK 2 LT 9	05113217	92	103	1	
SCIMITAR #1	BLK 2 LT 9	05113217	103	263	1	1
SCIMITAR #1	BLK 2 LT 10	05113218	0	18	4	
SCIMITAR #1	BLK 2 LT 10	05113218	18	55	3	
SCIMITAR #1	BLK 2 LT 10	05113218	55	95	4	
SCIMITAR #1	BLK 2 LT 10	05113218	95	101	3	3
SCIMITAR #1	BLK 2 LT 10	05113218	101	134	4	
SCIMITAR #1	BLK 2 LT 10	05113218	134	205	1	1
SCIMITAR #1	BLK 2 LT 14	05113222	0	63	3	
SCIMITAR #1	BLK 2 LT 14	05113222	63	65	2	
SCIMITAR #1	BLK 2 LT 14	05113222	65	105	3	
SCIMITAR #1	BLK 2 LT 14	05113222	105	107	2	2
SCIMITAR #1	BLK 2 LT 14	05113222	107	180	1	1
SCIMITAR #1	BLK 2 LT 15	05113223	0	21	3	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
SCIMITAR #1	BLK 2 LT 15	05113223	21	23	5	
SCIMITAR #1	BLK 2 LT 15	05113223	23	136	4	
SCIMITAR #1	BLK 2 LT 15	05113223	136	137	2	2
SCIMITAR #1	BLK 2 LT 15	05113223	137	139	8	
SCIMITAR #1	BLK 2 LT 15	05113223	139	900	1	1
SCIMITAR #1	BLK 2 LT 19	05113227	0	47	3	
SCIMITAR #1	BLK 2 LT 19	05113227	47	163	4	
SCIMITAR #1	BLK 2 LT 19	05113227	163	840	1	1
SCIMITAR #1	BLK 2 LT 20	05113228	0	10	4	
SCIMITAR #1	BLK 2 LT 20	05113228	10	12	5	
SCIMITAR #1	BLK 2 LT 20	05113228	12	208	4	
SCIMITAR #1	BLK 2 LT 20	05113228	208	212	3	3
SCIMITAR #1	BLK 2 LT 21	05113229	0	72	3	
SCIMITAR #1	BLK 2 LT 21	05113229	72	187	4	
SCIMITAR #1	BLK 2 LT 21	05113229	187	268	1	
SCIMITAR #1	BLK 2 LT 21	05113229	268	285	1	1
SCIMITAR #1	BLK 3 LT 1	05113239	0	35	4	
SCIMITAR #1	BLK 3 LT 1	05113239	35	38	3	
SCIMITAR #1	BLK 3 LT 1	05113239	38	85	4	
SCIMITAR #1	BLK 3 LT 1	05113239	85	97	3	
SCIMITAR #1	BLK 3 LT 1	05113239	97	99	3	3
SCIMITAR #1	BLK 3 LT 1	05113239	99	150	1	1
SCIMITAR #1	BLK 3 LT 2	05113238	0	54	3	
SCIMITAR #1	BLK 3 LT 2	05113238	54	94	4	
SCIMITAR #1	BLK 3 LT 2	05113238	94	600	1	1
SCIMITAR #1	BLK 3 LT 3	05113237	0	18	4	
SCIMITAR #1	BLK 3 LT 3	05113237	18	76	3	
SCIMITAR #1	BLK 3 LT 3	05113237	76	81	3	3
SCIMITAR #1	BLK 3 LT 3	05113237	81	123	4	
SCIMITAR #1	BLK 3 LT 3	05113237	123	124	1	
SCIMITAR #1	BLK 3 LT 5	05113235	0	37	3	
SCIMITAR #1	BLK 3 LT 5	05113235	37	84	4	
SCIMITAR #1	BLK 3 LT 5	05113235	84	101	7	
SCIMITAR #1	BLK 3 LT 5	05113235	101	271	1	1
SCIMITAR #1	BLK 3 LT 7	05113233	0	36	3	
SCIMITAR #1	BLK 3 LT 7	05113233	36	37	2	2
SCIMITAR #1	BLK 3 LT 7	05113233	37	112	4	
SCIMITAR #1	BLK 3 LT 7	05113233	112	305	1	1
SCIMITAR #1	BLK 3 LT 8	05113232	0	70	4	
SCIMITAR #1	BLK 3 LT 8	05113232	70	115	4	4
SCIMITAR #1	BLK 3 LT 8	05113232	115	330	1	1
SCIMITAR #1	BLK 3 LT 9	05113231	0	136	4	
SCIMITAR #1	BLK 3 LT 9	05113231	136	370	1	1
SCIMITAR #1	BLK 3 LT 10	05113230A	0	121	3	
SCIMITAR #1	BLK 3 LT 10	05113230A	121	740	1	1
SCIMITAR #1	BLK 3 LT 10	05113230B	0	20	3	
SCIMITAR #1	BLK 3 LT 10	05113230B	20	87	3	
SCIMITAR #1	BLK 3 LT 10	05113230B	87	96	4	
SCIMITAR #1	BLK 3 LT 10	05113230B	96	104	7	
SCIMITAR #1	BLK 3 LT 10	05113230B	104	132	4	
SCIMITAR #1	BLK 3 LT 10	05113230B	132	154	2	2
SCIMITAR #1	BLK 3 LT 10	05113230B	154	407	1	1
SCIMITAR #2	BLK 2 LT 22	05113240	0	145	4	
SCIMITAR #2	BLK 2 LT 22	05113240	145	147	4	4
SCIMITAR #2	BLK 2 LT 22	05113240	147	157	4	
SCIMITAR #2	BLK 2 LT 22	05113240	157	284	1	1
SCIMITAR #2	BLK 2 LT 23	05113241	0	29	3	
SCIMITAR #2	BLK 2 LT 23	05113241	29	33	5	
SCIMITAR #2	BLK 2 LT 23	05113241	33	125	4	
SCIMITAR #2	BLK 2 LT 23	05113241	125	133	3	
SCIMITAR #2	BLK 2 LT 23	05113241	133	141	4	
SCIMITAR #2	BLK 2 LT 23	05113241	141	155	3	
SCIMITAR #2	BLK 2 LT 23	05113241	155	162	3	3
SCIMITAR #2	BLK 2 LT 23	05113241	162	200	1	1

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
SCIMITAR #2	BLK 2 LT 24	05113242	0	26	3	
SCIMITAR #2	BLK 2 LT 24	05113242	26	34	5	
SCIMITAR #2	BLK 2 LT 24	05113242	34	55	3	
SCIMITAR #2	BLK 2 LT 24	05113242	55	62	2	
SCIMITAR #2	BLK 2 LT 24	05113242	62	157	3	
SCIMITAR #2	BLK 2 LT 24	05113242	157	300	1	1
SCIMITAR #2	BLK 2 LT 25	05113243	0	60	2	
SCIMITAR #2	BLK 2 LT 25	05113243	60	80	2	2
SCIMITAR #2	BLK 2 LT 26	05113244	0	85	2	
SCIMITAR #2	BLK 2 LT 26	05113244	85	180	1	1
SCIMITAR #2	BLK 2 LT 27	05113245	0	10	2	
SCIMITAR #2	BLK 2 LT 27	05113245	10	21	3	
SCIMITAR #2	BLK 2 LT 27	05113245	21	61	2	2
SCIMITAR #2	BLK 2 LT 28	05113246	0	10	3	
SCIMITAR #2	BLK 2 LT 28	05113246	10	50	4	
SCIMITAR #2	BLK 2 LT 28	05113246	50	440	1	1
SCIMITAR #2	BLK 2 LT 29	05113247	0	51	3	
SCIMITAR #2	BLK 2 LT 29	05113247	51	655	1	1
SCIMITAR #2	BLK 2 LT 31	05113249	0	8	3	
SCIMITAR #2	BLK 2 LT 31	05113249	8	34	4	
SCIMITAR #2	BLK 2 LT 31	05113249	34	440	1	1
SCIMITAR #2	BLK 2 LT 33	05113251	0	8	4	
SCIMITAR #2	BLK 2 LT 33	05113251	8	400	1	1
SCIMITAR #2	BLK 2 LT 36	05113254	0	101	3	
SCIMITAR #2	BLK 2 LT 36	05113254	101	364	1	1
SCIMITAR #2	BLK 3 LT 11	05113267	0	115	4	
SCIMITAR #2	BLK 3 LT 11	05113267	115	600	1	1
SCIMITAR #2	BLK 3 LT 12	05113266	0	41	4	
SCIMITAR #2	BLK 3 LT 12	05113266	41	46	2	
SCIMITAR #2	BLK 3 LT 12	05113266	46	93	4	
SCIMITAR #2	BLK 3 LT 12	05113266	93	682	1	1
SCIMITAR #2	BLK 3 LT 13	05113265	0	68	4	
SCIMITAR #2	BLK 3 LT 13	05113265	68	400	1	1
SCIMITAR #2	BLK 3 LT 14	05113264	253	400	1	
SCIMITAR #2	BLK 3 LT 15	05113263	0	99	4	
SCIMITAR #2	BLK 3 LT 15	05113263	99	625	1	1
SCIMITAR #2	BLK 3 LT 16	05113262	0	87	4	
SCIMITAR #2	BLK 3 LT 16	05113262	87	400	1	1
SCIMITAR #2	BLK 3 LT 18	05113260	0	94	3	
SCIMITAR #2	BLK 3 LT 18	05113260	94	600	1	1
SCIMITAR #2	BLK 3 LT 19	05113259	0	42	3	
SCIMITAR #2	BLK 3 LT 19	05113259	42	46	3	
SCIMITAR #2	BLK 3 LT 19	05113259	46	51	2	
SCIMITAR #2	BLK 3 LT 19	05113259	51	66	5	
SCIMITAR #2	BLK 3 LT 19	05113259	66	130	2	
SCIMITAR #2	BLK 3 LT 19	05113259	130	185	1	1
SCIMITAR #2	BLK 4 LT 10	05113256	0	2	3	
SCIMITAR #2	BLK 4 LT 10	05113256	2	180	1	1
SCIMITAR #3	BLK 1 LT 1	05113268	0	93	3	
SCIMITAR #3	BLK 1 LT 1	05113268	93	545	1	1
SCIMITAR #3	BLK 1 LT 2	05113269	0	30	2	
SCIMITAR #3	BLK 1 LT 2	05113269	30	92	4	
SCIMITAR #3	BLK 1 LT 2	05113269	92	580	1	1
SCIMITAR #3	BLK 1 LT 3	05113270	0	83	3	
SCIMITAR #3	BLK 1 LT 3	05113270	83	495	1	1
SCIMITAR #3	BLK 1 LT 4	05113271A	0	80	4	
SCIMITAR #3	BLK 1 LT 4	05113271A	80	408	1	1
SCIMITAR #3	BLK 1 LT 4	05113271B	0	42	3	
SCIMITAR #3	BLK 1 LT 4	05113271B	42	60	2	
SCIMITAR #3	BLK 1 LT 4	05113271B	60	180	4	
SCIMITAR #3	BLK 1 LT 4	05113271B	180	605	1	1
SCIMITAR #3	BLK 1 LT 5	05113272	0	74	4	
SCIMITAR #3	BLK 1 LT 5	05113272	74	308	1	1
SCIMITAR #3	BLK 1 LT 6	05113273	0	75	3	

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Lithologic Log Data

Parcel Name	Parcel Block/Lot	Parcel ID	Start Depth (ft.)	End Depth (ft.)	Lithologic Type	Aquifer Type
SCIMITAR #3	BLK 1 LT 6	05113273	75	375	1	
SCIMITAR #3	BLK 1 LT 6	05113273	375	387	1	1
SCIMITAR #3	BLK 1 LT 7	05113274	0	10	3	
SCIMITAR #3	BLK 1 LT 7	05113274	10	40	2	2
SCIMITAR #3	BLK 1 LT 7	05113274	40	75	5	5
SCIMITAR #3	BLK 1 LT 7	05113274	75	304	1	1
SCIMITAR #3	BLK 1 LT 8	05113275	0	158	2	
SCIMITAR #3	BLK 1 LT 8	05113275	158	550	1	1
SCIMITAR #3	BLK 1 LT 9	05113276	0	112	4	
SCIMITAR #3	BLK 1 LT 9	05113276	112	587	1	1
SCIMITAR #3	BLK 1 LT 10A	05113289	0	165	4	
SCIMITAR #3	BLK 1 LT 10A	05113289	165	767	1	1
SCIMITAR #3	BLK 1 LT 11A	05113290	0	20	4	
SCIMITAR #3	BLK 1 LT 11A	05113290	20	125	2	
SCIMITAR #3	BLK 1 LT 11A	05113290	125	135	5	
SCIMITAR #3	BLK 1 LT 11A	05113290	135	139	2	2
SCIMITAR #3	BLK 1 LT 11A	05113290	139	146	7	
SCIMITAR #3	BLK 1 LT 11A	05113290	146	164	2	
SCIMITAR #3	BLK 1 LT 11A	05113290	164	465	1	1
SCIMITAR #3	BLK 1 LT 12	05113279	0	170	4	
SCIMITAR #3	BLK 1 LT 12	05113279	170	680	1	1
SCIMITAR #3	BLK 1 LT 13	05113280	0	114	2	
SCIMITAR #3	BLK 1 LT 13	05113280	114	125	5	5
SCIMITAR #3	BLK 1 LT 13	05113280	125	127	7	
SCIMITAR #3	BLK 1 LT 13	05113280	127	143	2	
SCIMITAR #3	BLK 1 LT 13	05113280	143	285	1	1
SCIMITAR #3	BLK 1 LT 14	05113281	0	55	2	
SCIMITAR #3	BLK 1 LT 14	05113281	55	75	7	
SCIMITAR #3	BLK 1 LT 14	05113281	75	105	3	
SCIMITAR #3	BLK 1 LT 14	05113281	105	120	2	2
SCIMITAR #3	BLK 1 LT 14	05113281	120	265	1	1
SCIMITAR #3	BLK 1 LT 15	05113282	0	84	3	
SCIMITAR #3	BLK 1 LT 15	05113282	84	265	1	1
SCIMITAR #3	BLK 1 LT 16	05113283	0	33	4	
SCIMITAR #3	BLK 1 LT 16	05113283	33	280	1	1
SCIMITAR #3	BLK 2 LT 1	05113401	0	16	3	
SCIMITAR #3	BLK 2 LT 1	05113401	16	213	1	1
SCIMITAR #3	BLK 2 LT 2	05113402	0	16	4	
SCIMITAR #3	BLK 2 LT 2	05113402	16	173	1	1
SCIMITAR #3	BLK 3 LT 1	05113284	0	16	2	
SCIMITAR #3	BLK 3 LT 1	05113284	16	40	4	
SCIMITAR #3	BLK 3 LT 1	05113284	40	44	3	
SCIMITAR #3	BLK 3 LT 1	05113284	44	60	4	
SCIMITAR #3	BLK 3 LT 1	05113284	60	126	1	1
SCIMITAR #3	BLK 3 LT 2	05113285	0	40	4	
SCIMITAR #3	BLK 3 LT 2	05113285	40	45	3	3
SCIMITAR #3	BLK 3 LT 2	05113285	45	60	4	
SCIMITAR #3	BLK 3 LT 2	05113285	60	266	1	1
SCIMITAR #3	BLK 3 LT 3	05113286	0	45	4	
SCIMITAR #3	BLK 3 LT 3	05113286	45	500	1	1
SCIMITAR #3	BLK 3 LT 4	05113287	0	40	4	
SCIMITAR #3	BLK 3 LT 4	05113287	40	285	1	1
SCIMITAR #3	TRACT 1A	05113333A	0	65	4	
SCIMITAR #3	TRACT 1A	05113333A	65	66	3	3
SCIMITAR #3	TRACT 1A	05113333A	66	70	4	
SCIMITAR #3	TRACT 1A	05113333A	70	104	6	
SCIMITAR #3	TRACT 1A	05113333A	104	112	3	3
SCIMITAR #3	TRACT 1A	05113333B	0	5	4	
SCIMITAR #3	TRACT 1A	05113333B	5	17	5	
SCIMITAR #3	TRACT 1A	05113333B	17	30	4	
SCIMITAR #3	TRACT 1A	05113333B	30	43	5	
SCIMITAR #3	TRACT 1A	05113333B	43	66	4	
SCIMITAR #3	TRACT 1A	05113333B	66	500	1	1

Note:
1) Lithologic interpretations from available well logs March, 1999

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
SCIMITAR #1	BLK 1 LT 1	05113208	4.1	4/1/92
SCIMITAR #1	BLK 1 LT 1	05113208	5.8	8/5/98
SCIMITAR #1	BLK 1 LT 5	05113204	7.8	3/2/92
SCIMITAR #1	BLK 1 LT 5	05113204	6.8	6/6/94
SCIMITAR #1	BLK 1 LT 5	05113204	7.6	11/1/93
SCIMITAR #1	BLK 1 LT 5	05113204	3	9/12/88
SCIMITAR #1	BLK 1 LT 6	05113203	4.4	4/1/92
SCIMITAR #1	BLK 1 LT 6	05113203	3.7	6/13/91
SCIMITAR #1	BLK 1 LT 7	05113202	0	2/12/88
SCIMITAR #1	BLK 2 LT 1	05113209	0	3/1/92
SCIMITAR #1	BLK 2 LT 2	05113210	4.2	2/1/92
SCIMITAR #1	BLK 2 LT 2	05113210	4.5	4/1/93
SCIMITAR #1	BLK 2 LT 3	05113211	4.8	11/1/93
SCIMITAR #1	BLK 2 LT 4	05113212	0	1/19/89
SCIMITAR #1	BLK 2 LT 5	05113213	2.67	12/17/98
SCIMITAR #1	BLK 2 LT 6	05113214	2.7	2/1/92
SCIMITAR #1	BLK 2 LT 7	05113215	6.8	11/1/93
SCIMITAR #1	BLK 2 LT 8	05113216	4.5	3/20/92
SCIMITAR #1	BLK 2 LT 8	05113216	5.7	11/1/93
SCIMITAR #1	BLK 2 LT 8	05113216	8.38	8/26/98
SCIMITAR #1	BLK 2 LT 8	05113216	4.5	3/23/92
SCIMITAR #1	BLK 2 LT 8	05113216	6	6/3/92
SCIMITAR #1	BLK 2 LT 10	05113218	3.5	11/1/93
SCIMITAR #1	BLK 2 LT 10	05113218	3.2	4/1/93
SCIMITAR #1	BLK 2 LT 10	05113218	3	3/1/92
SCIMITAR #1	BLK 2 LT 15	05113223	0	3/1/92
SCIMITAR #1	BLK 2 LT 19	05113227	0.5	2/1/92
SCIMITAR #1	BLK 2 LT 19	05113227	0.5	11/29/90
SCIMITAR #1	BLK 2 LT 19	05113227	0	9/22/89
SCIMITAR #1	BLK 3 LT 3	05113237	6.6	4/1/93
SCIMITAR #1	BLK 3 LT 3	05113237	7.6	1/1/93
SCIMITAR #1	BLK 3 LT 3	05113237	6.9	3/1/92
SCIMITAR #1	BLK 3 LT 3	05113237	7.2	10/1/92
SCIMITAR #1	BLK 3 LT 3	05113237	7	9/15/93
SCIMITAR #1	BLK 3 LT 3	05113237	3.7	9/7/93
SCIMITAR #1	BLK 3 LT 3	05113237	6.2	9/22/93
SCIMITAR #1	BLK 3 LT 3	05113237	6.3	10/18/93
SCIMITAR #1	BLK 3 LT 3	05113237	6.35	10/27/93
SCIMITAR #1	BLK 3 LT 3	05113237	6.7	12/15/93
SCIMITAR #1	BLK 3 LT 5	05113235	1.5	7/20/88
SCIMITAR #1	BLK 3 LT 5	05113235	1.9	11/1/93
SCIMITAR #1	BLK 3 LT 5	05113235	8.85	9/26/97
SCIMITAR #1	BLK 3 LT 5	05113235	1.62	9/3/93
SCIMITAR #1	BLK 3 LT 7	05113233	3.1	3/1/92
SCIMITAR #1	BLK 3 LT 7	05113233	3.4	3/1/92
SCIMITAR #1	BLK 3 LT 7	05113233	3	2/1/92
SCIMITAR #1	BLK 3 LT 7	05113233	0	2/1/92
SCIMITAR #1	BLK 3 LT 7	05113233	3.1	4/1/93
SCIMITAR #1	BLK 3 LT 8	05113232	14.2	10/1/92
SCIMITAR #1	BLK 3 LT 8	05113232	12.5	1/1/93

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data in researched data sources.

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
SCIMITAR #1	BLK 3 LT 8	05113232	13.5	3/1/93
SCIMITAR #1	BLK 3 LT 8	05113232	16.5	4/1/93
SCIMITAR #1	BLK 3 LT 8	05113232	12.7	5/1/93
SCIMITAR #1	BLK 3 LT 8	05113232	17	9/1/93
SCIMITAR #1	BLK 3 LT 8	05113232	15	7/1/92
SCIMITAR #1	BLK 3 LT 8	05113232	0	3/1/92
SCIMITAR #1	BLK 3 LT 8	05113232	14.7	2/1/92
SCIMITAR #1	BLK 3 LT 8	05113232	15.3	2/1/92
SCIMITAR #1	BLK 3 LT 8	05113232	16.1	9/7/93
SCIMITAR #1	BLK 3 LT 8	05113232	15.9	3/28/97
SCIMITAR #1	BLK 3 LT 8	05113232	11.5	12/17/93
SCIMITAR #1	BLK 3 LT 8	05113232	14	10/27/93
SCIMITAR #1	BLK 3 LT 9	05113231	0	2/16/92
SCIMITAR #1	BLK 3 LT 9	05113231	0	11/8/91
SCIMITAR #1	BLK 3 LT 10	05113230	0.1	9/22/93
SCIMITAR #1	BLK 3 LT 10	05113230	0.1	9/22/93
SCIMITAR #1	BLK 3 LT 10	05113230	0	9/1/93
SCIMITAR #1	BLK 3 LT 10	05113230	0	4/23/96
SCIMITAR #1	BLK 3 LT 10	05113230	0	6/25/96
SCIMITAR #2	BLK 2 LT 22	05113240	0.2	11/13/87
SCIMITAR #2	BLK 2 LT 23	05113241	0.8	2/1/92
SCIMITAR #2	BLK 2 LT 24	05113242	0.3	12/22/88
SCIMITAR #2	BLK 2 LT 24	05113242	0.11	4/28/95
SCIMITAR #2	BLK 2 LT 25	05113243	3.5	2/1/92
SCIMITAR #2	BLK 2 LT 26	05113244	3.9	7/16/90
SCIMITAR #2	BLK 2 LT 26	05113244	3.4	2/1/92
SCIMITAR #2	BLK 2 LT 26	05113244	3.2	6/11/91
SCIMITAR #2	BLK 2 LT 26	05113244	4.61	11/19/97
SCIMITAR #2	BLK 2 LT 27	05113245	8	10/1/91
SCIMITAR #2	BLK 2 LT 27	05113245	6.9	3/1/93
SCIMITAR #2	BLK 2 LT 27	05113245	9.7	3/1/92
SCIMITAR #2	BLK 2 LT 27	05113245	0	2/1/92
SCIMITAR #2	BLK 2 LT 27	05113245	8.1	1/1/92
SCIMITAR #2	BLK 2 LT 27	05113245	5.5	12/18/89
SCIMITAR #2	BLK 2 LT 27	05113245	0	1/1/92
SCIMITAR #2	BLK 2 LT 27	05113245	0	3/1/92
SCIMITAR #2	BLK 2 LT 27	05113245	8	12/30/91
SCIMITAR #2	BLK 2 LT 27	05113245	5.8	7/3/89
SCIMITAR #2	BLK 2 LT 28	05113246	0.1	11/1/87
SCIMITAR #2	BLK 2 LT 28	05113246	0.1	2/19/95
SCIMITAR #2	BLK 2 LT 28	05113246	0.1	4/26/95
SCIMITAR #2	BLK 2 LT 35	05113253	3.4	6/1/92
SCIMITAR #2	BLK 2 LT 36	05113254	0.5	8/24/92
SCIMITAR #2	BLK 2 LT 37	05113255	0.3	12/1/93
SCIMITAR #2	BLK 3 LT 11	05113267	0	2/1/92
SCIMITAR #2	BLK 3 LT 13	05113265	0	2/1/92
SCIMITAR #2	BLK 3 LT 13	05113265	0	2/24/93
SCIMITAR #2	BLK 3 LT 14	05113264	3.4	11/1/93
SCIMITAR #2	BLK 3 LT 15	05113264	15	3/1/92
SCIMITAR #2	BLK 3 LT 15	05113264	0.6	4/1/92

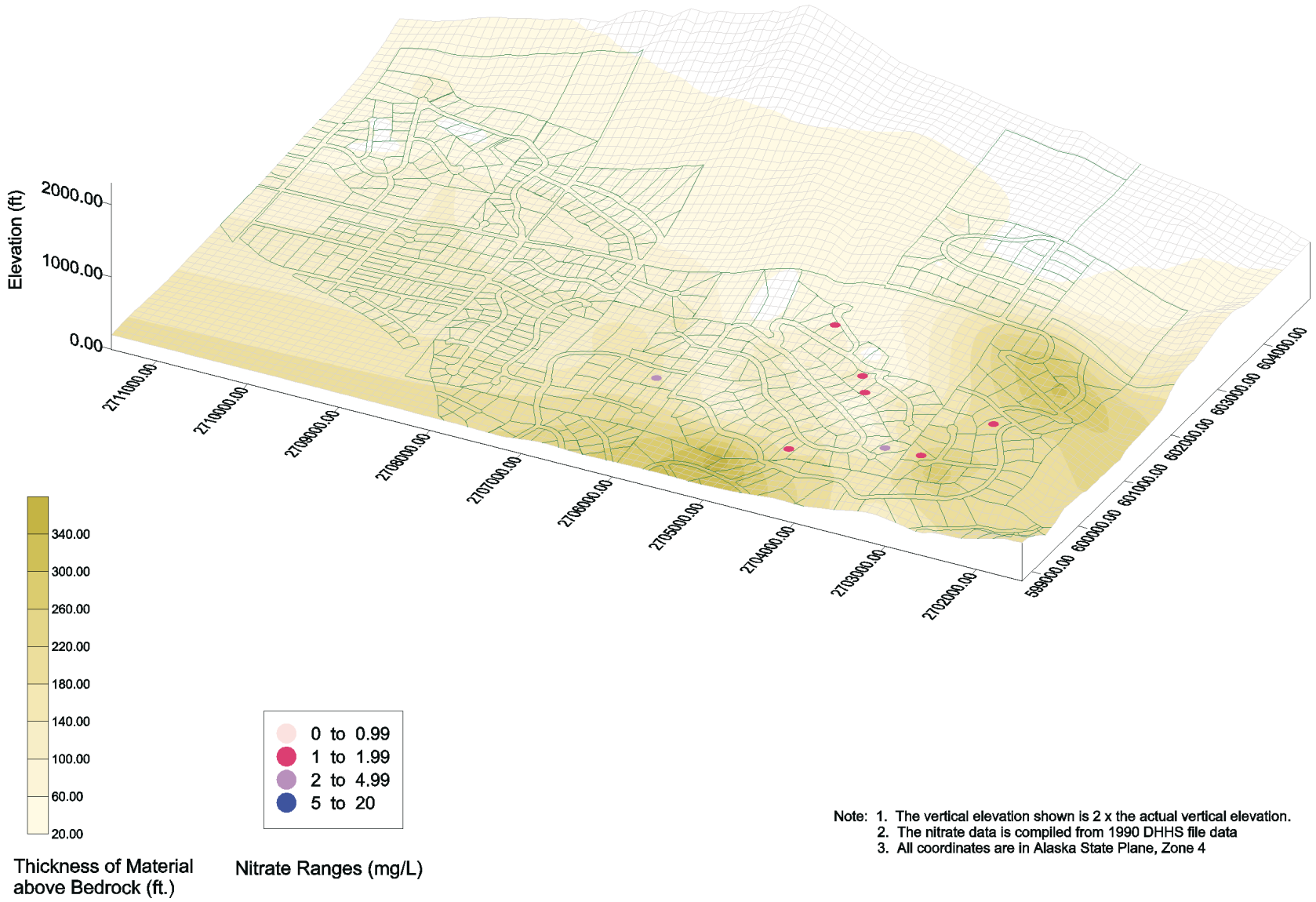
Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data in researched data sources.

Phase II Local Wellhead and Aquifer Protection Program
Scimitar Study Area Nitrate Data

Parcel Name	Parcel Block/Lot	Parcel ID	Nitrate (mg/L)	Sample Date
SCIMITAR #2	BLK 3 LT 16	05113262	4.3	11/1/93
SCIMITAR #2	BLK 3 LT 18	05113260	3.9	10/19/95
SCIMITAR #2	BLK 3 LT 19	05113259	0.5	2/1/92
SCIMITAR #2	BLK 3 LT 19	05113259	3.5	9/1/91
SCIMITAR #2	BLK 3 LT 19	05113259	2.3	4/1/92
SCIMITAR #2	BLK 3 LT 19	05113259	3.9	10/19/95
SCIMITAR #3	BLK 1 LT 1	05113268	0	3/13/88
SCIMITAR #3	BLK 1 LT 1	05113268	0	5/6/93
SCIMITAR #3	BLK 1 LT 2	05113269	0	7/22/89
SCIMITAR #3	BLK 1 LT 2	05113269	0.4	11/30/89
SCIMITAR #3	BLK 1 LT 3	05113270	0	8/2/95
SCIMITAR #3	BLK 1 LT 4	5113271A	3.6	8/1/97
SCIMITAR #3	BLK 1 LT 4	5113271A	0	10/18/88
SCIMITAR #3	BLK 1 LT 4	5113271A	0	11/1/88
SCIMITAR #3	BLK 1 LT 4	5113271A	0.9	1/8/90
SCIMITAR #3	BLK 1 LT 6	05113273	0.2	10/4/90
SCIMITAR #3	BLK 1 LT 7	05113274	0.1	11/18/91
SCIMITAR #3	BLK 1 LT 9	05113276	0	6/9/91
SCIMITAR #3	BLK 1 LT 9	05113276	0	8/2/89
SCIMITAR #3	BLK 1 LT 9	05113276	0	5/1/88
SCIMITAR #3	BLK 1 LT 9	05113276	0	1/1/88
SCIMITAR #3	BLK 1 LT 12	05113279	0	1/7/92
SCIMITAR #3	BLK 1 LT 12	05113279	0.2	10/14/96
SCIMITAR #3	BLK 1 LT 13	05113280	0	6/1/89
SCIMITAR #3	BLK 1 LT 13	05113280	1	6/25/91
SCIMITAR #3	BLK 1 LT 14	05113281	0	6/26/89
SCIMITAR #3	BLK 1 LT 14	05113281	0.6	8/20/87
SCIMITAR #3	BLK 1 LT 14	05113281	0.1	11/1/93
SCIMITAR #3	BLK 1 LT 16	05113283	0	2/1/92
SCIMITAR #3	BLK 1 LT 16	05113283	0	11/1/93
SCIMITAR #3	BLK 1 LT 10A	05113289	0	11/7/91
SCIMITAR #3	BLK 1 LT 10A	05113289	0	4/28/94
SCIMITAR #3	BLK 1 LT 10A	05113289	0	4/1/88
SCIMITAR #3	BLK 1 LT 11A	05113290	0	8/6/92
SCIMITAR #3	BLK 2 LT 1	05113401	0	10/17/96
SCIMITAR #3	BLK 2 LT 2	05113402	0	10/31/89
SCIMITAR #3	BLK 2 LT 2	05113402	0	6/22/94
SCIMITAR #3	BLK 3 LT 1	05113284	0.6	11/11/92
SCIMITAR #3	BLK 3 LT 1	05113284	0.8	6/1/92
SCIMITAR #3	BLK 3 LT 1	05113284	0.83	6/3/92
SCIMITAR #3	BLK 3 LT 2	05113285	0.3	10/18/90
SCIMITAR #3	BLK 3 LT 2	05113285	0.4	6/1/87
SCIMITAR #3	BLK 3 LT 4	05113287	0.3	11/5/92
SCIMITAR #3	BLK 3 LT 4	05113287	0.2	8/14/95

Note:
1) Nitrate data taken from nitrate database.
2) Parcels not listed do not have historic nitrate data in researched data sources.

JOB No. 1189104.010101 dhhs/aquifer/ph2study/d-1.cdr



Note: 1. The vertical elevation shown is 2 x the actual vertical elevation.
2. The nitrate data is compiled from 1990 DHHS file data
3. All coordinates are in Alaska State Plane, Zone 4

MONTGOMERY WATSON

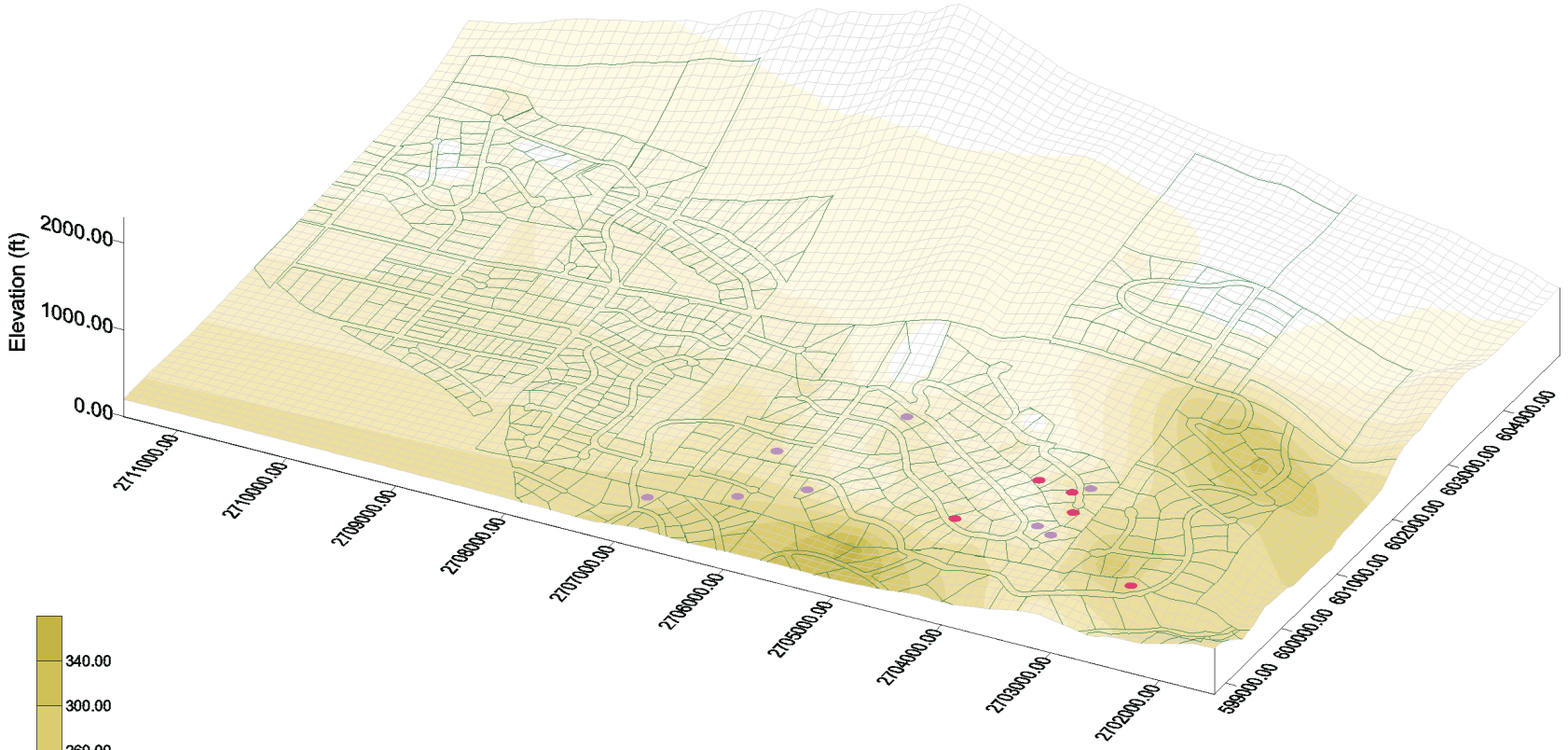
Anchorage, Alaska

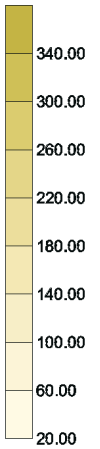
FIGURE D-1

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY - PHASE II

3-D SCIMITAR PILOT STUDY AREA PLOT 1990 NITRATE DATA

JOB No. 1189104.010101 dhhs/aquifer/ph2study/d-2.cdr





Thickness of Material above Bedrock (ft.)

Nitrate Ranges (mg/L)

Note: 1. The vertical elevation shown is 2 x the actual vertical elevation.
2. The nitrate data is compiled from 1991 DHHS file data
3. All coordinates are in Alaska State Plane, Zone 4

MONTGOMERY WATSON

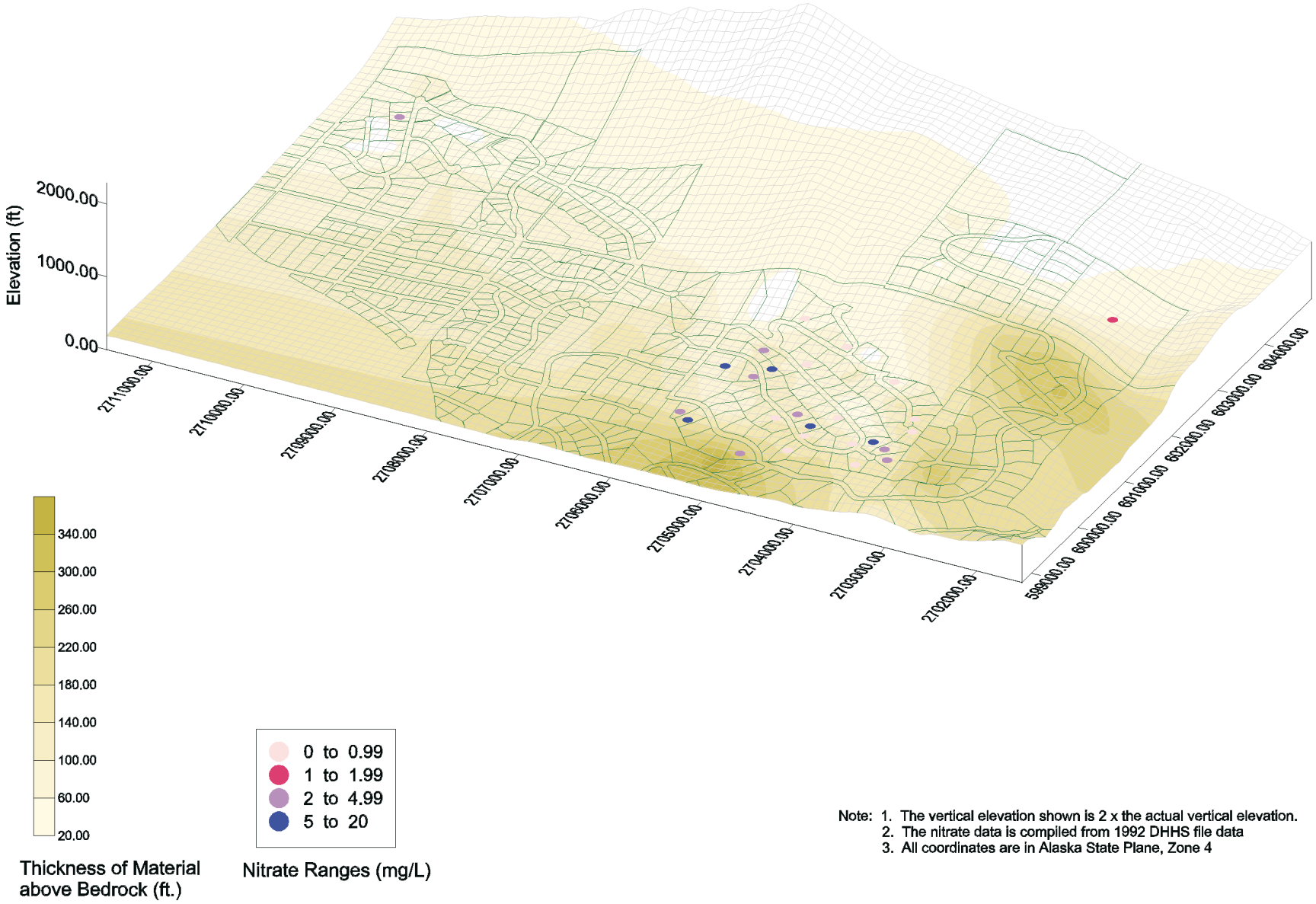
Anchorage, Alaska

FIGURE D-2

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY - PHASE II

3-D SCIMITAR PILOT STUDY AREA PLOT 1991 NITRATE DATA

JOB No. 1189104.010101 dhhs/aquifer/ph2study/d-3.cdr



Note: 1. The vertical elevation shown is 2 x the actual vertical elevation.
2. The nitrate data is compiled from 1992 DHHS file data
3. All coordinates are in Alaska State Plane, Zone 4

MONTGOMERY WATSON

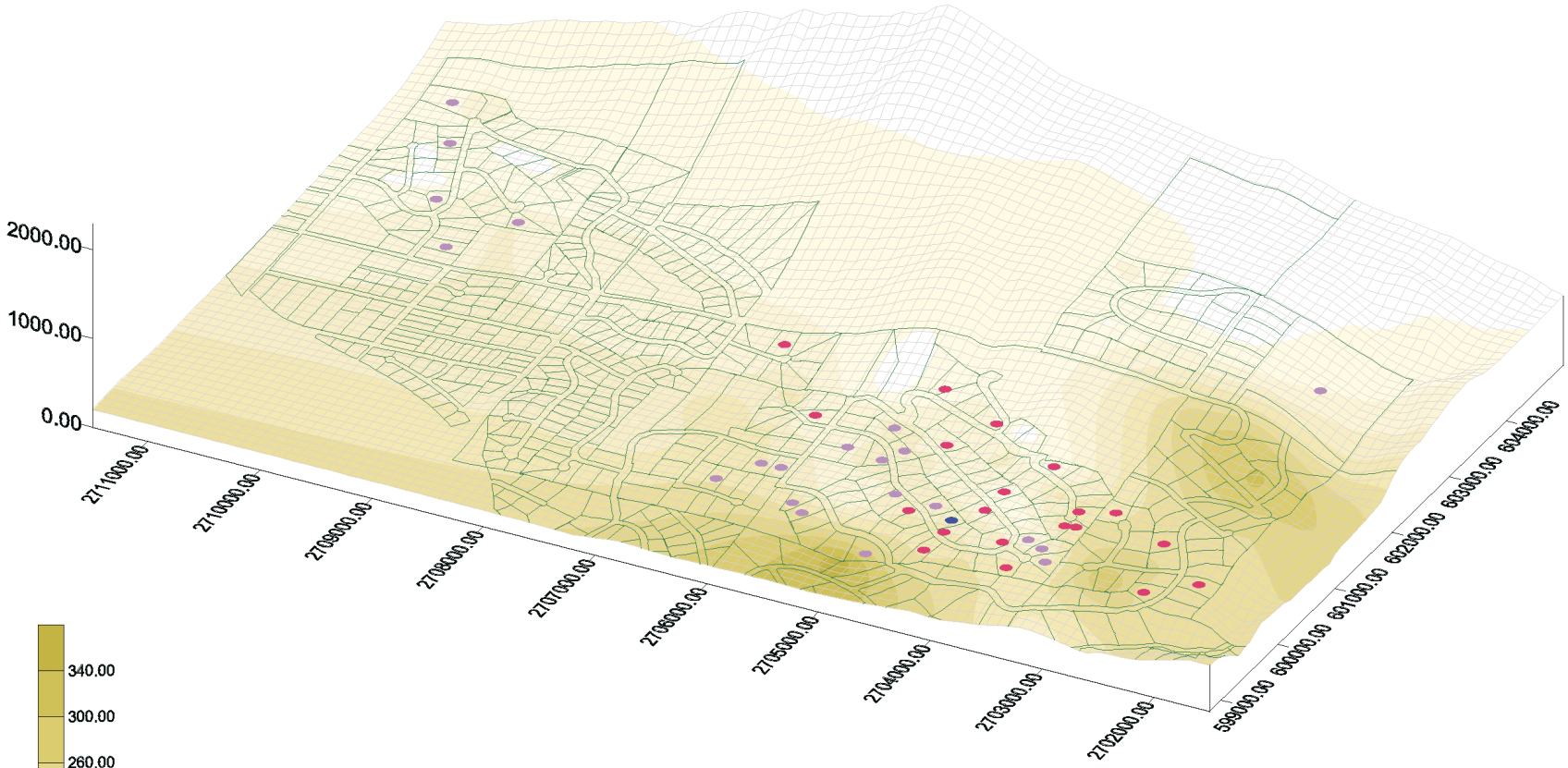
Anchorage, Alaska

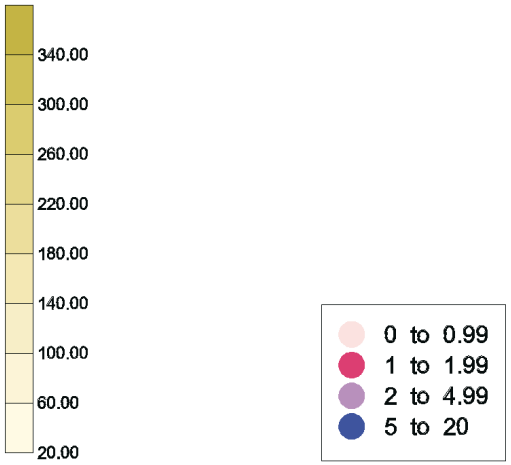
FIGURE D-3

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY - PHASE II

3-D SCIMITAR PILOT STUDY AREA PLOT 1992 NITRATE DATA

JOB No. 1189104.010101 dhhs/aquifer/ph2study/d-4.cdr





Thickness of Material above Bedrock (ft.)

Nitrate Ranges (mg/L)

Note:
1. The vertical elevation shown is 2 x the actual vertical elevation.
2. The nitrate data is compiled from 1993 DHHS file data
3. All coordinates are in Alaska State Plane, Zone 4

MONTGOMERY WATSON

Anchorage, Alaska

FIGURE D-4

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY - PHASE II

3-D SCIMITAR PILOT STUDY AREA PLOT 1993 NITRATE DATA

APPENDIX E

DeArmoun Pilot Study Area Cross-Sections

NORTH

SCALE IN FEET

0 600

A

B

C

D

FILE: S:\Cad\Proj\dhhs\aquifer\ph2study\fig-e1.dgn

TIME: 26-JUN-2000 15:29

JOB No. 118904.010101

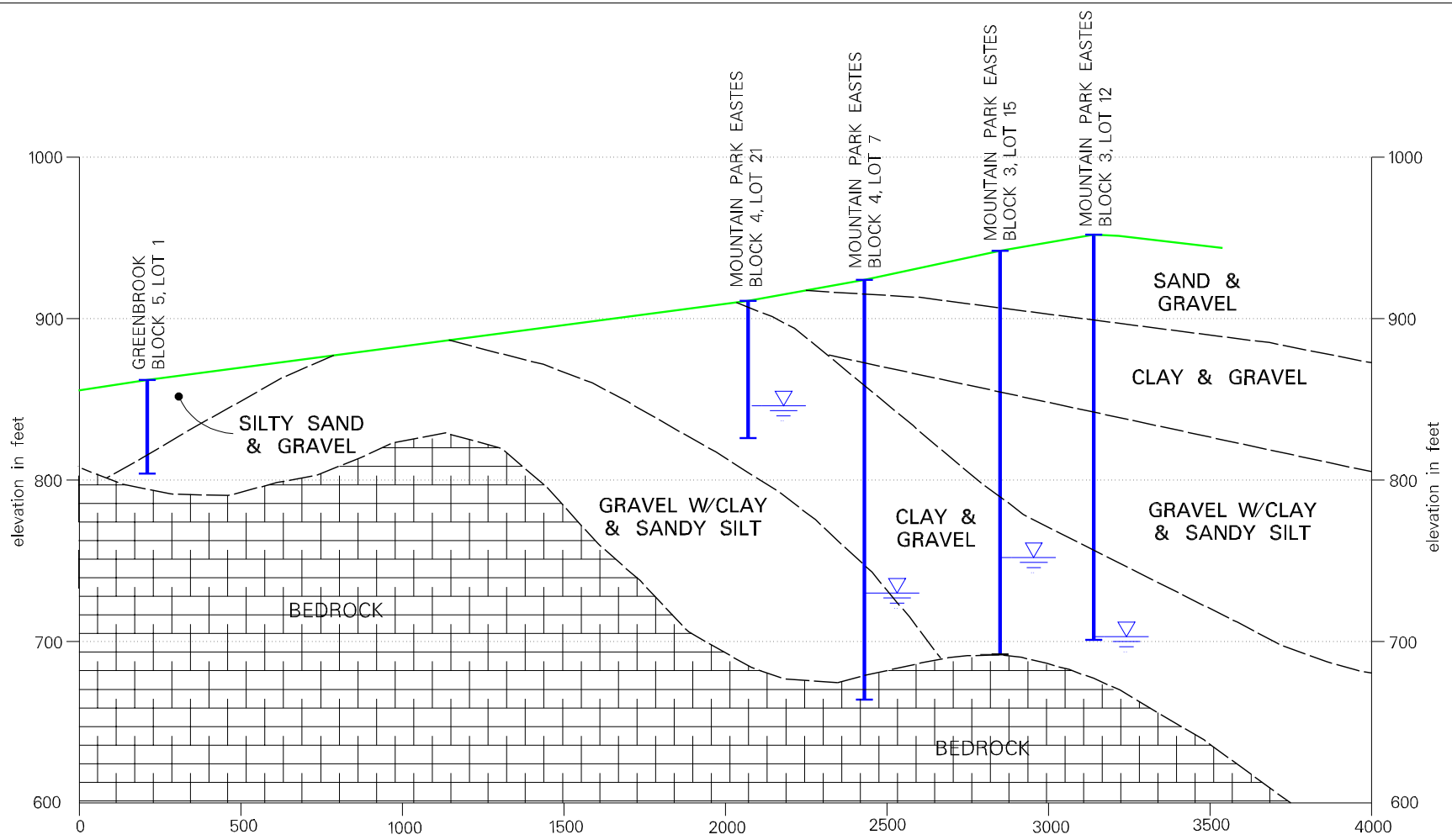
MONTGOMERY WATSON

Anchorage, Alaska

FIGURE E–1

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

WELL LOCATIONS AND SECTIONS



LEGEND:

- GROUND SURFACE
- ASSUMED FORMATION BOUNDARY
- WELL LOG STATIC WATER LEVEL
- WELL

NOTE:

BEDROCK INTERPOLATION FROM U.S. GEOLOGICAL SURVEY – ANCHORAGE AREA

HORIZONTAL SCALE IN FEET
0 500

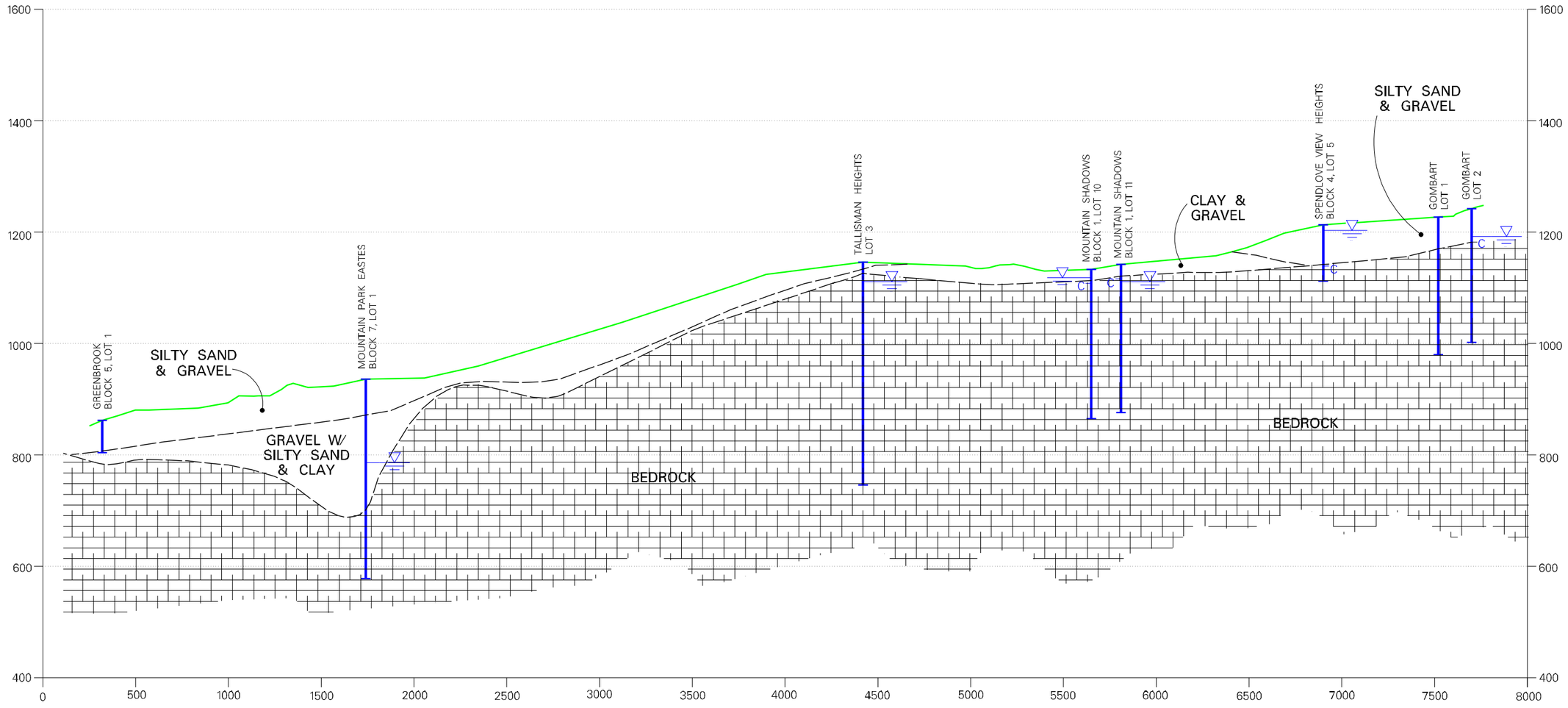
VERTICAL SCALE IN FEET
0 100

MONTGOMERY WATSON
Anchorage, Alaska

FIGURE E–2

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

CROSS–SECTION A



LEGEND:

GROUND SURFACE

ASSUMED FORMATION BOUNDARY

WELL LOG STATIC WATER LEVEL

WELL

C BOTTOM OF CASING

NOTE:

BEDROCK INTERPOLATION FROM
U.S. GEOLOGICAL SURVEY – ANCHORAGE AREA

HORIZONTAL
SCALE IN FEET
0 600

VERTICAL
SCALE IN FEET
0 200

MONTGOMERY WATSON

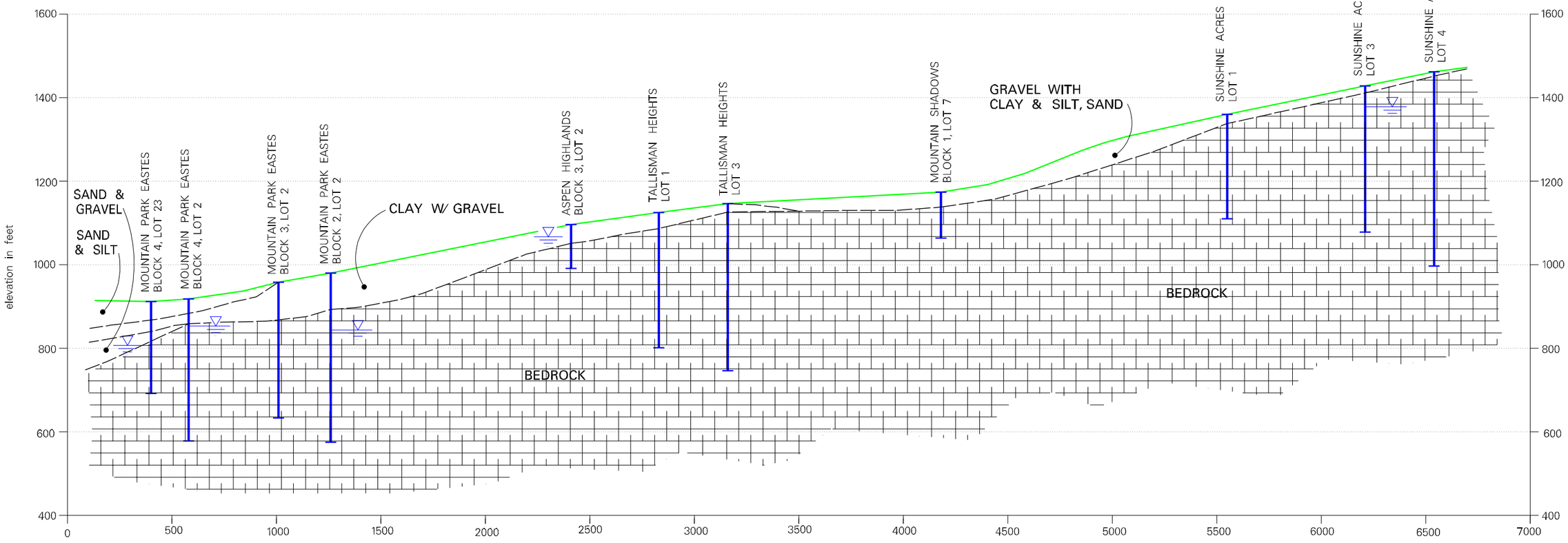
Anchorage, Alaska

FIGURE E–3

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

CROSS–SECTION B

JOB No. 18904.0101 TIME: 26-JUN-2000 15:32 FILE: s:\cad\proj\dnhs\aquifer\ph2study\fig_e3.dgn



LEGEND:

- GROUND SURFACE
- ASSUMED FORMATION BOUNDARY
- WELL LOG STATIC WATER LEVEL
- WELL

NOTE:

BEDROCK INTERPOLATION FROM
U.S. GEOLOGICAL SURVEY – ANCHORAGE AREA

HORIZONTAL SCALE IN FEET
0 500

VERTICAL SCALE IN FEET
0 250

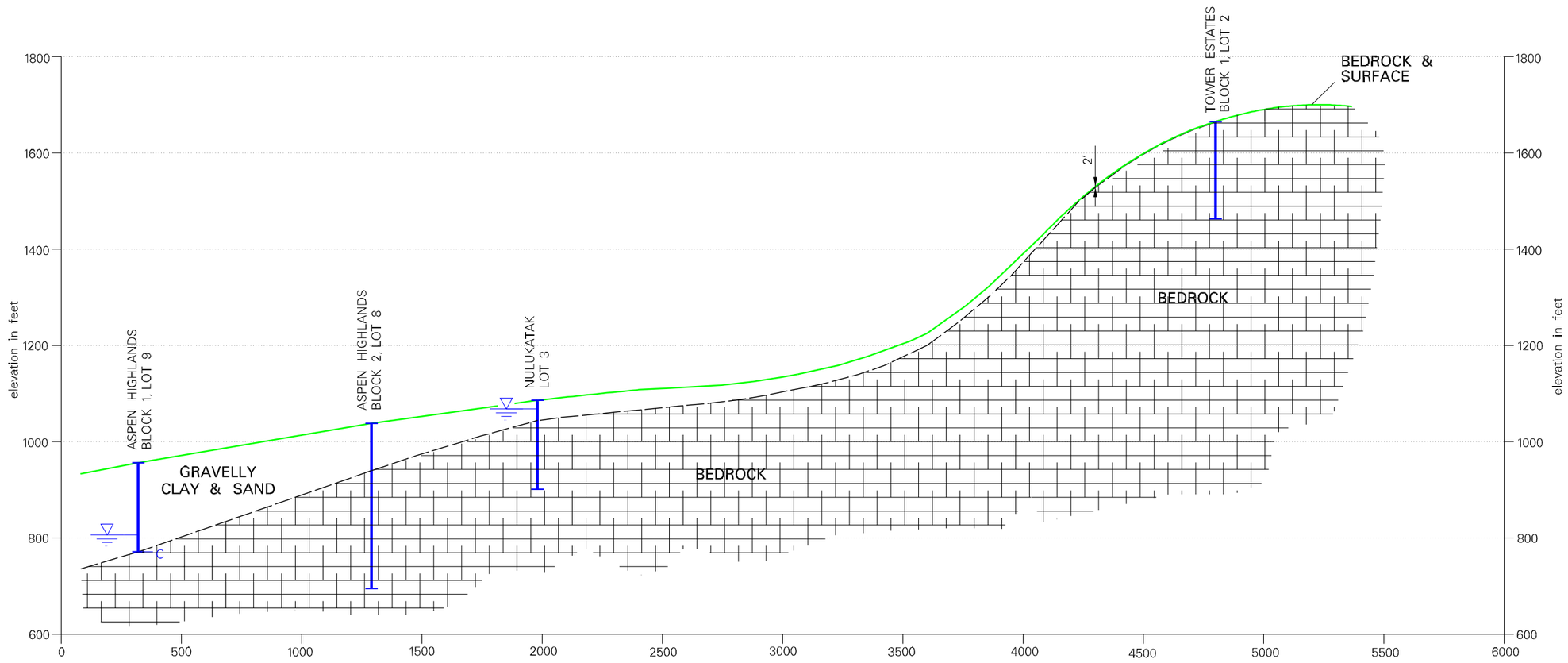
MONTGOMERY WATSON
Anchorage, Alaska

FIGURE E–4

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

CROSS–SECTION C

JOB No. 18910401010I TIME: 26-JUN-2000 15:34 FILE: s:\cad\proj\dnhs\aquifer\ph2study\fig_e4.dgn



LEGEND:

- GROUND SURFACE
- ASSUMED FORMATION BOUNDARY
- WELL LOG STATIC WATER LEVEL
- WELL
- C — BOTTOM OF CASING

NOTE:

BEDROCK INTERPOLATION FROM
U.S. GEOLOGICAL SURVEY – ANCHORAGE AREA

HORIZONTAL SCALE IN FEET
0 500

VERTICAL SCALE IN FEET
0 250

MONTGOMERY WATSON
Anchorage, Alaska

FIGURE E–5

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

CROSS–SECTION D

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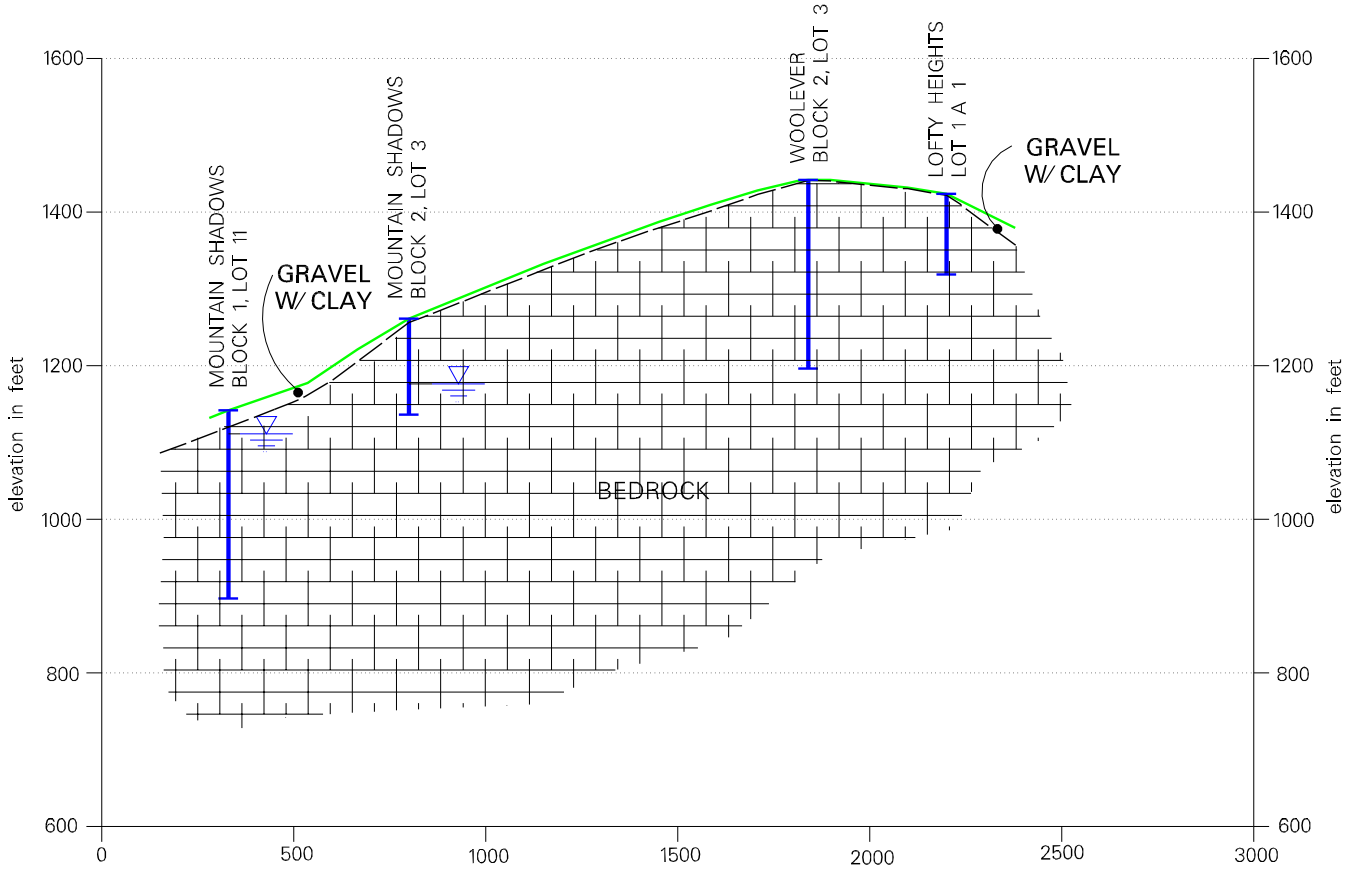
JOB No. 118904.010101



LEGEND:

GROUND SURFACE

ASSUMED FORMATION BOUNDARY

WELL LOG STATIC WATER LEVEL

WELL

NOTE:

BEDROCK INTERPOLATION FROM
U.S. GEOLOGICAL SURVEY – ANCHORAGE AREA

HORIZONTAL
SCALE IN FEET
0 500

VERTICAL
SCALE IN FEET
0 250

MONTGOMERY WATSON

Anchorage, Alaska

FIGURE E–6

MUNICIPALITY OF ANCHORAGE
LOCAL WELLHEAD AND AQUIFER PROTECTION STUDY – PHASE II

CROSS–SECTION E

APPENDIX F

DeArmoun Pilot Study Area Scatter Plots

Figure F-1

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Well Depth (n=101)

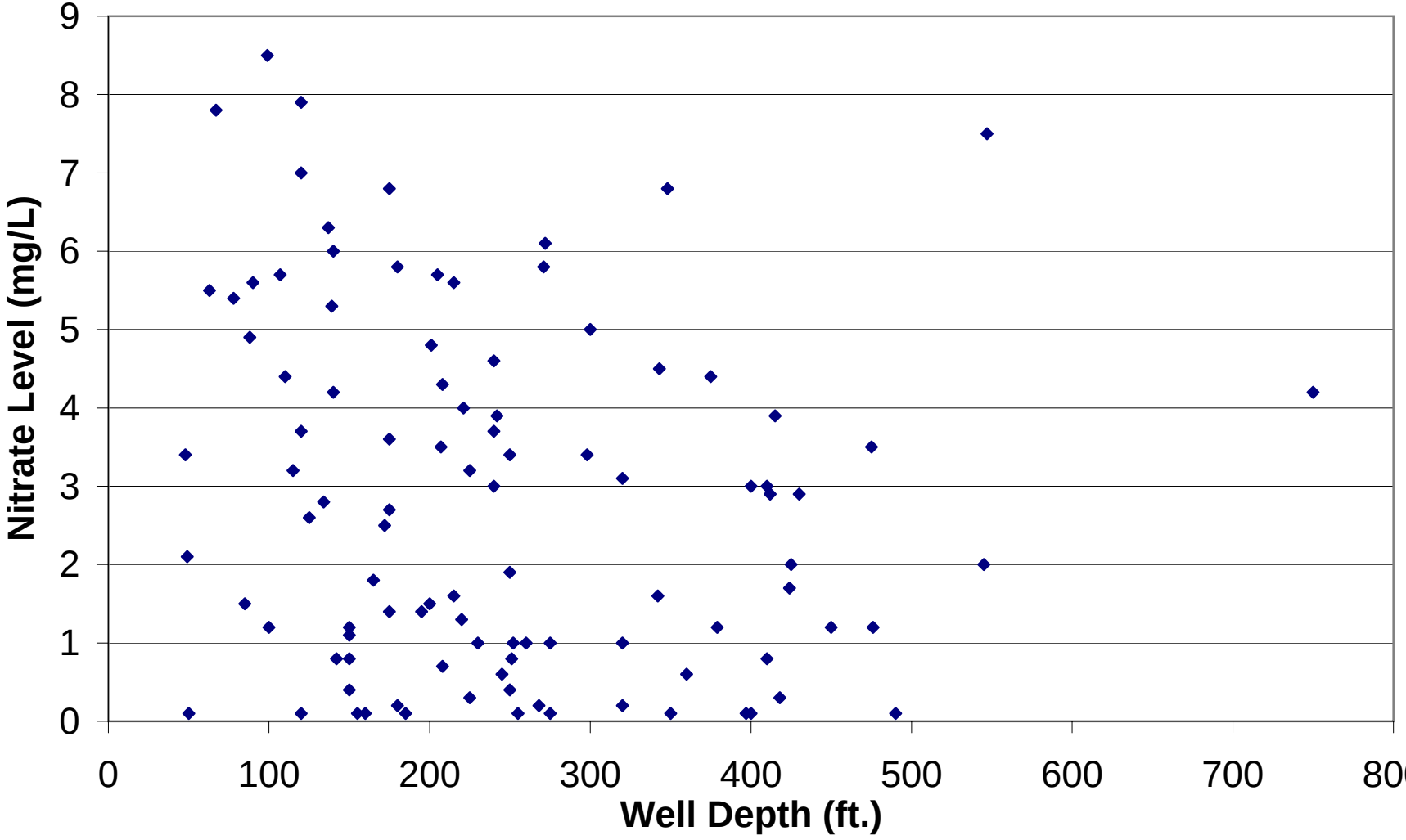


Figure F-2

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Casing Depth (n=80)

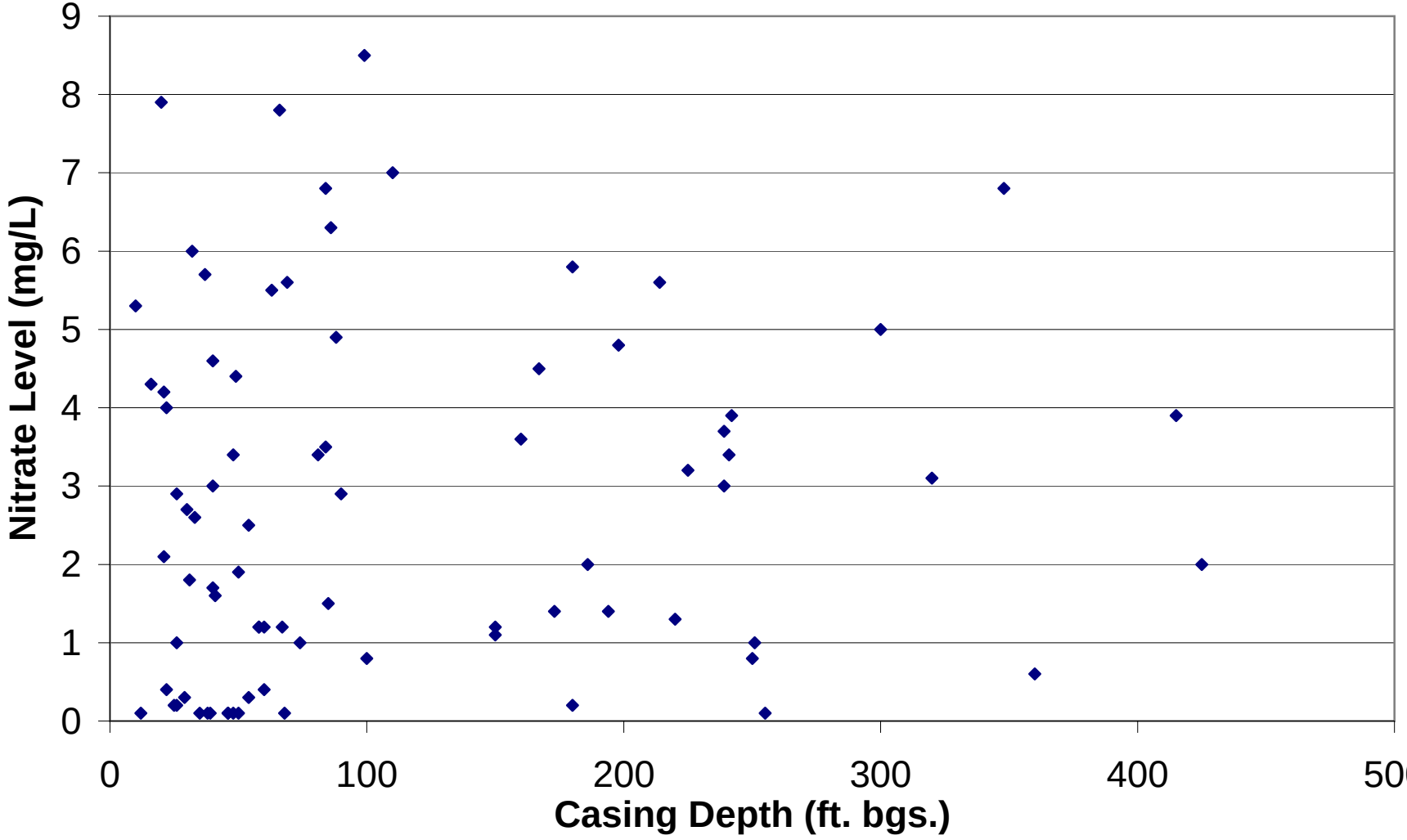


Figure F-3

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Distance Well to Septic Field (n=104)

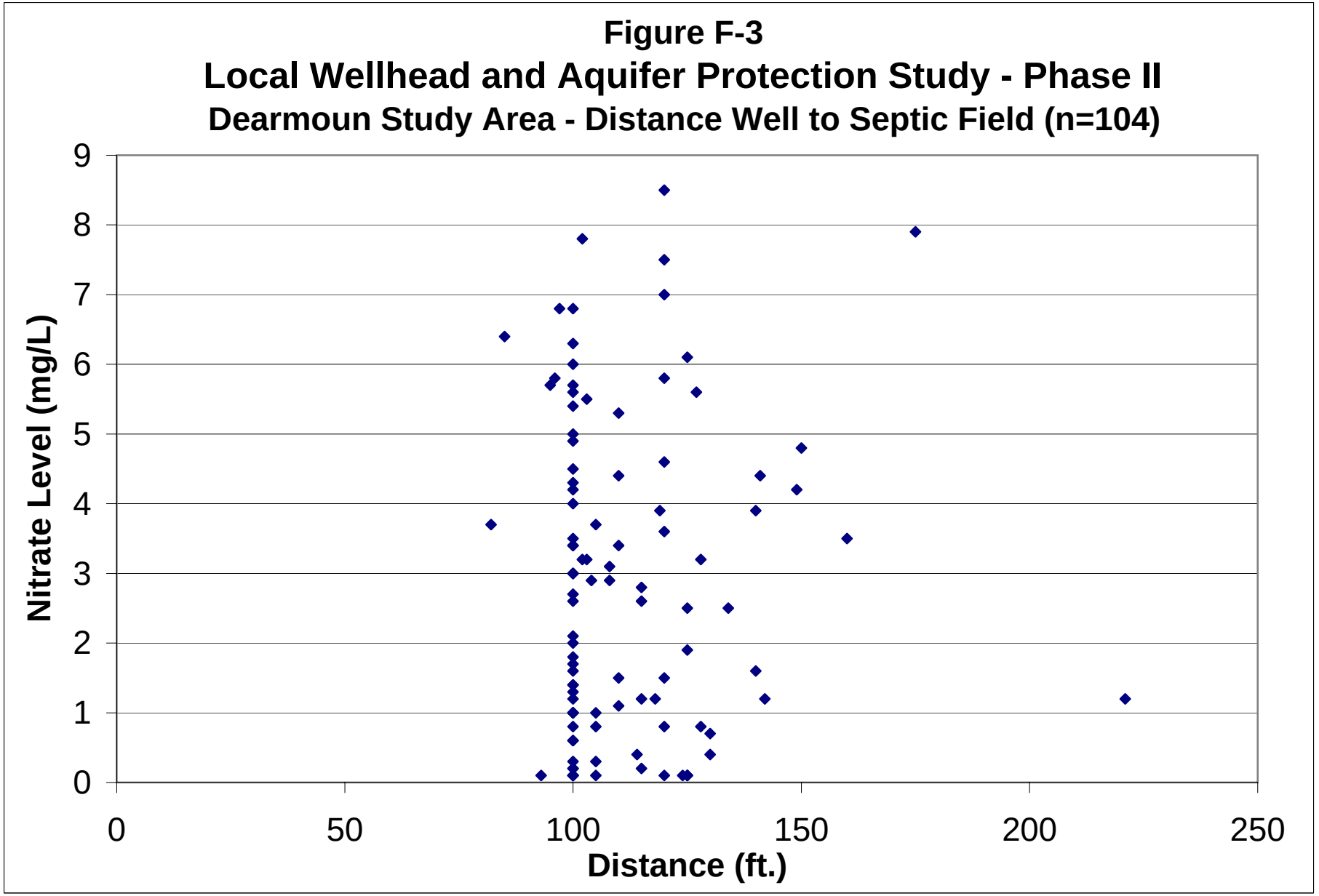


Figure F-4

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Well Yield (n=84)

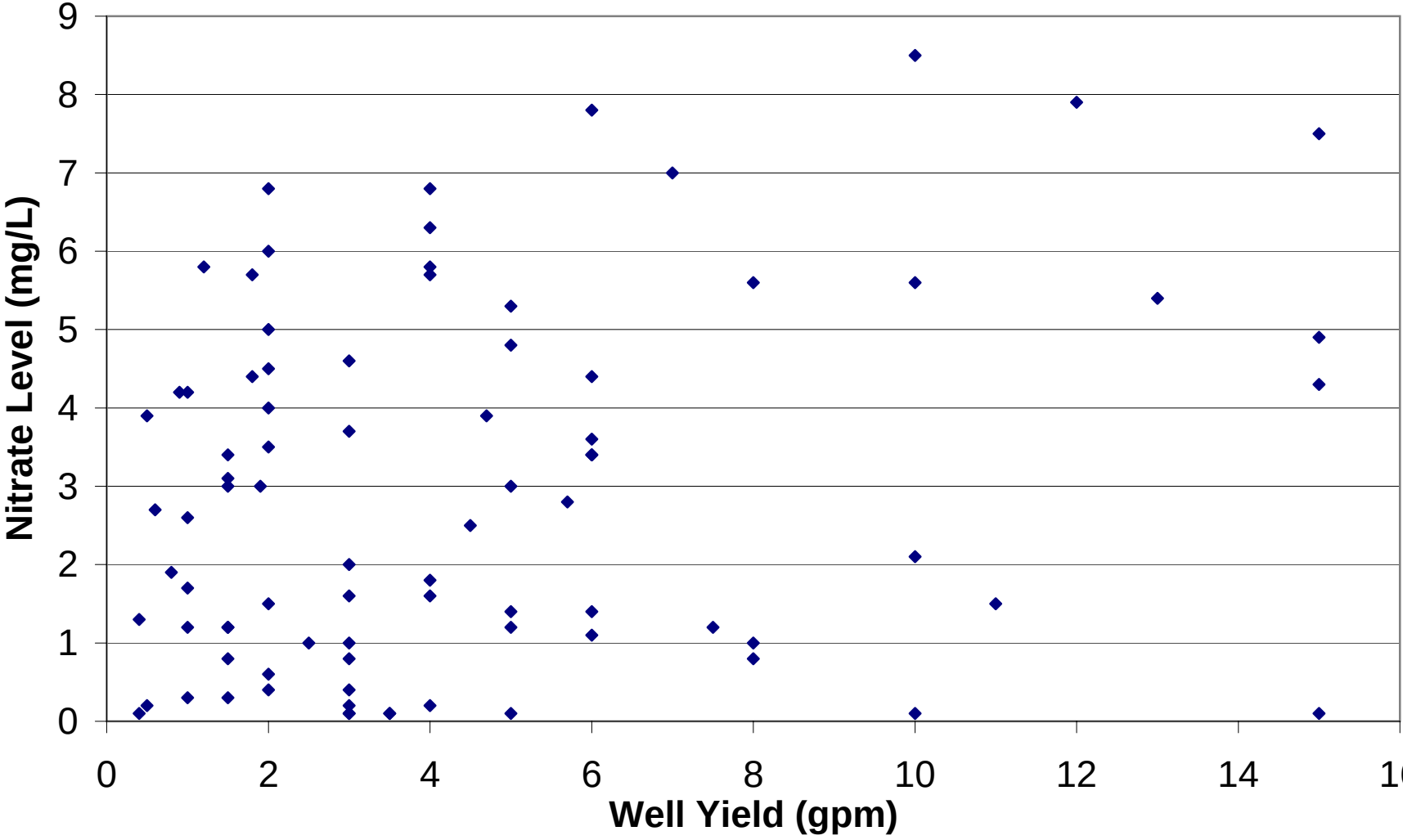


Figure F-5

1999 Local Wellhead and Aquifer Protection - Phase 2

Dearmoun Study Area - Bedroom Count (n=103)

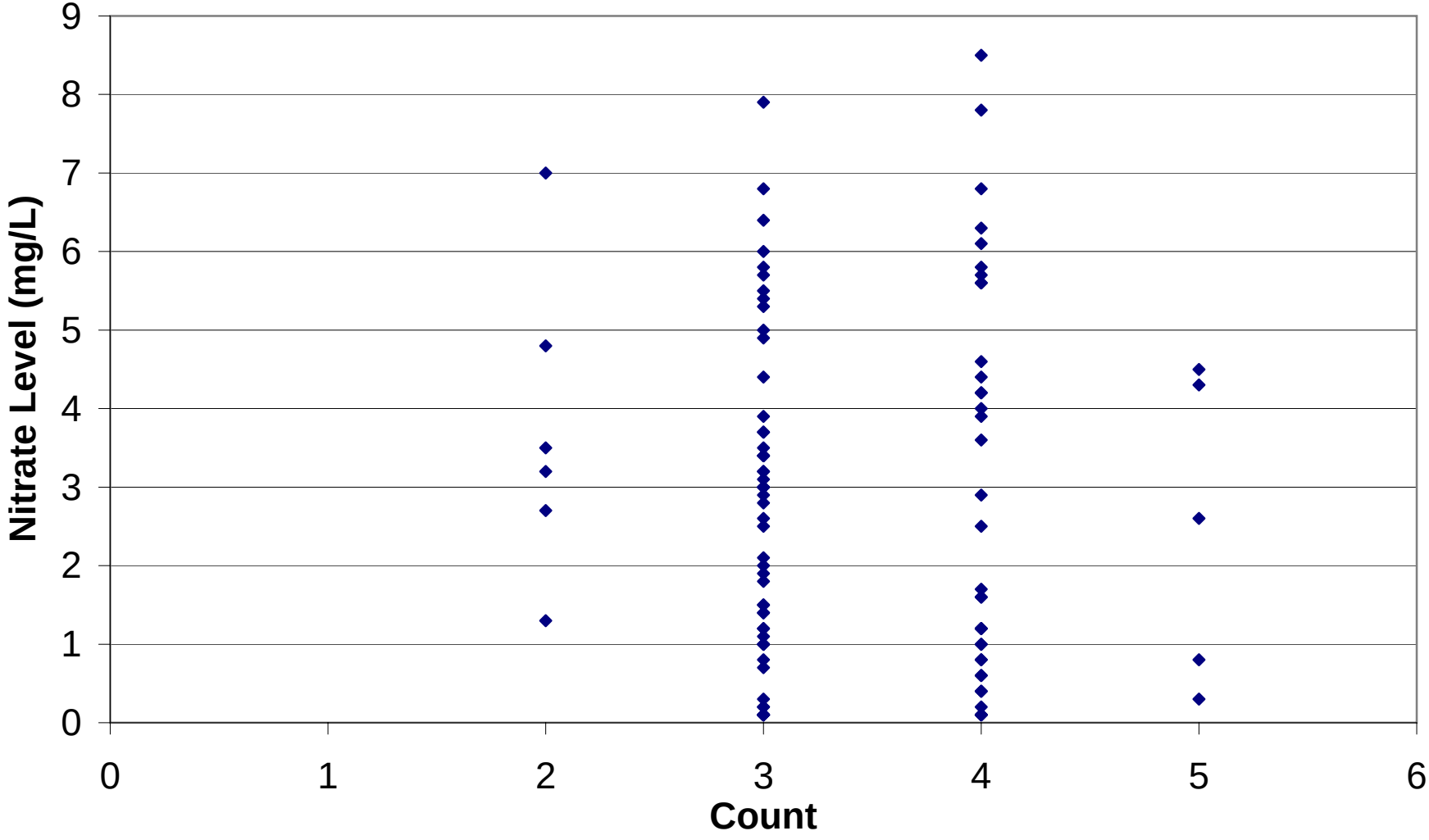


Figure F-6

Local Wellhead and Aquifer Protection Study- Phase II

Dearmoun Study Area - Soil Rating (n=43)

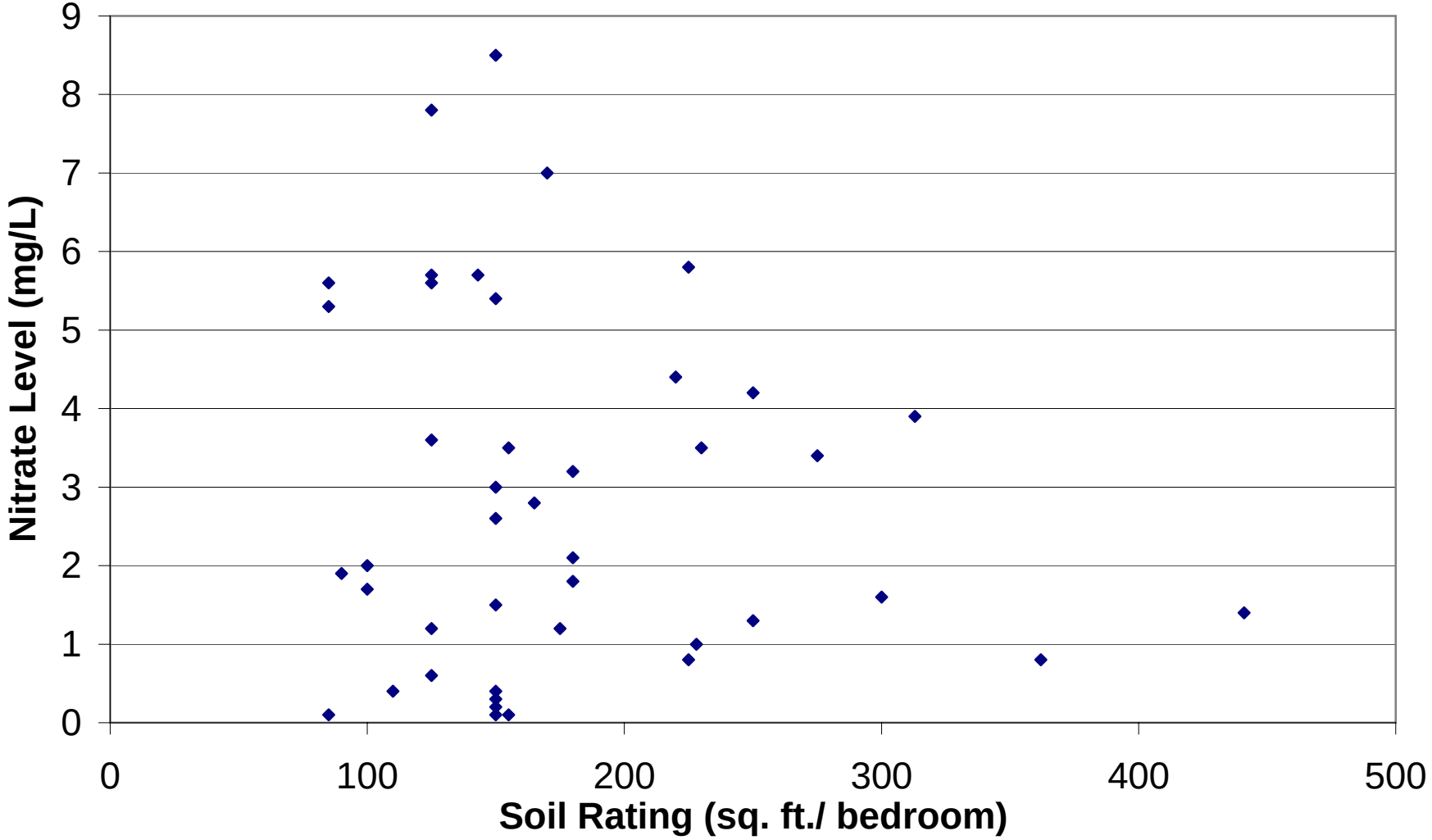


Figure F-7

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Sum of Bedrooms (n=103)

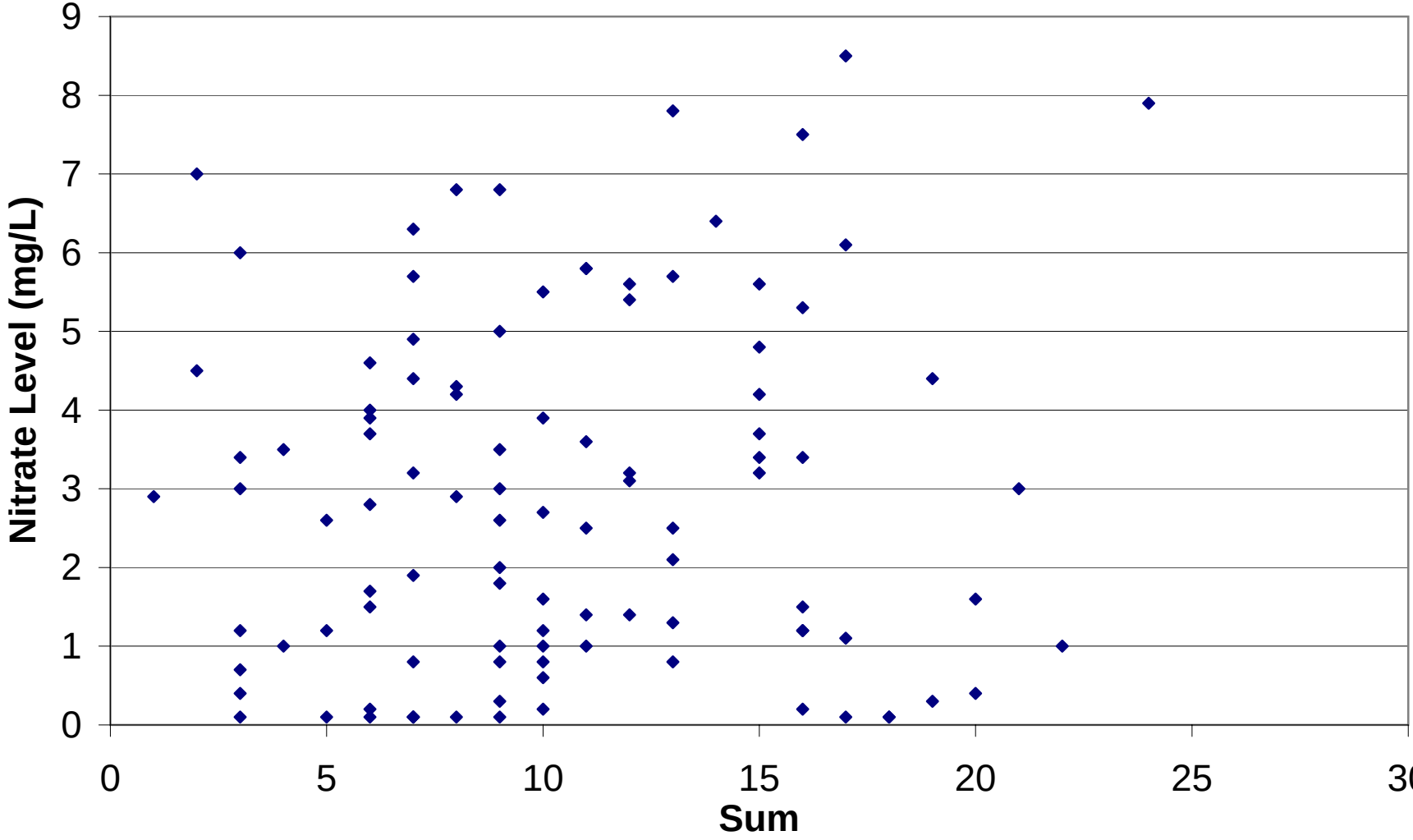


Figure F-8

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Bedrock (n=54)

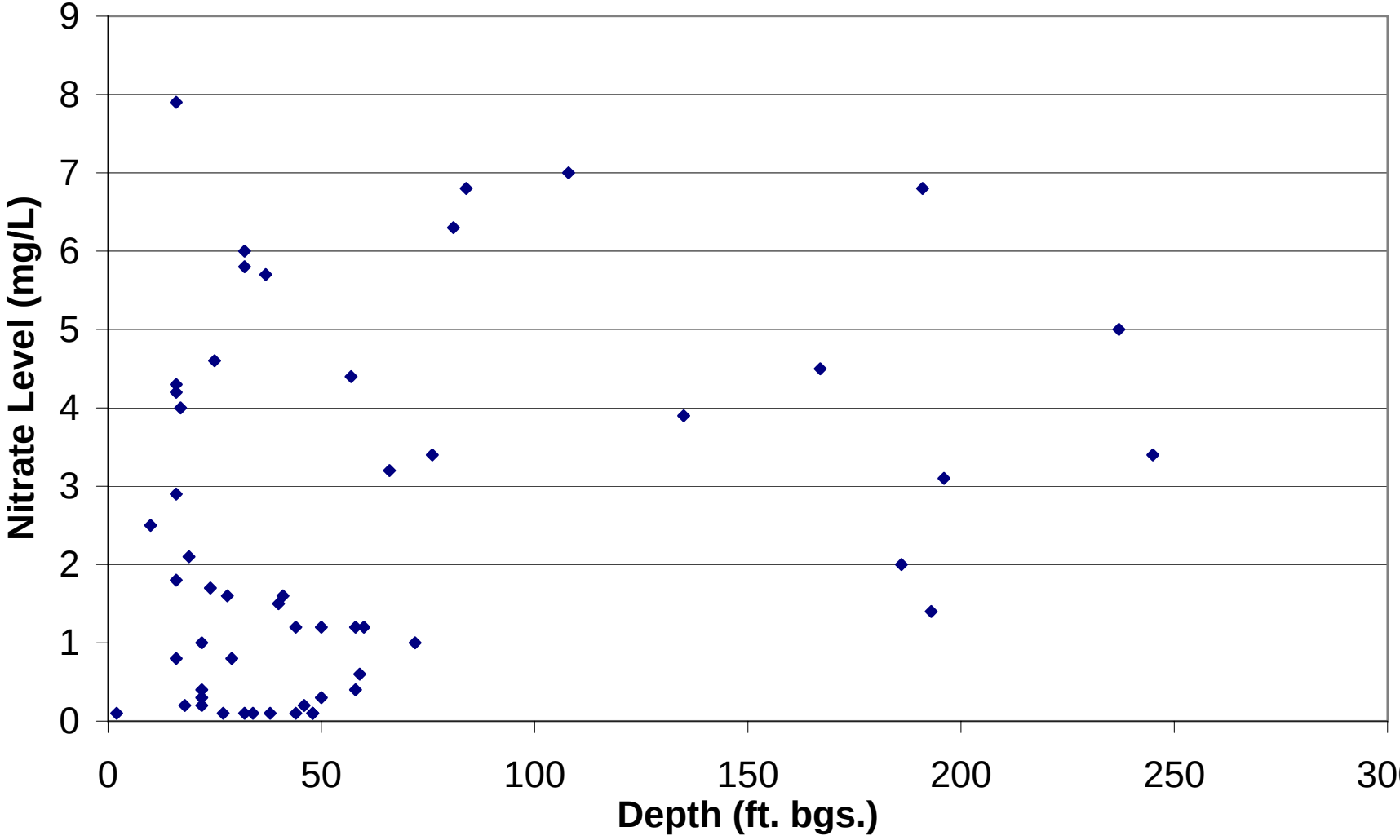
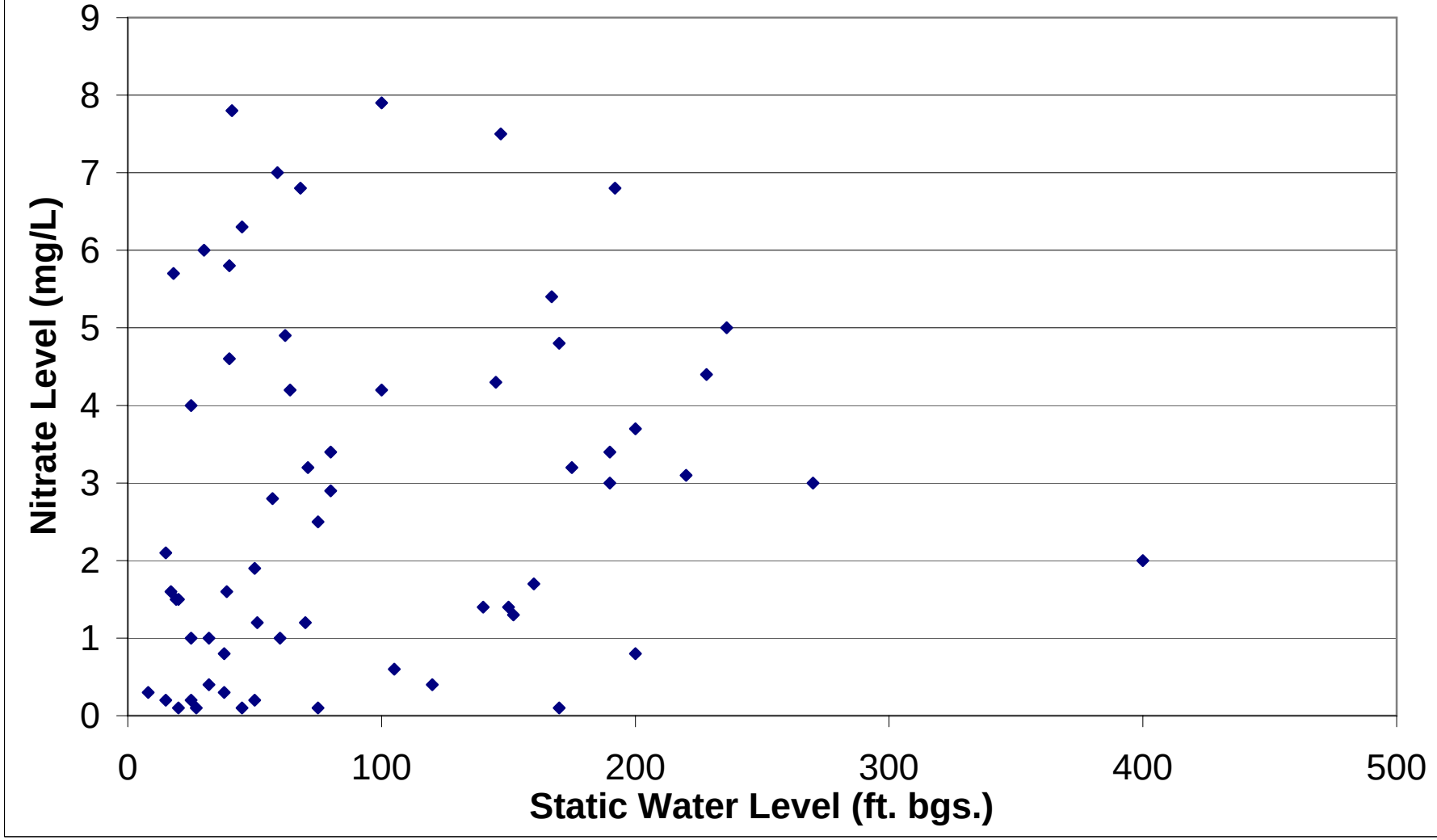


Figure F-9

Local Wellhead and Aquifer Protection Study - Phase II

Dearmoun Study Area - Static Water Level (n=62)



APPENDIX G

Scimitar Pilot Study Area – Field Investigation Questionnaire, Video Logs, and Well Logs

SCIMITAR COMMUNITY QUESTIONAIRE

A study in your area will analyze the sources and causes of nitrates in wells

The Anchorage Department of Health and Human Service is conducting a study of nitrate occurrence in selected groundwater wells of the Scimitar Subdivision. Information gained will be used as part of the ongoing Local Wellhead and Aquifer Protection study for the Municipality of Anchorage. Groundwater scientists and engineers from the US Geological Survey and Montgomery Watson, an international consulting firm, will be collecting field data in late July and August. We are currently soliciting participation of homeowners interested in having their wells included in the field study.

Each well selected for inclusion in the program will be located precisely with respect to latitude, longitude and elevation. Static water levels will be measured in each well to determine the elevation of the water table. In most instances this entails lowering a probe into the well which involves temporary removal and replacement of the sanitary seal at the wellhead. Certain wells will have samples taken which will be analyzed for a variety of chemical compounds. These analyses will help identify the source of the water and changes in water chemistry taking place in the soil. The interior of the sampled wells will also be inspected with a video camera to confirm existing well logs. For wells that are video taped and sampled, purging and pump extraction is necessary. Purging the well ensures a high quality sample, and pump extraction is necessary to video tape the well. Pump extraction and re-insertion will be performed by Jim Sullivan of Arctic Pump and Well, a certified pump installer who has many years of experience in the area. Care will be taken to minimize disturbance to landscaping. All work will be performed by competent and trained personnel, abiding by the municipal code concerning water wells.

If your well is selected for water table measurements, you will be required to:

- Minimize water usage one day prior to scheduled testing,
- Provide your consent to access across your property to the well, including a 20-foot wide path for truck-mounted well service equipment.
- Provide consent for access into the well casing for water level probing, and
- Allow for disconnection of power supply (via your circuit breaker), should pump removal be necessary in the unlikely event the probe may become stuck in your well.

If your well is selected for sampling and/or video inspection, you will also be required to:

- Assist with the field effort by pumping the well following water table measurement and prior to sampling, and
- Switch off the well pump power prior to pump removal.

In general, no more than one day will be necessary to complete the study on your lot. All data from your well will be available to you as soon as it has been reviewed, although some analysis may take 6 months or more to be performed. Individual data from your well will not be distributed to other homeowners in the area, although the data will become public record and will be discussed in interpretive reports published by the project team. To be considered for inclusion in the study, consent must be provided by signing the backside of this form where indicated and returning a copy of the form to the project team.

All interested parties are also invited to a informational meeting. This meeting will answer any questions you may have concerning the study and it will be held at:

Community Informational Meeting
July 21, 1999, 7:00 PM
Chugiak Benefits Association

Any questions about the study before the meeting can be answered by either **Sharon Minsch (894-4200)** or **William Rice (248-8883)**.

Montgomery Watson logo USGS logo MOA logo

If you are interested in participating in the program, please answer the following questions and sign this form. Your response is appreciated no later than the July 21st informational meeting.

1) ____Yes ____No Do you currently haul water?

2) ____Yes ____No Do you currently use your well as a water storage facility?

3) ____Yes ____No Do you have a low production well? _____ Est. gpm

4) ____Yes ____No Do you have any dry wells? (Please draw a rough map locating any on the back of this questionaire)

5) ____Yes ____No Would arrangements for access be possible during the weekdays the last week of July or the first week in August?

6) ____Yes ____No Do you have a pet that may interfere with testing?

7) ____Yes ____No Does your septic system use a leach field?

8) ____Yes ____No Have you had any current problems with your septic system?

9) When was your septic system installed?
_____ Date

I consent to the use of my well as outlined above for the Municipality of Anchorage Local Wellhead and Aquifer Protection study.

Name (Signature): _____ Date: _____

Name (Printed): _____

Address: _____

Day Phone # _____ Night Phone # _____

Please submit this questionaire to:

Attn: William Rice
Montgomery Watson
4100 Spenard Road
Anchorage, AK 99517

Montgomery Watson logo USGS logo MOA logo

Municipality of Anchorage
Dept of Health & Human Services
Environmental Services Division
On-Site Services Program

Scimitar Subdivision Water Well Filming
August 1999

Tape #1:

Scimitar #2, Lot 14 Block 3
20160 Tulwar Drive
End of casing, start of bedrock at 69'
Slight water running down casing at 85'+- - lens became cloudy with depth.
Total Probe of 170'

Scimitar #1, Lot 1 Block 1
20036 Chugach Park Drive
End of casing, start of bedrock at 38.5'
Static water level of 70'
Total probe of 75' – bottom of well, no leaks

Scimitar #1, Lot 8 Block 3
19920 Tulwar Drive
Casing perforated between 31' & 33' with a steady flow coming into well from the perforations

Tape #2:

Scimitar #3, Lot 2 Block 2
19835 Seika Drive
Slight drip from pitless area clouded lens; bedrock at 15'
Static water lever at 145
Total probe of 172'

Scimitar #3, Lot 2 Block 1
20016 Seika Drive
Slight drip at bedrock
End of casing, start of bedrock at 90'
No static water level found
Total probe of 190'

Scimitar #3, Lot 16 Block 1
19729 Belduque Court
No static water level or leaks found
Total probe of 190'

Tape #3

Scimitar #2, Lot 16 Block 3
20208 Tulwar Drive
End of casing, start of bedrock at 90’ with a steady water flow
Total probe of 190’

Scimitar #1, Lot 4 Block 2
NHN Chugach Park
Found a slight flow down the casing, maybe coming from pitless area, but more noticed at 125’+-
End of casing, start of bedrock at 61.5’
Total probe of 185’

Scimitar #1, Lot 5 Block 2
NHN Chugach Park
Perforations at 77’ to 82’ dry, no seeps
End of casing, start of bedrock at 82’ slight flow coming in at top of bedrock 82’
Static water level at 156’
Total probe of 195’

Tape #4:

Scimitar #1, Lot 7 Block 3
19890 Tulwar Drive
Small amount of water flowing in at perforations in casing at 48’
End of casing, start of bedrock at 112’ water seeping in at top of bedrock
No static water level found
Total probe of 190’

Scimitar #3, Lot 1 Block 6
19738 Seika Drive
End of casing, start of bedrock at 75’
No leaks or static water level found.
Total probe of 190’

Tape #5:

Scimitar #1, Lot 9 Block 2
19743 Tulwar Drive
Found slight flow along casing above bedrock
End of casing, start of bedrock at 85’
Static water lever at 115’
Lens became cloudy – no visibility on water
Probe abandoned.

Scimitar #1, Lot 2 Block 2
20125 Chugach Park Drive
End of casing, start of bedrock at 104’
Water flowing in at 157’
Total probed of 195”

Tape #6:

Scimitar #3, Lot 1 Block 1
20048 Seika Drive
End of casing start of bedrock at 92’
Slight water flow at top of bedrock 92’
No static water level found.
Total probe of 190’

Scimitar #2, Lot 18 Block 3
NHN Tulwar Drive
Perforations in casing at 63’ to 68’, but no flow, dry.
Bedrock at 72’ - end of casing
Start of liner at 100’.
No static water level found and no leaks.
Total probe of 195’

Scimitar #1 Lot 3 Block 2
20149 Chugach Park Drive
Slight flow starting at 30’+-
Static water lever at 100’
Bottom of well at 107’

1498

Scimitar 1 Block 1 Lot 1

1, 1, 1

(1)(1)(1)

Sc 1

IN UNIT #1

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURES
Division of Geological & Geophysical Surveys

Drilling Permit No. ______
A.D.L. No. ______

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Ia. Borough	Subdivision	Lot	Block	Ib. 1/4 qtrs.	Section No.	Township N ☐ S ☐	Range E ☐ W ☐	Meridian
Anch	Scimitar	1	1	__of__of__of__				

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL: Mr. Paul Myers
Address: Eagle River, Ak.

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Overburden	0	2
Gravel, some water	2	20
Larger gravel, water inc.	20	78

4. WELL DEPTH: (final) 78 ft.

5. DATE OF COMPLETION 5 - 5 - 82

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other:

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 78 ft. Depth Weight 17 lbs./ft.
diam. ___ in. to ___ ft. Depth Stickup ___ ft.

9. FINISH OF WELL:
Type: Open Hole Diameter: 6"
Slot/Mesh Size: ______ Length: ______
Set between ______ ft. and ______ ft.
Backfilling ______ Gravel pack ______

10. STATIC WATER LEVEL: 67 ft. on 5/5/82 Date
☐ Above or ☒ Below land surface
Equipment used:

11. PUMPING LEVEL below land surface and YIELD
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other:

13. PUMP: (If available) HP 1/3
Length of Drop Pipe 73 ft. capacity ___ g.p.m.
☒ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS: Perforations at 40-43 and 74-76. Bail tested at 10 GPM.

15. Water Temperature ___ ° ☐ F ☐ C

USGS SITE ID 612406149252601

USGS Local No.

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Magnuson Drilling
Registered Business Name

AA 5385
Contract License Number

Address: P.O. Box 504 Eagle River, Ak. 99577

Signed: William R. Magnuson
Authorized Representative

Date: May 5, 1982

Form 02-WWR (11/81) Copy Distribution: WHITE-State DGGS, PINK-Driller, CANARY-Customer

Scimitar 1 Block 2 Lot 2

RAMPART DRILLING WORKS

Box 1369, Star Route A Anchorage, Alaska 99502
344-7714

(1)(2)(3)

SIX INCH WATER WELL DRILLED AND CASED OUT TO THE DEPTH OF 305 feet

DRILLED AT THE RATE OF $21.00 PER FOOT.

PROPERTY OWNER Terry Thomascik ~~and or Gail Baker~~ 278-3966

LOCATION OF WELL SITE Lt. 2 Blk. 2 Sub: Scimitar Subd

DRILLER Bernie Claus of Rampart Drilling Works.

WELL LOG:

0----48' Hardpan with a 30% gravel composite and several small boulders.

48---75' Gravel and cobbles. 15 inch diameter boulder at 70 feet. Some traces of water at 75 feet.

75--110' Hardpan with more small boulders.

110-160' A compressed conglomerate of rock.

160-280' Sedimentary bedrock.

280-305' A porous granular rock yielding 2 GPM with a 200 foot head of water static. Pump should be installed 10 feet off bottom.

Total cost of Drilling: $6405.00

$500.00 received before Feb. 22nd, 77

COST INCLUDES ALL LABOR AND MATERIAL FOR COMPLETION OF SAID DRILLING.

WRITE CHECK PAYABLE TO RAMPART DRILLING WORKS FOR THE SUM OF $590.00

$5405.00 owed as of March 16th

THANK YOU VERY MUCH.

BERNIE CLAUS OF RAMPART DRILLING WORKS

DATE Feb. 20th, 77

SERVICE CHARGE OF 1½% PER MONTH WILL BE ASSESSED ON PAST DUE ACCOUNTS.

Certified Drilling Log

Scimitar 1 Block 2 Lot 3

by

DOC Co. dba

SULLIVAN WATER WELLS

P. O. BOX 272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND J F STUBALE FIZED

ADDRESS 2709 LEE RD ANCH 99504

LEGAL DESCRIPTION L 3 BLK 2 SCIMATAR

DATE - Started 12/82 Ended 12/82

PERMIT NUMBER 82-1046

DEPTH OF WELL 110' 8 3/4"

STATIC LEVEL OF WATER FT. 82'

DRAW DOWN FT.

GALS. PER HR 950

KIND OF CASING 6 5/00

KIND OF FORMATION:

From 0	Ft. to 2	Ft. OVERBURDEN	From	Ft. to	Ft.
From 2	Ft. to 14	Ft. SAND & GRAVEL	From	Ft. to	Ft.
From 14	Ft. to 51	Ft. CLAY GRAVEL &	From	Ft. to	Ft.
From	Ft. to	Ft. BOULDERS	From	Ft. to	Ft.
From 51	Ft. to 55	Ft. BOULDER	From	Ft. to	Ft.
From 55	Ft. to 92	Ft. CLAY & GRAVEL	From	Ft. to	Ft.
From 92	Ft. to 99	Ft. SAND GRAVEL CLAY	From	Ft. to	Ft.
From	Ft. to	Ft. MIXED WET	From	Ft. to	Ft.
From 99	Ft. to 107	Ft. CLAY & GRAVEL	From	Ft. to	Ft.
From 107	Ft. to 111	Ft. SAND GRAVEL S/	From	Ft. to	Ft.
From	Ft. to	Ft. CLAY - WATER	From	Ft. to	Ft.
From 111	Ft. to	Ft. BEDROCK	From	Ft. to	Ft.
From	Ft. to	Ft.	From	Ft. to	Ft.
From	Ft. to	Ft.	From	Ft. to	Ft.
From	Ft. to	Ft.	From	Ft. to	Ft.
From	Ft. to	Ft.	From	Ft. to	Ft.
From	Ft. to	Ft.	From	Ft. to	Ft.

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION
MAR 14 1983
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MISCL. INFORMATION:

NO PERMIT issued

DRILLER'S NAME

Scimitar 1 Block 2 Lot 4

Certified Drilling Log

by

DOC Co. dba

SULLIVAN WATER WELLS

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND WESTERN MORGAGE LOAN

ADDRESS 376 EAST 400 SOUTH SALT LAKE CITY UTAH 84111

LEGAL DESCRIPTION SCIMITAR #1 LOT 4 BLK 2

DATE - Started _____ Ended 12/88

PERMIT NUMBER _____

DEPTH OF WELL 600'

STATIC LEVEL OF WATER FT. 115

DRAW DOWN FT. _____

GALS. PER HR 10

KIND OF CASING 6-500'

KIND OF FORMATION:

From 0 Ft. to 2 Ft. CASING STICKUP
From 2 Ft. to 3 Ft. OVER BURDEN
From 3 Ft. to 18 Ft. SILTY SAND S/
From _____ Ft. to _____ Ft. GRAVEL
From 18 Ft. to 33 Ft. HARDPAN
From 33 Ft. to 53 Ft. SILTY SAND & GRAVEL
From _____ Ft. to _____ Ft. S/ CLAY
From 53 Ft. to 59 Ft. HARDPAN
From 59 Ft. to 320 Ft. BEDROCK HARD GREEN
From _____ Ft. to _____ Ft. VERY LITTLE CHANGE
From 320 Ft. to 335 Ft. BEDROCK GREEN W/
From _____ Ft. to _____ Ft. FINE QUARTZ SEAMS
From _____ Ft. to _____ Ft. 2-GPM
From 335 Ft. to 575 Ft. BEDROCK HARD GREEN
From _____ Ft. to _____ Ft. VERY LITTLE CHANGE
From 575 Ft. to 590 Ft. BEDROCK GREEN W/
From _____ Ft. to _____ Ft. FINE QUARTZ SEAMS & CLAY

From 590 Ft. to 600 Ft. HARD GREEN
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.
From _____ Ft. to _____ Ft.

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
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MISCL. INFORMATION:

61'4" TOTAL 6" CASING

DRILLER'S NAME _____

Scimitar 1 Block 2 Lot 4

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Ia. Borough	Subdivision	Lot	Block	Ib. 1/4 qtrs.	Section No.	Township N/S	Range E/W	Meridian
Anch.	Scimitar	4	2	___of___of___of___				

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL: Merle Beeter
Address: Sra Box 1546-E
Anch., Ak. 99507

2. WELL LOG Material Type	Feet Below Surface Top	Bottom
Organic:brown color,med. hard.	0	3
Till:grey color, and very hard,	3	60
with large boulders.		
Till:grey and hard, with water.	60	74
Bedrock:grey and very hard.	74	80
Bedrock:blue-grey and hard.	80	90
Bedrock:grey and very hard.	90	107
Bedrock:blue-grey and hard.	107	129
Bedrock:grey and very hard.	129	138
Bedrock:blue-grey and hard.	138	150
Bedrock:grey and very hard.	150	163
Bedrock:light green and hard.	163	166
Bedrock:blue-grey and hard.	166	170
Bedrock:light brown and hard.	170	177
Bedrock:light green and hard.	177	187
Bedrock:blue-grey and hard.	187	190
Bedrock:light green and hard.	190	200

4. WELL DEPTH: (final) 200 ft.

5. DATE OF COMPLETION 1 - 5 - 83

6. [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Auger [ ] Jetted [ ] Bored [ ] Other:

7. USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Recharge [ ] Commerical [ ] Test Well [ ] Other:

8. CASING: [ ] Threaded [X] Welded
diam. 6 in. to 75 ft. Depth Weight 17 lbs./ft.
diam. ___ in. to ___ ft. Depth Stickup 1 ft.

9. FINISH OF WELL: open hole/perforated
Type: knife Diameter: +5"-2"
Slot/Mesh Size: ___ Length: ___
Set between 60 ft. and 74 ft.
Backfilling ___ Gravel pack ___

10. STATIC WATER LEVEL: 62 ft. 1/5/83 Date
[ ] Above or [X] Below land surface
Equipment used: sand line

11. PUMPING LEVEL below land surface and YIELD
190 ft. after 24 hrs. pumping 33 g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. GROUTING Well Grouted: [ ] Yes [X] No
Material: [ ] Neat Cement [ ] Other:

13. PUMP: (if available) HP ___
Length of Drop Pipe ___ ft. capacity ___ g.p.m.
[ ] Subm. [ ] Jet [ ] Centrifical [ ] Other

14. REMARKS:

15. Water Temperature ___ ° [ ] F [ ] C

S 20810

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION
APR 14 1983
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16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Foss Drilling — Registered Business Name
AA 0758 — Contract License Number
Address: SR2 Box 7580 Northwoods Drive, Chugiak, Ak. 99567
Signed: Linda C. Foss — Authorized Representative
Date: 1/11/83

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

USGS Local No. ___

Certified Drilling Log

Scimitar 1 Block 2 Lot 5

by

DOC Co. dba

SULLIVAN WATER WELLS

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND MMM

ADDRESS Po Box 670495 CHUGIAK

LEGAL DESCRIPTION Scimitar #1 Blk 2 Lot 5

PERMIT NUMBER 980069 Date of Issue 4-21-98

TAX INDENTIFICATION NUMBER 0511 3213.

Is well located at approved permit location? ☒ Yes ☐ No

Method of Drilling: ☒ air rotary ☐ cable tool

Depth of well: 400

Casing Type STEEL Wall Thickness .250 inches

Diameter 6" inches, depth 80' 6" feet

Liner Type: NONE

Casing Stickup Above Ground: 2 feet

Static Water Level (from ground level): 78 feet

Pumping level: ____ feet after ____ hrs. pumping ____ gpm

Recover Rate: .22 gpm

Method of Testing: AIR

Well Intake Opening Type: ☐ Open End ☒ Open Hole

☐ Screened; Start ____ feet Stopped ____ feet

☒ Perforations Start 75 feet Stopped 80 feet

Grout Type: BENTONITE Volume 150LBS

Depth: from ____ feet, to ____ feet

Pump Intake Depth: ____ feet

Pump Size ____ hp Brand Name ____

Well Disinfected Upon Completion? ☐ Yes ☐ No

Method of Disinfection: ____

Comments:
DATE COMPLETED 5/15/98

BORE HOLE DATA

DEPTH From	DEPTH To	
0	2	CASING STICK UP
2	6	OVER BURDEN
6	12	SILTY GRAVEL
12	21	HARD PAN
21	30	SILTY SAND & GRAVEL
30	45	HARD PAN
45	60	SAND GRAVEL CLAY MIX
60	68	HARD PAN
68	80	SAND GRAVEL CLAY & BOULDERS
80	230	BEDROCK GREEN LITTLE CHANGE
230	300	BEDROCK GRAY
300	400	BEDROCK GREEN

RECEIVED
APR 1 1999
Municipality of Anchorage
Health & Human Services

Driller's Name [signature]

ATTENTION: It is the responsibility of the property owner to submit a copy of the well log to the proper authority. Municipality of Anchorage: Department of Health & Human Services and/or Department of Environmental Conservation. MatSu Borough Department of Environmental Conservation.

Certified Drilling Log

by

DOC Co. dba

SULLIVAN WATER WELLS

P. O. BOX 272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

688-2510 - Jim

Scimitar 1 Block 2 Lot 8

1558

1, 2, 8

OWNER OF LAND MIKE FIELD HOUSE

ADDRESS

LEGAL DESCRIPTION L 8 BLK 2 SCIMITAR Subd., Unit No. 1

DATE - Started 3/28/79 Ended 3/29/79

PERMIT NUMBER 790068

DEPTH OF WELL 200'

STATIC LEVEL OF WATER FT. 97'

DRAW DOWN FT.

GALS. PER HR 15°

KIND OF CASING 6 5/8 00

well w/in NE¼NE¼NW¼SE¼ Sec 10, T15N, R1W, SM

N 37 W20

KIND OF FORMATION:

From	0	Ft. to	3	Ft.	OVER BURDEN		
From	3	Ft. to	9	Ft.	CLAY + GRAVEL		
From	9	Ft. to	31	Ft.	SAND + GRAVEL		
From	31	Ft. to	42	Ft.	BLUE CLAY		
From	42	Ft. to	90	Ft.	CLAY + GRAVEL		
From	90	Ft. to	94	Ft.	TIGHT SAND GRAVEL		
From		Ft. to		Ft.	S/CLAY SATURATED		
From		Ft. to		Ft.	W/ WATER		
From	94	Ft. to	135	Ft.	BEDROCK		
From	135	Ft. to	137	Ft.	BEDROCK FRACTURED		
From		Ft. to		Ft.	30 GPM		
From	137	Ft. to	184	Ft.	BEDROCK		
From	184	Ft. to	188	Ft.	BEDROCK FRACTURED		
From		Ft. to		Ft.	2 GPM		
From	188	Ft. to	200	Ft.	BEDROCK		
From		Ft. to		Ft.			
From		Ft. to		Ft.			

LOCAL NO.

SITE ID

MISCL. INFORMATION:

94' 8" TOTAL 6" CASING

LAS.968.0. CC: D665 8/88 DRILLER'S NAME Bill Sullivan

Scimitar 1 Block 2 Lot 9

extra

WILSON WELL DRILLING

~~SRA - Box 476 - S~~
~~1305 W. 45TH STREET~~
ANCHORAGE, ALASKA ~~99503~~ 99507
PHONE ~~272-9943~~
344-1129

L-9
B-2
#-1

DRILLING LOG

Well Owner Mr. Leonard Brooks Use of Well Res.

Location (address of: Township, Range, Section, if known; or distance main road
Central Sub. Division
Peters Creek.

Size of casing 6" Depth of Hole 263 feet Cased to 92 feet

Static water level ____ ft. (above) (below) land surface. Finish of well (check one) open end ( ); Screen ( ); Perforated ( ).

Describe screen or perforation

Well pumping test at 5 gallons per (hour) (minute) for 8 of drawdown from static level. 50% ft.

Date of completion 1 August 1978

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
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WELL LOG

Depth in feet from ground surface	Give details of formations penetrated, size of material, color and hardness
0' TO 51'	Overburden (Sand, gravel & silt)
51' TO 56'	Rock Shelf
56' TO 74'	Hardpan
74' TO 83'	Rock
83' TO 92'	Rock pan
92' TO 104'	Entered Bedrock found Water at
TO	104' less than ½ GPM —
104' TO 183'	Quartzite found some water here 3/4 GPM
TO	1¼ GPM Total Thru Fair
183' TO 196'	Entered Meriam Sandstone 3/4 GPM.
196' TO 261'	Found a Fracture - and picked up 3 GPM
261' TO 263'	Developed Zone - Total 5 GPM —
TO	
TO	Please Pump Slowly until Well
TO	is Mature —

Scimitar 1 Block 2 Lot 10 — 14101, 1,2,10

OWNER OF LAND: Steven SAND BURG — DEPTH OF WELL: 200'

ADDRESS: — STATIC LEVEL OF WATER FT.: 123

L SITE: Lot 10, Blk 2, Scimitar Subd, Unit No. 1 — DRAW DOWN FT.: 15'

DATE—STARTED: 6/19/75 — GALS. PER HR.: 90 (1.5 GPM)

DATE—ENDED: 6/21/75 — KIND OF CASING: 6 5/8 OD

KIND OF FORMATION:

FROM	FT. TO	FT.	FROM	FT. TO	FT.
0	18	CLAY & GRAVEL	136	161	BEDROCK SOLID
18	55	SAND & GRAVEL			
55	74	CLAY & GRAVEL	161	163	FRACTURED W/ QUARTZ LENSES
74	95	HP			
95	101	SAND GRAVEL WET	163	185	SOLID
101	110	CLAY & GRAVEL	185	196	FRACTURED
110	134	HP & BOULDERS	196	205	SOLID
134	136	BROKEN BEDROCK WITH WATER			

MISCL. INFORMATION:
39' 6" CASING   AIR DEVELOPED 4 HRS

DRILLER'S NAME: BILL SULLIVAN

```
FILE           LAS              4185 A    WATER WELL INVENTORY CHANGE
CUSTOMER-ID    000178081 SANDBERG, STEVEN E
               QQQQ SW QQQ NW QQ NE Q SE S 10 TWN 015N RNG 001W M S
               LAT N33          LON W19         W       ALT             METH
DRILLER  A&L DRILLING    COMP DATE 06 21 1975   FIN DEPTH 00200.00
USE 8800 SINGLE DWELLING CONS METH              GROUTING
```

✓ cc: DGGS 1/87

SB 15-1-10 DABC 1-78
6124131492579 0

WELL LOG

Wheaton Water Wells, Inc.
POUCH R
WASILLA, ALASKA 99687
376-2041

Scimitar 1 Block 3 Lot 7

OWNER Kent - Corrinne Whisnant
ADDRESS 4231 Laurel Apt. 115 Anch. AK. 99504
WELL – SITE Lot 7 Blk. 3 Scimitar Sub. 1
DATE 4-30-81

DEPTH OF WELL 305' SEE ATTACHED FOR SPECIFIC INFO
STATIC LEVEL
GALS. PER MIN.
SIZE OF CASING 6" 1716

KIND OF FORMATION:

FROM	0	Ft. to	2	Ft.	Top Soil
FROM	2	Ft. to	12	Ft.	Sand - Gravel
FROM	12	Ft. to	36	Ft.	Hard Pan
FROM	36	Ft. to	37	Ft.	Gravel - Water ½ GPM
FROM	37	Ft. to	112	Ft.	Hard Pan
FROM	112	Ft. to	305'	Ft.	Bed Rock
FROM		Ft. to		Ft.	
FROM		Ft. to		Ft.	
FROM		Ft. to		Ft.	
FROM		Ft. to		Ft.	
FROM		Ft. to		Ft.	

FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		
FROM	Ft. to	Ft.		

CONTRACTOR Charles Pickenor

Scimitar 1 Block 3 Lot 8

1,3,8
(1980)

McKay Well Drilling

P.O. Box 557
Wasilla, Alaska 99687
Phone 376-5058

Well Owner CHUCK MCKENZIE Date 9-14-80

Well Location BLK #3 LOT #8 Phone _____
SCIMITAR SUB. DIV. 1

Size Casing 6" Depth of Hole 330' Cased to 116' feet

Static Water Level _____ feet Well Test _____ Gal per Minute for _____ Hours

Date of Completion 9-23-80

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION

FEB 6 1987

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WELL LOG

0 - 116' CLAY & GRAVEL
116 - 134' - RED ROCK
134 - 146 - SANDY CLAY & GRAVEL
146 - 240' - RED ROCK
240 - 245' - BROWN SHALE W/ STREAK OF OIL
245 - 255' - RED ROCK
255 - 260' - BROWN SHALE W/ OIL
260 - 330' - RED ROCK

1FT 4 SHOTS
PREFERATOR @ 115' - 110' - 105' - 100' - 95' - 90'
85' - 80' - 75' - 70' 40 SHOTS TOTAL
WILL INST 4" PLASTIC LINER WHEN YOU WANT IT
C.J. McKay

TOTAL 6603.00
LESS STOVE 300.00
TOTAL DUE $6303.00

AUTHORIZATION TO DRILL

I hereby authorize McKay Drilling to proceed with the above work. Payment shall be made in the following manner:

Rig up Minimum 310' feet @ ~~$20.00~~ per foot 6200.00
PREF SHOTS 403.00
$6603.00

Balance due upon completion.

In the event it is necessary to institute legal proceedings to collect any amounts due on this contract, I agree to pay an additional sum of Ten percent (10%) of the original contract price as attorney's fees, plus costs, for legal proceedings.

Name _____

Date _____ Address _____

Scimitar 1 Block 3 Lot 8

(1) OWNER:
Name
Address
City

(2) TYPE OF WORK:
New Well ☐ Deepened ☐ Reconditioned X Abandoned ☐
If abandonment, describe material and procedure in item 12.

(3) TYPE OF WELL: (4) PROPOSED USE (check):
Rotary Air X Driven ☐
Rotary Mud ☐
Cable ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☐
Diam. from ft. to ft. Gage
Diam. from ft. to ft. Gage

LINER INSTALLED:
Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforations ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed ☐ Yes X No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? X Yes ☐ No If yes, by whom? Friesen Drilling
Yield: 10 gal./min. with 3 ft. drawdown after 8 hrs.
"
Air test gal./min. with drill stem set at ft. for hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

Bond C-1054 Issued By PACIFIC MARINE
(Number) (Surety Company Name)

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name FRIESEN DRILLING CO. INC.
Address P.O. BOX [illegible] WASILLA, AK
[Signed] [signature]

(10) LOCATION OF WELL: 1, 3, 8
Borough: Anchorage Driller's well number (1985)
¼ ¼ Section T. R. W.M.
Tax lot # Blk. 3 Lot 8 Subdivision
Address at well location: Scimitar Sub 1

(11) WATER LEVEL Completed well.
Depth at which water was first found ft.
Static level 50 ft. below land surface. Date 5/29/[illegible]
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Depth drilled 530 ft. Depth of completed well 70 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
This well had			
been drilled in 1980			
We set a cement and			
bentonite plug at 70 ft			
in order to stop the			
water from running out			
though the broken rock at			
the bottom. Then we [illegible]			
the well with drill stem			
and water for 8 hrs and			
then test pumped it this at			
a rate of 10 gals per min with			
3 ft of drawdown			
Robert Friesen			
[signature]			

Work started 5/2[illegible] 19 85 Completed 5/2[illegible] 19 85
Date well drilling machine moved off of well 5/2[illegible] 19 85

WE SERVE

WELL #2

ALL ALASKA

JAY WILLIAMS DRILLING CO.

P.O. BOX 670042 — CHUGIAK, ALASKA 99567

CHUGIAK, AK
688-3199

WASILLA, AK
376-3199

OWNER OF LAND Joseph J Rollins

ADDRESS P.O. Box 266 Anchor Point Ak 99556

WELL – SITE Blk. 3 Lt. 10 Scimitar 1# M.O.A.

DATE – STARTED 4-22-94

DATE – ENDED 5-10-94

DEPTH OF WELL 407 ft.

STATIC LEVEL OF WATER FT. 142 ft.

DRAW DOWN FT. 400 ft.

GALS. PER HR. 27 Test pump 6 hrs

KIND OF CASING 154 ft. 6in A-53-B A.S.T.M.

KIND OF FORMATION:

FROM 0 FT. TO 2 FT. Stub up

FROM 2 FT. TO 4 FT. Overburden

FROM 4 FT. TO 18 FT. GRavel & Cobles

FROM 18 FT. TO 20 FT. Boulder

FROM 20 FT. TO 87 FT. Gravel & Sand

FROM 87 FT. TO 96 FT. Gravel & Clay

FROM 96 FT. TO 104 FT. Silty Clay

FROM 104 FT. TO 132 FT. Silty Gravel

FROM 132 FT. TO 154 FT. Gravel & Cobles

FROM 154 FT. TO 246 FT. Bedrock

FROM 246 FT. TO 247 FT. Fracture Quarts

FROM 247 FT. TO 281 FT. Bedrock

FROM 281 FT. TO 283 FT. Fracture Rock

FROM 283 FT. TO 338 FT. Bedrock

FROM 338 FT. TO 341 FT. Fracture Rock

FROM 341 FT. TO 396 FTRock

FROM 396 FT. TO 397 FT. Quarts

FROM 397 FT. TO 407 FT. Rock

FROM ... FT. TO ... FT.

FROM ... FT. TO ... FT.

FROM ... FT. TO ... FT.

FROM ... FT. TO ... FT.

FROM ... FT. TO ... FT.

FROM ... FT. TO ... FT.

MISCL. INFORMATION: Well is perfrated from 138ft to 154 ft. also due to so many fracture in rock well is lined with 4½ in P,V.C well casing perfrated Ect.

No warranty or no warranties implied

Permit No SW 940080

DRILLER'S NAME Jay Williams

Scimitar 1 Block 3 Lot 10

1, 3, 10 (1994) 9616

Scimitar 2 Block 2 Lot 24

CHUGIAK, ALASKA
?8-3199

JAY WILLIAMS DRILLING CO.

WE SERVE ALL ALASKA

POST OFFICE BOX 42 – CHUGIAK, ALASKA 99567

OWNER OF LAND [illegible]

ADDRESS 3011 Forest Village

WELL – SITE L 24-B2 Scimitar #2

DATE – STARTED 9-2-81

DATE – ENDED [illegible]81

820043

DEPTH OF WELL 300'

STATIC LEVEL OF WATER FT. 180' in hole

DRAW DOWN FT. 100% Est

GALS. PER HR. 120 Est

KIND OF CASING 6" Sch 40

KIND OF FORMATION:

FROM	FT. TO	FT.
0	1	Overburden
1	26	Sand & Gravel
26	34	Sand
34	55	Sand & Gravel
55	62	Gravel
62	122	Hardpan
122	141	Cobble Stone
141	157	Sand & Bolders
157	173	Fractured Rock
173	256	Bedrock
256	281	Sandstone
281	300	Unfractured Bedrock

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION
FEB 6 1987
RECEIVED

MISCL. INFORMATION:

DRILLER'S NAME Dennis Williams

RETURN TO: Division of Geological and Geophysical Surveys (DGGS)
3001 Porcupine Drive (Telephone: 277-6615)
Anchorage, Alaska 99501

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

WATER WELL RECORD

Drilling Company Name _____

U.S.G.S. Local No. _____
Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL — Please complete either 1a, 1b, or 1c.

1a. Borough	Subdivision	Lot	Block	1b. Fraction	Section No.	Township	Range	Meridian
Anch	#2 Scimitar	25	2	/ / /		N/S	/ E/W	

1c. Distance and Direction from Road Intersections

Street Address and Area of Well Location

3. OWNER OF WELL: Mr. Paul Myers
Address: Myers Const.
Eagle River, Ak.

2. WELL LOG — Material Type	Feet Below Surface Top	Bottom
Overburden	0	2
Boulders	2	21
Dry gravel	21	60
Wet gravel	60	80

4. WELL DEPTH: (completed)	Surface Elevation	Date of Completion
80 ft.	--	11-14-83

5. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other: _____

6. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commercial ☐ Test Well ☐ Other: _____

7. CASING: ☐ Threaded ☒ Welded
x 6" in. to 80 ft. Depth Weight 17 lbs/ft.
_____ in. to _____ ft. Depth

8. FINISH OF WELL:
Type: Open hole Diameter: 6"
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Fittings:

9. STATIC WATER LEVEL: _____ ft.
☐ Above ☐ Below land surface
Type of Measurement: _____

10. PUMPING LEVEL below land surface
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

11. WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter _____ inches above grade

12. GROUTING: Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (If available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
Type: ☐ Submersible ☐ Reciprocating ☐ Jet ☐ Other: _____

14. REMARKS: Perforations at 55-80 ft.
Bail tested at 5 GPM

15. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Magnuson Drilling — AA 5385
Registered Business Name — Contract License Number
Address: P.O. Box 504 Eagle River, Ak.
Signed: William A. Magnuson — Authorized Representative
Date: Nov. 14, 1983

Form 27-WW

Scimitar 2 Block 3 Lot 14

Certified Drilling Log

2,3,14

by

DOC Co. dba

SULLIVAN WATER WELLS

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND AL LEIGH

ADDRESS PO BOX 670137 CHUGIAK

LEGAL DESCRIPTION L 14 BLK 3 SCIMITAR #2

DATE - Started _____ Ended 84

PERMIT NUMBER _____

DEPTH OF WELL 400'

STATIC LEVEL OF WATER FT. _____

DRAW DOWN FT. _____

GALS. PER HR _____

KIND OF CASING 6 5/8 00

KIND OF FORMATION:

From 0 Ft. to 253 Ft. EXISTING WELL

From 253 Ft. to 290 Ft. HARD GREENSTONE

From 290 Ft. to 298 Ft. SOFT GREENSTONE

From 298 Ft. to 345 Ft. HARD GREENSTONE

From 345 Ft. to 355 Ft. GREENSTONE W/

From _____ Ft. to _____ Ft. FRACTURED SEAMS

From 355 Ft. to 364 Ft. HARD GREENSTONE

From 364 Ft. to 376 Ft. GREENSTONE W/ FRACTURES

From 376 Ft. to 400 Ft. MED GREENSTONE

MISCL. INFORMATION:

DRILLER'S NAME Bob Lee

Scimitar 2 Block 3 Lot 15

RAMPART DRILLING WORKS

BOX 1369, STAR ROUTE A ANCHORAGE, ALASKA 99502
344-7714

7 70414.

SIX INCH WATER WELL DRILLED AND CASED OUT TO THE DEPTH OF 625 feet.

DRILLED AT THE RATE OF $21.00 PER FOOT.

PROPERTY OWNER Mr. Eddie Williams 279-0878 688-2181

LOCATION OF WELL SITE Lt. 15 Blk. 3 Sub: Scimitar "2

DRILLER Bernie Claus of Rampart Drilling Works.

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION
FEB 6 1987
RECEIVED

WELL LOG:

0----28' Gravel and large cobbles.

28----62' Silty gravel and small boulders.

62----81' Hardpan.

81----99' Loose gravel and boulders.

99---625' BEDROCK. 99 to 330 feet: Sedimentary rock. 330 to 350: A wet area of a granular rock. 350 to 420: Sedimentary rock. 420 to 435: A wet granular rock.

435--460' Sedimentary rock: 460 to 470: A wet granular rock. 470 to 555: Sedimentary rock. 555 to 565: A wet granular rock. 565 to 625 feet: medium to very hard granite.

Total cost of drilling: $13,125.00

Rampart drilled from 525 to 625 feet no charge. $2100.00

Mr. Williams decision was to discontinue drilling at this time and if more volume of water is needed in the future, to continue at that time.

In 72 hours recovery time the water in this well should stand over 600 feet at 1.6 GPF.

Mr. Williams Well Cost to 525 with a 30% discount from 300 on is: $9607.50

COST INCLUDES ALL LABOR AND MATERIAL FOR COMPLETION OF SAID DRILLING.

WRITE CHECK PAYABLE TO RAMPART DRILLING WORKS FOR THE SUM OF $9607.50
$9607.50

THANK YOU VERY MUCH.

BERNIE CLAUS OF RAMPART DRILLING WORKS

Bernie Claus

DATE March 14th,77

SERVICE CHARGE OF 1½% PER MONTH WILL BE ASSESSED ON PAST DUE ACCOUNTS

Certified Drilling Log

Scimitar 2 Block 3 Lot 16

by

DOC Co. dba

SULLIVAN WATER WELLS

P. O. BOX 272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH &
ENVIRONMENTAL PROTECTION

JUL 29 1981

RECEIVED

OWNER OF LAND INGRID MEYER

ADDRESS PO Box 694 CHUGIAK AK

LEGAL DESCRIPTION Lot 16 Blk 3 Unit 2 Scimitar 2

DATE - Started 7/22/81 Ended 7/24/81

PERMIT NUMBER 810715

DEPTH OF WELL 400

STATIC LEVEL OF WATER FT. 100'

DRAW DOWN FT.

GALS. PER HR 5

KIND OF CASING 6 S00

KIND OF FORMATION:

From	Ft. to	Ft.		From	Ft. to	Ft.	
From 0	Ft. to 1	Ft.	OVERBURDEN	From	Ft. to	Ft.	
From 1	Ft. to 65	Ft.	SAND GRAVEL &	From	Ft. to	Ft.	
From	Ft. to	Ft.	BOULDERS & CLAY	From	Ft. to	Ft.	
From 65	Ft. to 87	Ft.	CLAY & GRAVEL	From	Ft. to	Ft.	
From 87	Ft. to 121	Ft.	BEDROCK	From	Ft. to	Ft.	
From 121	Ft. to 125	Ft.	BEDROCK W/ QUARTZ	From	Ft. to	Ft.	
From	Ft. to	Ft.	LENSES - 5 GPM	From	Ft. to	Ft.	
From 125	Ft. to 252	Ft.	BEDROCK SOLID	From	Ft. to	Ft.	
From 252	Ft. to 261	Ft.	BEDROCK W/ QUARTZ	From	Ft. to	Ft.	
From	Ft. to	Ft.	LENSES	From	Ft. to	Ft.	
From 261	Ft. to 400	Ft.	BEDROCK	From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	
From	Ft. to	Ft.		From	Ft. to	Ft.	

MISCL. INFORMATION:

400' 4" TOTAL 6" CASING

DRILLER'S NAME

Scimitar 2 Block 3 Lot 18

FROM : MMM CONTRACTING PHONE NO. : 6881238 Sep. 04 1997 01:34PM P1

AUG-29-97 FRI 12:13 PM SULLIVAN WATER WELLS 6 2759444444444444 P.02

2,3,18

Certified Drilling Log

by

DOC Co. dba

SULLIVAN WATER WELLS

Myers Tower

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND MmM

ADDRESS PO Box 670495 #2

LEGAL DESCRIPTION LOT 18 BLK 3 SCIMITAR

DATE - Started _____ Ended 8/26/97

PERMIT NUMBER _____

DEPTH OF WELL 600

STATIC LEVEL OF WATER FT. 100

DRAW DOWN FT. _____

GALS. PER HR 13

KIND OF CASING 6

KIND OF FORMATION:

From 0 Ft. to 400 Ft. EXISTING WELL

From 400 Ft. to 600 Ft. GREENSTONE BROCK

13-GPH

MISCL. INFORMATION:

CASING PERFORATED 67 TO 72 FT

4½" PVC CASING INSTALLED FROM 100 FT TO 600 FT PERFORATED

DRILLER'S NAME Bill Sullivan

Scimitar 3 Block 1 Lot 1

3,1,1

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Ia. Borough	Subdivision	Lot	Block	Ib. ¼ qtrs.	Section No.	Township N/S	Range E/W	Meridian
Anch	Scimitar #3	1	1	___of___of___of___				

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL:
Address: Mr. Paul Myers
Myers Construction
Chugiak, Ak. 99567

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Sand and gravel	0	93
Greenstone withlayers of red rock	93	290
Greenstone and water	290	320
Greenstone with layers of gray rock	320	500
Gray rock with quartz seams and water	500	525
Greenstone	525	545

4. WELL DEPTH: (final) 545 ft.

5. DATE OF COMPLETION 3 - 24 - 84

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other:

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 93 ft. Depth Weight 17 lbs./ft.
diam. ____ in. to ____ ft. Depth Stickup ____ ft.

9. FINISH OF WELL:
Type: _____ Diameter: _____
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: _____ ft. ___/___/___ Date
☐ Above or ☐ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (if available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS: Production of 20 GPH

15. Water Temperature ____° ☐ F ☐ C

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
FEB 6 1987
RECEIVED

#8-10088

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Magnuson Drilling — Registered Business Name
AA 5385 — Contract License Number
Address: P.O. Box 770504 Eagle River, Ak. 99577
Signed: William R Magnuson — Authorized Representative
Date: March 25, 1984

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

Scimitar 3 Block 1 Lot 2

3, ~~4~~ 1, 2

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Ia. Borough	Subdivision	Lot	Block	Ib. 1/4 qtrs.	Section No.	Township N/S	Range E/W	Meridian
Anch	Scimitar 3	2	1	___ of ___ of ___				

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL:
Mr. Paul Myers
Address: P.O. Box 351
Chugiak, Ak. 99567

2. WELL LOG Material Type	Feet Below Surface Top	Bottom
Sand, gravel, silt	0	20
Gravel, boulders	20	30
Gravel, silt, some boulders	30	92
Greenstone	92	365
Greenstone, crevices water	365	380
Greenstone with layers of gray rock	380	530
Greenstone, water	530	580

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
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#84-10081

4. WELL DEPTH: (final) 580 ft.

5. DATE OF COMPLETION: 3 - 24 - 84

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commercial ☐ Test Well ☐ Other: _____

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 92 ft. Depth Weigh 17 lbs./ft.
diam. ___ in. to ___ ft. Depth Stickup ___ ft.

9. FINISH OF WELL:
Type: _____ Diameter: _____
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: _____ ft. / / Date
☐ Above or ☐ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (if available) HP _____
Length of Drop Pipe ___ ft. capacity ___ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS:
Production of 20 GPH

15. Water Temperature ___ ° ☐ F ☐ C

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Magnuson Drilling — Registered Business Name
AA 5385 — Contract License Number
Address: P.O. Box 770504 Eagle River, Ak. 99577
Signed: William R Magnuson — Authorized Representative
Date: March 24, 1984

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

Scimitar 3 Block 1 Lot 3

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

3.

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Drilling Permit No. _____
A.D.L. No. _____

Ia. Borough	Subdivision	Lot	Block	Ib. 1/4 qtrs.	Section No.	Township	Range	Meridian
Anch	Scimitar3	3	1	___of___of___of___		N ☐ S ☐	E ☐ W ☐	

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL: Mr. Paul Myers
Address: P.O. Box 351
Chugiak, Ak. 99567

2. WELL LOG

Material Type	Feet Below Surface: Top	Bottom
Sand and gravel	0	83
Greenstone with layers of red rock	83	300
Black rock and water	300	318
Greenstone	318	370
Black rock	370	470
Grey rock with quartz seams and water	470	495

4. WELL DEPTH: (final) 495 ft.

5. DATE OF COMPLETION 3 - 21 - 84

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other: _____

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 82 ft. Depth Weight 17 lbs./ft.
diam. _____ in. to _____ ft. Depth Stickup _____ ft.

9. FINISH OF WELL:
Type: _____ Diameter: _____
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: _____ ft. / / Date
☐ Above or ☐ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (If available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS: Production of 2 GPM

15. Water Temperature ____° ☐ F ☐ C

RECEIVED
AUG 29 1995
Municipality of Anchorage
Dept. Health & Human Services

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Magnuson Drilling — Registered Business Name
AA 5385 — Contract License Number
Address: P.O. Box 770504 Eagle River, Ak. 99577
Signed: William R Magnuson — Authorized Representative
Date: March 24, 1984

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

Scimitar 3 Block 1 Lot 6

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

3,1,6
(1983)

Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL (Please complete either 1a, 1b or 1c.)

1a. Borough	Subdivision	Lot	Block	1b. ¼ qtrs.	Section No.	Township N/S	Range E/W	Meridian
Anch	Scimitar	6	1	—of—of—of—		N ☐ S ☐	E ☐ W ☐	

1c. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

#3

Street Address and Area of Well Location

3. OWNER OF WELL:
Address: Mr. Paul Myers
Myers Construction
Chugiak, Ak. 99567

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Sand, gravel, silt	0	75
Grey rock	75	80
Greenstone	80	120
Grey rock	120	136
Greenstone	136	143
Greenstone with seams of red rock	143	145
Greenstone	145	150
Grey rock	150	154
Greenstone	154	157
Grey rock	157	173
Greenstone	173	200
Grey rock	200	218
Greenstone	218	302
Grey rock	302	368
Greenstone	368	375
Grey rock with water	375	387

4. WELL DEPTH: (final) 387 ft.

5. DATE OF COMPLETION 7 - 3 - 83

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. [illegible] ☐ Domestic ☐ Public Supply ☐ Industrial ☐ Irrigation ☐ Recharge ☐ Commercial ☐ Test Well ☐ Other: _____

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 75 ft. Depth Weight 12 lbs./ft.
diam. ____ in. to ____ ft. Depth Stickup ____ ft.

9. FINISH OF WELL:
Type: _____ Diameter: _____
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: _____ ft. 1/1 Date
☐ Above or ☐ Below land surface
[illegible] _____

11. PUMPING LEVEL below land surface and YIELD
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (if available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS:
Production of 1½ GPM

15. WATER WELL CONTRACTOR'S CERTIFICATION:
16. WATER WELL EVALUATION & CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Magnuson Drilling — Registered Business Name
AA 5385 — Contractor License Number
Address: P.O. Box 504 Eagle River, Ak. 99577
Signed: William R. Magnuson — Authorized Representative
Date: July 3, 1983

MUNICIPALITY OF ANCHORAGE
DEPT. OF ENVIRONMENTAL PROTECTION
RECEIVED
DEC 26 1983

USGS Local No.

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

Scimitar 3 Block 1 Lot 7

RETURN TO: Division of Geological and G[illegible]ysical Surveys (DGGS)
3001 Porcupine Drive (Tel[illegible]: 277-6615)
Anchorage, Alaska 99501

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

WATER WELL RECORD

Drilling Company Name: Magnuson Drilling

U.S.G.S. Local No.
Drilling Permit No.
A.D.L. No.

LOCATION OF WELL — Please complete either 1a, 1b, or 1c.

1a. Borough	Subdivision	Lot	Block	1b. Fraction	Section No.	Township	Range	Meridian
Anch	Scimitar 3	7	1	/ / /		N/S	E/W	

1c. Distance and Direction from Road Intersections

Street Address and Area of Well Location

3. OWNER OF WELL: Mr. Paul Myers
Address: P.O. Box 351
Chugiak, Ak. 99567

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Dirt and cobbles	0	10
Dry gravel	10	40
Wet sand	40	75 -
Greenstone	75	181
Fracture	181	186
Greenstone	186	211
Purple rock	211	216
Greenrock	216	226
Fracture	226	231
Greenrock	231	245
Fracture	245	246
Blue rock	246	286
Fracture water incl	286	291
Greenstone	291	304

Ft.

051-132-7M

MUNICIPALITY OF ANCHORAGE
DEPT OF HEALTH & ENVIRONMENTAL PROTECTION
FEB 6 1987
RECEIVED

4. WELL DEPTH: (completed) 304 ft. | Surface Elevation | Date of Completion 11-1-82

5. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

6. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commercial ☐ Test Well ☐ Other:

7. CASING: ☐ Threaded ☒ Welded
6 in. to 75 ft. Depth Weight 17 lbs/ft.
in. to ft. Depth

8. FINISH OF WELL:
Type: Open Hole Diameter: 6
Slot/Mesh Size: Length: in.
Set between ft. and ft.
Fittings:

9. STATIC WATER LEVEL: ft.
☐ Above ☐ Below land surface
Type of Measurement:

10. PUMPING LEVEL below land surface
ft. after hrs. pumping g.p.m.
ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter inches above grade

12. GROUTING: Well Grouted: ☐ Yes ☒ No
Material: ☐ Neat Cement ☐ Other:

13. PUMP: (If available) HP
Length of Drop Pipe ft. capacity g.p.m.
Type: ☐ Submersible ☐ Reciprocating ☐ Jet ☐ Other:

14. REMARKS: Bail tested at 5 GPM
Water Temperature:

15. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief:

Magnuson Drilling — AA 5385
Registered Business Name — Contract License Number

Address: P.O. Box 504 Eagle River, Ak.

Signed: William R. Magnuson — Date: Nov. 3, 1982
Authorized Representative

wells deepened

Certified Drilling Log

by

Scimitar 3 Block 1 Lot #7

DOC Co. dba

SULLIVAN WATER WELLS

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2759

OWNER OF LAND JEFF WILLIAMS

ADDRESS PO BOX 774396 E R

LEGAL DESCRIPTION LOT 7 BLK 1 SCIMITAR

DATE - Started ______ Ended 6/96

PERMIT NUMBER ______

DEPTH OF WELL 560

STATIC LEVEL OF WATER FT 310

DRAW DOWN FT. ______

GALS. PER HR 30

KIND OF CASING 6"

KIND OF FORMATION:

From (Ft.)	To (Ft.)	Formation
0	300	EXISTING WELL
300	365	BEDROCK GREEN
365	370	BEDROCK BLACK
370	430	BEDROCK GREEN
430	450	BEDROCK GREEN
		QUARTZ SEAMS 30 GPH
450	470	BEDROCK BLACK
470	560	BEDROCK GREEN
		S/ QUARTZ

MISCL. INFORMATION:

DRILLER'S NAME Bill S[illegible]

RETURN: Division of Geological and Geophysical Surveys (DGGS)
3001 Porcupine Drive (Telephone: 277-5615)
Anchorage, Alaska 99501

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

5452 3,1,8

Scimitar 3 Block 1 Lot 8 WATER WELL RECORD

Drilling Company Name

U.S.G.S. Local No.
Drilling Permit No.
A.D.L. No. LAS 1675

LOCATION OF WELL — Please complete either 1a, 1b, or 1c.

1a. Borough	Subdivision	Lot	Block	1b. Fraction	Section No.	Township	Range	Meridian
Anch	Scimitar Unit 3	8	1	/ / /		N/S	E/W	

1c. Distance and Direction from Road Intersections
well w/in NE4 SE4 SW4 SE4 Sec 10, T15N, R1W, S.M
Chains N-0612355.3
W-1492521.6
Street Address and Area of Well Location

3. OWNER OF WELL: ~~Mr. Paul Myers~~ Charles Woodfin
Address: ~~P.O. Box 351~~ 19654 BELBUQUE
~~Chugiak, Ak.~~ PETERS, CREEK

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Top soil.	0	10
Gravel	10	105
Small boulders	105	115
Dry gravel	115	158
Greenstone	158	268
Gray stone	268	330
Greenstone	330	520
Fracture water incl	520	530
Greenstone	530	550

RED JACKET 3/4 PUMP

4. WELL DEPTH (completed) 550 ft. Surface Elevation Date of Completion 7-8-82

5. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

6. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commercial ☐ Test Well ☐ Other:

7. CASING: ☐ Threaded ☒ Welded
6 in. to 158 ft. Depth Weight 17 lbs/ft.
in. to ft. Depth

8. FINISH OF WELL:
Type: Open Hole Diameter: 6"
Slot/Mesh Size: Length:
Set between ft. and ft.
Fittings:

9. STATIC WATER LEVEL: ft.
☐ Above ☐ Below land surface
Type of Measurement:

10. PUMPING LEVEL below land surface
ft. after hrs. pumping g.p.m.
ft. after hrs. pumping g.p.m.

11. WELL HEAD COMPLETION: ☐ In Approved Pit
☒ Pitless Adapter inches above grade

12. GROUTING. Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other:

13. PUMP: (if available) HP 1½
Length of Drop Pipe 525 ft. capacity g.p.m.
Type: ☒ Submersible ☐ Reciprocating ☐ Jet ☐ Other:

14. REMARKS: Bail tested at 1/2 to 1 GPM
Water Temperature:

LAS 1675

cc: DGGS
Muni of Anch
8/16/84

15. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Magnuson Drilling — Registered Business Name
AA 5385 — Contract License Number
Address P.O. Box 504 Eagle River, Ak.
Signed [signature] — Authorized Representative
Date July 13, 1982

Form 02-WWR Copy: White - State DGGS, Pink - Driller, Canary - Customer

Scimitar 3 Block 1 Lot 16

3,1,16

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

LOCATION OF WELL (Please complete either Ia, Ib or Ic.)

Drilling Permit No. _____
A.D.L. No. _____

Ia. Borough	Subdivision	Lot	Block	Ib. 1/4 qtrs.	Section No.	Township	Range	Meridian
Anch	Scimitar 3	16	1	— of — of — of —		N ☐ S ☐	E ☐ W ☐	

Ic. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL: Mr. Paul Myers
Address: P.O. Box 351
Chugiak, Ak.

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
Fill	0	10
Top soil	10	20
Gravel	20	33
Greenstone	33	70
Fracture	70	75
Greenstone	75	95
Fracture	95	110
Greenstone	110	115
Fracture	115	117
Greenstone	117	155
Fracture	155	160
Greenstone	160	260
Fracture water included	260	270
Greenstone	270	280

4. WELL DEPTH: (final) 280 ft.

5. DATE OF COMPLETION 7 - 6 - 82

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other: _____

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 33 ft. Depth Weight 19 lbs./ft.
diam. _____ in. to _____ ft. Depth Stickup _____ ft.

9. FINISH OF WELL:
Type: Open Hole Diameter: 5"
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: _____ ft. 1/1 Date
☐ Above or ☐ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
_____ ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (if available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS:
Bail tested at 5-10 GPM

15. Water Temperature ____° ☐ F ☐ C

#820332

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
OCT 26 1982
RECEIVED

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Magnuson Drilling — Registered Business Name
AA 5385 — Contract License Number
Address: P.O. Box 504 Eagle River, Ak.
Signed: William Magnuson — Authorized Representative
Date: July 14, 1982

Form 02-WWR (11/81) Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

USGS Local No. _____

Scimitar 3 Block 1 Lot 16

well deepened 3,1,16

Certified Drilling Log

by

DOC Co. dba

SULLIVAN WATER WELLS

P.O. BOX 670272, CHUGIAK, ALASKA 99567 • TELEPHONE 688-2758

OWNER OF LAND LARRY SMITH

ADDRESS 2-900 9th ST SUITE 120 BOX 233 ELMENDORF 99506

LEGAL DESCRIPTION LOT 16 BLK 1 SCIMITAR #3

DATE - Started ______ Ended 3/93

PERMIT NUMBER ______

DEPTH OF WELL 500 FT

STATIC LEVEL OF WATER FT. ______

DRAW DOWN FT. ______

GALS. PER HR 1.3

KIND OF CASING 6 5/8 O.D.

KIND OF FORMATION:

From 0 Ft. to 280 Ft. EXISTING WELL

From 280 Ft. to 385 Ft. GREENSTONE LITTLE CHANGE

From 385 Ft. to 400 Ft. GREENSTONE W/ FRACTURES WET

From 400 Ft. to 460 Ft. GREENSTONE

From 460 Ft. to 465 Ft. GREENSTONE W/ QUARTZ SEAMS

From 465 Ft. to 495 Ft. GREENSTONE

From 495 Ft. to 499 Ft. GREENSTONE W/

From ___ Ft. to ___ Ft. QUARTZ SEAMS

From 499 Ft. to ___ Ft. GREENSTONE

From ___ Ft. to ___ Ft.

MISCL. INFORMATION:

DRILLER'S NAME [illegible]

Scimitar 3 Block 2 Lot 1

3, 2, 1

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

LOCATION OF WELL (Please complete either 1a, 1b or 1c.)

Drilling Permit No. _____
A.D.L. No. _____

1a. Borough	Subdivision	Lot	Block	1b. 1/4 qtrs.	Section No.	Township	Range	Meridian
aANCH	Scimitar 3	1	2	—of—of—of—		N ☐ S ☐	E ☐ W ☐	

1c. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL:
MYERS CONST.
Address:
P.O. Box 670351
CHUGIAK AK. 99567

2. WELL LOG

Material Type	Feet Below Surface Top	Bottom
soil sand gravel	0	16
rock gray	16	30
rock green	30	92
rock green & gray	92	160
rock green &gray h2o	160	213

4. WELL DEPTH: (final) 213 ft.

5. DATE OF COMPLETION 7 - 6 - 85

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other:

8. CASING: ☐ Threaded ☒ Welded
diam. 6 in. to 28 ft. Depth Weight 17 lbs./ ft.
diam. _____ in. to _____ ft. Depth Stickup _____ ft.

9. FINISH OF WELL:
Type: open Diameter: 6
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: 24 ft. 7/6/85 Date
☐ Above or ☐ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
150 ft. after _____ hrs. pumping _____ g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☐ No
Material: ☐ Neat Cement ☐ Other:

13. PUMP: (if available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS:

15. Water Temperature ____° ☐ F ☐ C

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
MAY 07 1986
RECEIVED

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

GENE SKYLES WELL DRILLING — a 1593
Registered Business Name — Contract License Number

Address: PO BOX 671473 CHUGIAK AK. 99567

Signed: _____ Date: 9/16/85
Authorized Representative

Form 02-WWR (11/81)

Copy Distribution: WHITE - State DGGS, PINK - Driller, CANARY - Customer

USGS Local No. _____

Scimitar 3 Block 2 Lot 2

WATER WELL RECORD
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Geological & Geophysical Surveys

Drilling Permit No. _____
A.D.L. No. _____

LOCATION OF WELL (Please complete either 1a, 1b or 1c.)

1a. Borough	Subdivision	Lot	Block	1b. ¼ qtrs. — of — of — of —	Section No.	Township N☐ S☐	Range E☐ W☐	Meridian
Anchorage	Scimitar 3	2	2					

1c. DISTANCE AND DIRECTION FROM ROAD INTERSECTIONS

Street Address and Area of Well Location

3. OWNER OF WELL: Myers & Myers
Address: P.O. Box 670351
Chugiak, Ak 99567

2. WELL LOG Material Type	Feet Below Surface Top	Bottom
sand and soil	0	16
rock grey	16	20
rock green	20	55
rock blue silty	55	65
rock grey dark and white	65	78
rock grey and black soft	78	83
rock black fractured	83	90
rock green	90	110
rock grey	110	148
rock green silty	148	151
rock black water	151	173

4. WELL DEPTH: (final) 192 ft.

5. DATE OF COMPLETION 4 - 5 - 85

6. ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Auger ☐ Jetted ☐ Bored ☐ Other:

7. USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Recharge ☐ Commerical ☐ Test Well ☐ Other: _____

8. CASING: ☐ Threaded ☒ Welded
diam. _____ in. to _____ ft. Depth Weight _____ lbs./ft.
diam. _____ in. to _____ ft. Depth Stickup _____ ft.

9. FINISH OF WELL:
Type: _____ Diameter: _____
Slot/Mesh Size: _____ Length: _____
Set between _____ ft. and _____ ft.
Backfilling _____ Gravel pack _____

10. STATIC WATER LEVEL: 60 ft. 4/5/85 Date
☐ Above or ☒ Below land surface
Equipment used: _____

11. PUMPING LEVEL below land surface and YIELD
160 ft. after 1 hrs. pumping 1 g.p.m.
_____ ft. after _____ hrs. pumping _____ g.p.m.

12. GROUTING Well Grouted: ☐ Yes ☒ No
Material: ☐ Neat Cement ☐ Other: _____

13. PUMP: (if available) HP _____
Length of Drop Pipe _____ ft. capacity _____ g.p.m.
☐ Subm. ☐ Jet ☐ Centrifical ☐ Other

14. REMARKS:

MUNICIPALITY OF ANCHORAGE
DEPT. OF HEALTH & ENVIRONMENTAL PROTECTION
NOV 05 1985
RECEIVED

15. Water Temperature ____° ☐ F ☐ C

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief;

Gene Skyles Well Drilling — Registered Business Name
A 16957 — Contract License Number
Address: P.O. Box 671473 Chugiak, Ak. 99567
Signed: Eugene M. Skyles — Authorized Representative
Date: 11/1/85

Copy Distribution WHITE - State DGGS PINK - Driller CANARY - Customer

APPENDIX H

Nitrate Trends in Select Public Wells

TECHNICAL MEMORANDUM

MONTGOMERY WATSON

To:	File	**Date:**	June 26, 2000
From:	Brett Jokela, Greta McGee	**Reference:**	
Subject:	Nitrate Trends in Selected Public Wells		

This memorandum has been prepared as an appendix to the Local Wellhead and Aquifer Protection Study - Phase II Report prepared for the Municipality of Anchorage Department of Health and Human Services. During the course of this study, increasing nitrate trends over time have been a concern in specific wells within the Anchorage municipality. For purposes of quantifying and illustrating trends, we reviewed current (1999) tabulations of Drinking Water Reporting data compiled and provided by the Alaska Department of Environmental Conservation (ADEC) for Class A and B public water systems. Wells that met the following criteria were selected for trend analysis:

- At least three samples were taken from the same location over a period of at least one year.
- Of the multiple sample results, at least one sample sustained a nitrate level of at least 3 milligrams per liter (mg/l).

These criteria were established to generate an unbiased database of information for wells with multiple nitrate samples. Several locations with multiple samples and elevated nitrates, such as Dawn Water Supply and St. John's Orthodox Church, were excluded from the analysis based on inconsistent sample location. In these areas and others, multiple sample locations or wells were identified under the ADEC primary name that attributed to varying nitrate results.

Attached to this memorandum are graphs from 29 locations showing ADEC nitrate sample results over time. The data have not be filtered for seasonal variability or responsiveness to short-term climatic and/or water balance variations. Thus, trending may be somewhat obscured.

The slope of the linear regression line and correlation coefficient (r-squared) was determined for each of the individual graphs. The r-squared value provides an indication of the reliability of the regression line in defining a statistically significant trend. Figure 1 illustrates the slopes of the linear regression lines plotted against the squared correlation coefficient. The majority of values indicate increasing slopes, although the wide range of r-squared values suggests that increasing trends throughout the Municipality are by no means certain.

Four sites (Camp Carlquist, Bear Mountain Condos, Fire Lake Subdivision, and Sun Valley Heights North) had correlation coefficients greater than 0.85, suggesting that the increasing nitrate trend for each is statistically significant. Other sites showing r-squared values less than

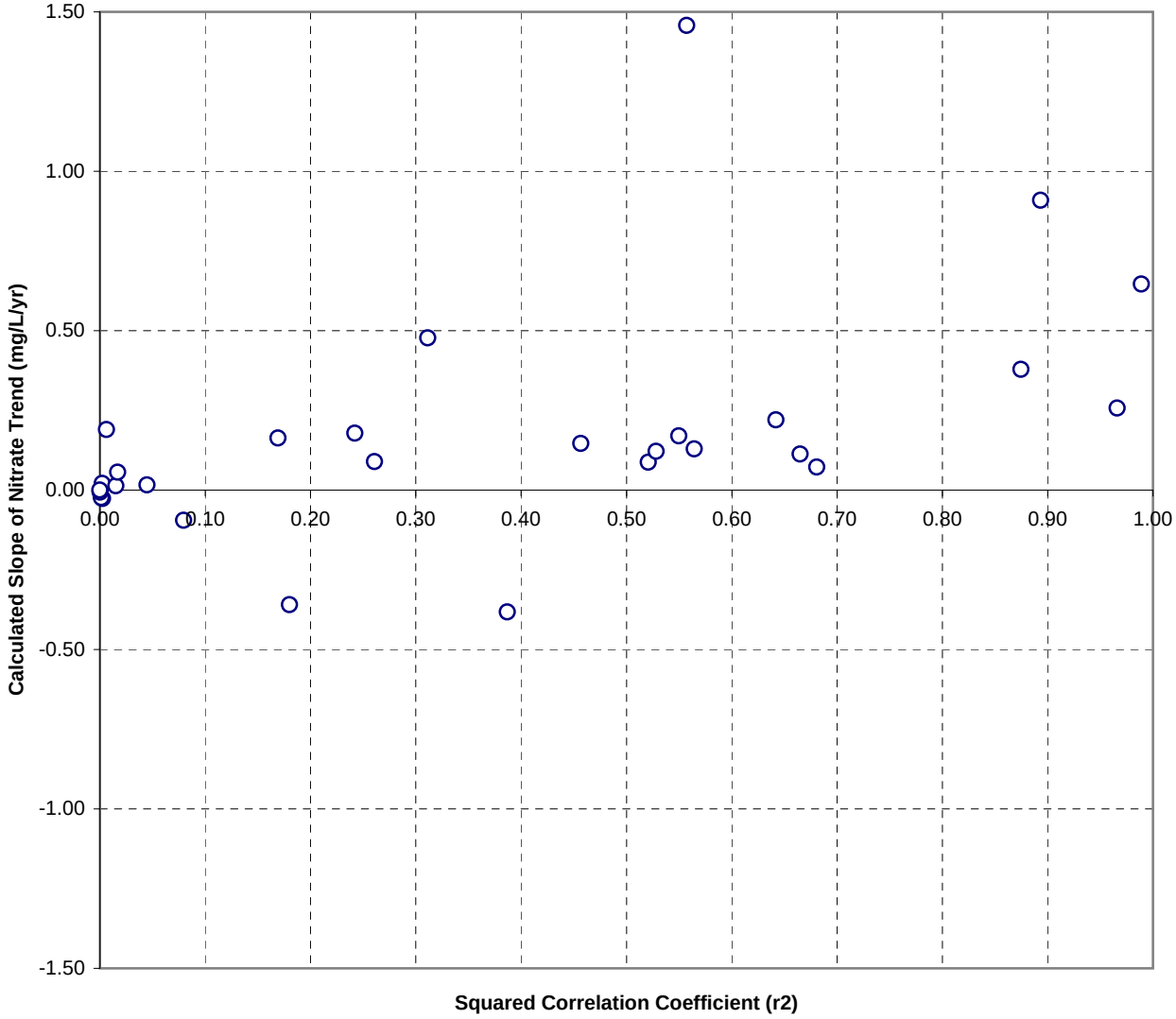
0.7 may be considered only as anecdotal evidence of a trend. A cluster of data near the origin (0,0) of the chart suggest that no linear trend exists at some locations.

Some changes in nitrate concentrations over time may not reflect linear trends, but other patterns specific to local hydrogeologic conditions and response to climate variation. For example, the Chugiak Benefits Association well was very consistent in nitrate concentration from 1985 through 1997, then suddenly doubled from 1.9 mg/L to 3.8 mg/L. Lack of a discernible linear trend does not necessarily indicate that changes are not occurring over time

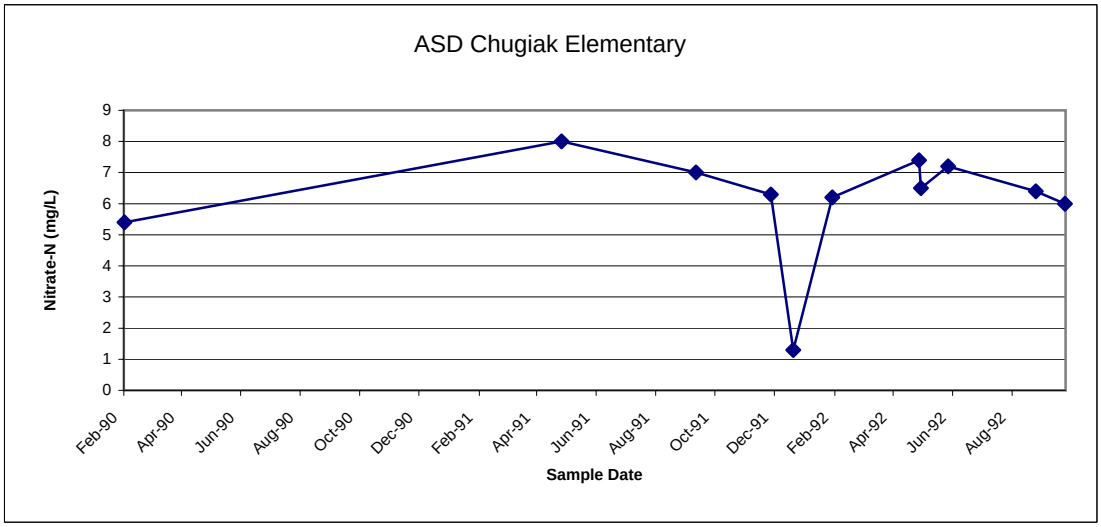
Therefore, we conclude that:

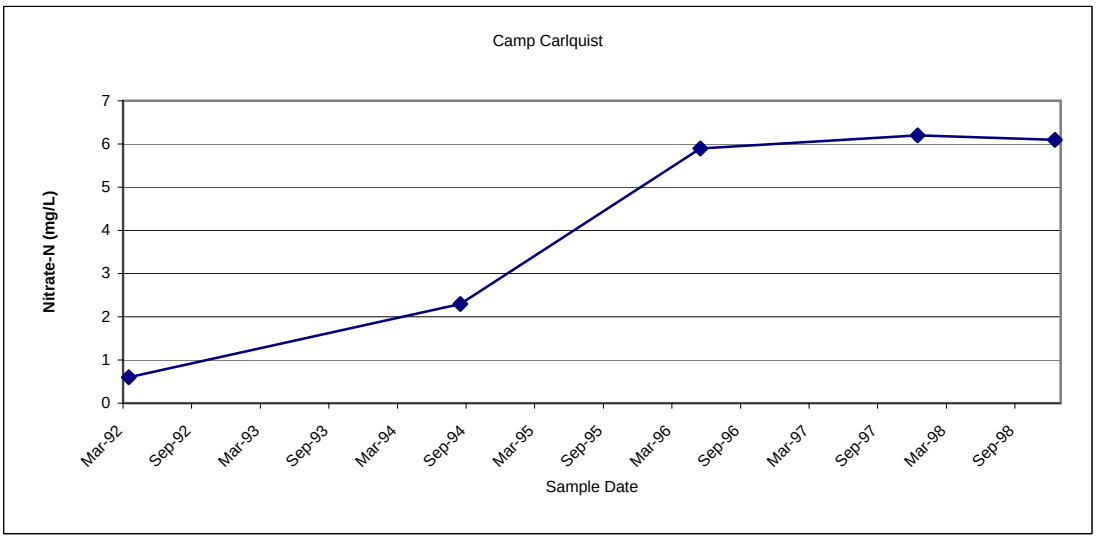
- Nitrate levels in certain public water supply wells in Anchorage are increasing with remarkable consistency.
- Nitrate levels are not increasing throughout the Municipality. Significant changes are limited to localized areas.
- Patterns of nitrate concentration time series may reflect a variety of hydrologic and source conditions, including response to changes in precipitation patterns and amounts.

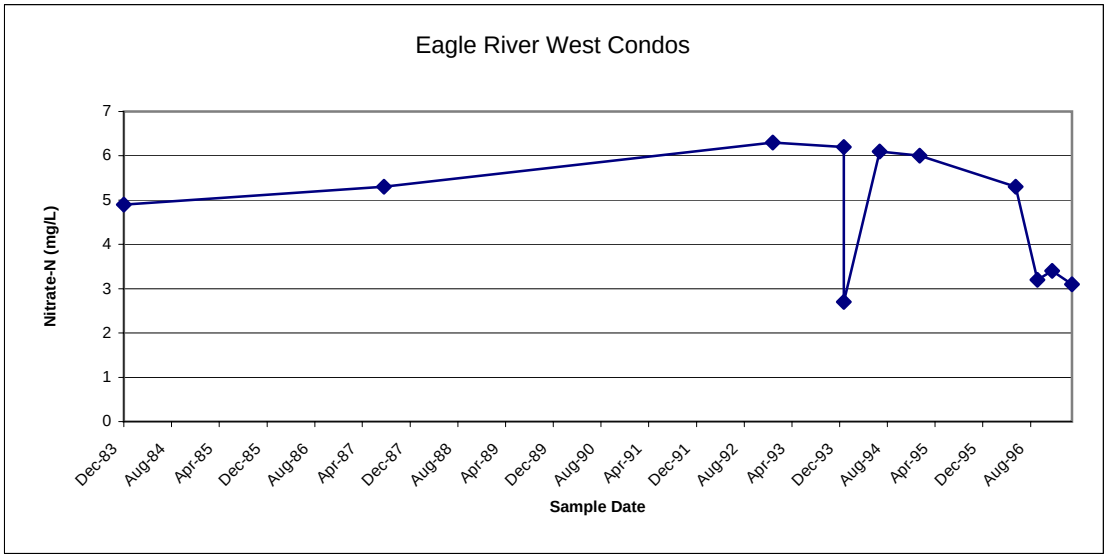
Figure 1. Nitrate Trend in Selected Public Wells (from ADEC Drinking Water Reporting Data)

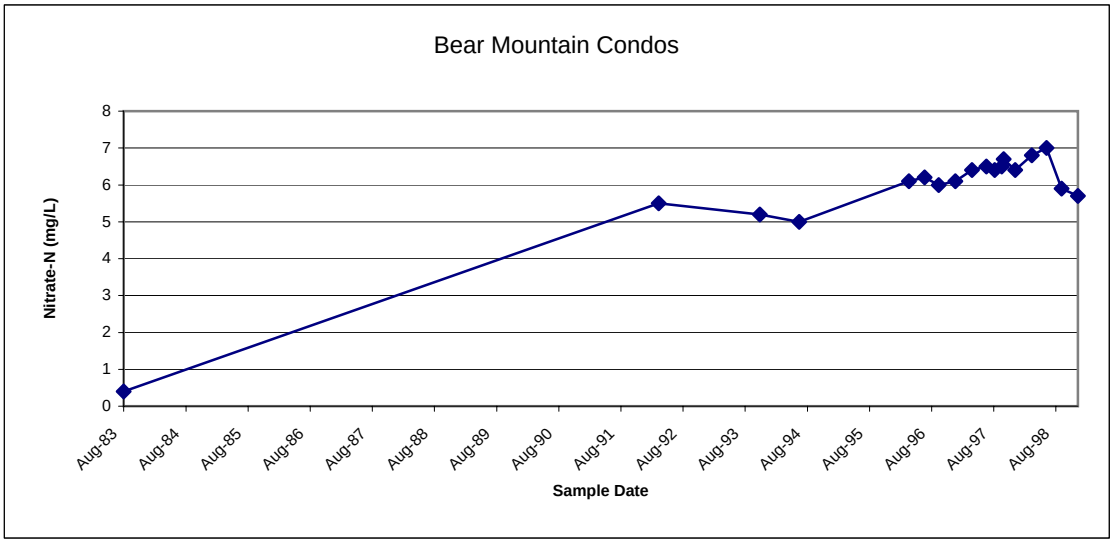


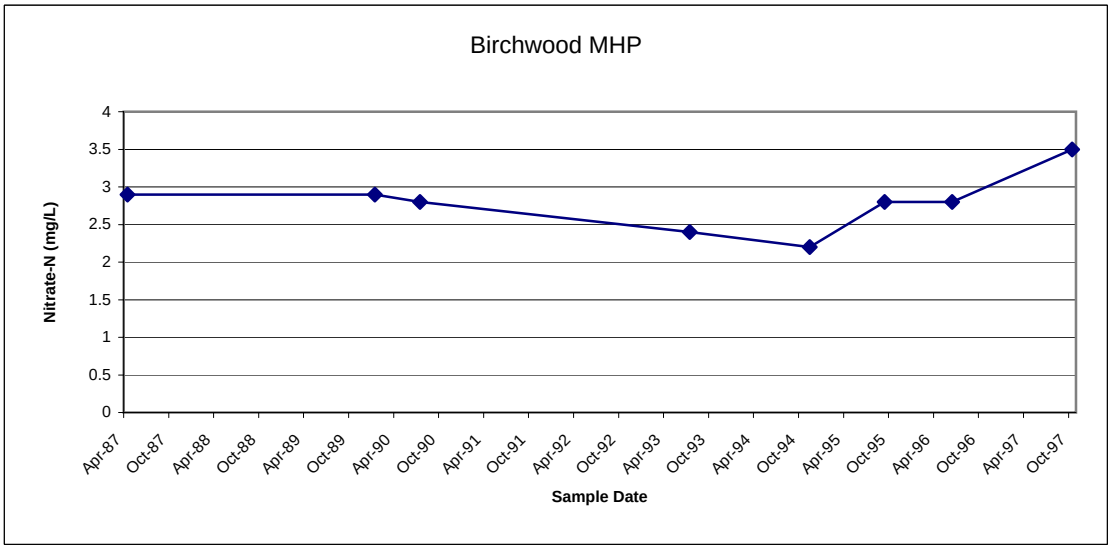
Location:	r2	Slope
ASD Chugiak Elementary	0.01	0.189
Camp Carlquist	0.89	0.909
Eagle River West Condos	0.08	-0.095
Chandelle Acres	0.00	0.021
Lakeridge Terrace 15/16A	0.56	1.457
American Legion Post 33	0.17	0.163
Bear Mountain Condos	0.87	0.378
Birchwood MHP	0.02	0.013
Birchwood Saloon	0.39	-0.382
Camp Gorsuch	.056	0.129
Chapel of the Cross	0.00	-0.027
Chugiak Benefit Ass.	0.46	0.146
Circle S Grocery	0.00	-0.024
Fire Lake Subdivision	0.99	0.626
First Baptist Church	0.31	0.477
Grace Brethren Church	0.24	0.178
Hilltop Ski Area	0.68	0.072
McKinley View Estates	0.67	0.112
Meadow Ridge Estates	0.00	-0.006
Metro Apartments	0.04	0.016
Midway Apartments	0.00	0.000
Our Redeemer Lutheran	0.18	-0.360
Parkway Apartments	0.55	0.169
Peters Creek Baptist	0.02	0.056
Peters Creek Christian	0.26	0.089
Peters Creek Manor	0.52	0.088
Peters Creek Terrace	0.64	0.220
St. Elizabeth Seton	0.53	0.122
Sun Valley Heights North	0.97	0.257

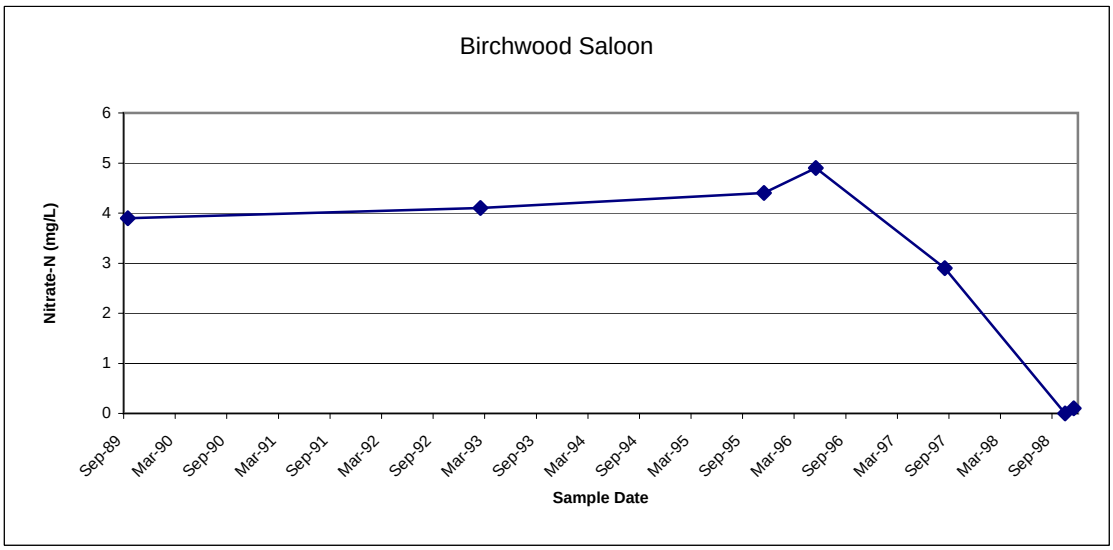

ASD Chugiak Elementary
Nitrate-N (mg/L)
0
1
2
3
4
5
6
7
8
9
Feb-90
Apr-90
Jun-90
Aug-90
Oct-90
Dec-90
Feb-91
Apr-91
Jun-91
Aug-91
Oct-91
Dec-91
Feb-92
Apr-92
Jun-92
Aug-92
Sample Date

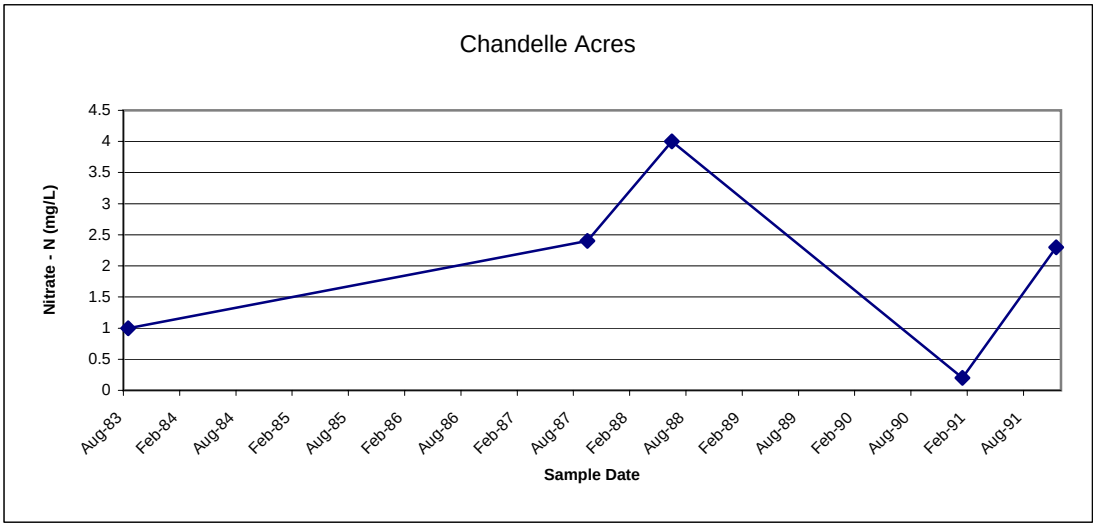

Camp Carlquist
Nitrate-N (mg/L)
0
1
2
3
4
5
6
7
Mar-92
Sep-92
Mar-93
Sep-93
Mar-94
Sep-94
Mar-95
Sep-95
Mar-96
Sep-96
Mar-97
Sep-97
Mar-98
Sep-98
Sample Date

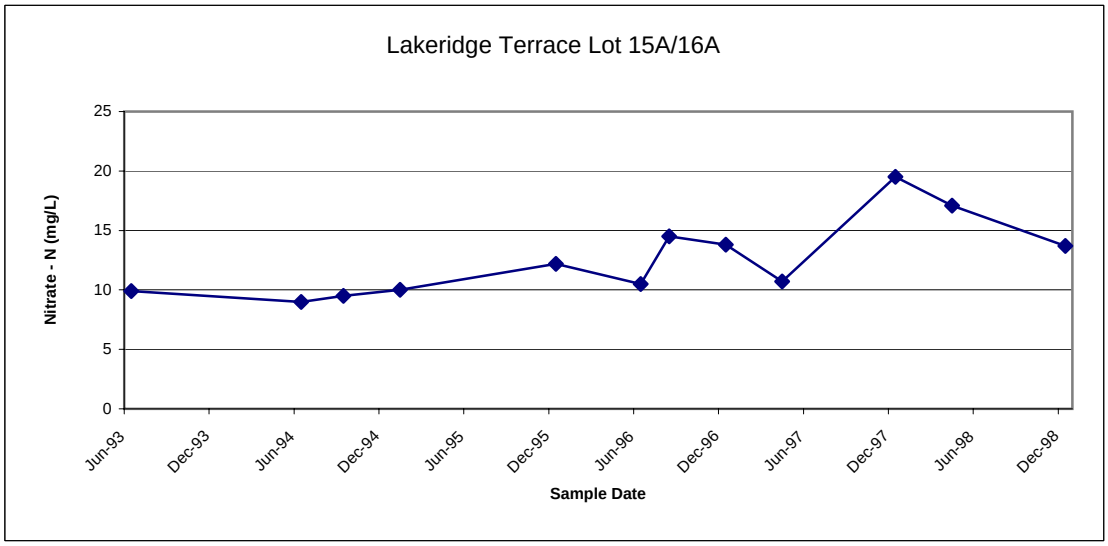

Eagle River West Condos
Nitrate-N (mg/L)
0
1
2
3
4
5
6
7
Dec-83
Aug-84
Apr-85
Dec-85
Aug-86
Apr-87
Dec-87
Aug-88
Apr-89
Dec-89
Aug-90
Apr-91
Dec-91
Aug-92
Apr-93
Dec-93
Aug-94
Apr-95
Dec-95
Aug-96
Sample Date

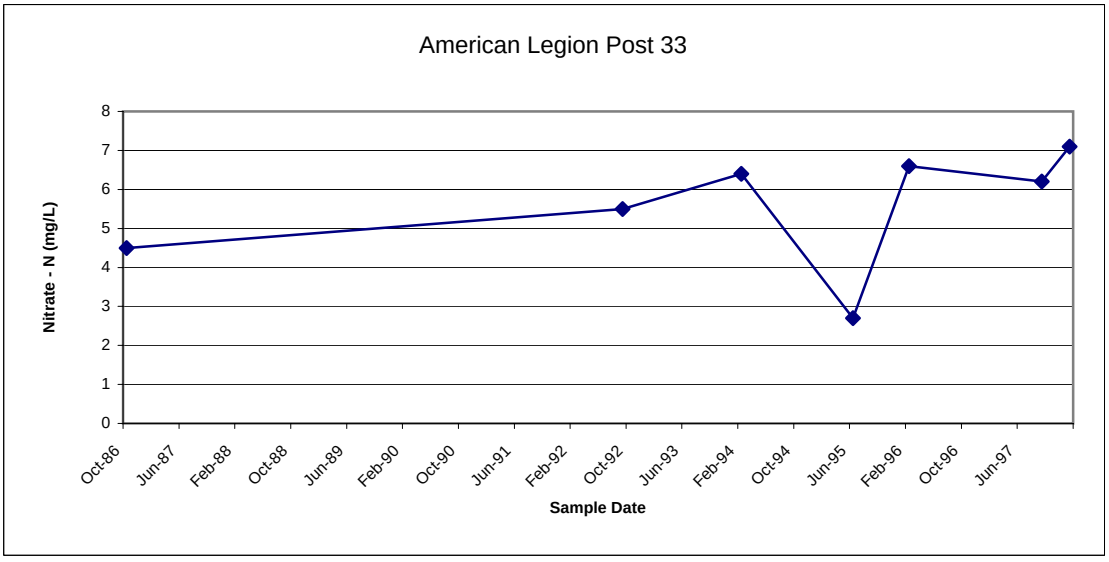

Bear Mountain Condos
Nitrate-N (mg/L)
0
1
2
3
4
5
6
7
8
Aug-83
Aug-84
Aug-85
Aug-86
Aug-87
Aug-88
Aug-89
Aug-90
Aug-91
Aug-92
Aug-93
Aug-94
Aug-95
Aug-96
Aug-97
Aug-98
Sample Date

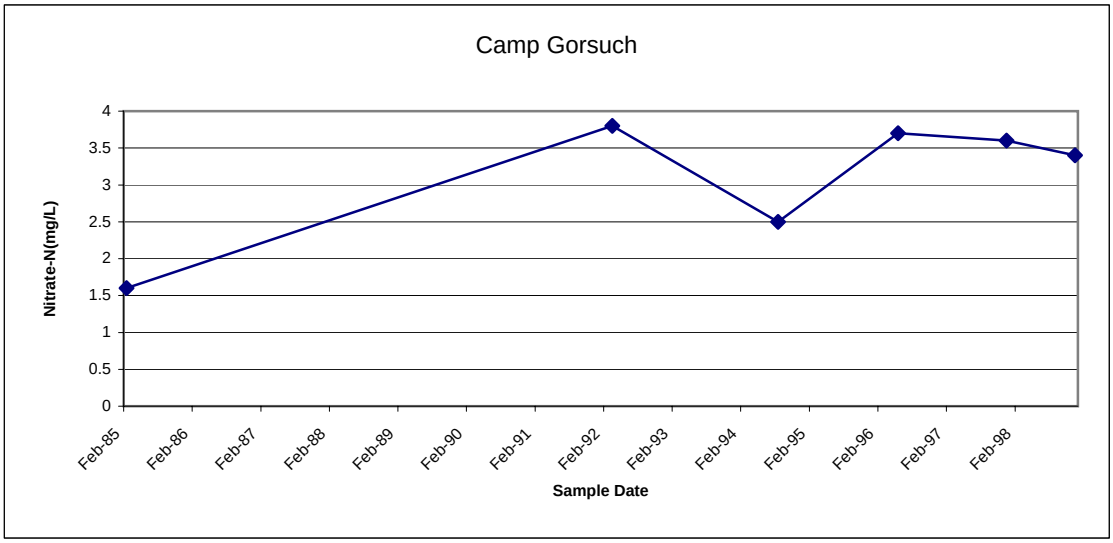

Birchwood MHP
Nitrate-N (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
4
Apr-87
Oct-87
Apr-88
Oct-88
Apr-89
Oct-89
Apr-90
Oct-90
Apr-91
Oct-91
Apr-92
Oct-92
Apr-93
Oct-93
Apr-94
Oct-94
Apr-95
Oct-95
Apr-96
Oct-96
Apr-97
Oct-97
Sample Date

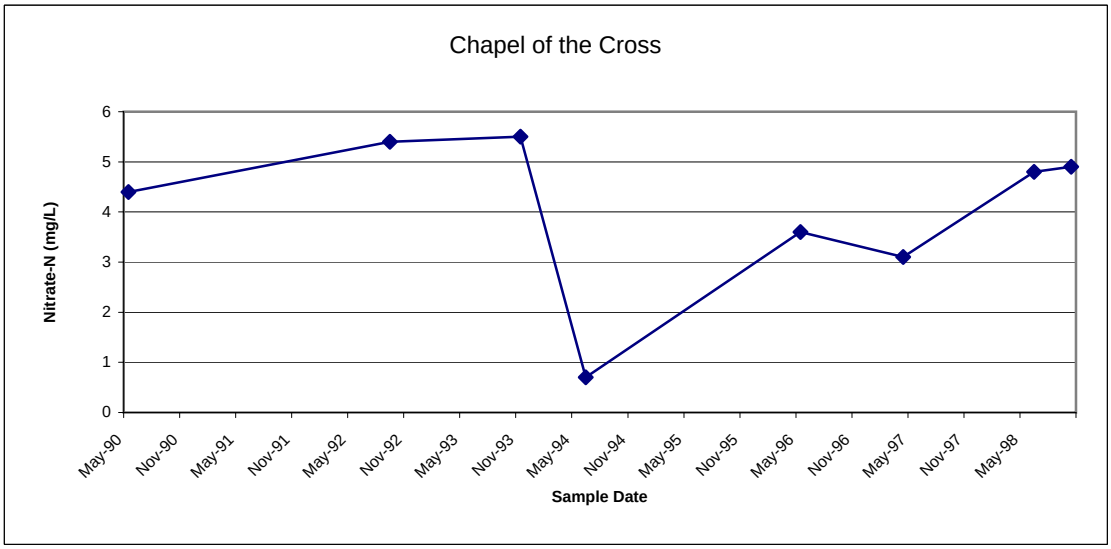

Birchwood Saloon
Nitrate-N (mg/L)
0
1
2
3
4
5
6
Sep-89
Mar-90
Sep-90
Mar-91
Sep-91
Mar-92
Sep-92
Mar-93
Sep-93
Mar-94
Sep-94
Mar-95
Sep-95
Mar-96
Sep-96
Mar-97
Sep-97
Mar-98
Sep-98
Sample Date

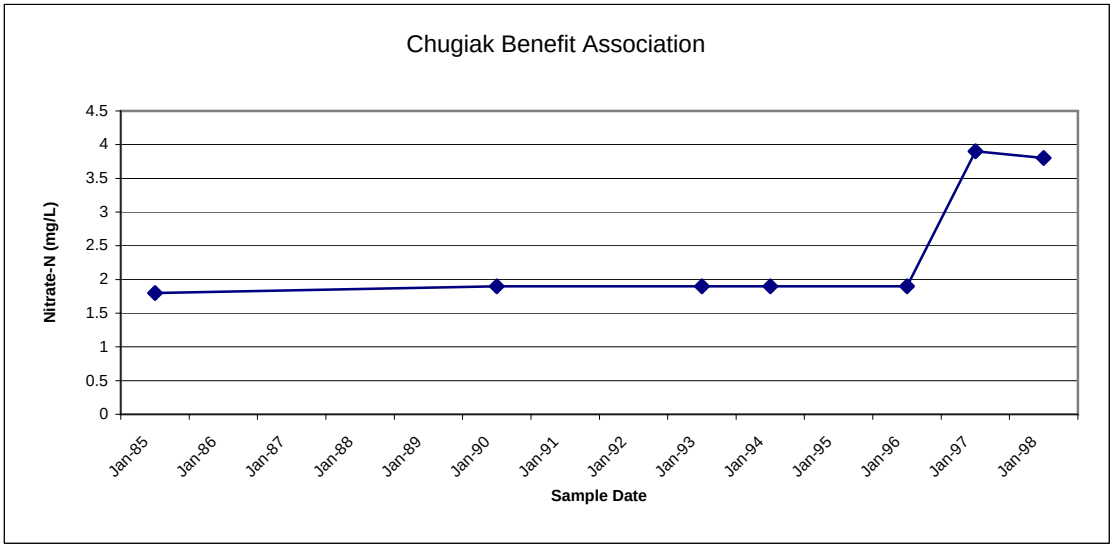

Chandelle Acres
Nitrate - N (mg/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Aug-83
Feb-84
Aug-84
Feb-85
Aug-85
Feb-86
Aug-86
Feb-87
Aug-87
Feb-88
Aug-88
Feb-89
Aug-89
Feb-90
Aug-90
Feb-91
Aug-91
Sample Date


Lakeridge Terrace Lot 15A/16A
Nitrate - N (mg/L)
25
20
15
10
5
0
Jun-93
Dec-93
Jun-94
Dec-94
Jun-95
Dec-95
Jun-96
Dec-96
Jun-97
Dec-97
Jun-98
Dec-98
Sample Date


American Legion Post 33
Nitrate - N (mg/L)
8
7
6
5
4
3
2
1
0
Oct-86
Jun-87
Feb-88
Oct-88
Jun-89
Feb-90
Oct-90
Jun-91
Feb-92
Oct-92
Jun-93
Feb-94
Oct-94
Jun-95
Feb-96
Oct-96
Jun-97
Sample Date


Camp Gorsuch
Nitrate-N(mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Feb-85
Feb-86
Feb-87
Feb-88
Feb-89
Feb-90
Feb-91
Feb-92
Feb-93
Feb-94
Feb-95
Feb-96
Feb-97
Feb-98
Sample Date


Chapel of the Cross
Nitrate-N (mg/L)
6
5
4
3
2
1
0
May-90
Nov-90
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Sample Date


Chugiak Benefit Association
Nitrate-N (mg/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-85
Jan-86
Jan-87
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Sample Date