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Baseline Hydrology Report

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Kennecott Minerals Company
Eagle Project

Environmental Baseline Study
Hydrology Report
Volume I

Prepared for

**Kennecott Minerals Company
And Golder Associates Inc.
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Table of Contents

EXECUTIVE SUMMARY **1**

1.0 INTRODUCTION **9**

2.0 STUDY AREA **11**

3.0 METHODS **14**

3.1 Soil Cores and Classification 14
3.2 Piezometer and Monitoring Well Installation 14
3.3 Hydrologic Data Collection 16
3.4 Water Quality Monitoring 17

4.0 GEOLOGY **20**

4.1 Bedrock Geology 20
4.2 Quaternary Geology 23
4.3 Stratigraphic Relationships 29

5.0 HYDROLOGY **31**

5.1 Introduction 31
5.2 Precipitation Data 31
5.3 Surface Water Flow 32
5.4 Groundwater Flow 36
5.5 Hydraulic Characteristics of Geologic Formations 40
5.6 Groundwater Flow Model 46

6.0 WATER QUALITY **58**

6.1 Introduction 58
6.2 Quality Control Data 58
6.3 Surface Water Quality 60
6.4 Surface Erosion 65
6.5 Groundwater Quality 68

7.0 REFERENCES **74**

TABLES

FIGURES

APPENDICES

LIST OF ABBREVIATIONS, ACRONYMS AND UNITS

TABLES

TABLE 1	Summary of Activities at Surface Water Monitoring Locations 2004 - 2005
TABLE 2	Summary of Activities at Groundwater Monitoring Locations 2004 - 2005
TABLE 3	Grain Size Distribution for Quaternary Deposits
TABLE 4	Surface Water Flow Measurements Salmon Trout River November 2002 – May 2005
TABLE 5	Surface Water Flow Measurements Yellow Dog River November 2002 – May 2005
TABLE 6	Surface Water Flow Measurements Cedar Creek November 2002 – May 2005
TABLE 7	Surface Water Flow Per Unit Area and Maximum / Minimum Flow Ratio
TABLE 8	Water Elevation Measurements
TABLE 9	Hydraulic Characteristics from the A Zone Pumping Test
TABLE 10	Hydraulic Characteristics from the D Zone Pumping Test
TABLE 11	Hydraulic Characteristics from the Bedrock Pumping Test
TABLE 12	Summary of Hydraulic Characteristics for Hydrostratigraphic Units
TABLE 13	Surface Water Quality Data Salmon Trout River Monitoring Locations
TABLE 14	Surface Water Quality Data Yellow Dog River Monitoring Locations
TABLE 15	Surface Water Quality Data Cedar Creek Reference Stream Monitoring Locations
TABLE 16	Surface Erosion Monitoring Sediment Trap Summary
TABLE 17	Groundwater Quality Data Wetland Deposit Monitoring Locations

TABLE 18 Groundwater Quality Data Quaternary Deposit Monitoring Locations

TABLE 19 Groundwater Quality Data Bedrock Monitoring Location 04EA054 August 2004

FIGURES

FIGURE 1 Site Location Map

FIGURE 2 Regional Overview

FIGURE 3 Bedrock Geology of the Eagle Project area

FIGURE 4 Quaternary Geology of the Eagle Project area

FIGURE 5 Generalized Geologic Cross Section

FIGURE 6 Groundwater Monitoring Locations

FIGURE 7 Surface Water Monitoring Locations

FIGURE 8 Surface Erosion Monitoring Locations

FIGURE 9 Pumping Test Locations

FIGURE 10 Gravity Anomaly Map

FIGURE 11 Quaternary Stratigraphic Column

FIGURE 12 Quaternary Deposit Isopach

FIGURE 13 Unsaturated Isopach

FIGURE 14 Confining Unit (B & C Zone) Isopach

FIGURE 15 Conceptual Hydrogeologic Cross Section A-A'

FIGURE 16 Conceptual Hydrogeologic Cross Section B-B'

FIGURE 17 Conceptual Hydrogeologic Cross Section C-C'

FIGURE 18 Conceptual Hydrogeologic Cross Section D-D'

FIGURE 19 Monthly Precipitation from June 2004 to May 2005 at the Marquette National Weather Service Monitoring Station Compared to Average Monthly Precipitation from 1979 to 1998

FIGURE 20 Hydrographs of Mean Daily Flow for Salmon Trout River and Yellow Dog River Continuous Monitoring Locations (September 2004 - May 2005)

FIGURE 21 Detailed Seep and Surface Water Mapping Downgradient of Eagle Project area

FIGURE 22 A Zone Groundwater Elevation Contours (Spring Snowmelt Runoff, May 2004)

FIGURE 23 A Zone Groundwater Elevation Contours (Summer Baseflow, August 2004)

FIGURE 24 A Zone Groundwater Elevation Contours (Fall Rain Runoff, October 2004)

FIGURE 25 A Zone Groundwater Elevation Contours (Winter Baseflow, March 2005)

FIGURE 26 A Zone Groundwater Elevation Contours (Spring Snowmelt Runoff, May 2005)

FIGURE 27 D Zone Groundwater Elevation Contours (Spring Snowmelt Runoff, May 2004)

FIGURE 28 D Zone Groundwater Elevation Contours (Summer Baseflow, August 2004)

FIGURE 29 D Zone Groundwater Elevation Contours (Fall Rain Runoff, October 2004)

FIGURE 30 D Zone Groundwater Elevation Contours (Winter Baseflow, March 2005)

FIGURE 31 D Zone Groundwater Elevation Contours (Spring Snowmelt Runoff, May 2005)

FIGURE 32 Hourly Groundwater Elevation Data for Selected Monitoring Locations

FIGURE 33 Quaternary Pumping Test Hydrogeologic Cross Section E-E'

FIGURE 34 Conceptual Regional Hydrogeologic Cross Section

FIGURE 35 Generalized Groundwater Flow Model Domain, Boundaries and Grid Spacing

FIGURE 36 Comparison of Model Calculated Heads to Measured Heads

FIGURE 37 Model Head Equipotentials for Layer 2 (A Zone)

FIGURE 38 Model Head Equipotentials for Layer 5 (D Zone)

FIGURE 39 Simulated River Outflow by Groundwater Basin Compared to Estimated Baseflow at Key Gaging Locations

FIGURE 40 Model Mass Balance by Hydraulic Feature

FIGURE 41 Layer 2 (A Zone) Model Equipotential Simulation with Groundwater Basin Divides

FIGURE 42 Layer 5 (D Zone) Model Equipotential Simulation with Groundwater Basin Divides

FIGURE 43 Temperature at Continuous Monitoring Locations (September 2004 – May 2005)

FIGURE 44 Continuous Surface Water Temperature Data for Additional Salmon Trout River Monitoring Locations (September 2004 – May 2005)

FIGURE 45 Mean Daily Specific Conductance at Continuous Monitoring Locations on the Salmon Trout River and Yellow Dog River (September 2004 – May 2005)

FIGURE 46 Hardness at Selected Surface Water Monitoring Locations (Fall Rain Runoff 2004)

FIGURE 47 Seasonal Variation of Hardness at Selected Surface Water Monitoring Locations

FIGURE 48 Piper Diagram Surface Water (Winter Baseflow 2004)

FIGURE 49 Piper Diagram Surface Water (Spring Snowmelt Runoff 2004)

FIGURE 50 Piper Diagram Surface Water (Spring Rain Runoff 2004)

FIGURE 51 Piper Diagram Surface Water (Summer Baseflow 2004)

FIGURE 52 Piper Diagram Surface Water (Fall Rain Runoff 2004)

FIGURE 53 Piper Diagram Surface Water (Winter Baseflow 2005)

FIGURE 54 Piper Diagram Surface Water (Spring Snowmelt Runoff 2005)

FIGURE 55 Seasonal Variation of Flow and Mercury Concentration in the Salmon Trout River Watershed

FIGURE 56 Piper Diagram Groundwater (Spring Snowmelt Runoff 2004)

FIGURE 57 Piper Diagram Groundwater (Summer Baseflow 2004)

FIGURE 58 Piper Diagram Groundwater (Fall Rain Runoff 2004)

FIGURE 59 Piper Diagram Groundwater (Winter Baseflow 2005)

FIGURE 60 Piper Diagram Groundwater (Spring Snowmelt Runoff 2005)

FIGURE 61 Piper Diagram Surface Water/Groundwater B-B' (Fall Rain Runoff 2004)

FIGURE 62 Piper Diagram Surface Water/Groundwater C-C' (Fall Rain Runoff 2004)

FIGURE 63 Piper Diagram Comparison of Quaternary Formation and Bedrock Water Quality

VOLUME II

APPENDICES

APPENDIX A	Piezometer/Monitoring Well Construction Summary and Boring Logs
APPENDIX B	Pumping test Reports
APPENDIX C	Baseline Groundwater Flow Model Status Report
APPENDIX D	Parameters and Analytical Methods
APPENDIX E	Field Sampling Report
APPENDIX F	Hourly Hydrographs with Discrete Flow Measurements
APPENDIX G	Continuous Groundwater Monitoring Data
APPENDIX H	Quality Control Report

VOLUME III

All laboratory reports associated with this study are compiled in Volume III (Eagle Project Compendium of Laboratory Reports November 2002– May 2005).

LIST OF ABBREVIATIONS, ACRONYMS AND UNITS

Abbreviations

East Branch	East branch tributary of the Salmon Trout River
Golder	Golder Associates Inc.
Main Branch	Main branch of the Salmon Trout River
Peridotite	Yellow Dog Peridotite
Plains	Yellow Dog Plains
Project	Kennecott Mineral Company's Eagle Project
redox	oxidation-reduction
State	State of Michigan
Study	Baseline study of hydrologic conditions
Study Area	Hydrologic study area consisting of the Salmon Trout River watershed, a portion of the Yellow Dog River watershed adjacent to the divide within the plains, and a section of the Cedar Creek watershed.
West Branch	West branch tributary of the Salmon Trout River
wetland	The large wetland complex located on the Yellow Dog Plains.

Acronyms

ASTM	American Society for Testing and Materials
bgs	below ground surface
CDRA	Unnamed headwater tributary to Cedar Creek
CDRM	Main branch of Cedar Creek
EBS	Environmental baseline study
KEX	Kennecott Exploration Company
KMC	Kennecott Minerals Company
MDEQ	Michigan Department of Environmental Quality
MI DNR	Michigan Department of Natural Resources
MSL	mean sea level
NAD	North American Datum
NJC	North Jackson Company
PVC	polyvinyl chloride
QAL	Quaternary alluvium
RMS	root mean squared error
RPD	relative percent difference

LIST OF ABBREVIATIONS, ACRONYMS AND UNITS

Acronyms, continued

STRE	Salmon Trout River East Branch
STRM	Salmon Trout River Main Branch
STRW	Salmon Trout River West Branch
TDS	total dissolved solids
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
WLD	Wetland deposit
YDRM	Yellow Dog River

Units

ACU	apparent color units
cfs	cubic feet per second
cm	centimeter
ft	feet
ft^3	cubic feet
gpd	gallons per day
gpm	gallons per minute
in.	inch
L	liter
m	meter
meq	milliequivalents
mg	milligrams
mi	mile
mi^2	square mile
ng	nanograms
^oC	degrees Celsius
SU	standard units
TU	tritium units
µg	microgram

Executive Summary

This report presents results of a baseline study of hydrologic conditions near the Kennecott Minerals Company Eagle Project. The proposed Eagle Project would include underground mining of nickel and copper from an ore body located in the Yellow Dog Plains (Plains), approximately 9.5 miles southwest of Big Bay in Marquette County, Michigan.

The Plains are a relatively flat-lying, sandy geomorphologic feature covering 27 square miles. The Plains trend from the northwest to the southeast and are bounded to the south by shallow igneous and metamorphic bedrock that rises above the Plains and to the north by a steep, terraced escarpment (north terrace) of glacial moraine that slopes north to a northeast-trending valley below the Plains. The Yellow Dog Peridotite, containing the mineralized ore body of mining interest, is an igneous intrusion into the metasedimentary basin rock formation underlying the Plains. The Yellow Dog Peridotite outcrops in the Plains near the headwaters of the Salmon Trout River.

The Eagle Project is situated near a hydrologic divide of surface watersheds mapped by the State of Michigan: those drained by the Salmon Trout River and those by the Yellow Dog River. Because of this condition, a watershed perspective was implemented to assess baseline hydrology for the Eagle Project. The hydrologic study area (Study Area) consists of the Salmon Trout River watershed and the portion of the Yellow Dog River watershed adjacent to the divide and within the Plains. A headwater section of a third watershed (the Cedar Creek subwatershed of the Pine River watershed) has also been included in the Study Area to serve as a potential reference watershed. All Study Area streams flow to Lake Superior.

Study Area streams follow typical regional seasonal flow patterns, with peak flows associated with snowmelt runoff and low flows occurring in late summer and winter.

The headwaters of the main branch (Main Branch) of the Salmon Trout River are located in a large wetland complex (wetland) on the Plains south of the Project Area. The East Branch and West Branch headwaters are largely seeps located along the north terrace. All branches of the Salmon Trout River gain flow rapidly from north terrace groundwater seepage.

The Salmon Trout River East Branch, Main Branch and West Branch provide about 46% (22 cubic feet per second), 15% (7 cubic feet per second) and 12% (6 cubic feet per second), respectively, of the estimated flow of the Salmon Trout River system measured close to the mouth of the river (48 cubic feet per second). The balance of the Salmon Trout River flow to Lake Superior is derived from the bedrock dominated watershed downstream of the Plains and north terrace.

The Salmon Trout River tributaries exhibit short duration surface runoff events relative to the downstream Salmon Trout River and Yellow Dog River monitoring locations. This is due to the predominance of high permeability outwash within much of the upper Salmon Trout River watershed, resulting in a relatively greater contribution of groundwater to surface water flow. Downstream flows are flashy because they receive a relatively greater contribution of surface runoff due to the predominance of shallow bedrock in this portion of the watershed. The Yellow Dog River is also more strongly affected by surface runoff from the bedrock highlands of its headwaters and by wetland storage along its banks within the Plains.

The most transmissive units within the Study Area are found in the glacial deposits. These units are outwash materials composed primarily of fine- to medium-grained sand and are separated into upper and lower units by an

extensive deposit of low permeability clay, likely deposited during the most recent continental glaciation. These units discharge to the Salmon Trout River, Cedar Creek and, to some degree, to the Yellow Dog River.

Groundwater flow in the uppermost unit (A zone) is generally to the north/northeast across the Plains. A divide exists between the Salmon Trout River and the Yellow Dog River groundwater basins within the Plains wetland south of the Eagle Project. The Plains wetland is hydrologically upgradient of the Eagle Project and is the uppermost component of the Salmon Trout River groundwater basin. The wetland must therefore have a primary storage and recharge function in relation to groundwater and must be supported by precipitation.

The general horizontal flow direction in the lower transmissive outwash unit (D zone) is also to the north/northeast. The D zone flow patterns are locally influenced by shallow bedrock creating divergent flow patterns and thicker D zone deposits in buried bedrock channels creating convergent flow patterns.

The continuous groundwater elevation data are fairly stable, with small fluctuations that are typical of seasonal changes. Declining groundwater elevations are observed from late summer through winter, corresponding to a period of low infiltration. Groundwater elevations then increase in spring in response to snowmelt recharge at most locations, with the greatest increases observed near the Plains wetland recharge areas. Groundwater elevation data indicate that downward vertical gradients exist between the A and D zones at locations close to the north terrace and upward vertical gradients exist south (QAL004) and west (QAL007) of the Project Area. Where the low permeability silt and clay deposits (B and C zones) are absent near the north terrace, there is essentially no head difference between the A and D zones.

The Quaternary deposit pumping test results indicate an A zone average horizontal hydraulic conductivity of 50 feet per day and average specific yield of

0.048. The D zone average horizontal hydraulic conductivity is 39 feet per day and the average storage coefficient is 1.7E-4. Groundwater flow in the primary productive hydrostratigraphic units (A and D zones) is strongly horizontal. The A zone is unconfined while the D zone is confined throughout most of the Study Area. Where present, the B and C zones act together as a substantial hydraulic barrier, restricting groundwater movement between the A and D zones.

The bedrock pumping test specific capacity results indicate that bedrock hydraulic conductivity values range from 0.02 to 0.13 feet per day, which is up to 4 orders of magnitude lower hydraulic conductivity than observed in A and D zones of the glacial alluvium. This indicates that most groundwater flow occurs in the glacial deposits and that very little groundwater flow occurs between the glacial alluvium and the bedrock. Regionally, similar bedrock formations are known to yield low quantities of water.

A numerical flow model of steady-state conditions of the groundwater/surface water system was constructed using Visual MODFLOW software. The model reflects that groundwater in the Plains is mainly derived from precipitation infiltrating the wetland and sandy surface soils that cover the Plains. The infiltrated precipitation travels as groundwater through the A and D zones before discharging to seeps and streams as surface water. The model's water balance indicates that the groundwater/surface water system is not connected to other flow systems or watersheds of the region.

Backward particle tracking from model river cells was used to derive groundwater divides (and associated groundwater basins) for the subwatersheds of the Salmon Trout River West Branch, Main Branch, East Branch and a portion of the Yellow Dog River. The locations of the model-derived divides indicate that the Salmon Trout River basin captures groundwater from a significantly larger area of the Plains than is represented by the surface watersheds mapped by the State of Michigan. This is particularly true for the East Branch, where the groundwater

basin divide is offset approximately 1 mile south from the surface watershed divide. This finding is supported by East Branch stream flow data collected near the base of the north terrace normalized to surface water drainage area, which indicate that the East Branch average discharge per square mile of surface watershed is approximately 60% greater than that of the entire Salmon Trout River watershed.

The model results also indicate that the Salmon Trout River East Branch groundwater basin captures D zone groundwater from beneath a segment of the Yellow Dog River. This result reflects the effect of the presence of extensive glacial lake fine-grained materials (B and C zones), which likely provide a hydraulic separation between the Yellow Dog River and the D zone. This model finding is consistent with Yellow Dog River surface flow characteristics, which indicate a relatively high contribution from surface water relative to the upper tributaries of the Salmon Trout River, particularly the East Branch, which have a relatively high contribution of groundwater. The model finding is also consistent with Segerstrom's geologic model (1964), which suggested the future hydrogeologic evolution of the Plains may eventually result in capture of the upper Yellow Dog River within the Salmon Trout River watershed via groundwater flow processes.

The Study Area surface water quality can be generally described as soft to moderately hard, with neutral pH and a low degree of mineralization and turbidity. Calcium and bicarbonate ions are the principal dissolved constituents at all locations monitored. Nutrient concentrations are generally low and dissolved oxygen is generally high.

The water quality data support hydrologic data and the groundwater/surface water system model indicating that the Salmon Trout River and Cedar Creek monitoring locations downstream of the north terrace are dominated by contributions from groundwater flow. At these locations these streams have

somewhat higher conductivity values, less color, lower organic carbon content, greater hardness concentrations, warmer winter temperatures and cooler summer temperatures compared to the Yellow Dog River and Salmon Trout River monitoring locations on the Plains and near the mouth of the Salmon Trout River.

Surface water temperature data follow typical seasonal patterns. Surface water conductivity data show the periodic influence of increased surface water contribution associated with snowmelt runoff and spring and fall precipitation. Increased mercury concentrations occur during periods of increased surface runoff and are most noticeable at stream sampling locations that are dominated by shallow groundwater flow input or surface runoff. These data suggest that the observed variability of mercury concentration appears to be related to regional mercury deposition released to streams from surface runoff rather than point sources of mercury in the watershed. Somewhat higher turbidity and total suspended solids are also detected in streams following snowmelt runoff.

Minor and trace constituents detected in most surface water samples include iron, manganese and aluminum. Because dissolved iron is an oxidation-reduction sensitive parameter, its concentration increases seasonally at locations exhibiting lower dissolved oxygen concentrations during warm water conditions.

The surface water quality monitoring results are in good agreement with those reported for an independent monitoring study conducted on behalf of the Michigan Department of Environmental Quality in 2004.

A potential significant existing impact to surface water quality is surface erosion associated with the current road network. The estimated road density for the upper Salmon Trout River watershed was 7 miles per square mile. The US Forest Service considered densities greater than 4.7 miles per square mile as extremely high in logged watersheds relative to sensitive trout habitat. The estimated annual rate of sediment delivery to streams associated with surface

erosion of roads is 43 tons per square mile. Relative to the estimated annual rate of naturally-derived (from soil creep) sediment delivery (8 tons per square mile) to streams, under baseline conditions, the current road network appears to deliver an annual sediment load to streams at a rate roughly 6 times higher than natural conditions.

Traffic appears to be the strongest factor influencing erosion rates, consistent with what has been documented in studies of road surface erosion associated with heavily logged watersheds. High-traffic monitoring locations on the Triple A Road yielded estimates of 256 and 515 tons per mile, respectively. Less frequently traveled Northwestern Road and secondary road monitoring locations yielded estimates that were 1 to 2 orders of magnitude less (0.9-55 tons per mile).

Groundwater quality in the Quaternary deposit can be generally characterized as very fresh to fresh, soft to moderately hard and dominated by calcium and bicarbonate ions. Dissolved oxygen concentrations generally are depleted at depth and dissolved iron and manganese increase with depth in response to this oxidation-reduction condition. Total dissolved solids and pH tend to increase with depth in the A and D zone. This pattern indicates that shallow groundwater is dominated by precipitation recharge and becomes more mineralized and alkaline with depth and increased residence time within the glacial deposit.

Other than the depth-dependent variations in hydrochemistry, there is no consistent, widespread pattern of hydrochemical facies changes in the Quaternary system groundwater. This indicates that there are no distinct or separate source waters for the Quaternary system within the Study Area.

Bedrock groundwater quality appears to be distinct from Quaternary deposit groundwater quality. Bedrock groundwater hydrochemistry is dominated by relatively high concentrations of sodium and chloride in contrast to Quaternary deposit groundwater hydrochemistry, which is dominated by calcium and

bicarbonate ions. This provides additional evidence of the poor hydraulic connection between the Quaternary deposits and bedrock.

1.0 Introduction

This report presents results of the baseline study of hydrologic conditions (Study) of the watersheds surrounding the Kennecott Minerals Company Eagle Project (Project). The proposed Project would include underground mining of nickel and copper from an ore body located in the Yellow Dog Plains (Plains), approximately 9.5 miles (mi) southwest of Big Bay in Marquette County, Michigan (Figure 1).

The data collection period presented in this report is November 2002 through May 2005. In November 2002 North Jackson Company (NJC) began surface water quality and flow monitoring of the Salmon Trout River and Yellow Dog River watersheds at locations on the Plains on behalf of Kennecott Exploration Company (KEX). In 2003 a third watershed (Cedar Creek subwatershed of the Pine River) was added to the Study to provide a potential reference watershed located outside of the Project area.

In January 2004 the Study was again expanded as part of a broader environmental baseline study (EBS) conducted on behalf of Kennecott Minerals Company (KMC). This expansion was performed in 2 stages: Stage 1 during January through May 2004 and Stage 2 from June 2004 through May 2005. Results from Stage 1 and interim results from Stage 2 have been presented in earlier reports (NJC 2004 and 2005).

NJC and Fletcher Driscoll & Associates LLC have been contracted by Golder Associates Inc. (Golder) to conduct the hydrologic assessment for the EBS. NJC and Fletcher Driscoll & Associates LLC are conducting the hydrologic aquifer testing and hydrogeologic modeling in a collaborative effort. Golder has been engaged by KMC to serve as the EBS manager and is responsible for technical review and oversight of the EBS for the Project.

The hydrologic components of the Study are designed to:

1. Document baseline water quality and hydrologic conditions in the watersheds;
2. Describe the relationship and interaction between groundwater and surface water resources within the watersheds; and,
3. Develop a groundwater flow model that simulates the hydraulics of the groundwater/surface water system for a broad area of the Plains and use this model as a quantitative assessment tool for baseline conditions of groundwater/surface water interaction.

2.0 Study Area

The Project is located near the headwaters of the Salmon Trout River main branch (Main Branch) within the Plains (Figure 2). The Plains are a relatively flat-lying, sandy geomorphologic feature covering about 27 square miles (mi^2). The Plains trend from the northwest to the southeast and are bounded to the south by shallow igneous and metamorphic bedrock that rises above the Plains (Figure 3) and to the north by a steep, terraced escarpment (north terrace) of glacial moraine that slopes north to a northeast-trending valley below the Plains (Figure 4). The Yellow Dog Peridotite (Peridotite) containing the ore body of interest is an igneous intrusion into the metasedimentary basin rock formation underlying the Plains (Figure 5). The Peridotite outcrops in the Plains in close proximity to the headwaters of the Salmon Trout River Main Branch.

The Project is situated near a hydrologic divide of surface watersheds mapped by the State of Michigan (State): those drained by the Salmon Trout River and those drained by the Yellow Dog River (MI DNR 2000) (Figure 2). Because of the proximity of the Project to the divide, a watershed characterization approach was implemented to define baseline hydrology for the Project. The hydrologic Study area (Study Area) consists of the Salmon Trout River watershed and the portion of the Yellow Dog River watershed adjacent to the divide and within the Plains (Figure 1). A headwater section of a third State-defined watershed, the Pine River watershed (containing the Cedar Creek subwatershed), has also been included in the Study. The Cedar Creek subwatershed was determined to have hydrologic characteristics similar to the upper Salmon Trout River subwatersheds and is outside of the area with potential for direct or indirect hydrologic impacts from the Project (NJC 2004). Therefore the Cedar Creek subwatershed may serve as a reference watershed for comparative data collection over the life of the Project. All Study Area streams flow to Lake Superior (average elevation 602 feet (ft) above mean sea level (MSL)).

The Salmon Trout River watershed encompasses an area of approximately 50 mi^2. The Salmon Trout River flows northward from its headwaters in the Plains and the north terrace, emptying into Lake Superior at Salmon Trout Bay northwest of the town of Big Bay. For the purpose of baseline hydrologic assessment, the upper portion of the State-defined watershed (MI DNR 2000) has been further divided into 3 topographically delineated subwatersheds referred to as the West Branch (3.3 mi^2), Main Branch (8.8 mi^2) and East Branch (13.0 mi^2) (Figure 2). The headwaters of the Salmon Trout River Main Branch originate from a large wetland complex (wetland) on the Plains located south of the Project at elevations between 1,430 and 1,460 ft above MSL. The Main Branch flows from the wetland northerly down the north terrace, joining the East Branch and West Branch downstream of the north terrace. The tributaries of the West Branch and most of the tributaries of the East Branch emerge from groundwater seepage along the north terrace.

The Yellow Dog River watershed area is approximately 98 mi^2. The Yellow Dog River headwaters are in bedrock highlands at the outlet of Bulldog Lake in the Ottawa National Forest, Baraga County. The headwater lake elevation is at approximately 1,730 ft above MSL, about 300 ft higher than the Plains. After flowing northward from these highlands, the Yellow Dog River flows west to east across the southern edge of the Plains (normal to the direction of flow of the Salmon Trout River Main Branch). The river then continues northward to Lake Independence in the town of Big Bay. The portion of the Yellow Dog River watershed within the Study Area is roughly 30 mi^2.

The Cedar Creek subwatershed area is approximately 7.4 mi^2. and is a part of the State-defined Pine River watershed (MI DNR 2000), a complex system made up of several small streams that flow north from the Plains and Huron Mountains into a series of inland lakes in northwest Marquette County. Cedar Creek is a

major headwater stream of the Pine River watershed, originating in the Plains and flowing for roughly 5 mi before emptying into Mountain Lake (Figure 2).

3.0 Methods

Background data was obtained from publicly available sources and proprietary mineral exploration data provided by KEX. Methods for site-specific data collection are described in detail in the Eagle Project Environmental Baseline Study Stage 2 Hydrological Assessment Work Plan (NJC 2004a), Quality Assurance Project Plan for Stage 2 Hydrological Assessments (NJC 2004b) and Eagle Project Hydrological Assessments Standard Operating Procedures Manual (NJC 2004c).

A summary of the primary components of baseline hydrologic assessment site-specific data collection methods is included below.

3.1 Soil Cores and Classification

Continuous Quaternary deposit soil cores (designated with a QAL prefix for Quaternary alluvium) were collected from 15 locations (QAL001-QAL014 and QAL023) using sonic drilling methods (Figure 6). Representative soil samples were collected from major hydrostratigraphic units and submitted for analyses of grain size distribution and select samples of finer-grained units were submitted for permeability testing. Grain size classifications and soil descriptions were made by the laboratory following the Unified Soil Classification System (USCS). For samples which the laboratory provided hydrometer analyses (typically samples with a significant percentage of fines), silt and clay were separated using a fraction boundary of 1.5E-4 inch (in.) (Folk 1980). Boring logs are presented in Appendix A.

3.2 Piezometer and Monitoring Well Installation

Twenty-three shallow hand-driven galvanized well points (piezometers) for groundwater elevation measurement and 4 shallow hand-driven stainless steel

well points for water quality sample collection were placed in the Plains wetland between the Yellow Dog River and Salmon Trout River Main Branch (Figure 6). The wetland piezometers are designated with a WLD prefix (wetland deposit). A construction summary for the wetland piezometers is included in Appendix A.

Eight shallow hand-driven stainless steel well points (piezometers) were placed at groundwater seeps that are tributary to the Salmon Trout River (East Branch and Main Branch) and Cedar Creek (Figure 6). These points are identified with the QAL prefix (piezometers QAL015 through QAL022). Construction summaries for the seep piezometers are presented in Appendix A.

Twenty monitoring wells consisting of 9 two-well nests and 2 single-well placements have been installed within the glacial deposits across a broad area of the Plains (Figure 6). These monitoring wells are identified with the same QAL identifier as was used for the corresponding soil boring. This monitoring network is designed to provide both regional and local Project site-scale data. The wells were constructed in borings using sonic drilling methods. The well nests consist of a water table well screened in the unconfined upper hydrostratigraphic unit (identified as the A zone) and a second well screened within the lowermost (confined) productive hydrostratigraphic unit (most often identified as the D zone) identified from the Quaternary deposit cores. Each water table well was constructed using a 2-in. diameter, schedule 40 polyvinyl chloride (PVC) riser with a 10-ft screen. The B and D zone wells were constructed using 2.5-in. diameter, schedule 80 PVC riser (for greater strength and larger diameter if needed to accommodate sampling pumps) and a 5-ft screen. In addition 3 additional observation well nests of similar design and construction and 2 pumping wells (6-in. diameter steel construction) were installed for a multi-well pumping test described below. A construction summary and boring logs for these monitoring wells and pumping test wells are included in Appendix A.

3.3 Hydrologic Data Collection

Hydrologic data collected for the Study includes surface water flow, groundwater elevations and aquifer hydraulic parameters. Surface water flow measurements were collected during winter baseflow, spring snowmelt runoff, spring rain runoff, summer baseflow and fall rain runoff (Table 1). Monitoring locations were selected on the Yellow Dog River (YDRM prefix); upper Salmon Trout River tributaries consisting of the Main Branch (STRM prefix), East Branch (STRE prefix) and West Branch (STRW prefix); and the Salmon Trout River main branch near its confluence with Lake Superior. Two monitoring locations were also established on Cedar Creek (CDR prefix) (Figure 7). Surface water flow measurements were made by cross-sectional profiling of stream segments (NJC 2004c). Continuous (hourly) stage recorders (pressure transducers) were installed on the Yellow Dog River, Salmon Trout River Main Branch and East Branch at natural control points (Table 1). Frequent flow measurements were made at these locations to develop rating curves for modeling flow. Ten surface erosion monitoring locations were also established as part of the watershed monitoring network (Figure 8).

A registered land surveyor was contracted to define well, piezometer and surface water gage locations and elevations. Locations were established in the North American Datum (NAD) 83 Universal Transverse Mercator (UTM) horizontal datum system. Elevation was established relative to MSL to the nearest 0.01 ft. Groundwater elevations were collected at monitoring wells and piezometers during the spring snowmelt runoff, summer baseflow and fall rain runoff monitoring periods of 2004 and winter baseflow and spring snowmelt runoff periods of 2005. Because the monitoring network has been expanded with each successive stage of investigation, not all wells have measurements recorded for each date. Groundwater elevation recorders (pressure transducers) were installed in a select set of wells and piezometers (Table 2) to measure elevations on an hourly basis.

Two constant-rate pumping tests were conducted over a 9-day period (October 21-29, 2004) to determine the hydraulic parameters of the primary productive hydrostratigraphic units (zones) identified from soil classification of the sonic drill cores of the glacial alluvium. A preliminary bedrock pumping test was also conducted from August 2-4, 2004 within a mineral exploration corehole. The pumping test locations are representative of average conditions in the primary productive hydrostratigraphic units near the Salmon Trout River Main Branch, the Plains wetland and the Project ore body (Figure 9). Appendix B contains a detailed report describing the pumping tests. Additional bedrock hydrogeologic investigations and hydraulic parameter testing are being performed for mine geotechnical characterization and feasibility study testing work (Golder 2005).

The baseline groundwater flow model was constructed using Visual MODFLOW software. This program implements the MODFLOW 2000 finite-difference code that is commonly used for hydrogeologic modeling. A calibrated, steady-state model was constructed to represent average conditions in the model domain. A full report on the baseline model is presented in Appendix C.

3.4 Water Quality Monitoring

Surface Water Quality Monitoring. Surface water quality samples representative of winter baseflow, spring snowmelt runoff, spring rain runoff, summer baseflow and fall rain runoff hydrologic events were collected (Table 1). Monitoring locations generally coincide with surface water flow measuring sites and were selected on the Yellow Dog River, Upper Salmon Trout River tributaries (West Branch, Main Branch and East Branch), the Salmon Trout River near its confluence with Lake Superior and Cedar Creek (Figure 7). Samples were analyzed for pH, dissolved oxygen, specific conductance and temperature in the field and submitted to laboratories for analysis of parameters listed in Appendix D. Hardness was calculated using calcium and magnesium concentrations (Freeze and Cherry 1979). For quality control analyses sample results less than

the laboratory reporting limit were assigned one-half of the reporting limit. Continuous water quality monitoring instruments were installed at 4 locations to record temperature and conductivity (Table 1 and Figure 7). Continuous temperature recorders were installed at an additional 8 surface water monitoring locations.

Surface Erosion Monitoring. Monitoring was completed to characterize inputs to streams from road-related surface erosion. The monitoring network consisted of traffic counters installed at 4 locations, sediment traps constructed (generally following the method described in Dissmeyer 1982) at 10 locations along representative roads and all-terrain vehicle trails, and a series of road cross sections surveyed at 11 locations (Figure 8). The traffic counters record the number of vehicle axles crossing the eastern and western boundaries of the Salmon Trout River watershed on the 2 primary access roads within the Study Area: the Triple A Road and Northwestern Road. These locations were selected to characterize the relative influence of traffic on surface erosion rates. Sediment trap and road cross section locations were selected to represent the range of traffic use, parent road material and road gradients that exist within the Study Area. The sediment traps provide rates of surface erosion from roads, which can be used to estimate sediment delivery to streams within the upper Salmon Trout River watershed. The road cross sections were completed in the summer and early fall of 2004 and provide a rough measurement of long-term surface erosion that has taken place over the life of the Triple A Road and Northwestern Road.

Detailed mapping of roads within the area shown on Figure 8 was completed during May and June of 2005 to provide a basis to estimate road density for the upper Salmon Trout River watershed.

Groundwater Quality Monitoring. Groundwater quality samples representative of winter baseflow, spring snowmelt runoff (recharge), summer baseflow and fall rain runoff (recharge) hydrologic events were collected (Table 2). Samples were

collected from select wetland piezometers, seep piezometers, Quaternary deposit monitoring wells and a bedrock mineral exploration corehole (Table 2 and Figure 6). Samples were analyzed for pH, dissolved oxygen, specific conductance, ferrous iron and temperature in the field and submitted to laboratories for analysis of parameters listed in Appendix D. Hardness was calculated using calcium and magnesium concentrations (Freeze and Cherry 1979). Continuous temperature recorders were installed in 2 seep piezometers (Table 2).

4.0 Geology

The geology of the Plains can be simply described as surficial deposits of unconsolidated glacial outwash and till, and post-glacial sedimentation underlain by igneous and metamorphosed sedimentary (metasedimentary) rocks of Precambrian age. Within Marquette County this type of geologic setting is not unique, as large areas of outwash plains overlying Precambrian bedrock are well documented (Twenter 1981). The closest well-studied example of a similar geologic setting is the Sands Plain, a 225 mi^2 feature located between the towns of Marquette and Gwinn (Figure 1) (Grannemann 1984). In the Sands Plain area the principal water-bearing strata are found in the glacial deposits. Precambrian bedrock formations in Marquette County are typically found to yield low quantities of water compared to glacial outwash aquifers (Grannemann 1984, Twenter 1981).

A detailed description of the geology of the bedrock and Quaternary formations is presented below.

4.1 Bedrock Geology

Regional bedrock geology has been described in maps, reports and geology textbooks (e.g., Boyum 1964, Dorr and Eschman 1970, Klasner et al. 1979 and Twenter 1981). Bedrock formations within the Study Area have been specifically investigated and characterized near the Project during historic and current mineral exploration activities. Bedrock hydrogeologic investigations are being performed along with mine geotechnical design work for the Project (Golder 2005). General descriptions of bedrock formations that are known to be present beneath the Plains are presented below and shown in the regional bedrock geology map in Figure 3.

The bedrock beneath the Plains is mostly metasedimentary rocks of the Michigamme Formation, part of the Marquette Range Supergroup of Proterozoic age (Precambrian) rocks roughly 2 billion years old. Regionally, the Michigamme Formation is thought to exceed 5,000 ft in thickness and is also large in areal extent over much of central Upper Michigan (Boyum 1964).

In the Study Area the Michigamme Formation is contained in an east-west trending structural trough known as the Baraga Basin (Klasner et al. 1979). The trough is flanked on the north, south and east by gneiss and greenstone Archean basement rocks, older than 2.5 billion years. Because of the extensive Quaternary deposit on the Plains, very little exposure of the Michigamme Formation exists in this area. The Archean basement rocks have numerous outcrop exposures surrounding the Baraga Basin.

The Michigamme Formation is described as consisting mostly of fine-grained clastic rocks, largely black slate and argillite as shown by core drilling (Klasner et al. 1979). The term siltstone (fine-grained, nonfissile rocks) has been used in this report to describe these units, consistent with exploration core logs supplied by KEX. The siltstone is commonly thought to have been deposited in marine waters and later deformed and metamorphosed regionally to the greenschist facies about 1.9 billion years ago, during the Penokean orogenic (mountain building) event (Dorr and Eschman 1970). The Penokean Orogeny was widespread throughout the Canadian Shield of North America and produced mountainous highlands in many areas. In central Upper Michigan the mountain building was the apparent result of compressional forces acting from present day north to south, resulting in synclines (troughs) whose long axes trend east-west (Dorr and Eschman 1970). The Marquette Iron Range deposits occur in a similar structural trough of sedimentary deposits located south of the Baraga Basin.

Emplaced into the Michigamme Formation are east-to-west-trending diabase dikes which are iron-rich igneous rocks from magma intrusions into the older

sedimentary rock deposits. These intrusives are Keweenawan age (about 1.1 billion years old) and are found in many areas around the Lake Superior Basin (Dorr and Eschman 1970). They are associated with the development of the mid-continent rift basin. The tectonic rifting of the basin resulted in a significant period of volcanic rock formations and igneous intrusions that are well documented along the rift basin and are extensive in northern Minnesota and in Upper Michigan's Keweenaw Peninsula.

One of these intrusive formations, the Peridotite, outcrops in the Plains at 2 locations (T50N, R29W, Section 11 and 12) (Figure 10). The Peridotite is crystalline, coarse-grained and massive, very hard and heavy, and greenish black. It is composed mainly of ferromagnesian minerals and derived from molten magma crystallized deep in the subsurface. Due to its relatively high density and shallow depth from the ground surface, this dike feature stands out as a prominent anomaly in gravity maps of the area (Figure 10). This dike was also resistant to glacial erosion and formed a paleotopographic high in the Plains during glacial deposition, described below.

The ore body is located within the Peridotite, generally beneath the outcrop located in Section 11 (at approximately 5177500N and 431500E, Figure 10). The Peridotite outcrop in Section 12 is described as undeformed and only moderately serpentinized, with a slightly weathered rind a few tenths of inches thick on the surface (Klasner et al. 1979). The higher grade mineralization and deformation is found at depth. The mineralization either postdates or is syn-deformation. The deformation event observed in the core samples of the Peridotite is best characterized as a west/northwest-east/southeast-trending dextral shear couple with evidence of dilation (Golder 2005). The event may have been responsible for the location of and control of the shape of the intrusive units including the massive and semi-massive sulfide mineralization. Other igneous intrusions exist on the edges or contacts of the Peridotite intrusions,

including gabbros, pyroxenites and other peridotites containing disseminated sulfides (Golder 2005).

The competent nature and solid structure of igneous and metasedimentary rocks result in limited capacity for water storage and transmission (Driscoll 1986). Alterations caused by secondary jointing, fracturing, or chemical weathering may allow the hydraulic properties of these rocks to improve. Hydraulic characteristics of both the igneous and metasedimentary rock formations near the Project are being investigated for mine geotechnical and tunneling properties (Golder 2005).

The Peridotite and Michigamme Formation form a flow control boundary for groundwater in the overlying glacial deposits. Similarly, as seen in Figure 10, the Salmon Trout River Main Branch channel turns about 90 degrees at the Peridotite outcrop in Section 11 reflecting of the erosional resistance of the Peridotite.

4.2 Quaternary Geology

The Quaternary deposits have been described in regional studies (Twenter 1981, Drexler 1981, Segerstrom 1964) and are being investigated through the soil coring program described in Section 3.

The Quaternary deposits of the Plains include outwash and till deposited during late-continental glaciation. Glacial outwash and drainage channel deposits are deposited from glacial melt water and are composed of well-sorted, stratified sand and gravel with some silt. Outwash deposits take a variety of forms including outwash plains, valley trains, kames, or eskers (Dorr and Eschman 1970). Outwash deposits laid down far from the melt water source or within quiet melt water ponds formed by natural barriers to flow may become finer-grained, characteristic of lacustrine (lake) depositional environments. Till is material deposited directly by glacial ice and is therefore a poorly sorted, nonstratified

mixture of sand, silt, clay, gravel and boulders. Till deposits take a variety of forms known generally in glacial geology terms as moraines.

As shown in Figure 4, the surficial Quaternary deposits are mapped regionally as glacial outwash sand and gravel and post-glacial alluvium (MI DNR 2000). These outwash deposits are mapped up to 200 ft thick (Twenter 1981) and are described as a large outwash-fan delta (Drexler 1981). Along the north terrace the surficial deposits are mapped as coarse-textured glacial till of extremely heterogeneous particle size. This unit is referred to in geologic literature as the Negaunee Moraine (Segerstrom 1964). Clay-rich, hard till is present sporadically on the north terrace, but the surficial deposits are generally sandy with scattered boulders and cobbles. The outwash deposits become finer and better sorted from the north toward the south (Segerstrom 1964).

The depositional model of the area proposed by Segerstrom (1964) indicates a late glacial history that was dominated by a stagnated ice margin along the valley separating the Plains from the Huron Mountains to the north. This glacier was part of a late-continental glacier readvance referred to as the “Marquette” phase that nearly refilled the Lake Superior basin about 10,000 years before present (Farrand and Drexler 1985). Locally, the ice was thickest through the valley along the southern edge of the Huron Mountains. Melt water then deposited kames and outwash plains as it flowed southward from this ice margin. The flow of melt water was obstructed by the high bedrock hills to the south, causing ponding within a glacial lake basin that stood at an elevation well above the elevation of other glacial lakes and outlets present in this area during this time period (Drexler 1981). Ponding of the melt water continued until the water depth increased enough to breach a gap in the bedrock hills in the southeast corner of the Plains, near the present Pinnacle Falls of the Yellow Dog River. This drainage flowed southward through the Mulligan Plains to the valley containing the Dead River (Segerstrom 1964).

Subsequent erosion of the gap resulted in drainage of the glacial lake. Following deglaciation, the drainage of the Plains soon became dominated by rapid headward cutting of tributary streams of the Salmon Trout River into the steep slope of the north terrace and the re-excavation of the Yellow Dog River along the southern Plains and then north toward Lake Superior. The strong hydraulic control of the continued headward cutting of the Salmon Trout River tributary streams could eventually capture flow of the Yellow Dog River on the Plains (Segerstrom 1964).

The baseline hydrologic assessment Quaternary deposit drilling program data are generally in good agreement with the regional mapping data and the glacial depositional model discussed above. The general stratigraphic column of Quaternary deposits identified in soil core samples obtained from the drilling program is shown in Figure 11. Logs of soil borings and monitoring well installations performed for this baseline hydrologic assessment are included in Appendix A. Laboratory reports containing soil test results are contained in Volume III of this report.

The observed thickness of Quaternary deposit within the Study Area ranges from 0 to 255 ft (Figure 12). The deposit thickens in all directions away from the Peridotite outcrops, with the greatest thickness observed at location QAL009, east of the Peridotite outcrop and at location QAL007, northwest of the Project area (Figure 12). The deposit thins toward the north and south, terminating at the boundary of the Archean bedrock formation.

A surface soil layer (black color with organic material and tree litter) was identified at most drilling locations within the Study Area. This layer is generally less than 1 ft thick (and mapped regionally as 0-2 in. thick on the Plains). Using the USCS system this surface layer is classified as a sandy organic soil (OL/OH). An organic deposit is also present in the Plains wetland, although these soils were not analyzed for texture by lab procedures. Blow counts observed while

installing hand-driven piezometers in the wetland indicated very thin, soft wetland deposits (peat or muck), typically less than 3 ft thick, overlying firm deposits (likely outwash sand).

The following sections describe from youngest to oldest the major hydrostratigraphic units identified within the Quaternary deposits. Hydraulic characteristics of the units are further described in Section 5.5.

4.2.1 Outwash and Beach Deposits (A Zone)

The outwash and beach deposits are coarse-grained, comprised of well-sorted, stratified fine- to medium-grained sand, with some gravel and minor quantities of silt and clay (less than 10%, Table 3) (USCS classification SP to SP/SP-SM). The sand fraction of this material appears to be predominantly rounded quartz with trace to minor amounts of platy and angular mafic mineral grains. The unsaturated portion of this deposit is typically reddish brown and the saturated portion is brown. Excluding wetland locations where the water table is at or very near the ground surface, the minimum vadose zone thickness measured was about 5-8 ft at the near the Plains wetland (locations QAL005 and QAL006) (Figure 13). The maximum vadose zone thickness measured was about 100 ft near the north terrace (location QAL009) (Figure 13). For classification these deposits include the vadose zone (labeled as the A+ zone in Table 3). These deposits are mapped regionally as having very rapid water infiltration rate characteristics (greater than 10 in./hour) (Twenter, 1981). An unconfined water table defined in this Study as the A zone hydrostratigraphic unit occurs in the saturated portion of this deposit. Generally, the fine sand fraction increases with depth in samples from the vadose zone to the base of the A zone.

4.2.2 Transitional Deposit (B Zone)

A gradational contact exists between the A zone outwash sand and deeper deposits that are finer-grained. This contact includes a transitional zone that contains a mix of fine sand, silt and clay (SM), fining downward to predominantly

silt (ML) and clay (CL). While all of these deposits may be derived from melt water processes and could be lumped as outwash, the grain size characteristic change from predominantly sand (coarse-grained material) to predominantly silt and clay (fine-grained material) indicates a significant change in permeability. This transitional zone was encountered at all boring locations except QAL009 and was defined as the B zone hydrostratigraphic unit. The absence of the B zone at QAL009 is consistent with the glacial depositional history, as the transitional unit would be expected to pinch out toward the north where outwash deposits are mapped regionally as terminating at the edge of the moraine (Figure 4). The areal distribution of the B zone and the underlying clay lacustrine deposit are shown in the isopach of these fine-grained deposits (Figure 14).

4.2.3 Lacustrine Deposit (C Zone)

A laterally extensive, massive clay deposit (CL) was identified in samples from most borings, absent only at locations QAL003 and QAL023, near the Peridotite outcrop (where a thick deposit of B zone silt and clay is present) and at location QAL009. The clay deposit is easily recognized in soil sample cores as lean clay with high plasticity. A sharp contact is observed at both the top and bottom of this deposit. Laboratory analyses indicated that on average the deposit contains 98% silt and clay (Table 3).

The top of the clay deposit was encountered in borings between 1,315 and 1,399 ft above MSL and ranged in thickness from 7-63 ft, thickest in the south/southeast part of the Plains (locations QAL004, QAL006 and QAL010) and thinnest to absent in the north and northeast, respectively, where this unit pinches out (Figure 14). This areal distribution pattern indicates that the deposit was formed in ponded water between the bedrock highlands south of the Plains and glacial ice to the north, consistent with the depositional model proposed by Segerstrom (1964). This deposit is defined as the C zone hydrostratigraphic unit.

4.2.4 Outwash/Ablation Till (D Zone)

A deeper deposit of coarser-grained material was encountered beneath the C zone lacustrine deposit at most drilling locations. Samples from this deposit are classified as SP to SM materials (predominantly fine- to medium-grained sand) and are similar to samples of A zone material (Table 3). This material appears to be outwash deposited prior to the glacial lake period on the Plains.

Greater heterogeneity in grain size characteristics was observed within the D zone compared to the A zone. At 2 locations (QAL004 and QAL005) the deposit contains a layer with significant amounts of gneiss and granitoid cobble and gravel outwash (likely high flow glacial drainage channel deposits). At other locations (QAL001, QAL002 and the base of QAL004) the deposit contains a relatively high percentage of fine sand and silt. Generally this deposit becomes increasingly finer-grained toward its base. The finer-grained portion is possibly derived from direct ice melt or sublimation (ablation till), since the base of this zone is most often identified in contact with a basal till deposit, described below. This outwash deposit is also discontinuous, interrupted by shallow bedrock and pinched out between the fine-grained units above and below. This deposit was not encountered beneath the C zone in the southeasterly borings (QAL006 and QAL010). This deposit appears to be confined or partially confined, except at location QAL009 where the overlying C zone clay is absent. This deposit is defined as the D zone hydrostratigraphic unit.

4.2.5 Basal Till (E Zone)

Basal till is glacial material deposited directly from the base of the ice sheet. The material is poorly-sorted and consists of boulder- to sandy-sized clasts in a fine-grained matrix. This is the lowermost Quaternary deposit material identified in samples from all but one boring (QAL004) within 3,000 ft of the Project. In areas more distant from the Project, this unit is substantially thicker as observed in core samples from borings QAL007 (west/northwest), QAL009 (east) and QAL010

(southeast). Bedrock is also encountered at greater depths at these distant locations, indicating that earlier glacial moraine deposition occurred in the bedrock valleys. The unit appears to be wet to water saturated at locations close to the Project where it is a fairly thin deposit and directly overlies bedrock; but it was found to be dry at locations QAL009 and QAL010 where a significant thickness of basal till is present. This deposit is defined as the E zone hydrostratigraphic unit.

4.2.6 Lower Outwash Units (F Zone)

At 2 locations distant from the Project area (QAL007and QAL010), lower outwash deposits were found interlayered with E zone till. Representative samples of the lower outwash material are classified as SP to SM (predominantly fine- to medium-grained sand) (Table 3). In QAL010 these units were dry. The interlayered nature of the till and lower outwash units indicates fluctuations in glacial advances and retreats during earlier glacial depositional sequences. This lower outwash deposit is defined as the F zone hydrostratigraphic unit.

4.3 Stratigraphic Relationships

The relationship between the hydrostratigraphic units is depicted in cross-sectional views at locations shown in Figure 4. These cross sections (Figures 15-18) depict the primary water-bearing zones in the area (unconfined A zone and confined D zone) that are separated by the fine-grained B zone transitional deposit and C zone lacustrine clay unit near the Project area. The bedrock topographic highs in the area coincide with the Peridotite intrusive that appears to have been an erosionally resistant feature during the time of Quaternary deposition.

The B and C zone fine-grained deposits are laterally extensive across a broad area of the Plains, but pinch out into the glacial moraine at the northern edge of the Plains (Figures 16 and 17). As a result of the pinch-out of the fine-grained deposits, the A and D zones become a single, unconfined hydrostratigraphic unit

north of the Peridotite outcrop (QAL009, Figure 18). This is consistent with the depositional model, which suggests that these fine-grained units were formed from a glacial lake created by melt water ponding between the stagnant ice margin at the northern edge of the Plains and the bedrock highland to the south.

The hydrologic significance of these relationships is discussed in detail in Section 5.

5.0 Hydrology

5.1 Introduction

This section presents the results of data collection relating to the hydrologic characteristics of the watersheds. This section also includes an assessment of groundwater/surface water interaction within the watersheds through the aid of a numerical model calibrated to measured hydrologic data. Specifically these data and analyses include:

- Regional precipitation;
- Surface water flow characteristics;
- Groundwater flow patterns;
- Hydraulic parameters of bedrock and glacial deposits and hydraulic connections between specific hydrostratigraphic units; and,
- Quantitative model of groundwater/surface water interaction and an assessment of groundwater basins on the Plains that are hydraulically connected to subwatersheds near the Project area.

5.2 Precipitation Data

From April to September most precipitation in the region occurs as rain, while from November to mid-March it is usually in the form of snow. Precipitation stored in the form of snow throughout winter months is released to streams and groundwater in late winter and early spring.

Precipitation data collected by the National Weather Service during the latter portion of the Study period (June 2004-May 2005) are presented in the bar chart

in Figure 19. Average monthly precipitation data from 1979-1998 are included for comparison. During June 2004-May 2005 precipitation was 2.76 in. below the 1979-1998 average (35.39 in.). Notable changes to the average distribution of precipitation were dryer than average conditions in September 2004 (1.64 in. of rain compared to 3.63 in.) and wetter than average conditions in December 2004 with 5.05 in. of precipitation (water equivalent of snowfall that month), compared to 2.38 in. for the average. These data indicate that regional monthly precipitation during the Study period was close to recent climatologic averages.

5.3 Surface Water Flow

Surface water flow was measured directly at a broad network of monitoring locations described in Section 3. Direct flow measurements were made during seasonally significant flow periods in association with water quality sampling. Four monitoring locations (STRM004, STRM005, STRE002 and YDRM002) also included continuous (hourly) measurement of stage (water height) and water quality index parameters. Flow measurements were made at these locations at a higher frequency to develop rating curves. Supplemental surface water flow measurements were also made at numerous subwatershed tributary streams, seeps and springs to aid in the development of an overall understanding of groundwater/surface water interactions.

5.3.1 Surface Water Flow Data Summary

This section of the report provides a summary of surface water flow data collected during the Study. Direct flow measurement data for monitoring locations on the Salmon Trout River, Yellow Dog River and Cedar Creek are presented in Tables 4-6, respectively and in the Field Sampling Report (Appendix E).

Mean daily hydrographs for September 2004-May 2005 for 4 monitoring locations on the Salmon Trout River Main Branch (STRM004 and STRM005), East Branch

(STRE002) and the Yellow Dog River (YDRM002) are shown in Figure 20. The flow data presented in this figure were derived from rating curves depicting the relationship of the stage to measured flow. Hourly hydrographs with discrete flow data are presented in Appendix F.

Regional surface water flow typically follows a seasonal pattern of peak flows during spring following snowmelt runoff, and low flows in late summer and winter (Grannemann 1984). Discrete flow measurements indicate that Study Area streams generally follow this pattern (Tables 4-6). The hydrographs in Figure 20 further confirm this pattern. Other precipitation events contributing to increased surface runoff are seen in the hydrographs, including fall precipitation and some short duration winter thaw and snowfall events.

All stream sections generally show increased flow with distance downstream under all seasonal conditions. This is typical of most watersheds in this region, although locally streams may also lose flow to the groundwater system.

All of the Salmon Trout River and Cedar Creek monitoring locations along the north terrace have steep gradients and well-confined channels and show increasing flow with distance downstream. Detailed groundwater seepage and small tributary channel mapping in a focused area downgradient of the Project was performed following the end of 2005 spring snowmelt runoff conditions in the Salmon Trout River East Branch (Figure 21). Small tributary streams gain significant flow in this area. For example, from the seep area located near seep piezometer QAL016, the associated East Branch tributary gains rapidly downstream from location STRE013 to STRE011 (from 1.7 cfs to 3.2 cfs). This indicates that groundwater provides significant input to the streams along the north terrace.

Hydrographs for the Salmon Trout River (STRM004, STRM005 and STRE002) and the Yellow Dog River (YDRM002) are presented in Figure 20 and flow characteristics at these locations are summarized in Table 7. The hydrographs

do not include the summer baseflow period. As a result, average calculations are skewed somewhat high, but relative comparisons between locations are valid.

Hydrographs for Salmon Trout River monitoring locations STRM004 and STRE002 exhibit similarity, with fairly short peak and duration responses to precipitation events. The STRM004 mean daily flow range is 4.2 to 41 cfs with an average flow of 7.3 cfs and the STRE002 flow range is 12 to 119 cfs with an average flow of 22 cfs (Table 7). Both locations have a maximum flow to minimum flow ratio of 10. By comparison the hydrograph for the downstream Salmon Trout River Main Branch location (STRM005) exhibits somewhat higher peak response and longer duration to the significant runoff events. The STRM005 mean daily flow range is 22 to 397 cfs with an average flow of 48 cfs. The maximum to minimum flow ratio of this location is 18 (Table 7). The higher ratio indicates that the downstream location has a different flow character and is flashier in response to major events. This difference likely is caused by the greater drainage area contributing flow to location STRM005 and by a significant portion of drainage area downgradient of the Plains containing shallow low permeability bedrock that allows for less infiltration of runoff to groundwater. By contrast the drainage areas captured by the hydrographs for locations STRM004 and STRE002 are strongly affected by the highly permeable outwash deposits (A and D zones), which tend to attenuate the effect of precipitation runoff events on surface water flow.

The hydrograph response to precipitation events at YDRM002 also shows a more pronounced response to surface runoff events in both peak flows and event duration relative to the Salmon Trout River locations, particularly in comparison to the locations at the base of the north terrace (STRE002 and STRM004). The YDRM002 mean daily flow range is 7.2 to 242 cfs with an average flow of 34 cfs. The maximum to minimum flow ratio is 37. This response indicates more surface runoff input from the bedrock highlands of the headwaters area and possibly the

surface water storage in the Plains wetland between location YDRM003 and YDRM002.

Calculated average mean daily flows (Table 7) can be used to compare the quantity of surface water originating from 2 of the 3 headwater subwatersheds of the upper Salmon Trout River. The East Branch and Main Branch subwatersheds (above STRM004) account for about 46% and 15% of the total flow respectively. These percentages correspond closely to those calculated from the discrete measurement data for October 2004. During October 2004 discrete flow measurements at locations STRM004, STRW001, STRE002 and STRM005 were made within a 2-day period (Appendix E). About 70% of the 33 cfs flow measured near the mouth of the Salmon Trout River (STRM005) originates from the upper Salmon Trout River subwatersheds. The largest contributor of flow is the East Branch (STRE002) with 42% (14 cfs) of the flow. The Main Branch (STRM004) and West Branch (STRW001) contribute similar amounts of flow: 15% (5.1 cfs) and 12% (3.9 cfs), respectively.

5.3.2 Summary of Findings from Surface Water Flow Data

- The streams in the watersheds follow typical regional seasonal flow patterns, with peak flows associated with snowmelt runoff and low flows occurring in summer and winter.

- Hydrographs for the Salmon Trout River tributaries measured at the base of the north terrace (STRE002 and STRM004) show more attenuated responses due to the influence of groundwater contribution from outwash deposits (A and D zones). Surface runoff events at these locations appear to be relatively minor compared to downstream locations where flows are affected by low permeability bedrock surface overland runoff.

- Relative to hydrographs for Salmon Trout River tributaries measured at the base of the north terrace, the Yellow Dog River hydrograph shows

higher peak flows and longer duration of surface runoff to precipitation events. This suggests that the Yellow Dog River at location YDRM002 is more strongly affected by surface runoff from the headwater bedrock highlands and by wetland storage along its banks on the Plains.

- The Salmon Trout River tributaries gain significant flow from groundwater seeps along the face of the north terrace.

- The Salmon Trout River East Branch, Main Branch and West Branch originating from the Plains and north terrace provide about 46%, 15% and 12%, respectively, of the total flow of the Salmon Trout River system. On the order of 27% of the remaining flow is derived from runoff downstream of the upper Salmon Trout River watershed.

5.4 Groundwater Flow

Baseline groundwater flow characteristics have been assessed through data collected from exploration drilling, measurement of groundwater elevations, mapping of seep and stream locations and elevations, pumping tests and laboratory measurements of soil grain size characteristics and permeability. The results from these assessments are summarized below.

5.4.1 Groundwater Flow Mapping Data Summary

As discussed in Section 4, groundwater flow on the Plains principally occurs in the transmissive portions of the glacial deposits. These hydrostratigraphic units are the saturated, coarse-grained outwash deposits, defined in this Study as the A and D zones. In order to map flow, both discrete and continuous groundwater elevation measurements have been made in the A and D zones (Table 8). The potentiometric surface maps are presented for the A zone data in Figures 22-26 and for the D zone data in Figures 27-31. Continuous groundwater elevation data from wells and piezometers are presented in Appendix H and are shown for selected locations upgradient and downgradient of the Project area (Figure 32).

Groundwater elevations fluctuate seasonally in response to infiltration (Grannemann 1984). This results in rising groundwater elevations in the spring and after snowmelt recharge and declining groundwater elevations from late summer through the winter months. All of the groundwater elevation contour maps indicate similar flow patterns during each seasonal measurement event and fairly similar flow patterns. Groundwater in both the A and D zones can be generally described as flowing to the north/northeast. Based on this pattern the Plains wetland is primarily a groundwater recharge location and therefore must be supported primarily by precipitation. Conversely, the north terrace is drained by seeps and streams and is a discharge area for groundwater of both the A and D zones. This flow pattern is consistent with the conceptual model of hydrology developed by Segerstrom (1964) based on regional drainage patterns and the glacial depositional model.

Within this regional drainage pattern are a number of variations with local significance. In the A zone the Salmon Trout River and the Yellow Dog River create a groundwater drainage basin divide indicated by a dashed line and arrows showing divergence of flow on Figures 22-26. Near the Project area a divide between groundwater flowing toward the Salmon Trout River Main Branch and East Branch basin is indicated by arrows showing divergence of flow. These basin divides are evaluated in detail in Section 5.6.

D zone groundwater also discharges to the Salmon Trout River tributaries, but the D zone deposit is more discontinuous, pinched out between bedrock barriers and convergence of the contact of the upper lacustrine unit and lower glacial till. These heterogeneities result in some flow divergences around the discontinuities (Figures 27-31). The regional hydrostratigraphic mapping of the B and C zone confining units discussed in Section 4 also indicates that the D zone is likely not well connected to the Yellow Dog River (Figure 14). Hydraulic connectivity between the A and D zones using the groundwater flow model is discussed in Section 5.6.

Figure 32 presents continuous groundwater elevation data for a subset of wells and piezometers (monitoring locations QAL004, QAL008, QAL018 and WLD001) situated along hydrogeologic cross section C-C', which generally coincides with a groundwater flow path through the Project area (Figure 6 and Figure 17). The data show that groundwater elevations have been fairly stable with fluctuations generally less than 2 ft (Figure 32). The influence of seasonal infiltration is apparent, with declining groundwater elevations from summer 2004 through winter 2005, followed by an increase in groundwater elevations following snowmelt, particularly at locations close to the Plains wetland recharge area. Wetland deposit groundwater elevations (represented by data from location WLD001) are fairly stable, as are groundwater elevations measured in piezometers located along the north terrace (represented by data from location QAL018) (Figure 32). Additional groundwater elevation data for wetland piezometers show similar stable responses (Appendix H), with the exception of WLD021, located near the Yellow Dog River. The groundwater elevation at this location appears to be closely correlated to the stage of the Yellow Dog River.

The continuous groundwater elevation data show significant vertical gradients between the A and D zones, indicating a high degree of hydraulic separation between the coarse-grained outwash units due to the presence of the B and C zone confining units. The direction of the vertical gradient between zones varies, with an upward gradient consistently present at location QAL004 and a downward gradient at QAL008. This pattern suggests that the D zone at QAL004 is connected hydraulically to a recharge area upgradient (southwest) of the well and that the D zone at QAL008 is connected hydraulically to a discharge area downgradient (northeast of the well). As shown by the measurements in Table 8, similar downward gradients are present at the other monitoring locations near the northern edge of Plains (well nests QAL001 and QAL002), while upward gradients are present at well nest QAL007, which is located closer to recharge areas and more distal to discharge areas along the north terrace. By comparison, data for well nest QAL009 indicate essentially no vertical gradient in

the absence of the fine-grained confining unit. In addition the D zone wells located below the confining unit (B and C zones) show a greater degree of high frequency fluctuation (daily) which most likely is caused by barometric efficiency of the D zone.

5.4.2 Summary of Findings on Groundwater Flow

- Regional groundwater flow in the A zone is generally to the north/northeast in each discrete time period represented in the groundwater potentiometric maps.

- Localized capture of A zone groundwater occurs on the Plains by the Salmon Trout River Main Branch and the Yellow Dog River. A groundwater divide exists between these A zone groundwater basins in the Plains wetland.

- The general horizontal flow direction in the D zone is also to the north/northeast in the monitored area. The D zone flow patterns are locally influenced by shallow bedrock creating divergent flow patterns and thicker D zone deposits in buried bedrock channels creating convergent flow patterns.

- The Plains wetland is hydrologically upgradient of the Project and is the uppermost component of the groundwater basin. The wetland must therefore have a primary storage and recharge function in relation to groundwater and must be supported by precipitation.

- Groundwater discharge for most of the Plains occurs to streams originating along the north terrace.

- The A and D zone water elevation data are fairly stable, with small fluctuations that are typical of seasonal changes.

- The finer-grained B and C zones act as a hydraulic barrier to vertical flow between the A zone and D zone, and where present, provide a significant degree of separation of flow between these units.

5.5 Hydraulic Characteristics of Geologic Formations

5.5.1 Aquifer Hydraulic Testing Data Summary

Hydraulic characteristics of geologic formations have been assessed by the following methods:

- In-situ aquifer tests including pumping tests (both multiple well and single well methodologies), slug tests and packer tests;
- Laboratory permeability tests; and
- Correlation of grain size analysis data to permeability of representative materials.

The primary goal of these tests is to establish hydraulic parameters of the A and D zones for quantitative assessment of groundwater flow using a computer model of baseline groundwater flow conditions. The tests also provide an understanding of the degree of hydraulic connection between the A and D zones and the nature of the low conductivity sediments found in the B and C zones.

For the glacial deposits the most accurate method employed for estimates of hydraulic conductivity was multiple well, constant rate pumping tests of the A and D zones. The tests consisted of 72-hour and 24-hour pumping periods for the A zone and D zone, respectively, in October 2004. The test well layout is shown in Figure 33. Results of the tests are summarized in Tables 9 and 10. A complete report on these tests is included in Appendix B.

Bedrock hydraulic testing, using specific capacity tests was performed to provide initial test data for the Peridotite. Following this initial test additional hydraulic

testing on both igneous intrusive formations and metasedimentary bedrock formations were performed in a separate study associated with a mine geotechnical evaluation and tunnel in-flow modeling of the bedrock formations (Golder 2005).

For the initial bedrock test pumping and drawdown data were collected during the installation of mineral exploration borehole 04EA054, drilled as a nominal 3-in. open hole with NQ2 size core barrel (borehole log is attached in Appendix A). The hole was drilled in August 2004 within the ore body at a location near the Salmon Trout River Main Branch (Figure 9) as part of the resource definition drilling program for KMC. Test pumping was performed in increasing open hole length intervals, ranging from 38 to 478 ft. The rock surface in this area is 38 ft below ground surface (bgs) and the surficial deposits were identified as B zone transitional deposits from adjacent continuous sonic core drilling at location QAL023 (Appendix A). The test hole encountered both unmineralized Peridotite in the upper portion of the hole and semi-massive sulfide zones of the intrusive in the lower portions (Appendix A).

For the specific capacity testing at 04EA054 each open hole interval was pumped for 1 to 2 hours. Test data included drawdown collected during pumping and pumping rate from the intervals defined as A, B, C, D and E in the bedrock open hole (Table 11). Pumping rates achieved with apparently stable water levels ranged from 0.6 gallons per minute (gpm) to 3.5 gpm. Drawdown ranged from 11 to 27 ft.

5.5.2 Summary of Findings on the Hydraulic Characteristics of Glacial Deposits

Analysis of the hydraulic testing data indicates the following:

- The average D zone transmissivity is about 6,100 gallons per day per foot (gpd/ft) and is generally consistent throughout most of the test area. The transmissivity may be lower, however, to the north/northeast and

south/southeast toward the bedrock outcrop as a result of D zone discontinuity.

- The average horizontal hydraulic conductivity of the D zone in the test area is 40 feet per day (ft/d).
- The average storage coefficient for the D zone in the test area is 1.7E-4.
- The A zone transmissivity increases from northeast to southwest in the test area, ranging from about 7,700-12,400 gpd/ft. Because the saturated thickness of the hydrostratigraphic unit is similar along the test array, the areal increase in transmissivity likely results from higher hydraulic conductivity of the sediments.
- Horizontal hydraulic conductivities in the A zone test area range from 37 to 69 ft/d with the highest values in the southwest part of the test area. The average value determined from the test is 50 ft/d.
- The average specific yield of the A zone is 0.048.
- The average anisotropy ratio of A zone sediments is 0.036.
- The average vertical hydraulic conductivity of the A zone is 1.9 ft/d or approximately 26 times less than the average horizontal hydraulic conductivity value.
- Water flow in the primary productive hydrostratigraphic units (A and D zones) is strongly horizontal.
- The A zone hydrostratigraphic unit is unconfined.
- The B and C zones act together as a hydraulic barrier, restricting groundwater movement, or leakage, between the A and D zones in the tested area. The D zone hydrostratigraphic unit is confined.

Short duration specific capacity tests (single well tests) were also performed in the A, D and B zones at select monitoring wells to provide hydraulic characterization of a broad area around the Project. Specific capacity tests are widely used in the water well industry to estimate production well performance and these test data are capable of producing reliable estimates of hydraulic conductivity (Bradbury and Rothschild 1985). Each of these tests was performed by pumping the wells for 1 hour or less at a rate of 2 gpm or less. Water levels recorded during pumping were used to estimate specific capacity (discharge rate divided by drawdown). These data (drawdown-discharge) were analyzed using an iterative method incorporating the Theis equation to calculate hydraulic conductivity values. This approach accounted for the pumping time during the specific capacity tests as well as the effects of partial penetration and well-efficiency. Although these values are not considered to be as accurate as values determined by the multiple-well pumping tests, they do provide a good means of obtaining hydraulic characteristic values over a broad area with reasonable accuracy.

The specific capacity tests in the outwash units generally result in lower hydraulic conductivity estimates by one-half to one-third when compared to data for the same wells obtained in the longer term, multiple-well tests described above (Table 10). These specific capacity test results are very similar to those presented in hydrogeologic studies of similar glacial hydrostratigraphic units in Marquette County, which employed the same methodologies for parameter testing over a broad area of the Sands Plain groundwater basin (Grannemann 1984).

Hydraulic conductivity estimates have also been obtained from laboratory permeability tests on fine-grained material (C zone) and sieve analyses for all of the glacial hydrostratigraphic units (Table 10). One sample (QAL006 118-120 ft) is not considered representative of the formation for the specified depth interval. A comparison of field classification of this depth interval with laboratory

classification of the sample suggest that the sample was likely disturbed material carried to the bottom of the borehole by drilling (Volume II).

Hydraulic conductivity measurement scale effects are known to occur and measured values of hydraulic conductivity tend to increase as the scale of measurement increases (Bradbury and Muldoon 1990). Incorporation of these data for quantitative flow assessment over a broad area of the Plains is discussed further in Section 5.5.3 below.

5.5.3 Preliminary Findings on the Hydraulic Characteristics of Bedrock

The specific capacity test data for the bedrock exploration hole are discussed in detail here. The primary purpose of this evaluation was to obtain hydraulic testing data with which to test the conceptual model of bedrock as a barrier to groundwater flow and therefore as a no-flow boundary under baseline conditions. Results from a geotechnical testing program on bedrock hydraulic characteristics designed for preliminary estimates of mine inflows (Golder 2005) are also incorporated into the summary of hydraulic characteristics for each hydrostratigraphic unit shown in Table 12.

- Raw specific capacity values (discharge divided by drawdown) were less than 1 gpm/ft, ranging between 0.03-0.32 gpm/ft. The time-drawdown data were further analyzed using a Jacob/Cooper semi-log (straight-line) method (Appendix B). Transmissivity values could be determined by this method because pumping rates were generally held steady enough for a portion of the pumping period early in the test. The results range from 5 to 152 gpd/ft. In one case (D bedrock open hole interval) data from a second pumping period (following a period of non-pumping recovery) were analyzed using this method. Because water levels may not have fully stabilized, results from the analysis of the D bedrock open hole interval may not represent true conditions.

- Hydraulic conductivity values were calculated based on the length of the tested interval. The results range from 0.02 to 0.13 ft/d (Table 9). These results indicate that the bedrock hydraulic conductivity in the uppermost bedrock zones have up to 4 orders of magnitude lower hydraulic conductivity than the primary productive hydrostratigraphic units of the glacial alluvium. This finding supports the conceptual model that groundwater flow occurs principally in the glacial deposits and that virtually no water flows into the glacial hydrostratigraphic unit from the bedrock.

- Transmissivity and hydraulic conductivity values were also determined for discrete intervals in the borehole by subtracting the transmissivity values for a given interval from the previous interval(s) and dividing by the discrete interval length. The results for the interval calculations indicate transmissivity values between 5 and 108 gpd/ft and average hydraulic conductivity values between 0.02 and 0.24 ft/d (Table 9). All intervals tested have horizontal hydraulic conductivity values well below 1 ft/d and up to 4 orders of magnitude lower than the overlying A and D zone outwash deposits. These data indicate that these bedrock materials may be considered significant barriers to groundwater flow.

- The interval 100-160 ft bgs is the most conductive interval tested. This finding was consistent with the drilling crew report of lost fluid circulation (potable water) within the interval 140-150 ft bgs.

The bedrock geotechnical evaluation using the slug testing/packer testing methodology produced slightly lower hydraulic conductivity values than the specific capacity tests for similar depths (Table 12) (Golder 2005). Heat pulse flow logging in these evaluations also identified a possible fracture flow zone within the same depth interval as the most conductive zone found in the specific capacity testing performed in hole 04EA054 (Golder 2005). The deeper tests performed in the slug test/packer tests indicated decreasing hydraulic

conductivity with depth, attributed to decreasing frequency of rock fractures. As a conceptual model of bedrock hydraulic characteristics the rock is assumed to contain an upper zone of slightly higher conductivity located in the upper 300 ft of the rock (Golder 2005). These tests also included monitoring of the overlying glacial deposits during the pumping tests. No response to bedrock pumping was observed in the monitored glacial deposit (Golder 2005).

The hydraulic conductivity values produced by these tests appear reasonable for poorly fractured igneous and metamorphic bedrock and are considered to be sufficient for baseline conditions modeling.

5.6 Groundwater Flow Model

The analysis of groundwater/surface water interaction was further advanced by development of a numerical model that simulates the baseline hydraulic features. For the baseline conditions simulation, a steady-state model was developed to represent average conditions (precipitation recharge to groundwater, groundwater elevations and surface water flow) in the model domain. The model is calibrated to represent groundwater head data as well as surface water flow data. The primary objectives of this model are to quantitatively estimate the groundwater balance for the Study Area and to delineate the groundwater basins on the Plains that provide baseflow to stream subwatersheds near the Project.

Initial model development was based on the conceptual model represented by the hydrogeologic cross section shown in Figure 34. In the conceptual model groundwater flow principally occurs in the glacial deposits. Baseline hydraulic data indicate that the igneous and metamorphic bedrock formations act as barriers to flow due to poor properties for water storage and transmissivity. The source of water to glacial deposits within the Plains is precipitation recharge that infiltrates rapidly through the wetland surficial sand outwash deposits. Groundwater discharge from the glacial deposits occurs by leakage to seeps and

streams. Recharge and discharge occur only by natural means within the Study Area, so no artificial recharge or discharge locations (e.g., groundwater supply wells) are present in the model.

The model is constructed to represent the physical geologic and hydrologic elements of the Study Area presented in Sections 4.0-5.5. Therefore this model is considered to have appropriate physical data constraints with which to accurately represent conditions present in the model domain and to calibrate the model to representative data. A complete report on the model is presented in Appendix C. This section summarizes the primary results and provides a discussion of the results.

5.6.1 Model Construction, Calibration and Sensitivity Analysis

Model Domain

The flow model is constructed on a regional scale to coincide with major hydraulic features (boundaries) that influence groundwater and surface water movement near the Project. The general area covered by the model includes the southeastern 75% of the Plains (Figure 35). A smaller area within the overall model domain composes the active portion of the model in the upper 6 model layers. The maximum extents of the active model area are approximately 39,000 ft (7.5 mi) from northwest to southeast and 26,000 ft (5 mi) from northeast to southwest. The east/northeastern, southeastern and southern limits of this area generally coincide with the physical extent of the glacial deposits (outwash and moraine) that comprise the Plains and north terrace. The northwestern extent is determined by a significant groundwater basin divide (hydrologic boundary) parallel to groundwater flow which generally coincides with a watershed boundary between the Salmon Trout River West Branch and Cedar Creek (Pine River Watershed). The portion of the Yellow Dog River basin included in the model is defined on the south by the southern limit of the Plains (which occurs at a shallow bedrock boundary as defined in regional geologic maps) and on the

north by the groundwater divide between the Yellow Dog River and Salmon Trout River basins (Figures 22-26).

The overall model domain provides sufficient coverage to achieve the modeling objectives of the baseline analysis. The domain, although large, has been selected to provide a balance between the need to provide a calibrated baseline conditions model that is capable of simulating watershed-scale flow conditions while also capable of being used as an assessment tool for future predictive simulations of smaller scale, local mine facility conditions.

Grid Spacing and Orientation

The horizontal dimensions of individual cells are 164 ft by 164 ft throughout the model (Figure 35). The model grid is oriented to regional groundwater flow (southwest to northeast) with model columns aligned approximately 30 degrees east of north, essentially normal to the steep-faced north terrace and model rows aligned 60 degrees west of north and approximately parallel to the terrace face.

Layer Definition

The model is divided into 13 layers: 11 active layers and 2 inactive layers to represent the vertical extent of the model. The layers generally coincide with hydrostratigraphic units (where present) identified and defined as follows:

- Layer 1 – Upper A zone (coarse-grained outwash)
- Layer 2 – Lower A zone (coarse-grained outwash)
- Layer 3 – B zone (fine-grained outwash)
- Layer 4 – C zone (fine-grained outwash, lacustrine deposit)
- Layer 5 – D zone (coarse-grained outwash)

- Layer 6 – E zone and F zone (fine and coarse-grained till and outwash)
- Layer 7 – Uppermost section of bedrock under Plains, transitioning to coarse-textured till beneath and north of the north terrace slope
- Layer 8 – Middle section of bedrock under Plains, transitioning to coarse-textured till beneath and north of the north terrace slope
- Layer 9 – Bottommost section of bedrock under Plains, transitioning to coarse-textured till beneath and north of the north terrace slope
- Layers 10 and 11 – Upper bedrock
- Layers 12 and 13 – Lower bedrock with occasional water conductive fractures

The vertical extent of the model is represented in cross section view in Appendix C.

Hydraulic Parameters

Horizontal hydraulic conductivity was assigned to the model based on data from the A and D zone pumping tests, specific capacity tests of monitoring wells, laboratory permeability testing and grain-size distribution of sediments where available. Values of vertical hydraulic conductivity were assigned based on the anisotropy ratios determined in the A zone pumping test. A summary of the data used is shown in Table 12. As much as possible the areal distribution of hydraulic parameters is based on natural neighbor interpolation between monitoring well locations where the parameters have been defined. Some adjustment of the interpolation is necessary to give more weight to values determined from more reliable methods (i.e., well pumping tests and certain specific capacity tests). Furthermore, as described previously, hydraulic conductivity values from an adjacent layer are assigned locally to a layer where it

is not present in the field. Specific yield and storativity parameters are based on results from the well pumping tests.

Bedrock hydraulic parameters used are based on data from the bedrock hydrogeologic investigation initiated along with mine engineering studies (Golder 2005). Specific capacity tests of exploration boreholes performed as part of the EBS were also considered while assigning bedrock parameters.

Boundary Conditions

Boundary conditions define the character of water movement at the limits of the active model and at certain points within the model domain where water is either added or removed. The boundary conditions being used in the current model are the following:

- **No flow:** These boundaries are placed at locations corresponding to the physical limits of glacial deposits, watershed hydrologic boundaries and at the bottom of the model domain corresponding to the estimated limits of more densely fractured (referred to as “upper”) bedrock (Golder 2005).

- **Constant head:** These boundaries correspond to limits of the streams and water table at the location of the northern terminus of glacial deposits where shallow Archean-age granitic bedrock is at or near the ground surface and along the Yellow Dog River where it enters the model to the southwest and borders the model domain to the southeast.

- **Drain:** Drain cells are included on the north terrace. These drains are placed in the model at the locations of seep piezometers and are used to represent the groundwater seeps that occur on this slope. Only a limited number of drain cells are used in the model to allow most seeps to be represented within the river cell boundaries discussed below.

- **River:** The MODFLOW river package was used to represent water entering or leaving the Study Area by the streams that occur within the area represented by the active model domain. River cells coincide with the important stream courses shown in Figure 2. The primary tributaries of the Salmon Trout River West Branch, Main Branch and East Branch are represented by river cells, as is the segment of the Yellow Dog River included within the boundaries of the model. Stream channel location and characteristics that are not directly available from the baseline condition studies are based on extrapolation of data from United States Geological Survey (USGS) topographic maps.

- **Recharge:** Recharge assumed for the model is "net" recharge, that is, recharge less any assumed evapotranspiration. Based on the different topographic conditions in the model domain, different zones of recharge were initially assigned to the model. Initial recharge rates were based on extrapolations of net recharge from the groundwater model of the Sands Plain (Grannemann 1984) adjusted for 2004 precipitation conditions measured regionally for Marquette County.

Water Budget Zones

Four separate zones were established in the model using the MODFLOW Zone Budget package to represent subregional water budgets within the 4 subwatersheds in the model domain: the Salmon Trout River Main Branch, East Branch, West Branch and the Yellow Dog River. These zones provide water balance information useful in model calibration. The zones were assigned initially based on topographic analysis. Final location of the zone boundaries was established by particle tracking and analysis of velocity vectors during model calibration.

The particle tracking analysis is also used to provide the estimated delineation of groundwater basins associated with the subwatershed budget zones listed

above, which is a primary goal of the model simulation of baseline conditions. This is discussed in results of the simulation below.

Model Calibration

Model calibration was guided by 3 objectives:

- Achieve the best possible statistical match of model calculated (simulated) heads to measured heads based on an analysis of the normalized root mean squared error (RMS);
- Attain the best match of simulated heads to measured heads in areas closest to the proposed mine facility and underground workings (for example, the calibration sought to achieve a close match of model calculated heads to measured heads in the vicinity of monitoring wells QAL023 (above the ore body) and QAL008 (downgradient of the Peridotite outcrop)); and,
- Match simulated river outflows to measured surface water flow (adjusted to baseflow conditions).

The calibration effort sought an overall best fit to the calibration objectives rather than maximizing or over-weighting any of the 3 measures listed above.

Calibration targets were established for the steady-state model based on groundwater elevations and surface water flow data. Groundwater elevation data collected during October and November 2004 were used as head calibration targets because they provide a complete data set judged to be representative of average stream hydrographs and groundwater elevations over the period of baseline data collection (Sections 5.3 and 5.4). The comparison of model-calculated heads to measured heads is shown in Figure 36.

The contoured distribution of heads (equipotentials) produced by the calibrated model is shown in Figures 37 and 38. Equipotentials shown for Layer 2 correspond to the saturated (lower) portion of the A zone. Because Layer 2 is only active in the southern portion of the model, equipotentials are only shown for that area. Equipotentials for model Layer 5 generally correspond to the D zone. In some areas, however, where the D zone is absent, Layer 5 represents other hydrostratigraphic units. For example, where the D zone is absent in the vicinity of monitoring wells QAL006A/B and QAL010A, Layer 5 was assigned hydraulic properties representative of the E zone. Thus, simulated heads in Layer 5 in the area surrounding and east of those wells represent heads in the E zone. Similarly, heads near the proposed mine facility are representative of the B zone near QAL023 and of the weathered bedrock near the Peridotite bedrock outcrop.

Model calibration targets for the groundwater component of surface water flow (baseflow) were established by standard manual hydrograph separation (where flow rating curves were available) and by discrete flow measurements taken contemporaneously with the groundwater elevation measurements. The comparison of the model simulated stream outflow and the estimated groundwater baseflow component of stream flow are shown in Figure 39. As described previously, stream stage is measured continuously and these data yield rating curves for flow at the key monitoring locations of the water budget zones, except for West Branch location STRW001 where only discrete flow data have been collected. Estimated groundwater baseflow percentages for the Main Branch (71%) and East Branch (96%) were averaged to establish a baseflow percentage for the West Branch (83%). This estimated baseflow target and the targets for the other monitoring locations based on hydrograph separation were used as final calibration targets for the steady-state simulation. During calibration water balance data (simulated river outflow) from each of the 4 water budget zones were compared to the corresponding baseflow calibration targets.

In addition to calibrating to the groundwater head and surface water flow targets, calibration objectives also included closely monitoring head residuals (calculated head minus measured head), particularly at locations close to the Project area. Residuals at these locations were minimized as much as possible during calibration.

Sensitivity Analyses

After completion of calibration selected model parameters were adjusted to determine which parameters cause model outputs to deviate most from calibration targets. Horizontal and vertical hydraulic conductivity, recharge and streambed conductance were tested in this analysis by increasing and decreasing the values by up to 20%. The relative effects these changes have on model results were determined by examining both their effect on model groundwater levels (heads) and surface water flow (net river leakage). The effect of parameter adjustments on model heads is judged by changes in the normalized RMS %. The effect on surface water flow is judged by changes in the net overall river leakage relative to the overall surface water flow calibration target. Results of this sensitivity testing are included in Appendix C.

Variations in horizontal hydraulic conductivity from 0.8 to 1.2 times the calibrated values have the greatest effect on the RMS %. This result is expected because of the large change in head values over the model domain. The effect these variations have on surface water flow is less pronounced, but nonetheless apparent. Changes to assigned recharge rates produce significant effects on simulated surface water flow, but only moderate effects on simulated heads are apparent. Changes to vertical hydraulic conductivity and streambed conductance result in only subdued effects on both simulated heads and surface water flow over the range of changes.

5.6.2 Model Results

The validity of the model solution was also judged during calibration by examining the results of the model water balance. This was done to determine if the model solver parameters were sufficient to produce a reliable solution without mass loss. Generally, if the mass balance error is less than 2%, the simulation is considered acceptable. Results of the water balance evaluation for the baseline model show an excellent match between mass entering the model and mass leaving the model (Figure 40). The mass balance error is less than 0.03%. This water balance analysis also provides a good understanding of the overall hydrologic cycle and groundwater budget for the Plains. Groundwater in the Plains is mainly derived from precipitation infiltrating the sandy surface soils that covers the Plains. Groundwater then discharges to seeps and streams and becomes surface water. Because the water balance is achieved through recharge and discharge areas that are quite close together, this is a fairly isolated groundwater/surface water system that is not connected to other groundwater basins or watersheds within the region through inter-basin flow mechanisms or significant flux from other hydrogeologic units not represented in the model. This model calculation of the groundwater balance provides a quantitative assessment of the conceptual hydrologic model of the Plains groundwater/surface water system and indicates that the conceptual model is a good description of this hydrologic system.

Based on an evaluation of average subwatershed flow normalized to surface water drainage area (as shown in Figure 2), it appears that groundwater basins are likely significantly larger than the mapped surface watersheds particularly for the streams originating from seepage from the north terrace. This is particularly noticeable in the calculated average flow per square mile of surface watershed area for the Salmon Trout River East Branch, which is approximately double that of the other subwatersheds measured with continuous gaging (Table 7). In order to estimate the area of groundwater basins associated with water budget zones

in the model, the groundwater basin divides were determined from model simulations by backward particle tracking from model river cells.

The baseflow component calculated from October 2004 surface water flow measurements at the 4 key monitoring locations (STRM002, STRE002, STRW001 and YDRM002) totals 27.84 cfs. The total simulated river outflow was 27.79 cfs, suggesting an overall satisfactory calibration to surface water flow. Simulated outflows compared to baseflows for the individual monitoring locations is also generally good, however, the model calculates less groundwater baseflow to the Yellow Dog River upstream of location YDRM002, but calculates somewhat higher baseflow to the Salmon Trout River Main Branch.

Groundwater divides (and associated groundwater basins) for the subwatersheds of the Salmon Trout River West Branch, Main Branch, East Branch and Yellow Dog River are shown in Figure 41 for model Layer 2 (approximate A zone) and in Figure 42 for model Layer 5 (approximate D zone). A comparison of the groundwater basins in Figure 41 to the State-defined surface watershed delineations (Figure 2) suggests that the Salmon Trout River basin captures groundwater from a significantly larger area of the Plains than is represented by the State-defined watershed. This is particularly true in the area of the Salmon Trout River East Branch basin, where the groundwater basin divide is offset approximately 1 mile south from the estimated surface watershed divide.

The derived groundwater basins of the lower primary productive zone (D hydrostratigraphic zone represented by model Layer 5) show a similar and somewhat greater difference in groundwater basin divides compared to surface watershed divides (Figure 2). The model simulation estimates that the groundwater basin of the lower hydrostratigraphic zones associated with the Salmon Trout River East Branch captures groundwater from beneath the Yellow Dog River within the south-central portion of the model domain. The primary reason for this is that the extensive glacial lake fine-grained units (B and C

hydrostratgraphic zones) likely provide a hydraulic separation between the Yellow Dog River and the D zone in this area.

These findings are consistent with the surface water flow characteristics represented by the hydrographs shown in Figure 20 and Table 7. The Yellow Dog River flow characteristics indicate a relatively higher influence of surface runoff and surficial groundwater flow processes, whereas the upper tributaries of the Salmon Trout River, particularly the East Branch, are dominated by groundwater flow from deeper flow regimes. This is also consistent with the geologic model suggested by Segerstrom (1964) that suggested the future hydrogeologic evolution of the Plains may eventually result in capture of the upper Yellow Dog River within the Salmon Trout River watershed via groundwater flow.

6.0 Water Quality

6.1 Introduction

This section presents the results from baseline surface water and groundwater quality monitoring. Surface water quality data have been collected from November 2002-May 2005 (Table 1) and groundwater quality data from May 2004-May 2005 (Table 2). This section includes interpretations of these data with respect to:

- Data quality objectives;
- General characterization of stream water and groundwater quality;
- The influence of groundwater contribution to surface water quality;
- Seasonal variability of surface water and groundwater quality;
- Expected annual road-derived sediment delivery to Study Area streams; and,
- Secondary evidence of the degree of hydraulic communication between glacial deposits and bedrock.

6.2 Quality Control Data

Data quality control, field and laboratory quality control procedures and analytical results were reviewed according to the Quality Assurance Project Plan for Stage 2 Hydrologic Assessments (NJC 2004b). Appendix G presents quality control reports for each water quality sampling event. Laboratory reports for water quality analyses have been compiled as Volume III of this document.

These quality control checks indicate that the data can be considered valid and representative of baseline conditions. All exceptions to quality control guidelines are indicated in the water quality data tables and figures.

External quality control checks on surface water quality data have also been completed through a comparison of data from samples collected by Michigan Department of Environmental Quality (MDEQ) in 2003 (unpublished) and 2004 (White Water Associates Inc. 2005) and available USGS continuous monitoring records for temperature and specific conductance (USGS 2005). Neither the MDEQ nor the USGS data are true split samples as the MDEQ samples were typically collected at different times (usually within a 24-hour period) and the USGS data is collected from different locations. The Salmon Trout River Main Branch location is STRM004 located downstream of USGS station 04043238. The Yellow Dog River location is YDRM002 located upstream of USGS station 04043275.

These external data are presented for comparison in Appendix G. The external quality control checks provide confirmation that the water quality and flow data collected for this Study can be considered valid and representative of baseline conditions.

Internal quality assurance indicated 3 potential exceptions to split sample quality control guidelines based on relative percent difference (RPD) between the sample and duplicate, including reported zinc, alkalinity and dissolved oxygen values. The RPD of reported zinc values exceed the quality control limit at monitoring location STRM001 during the winter baseflow 2003 monitoring event. The RPD of reported alkalinity values exceed the quality control limit at monitoring locations CDRM004 and STRM002 during the fall rain runoff 2004 monitoring event and for STRM001 during the summer baseflow 2004 monitoring event.

MDEQ measurements of dissolved oxygen values are at or slightly above 95% to 100% saturation and the values recorded by KMC are at about 60% to 70% of saturation. When the dissolved oxygen data meet quality control criteria, MDEQ values are consistently higher, but both KMC and MDEQ values are in the 70% to 85% of saturation range. These quality control data suggest that MDEQ values may be high and KMC values slightly low relative to actual. The MDEQ measurements were performed using a membrane probe while the KMC method employed visual colormetric snap tubes.

6.3 Surface Water Quality

6.3.1 Surface Water Quality Summary

Laboratory analyses of chemical constituents in surface water samples are presented in Table 13 (Salmon Trout River samples), Table 14 (Yellow Dog River samples) and Table 15 (Cedar Creek samples). These tables also include measurements of field index parameters (temperature, pH, specific conductance and dissolved oxygen). Sampling reports for each field event are attached in Appendix E.

The Study Area surface water quality can be generally described as soft (hardness <60 milligrams per liter (mg/L)) to moderately hard (60-120 mg/L), with neutral pH (ranging from weakly acidic to weakly alkaline) and with a low degree of mineralization and turbidity. Nutrient concentrations are generally low. Dissolved oxygen is generally high, although it does vary somewhat seasonally, typically decreasing during warm weather when biological and chemical demand is higher. This is most evident at Salmon Trout River monitoring location STRM001, which is situated within an area of fairly stagnant flow caused by beaver ponds on the Plains (dissolved oxygen levels as low as 2 mg/L have been measured during summer months) and to a lesser extent at the Yellow Dog River monitoring locations.

Yellow Dog River samples have somewhat higher color (40-138 apparent color units (ACU)) compared to Salmon Trout River and Cedar Creek samples collected from monitoring locations at the base of the north terrace (STRE001, STRE002, STRM003, STRM004, STRW001, CDRA002 and CDRM004) (10-60 ACU) reflecting a higher total organic carbon content in the Yellow Dog River samples (5.7-13 mg/L versus 1.7-8.7 mg/L).

Surface water temperature monitoring data (Tables 13-15 and Figure 43) also indicate some differences in the flow regimes of the Yellow Dog River and the streams originating from seepage from the Plains. The temperature record from monitoring locations situated at the base of the north terrace (STRE001, STRE002, STRM004, STRM007, STRW001, CDRA002 and CDRM004) have slightly warmer winter temperatures (0-2 ^{o}C versus 0-0.4 ^{o}C) and cooler summer temperatures (9-16 ^{o}C versus 15-21 ^{o}C) compared to the Yellow Dog River (YDRM002) and Salmon Trout River monitoring locations on the Plains (STRM001 and STRM002) and the downstream Salmon Trout River monitoring location (STRM005). The continuous temperature data show a relatively uniform seasonal pattern of cooling throughout the fall with stable (near 0 ^{o}C) temperatures throughout the winter and warming temperatures in the spring (Figure 44).

Specific conductance data collected during water quality monitoring (Tables 13-15) are also somewhat higher (58-136 micromhos per centimeter at 25 degrees Celsius (µmhos/cm @ 25 ^{o}C) versus 17-99 µmhos/cm @ 25 ^{o}C) for surface water monitoring locations at the base of the north terrace compared to those on the Plains. These data indicate that monitoring locations below the north terrace are characterized by a slightly higher degree of dissolved ionic constituents likely associated with higher groundwater baseflow inputs. Continuous monitoring data also reflect this pattern (Figure 45).

Hardness concentrations are somewhat greater (27-73 mg/L) for surface water monitoring locations at the base of the north terrace relative to concentrations measured at monitoring locations on the Plains (9-44 mg/L) and increase downstream in the Salmon Trout River (Figures 46). The seasonality of hardness is observed in the plot shown in Figure 47, with lowest hardness conditions present during spring snowmelt and the highest levels observed during summer baseflow conditions.

Major ion chemistry for all surface water samples is presented on the Piper diagrams in Figures 48-54. These data indicate that Study Area streams are dominated by calcium and bicarbonate ions. The stream major ion chemistry is quite stable seasonally, although the Yellow Dog River samples are characterized by a slightly lower proportion of bicarbonate ions, as are the headwater Salmon Trout River Main Branch samples (STRM001) during sprirunoff events.

Mercury (total) was detected in all surface water samples (Tables 13-15) at concentrations within the range of those typically found in US rivers and streams (1-7 nanogram per liter (ng/L), USEPA 1997). Generally, the Yellow Dog River samples exhibit a slightly higher range of mercury concentration (1.7-6.8 ng/L) than is observed in the Salmon Trout River and Cedar Creek samples (<0.25-5.6 ng/L). All monitoring locations appear to exhibit increased mercury concentrations during periods of increased surface runoff (i.e., spring snowmelt runoff) and mercury concentrations tend to increase with distance downstream. Figure 55 illustrates this relationship for the Salmon Trout River monitoring locations.

Manganese (total unfiltered) was reported at low concentrations in most samples collected from monitoring locations other than the upstream Cedar Creek (CDRA002). Trace concentrations of barium (total) were reported in the results from samples collected from most Salmon Trout River monitoring locations and

the downstream Cedar Creek monitoring location. Samples collected from monitoring locations near the base of the north terrace (STRM003, STRM004, STRW001, STRE001, STRE002 and CDRM004) often contained trace concentrations of total arsenic (1.0-2.8 microgram per liter (μg/L)). Total iron concentrations for all monitoring locations was typical of area streams (<10-5,860 μg/L). Because dissolved iron is a highly oxidation-reduction (redox) sensitive parameter, its concentration is generally inversely related to dissolved oxygen concentration. Yellow Dog River and Salmon Trout River monitoring locations on the Plains (STRM001 and STRM002) occasionally contained total trace concentrations of arsenic (<1-1.3 μg/L) and copper (<1-1.2 μg/L). Aluminum was reported at trace concentrations (52-160 μg/L) in most samples analyzed for the long list of parameters in 2005.

6.3.2 Summary of Findings for Surface Water Quality Data

- Surface water monitoring results generally indicate good water quality at all monitoring locations.

- Calcium and bicarbonate ions are the principal dissolved constituents in water at all locations monitored. The streams can be generally described as soft (hardness <60 mg/L) to moderately hard (60-120 mg/L) with neutral pH (ranging from weakly acidic to weakly alkaline) with a low degree of mineralization and turbidity. Nutrient concentrations are generally low and dissolved oxygen is generally high.

- The streams dominated by seepage from the north terrace exhibit water quality conditions indicative of higher contributions from groundwater flow. These streams have somewhat higher conductivity values, greater hardness concentrations, warmer winter temperatures and cooler summer temperatures compared to the Yellow Dog River and Salmon Trout River on the Plains (STRM001) and also in comparison to the downstream location of the Salmon Trout River Main Branch (STRM005). The streams

at the base of the north terrace also have less color and lower organic carbon content. This finding provides additional supporting evidence of significant capture of groundwater from the Plains within the Salmon Trout River tributary streams watershed, consistent with the results of the groundwater/surface water flow interaction assessment (Section 5.0) and earlier geologic models of the Plains (Segerstrom 1964).

- Seasonally water quality varies somewhat. The surface water continuous specific conductance data show the periodic influence of increased surface water contribution associated with snowmelt runoff and from significant precipitation events. Also, increased mercury concentrations occur during periods of increased surface runoff. Based on the comparison of these concentrations to nationwide conditions cited above, mercury concentration appears to be related to regional atmospheric mercury deposition released to streams from surface runoff rather than localized sources of mercury in the watershed. Somewhat higher turbidity and total suspended solids are also detected in streams following snowmelt runoff.

- Minor and trace constituents detected in most streams include iron, arsenic, barium, manganese and aluminum. Trace concentrations of copper, zinc and cadmium were infrequently detected in samples from a few monitoring locations. Because dissolved iron is a redox sensitive parameter, its concentration also varies seasonally, particularly at locations exhibiting a seasonally wide range of dissolved oxygen concentrations (e.g., STRM001).

6.4 Surface Erosion

6.4.1 Surface Erosion Data Summary

Sediment trap monitoring locations are shown on Figure 8. Table 16 describes the conditions affecting surface erosion rates at each monitoring location in terms of the relative traffic rating, road gradient and parent material. The monitoring period for each sediment trap varies depending on when the trap was installed and whether it was functioning at all times. For all cases accumulated volumes represent the minimum amount of sediment eroded from road surfaces as the traps were not always functioning properly (resulting in bypass or overtopping).

The total amount of accumulated sediment in the traps ranged from 1.5 cubic feet (ft^3) at SED01, which traps sediment from a low traffic, low gradient spur road with some vegetation on road surfaces, constructed on coarse glacial till to 204 ft^3 at SED08, which is a high traffic, frequently graded, steep gradient portion of the Triple A Road constructed on coarse glacial till. Using the road drainage area (area of road contributing sediment to the trap) at each monitoring location and assuming a cubic yard of eroded material weighs 1.5 tons, these volume measurements were converted to represent the weight of sediment that would be expected to be eroded per mile of each road type monitored.

Traffic appears to be the strongest factor influencing erosion rates, which is consistent with what has been documented in studies of road surface erosion associated with heavily logged watersheds (Reid and Dunne 1984). Two high-traffic monitoring locations (SED03 and SED08) on the Triple A Road yielded estimates of 256 and 515 tons per mile of road (tons/mi), respectively.

Monitoring locations on the less frequently traveled Northwestern Road and secondary roads yielded estimates that were 1 to 2 orders of magnitude less (0.9-55 tons/mi) than the Triple A Road.

These estimates of surface erosion rates appear to be supported by a preliminary analysis of the initial series of road cross sections surveyed on the Triple A Road and Northwestern Road (Figure 8). A comparison of the current road profile to natural topography suggests that since construction, an average depth of roughly 1.7 ft of soil has been removed from the Triple A Road bed at these locations through a combination of initial road construction, repeated grading and a relatively high rate of surface erosion, whereas cross sections along the Northwestern Road indicate an estimated long-term soil depth loss of 0.7 ft. Assuming the Triple A Road is about 100 years old, this would correlate with an annual sediment loss of roughly 2,500 ft^3/mi or 140 tons/mi, and for the Northwestern Road, roughly 740 ft^3/mi or 40 tons/mi (assuming the Northwestern Road is also about 100 years old).

To extrapolate the surface erosion data generated by the sediment traps, it was necessary to measure the density of the road network (miles of road per square mile of land area, mi/mi^2) and to estimate how much of the sediment eroded from roads is actually delivered to streams. Roads were mapped using GPS in the area shown on Figure 8. Based on this detailed mapping, an average road density of 7 mi/mi^2 was assumed for the upper Salmon Trout River watershed.

All sediment derived from the Triple A Road was assumed to be delivered to streams along the length of road (about 0.5 mi) that parallels the East Branch Salmon Trout River in close proximity. Total delivery was also assumed for distances approximately 200 ft on either side of stream crossings or where the road directs flow to the river for distances over 200 ft. Using this approach, only 16% or 1.2 mi of road deliver sediment directly to the stream network of the total length of the Triple A Road within the upper Salmon Trout River watershed (7.5 mi),. A similar approach for the Northwestern Road suggests that 51% of the total road length within the watershed (4.0 mi) delivers sediment to streams. An extensive network of secondary roads and trails within the watershed make up the bulk of the road density. These roads were assumed to have a relatively high

delivery rate (50-80%) because of their position on the north terrace and due to the high number of stream crossings.

On a subwatershed basis the annual estimate of sediment delivered to streams by surface erosion of roads was fairly similar, ranging from 33 tons/mi^2 for the West Branch to 50 tons/mi^2 for the East Branch and an overall estimate of 43 tons/mi^2. This value can be compared to an estimate of the natural sediment delivery rate expected for the upper Salmon Trout River watershed.

In the absence of roads (and other disturbances to the landscape associated with commercial forestry and recreational activities), the main mechanism delivering sediment to streams is soil creep. Soil creep is defined as the slow downhill movement of debris that results from disturbance of the soil by freezing and thawing, wetting or drying, or slow plastic deformation under the soil's own weight. It occurs on all hillsides and though it is slow, it is responsible for most of the downslope transport of debris to stream channels in heavily vegetated regions (Dunne and Leopold 1978). The few known studies that have measured rates of soil creep show it to vary between 0.08-0.2 in./year over a soil depth of 1.6-3.3 ft. Based on field observations of road cuts and stream banks, a soil depth of 3 ft was assumed. The low end of measured soil creep rates (0.08 in./year) was used because slopes in the upper Salmon Trout River watershed are generally less than 20%. Based on detailed surface water mapping (Figure 21), a stream drainage density of 2.4 mi/mi^2 was used to compute the length of stream receiving creep-derived sediment inputs.

These assumptions yielded an annual estimate of naturally-derived sediment delivery (through soil creep alone) to streams of roughly 8 tons/mi^2. This preliminary finding suggests that under baseline conditions, surface erosion associated with the current road network yields an annual sediment delivery to streams that is a factor of 6 above natural conditions.

This is consistent with Cedarholm et al. (1980) who found that fine sediment in gravels increased by 2.6-4.3 times in watersheds with a road density greater than 4.1 mi/mi^2.

6.4.2 Summary of Findings for Surface Erosion Data

- Road density was estimated to be about 7 mi/mi^2 for the upper Salmon Trout River watershed. The US Forest Service considered densities greater than 4.7 mi/mi^2 as extremely high in an analysis of road densities in logged watersheds relative to sensitive trout habitat (Quigley et al. 1996).

- A preliminary annual estimate of the rate of naturally-derived sediment delivery (from soil creep) to streams is 8 tons/mi^2.

- Extrapolation of sediment trap data suggests an annual estimate of sediment delivery associated with surface erosion of roads of 43 tons/mi^2.

- These findings suggest that under baseline conditions, surface erosion associated with the current road network delivers an annual sediment load to streams at a rate roughly 6 times higher than natural conditions.

6.5 Groundwater Quality

6.5.1 Groundwater Quality Summary

Groundwater quality data are presented in Table 17 (wetland monitoring locations), Table 18 (Quaternary deposit monitoring locations) and Table 19 (bedrock monitoring locations). Field sampling reports are attached in Appendix E and laboratory data reports have been compiled as Volume III of this report.

Wetland deposit and Quaternary deposit groundwater quality can be generally categorized as very fresh (total dissolved solids (TDS) <100 mg/L) to fresh (TDS 100-1000 mg/L) and soft (hardness <60 mg/L) to moderately hard (60-120 mg/L).

The A zone Quaternary deposit groundwater is largely very fresh (TDS <100 mg/L) and soft (hardness <60 mg/L) while the D zone Quaternary deposit groundwater trends toward fresh and moderately hard. Where the water table is shallow, A zone samples tend to be weakly acidic and pH increases to weakly alkaline with depth. Dissolved oxygen concentrations generally decrease with depth, with A zone samples having dissolved oxygen levels as high as 7 mg/L while D zone samples typically have concentrations less than 0.001 mg/L. This pattern suggests that shallow water is recharged by precipitation infiltration and becomes more mineralized and depleted in oxygen with depth and residence time in the aquifer.

Major ion chemistry for groundwater samples is presented in the seasonal Piper diagrams in Figures 56-60. Water quality of most samples plots in the region dominated by calcium and bicarbonate ions. Exceptions are the samples collected from well QAL006A, with no dominant (greater than 50% milliequivalents per liter (meq/L)) anion chemistry, wells QAL005A, QAL006A and WLD006, with no to weakly calcium dominant cation chemistry, and well QAL001D, with no to weakly dominant sodium cation chemistry.

Minor constituents detected include iron, fluoride and nitrate (mostly at concentrations <1 mg/L). Dissolved iron and manganese are redox-sensitive parameters and thus they tend to increase in concentration in response to oxygen depletion with depth, and in wetland soils. Notably high dissolved iron was detected in the samples from QAL006B (13.4-16.5 mg/L) and WLD006 (8.7-20.4 mg/L). Other dissolved trace metals consistently detected in groundwater samples consist of aluminum (QAL006A, WLD006 and WLD021), arsenic (QAL001D, QAL002D, QAL003B, QAL004D, QAL005D, QAL008D, QAL009D and WLD021), barium (QAL002D, QAL005A, QAL005D and QAL007D), molybdenum (QAL001D and QAL002D) and zinc (QAL009A and WLD021). Mercury was detected in most samples at concentrations less than 1 ng/L.

Piper diagrams combining both surface water and groundwater samples (Figures 61 and 62) are presented for select surface water and groundwater samples in the area and downgradient of cross sections B-B' and C-C' (see Figure 6 for cross section locations). These plots indicate that both groundwater and surface water are dominated by calcium and bicarbonate ions, with some local variation. Exceptions are seen in the samples collected from well QAL005A and QAL001D with no dominant (greater than 50% meq/L) anion chemistry.

Bedrock water quality results are presented in Table 19. The samples were collected from exploration borehole 04EA054 during specific capacity pumping test activities in order to obtain water quality characteristics of bedrock water. This borehole was advanced during active exploration drilling and a significant volume of drill fluid (potable water from a private camp well in Quaternary deposits) was lost to the formation (below the B sample interval). The pace of borehole advancement prevented adequate development and stabilization of the monitoring intervals prior to sampling. This situation combined with the loss of drill fluid suggests that the reported results are likely not entirely representative of bedrock formation water quality as the samples were likely diluted with drill water. Nevertheless, they do provide some means of assessing water quality within the igneous formation (likely minimum concentrations for most parameters) and are useful for an initial comparison to the water quality in overlying Quaternary deposits.

The samples from the upper bedrock horizons containing the non-mineralized portion of the Peridotite (A and B open hole intervals) indicated fairly low TDS concentrations (up to 128 mg/L) and can be classified as fresh water (TDS <1,000 mg/L). Samples collected from the deeper zones (D and E intervals open to the upper 480 ft of bedrock) had somewhat higher TDS (up to 272 mg/L). Higher TDS concentrations were reported from samples collected at a deeper horizon in the bedrock (1,590 mg/L) (Golder 2005). A Piper diagram plot of samples from the bedrock compared to typical Quaternary deposit groundwater

shows that the bedrock samples are dominated by sodium, potassium and chloride rather than calcium and bicarbonate ions (Figure 63). This fingerprint is indicative of increasing residence time of water within the formation or significantly different source water chemistry.

Minor constituents detected included iron in most samples, plus fluoride. Trace metals detected in these samples consist of lithium, boron, barium, manganese, molybdenum, nickel, selenium and zinc. A similar list of trace metal ions and with similar concentrations (within an order of magnitude) were reported for the deeper bedrock water quality sample obtained in the packer testing program (Golder 2005). The most notable trace metal detected consistently is boron, with concentrations greater than 1 mg/L in all samples. Studies of Precambrian rock formations within the Lake Superior basin have documented that boron concentrations as high as 30 mg/L exist in saline brines, which are found in association with metasedimentary rock formations originally deposited in marine environments (Tipping 1998; Allen et al. 1998), and are attributed to marine water incursions to these formations during the development of the mid continent rift, discussed in Section 4.

Mercury (total dissolved) was detected at less than 1 ng/L in the uppermost interval samples and at 4.950 ng/L in the deepest horizon sampled. An order of magnitude greater total mercury concentration (89.1 ng/L) was reported for the deeper bedrock water quality sample obtained in the packer testing program (Golder 2005).

Low level total tritium analyses were performed on these samples to provide another means of relative age dating and as a comparative environmental isotope to the groundwater present in the glacial deposits. The uppermost interval bedrock samples (A and B open hole intervals above the location of drill fluid loss) have the lowest tritium values reported for the bedrock (1.32 and 2.23 tritium units (TU), respectively). The lowest interval samples show the highest

values (7.86 and 7.02 TU below the location of drill fluid loss). Similar results (9.20 TU) were reported for the deeper bedrock water quality sample obtained in the packer testing program (Golder 2005). The Quaternary deposit samples are generally between 8 and 12 TU, with one sample reported as less than 1 TU. Concentrations near 1 or <1 TU are considered to indicate sub-modern (old) groundwater, whereas concentrations between 5 and 10 are usually indicative of modern water sources.

6.5.2 Summary of Findings for Groundwater Quality

- Quaternary water quality of most groundwater samples can be generally characterized as very fresh, soft to moderately hard and dominated by calcium and bicarbonate ions. Dissolved oxygen concentrations are generally depleted with depth and dissolved iron and manganese increase in response to this redox condition. TDS tend to increase with depth. This pattern indicates that shallow water is dominated by precipitation recharge and then becomes mineralized with depth and residence time.

- Other than the vertical changes in hydrochemistry, there are some local variations found in major, minor and trace constituents at specific monitoring points, but no apparent widespread pattern of hydrochemical facies changes in the Quaternary system. This indicates that there are no distinct or separate source waters for the Quaternary system.

- Bedrock groundwater is dominated by sodium, potassium and chloride ions, whereas Quaternary deposit groundwater is dominated by calcium and bicarbonate ions. This provides further evidence of poor hydraulic communication between the glacial deposits and bedrock, which is consistent with the results of hydraulic property testing presented in Section 5.

- The bedrock sample tritium results indicate potential evidence of mixing with younger water. However, significant drill fluid (potable water) loss to the formation while drilling below the B sample interval in borehole 04EA054 was reported. Thus, it is likely that the water quality results for samples collected from the bedrock test hole B through E intervals represent a mix of potable water used for drilling fluid and bedrock groundwater and likely do not precisely represent water quality conditions of the bedrock.

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TABLES

Table 1
Summary of Activities at Surface Water Monitoring Locations 2002 - 2005
Eagle Project

	Continuous Data[1]			Water Quality Sampling[2]																
				Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff (September)	Fall Rain Runoff	Fall Rain Runoff (November)	Winter Baseflow	Winter Baseflow	Spring Snowmelt Runoff
Location	**Temperature**	**Conductivity**	**Stage**	2002	2003	2003	2003	2003	2003	2003	2004	2004	2004	2004	2004	2004	2004	2004	2005	2005
				Long List*	Long List*	Short List	Short List	Short List	Short List	Long List	Short List	Short List	Short List*	Short List	Short List	Short List	Short List	Short List	Long List	Long List
Salmon Trout River																				
STRM001	9/22/04			X	X	X	X	X	X		X	X	X	X		X	X		X	X
STRM002	9/22/04			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
STRM003											X	X	X	X		X	X	X	X	X
STRM004	9/22/04	9/22/04	9/22/04										X	X	X	X		X	X	X
STRM005	9/22/04	9/22/04	9/22/04											X		X			X	X
STRM007	9/22/04																			
STRW001	9/22/04										X	X	X	X		X			X	X
STRE001	9/22/04										X	X	X	X		X			X	X
STRE002	9/22/04	9/22/04	9/22/04										X	X	X	X		X	X	X
STRE003	9/22/04																			
STRE004	9/22/04																			
STRE005	9/22/04																			
STRE006																	X		X	
Yellow Dog River																				
YDRM001				X	X	X	X	X	X		X	X								
YDRM002	9/22/04	9/22/04	9/22/04	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
YDRM003											X	X	X	X		X			X	X
Cedar Creek																				
CDRA002						X	X	X	X		X	X	X	X		X			X	X
CDRM004								X	X		X	X	X	X	X	X	X	X	X	X

1 Ongoing continuous monitoring was begun on date indicated.
2 Refer to parameter lists found in Appendix D (* indicates supplemental parameters were included).

Table 2
Summary of Activities at Groundwater Monitoring Locations 2004 - 2005
Eagle Project

Location	Continuous Data[1]		Water Quality Sampling[2]						
	Temperature	Water Elevation[3]	Spring Snowmelt Runoff 2004	Summer Baseflow 2004	Fall Rain Runoff 2004	Fall Rain Runoff 2004	Winter Baseflow 2004	Winter Baseflow 2005	Spring Snowmelt Runoff 2005
			Full Network	Full Network	Partial Network	Full Network	Partial Network	Full Network	Full Network
Wetland Deposit Piezometers									
WLD001		8/21/04	x	x		x		x	x
WLD006			x	x		x		x	x
WLD016			x	x		x		x	x
WLD021		8/21/04	x	x		x		x	x
WLD022		8/21/04							
WLD023		8/21/04							
Quaternary Deposit Monitoring Wells									
QAL001A/D			x	x		x		x	x
QAL002A/D			x	x A only		x		x	x
QAL003A/B			x	x		x		x	x
QAL004A/D		9/24/04	x	x	x	x*	x	x	x
QAL005A/D		8/21/04	x	x	x	x*	x	x	x
QAL006A/B			x	x	x	x	x	x	x
QAL007A/D						x		x	x
QAL008A/D		11/10/04				x*	x	x	x
QAL009A/D						x	x	x	x
QAL010A						x		x	x
Quaternary Deposit Piezometers									
QAL015		8/26/04		x		x		x	x
QAL016		9/29/04		x		x		x	x
QAL018	9/22/04	8/21/04		x		x*		x	x
QAL020	9/22/04[4]	8/21/04		x		x*		x	x
Bedrock Monitoring Well									
04EA054				x					

1 Ongoing continuous monitoring was begun on date indicated.

2 Refer to parameter lists found in Appendix D (* indicates supplemental parameters were included).

3 Water elevations were measured at all piezometers and monitoring wells (exceptions noted in Field Report) in May, August and October of 2004 and March and May of 2005.

4 Probe vandalized. Record lost.

Table 3
Grain Size Distribution for Quaternary Deposits
Eagle Project

Location	Depth (ft)	Geologic Description	Zone Designation	USCS Classification	Percentage Retained by Weight (%)						
					Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt	Clay	Fines (Silt + Clay)
QAL008	10	Unsaturated outwash, drainage channel and beach deposits	A+	SP	4	0.9	12	83			0.7
QAL004	15		A+	SP-SM	15	11	44	24			7
QAL013	17		A+	SP	2	2	22	72			3
QAL008	30		A+	SP/SP-SM	6	2	24	64			4
QAL009	37		A+	SP	0.1	0.7	11	85			4
Average:			**A+**		**5**	**3**	**23**	**65**			**4**
QAL006	23	Saturated outwash, drainage channel and beach deposits	A	SP	0.0	0.3	19	79			1
QAL014	37		A	SP	0.0	0.0	1	96			3
QAL011	39		A	SP/SP-SM	0.1	0.2	7	88			5
QAL013	43		A	SP-SM	0.3	0.1	2	89			9
QAL010	43		A	SP-SM	0.7	0.9	7	83			9
QAL007	50		A	SP/SP-SM	1	0.3	6	87			5
QAL004	52		A/B	SM	0.1	0.9	3	80			16
QAL002	56-58		A	SP-SM	3	1	18	72			6
QAL001	60		A/B	SM	0.0	0.3	4	77			19
QAL009	102		A	SP/SP-SM	0.0	0.0	1	94			4
Average:			**A**		**0.5**	**0.4**	**7**	**85**			**8**
QAL023	16	Transitional deposits	B	CL	0.0	0.0	0.5	5	67	28	95
QAL023	28		B	SP-SM	0.0	0.5	12	79			8
QAL003	28-30		B	CL-ML	0.0	0.0	1	7	75	17	92
QAL013	67		B	ML	0.0	0.0	0.0	28	68	4	72
QAL013	67-69		B	ML	0.0	0.0	0.0	7	87	6	93
QAL006	71		B	SP	0.0	0.0	0.2	96			4
QAL007	75		B	SM	0.0	0.0	0.1	62			38
QAL005	75		B	SM	0.0	0.0	0.0	74	25	0.5	26
QAL008	84		B	ML	0.0	0.0	0.1	16	77	7	84
QAL008	88		B	SP-SM	0.0	0.0	0.7	90			10
Average:			**B**		**0.0**	**0.1**	**1**	**46**			**52**
QAL001	70	Lacustrine	C	ML/CL-ML	0.5	0.5	0.7	4	83	12	95
QAL004	98-100		C	CL-ML	0.0	0.0	0.0	0.2	93	7	100
QAL008	107-109		C	CL	0.0	0.0	0.2	3	59	38	97
QAL014	108-110		C	CL	0.0	0.0	0.0	0.2	53	47	100
QAL002	118-120		C	CL	0.0	0.0	0.3	3	35	62	97
Average:			**C**		**0.1**	**0.1**	**0.2**	**2**			**98**
QAL001	83	Saturated outwash, drainage channel and beach deposits	D	SM	2	3	13	67			15
QAL008	117		D	SP	0.4	0.2	22	75			3
QAL005	121		D	SP	26	12	28	33			2
QAL013	121		D	SP	17	17	34	30			2
QAL002	136		D	SM/SP-SM	0.0	0.0	0.9	86			13
QAL014	137		D	SP-SM	8	4	29	55			4
QAL004	142		D	SM	3	7	18	55			18
QAL009	145		D	SP/SP-SM	0.3	5	32	58			5
QAL007	177		D	SP	0.4	1	46	50			3
Average:			**D**		**6**	**6**	**25**	**56**			**7**
QAL023	34	Glacial till	E	SC-SM	11	4	10	41	22	11	33
QAL010	134		E	CL/CH	3	2	5	21	35	35	70
QAL013	144		E	SM	7	4	10	54	19	6	25
QAL009	157		E	CH	1	0.1	1	5	14	78	92
QAL009	163		E	SM	0.0	0.2	17	58			26
QAL009	185		E	SM	0.0	0.0	0.2	71	22	6	28
QAL007	197		E	CL/CL-ML	1	0.6	4	37	47	10	57
QAL009	238		E	ML	0.0	0.0	0.6	11	83	6	89
QAL009	254		E	SC	29	9	12	27	15	9	24
Average:			**E**		**6**	**2**	**7**	**36**			**49**
QAL010	102	Lower outwash, unsaturated	F	SP-SM	8	3	16	67			6
QAL010	178		F	SP/SP-SM	31	9	21	35			4
Average:			**F**		**19**	**6**	**19**	**51**			**5**

Table 4
Surface Water Flow Measurements
Salmon Trout River
November 2002 - May 2005
Eagle Project

Monitoring Location	Flow (cfs)
STRM001	
11/05/02	0.1
02/25/03	0.3
06/19/03	0.2
08/13/03	0.2
10/28/03	0.2
02/26/04	0.1
06/30/04	0.1
08/04/04	0.1
10/04/04	0.2
11/09/04	0.3
02/21/05	0.8
04/13/05	0.6
STRM002	
11/05/02	1.8
02/25/03	1.5
04/25/03	3.3
06/19/03	0.9
08/13/03	1.4
10/28/03	1.1
02/25/04	1.4
04/07/04	4.2
06/29/04	2.2
08/03/04	1.8
09/14/04	4.3
10/04/04	2.1
11/08/04	1.6
12/14/04	1.8
02/16/05	1.3
04/12/05	5.3
STRM003	
10/29/03	5.5
02/25/04	4.9
04/07/04	13
06/29/04	6.3
08/04/04	4.0
10/04/04	5.5
11/08/04	5.7
02/15/05	5.2
04/14/05	9.3
STRM004	
08/14/03	4.2
07/06/04	7.0
08/05/04	3.7
08/23/04	6.7
08/25/04	6.4
09/01/04	4.7
09/15/04	9.2
09/29/04	4.2
10/06/04	5.1
10/25/04	8.0

Monitoring Location	Flow (cfs)
STRM004, continued	
11/08/04	6.1
12/01/04	5.9
02/15/05	6.3
03/17/05	4.8
04/02/05	16
04/06/05	49
04/14/05	11
04/21/05	10
06/01/05	5.6
07/06/05	5.4
STRM005	
08/25/04	36
09/02/04	31
09/15/04	41
09/29/04	34
10/06/04	33
10/25/04	47
11/08/04	37
12/01/04	31
03/10/05	37
04/04/05	182
04/06/05	318
04/07/05	435
04/13/05	116
04/21/05	71
05/31/05	36
07/06/05	36
STRM007	
8/14/03	0.5
10/29/03	0.2
10/27/04	0.8
STRM008	
10/27/04	0.3
STRM009	
10/27/04	0.2
STRW001	
08/14/03	3.1
10/29/03	4.5
02/25/04	4.2
04/07/04	20
06/29/04	3.6
08/05/04	3.3
10/06/04	3.9
02/15/05	4.9
04/14/05	10
06/20/05	3.5
STRE001	
08/14/03	11
10/29/03	12
02/25/04	11

Monitoring Location	Flow (cfs)
STRE001, continued	
04/07/04	25
06/29/04	13
08/05/04	10
10/06/04	11
02/15/05	13
04/07/05	41
04/14/05	19
06/20/05	13
STRE002	
06/30/04	12
08/05/04	12
08/23/04	19
08/25/04	18
09/01/04	14
09/15/04	20
09/29/04	13
10/06/04	14
10/25/04	21
11/08/04	17
12/01/04	18
02/21/05	18
03/17/05	19
04/02/05	56
04/07/05	84
04/19/05	24
04/21/05	25
06/01/05	16
06/20/05	17
07/06/05	15
STRE005	
10/27/04	0.7
05/18/05	0.4
06/20/05	0.6
STRE006	
11/10/04	0.2
02/21/05	0.1
05/17/05	0.4
STRE009	
06/20/05	3.6
STRE010	
05/17/05	3.1
06/20/05	2.7
STRE011	
05/18/05	3.2
STRE012	
05/18/05	2.9
STRE013	
05/17/05	1.7
STRE014	
05/17/05	0.2

Table 5
Surface Water Flow Measurements
Yellow Dog River
November 2002 - May 2005
Eagle Project

Monitoring Location	Flow (cfs)
YDRM001	
11/05/02	25
02/26/03	16
06/19/03	16
08/13/03	11
10/28/03	17
02/26/04	14
YDRM002	
11/05/02	27
02/26/03	12
04/25/03	130
06/19/03	16
08/13/03	11
10/28/03	15
02/26/04	15
04/06/04	91
06/30/04	19
08/04/04	12
08/23/04	18
08/25/04	13
09/02/04	11
09/15/04	16
09/29/04	7.2
10/04/04	13
10/13/04	9.1

Monitoring Location	Flow (cfs)
YDRM002, continued	
10/25/04	34
11/08/04	20
12/01/04	18
02/16/05	17
03/17/05	17
03/30/05	66
04/02/05	104
04/04/05	91
04/07/05	242
04/12/05	196
04/13/05	155
04/19/05	100
04/21/05	91
05/05/05	32
05/31/05	27
YDRM003	
02/26/04	14
04/06/04	53
06/30/04	16
08/04/04	9.8
10/13/04	6.4
02/16/05	14
04/21/05	66

Table 6
Surface Water Flow Measurements
Cedar Creek
November 2002 - May 2005
Eagle Project

Monitoring Location	Flow (cfs)
CDRA002	
05/06/03	1.7
06/25/03	1.6
08/14/03	1.5
10/29/03	1.6
02/25/04	1.5
04/08/04	1.9
06/29/04	1.7
08/03/04	1.7
10/06/04	2.0
02/15/05	1.7
04/19/05	2.0
CDRM004	
08/14/03	9.4
10/29/03	13
02/25/04	12
04/08/04	22
06/29/04	11
08/03/04	9.5
09/14/04	7.7
10/04/04	12
11/08/04	12
12/14/04	13
02/15/05	14
04/19/05	18

Table 7
Streamflow Characteristics at Continuous Gaging Stations
September 2004 - May 2005
Eagle Project

Monitoring Location	Area (sq mi)	Average Daily Flow During Period of Record (cfs)	Average Flow Per Unit Area (cfs/sq mi)	Flow (cfs)		Maximum / Minimum
				Maximum	Minimum	
Salmon Trout River						
STRM004	8.8	7.3	0.8	41	4.2	10
STRM005	41.7	48	1.2	397	22	18
STRE002	11.5	22	1.9	119	12	10
Yellow Dog River						
YDRM002	26.5	34	1.3	242	6.5	37

Table 8
Water Elevation Measurements
Eagle Project

Location	Water Elevation (ft MSL)				
	5/11/04	8/26/04	10/27/04	3/15/05	5/4/05
WLD001	1428.96	1428.87	1428.37	1428.80	1428.38
WLD002	1430.73	1430.58	1430.77	1430.67	1430.79
WLD003	1433.84	1433.61	1433.75	1433.62	1433.90
WLD004	1446.50	1446.14	1446.40	1446.21	1447.48
WLD005	1451.23	1450.98	1451.09	1450.94	1451.23
WLD006	1455.51	1455.32	1455.38	1454.97	1455.50
WLD007	1450.70	1450.51	1450.54	1450.20	1450.69
WLD008	1453.59	1453.32	1453.55	1453.40	1453.64
WLD009	1457.09	1457.01	1457.12	1456.82	1457.07
WLD010	1447.49	1447.25	1447.48	1447.23	1447.50
WLD011	1446.80	1445.91	1446.43	1445.97	1446.69
WLD012	1446.22	1445.77	1445.99	1446.03	1446.18
WLD013	1445.00	1444.02	1444.75	1444.83	1445.98
WLD014	1441.64	1441.20	1441.45	1441.24	1441.58
WLD015	1428.98	1428.90	1429.06	1428.91	1429.13
WLD016	1428.44	1428.36	1428.41	1428.40	1428.56
WLD017	1423.64	1422.98	1423.64	1423.29	1423.63
WLD018	1423.13	1422.94	1423.10	1423.03	1423.16
WLD019	1421.02	NM	1421.08	1420.47	1420.95
WLD020	1420.17	1419.79	1420.18	1419.96	1420.24
WLD021	1416.04	1415.36	1416.38	1415.19	1416.19
WLD022	1422.61	1422.55	1422.63	1422.11	1422.58
WLD023	1413.59	1413.59	NM	1413.60	1413.58

Table 8
Water Elevation Measurements
Eagle Project

Location	Water Elevation (ft MSL)				
	5/11/04	8/26/04	10/27/04	3/15/05	5/4/05
QAL001A	1410.94	1412.79	1412.72	1412.00	1411.61
QAL001D	1405.17	1407.90	1407.66*	1406.47	1406.38
QAL002A	1433.86	1435.23	1434.76	1433.35	1433.54
QAL002D	1391.91	1391.95	1395.92	1395.30	1395.21
QAL003A	1428.08	1426.58	1425.99*	1425.15	1427.55
QAL003B	1414.19	1413.12	1412.93*	1412.45	1413.93
QAL004A	1426.44	1425.64	1425.21	1424.62	1426.16
QAL004D	1434.41	1434.14	1434.02	1433.72	1434.36
QAL005A	1455.70	1454.37	1454.18	1453.34	1455.54
QAL005D	1453.96	1453.19	1452.94	1452.35	1453.68
QAL006A	1416.49	1415.13	1414.60	1414.02	1415.96
QAL006B	1401.47	1400.94	1400.23	1398.78	1400.11
QAL007A	NM	NM	1430.17	1428.74	1428.99
QAL007D	NM	NM	1438.35	1437.11	1438.15
QAL008A	NM	NM	1390.43	1389.59	1389.26
QAL008D	NM	NM	1354.07	1353.72	1353.82
QAL009A	NM	NM	1354.99	1354.57	1354.02
QAL009D	NM	NM	1354.84	1354.47	1354.32
QAL0010A	NM	NM	1424.54	1422.77	1424.89
QAL015	NM	1292.56	1292.69	1292.90	1292.91
QAL016	NM	1274.80	1274.20	1273.73	1273.69
QAL017	NM	1251.00	1251.37	1251.40	1251.17
QAL018	NM	1250.22	1250.24	1250.37	1250.41
QAL019	NM	1285.55	1285.41	1285.35	1285.39
QAL020	NM	1335.61	1335.65	1336.10	1335.71
QAL021	NM	1389.30	1389.33	1389.22	1389.28
QAL022	NM	1298.36	1298.44	1298.40	1298.42
QAL023B	NM	1420.57	1418.52	NM	1418.16
YDRM002	NM	1412.21	1412.65	1412.33	NM
STRM002	NM	1400.91	NM	1403.19	1400.09

NM Not measured
MSL Mean sea level
* Measured on 11/10/04

Table 9
Hydraulic Characteristics from the A Zone Pumping Test
Eagle Project

Well	Method[1]	Transmissivity (gpd/ft)	Specific Yield[2]	Anisotropy Ratio	Average Transmissivity (gpd/ft)	Average Specific Yield	Saturated Thickness (ft)	Average Horizontal K Value (ft/day)	Average Vertical K Value (ft/day)
QAL011A	Jacob Time Drawdown	7,703	--	--	--	--	--	--	--
QAL011A	Theis Time Drawdown	7,650	--	--	--	--	--	--	--
QAL011A Summary Hydraulic Characteristics		--	--	--	**7,677**	--	**21**	**49**	--
QAL012A	Jacob Time Drawdown	7,647	0.038	--	--	--	--	--	--
QAL012A	Theis Time Drawdown	7,605	0.039	--	--	--	--	--	--
QAL012A	Neuman Time Drawdown	7,787	0.051	--	--	--	--	--	--
QAL012A Summary Hydraulic Characteristics		--	--	**0.043**	**7,680**	**0.043**	**22**	**47**	**2.0**
QAL013A	Jacob Time Drawdown	8,296	0.035	--	--	--	--	--	--
QAL013A	Theis Time Drawdown	8,150	0.039	--	--	--	--	--	--
QAL013A	Neuman Time Drawdown	8,173	0.039	--	--	--	--	--	--
QAL013A Summary Hydraulic Characteristics		--	--	**0.038**	**8,206**	**0.038**	**25**	**44**	**1.7**
QAL014A	Jacob Time Drawdown[3]	12,835	0.053	--	--	--	--	--	--
QAL014A	Theis Time Drawdown	12,200	0.058	--	--	--	--	--	--
QAL014A	Neuman Time Drawdown	12,150	0.067	--	--	--	--	--	--
QAL014A Summary Hydraulic Characteristics		--	--	**0.026**	**12,395**	**0.059**	**27**	**61**	**1.6**

Distance Drawdown (Jacob) at 4295 minutes	6,782	0.063	--	--	--	--	--	--
Average All Time Drawdown	--	--	0.036	9,109	0.047	24	50	1.8
Average All Time Drawdown, no QAL014A	--	--	0.041	7,876	0.040	24	46	1.8
Average Jacob Time Drawdown	--	--	--	9,120	0.042	--	--	--
Average Theis Time Drawdown	--	--	--	8,901	0.045	--	--	--
Average Neuman Time Drawdown	--	--	--	9,370	0.052	--	--	--
Average All Methods	--	--	--	8,915	0.048	--	--	--

Notes:

1. Recovery data were affected by delayed drainage conditions and were not analyzed.
2. Specific yield values cannot be calculated from the pumping well.
3. Some of the drawdown data used to calculate the transmissivity and specific yield values by the Jacob method for QAL014A do not meet the criteria for using the Jacob analysis (i.e., the "u" value slightly exceeds 0.05).

Table 10
Hydraulic Characteristics from the D Zone Pumping Test
Eagle Project

Well	Method	Transmissivity (gpd/ft)	Storage Coefficient[1,2]	Average Transmissivity (gpd/ft)	Average Storage Coefficient	Aquifer Thickness (ft)	Average K Value (ft/day)
QAL011D	Theis Time Drawdown	6,100	--	--	--	--	--
QAL011D	Jacob Time Drawdown[3]	5,159	--	--	--	--	--
QAL011D	Jacob Recovery	5,815	--	--	--	--	--
QAL011D Summary Hydraulic Characteristics		--	--	**5,691**	--	**19**	**40**
QAL012D	Theis Time Drawdown	6,300	2.5E-04	--	--	--	--
QAL012D	Jacob Time Drawdown	5,980	3.0E-04	--	--	--	--
QAL012D	Jacob Recovery	6,439	--	--	--	--	--
QAL012D Summary Hydraulic Characteristics		--	--	**6,240**	**2.7E-04**	**25**	**33**
QAL013D	Theis Time Drawdown	6,200	1.2E-04	--	--	--	--
QAL013D	Jacob Time Drawdown	5,938	1.3E-04	--	--	--	--
QAL013D	Jacob Recovery	6,243	---	--	--	--	--
QAL013D Summary Hydraulic Characteristics		--	--	**6,127**	**1.3E-04**	**21**	**39**
QAL014D	Theis Time Drawdown	6,100	1.8E-04	--	--	--	--
QAL014D	Jacob Time Drawdown	6,219	1.8E-04	--	--	--	--
QAL014D	Jacob Recovery	6,326	--	--	--	--	--
QAL014D Summary Hydraulic Characteristics		--	--	**6,215**	**1.8E-04**	**26**	**32**
QAL004D	Theis Time Drawdown	6,500	7.9E-05	--	--	--	--
QAL004D	Jacob Time Drawdown	4,965	9.3E-05	--	--	--	--
QAL004D	Jacob Recovery	5,767	---	--	--	--	--
QAL004D Summary Hydraulic Characteristics		--		**5,744**	**9.3E-05**	**14**	**55**

Distance Drawdown (Jacob) at 120 minutes	7,255	1.00E-04	--	--	21	46
Average All Time Drawdown	--	--	5,946	1.7E-04	--	--
Average All Time Drawdown, no QAL011D Jacob[3]	--	--	6,034	1.7E-04	--	--
Average All Time Drawdown and Recovery	--	--	6,003	1.7E-04	--	--
Average All Time Drawdown and Recovery, no QAL011D Jacob[3]	--	--	6,064	1.9E-04	--	--
Average Theis Time Drawdown	--	--	6,240	1.6E-04	--	--
Average Jacob Time Drawdown	--	--	5,652	1.7E-04	--	--
Average Jacob Recovery[2]	--	--	6,118	--	--	--
Average All Methods	--	--	6,082	1.6E-04	--	--
Average All Methods, no QAL011D Jacob[3]	--	--	6,143	1.6E-04	--	--

Notes:

1. Storage coefficients cannot be calculated from the pumping well.
2. Storage coefficients from recovery data are not representative because of negative boundary effects and, therefore, are not reported here.
3. The transmissivity value calculated by the Jacob method for the pumping well are affected by well inefficiency and may not be representative (low). This value, therefore, is not used to calculate the average transmissivity for well QAL011D.

Table 11
Hydraulic Characteristics from the Bedrock Pumping Test
Eagle Project

Tested Interval Designation	Tested Interval			
	Zone Depth (ft bgs)	Interval Length (ft)	Transmissivity (gpd/ft)	Average K (ft/day)
04EA054A	42 - 80	38	5	0.02
04EA054B	42 - 100	58	9	0.02
04EA054C2[1]	42 - 160	118	117	0.13
04EA054D	42 - 280	238	140	0.08
04EA054E	42 - 520	478	152	0.04

Tested Interval Designation	Discrete Interval			
	Zone Depth (ft bgs)	Interval Length (ft)	Transmissivity (gpd/ft)	Average K (ft/day)
04EA054A	42 - 80	38	5	0.02
04EA054B	80 - 100	20	4	0.03
04EA054C2	100 - 160	60	108	0.24
04EA054D	160 - 280	120	23	0.03
04EA054E	280 - 520	240	12	0.01

Note:

1. The "C" interval was re-tested after the first test returned significant drill cutting fines.

Table 12
Summary of Hydraulic Characteristics for Hydrostratigraphic Units
Eagle Project

Location	Zone	Tested or Screened Interval Top (ft bgs)	Tested or Screened Interval Bottom (ft bgs)	Horizontal K value (ft/day)	Basis for Horiz. K Value	Vertical K value (ft/day)	Basis for Vert. K Value
QAL002	A	50	60	2.5E+01	SC	8.8E-01	NeuAvg
QAL002	A	56	58	7.9E+00	LabC	2.8E-01	NeuAvg
QAL004	A	15	15	6.7E+01	Sieve	2.4E+00	NeuAvg
QAL004	A	45	55	2.0E+01	SC	7.3E-01	NeuAvg
QAL005	A	15	25	3.5E+01	SC	1.3E+00	NeuAvg
QAL006	A	15	25	6.1E+01	SC	2.2E+00	NeuAvg
QAL006	A	23	23	2.7E+01	Sieve	9.6E-01	NeuAvg
QAL007	A	50	50	3.5E+01	Sieve	1.3E+00	NeuAvg
QAL008	A	10	10	5.3E+01	Sieve	1.9E+00	NeuAvg
QAL008	A	30	30	6.1E+01	Sieve	2.2E+00	NeuAvg
QAL008	A	84	84	1.3E-01	Sieve	4.6E-03	NeuAvg
QAL008	A	88	88	3.6E+01	Sieve	1.3E+00	NeuAvg
QAL009	A	37	37	3.9E+01	Sieve	1.4E+00	NeuAvg
QAL009	A	102	102	3.7E+01	Sieve	1.3E+00	NeuAvg
QAL010	A	43	43	3.5E+01	Sieve	1.3E+00	NeuAvg
QAL011	A	11	21	4.9E+01	PT	1.7E+00	NeuAvg
QAL011	A	39	39	3.7E+01	Sieve	1.3E+00	NeuAvg
QAL012	A	11	21	4.9E+01	PT	2.1E+00	PTN
QAL013	A	11	21	5.2E+01	PT	2.0E+00	PTN
QAL013	A	17	17	5.6E+01	Sieve	2.0E+00	NeuAvg
QAL013	A	43	43	2.8E+01	Sieve	1.0E+00	NeuAvg
QAL014	A	11	21	7.6E+01	PT	2.0E+00	PTN
QAL014	A	37	37	2.5E+01	Sieve	8.9E-01	NeuAvg
QAL001	A/B	50	65	1.8E+00	SC	6.5E-02	NeuAvg
QAL001	A/B	60	60	1.3E-01	Sieve	4.8E-03	NeuAvg
QAL004	A/B	52	52	1.3E-01	Sieve	4.8E-03	NeuAvg
QAL001	B	70	70	8.0E+00	Sieve	2.9E-01	NeuAvg
QAL003	B	20	30	7.1E-02	SC	2.5E-03	NeuAvg
QAL003	B	28	30	5.4E-03	LabF	1.9E-04	NeuAvg
QAL003	B	43	48	1.7E-01	SC	6.2E-03	NeuAvg
QAL005	B	75	75	2.0E+00	Sieve	7.2E-02	NeuAvg
QAL006	B	71	71	1.7E+01	Sieve	6.0E-01	NeuAvg
QAL006	B	75	80	6.3E-01	SC	2.3E-02	NeuAvg
QAL007	B	75	75	5.0E+00	Sieve	1.8E-01	NeuAvg
QAL013	B	57	57	1.3E-01	Sieve	4.6E-03	NeuAvg
QAL013	B	67	69	1.0E-02	LabF	3.6E-04	NeuAvg
QAL023	B	16	16	1.3E-01	Sieve	4.6E-03	NeuAvg
QAL023	B	28	28	1.2E-01	SlugG	4.3E-03	NeuAvg
QAL023	B	34	34	1.2E-01	SlugG	4.3E-03	NeuAvg

Table 12
Summary of Hydraulic Characteristics for Hydrostratigraphic Units
Eagle Project

Location	Zone	Tested or Screened Interval Top (ft bgs)	Tested or Screened Interval Bottom (ft bgs)	Horizontal K value (ft/day)	Basis for Horiz. K Value	Vertical K value (ft/day)	Basis for Vert. K Value
QAL002	C	118	120	5.7E-05	LabF	2.0E-06	NeuAvg
QAL004	C	98	100	5.1E-03	LabF	1.8E-04	NeuAvg
QAL008	C	107	109	8.5E-05	LabF	3.0E-06	NeuAvg
QAL014	C	108	110	6.2E-05	LabF	2.2E-06	NeuAvg
QAL001	D	80	85	3.5E-01	SC	1.3E-02	NeuAvg
QAL002	D	135	140	<7.0E-02	SC	<2.5E-03	NeuAvg
QAL002	D	136	136	6.7E+00	Sieve	2.4E-01	NeuAvg
QAL004	D	140	145	6.1E+01	PT	2.2E+00	NeuAvg
QAL004	D	140	145	2.6E+01	SC	9.3E-01	NeuAvg
QAL004	D	142	142	2.0E+00	Sieve	7.2E-02	NeuAvg
QAL005	D	121	121	8.0E+01	Sieve	2.9E+00	NeuAvg
QAL005	D	123	128	1.3E+02	SC	4.6E+00	NeuAvg
QAL007	D	177	177	9.0E+01	Sieve	3.2E+00	NeuAvg
QAL008	D	117	117	4.9E+01	Sieve	1.8E+00	NeuAvg
QAL009	D	145	145	4.8E+01	Sieve	1.7E+00	NeuAvg
QAL011	D	140	145	4.3E+01	PT	1.5E+00	NeuAvg
QAL012	D	140	145	4.4E+01	PT	1.6E+00	NeuAvg
QAL013	D	121	121	2.7E+01	Sieve	9.7E-01	NeuAvg
QAL013	D	140	145	4.4E+01	PT	1.6E+00	NeuAvg
QAL014	D	137	137	6.4E+01	Sieve	2.3E+00	NeuAvg
QAL014	D	140	145	4.6E+01	PT	1.6E+00	NeuAvg
QAL007	E	197	197	1.3E-01	Sieve	4.8E-03	NeuAvg
QAL009	E	157	157	5.7E-05	Sieve	2.0E-06	NeuAvg
QAL009	E	163	163	4.0E+00	Sieve	1.4E-01	NeuAvg
QAL009	E	185	185	5.0E+00	Sieve	1.8E-01	NeuAvg
QAL009	E	238	238	1.3E-01	Sieve	4.6E-03	NeuAvg
QAL009	E	254	254	3.3E+01	Sieve	1.2E+00	NeuAvg
QAL010	E	134	134	2.0E+00	Sieve	7.1E-02	NeuAvg
QAL013	E	144	144	4.0E+00	Sieve	1.4E-01	NeuAvg
QAL010	F	102	102	4.9E+01	Sieve	1.8E+00	NeuAvg
QAL010	F	178	178	6.4E+01	Sieve	2.3E+00	NeuAvg

Table 12
Summary of Hydraulic Characteristics for Hydrostratigraphic Units
Eagle Project

Location	Zone	Tested or Screened Interval Top (ft bgs)	Tested or Screened Interval Bottom (ft bgs)	Horizontal K value (ft/day)	Basis for Horiz. K Value	Vertical K value (ft/day)	Basis for Vert. K Value
04EA054A	BdrkA	42	80	1.8E-02	BRD	--	--
04EA054B	BdrkB	80	100	2.7E-02	BRD	--	--
04EA054B	BdrkB	80	100	8.7E-02	BRQ	--	--
04EA054C2	BdrkC	100	160	2.4E-01	BRD	--	--
04EA054D	BdrkD	160	280	2.6E-02	BRD	--	--
04EA054D	BdrkD	160	280	7.4E-02	BRQ	--	--
04EA047	Bdrk	46	331	6.0E-03	BRSP	--	--
04EA073	Bdrk	51	261	5.1E-03	BRSP	--	--
04EA083	Bdrk	51	261	1.5E-02	BRSP	--	--
04EA084	Bdrk	50	331	3.0E-03	BRSP	--	--
04EA054E	BdrkE	280	520	6.7E-03	BRD	--	--
04EA054E	BdrkE	280	520	6.0E-02	BRQ	--	--
04EA047	Bdrk	331	661	3.8E-05	BRSP	--	--
04EA047	Bdrk	661	880	2.1E-05	BRSP	--	--
04EA073	Bdrk	261	491	5.4E-04	BRSP	--	--
04EA073	Bdrk	491	874	4.1E-05	BRSP	--	--
04EA083	Bdrk	261	541	1.5E-05	BRSP	--	--
04EA083	Bdrk	541	787	1.8E-04	BRSP	--	--
04EA084	Bdrk	331	991	2.7E-03	BRSP	--	--

Notes:

Bdrk	Bedrock
bgs	Below Ground Surface
amsl	Above Mean Sea Level

Basis Codes:

LabC	K value based on constant-head laboratory permeability test
LabF	K value based on falling-head laboratory permeability test
Sieve	K value based on comparison of grain-size distribution with similar grain size distribution of sample with known or calculated K value
PT	K value based on results of QAL011A and QAL011D pumping tests
SC	K value based on FDA analysis of data from brief specific capacity tests done by North Jackson
BRD	K value based on analysis of time-drawdown data from North Jackson specific capacity testing of bedrock boring
BRQ	K value based on analysis of specific capacity data from North Jackson specific capacity testing of bedrock boring
SlugG	K value based on slug testing of alluvium by Golder
BRSP	K value based on packer/slug testing of bedrock by Golder
PTN	Based on anisotropy ratio calculated from Neuman analysis of pumping test data from this well
NeuAvg	Based on average anisotropy ratio calculated from all Neuman analyses of A-zone pumping test data

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM001
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow	Spring Snowmelt Runoff
		11/5/02	2/25/03	4/23/03	6/19/03	8/13/03	10/28/03	2/18/04	4/7/04	6/30/04	8/4/04	10/4/04	11/9/04	2/21/05	4/13/05
Field Parameters															
Temperature	°C	**1.8**	**0.4**	**5.3**	**16**	**19**	**3.5**	**0.4**	**1.6**	**21**	**16**	**6.9**	**2.2**	**0.2**	**8.1**
Specific Conductance	µmhos/cm @ 25°C	**38**	**43**	**26**	**67**	**71**	**39**	**41**	**27**	**68**	**99**	**40**	**38**	**42**	**17**
pH	SU	**6.2**	**7.4**	**6.5**	**7.6**	**6.1**	**7.5**	**7.8**	**6.7**	**8.7**	**7.5**	**6.4**	**6.3**	**6.6**	**6.5**
D.O.	ppm	**4.5**	**4.5**	**4.5**	**2.5**	**2**	**5**	**4.5**	**7**	**3.5**	**2**	**3.5**	**5**	**4.5**	**6**
Organics (BTEX)															
Benzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	<3.0	<3.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics															
Aluminum, Total	µg/L	<200	<200	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Lithium, Total	µg/L	<20	<20	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.5**	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	**11**	<10	**22**	**21**	<10	<10	<10	**19**	**32**	<10	<10	<10	<10
Iron, Total	µg/L	**290**	**600**	**240**	**1,530**	**3,120**	**330**	**390 a**	**400**	**1,460**	**5,860**	**490**	**350**	**490**	**390**
Beryllium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	<50	<50	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	**1.2**	<1.0	<1.0	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**12**	**36**	<10	**145**	**199**	**17**	**21 a**	<10	**84**	**369**	**25**	**17**	**20**	<10
Molybdenum, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**0.937**	**0.914**	**1.730**	**3.260**	**0.861**	**0.701**	**0.716**	**1.960**	**2.120 a**	**2.870**	**0.940**	**0.810**	**0.831**	**1.820**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM001
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow	Spring Snowmelt Runoff
		11/5/02	2/25/03	4/23/03	6/19/03	8/13/03	10/28/03	2/18/04	4/7/04	6/30/04	8/4/04	10/4/04	11/9/04	2/21/05	4/13/05
Major Anions															
Alkalinity, Bicarbonate	mg/L	**13**	**21**	**11**	**38**	**37**	**20**	**19**	**6.0**	**31 a**	**38**	**17**	**13**	**12 a**	**11**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	**8.0**	**1.4**	**1.2**	<1.0	<1.0	**1.4**	**1.6**	<1.0	<1.0	<1.0	**1.5**
Fluoride	mg/L	<0.10	<0.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.05**	**0.06**	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	<0.50	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	**6.7**	**8.4**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**7.1**	<1.0
Sulfide	mg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations															
Calcium, Dissolved	mg/L	**4.7**	**5.0**	**3.3**	**9.5**	**9.5**	**4.6**	**4.3**	**3.2**	**10 a**	**12**	**4.9**	**4.5**	**4.8**	**3.4**
Potassium, Dissolved	mg/L	<0.50	<0.50	**0.56**	<0.50	**0.51**	**0.63**	<0.50	**0.66**	<0.50	**0.54**	**0.74**	**0.65**	**0.56**	<0.50
Magnesium, Dissolved	mg/L	**1.1**	**1.1**	**0.78**	**2.2**	**2.1**	**1.1**	**1.0**	**0.76**	**2.2**	**2.3**	**1.2**	**1.1**	**1.2**	**0.82**
Sodium, Dissolved	mg/L	<0.50	**0.77**	**0.56**	**0.80**	**0.63**	**0.89**	**0.71**	<0.50	**0.86**	**0.53**	**0.68**	<0.50	**0.85**	**0.98**
General Chemistry															
Hardness (calculated) as CaCO3	mg/L	**16**	**17**	**11**	**33**	**32**	**16**	**15**	**11**	**34 a**	**39**	**17**	**16**	**17**	**12**
Residue, Dissolved @ 180°C	mg/L	**56**	**27**	**92**	**74**	**64**	**52**	**96**	**27**	**92**	**91**	**49**	<20	<20	**34**
Residue, Suspended	mg/L	<5	<6	<3	<10	<10	<13	<3	**6**	**9**	**10**	<4	<3	<3	<3
Alkalinity, Total	mg/L	**13**	**21**	**11**	**38**	**37**	**20**	**19**	**6.0**	**31 a**	**38**	**17**	**13**	**12**	**11**
Chemical Oxygen Demand	mg/L	**16**	**9.8**	**17**	**26**	**32**	**12**	**10**	**23**	**33**	**35**	**14**	**15**	**11**	**21**
Carbon, Dissolved Organic	mg/L	**8.9**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**4.7**	**7.9**
Carbon, Total Organic	mg/L	**6.3**	**4.1**	**7.2**	**16**	**12**	**4.8**	**4.2**	**7.7**	**12**	**14**	**4.8**	**5.0**	**4.4**	**7.4**
BOD, (5-Day)	mg/L	**1.3**	<1.0	**6.1**	**1.2**	**1.7**	**1.6**	<1.0	<1.0	<1.0	**2.3**	<1.0	<1.0	<1.0	<1.0
Coliform, Total	col/100 mL	**1,600 a**	**130 a,b**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**220 a**	**500 a**
E. Coli	neg/pos	neg	neg	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**60**	**30**	**62**	**250**	**200**	**35**	**45**	**75**	**125**	**200**	**35**	**25**	**40**	**80**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	<1.0	<1.0	<1.0	**2.0**	**6.7**	<1.0	**2.5**	**2.2**	**2.1**	**8.3**	**2.2**	<1.0	<1.0	**1.4**
Gross-Alpha	pCi/L	u	u	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	j	j	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
j Result is greater than instrument detection limit but less than stated reporting limit.
NM Not measured.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM002
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		11/5/02	2/25/03	4/23/03	6/19/03	8/13/03	10/28/03	12/4/03	2/18/04	4/7/04	6/29/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/16/05	4/13/05
Field Parameters																		
Temperature	°C	**1.7**	**0.2**	**5.1**	**14**	**18**	**3.3**	**0.3**	**0.4**	**3.7**	**16**	**16**	**16**	**7.0**	**2.4**	**0.4**	**0.4**	**6.6**
Specific Conductance	µmhos/cm @ 25°C	**53**	**69**	**34**	**61**	**63**	**59**	**70**	**70**	**41**	**58**	**66**	**69**	**57**	**57**	**58**	**62**	**34**
pH	SU	**6.2**	**7.0**	**7.5**	**8.1**	**6.4**	**7.8**	**7.7**	**8.3**	**6.8**	**7.5**	**7.2**	**7.3**	**7.1**	**7.3**	**6.9**	**7.1**	**7.1**
D.O.	ppm	**11**	**6**	**7**	**4.5**	**5**	**5**	NM	**7**	**8**	**7**	**8**	**7**	**7**	**9**	**0.4**	**7**	**7**
Organics (BTEX)																		
Benzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	<3.0	<3.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics																		
Aluminum, Total	µg/L	<200	<200	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**60**	<50
Lithium, Total	µg/L	<20	<20	NM	NM	NM	NM	<20	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	**12**	**11**	<10	<10	<10	<10	<10	**12**	**12**	<10	<10	<10	<10	<10
Iron, Total	µg/L	**180**	**160**	**200**	**650**	**580**	**210**	**220**	**180 a**	**290**	**440**	**580**	**400**	**330**	**320**	**310**	**210**	**290**
Beryllium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	<50	<50	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	<10	<10	NM	NM	NM	NM	<10	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	<10	<10	<10	**54**	**21**	<10	<10	**10 a**	**11**	**32**	**23**	**18**	**13**	**12**	**13**	**11**	**14**
Molybdenum, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	<10	<10	NM	NM	NM	NM	**145 a**	NM	NM	NM	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**1.530**	**0.887**	**3.130**	**2.580**	**1.360**	**1.230**	<200	**0.887**	**3.150**	**2.030 a**	**2.210**	**1.270**	**1.990**	**1.660**	**1.590**	**1.300**	**3.880**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM002
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		11/5/02	2/25/03	4/23/03	6/19/03	8/13/03	10/28/03	12/4/03	2/18/04	4/7/04	6/29/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/16/05	4/13/05
Major Anions																		
Alkalinity, Bicarbonate	mg/L	**30**	**33**	**14**	**32**	**33**	**29**	**30**	**33**	**16**	**24 a**	**38**	**34**	**24**	**36**	**29**	**30 a**	**26**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NM	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	**1.5**	**1.3**	**1.0**	**1.1**	<1.0	<1.0	<1.0	**1.1**	**1.0**	<1.0	<1.0	<1.0	**1.4**	<1.0
Fluoride	mg/L	<0.10	<0.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.05**	<0.02
Nitrogen, Nitrate	mg/L	**0.06**	**0.14**	<0.05	<0.05	<0.05	<0.05	**0.09**	**0.12**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.06**	**0.08**	<0.05
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.50	NM	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	**5.7**	**5.2**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations																		
Calcium, Dissolved	mg/L	**7.4**	**9.0**	**4.5**	**8.3**	**8.9**	**7.9**	**9.3**	**8.7**	**5.6**	**8.7 a**	**10**	**10**	**8.1**	**7.9**	**7.9**	**8.2**	**4.7**
Potassium, Dissolved	mg/L	<0.50	**0.65**	**0.68**	<0.50	<0.50	**0.69**	**0.67**	**0.64**	**0.65**	<0.50	<0.50	<0.50	**0.67**	**0.64**	**0.56**	**0.6**	<0.50
Magnesium, Dissolved	mg/L	**1.5**	**1.8**	**0.97**	**1.7**	**1.9**	**1.7**	**2.0**	**1.8**	**1.2**	**1.8**	**2.0**	**2.2**	**1.8**	**1.7**	**1.6**	**1.8**	**1.1**
Sodium, Dissolved	mg/L	<0.50	**1.2**	**0.63**	**0.83**	**0.74**	**1.1**	**3.2 a**	**0.92**	**0.56**	**0.62**	<0.50	**1.0**	**0.65**	<0.50	**0.84**	**0.97**	**0.51**
General Chemistry																		
Hardness (calculated) as CaCO3	mg/L	**25**	**30**	**15**	**28**	**30**	**27**	**31**	**29**	**19**	**29 a**	**33**	**34**	**28**	**27**	**26**	**28**	**16**
Residue, Dissolved @ 180°C	mg/L	**64**	**66**	**110**	**60**	**60**	**50**	NM	**60**	**64**	**78**	**67**	**58**	**58**	<20	**42**	<20	**38**
Residue, Suspended	mg/L	<5	<3	<3	<6	<3	<5	NM	<3	**4**	<3	<3	<3	<3	<3	<3	<3	**3**
Alkalinity, Total	mg/L	**30**	**33**	**14**	**32**	**33**	**29**	NM	**33**	**16**	**24 a**	**38**	**34**	**24**	**36**	**29**	**30**	**26**
Chemical Oxygen Demand	mg/L	**14**	**7.4**	**23**	**22**	**22**	**16**	**12**	**8.6**	**23**	**20**	**22**	**15**	**24**	**19**	**11**	**11**	**25**
Carbon, Dissolved Organic	mg/L	**7.6**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**4.7**	**9.5**
Carbon, Total Organic	mg/L	**6.1**	**3.0**	**9.5**	**8.8**	**8.3**	**5.9**	**4.4**	**3.2**	**7.8**	**6.9**	**7.7**	**5.6**	**7.7**	**6.6**	**5.0**	**4.2**	**8.5**
BOD, (5-Day)	mg/L	**1.2**	<1.0	**4.4**	**1.6**	<1.0	**1.2**	NM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	**1.0**
Coliform, Total	col/100 mL	**140 a**	**70 a,b**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**110 a**	**900 a**
E. Coli	neg/pos	neg	**pos**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**70**	**25**	**75**	**125**	**100**	**60**	NM	**35**	**120**	**100**	**90**	**50**	**70**	**70**	**45**	**45**	**90**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	<1.0	<1.0	<1.0	**1.6**	**1.5**	<1.0	NM	<1.0	**1.1**	**1.6**	**2.1**	**2.0**	**2.5**	**1.3**	**1.3**	**1.6**	**1.7**
Gross-Alpha	pCi/L	u	u	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	u	u	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
NM Not measured.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM003
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/4/04	10/4/04	11/9/04	2/15/05	4/14/05
Field Parameters									
Temperature	°C	**2.2**	**4.7**	**14**	**13**	**6.4**	**1.9**	**1.1**	**5.2**
Specific Conductance	µmhos/cm @ 25°C	**94**	**65**	**87**	**72**	**87**	**96**	**90**	**68**
pH	SU	**7.9**	**7.2**	**7.8**	**8.1**	**7.9**	**7.8**	**7.9**	**7.9**
D.O.	ppm	**10**	**10**	**8**	**7**	**7**	**9**	**10**	**9**
Organics (BTEX)									
Benzene	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0 e
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0 e
Toluene	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0 e
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	NM	<3.0	<3.0 e
Metals/Inorganics									
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	NM	**94**	**140**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	**1.5**	**1.3**	**1.3**	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	**11**	<10	<10	<10	<10	**20**
Iron, Total	µg/L	**180 a**	**220**	**560**	**280**	**210**	**160**	**160**	**290**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**11 a**	**18**	**39**	**11**	**12**	<10	<10	**14**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**1.250**	**4.130**	**3.670 a**	**1.410**	**1.620**	**1.100**	**1.220**	**3.960**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM003
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/4/04	10/4/04	11/9/04	2/15/05	4/14/05
Major Anions									
Alkalinity, Bicarbonate	mg/L	**49**	**31**	**45 a**	**44**	**40**	**41**	**44 a**	**31**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	**0.13**	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	**0.24**	**0.11**	**0.12**	**0.12**	**0.11**	**0.13**	**0.2**	**0.11**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	<0.50	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations									
Calcium, Dissolved	mg/L	**13**	**9.6**	**14 a**	**15**	**13**	**13**	**13**	**9.6**
Potassium, Dissolved	mg/L	**0.63**	**0.71**	**0.50**	**0.54**	**0.60**	**0.54**	**0.64**	**0.62**
Magnesium, Dissolved	mg/L	**2.4**	**2.1**	**2.4**	**2.6**	**2.4**	**2.4**	**2.3**	**2.1**
Sodium, Dissolved	mg/L	**0.95**	**0.84**	**0.81**	**0.97**	**0.82**	**0.65**	**0.88**	**0.71**
General Chemistry									
Hardness (calculated) as CaCO3	mg/L	**42**	**33**	**45 a**	**48**	**42**	**42**	**42**	**33**
Residue, Dissolved @ 180°C	mg/L	**58**	**69**	**86**	**75**	**66**	<20	**46**	**55**
Residue, Suspended	mg/L	**3**	**6**	**15**	<3	<3	<3	<3	**6**
Alkalinity, Total	mg/L	**49**	**31**	**45 a**	**44**	**40**	**41**	**44**	**31**
Chemical Oxygen Demand	mg/L	**7.8**	**19**	**21**	**10**	**13**	**12**	**7.3**	**18**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	NM	**3**	**6.7**
Carbon, Total Organic	mg/L	**2.4**	**6.4**	**3.9**	**3.7**	**4.0**	**3.7**	**2.5**	**5.8**
BOD, (5-Day)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.1**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	NM	**90 a**	**500 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**30**	**50**	**50**	**40**	**35**	**30**	**25**	**60**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**1.9**	**3.9**	**6.1**	**1.8**	**2.0**	**1.1**	**1.9**	**4.0**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
NM Not measured.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM004
Eagle Project

Parameter	Units	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		7/6/04	8/5/04	9/15/04	10/6/04	12/14/04	2/15/05	4/14/05
Field Parameters								
Temperature	°C	**10**	**13**	**15**	**9.4**	**0.1**	**0.9**	**3.5**
Specific Conductance	µmhos/cm @ 25°C	**92**	**100**	**87**	**95**	**93**	**98**	**64**
pH	SU	**8.3**	**7.9**	**7.7**	**7.7**	**6.9**	**7.8**	**7.8**
D.O.	ppm	**8**	**8**	**7**	**7**	**9**	**10**	**8**
Organics (BTEX)								
Benzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Toluene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	<3.0	<3.0 e
Metals/Inorganics								
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	**150**	**130**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	**1.0**	**1.3**	**1.3**	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	**12**	<10	<10	<10	<10
Iron, Total	µg/L	**350**	**290**	**390**	**230**	**260**	**160**	**270**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**32**	**21**	**34**	**16**	**19**	**15**	**14**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**2.140 a**	**1.420**	**2.720**	**1.260**	**2.080**	**1.160**	**3.860**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM004
Eagle Project

Parameter	Units	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		7/6/04	8/5/04	9/15/04	10/6/04	12/14/04	2/15/05	4/14/05
Major Anions								
Alkalinity, Bicarbonate	mg/L	**44 a**	**51**	**47**	**52**	**48**	**47 a**	**34**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	**1.0**	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	**0.10**	**0.11**	**0.08**	**0.09**	**0.19**	**0.23**	**0.11**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	<0.50	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations								
Calcium, Dissolved	mg/L	**15 a**	**16**	**16**	**14**	**12.8**	**14**	**9.4**
Potassium, Dissolved	mg/L	**0.50**	**0.53**	**0.68**	**0.72**	**0.66**	**0.58**	**0.53**
Magnesium, Dissolved	mg/L	**2.8**	**3.0**	**3.1**	**2.7**	**2.7**	**2.6**	**2.0**
Sodium, Dissolved	mg/L	**0.73**	**0.78**	**0.92**	**0.82**	**0.93**	**0.81**	**0.55**
General Chemistry								
Hardness (calculated) as CaCO3	mg/L	**49 a**	**52**	**53**	**46**	**43**	**46**	**32**
Residue, Dissolved @ 180°C	mg/L	**48**	**73**	**74**	**63**	<20	**55**	**52**
Residue, Suspended	mg/L	**6**	<3	**5**	<3	**3**	<3	**3**
Alkalinity, Total	mg/L	**44 a**	**51**	**47**	**52**	**48**	**47**	**34**
Chemical Oxygen Demand	mg/L	**16**	**9.5**	**18**	**15**	**9.7**	**7.5**	**18**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	**3.4**	**7.4**
Carbon, Total Organic	mg/L	**5.2**	**3.8**	**5.4**	**3.6**	**4.1**	**3**	**6.4**
BOD, (5-Day)	mg/L	<1.0	**1.1**	**1.2**	**3.1**	<1.0	**1.1**	**1.6**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	**280 a**	**300 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**50**	**35**	**45**	**30**	**30**	**25**	**50**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**2.8**	**1.8**	**3.4**	**1.6**	**4.8**	**1.6**	**2.7**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	u	j

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
j Result is greater than instrument detection limit but less than stated reporting limit.
NM Not measured.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM005
Eagle Project

Parameter	Units	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		8/25/04	10/6/04	2/24/05	4/13/05
Field Parameters					
Temperature	^{o}C	**14**	**6.8**	**0**	**4.4**
Specific Conductance	µmhos/cm @ 25^{o}C	**96**	**135**	**133**	**50**
pH	SU	**7.0**	**7.9**	**7.7**	**7.7**
D.O.	ppm	**7**	**8**	**10**	**10**
Organics (BTEX)					
Benzene	µg/L	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	<3.0	<3.0
Metals/Inorganics					
Aluminum, Total	µg/L	NM	NM	**130**	**160**
Lithium, Total	µg/L	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	**14**	**13**	**14 e**	**10**
Iron, Total	µg/L	**180**	**200**	**160**	**250**
Beryllium, Total	µg/L	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0 e	<1.0
Lead, Total	µg/L	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**13**	**11**	**12**	**19**
Molybdenum, Total	µg/L	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	**13 a**	<10
Mercury, Total	ng/L	**1.240**	**0.826**	**1.110**	**5.610**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRM005
Eagle Project

Parameter	Units	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		8/25/04	10/6/04	2/24/05	4/13/05
Major Anions					
Alkalinity, Bicarbonate	mg/L	**75**	**60**	**59 a**	**31**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	**1.9**	<1.0
Fluoride	mg/L	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	**0.02**	<0.02
Nitrogen, Nitrate	mg/L	**0.05**	**0.07**	**0.21**	**0.06**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	**5.6**	<1.0
Sulfide	mg/L	NM	NM	<1.0	<1.0
Major Cations					
Calcium, Dissolved	mg/L	**20**	**20**	**19**	**10**
Potassium, Dissolved	mg/L	**0.65**	**0.64**	**0.65**	**0.52**
Magnesium, Dissolved	mg/L	**4.0**	**4.1**	**3.8**	**2.0**
Sodium, Dissolved	mg/L	**0.89**	**1.1**	**1.3**	**0.80**
General Chemistry					
Hardness (calculated) as CaCO3	mg/L	**66**	**67**	**63**	**33**
Residue, Dissolved @ 180°C	mg/L	**81**	**85**	**70**	**64**
Residue, Suspended	mg/L	<3	<3	<3	**5**
Alkalinity, Total	mg/L	**75**	**60**	**59**	**31**
Chemical Oxygen Demand	mg/L	**8.5**	**11**	**9.2**	**23**
Carbon, Dissolved Organic	mg/L	NM	NM	**2.8**	**8.8**
Carbon, Total Organic	mg/L	**3.8**	**3.0**	**2.5**	**7.8**
BOD, (5-Day)	mg/L	**1.1**	**11**	**1.5**	<1.0
Coliform, Total	col/100 mL	NM	NM	**30 a,b**	**300 a,b**
E. Coli	neg/pos	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**15**	**20**	**15**	**60**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	<10	<10
Turbidity	NTU	<1.0	**2.0**	**1.9**	**2.9**
Gross-Alpha	pCi/L	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
NM Not measured.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRW001
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/5/04	10/6/04	2/15/05	4/14/05
Field Parameters								
Temperature	^{o}C	**1.4**	**2.6**	**15**	**13**	**8.7**	**0.5**	**4.0**
Specific Conductance	µmhos/cm @ 25^{o}C	**118**	**58**	**121**	**106**	**131**	**107**	**67**
pH	SU	**7.7**	**6.9**	**7.5**	**7.7**	**7.5**	**7.5**	**7.5**
D.O.	ppm	**10**	**10**	**7**	**8**	**8**	**9**	**9**
Organics (BTEX)								
Benzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics								
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	<50	**120**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	**2.8**	**1.5**	<1.0	<1.0	<1.0
Barium, Total	µg/L	**12**	<10	**17**	**17**	**15**	**12**	**11**
Iron, Total	µg/L	**270 a**	**270**	**440**	**650**	**350**	**220**	**270**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**34 a**	**13**	**64**	**87**	**33**	**23**	**22**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**1.990**	**5.030**	**2.180 a**	**1.600**	**1.120**	**1.330**	**4.350**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRW001
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/5/04	10/6/04	2/15/05	4/14/05
Major Anions								
Alkalinity, Bicarbonate	mg/L	**63**	**28**	**62 a**	**75**	**59**	**55 a**	**31**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	**0.10**	**0.06**	<0.05	<0.05	<0.05	**0.08**	<0.05
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	<0.50	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations								
Calcium, Dissolved	mg/L	**17**	**8.3**	**20 a**	**23**	**20**	**16**	**9.9**
Potassium, Dissolved	mg/L	**0.68**	**0.66**	**0.53**	**0.54**	**0.73**	**0.58**	**0.51**
Magnesium, Dissolved	mg/L	**2.9**	**1.6**	**3.3**	**3.7**	**3.5**	**2.8**	**1.8**
Sodium, Dissolved	mg/L	**1.3**	**0.66**	**0.88**	**0.93**	**1.5**	**1.0**	**0.68**
General Chemistry								
Hardness (calculated) as CaCO3	mg/L	**54**	**27**	**64 a**	**73**	**64**	**51**	**32**
Residue, Dissolved @ 180°C	mg/L	**68**	**56**	**102**	**99**	**90**	**63**	**53**
Residue, Suspended	mg/L	**6**	**5**	**7**	<3	<3	<3	<3
Alkalinity, Total	mg/L	**63**	**28**	**62 a**	**75**	**59**	**55**	**31**
Chemical Oxygen Demand	mg/L	**10**	**25**	**13**	**13**	**15**	**9.8**	**22**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	**4.6**	**8.5**
Carbon, Total Organic	mg/L	**3.5**	**8.7**	**4.8**	**5.4**	**4.8**	**4.0**	**7.7**
BOD, (5-Day)	mg/L	**1.3**	**1.0 s**	<1.0	**1.4**	**1.5**	<1.0	**1.2**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	**170 a**	**130 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**25**	**50**	**35**	**40**	**25**	**25**	**50**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**1.9**	**3.1**	**3.1**	**2.4**	**1.3**	**1.4**	**1.9**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE001
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/5/04	10/6/04	2/15/05	4/14/05
Field Parameters								
Temperature	^{o}C	**3.8**	**5.7**	**16**	**12**	**7.2**	**2.1**	**6.4**
Specific Conductance	µmhos/cm @ 25^{o}C	**128**	**84**	**83**	**135**	**134**	**125**	**99**
pH	SU	**7.8**	**7.2**	**8.1**	**7.9**	**7.7**	**7.9**	**8.0**
D.O.	ppm	**8**	**8**	**8**	**7**	**8**	**8**	**9**
Organics (BTEX)								
Benzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Toluene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0 e
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	<3.0	<3.0 e
Metals/Inorganics								
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	**91**	**140**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0 e
Arsenic, Total	µg/L	<1.0	<1.0	**1.1**	**1.2**	**1.0**	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	**11**	**11**	<10	<10
Iron, Total	µg/L	**92 a**	**190**	**83**	**100**	**94**	**75 e**	**150**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**11 a**	**12**	**12**	<10	**11**	<10	**12**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	<10	<10 e
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**0.926**	**3.920**	**1.100 a**	**1.030**	**1.270**	**0.928**	**3.040**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE001
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/24/04	4/7/04	6/29/04	8/5/04	10/6/04	2/15/05	4/14/05
Major Anions								
Alkalinity, Bicarbonate	mg/L	**69**	**41**	**67 a**	**70**	**60**	**65 a**	**50**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	**3.0**	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	**0.09**	**0.07**	<0.05	<0.05	<0.05	**0.09**	**0.05**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	<0.50	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	**3.9**	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations								
Calcium, Dissolved	mg/L	**18**	**12**	**21 a**	**21**	**19**	**19**	**14**
Potassium, Dissolved	mg/L	**0.51**	<0.50	<0.50	<0.50	**0.52**	**0.55**	<0.50
Magnesium, Dissolved	mg/L	**3.8**	**2.6**	**4.0**	**4.3**	**4.0**	**3.8**	**2.8**
Sodium, Dissolved	mg/L	**1.1**	**0.67**	**0.92**	**0.90**	**1.3**	**1.2**	**0.73**
General Chemistry								
Hardness (calculated) as CaCO3	mg/L	**61**	**41**	**69 a**	**70**	**64**	**63**	**46**
Residue, Dissolved @ 180°C	mg/L	**42**	**49**	**124**	**82**	**79**	**73**	**72**
Residue, Suspended	mg/L	**3**	**9**	**4**	<3	**3**	<3	**6**
Alkalinity, Total	mg/L	**69**	**41**	**67 a**	**70**	**60**	**65**	**50**
Chemical Oxygen Demand	mg/L	**5.5**	**20**	**7.1**	**5.0**	**8.6**	<5.0	**14**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	**2.1**	**5.7**
Carbon, Total Organic	mg/L	**1.8**	**6.2**	**2.2**	**2.5**	**2.0**	**1.7**	**4.9**
BOD, (5-Day)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	**50 a**	**80 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**15**	**50**	**20**	**15**	**15**	**10**	**35**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**1.9**	**3.8**	<1.0	**1.1**	**1.3**	<1.0	**2.8**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.

NM Not measured.

u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE002
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		6/30/04	8/5/04	9/15/04	10/6/04	12/14/04	2/21/05	4/19/05
Field Parameters								
Temperature	^{o}C	**13**	**10**	**13**	**7.6**	**0.1**	**0.2**	**11**
Specific Conductance	µmhos/cm @ 25^{o}C	**90**	**101**	**132**	**136**	**126**	**133**	**104**
pH	SU	**8.9**	**8.3**	**8.0**	**7.9**	**7.7**	**8.0**	**8.1**
D.O.	ppm	**7**	**8**	**7**	**7**	**8**	**10**	**8**
Organics (BTEX)								
Benzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics								
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	**97**	**52**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	**1.3**	**1.4**	**2.1**	**1.1**	**1.1**	**1.5**	<1.0
Barium, Total	µg/L	**11**	**12**	**13**	**11**	**11**	**11**	**11**
Iron, Total	µg/L	**76**	**91**	**130**	**79**	**130**	**150**	**130**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	<0.2	**0.3**
Chromium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	<10	<10	**12**	<10	**11**	**14**	**11**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	<10 a	**15**
Mercury, Total	ng/L	**0.885 a**	**0.921**	**1.440**	**0.779**	**1.520**	**1.540**	**1.940**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE002
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		6/30/04	8/5/04	9/15/04	10/6/04	12/14/04	2/21/05	4/19/05
Major Anions								
Alkalinity, Bicarbonate	mg/L	**67 a**	**75**	**63**	**58**	**61**	**62 a**	**51**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	**0.09**	<0.05	**0.07**	<0.02	<0.02
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	**0.08**	**0.10**	**0.05**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	<0.50	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	**4.0**	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations								
Calcium, Dissolved	mg/L	**21 a**	**21**	**21**	**20**	**18**	**19**	**16**
Potassium, Dissolved	mg/L	<0.50	**0.62**	**0.77**	**0.58**	**0.55**	**0.63**	**0.62**
Magnesium, Dissolved	mg/L	**4.1**	**4.3**	**4.6**	**4.1**	**3.7**	**3.9**	**3.1**
Sodium, Dissolved	mg/L	**1.2**	**1.0**	**1.3**	**1.4**	**1.1**	**1.3**	**0.96**
General Chemistry								
Hardness (calculated) as CaCO3	mg/L	**69 a**	**70**	**71**	**67**	**60**	**63**	**53**
Residue, Dissolved @ 180°C	mg/L	**80**	**90**	**72**	**84**	<20	**46**	**63**
Residue, Suspended	mg/L	<3	<3	**3**	<3	**4**	**5**	<3 e
Alkalinity, Total	mg/L	**67 a**	**75**	**63**	**58**	**61**	**62**	**51**
Chemical Oxygen Demand	mg/L	**7.4**	<5.0	**10**	**9.3**	**7.8**	**7.8**	**15**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	**2.2**	**6.7**
Carbon, Total Organic	mg/L	**2.2**	**2.2**	**3.2**	**2.2**	**3.4**	**2.0**	**5.4**
BOD, (5-Day)	mg/L	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0	**1.4**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	**80 a**	**300 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**15**	**15**	**20**	**15**	**20**	**10**	**40**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**1.1**	**1.4**	**2.6**	**1.3**	**2.1**	**2.8**	**2.1**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.

NM Not measured.

u Result is less than the sample detection limit.

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE006
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow
		11/9/04*	2/21/05
Field Parameters			
Temperature	^{o}C	**6.5**	**3.3**
Specific Conductance	µmhos/cm @ 25^{o}C	**131**	**133**
pH	SU	**7.8**	**8.1**
D.O.	ppm	NM	**9**
Organics (BTEX)			
Benzene	µg/L	NM	<1.0
Ethylbenzene	µg/L	NM	<1.0
Toluene	µg/L	NM	<1.0
Xylene (Total)	µg/L	NM	<3.0
Metals/Inorganics			
Aluminum, Total	µg/L	<100	**78**
Lithium, Total	µg/L	<10	<10
Antimony, Total	µg/L	<5.0	<2.0
Arsenic, Total	µg/L	<2.0	<1.0
Barium, Total	µg/L	<20	<10
Iron, Total	µg/L	<20	**26**
Beryllium, Total	µg/L	<1.0	<1.0
Boron, Total	µg/L	<100	<50
Cadmium, Total	µg/L	<0.5	<0.2
Chromium, Total	µg/L	<5.0	<1.0
Cobalt, Total	µg/L	<10	<10
Copper, Total	µg/L	<5.0	<1.0
Lead, Total	µg/L	<1.0	<1.0
Manganese, Total	µg/L	<20	<10
Molybdenum, Total	µg/L	<10	<10
Nickel, Total	µg/L	<25	<1.0
Selenium, Total	µg/L	<1.0	<2.0
Silver, Total	µg/L	<0.2	<0.2
Zinc, Total	µg/L	<10	<10 a
Mercury, Total	ng/L	**0.574**	**0.576**

Table 13
Surface Water Quality
Salmon Trout River
Monitoring Location STRE006
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow
		11/9/04*	2/21/05
Major Anions			
Alkalinity, Bicarbonate	mg/L	**77**	**63 a**
Alkalinity, Carbonate	mg/L	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10
Nitrogen, Ammonia	mg/L	NM	<0.02
Nitrogen, Nitrate	mg/L	**0.12**	**0.2**
Nitrogen, Nitrite	mg/L	NM	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM
Sulfate	mg/L	<5.0	**3.6**
Sulfide	mg/L	NM	<1.0
Major Cations			
Calcium, Dissolved	mg/L	**21**	**21**
Potassium, Dissolved	mg/L	**0.60**	**0.51**
Magnesium, Dissolved	mg/L	**3.4**	**3.5**
Sodium, Dissolved	mg/L	**0.85**	**1.1**
General Chemistry			
Hardness (calculated) as CaCO3	mg/L	**66**	**67**
Residue, Dissolved @ 180°C	mg/L	<50	**60**
Residue, Suspended	mg/L	NM	<3
Alkalinity, Total	mg/L	NM	**63**
Chemical Oxygen Demand	mg/L	NM	<5.0
Carbon, Dissolved Organic	mg/L	NM	**2**
Carbon, Total Organic	mg/L	NM	**1.5**
BOD, (5-Day)	mg/L	NM	<1.0
Coliform, Total	col/100 mL	NM	**80 a**
E. Coli	neg/pos	NM	NM
Color (Apparent)	A.C.U.	NM	**10**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	<10
Turbidity	NTU	NM	<1.0
Gross-Alpha	pCi/L	NM	u
Gross-Beta	pCi/L	NM	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
u Result is less than the sample detection limit.
* Metals are dissolved.

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM001
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		11/5/02	2/26/03	4/23/03	6/19/03	8/13/03	10/28/03	2/18/04	4/7/04
Field Parameters									
Temperature	°C	**1.5**	**0.2**	**5.2**	**17**	**15**	**3.8**	**0.2**	**1.0**
Specific Conductance	µmhos/cm @ 25°C	**47**	**74**	**19**	**65**	**74**	**68**	**73**	**29**
pH	SU	**6.8**	**7.1**	**6.3**	**6.9**	**7.5**	**7.2**	**8.1**	**6.5**
D.O.	ppm	**9**	**7**	**7**	**7**	**5.5**	**7**	**8**	**10**
Organics (BTEX)									
Benzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Ethylbenzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Toluene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Xylene (Total)	µg/L	<3.0	<3.0	NM	NM	NM	NM	NM	NM
Metals/Inorganics									
Aluminum, Total	µg/L	<200	<200	NM	NM	NM	NM	NM	NM
Lithium, Total	µg/L	<20	<20	NM	NM	NM	NM	NM	NM
Antimony, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Iron, Total	µg/L	**510**	**400**	**200**	**710**	**640**	**650**	**490 a**	**360**
Beryllium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Boron, Total	µg/L	<50	<50	NM	NM	NM	NM	NM	NM
Cadmium, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	NM	NM
Chromium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Cobalt, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM
Copper, Total	µg/L	<1.0	<1.0	**1.1**	<1.0	<1.0	**1.2**	<1.0	<1.0
Lead, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Manganese, Total	µg/L	**34**	**20**	<10	**30**	**18**	**34**	**32 a**	**13**
Molybdenum, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM
Silver, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	NM	NM
Zinc, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM
Mercury, Total	ng/L	**4.120**	**1.890**	**5.300**	**2.810**	**1.180**	**2.260**	**1.820**	**6.310**

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM001
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		11/5/02	2/26/03	4/23/03	6/19/03	8/13/03	10/28/03	2/18/04	4/7/04
Major Anions									
Alkalinity, Bicarbonate	mg/L	**25**	**52**	**6.4**	**30**	**35**	**40**	**38**	**8.1**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	**1.4**	**1.2**	**1.3**	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	NM	NM	NM	NM	NM	NM
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Nitrate	mg/L	**0.06**	**0.12**	**0.09**	<0.05	<0.05	**0.05**	**0.12**	**0.13**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	**12**	**6.5**	**5.3**	**7.1**	<5.0	<5.0	**8.1**	<5.0
Sulfide	mg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM
Major Cations									
Calcium, Dissolved	mg/L	**6.3**	**9.6**	**3.0**	**8.4**	**9.8**	**9.6**	**9.2**	**3.7**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	**0.51**	<0.50	<0.50
Magnesium, Dissolved	mg/L	**1.4**	**2.0**	**0.70**	**1.8**	**2.2**	**2.1**	**2.0**	**0.87**
Sodium, Dissolved	mg/L	<0.50	**1.5**	**0.54**	**0.91**	**0.82**	**1.0**	**0.88**	<0.50
General Chemistry									
Hardness, (calculated) as CaCO3	mg/L	**21**	**32**	**10**	**28**	**34**	**33**	**31**	**13**
Residue, Dissolved @ 180°C	mg/L	**68**	**74**	**66**	**60**	**59**	**68**	**66**	**89**
Residue, Suspended	mg/L	<5	<3	<6	<3	<3	<5	<3	**4**
Alkalinity, Total	mg/L	**25**	**52**	**6.4**	**30**	**35**	**40**	**38**	**8.1**
Chemical Oxygen Demand	mg/L	**26**	**14**	**25**	**24**	**18**	**25**	**15**	**34**
Carbon, Dissolved Organic	mg/L	**12**	NM	NM	NM	NM	NM	NM	NM
Carbon, Total Organic	mg/L	**12**	**5.7**	**11**	**8.8**	**6.7**	**10**	**6.3**	**13**
BOD, (5-Day)	mg/L	**1.4**	**1.2**	**1.9**	<1.0	<1.0	**1.2**	<1.0	<1.0
Coliform, Total	col/100 mL	**280 a**	**70 a**	NM	NM	NM	NM	NM	NM
E. Coli	neg/pos	**pos**	**pos**	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**100**	**40**	**75**	**138**	**75**	**100**	**60**	**100**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	<10	<10	NM	NM	NM	NM	NM	NM
Turbidity	NTU	**1.3**	**1.4**	**1.3**	**1.7**	**2.0**	**1.3**	**1.6**	**2.5**
Gross-Alpha	pCi/L	u	u	NM	NM	NM	NM	NM	NM
Gross-Beta	pCi/L	u	u	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
u Result is less than instrument detection limit.

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM002
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		11/5/02	2/26/03	4/23/03	6/19/03	8/13/03	10/28/03	12/4/03	2/18/04	4/6/04	6/30/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/16/05	4/12/05
Field Parameters																		
Temperature	°C	**1.7**	**0.0**	**5.4**	**17**	**16**	**3.8**	**0.2**	**0.3**	**3.1**	**18**	**17**	**17**	**7.7**	**1.7**	**0**	**0.3**	**4.7**
Specific Conductance	µmhos/cm @ 25°C	**47**	**74**	**21**	**64**	**75**	**69**	**56**	**74**	**28**	**59**	**65**	**90**	**75**	**54**	**57**	**59**	**18**
pH	SU	**6.7**	**7.3**	**6.5**	**7.2**	**7.1**	**7.4**	**7.5**	**8.5**	**6.4**	**7.9**	**7.2**	**7.4**	**7.3**	**7.0**	**7.0**	**6.9**	NM
D.O.	ppm	**8**	**7**	**7**	**7**	**5.5**	**7**	NM	**8**	**9**	**7**	**7**	**7**	**7**	**9**	**9**	NM	**8**
Organics (BTEX)																		
Benzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	<3.0	<3.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics																		
Aluminum, Total	µg/L	<200	<200	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**68**	**150**
Lithium, Total	µg/L	<20	<20	NM	NM	NM	NM	<20	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.3**	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Iron, Total	µg/L	**620**	**550**	**230**	**1,030**	**830**	**840**	**510**	**650 a**	**440**	**840**	**1,060**	**1,200**	**880**	**750 e**	**610**	**590**	**290**
Beryllium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	<50	<50	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	<10	<10	NM	NM	NM	NM	<10	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	**1.1**	<1.0	**1.2**	<1.0	<1.0	**1.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	<1.0	<1.0	NM	NM	NM	NM	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**37**	**22**	<10	**40**	**19**	**32**	**28**	**33 a**	**19**	**29**	**31**	**21**	**23**	**34**	**34**	**31**	<10
Molybdenum, Total	µg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**3.2**	<1.0
Selenium, Total	µg/L	<2.0	<2.0	NM	NM	NM	NM	<2.0	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	<0.2	<0.2	NM	NM	NM	NM	<0.2	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	<10	<10	NM	NM	NM	NM	**24 a**	NM	NM	NM	NM	NM	NM	NM	NM	**71 a**	<10
Mercury, Total	ng/L	**3.650**	**1.690**	**5.530**	**4.290**	**2.010**	**2.530**	<200	**1.820**	**6.280**	**3.290 a**	**2.850**	**1.860**	**4.460**	**3.050**	**2.610**	**2.320**	**6.780**

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM002
Eagle Project

Parameter	Units	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		11/5/02	2/26/03	4/23/03	6/19/03	8/13/03	10/28/03	12/4/03	2/18/04	4/6/04	6/30/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/16/05	4/12/05
Major Anions																		
Alkalinity, Bicarbonate	mg/L	**20**	**30**	**5.3**	**30**	**34**	**32**	**23**	**40**	**9.9**	**24 a**	**24**	**38**	**30**	**18**	**24**	**21 a**	**5.0**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NM	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	**133 a**	<1.0	**1.2**	**1.2**	**1.4**	<1.0	**1.5**	**1.2**	**1.4**	**1.1**	**1.3**	<1.0	<1.0	<1.0	**1.5**	**1.3**
Fluoride	mg/L	<0.10	<0.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.09**	<0.05	<0.05	**0.11**	<0.02
Nitrogen, Nitrate	mg/L	**0.05**	**0.11**	**0.10**	<0.05	<0.05	<0.05	**0.10**	**0.11**	**0.14**	<0.05	<0.05	<0.05	<0.05	<0.05	**0.09**	**0.10**	**0.08**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.50	NM	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	**15**	**5.1**	**6.0**	**8.3**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	<1.0	<1.0	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations																		
Calcium, Dissolved	mg/L	**6.6**	**9.6**	**2.8**	**8.8**	**9.9**	**9.5**	**7.2**	**9.7**	**3.9**	**8.8 a**	**10**	**13**	**10**	**7.5**	**7.6**	**7.9**	**2.7**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	**0.56**	<0.50	<0.50	**0.51**	<0.50	<0.50	**0.52**	**0.62**	<0.50	<0.50	<0.50	<0.50
Magnesium, Dissolved	mg/L	**1.4**	**2.0**	**0.64**	**1.9**	**2.2**	**2.1**	**1.6**	**2.1**	**0.89**	**1.8**	**2.0**	**2.9**	**2.3**	**1.6**	**1.6**	**1.9**	**0.64**
Sodium, Dissolved	mg/L	<0.50	<0.50	<0.50	**0.96**	**0.84**	**1.0**	**1.7 a**	**0.96**	**0.53**	**0.93**	<0.50	**0.91**	**0.90**	**0.86**	**0.78**	**0.83**	<0.50
General Chemistry																		
Hardness, (calculated) as CaCO3	mg/L	**21**	**32**	**10**	**28**	**34**	**33**	**24**	**31**	**13**	**29 a**	**33**	**44**	**34**	**25**	**26**	**28**	**9**
Residue, Dissolved @ 180°C	mg/L	**68**	**94**	**60**	**66**	**56**	**70**	NM	**84**	**31**	**60**	**75**	**75**	**70**	**25**	**64**	<20	**20**
Residue, Suspended	mg/L	<5	<3	<3	<3	<3	<5	NM	<3	**4**	**4**	<3	<3	<3	<3	<3	<3	<3
Alkalinity, Total	mg/L	**20**	**30**	**5.3**	**30**	**34**	**32**	**7.2**	**40**	**9.9**	**24 a**	**24**	**38**	**30**	**18**	**24**	**21**	**5.0**
Chemical Oxygen Demand	mg/L	**28**	**14**	**28**	**27**	**18**	**27**	**24**	**16**	**37**	**24**	**23**	**16**	**26**	**33**	**20**	**20**	**32**
Carbon, Dissolved Organic	mg/L	**13**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**8.5**	**12**
Carbon, Total Organic	mg/L	**12**	**6.1**	**11**	**9.3**	**7.1**	**11**	NM	**6.3**	**13**	**8.3**	**8.5**	**6.2**	**8.3**	**12**	**8.1**	**7.8**	**12**
BOD, (5-Day)	mg/L	**1.3**	**1.8**	**2.1**	**1.2**	<1.0	**1.0**	NM	<1.0	**1.8 s**	<1.0	<1.0	<1.0	**1.3**	<1.0	<1.0	**1.6**	**1.9**
Coliform, Total	col/100 mL	**240 a**	**170 a**	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**30 a**	**280 a**
E. Coli	neg/pos	**pos**	neg	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**125**	**40**	**75**	**112**	**75**	**100**	NM	**60**	**100**	**100**	**80**	**75**	**70**	**100**	**70**	**80**	**100**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	<10	<10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	**3.8**	**1.8**	**1.3**	**4.8**	**2.6**	**1.6**	NM	**1.9**	**1.5**	**2.3**	**3.3**	**3.5**	**6.0**	**1.6**	**1.8**	**1.8**	**1.4**
Gross-Alpha	pCi/L	u	u	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	u	u	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
NM Not measured.
s Potential false positive value. Compound present in field blank.
u Result is less than the sample detection limit.

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM003
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/19/04	4/6/04	6/30/04	8/4/04	10/13/04	2/16/05	4/21/05
Field Parameters								
Temperature	^{o}C	**0.2**	**2.1**	**20**	**17**	**8.4**	**0.2**	**4.3**
Specific Conductance	µmhos/cm @ 25^{o}C	**65**	**31**	**47**	**61**	**73**	**53**	**24**
pH	SU	**8.1**	**7.2**	**6.7**	**7.4**	**7.2**	**7.0**	**6.9**
D.O.	ppm	**9**	**8**	**8**	**7**	**7**	**9**	**9**
Organics (BTEX)								
Benzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics								
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	**59**	**63**
Lithium, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	<10	<10	<10	<10
Iron, Total	µg/L	**230 a**	**250**	**360**	**480**	**460**	**300**	**260**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**21 a**	**12**	**25**	**27**	**24**	**18**	**10**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**1.850**	**5.710**	**3.040 a**	**2.720**	**2.010**	**2.580**	**2.390**

Table 14
Surface Water Quality
Yellow Dog River
Monitoring Location YDRM003
Eagle Project

Parameter	Units	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		2/19/04	4/6/04	6/30/04	8/4/04	10/13/04	2/16/05	4/21/05
Major Anions								
Alkalinity, Bicarbonate	mg/L	**46**	**7.7**	**21 a**	**24**	**31**	**23 a**	**10**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	**1.7**	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	**0.07**	<0.02
Nitrogen, Nitrate	mg/L	**0.13**	**0.16**	<0.05	<0.05	<0.05	**0.12**	**0.07**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	<0.50	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations								
Calcium, Dissolved	mg/L	**8.2**	**4.1**	**7.4 a**	**9.0**	**11**	**7.1**	**3.5**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	**0.54**	<0.50	<0.50
Magnesium, Dissolved	mg/L	**1.9**	**0.97**	**1.6**	**1.9**	**2.4**	**1.7**	**0.81**
Sodium, Dissolved	mg/L	**0.90**	**0.55**	**0.80**	**0.75**	<0.50	**0.81**	**0.55**
General Chemistry								
Hardness, (calculated) as CaCO3	mg/L	**28**	**14**	**25 a**	**30**	**37**	**25**	**12**
Residue, Dissolved @ 180°C	mg/L	**54**	**32**	**50**	**63**	**69**	**26**	**29**
Residue, Suspended	mg/L	<3	**3**	**4**	<3	<3	<3	<3
Alkalinity, Total	mg/L	**46**	**7.7**	**21 a**	**24**	**31**	**23**	**10**
Chemical Oxygen Demand	mg/L	**15**	**30**	**22**	**21**	**21**	**20**	**28**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	**8.4**	**11**
Carbon, Total Organic	mg/L	**8.3**	**11**	**7.7**	**7.4**	**7.7**	**7.5**	**10**
BOD, (5-Day)	mg/L	<1.0	**1.5 s**	<1.0	<1.0	**1.4**	<1.0	**1.4**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	**130 a**	**900 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**55**	**120**	**75**	**70**	**60**	**70**	**100**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	<1.0	**1.7**	**1.1**	**1.8**	**1.6**	**1.9**	**1.3**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	u	j

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
j Result is greater than instrument detection limit but less than stated reporting limit.
NM Not measured.
s Potential false positive value. Compound present in field blank.
u Result is less than the sample detection limit.

Table 15
Surface Water Quality
Cedar Creek Reference Stream
Monitoring Location CDRA002
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		5/6/03	6/25/03	8/14/03	10/29/03	2/24/04	4/8/04	6/29/04	8/3/04	10/6/04	2/15/05	4/19/05
Field Parameters												
Temperature	°C	**9.7**	**11**	**9.2**	**6.6**	**5.2**	**6.5**	**11**	**9.5**	**8.6**	**4.2**	**8.9**
Specific Conductance	µmhos/cm @ 25°C	**93**	**70**	**97**	**96**	**95**	**93**	**131**	**99**	**98**	**97**	**93**
pH	SU	**8.0**	**7.7**	**6.6**	**7.3**	**8.2**	**7.7**	**8.1**	**8.0**	**7.9**	**8.0**	**8.4**
D.O.	ppm	**7**	**7**	**7**	**7**	**10**	**8**	**8**	**9**	**9**	**10**	**9**
Organics (BTEX)												
Benzene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics												
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	**50**	<50
Lithium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium, Total	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Iron, Total	µg/L	<20	**44**	**29**	<20	**30 a**	**42**	**23**	**33**	<20	<20	**31**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**0.394**	**0.678**	**0.123 B**	**0.196 B**	**0.248 B**	**0.815**	**0.418 a**	**0.465**	**0.273**	**0.173 B**	**0.476**

Table 15
Surface Water Quality
Cedar Creek Reference Stream
Monitoring Location CDRA002
Eagle Project

Parameter	Units	Spring Snowmelt Runoff 5/6/03	Spring Rain Runoff 6/25/03	Summer Baseflow 8/14/03	Fall Rain Runoff 10/29/03	Winter Baseflow 2/24/04	Spring Snowmelt Runoff 4/8/04	Spring Rain Runoff 6/29/04	Summer Baseflow 8/3/04	Fall Rain Runoff 10/6/04	Winter Baseflow 2/15/05	Spring Snowmelt Runoff 4/19/05
Major Anions												
Alkalinity, Bicarbonate	mg/L	**43**	**48**	**48**	**52**	**53**	**42**	**45 a**	**48**	**43**	**114 a**	**50**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	**0.06**	<0.05	<0.05	<0.05	**0.06**	**0.08**	**0.06**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	NM	NM	<0.50	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**3.1**	**2.9**
Sulfide	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations												
Calcium, Dissolved	mg/L	**15**	**15**	**15**	**14**	**14**	**15**	**16 a**	**17**	**15**	**15**	**15**
Potassium, Dissolved	mg/L	**0.51**	<0.50	<0.50	**0.50**	<0.50	<0.50	<0.50	**0.57**	**0.56**	**0.53**	**0.67**
Magnesium, Dissolved	mg/L	**2.1**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**
Sodium, Dissolved	mg/L	**0.50**	**0.71**	**0.55**	**0.84**	**0.81**	**0.61**	**0.56**	**0.80**	**0.61**	**0.61**	**0.66**
General Chemistry												
Hardness, (calculated) as CaCO3	mg/L	**46**	**46**	**46**	**43**	**43**	**46**	**49 a**	**52**	**47**	**47**	**47**
Residue, Dissolved @ 180°C	mg/L	**66**	<25	**56**	**68**	**35**	**61**	**90**	**70**	**58**	**46**	**46**
Residue, Suspended	mg/L	<3	**4**	<3	<5	<3	<3	**4**	<3	<3	<3	<3
Alkalinity, Total	mg/L	**43**	**48**	**48**	**52**	**53**	**42**	**45 a**	**48**	**43**	**114**	**50**
Chemical Oxygen Demand	mg/L	<5.0	<5.0	<5.0	**11**	<5.0	**5.0**	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	**1.1**	**1.2**
Carbon, Total Organic	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	**1.5**	<1.0	<1.0	<1.0	<1.0	**1.0**
BOD, (5-Day)	mg/L	<1.0	<1.0	<1.0 b	**1.2**	**1.3**	<1.0	<1.0	<1.0	<1.0	**1.1**	<1.0
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	NM	NM	NM	NM	**30 a,b**	**170 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**10**	**5**	**5 b**	**5**	**5**	**15**	**5**	<5	<5	<5	**10**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	<1.0	<1.0	<1.0 b	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
u Result is less than the sample detection limit.

Table 15
Surface Water Quality
Cedar Creek Reference Stream
Monitoring Location CDRM004
Eagle Project

Parameter	Units	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		8/14/03	10/29/03	2/24/04	4/8/04	6/29/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/15/05	4/19/05
Field Parameters													
Temperature	^{o}C	**14**	**5.5**	**2.1**	**3.4**	**16**	**14**	**14**	**6.9**	**2.6**	**0.9**	**1.5**	**10**
Specific Conductance	µmhos/ cm @ 25^{o}C	**150**	**120**	**116**	**84**	**122**	**116**	**149**	**141**	**134**	**129**	**132**	**112**
pH	SU	**7.3**	**7.0**	**8.2**	**7.3**	**8.1**	**8.0**	**8.0**	**7.8**	**7.8**	**7.7**	**7.8**	**8.0**
D.O.	ppm	**7**	**7**	**11**	**8**	**7**	**9**	**7**	**7**	**9**	**8**	**8**	**7**
Organics (BTEX)													
Benzene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Ethylbenzene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Toluene	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Xylene (Total)	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<3.0	<3.0
Metals/Inorganics													
Aluminum, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**57**	<50
Lithium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Antimony, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Arsenic, Total	µg/L	**1.9**	**1.3**	**1.3**	<1.0	**1.6**	**2.3**	**2.3**	**1.8**	**1.3**	**1.4**	<1.0	**1.4**
Barium, Total	µg/L	**14**	**11**	**11**	<10	**12**	**14**	**15**	**13**	**11**	**11**	**11**	**12**
Iron, Total	µg/L	**190**	**130**	**87 a**	**150**	**110**	**160**	**140**	**120**	**100**	**98**	**88 e**	**120**
Beryllium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Boron, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<50	<50
Cadmium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Chromium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Cobalt, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Copper, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Lead, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Manganese, Total	µg/L	**14**	**119**	**12 a**	<10	**13**	**16**	**11**	**15**	**13**	<10	<10	**13**
Molybdenum, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Nickel, Total	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<2.0	<2.0
Silver, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.2	<0.2
Zinc, Total	µg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10 a	<10
Mercury, Total	ng/L	**0.403**	**0.803**	**0.659**	**3.670**	**1.040 a**	**0.981**	**0.890**	**0.856**	**0.691**	**0.941**	**0.776**	**1.290**

Table 15
Surface Water Quality
Cedar Creek Reference Stream
Monitoring Location CDRM004
Eagle Project

Parameter	Units	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Rain Runoff	Summer Baseflow	Fall Rain Runoff			Winter Baseflow		Spring Snowmelt Runoff
		8/14/03	10/29/03	2/24/04	4/8/04	6/29/04	8/3/04	9/14/04	10/4/04	11/9/04	12/14/04	2/15/05	4/19/05
Major Anions													
Alkalinity, Bicarbonate	mg/L	**68**	**60**	**69**	**40**	**77 a**	**72**	**69**	**65**	**68**	**63**	**62 a**	**54**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	**1.0**	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<0.10	<0.10
Nitrogen, Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02
Nitrogen, Nitrate	mg/L	<0.05	<0.05	**0.10**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.08**	**0.10**	**0.06**
Nitrogen, Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen, Total Kjeldahl	mg/L	NM	NM	NM	NM	<0.50	NM	NM	NM	NM	NM	NM	NM
Sulfate	mg/L	<5.0	<5.0	**5.1**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
Sulfide	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	<1.0
Major Cations													
Calcium, Dissolved	mg/L	**22**	**19**	**19**	**13**	**22 a**	**25**	**24**	**22**	**21**	**19**	**20**	**18**
Potassium, Dissolved	mg/L	<0.50	**0.55**	**0.52**	**0.57**	<0.50	<0.50	**0.59**	**0.53**	<0.50	<0.50	**0.62**	**0.59**
Magnesium, Dissolved	mg/L	**3.7**	**3.3**	**3.3**	**2.3**	**3.6**	**4.0**	**4.0**	**3.7**	**3.6**	**3.2**	**3.4**	**2.7**
Sodium, Dissolved	mg/L	**1.0**	**1.3**	**1.2**	**0.78**	**0.73**	**1.3**	**1.2**	**1.1**	**1.0**	**1.2**	**1.2**	**0.98**
General Chemistry													
Hardness, (calculated) as CaCO3	mg/L	**70**	**61**	**61**	**42**	**70 a**	**79**	**76**	**70**	**67**	**61**	**64**	**56**
Residue, Dissolved @ 180°C	mg/L	**84**	**88**	**42**	**31**	**112**	**99**	**96**	**99**	**90**	**62**	**67**	**70**
Residue, Suspended	mg/L	<3	<5	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Alkalinity, Total	mg/L	**68**	**60**	**69**	**40**	**77 a**	**72**	**69**	**65**	**68**	**63**	**62**	**54**
Chemical Oxygen Demand	mg/L	**7.5**	<5.0	**5.8**	**21**	**10**	**8.7**	**19**	**13**	**9.5**	**10**	**5.7**	**13**
Carbon, Dissolved Organic	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**2.7**	**21**
Carbon, Total Organic	mg/L	**3.2**	**4.2**	**2.4**	**7.0**	**2.8**	**3.2**	**2.8**	**3.3**	**3.2**	**3.4**	**2.5**	**4.8**
BOD, (5-Day)	mg/L	**1.1 b**	**1.5**	**2.2**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.0**	**1.2**
Coliform, Total	col/100 mL	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	**240 a,b**	**280 a**
E. Coli	neg/pos	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Color (Apparent)	A.C.U.	**30 b**	**25**	**15**	**45**	**20**	**20**	**20**	**15**	**20**	**20**	**20**	**35**
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	mg/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<10	<10
Turbidity	NTU	<1.0 b	**1.4**	**1.3**	**2.2**	**1.0**	**1.1**	**1.1**	**1.5**	<1.0	<1.0	<1.0	**1.3**
Gross-Alpha	pCi/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u
Gross-Beta	pCi/L	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	u	u

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
NM Not measured.
u Result is less than the sample detection limit.

Table 16
Surface Erosion Monitoring Sediment Trap Summary
July 2004 - July 2005
Eagle Project

Sediment Trap Number	Road	Relative Traffic Rating	Road Gradient	Parent Material (Quaternary Geology)	Sediment Volume Accumulated (ft^3)	Sediment Volume (tons/mi of road)
SED01	Secondary	Low	Low	Coarse Glacial Till	1.5	0.9
SED02	Secondary	Low	Moderate	Post Glacial Alluvium	NF	NF
SED03	Triple A Road	High	Moderate	Post Glacial Alluvium	152	256
SED04	Secondary	Low	Steep	Thin Till Over Bedrock	27	29
SED05	Northwestern Road	Medium	Moderate	Post Glacial Alluvium	27	35
SED06	Secondary	Low	Steep	Thin Till Over Bedrock	8.2	10
SED07	Northwestern Road	Medium	Steep	Coarse Glacial Till	30	13
SED08	Triple A Road	High	Steep	Coarse Glacial Till	204	515
SED09	Triple A Road	High	Moderate	Glacial Outwash	NF	NF
SED10	Secondary	Low	Steep	Coarse Glacial Till	67	55

Salmon Trout River Subwatershed	Total Road Length (mi)	Fraction of Active Roads Delivering Sediment to Streams	Delivery Length of Active Roads (mi)	Estimated Annual Sediment Delivery (tons)	Estimated Annual Sediment Delivery (tons/mi^2 of watershed)
East Branch	57	0.8	46	588	50
Main Branch	51	0.5	26	379	39
West Branch	17	0.8	13	101	33
Upper Salmon Trout Watershed	125	0.7	92	1067	43

Notes:

All accumulated volume measurements are minimums as none of the sediment traps were functioning for 100% of the monitoring period.

SE-2 and SE-9 did not function (NF) during significant portions of the monitoring period and therefore were eliminated from analysis.

Assumed 1.5 tons/yd^3 to convert yd^3 to tons.

Assumed a mean road density of 7 mi/mi^2.

Assumed that 30% of roads are abandoned and vegetated.

If delivery occurs at any time during the year (e.g., during spring rain and snowmelt runoff conditions), 100% delivery is assumed.

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD001
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/18/04	2/22/05	5/2/05
Field Parameters						
Temperature	^{o}C	**3.9**	**11**	**9.2**	**3.9**	**6.7**
Specific Conductance	µmhos/ cm @ 25^{o}C	**162**	**158**	**163**	**155**	**149**
pH	SU	**7.2**	**7.2**	**7.1**	**7.0**	**7.3**
D.O.	ppm	**0.4**	**0.4**	**>1**	NM	**1**
Ferrous Iron	mg/L	**1.5**	**1**	**1.5**	**1**	**1**
Metals/Inorganics						
Aluminum, Dissolved	µg/L	<100	<100	<100	**52**	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	**21**	<20	<20
Iron, Dissolved	µg/L	**1,110**	**1,090**	**1,050**	**1010**	**860**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	**28**	**30**	**22**	**22**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.468**	**1.600 s**	**1.630 a**	**0.452**	**0.775 s**

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD001
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/18/04	2/22/05	5/2/05
Major Anions						
Alkalinity, Bicarbonate	mg/L	**113**	**94**	**89 a**	**81**	**81**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	**0.14**	<0.10	<0.10	**0.12**	**0.10**
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05 b
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations						
Calcium, Dissolved	mg/L	**24**	**24**	**26**	**23**	**22**
Potassium, Dissolved	mg/L	**0.82**	**0.85**	**1.0**	**0.8**	**0.86**
Magnesium, Dissolved	mg/L	**5.0**	**4.7**	**4.9**	**4.7**	**4.4**
Sodium, Dissolved	mg/L	**1.0**	**1.0**	**0.82**	**1.1**	**0.60**
General Chemistry						
Hardness, (calculated) as CaCO3	mg/L	**80**	**79**	**85**	**77**	**73**
Residue, Dissolved @ 180°C	mg/L	**82**	**104**	**102**	<50	**74**
Tritium	TU	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

b Estimated value. Sample received after EPA-established hold time expired.

NM Not measured.

s Potential false positive value. Compound present in blank sample.

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD006
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/18/04	10/19/04	2/22/05	5/5/05
Field Parameters						
Temperature	^{o}C	**3.1**	**12**	**11**	**3.2**	**5.5**
Specific Conductance	µmhos/cm @ 25^{o}C	**38**	**39**	**74**	**35**	**31**
pH	SU	**6.9**	**6.1**	**5.9**	**6.0**	**6.3**
D.O.	ppm	<0.05	<0.005	<0.001	<0.001	<1.0
Ferrous Iron	mg/L	**9**	**9**	**22**	**10**	**2**
Metals/Inorganics						
Aluminum, Dissolved	µg/L	**340**	**330**	**610**	**550**	**500**
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	**10,400**	**9,540**	**20,400**	**9860**	**8730**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	**29**	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	**191**	<10
Mercury, Dissolved	ng/L	**0.598**	**1.950**	**3.800 a**	**1.330**	**0.954 s**

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD006
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/18/04	10/19/04	2/22/05	5/5/05
Major Anions						
Alkalinity, Bicarbonate	mg/L	**6.5**	**13**	**27 a**	**9.4**	**7.3**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**1.7**	<1.0	**2.0**	**1.5**	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	**0.38**
Nitrogen, Nitrate	mg/L	<0.05	<0.05	**0.07**	<0.05	<0.05 b
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations						
Calcium, Dissolved	mg/L	<0.50	<0.50	**0.90**	**0.67**	<0.50
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50
Magnesium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50
Sodium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50
General Chemistry						
Hardness, (calculated) as CaCO3	mg/L	<3	<3	**3**	**3**	<3
Residue, Dissolved @ 180°C	mg/L	**50**	**70**	**110**	<50	<50
Tritium	TU	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

b Estimated value. Sample received after EPA-established hold time expired.

NM Not measured.

s Potential false positive value. Compound present in blank sample.

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD016
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/19/04	2/22/05	5/4/05
Field Parameters						
Temperature	^{o}C	**4.4**	**9.1**	**8.6**	**4.6**	**5.7**
Specific Conductance	µmhos/ cm @ 25^{o}C	**146**	**180**	**169**	**164**	**164**
pH	SU	**7.6**	**8.3**	**8.3**	**8.4**	**8.8**
D.O.	ppm	**1.5**	**0.1**	**0.4**	**1**	<1
Ferrous Iron	mg/L	<0.1	**0.1**	**0.2**	**0.3**	**0.2**
Metals/Inorganics						
Aluminum, Dissolved	µg/L	<100	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	**55**	**100**	**230**	**140**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.244 B**	**0.376 s**	**0.184 a,B,s**	**0.167 B,s**	**0.100 U**

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD016
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/19/04	2/22/05	5/4/05
Major Anions						
Alkalinity, Bicarbonate	mg/L	**76**	**95**	**84 a**	**83**	**83**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	**0.11**	<0.10	<0.10	<0.10	**0.11**
Nitrogen, Nitrate	mg/L	**0.50**	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	**6.2**	<5.0	**5.7**	**5**	<5.0
Major Cations						
Calcium, Dissolved	mg/L	**22**	**26**	**25**	**23**	**25**
Potassium, Dissolved	mg/L	**0.97**	**1.2**	**0.98**	**0.97**	**0.90**
Magnesium, Dissolved	mg/L	**5.4**	**6.1**	**5.9**	**5.5**	**5.9**
Sodium, Dissolved	mg/L	**1.0**	**1.1**	**0.89**	**0.92**	**1.2**
General Chemistry						
Hardness, (calculated) as CaCO3	mg/L	**77**	**90**	**87**	**80**	**87**
Residue, Dissolved @ 180°C	mg/L	**54**	**106**	**116**	<50	**96**
Tritium	TU	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the quantitation limit of 0.25 ng/L.

NM Not measured.

s Potential false positive value. Compound present in blank sample.

U Result was below the reporting limit and reported at the method detection limit.

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD021
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/19/04	2/22/05	5/5/05
Field Parameters						
Temperature	^{o}C	**3.1**	**11**	**9.7**	**3.6**	**5.1**
Specific Conductance	µmhos/ cm @ 25^{o}C	**36**	**34**	**36**	**29**	**34**
pH	SU	**6.6**	**5.9**	**5.7**	**5.6**	**5.9**
D.O.	ppm	<0.05	<0.001	**0.05**	**1**	<1.0
Ferrous Iron	mg/L	**1.5**	**2.0**	**2.0**	**0.8**	**2**
Metals/Inorganics						
Aluminum, Dissolved	µg/L	**360**	**410**	**450**	**490**	**470**
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	**9.4**	**4.2**	**4.5**	**5.7**	**4.6**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	**1,730**	**1,490**	**2,060**	**530**	**1660**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	**94**	**17 e**	**118**	**119**
Mercury, Dissolved	ng/L	**0.921**	**1.000 s**	**0.918 a,s**	**0.100 s,U**	**2.090 s**

Table 17
Groundwater Quality Data
Wetland Deposit Monitoring Location WLD021
Eagle Project

Parameter	Units	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		3/31/04	8/19/04	10/19/04	2/22/05	5/5/05
Major Anions						
Alkalinity, Bicarbonate	mg/L	**8.3**	**19**	**11 a**	**6.6**	**13**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**1.1**	<1.0	**1.2**	<1.0	<1.0
Fluoride	mg/L	**0.11**	<0.10	<0.10	<0.10	<0.10
Nitrogen, Nitrate	mg/L	**0.77**	<0.05	<0.05	**0.08**	<0.05 b
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations						
Calcium, Dissolved	mg/L	**4.0**	**4.1**	**4.2**	**4.1**	**5.0**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50
Magnesium, Dissolved	mg/L	<0.50	**0.61**	**0.53**	**0.71**	**0.66**
Sodium, Dissolved	mg/L	**0.58**	**0.67**	<0.50	**0.56**	<0.50
General Chemistry						
Hardness, (calculated) as CaCO3	mg/L	**11**	**13**	**13**	**13**	**15**
Residue, Dissolved @ 180°C	mg/L	**66**	**58**	**74**	<50	<50
Tritium	TU	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
e Estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL001
Eagle Project

Parameter	Units	QAL001A					QAL001D				
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/14/04	8/19/04	10/21/04	3/2/05	4/28/05	4/15/04	8/19/04	10/21/04	3/2/05	4/28/05
Field Parameters											
Temperature	°C	**7.3**	**7.2**	**8.3**	**7.6**	**7.2**	**7.2**	**8.0**	**7.7**	**7.3**	**7.8**
Specific Conductance	µmhos/cm @ 25°C	**66**	**66**	**83**	**103**	**88**	**197**	**174**	**159**	**153**	**149**
pH	SU	**9.1**	**9.0**	**9.1**	NM	**9.2**	**9.0**	**8.8**	**8.9**	NM	**9.4**
D.O.	ppm	**8**	**7**	**7**	NM	**6**	**0.003**	**0.008**	**0.15**	**0.008**	**0.004**
Ferrous Iron	mg/L	**0.15**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	**0.1**
Metals/Inorganics											
Aluminum, Dissolved	µg/L	<100	<100	<100	<50	<50	<100	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**3.7**	**4.7**	**4.3**	**3.9**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	**47**	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	**20**	**18**	**14**	**11**
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	**16**	<10	<10	<10	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.302**	**0.203 B,s**	**0.130 a,B,s**	**0.699**	**0.126 B**	**0.717**	**0.765 s**	**0.925 a,s**	**0.549**	**0.683 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL001
Eagle Project

Parameter	Units	QAL001A					QAL001D				
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/14/04	8/19/04	10/21/04	3/2/05	4/28/05	4/15/04	8/19/04	10/21/04	3/2/05	4/28/05
Major Anions											
Alkalinity, Bicarbonate	mg/L	**31**	**35**	**46 a**	**51**	**54**	**92**	**81**	**75 a**	**73**	**72**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**1.1**	<1.0	<1.0	<1.0	<1.0	**11**	**1.9**	**1.3**	**1.0**	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	**0.17**	**0.11**	<0.10	**0.12**	**0.18**
Nitrogen, Nitrate	mg/L	<0.05	<0.05	**0.05**	**0.06**	**0.05**	**0.06**	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	**33**	**18**	**11**	**11**	**9.2**
Major Cations											
Calcium, Dissolved	mg/L	**8.6**	**8.9**	**12**	**16**	**16**	**10**	**11**	**13**	**12**	**13.2**
Potassium, Dissolved	mg/L	**0.82**	**0.62**	**0.64**	**0.97**	**0.87**	**0.95**	**0.86**	**0.77**	**0.70**	**0.66**
Magnesium, Dissolved	mg/L	**1.5**	**1.5**	**2.1**	**2.9**	**2.8**	**2.5**	**2.7**	**3.5**	**3.1**	**3.4**
Sodium, Dissolved	mg/L	**1.7**	**1.1**	**0.88**	**1.4**	**1.3**	**29**	**21**	**16**	**13**	**13**
General Chemistry											
Hardness, (calculated) as CaCO3	mg/L	**28**	**28**	**39**	**52**	**51**	**35**	**39**	**47**	**43**	**47**
Residue, Dissolved @ 180°C	mg/L	**52**	**62**	**74**	<50	<50	**284**	**120**	**126**	**62**	**66**
Tritium	TU	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL002
Eagle Project

Parameter	Units	QAL002A					QAL002D			
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/28/04	8/19/04	10/20/04	3/3/05	5/5/05	4/29/04	10/20/04	3/3/05	5/5/05
Field Parameters										
Temperature	°C	**7.5**	**7.5**	**7.2**	**6.5**	**7.1**	**9.2**	**7.5**	**6.3**	**7.1**
Specific Conductance	µmhos/cm @ 25°C	**58**	**59**	**60**	**64**	**56**	**199**	**201**	**227**	**115**
pH	SU	**9.1**	**8.8**	**9.2**	NM	**9.3**	**8.0**	**8.2**	NM	**8.5**
D.O.	ppm	**5**	**7**	NM	NM	NM	**0.9**	NM	NM	NM
Ferrous Iron	mg/L	<0.1	<0.1	NM	NM	NM	**0.3**	NM	NM	NM
Metals/Inorganics										
Aluminum, Dissolved	µg/L	<100	<100	<100	<50	<50	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**3.2**	**5.2**	**3.1**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	**39**	**26**	**25**	**29**
Iron, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	**43**	<20	**26**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20	**64**	**130**	**88**	**110**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	**15**	**16**	**13**	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	**12**	<10	<10	<10	**17**	<10	<10	<10
Mercury, Dissolved	ng/L	**0.229 B**	**0.210 B,s**	**7.090 a**	**0.466**	**0.581 s**	**0.516**	**0.511 a,s**	**0.245 B**	**0.344 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL002
Eagle Project

Parameter	Units	QAL002A					QAL002D			
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/28/04	8/19/04	10/20/04	3/3/05	5/5/05	4/29/04	10/20/04	3/3/05	5/5/05
Major Anions										
Alkalinity, Bicarbonate	mg/L	**33**	**32**	**29 a**	**43**	**34**	**106**	**109 a**	**100**	**103**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	**4.2**	<1.0	<1.0	**2.1**	**2.0**	**1.3**	**1.1**
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.14**	**0.12**
Nitrogen, Nitrate	mg/L	**0.18**	**0.16**	**0.17**	**0.18**	<0.05 b	<0.05	<0.05	<0.05	<0.05 b
Sulfate	mg/L	<5.0	<5.0	**6.1**	<5.0	<5.0	**5.6**	<5.0	<5.0	<5.0
Major Cations										
Calcium, Dissolved	mg/L	**8.9**	**9.0**	**8.8**	**9.1**	**9.0**	**24**	**27**	**26**	**28**
Potassium, Dissolved	mg/L	**0.56**	<0.50	**0.65**	**0.70**	**0.80**	**1.6**	**2.0**	**2.1**	**1.6**
Magnesium, Dissolved	mg/L	**0.96**	**0.97**	**1.0**	**1.2**	**1.0**	**4.0**	**4.0**	**4.3**	**3.9**
Sodium, Dissolved	mg/L	<0.50	**0.54**	**0.59**	**0.62**	<0.50	**11**	**5.7**	**4.9**	**3.9**
General Chemistry										
Hardness, (calculated) as CaCO3	mg/L	**26**	**26**	**26**	**28**	**27**	**76**	**84**	**83**	**86**
Residue, Dissolved @ 180°C	mg/L	**56**	**52**	**102**	<50	<50	**106**	**134**	**106**	**110**
Tritium	TU	NM	NM	NM	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL003
Eagle Project

Parameter	Units	QAL003A					QAL003B				
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/13/04	8/18/04	10/18/04	3/1/05	4/26/05	4/13/04	8/18/04	10/18/04	3/1/05	4/26/05
Field Parameters											
Temperature	°C	**8.1**	**8.4**	**9.0**	**8.1**	**6.8**	**7.8**	**8.4**	**7.8**	**7.4**	**7.7**
Specific Conductance	µmhos/cm @ 25°C	**158**	**152**	**147**	**140**	**136**	**158**	**158**	**156**	**156**	**87**
pH	SU	**8.1**	**8.3**	**8.4**	NM	**9.0**	**8.2**	**8.1**	**8.4**	NM	**8.7**
D.O.	ppm	**3**	NM	**>1**	**7**	NM	**0.3**	<0.02	<0.001	<0.001	<0.001
Ferrous Iron	mg/L	**0.3**	NM	<0.1	**0.1**	NM	**0.4**	<0.1	**0.1**	**0.2**	<0.1
Metals/Inorganics											
Aluminum, Dissolved	µg/L	<100	<100	**130**	<50	<50	<100	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	**5.2**	**4.2**	**4.9**	**5.3**	**4.9**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	**130**	<20	<20	<20	**28**	**39**	**37**	**45**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	**24**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.618**	**0.479 s**	**0.617 a,s**	**0.473**	**0.624 s**	**0.390**	**0.391 s**	**0.100 a,U**	**0.223 B, s**	**0.158 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL003
Eagle Project

Parameter	Units	QAL003A					QAL003B				
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		4/13/04	8/18/04	10/18/04	3/1/05	4/26/05	4/13/04	8/18/04	10/18/04	3/1/05	4/26/05
Major Anions											
Alkalinity, Bicarbonate	mg/L	**75**	**58**	**64 a**	**61**	**66**	**77**	**92**	**78 a**	**79**	**82**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	**3.2**	**1.4**	<1.0	**1.8**	<1.0	<1.0	**1.4**	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	**0.12**	<0.10	<0.10	<0.10	<0.10	**0.17**
Nitrogen, Nitrate	mg/L	<0.05	**3.8**	**3.6**	**2.6**	**2.5 b**	<0.05	<0.05	<0.05	<0.05	<0.05 b
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	**5.9**	**6.1**	**5.3**	**6.9**	**6.3**
Major Cations											
Calcium, Dissolved	mg/L	**21**	**18**	**20**	**18**	**18**	**20**	**20**	**21**	**19**	**22**
Potassium, Dissolved	mg/L	**0.71**	<0.50	**0.58**	**0.51**	<0.50	**2.4**	**1.1**	**1.2**	**0.95**	**0.98**
Magnesium, Dissolved	mg/L	**5.9**	**5.2**	**5.5**	**5.5**	**5.4**	**5.9**	**5.6**	**6.0**	**5.7**	**6.0**
Sodium, Dissolved	mg/L	**1.7**	**1.2**	**1.1**	**1.1**	**1.2**	**2.2**	**2.0**	**1.8**	**1.9**	**2.3**
General Chemistry											
Hardness, (calculated) as CaCO3	mg/L	**77**	**66**	**73**	**68**	**67**	**74**	**73**	**77**	**71**	**80**
Residue, Dissolved @ 180°C	mg/L	**108**	**112**	**108**	**102**	**92**	**108**	**118**	**92**	**98**	**90**
Tritium	TU	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

a	Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b	Estimated value. Sample received after EPA-established hold time expired.
B	Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM	Not measured.
s	Potential false positive value. Compound present in blank sample.
U	Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL004
Eagle Project

Parameter	Units	QAL004A							QAL004D						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/14/04	8/17/04	9/21/04	10/19/04	12/15/04	2/24/05	4/27/05	4/14/04	8/17/04	9/21/04	10/19/04	12/15/04	2/25/05	4/27/05
Field Parameters															
Temperature	°C	**7.1**	**7.2**	**7.2**	**7.0**	**7.0**	**7.2**	**7.1**	**7.5**	**7.6**	**7.7**	**7.4**	**7.4**	**7.3**	**7.5**
Specific Conductance	µmhos/cm @ 25°C	**90**	**94**	**92**	**90**	**91**	**84**	**85**	**155**	**156**	**155**	**156**	**154**	**151**	**151**
pH	SU	**8.9**	**9.1**	**9.1**	**9.0**	**9.1**	**9.1**	**9.6**	**8.6**	**7.9**	**8.4**	**8.2**	**8.5**	**8.5**	**8.9**
D.O.	ppm	**5**	**7**	**5**	**6**	**6**	**5**	**5**	<0.001	<0.001	<0.001	<0.001	**0.002**	<0.001	<0.001
Ferrous Iron	mg/L	**0.15**	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	**0.15**	**0.15**	**0.2**	**0.1**	**0.1**	**0.2**	**0.2**
Metals/Inorganics															
Aluminum, Dissolved	µg/L	<100	<100	<100	<100	<100	<50	<50	<100	<100	<100	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	**4.8**	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**8.4**	**8.5**	**8.7**	**8.7**	**7.6**	**9.8**	**9.4**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	**100**	**100**	**110**	**110**	**110**	**110**	**99**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	**52**	**53**	**55**	**56**	**54**	**54**	**58**
Molybdenum, Dissolved	µg/L	**40**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.267**	**0.100 U**	**0.209 B,s**	**0.344 a,s**	**0.194 B,s**	**0.191 B,s**	**0.100 U**	**0.322**	**0.100 U**	**0.293 s**	**0.179 a,B,s**	**0.190 B,s**	**0.181 B,s**	**0.100 U**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL004
Eagle Project

Parameter	Units	QAL004A							QAL004D						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/14/04	8/17/04	9/21/04	10/19/04	12/15/04	2/24/05	4/27/05	4/14/04	8/17/04	9/21/04	10/19/04	12/15/04	2/25/05	4/27/05
Major Anions															
Alkalinity, Bicarbonate	mg/L	**50**	**44**	**53**	**45 a**	**46**	**42**	**44**	**89**	**97**	**79**	**84 a**	**80**	**87**	**81**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.20**
Nitrogen, Nitrate	mg/L	**0.08**	**0.21**	**0.16**	**0.13**	**0.12**	**0.18**	**0.19**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	<5.0	<5.0	**9.3**	<5.0	<5.0	<5.0	<5.0	<5.0	<0.05	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations															
Calcium, Dissolved	mg/L	**12**	**14**	**14**	**14**	**14**	**13**	**13**	**25**	**23**	**24**	**26**	**25**	**25**	**25**
Potassium, Dissolved	mg/L	**0.73**	<0.50	**0.62**	**0.55**	**0.57**	**0.52**	**0.54**	**1.3**	**0.81**	**1.0**	**0.79**	**0.95**	**0.88**	**0.93**
Magnesium, Dissolved	mg/L	**2.1**	**2.3**	**2.4**	**2.5**	**2.3**	**2.1**	**2.3**	**3.2**	**3.0**	**3.1**	**3.3**	**3.1**	**3.2**	**3.3**
Sodium, Dissolved	mg/L	**1.8**	**0.66**	**0.97**	**0.63**	**0.86**	**0.80**	**0.87**	**2.8**	**2.0**	**2.1**	**1.9**	**2.1**	**2.2**	**2.2**
General Chemistry															
Hardness, (calculated) as CaCO3	mg/L	**39**	**44**	**45**	**45**	**44**	**41**	**42**	**76**	**70**	**73**	**79**	**75**	**76**	**76**
Residue, Dissolved @ 180°C	mg/L	**62**	**72**	**72**	**60**	<50 a	<50	**60**	**84**	**104**	**118**	**138**	<50 a	**81**	**104**
Tritium	TU	NM	NM	NM	**9.08**	NM	NM	NM	NM	NM	NM	<0.8	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL005
Eagle Project

Parameter	Units	QAL005A							QAL005D						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/15/04	8/17/04	10/6/04	10/20/04	12/15/04	2/24/05	4/26/05	4/15/04	8/17/04	9/16/04	10/20/04	12/15/04	2/23/05	4/26/05
Field Parameters															
Temperature	°C	**6.6**	**7.1**	**7.7**	**7.7**	**7.9**	**7.2**	**6.6**	**7.6**	**7.8**	**7.9**	**7.7**	**7.6**	**7.5**	**7.6**
Specific Conductance	µmhos/cm @ 25°C	**22**	**18**	**18**	**18**	**17**	**17**	**16**	**169**	**163**	**163**	**168**	**166**	**165**	**85**
pH	SU	**7.1**	**5.6**	**5.4**	**5.5**	**5.5**	**5.5**	**5.6**	**8.0**	**7.8**	**8.2**	**8.0**	**8.0**	**8.0**	**8.3**
D.O.	ppm	**2**	**2**	**2**	**1.5**	**1.5**	**2.0**	**1.5**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.6**
Ferrous Iron	mg/L	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**	**0.2**	**0.2**	**0.4**	**0.7**	**0.8**	**1.0**	**0.7**	**1.0**	**0.6**
Metals/Inorganics															
Aluminum, Dissolved	µg/L	<100	<100	<100	<100	<100	<50	<50	<100	<100	<100	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**3.1**	**3.7**	**3.4**	**3.6**	**3.8**	**3.7**
Barium, Dissolved	µg/L	**27**	<20	<20	**21**	**20**	**23**	<20	<20	**28**	**30**	**33**	**31**	**32**	**30**
Iron, Dissolved	µg/L	**240**	**350**	**380**	**350**	**420**	**240**	**120**	**540**	**710**	**790**	**720**	**740**	**740**	**670**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	**140**	**24**	<20	<20	<20	<20	<20	**180**	**200**	**210**	**190**	**200**	**210**	**200**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	**13**	<10	<10	<10	<10	<10	<10	**18**	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.274**	**0.100 U**	**0.277 s**	**0.103 a,B,s**	**0.253 s**	**0.182 B,s**	**0.187 B,s**	**0.340**	**0.100 U**	**0.252 s**	**0.126 a,B,s**	**0.114 B,s**	**0.208 B,s**	**0.100 U**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL005
Eagle Project

Parameter	Units	QAL005A							QAL005D						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/15/04	8/17/04	10/6/04	10/20/04	12/15/04	2/24/05	4/26/05	4/15/04	8/17/04	9/16/04	10/20/04	12/15/04	2/23/05	4/26/05
Major Anions															
Alkalinity, Bicarbonate	mg/L	**6.5**	**4.7**	**6.1**	**6.9 a**	<2.0	**4.5**	**2.8**	**96**	**96**	**86**	**93 a**	**89**	**110**	**86**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**1.0**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	**1.4**	<1.0	<1.0	<1.0	**1.3**	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.16**
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05 b	<0.05	<0.05	**0.16**	<0.05	<0.05	<0.05	<0.05 b
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**6.1**	<5.0	<5.0	<5.0	<5.0
Major Cations															
Calcium, Dissolved	mg/L	**1.7**	**1.2**	**1.1**	**1.2**	**1.2**	**1.3**	**1.3**	**28**	**27**	**29**	**27**	**28**	**28**	**28**
Potassium, Dissolved	mg/L	**0.73**	**0.69**	**0.71**	**0.66**	**0.81**	**0.68**	**0.60**	**1.0**	**0.53**	**0.65**	**0.66**	**0.61**	**0.57**	**0.58**
Magnesium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**3.3**	**2.9**	**3.2**	**2.8**	**2.9**	**2.9**	**2.9**
Sodium, Dissolved	mg/L	**0.89**	<0.50	**0.89**	**0.78**	**0.66**	**0.58**	**0.69**	**1.5**	**1.4**	**1.3**	**1.2**	**1.4**	**1.5**	**1.4**
General Chemistry															
Hardness, (calculated) as CaCO3	mg/L	**5.0**	**4**	**4**	**4**	**4**	**4**	**4**	**84**	**79**	**86**	**79**	**82**	**82**	**82**
Residue, Dissolved @ 180°C	mg/L	<50	<50	<50	<50	**52 a**	<50	<50	**104**	**114**	**122**	**124**	**96 a**	**92**	**94**
Tritium	TU	NM	NM	NM	**8.98**	NM	NM	NM	NM	NM	NM	**7.07**	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
b Estimated value. Sample received after EPA-established hold time expired.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL006
Eagle Project

Parameter	Units	QAL006A							QAL006B						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/28/04	8/17/04	9/16/04	10/18/04	12/28/04	2/22/05	4/27/05	4/28/04	8/17/04	10/6/04	10/18/04	12/28/04	2/22/05	4/27/05
Field Parameters															
Temperature	°C	**5.9**	**7.8**	**8.5**	**9.0**	**8.1**	**7.1**	**6.1**	**8.0**	**8.2**	**8.1**	**7.8**	**7.9**	**7.9**	**7.8**
Specific Conductance	µmhos/cm @ 25°C	**19**	**16**	**16**	**15**	**15**	**18**	**16**	**198**	**167**	**177**	**179**	**172**	**169**	**168**
pH	SU	**6.1**	**5.4**	**5.5**	**5.4**	**5.4**	**5.3**	**5.3**	**6.9**	**6.9**	**6.9**	**6.9**	**6.9**	**7.0**	**7.3**
D.O.	ppm	**4**	**7**	**5**	**>1**	**2.5**	**2**	**4**	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.1
Ferrous Iron	mg/L	**0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**12**	**15**	**30**	**18**	**16**	**27**	**16**
Metals/Inorganics															
Aluminum, Dissolved	µg/L	<100	<100	<100	<100	**100**	**150**	**120**	<100	<100	<100	<100	<100	**67**	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	**16,500**	**15,100**	**14,400**	**15,200**	**13,400**	**14300**	**13800**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	**150**	**140**	**150**	**150**	**130**	**140**	**140**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.6**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.628**	**0.494 s**	**0.551**	**0.546 a,s**	**0.511**	**0.420**	**0.463 s**	**0.443**	**0.454 s**	**0.250 s**	**0.147 a,B,s**	**0.290 s**	**0.159 B,s**	**0.100 U**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL006
Eagle Project

Parameter	Units	QAL006A							QAL006B						
		Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff	Spring Snowmelt Runoff	Summer Baseflow	Fall Rain Runoff		Winter Baseflow		Spring Snowmelt Runoff
		4/28/04	8/17/04	9/16/04	10/18/04	12/28/04	2/22/05	4/27/05	4/28/04	8/17/04	10/6/04	10/18/04	12/28/04	2/22/05	4/27/05
Major Anions															
Alkalinity, Bicarbonate	mg/L	**3.1**	<2.0	<2.0	<2.0 a	<2.0	<2.0	**3.2**	**87**	**109**	**85**	**78 a**	**71**	**77**	**71**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**3.7**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.8**	**2.1**	**2.1**	**1.0**	<1.0	**1.8**	**1.4**
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.15**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.17**
Nitrogen, Nitrate	mg/L	**0.20**	**0.15**	<0.05	**0.17**	**0.15**	**0.18**	**0.14**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations															
Calcium, Dissolved	mg/L	**1.2**	**0.86**	**0.87**	**0.89**	**1.0**	**1.0**	**1.0**	**20**	**17**	**18**	**20**	**17**	**18**	**18**
Potassium, Dissolved	mg/L	<0.50	<0.50	**0.50**	<0.50	**0.74**	<0.50	<0.50	**0.79**	**0.67**	**0.67**	**0.70**	**0.73**	**0.68**	**0.62**
Magnesium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	**5.4**	**5.1**	**5.7**	**5.8**	**5.0**	**5.4**	**5.2**
Sodium, Dissolved	mg/L	**0.51**	**0.62**	**0.72**	<0.50	**0.58**	**0.63**	**0.62**	**4.3**	**2.1**	**2.4**	**1.7**	**1.8**	**1.7**	**1.6**
General Chemistry															
Hardness, (calculated) as CaCO3	mg/L	**4**	**3**	**3**	**3**	**4**	**4**	**4**	**72**	**63**	**68**	**74**	**63**	**67**	**66**
Residue, Dissolved @ 180°C	mg/L	**52**	<50	<50	<50	**54 a**	<50	<50	**158**	**144**	**131**	**138**	**204 a**	**100**	**126**
Tritium	TU	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL007
Eagle Project

Parameter	Units	QAL007A			QAL007D		
		Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		10/21/04	3/1/05	4//26/05	10/21/04	3/1/05	4/26/05
Field Parameters							
Temperature	°C	**7.1**	**7.1**	**7.2**	**7.6**	**7.4**	**7.4**
Specific Conductance	µmhos/cm @ 25°C	**50**	**44**	**43**	**221**	**179**	**98**
pH	SU	**7.1**	**7.0**	**7.4**	**8.0**	NM	**8.3**
D.O.	ppm	**8**	**7**	**7**	**0.3**	<0.001	<0.001
Ferrous Iron	mg/L	**0.1**	<0.1	<0.1	**1.5**	**1.5**	**1.5**
Metals/Inorganics							
Aluminum, Dissolved	µg/L	<100	<50	<50	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20	**23**	**29**
Iron, Dissolved	µg/L	<20	<20	<20	**870**	**1740**	**1720**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	**10**
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	**120**	**130**	**120**
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.100 U,a**	**0.139 B,s**	**0.107 B**	**0.285 a,s**	**0.100 U,s**	**0.236 B,s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL007
Eagle Project

Parameter	Units	QAL007A			QAL007D		
		Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		10/21/04	3/1/05	4//26/05	10/21/04	3/1/05	4/26/05
Major Anions							
Alkalinity, Bicarbonate	mg/L	**20**	**18**	**16**	**127**	**112**	**105**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	**1.6**	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	**0.13**	<0.10	<0.10	**0.18**
Nitrogen, Nitrate	mg/L	**0.32**	**0.37**	**0.37**	<0.05	<0.05	<0.05
Sulfate	mg/L	<5.0	<5.0	<5.0	**11**	<5.0	<5.0
Major Cations							
Calcium, Dissolved	mg/L	**7.2**	**6.4**	**6.3**	**31**	**30**	**31**
Potassium, Dissolved	mg/L	**0.63**	**0.63**	**0.78**	**1.5**	**1.5**	**1.1**
Magnesium, Dissolved	mg/L	**0.80**	**0.93**	**0.81**	**4.5**	**4.1**	**4.1**
Sodium, Dissolved	mg/L	<0.50	<0.50	**0.68**	**7.1**	**5.5**	**3.8**
General Chemistry							
Hardness, (calculated) as CaCO3	mg/L	**21**	**20**	**19**	**96**	**92**	**94**
Residue, Dissolved @ 180°C	mg/L	<50	<50	<50	**170**	**124**	**132**
Tritium	TU	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.

NM Not measured.

s Potential false positive value. Compound present in blank sample.

U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL008
Eagle Project

Parameter	Units	QAL008A				QAL008D			
		Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		11/3/04	12/28/04	2/25/05	4/27/05	11/3/04	12/28/04	2/25/05	4/27/05
Field Parameters									
Temperature	^{o}C	**7.4**	**5.8**	**6.4**	**7.3**	**6.8**	**7.3**	**6.2**	**6.7**
Specific Conductance	µmhos/cm @ 25^{o}C	**70**	**64**	**65**	**60**	**121**	**121**	**107**	**88**
pH	SU	**9.2**	**9.1**	**9.2**	**9.4**	**8.4**	**8.0**	**8.3**	**8.6**
D.O.	ppm	NM	NM	NM	NM	NM	NM	NM	NM
Ferrous Iron	mg/L	NM	NM	NM	NM	NM	NM	NM	NM
Metals/Inorganics									
Aluminum, Dissolved	µg/L	<100	<100	<50	<50	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	**3.2**	<2.0	**3.9**	**3.0**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	**29**	<20	<20	<20	<20	**55**	<20	**56**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	**39**	**58**	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	**52**	<10	<10	<10	**12**
Mercury, Dissolved	ng/L	**0.808 a,s**	**0.346 s**	**0.394**	**0.451 s**	**1.340 a**	**0.643**	**0.704**	**0.620 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL008
Eagle Project

Parameter	Units	QAL008A				QAL008D			
		Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		11/3/04	12/28/04	2/25/05	4/27/05	11/3/04	12/28/04	2/25/05	4/27/05
Major Anions									
Alkalinity, Bicarbonate	mg/L	**66 a**	**28**	**30**	**31**	**66 a**	**53**	**47**	**50**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**3.8**	<1.0	**1.0**	<1.0	**6.3**	**1.5**	**1.7**	**2.5**
Fluoride	mg/L	<0.10	<0.10	<0.10	**0.11**	<0.10	<0.10	<0.10	**0.15**
Nitrogen, Nitrate	mg/L	**0.12**	**0.12**	**0.11**	**0.10**	<0.05	<0.05	**0.05**	**0.06**
Sulfate	mg/L	**5.3**	<5.0	<5.0	<5.0	**11**	**8.7**	**7.4**	**7.9**
Major Cations									
Calcium, Dissolved	mg/L	**8.7**	**8.8**	**9.6**	**9.8**	**15**	**16**	**14**	**14**
Potassium, Dissolved	mg/L	**0.82**	**0.64**	<0.50	**0.65**	**1.8**	**1.8**	**0.81**	**1.2**
Magnesium, Dissolved	mg/L	**1.4**	**1.4**	**1.5**	**1.5**	**2.9**	**3.0**	**2.8**	**2.9**
Sodium, Dissolved	mg/L	**1.3**	**0.70**	**0.76**	**0.98**	**2.9**	**3.3**	**2.4**	**2.1**
General Chemistry									
Hardness, (calculated) as CaCO3	mg/L	**27**	**28**	**30**	**31**	**49**	**52**	**46**	**47**
Residue, Dissolved @ 180°C	mg/L	**54**	**50 a**	<50	<50	**84**	**146 a**	**50**	**90**
Tritium	TU	**9.08**	NM	NM	NM	**12.6**	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
s Potential false positive value.
Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL009
Eagle Project

Parameter	Units	QAL009A				QAL009D			
		Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		10/20/04	12/28/04	2/25/05	4/27/05	11/3/04	12/28/04	2/25/05	4/28/05
Field Parameters									
Temperature	^{o}C	**7.3**	**5.4**	**5.8**	**7.0**	**7.4**	**5.6**	**5.2**	**7.1**
Specific Conductance	µmhos/cm @ 25^{o}C	**101**	**101**	**93**	**80**	**133**	**132**	**134**	**68**
pH	SU	**8.4**	**8.8**	**9.1**	**9.0**	**8.5**	**8.1**	**8.5**	**8.6**
D.O.	ppm	NM	NM	NM	NM	**0.02**	NM	NM	**0.40**
Ferrous Iron	mg/L	NM	NM	NM	NM	NM	NM	NM	<0.1
Metals/Inorganics									
Aluminum, Dissolved	µg/L	<100	<100	<50	<50	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**2.5**	**2.3**
Barium, Dissolved	µg/L	<20	<20	<20	<20	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20	**72**	**34**	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20	**21**	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2	**1.1**	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	**12**	**10**	**14**	<10	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**1.140 a**	**1.370**	**0.476**	**0.568 s**	**0.100 a, U**	**0.545**	**0.617**	**0.125 B**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL009
Eagle Project

Parameter	Units	QAL009A				QAL009D			
		Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff	Fall Rain Runoff	Winter Baseflow		Spring Snowmelt Runoff
		10/20/04	12/28/04	2/25/05	4/27/05	11/3/04	12/28/04	2/25/05	4/28/05
Major Anions									
Alkalinity, Bicarbonate	mg/L	**54 a**	**49**	**46**	**52**	**66 a**	**66**	**66**	**67**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	**5.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10	**0.14**	**0.14**	**0.12**	**0.20**
Nitrogen, Nitrate	mg/L	**0.14**	**0.19**	**0.16**	**0.20**	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	**12**	**14**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Major Cations									
Calcium, Dissolved	mg/L	**15**	**14**	**14**	**14**	**18**	**18**	**18**	**19**
Potassium, Dissolved	mg/L	**1.4**	**1.5**	**0.64**	**0.93**	**0.90**	**1.0**	**0.93**	**0.84**
Magnesium, Dissolved	mg/L	**2.4**	**2.3**	**2.4**	**2.4**	**4.0**	**4.2**	**4.2**	**4.2**
Sodium, Dissolved	mg/L	**0.79**	**0.96**	**0.64**	**0.95**	**2.5**	**2.6**	**2.7**	**2.6**
General Chemistry									
Hardness, (calculated) as CaCO3	mg/L	**47**	**44**	**45**	**45**	**61**	**62**	**62**	**65**
Residue, Dissolved @ 180°C	mg/L	**116**	**52 a**	**50**	<50	**104**	**130 a**	**74**	**58**
Tritium	TU	NM	NM	NM	NM	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.
NM Not measured.
s Potential false positive value. Compound present in blank sample.
U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL010
Eagle Project

Parameter	Units	QAL010A		
		Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		10/20/04	2/23/05	4/26/05
Field Parameters				
Temperature	^{o}C	**7.2**	**7.3**	**7.3**
Specific Conductance	µmhos/cm @ 25^{o}C	**85**	**82**	**68**
pH	SU	**8.7**	**8.7**	**8.8**
D.O.	ppm	**5**	**4**	**6**
Ferrous Iron	mg/L	<0.1	<0.1	<0.01
Metals/Inorganics				
Aluminum, Dissolved	µg/L	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	**132**
Arsenic, Dissolved	µg/L	<2.0	<2.0	**90**
Barium, Dissolved	µg/L	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	**1.1**
Boron, Dissolved	µg/L	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	**12**
Chromium, Dissolved	µg/L	<5.0	<5.0	**21**
Cobalt, Dissolved	µg/L	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	**13**
Lead, Dissolved	µg/L	<1.0	<1.0	**16**
Manganese, Dissolved	µg/L	**41**	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	**18**
Nickel, Dissolved	µg/L	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	**64**
Silver, Dissolved	µg/L	<0.2	<0.2	**6.3**
Zinc, Dissolved	µg/L	<10	<10	**28**
Mercury, Dissolved	ng/L	**0.291 a,s**	**0.984**	**0.201 B,s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL010
Eagle Project

Parameter	Units	QAL010A		
		Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		10/20/04	2/23/05	4/26/05
Major Anions				
Alkalinity, Bicarbonate	mg/L	**41 a**	**39**	**39**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	**0.12**
Nitrogen, Nitrate	mg/L	**0.15**	**0.17**	**0.19**
Sulfate	mg/L	<5.0	<5.0	<5.0
Major Cations				
Calcium, Dissolved	mg/L	**12**	**11**	**12**
Potassium, Dissolved	mg/L	**1.2**	**1.1**	**0.92**
Magnesium, Dissolved	mg/L	**2.3**	**2.0**	**2.2**
Sodium, Dissolved	mg/L	**1.2**	**1.7**	**1.4**
General Chemistry				
Hardness, (calculated) as CaCO3	mg/L	**39**	**36**	**39**
Residue, Dissolved @ 180°C	mg/L	**64**	<50	**52**
Tritium	TU	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.

NM Not measured.

s Potential false positive value.
Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL015
Eagle Project

Parameter	Units	QAL015			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		9/9/04	10/18/04	3/1/05	5/3/05
Field Parameters					
Temperature	^{o}C	**7.9**	**7.0**	**5.0**	**5.7**
Specific Conductance	µmhos/cm @ 25^{o}C	**120**	**116**	**116**	**113**
pH	SU	**7.6**	**8.2**	NM	**8.6**
D.O.	ppm	**4.5**	**>1**	**7**	**7**
Ferrous Iron	mg/L	<0.1	<0.1	<0.1	<0.1
Metals/Inorganics					
Aluminum, Dissolved	µg/L	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.365 s**	**0.237 a,B,s**	**0.192 B,s**	**0.125 B**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL015
Eagle Project

Parameter	Units	QAL015			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		9/9/04	10/18/04	3/1/05	5/3/05
Major Anions					
Alkalinity, Bicarbonate	mg/L	**58**	**61 a**	**60**	**59**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	**0.12**
Nitrogen, Nitrate	mg/L	<0.05	<0.05	**0.08**	**0.09**
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0
Major Cations					
Calcium, Dissolved	mg/L	**19**	**20**	**18**	**18**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50
Magnesium, Dissolved	mg/L	**3.1**	**3.0**	**3.0**	**2.9**
Sodium, Dissolved	mg/L	**0.60**	<0.50	**0.51**	**0.77**
General Chemistry					
Hardness, (calculated) as CaCO3	mg/L	**60**	**62**	**57**	**57**
Residue, Dissolved @ 180°C	mg/L	**50**	**88**	**72**	**56**
Tritium	TU	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.

NM Not measured.

s Potential false positive value. Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL016
Eagle Project

Parameter	Units	QAL016			
		Summer Baseflow	**Fall Rain Runoff**	**Winter Baseflow**	**Spring Snowmelt Runoff**
		9/9/04	10/20/04	2/23/05	5/3/05
Field Parameters					
Temperature	^{o}C	**7.0**	**7.1**	NM	**6.5**
Specific Conductance	µmhos/cm @ 25^{o}C	**127**	**120**	NM	**138**
pH	SU	**8.7**	**8.6**	NM	**9.1**
D.O.	ppm	**7**	NM	NM	**7**
Ferrous Iron	mg/L	<0.1	NM	NM	<0.1
Metals/Inorganics					
Aluminum, Dissolved	µg/L	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20
Iron, Dissolved	µg/L	<20	<20	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.108 B,s**	**0.228 a,B,s**	**0.100 U,s**	**0.103 B**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL016
Eagle Project

Parameter	Units	QAL016			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		9/9/04	10/20/04	2/23/05	5/3/05
Major Anions					
Alkalinity, Bicarbonate	mg/L	**64**	**69 a**	**61**	**72**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	**0.12**
Nitrogen, Nitrate	mg/L	**0.10**	**0.10**	**0.09**	**0.11**
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0
Major Cations					
Calcium, Dissolved	mg/L	**20**	**20**	**21**	**23**
Potassium, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50
Magnesium, Dissolved	mg/L	**3.3**	**3.1**	**3.5**	**3.6**
Sodium, Dissolved	mg/L	**0.63**	<0.50	**0.79**	**0.86**
General Chemistry					
Hardness, (calculated) as CaCO3	mg/L	**64**	**63**	**67**	**72**
Residue, Dissolved @ 180°C	mg/L	**60**	**84**	**67**	**54**
Tritium	TU	NM	NM	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.

B Estimated value because sample result is above the method detection limit of 0.10 ng/L but below the reporting limit of 0.25 ng/L.

NM Not measured.

s Potential false positive value.
Compound present in blank sample.

U Result was below the reporting limit and reported at the method detection limit.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL018
Eagle Project

Parameter	Units	QAL018			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		8/19/04	10/20/04	3/2/05	5/3/05
Field Parameters					
Temperature	^{o}C	**7.4**	**7.5**	**5.5**	**5.9**
Specific Conductance	µmhos/cm @ 25^{o}C	**136**	**141**	**168**	**115**
pH	SU	**7.5**	**7.2**	NM	**7.8**
D.O.	ppm	**3.5**	NM	**7**	**4.5**
Ferrous Iron	mg/L	<0.1	NM	**0.15**	<0.1
Metals/Inorganics					
Aluminum, Dissolved	µg/L	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20
Iron, Dissolved	µg/L	**47**	**180**	**76**	**39**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	<10	<10
Mercury, Dissolved	ng/L	**0.707 s**	**1.740 a**	**0.562**	**1.120 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL018
Eagle Project

Parameter	Units	QAL018			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		8/19/04	10/20/04	3/2/05	5/3/05
Major Anions					
Alkalinity, Bicarbonate	mg/L	**37**	**72 a**	**63**	**56**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	**0.12**
Nitrogen, Nitrate	mg/L	**0.17**	**0.20**	**0.20**	**0.12**
Sulfate	mg/L	<5.0	**5.1**	**5.4**	<5.0
Major Cations					
Calcium, Dissolved	mg/L	**20**	**21**	**20**	**17**
Potassium, Dissolved	mg/L	<0.50	<0.50	**0.52**	<0.50
Magnesium, Dissolved	mg/L	**3.8**	**4.1**	**4.0**	**3.5**
Sodium, Dissolved	mg/L	**1.1**	**0.80**	**0.89**	**1.1**
General Chemistry					
Hardness, (calculated) as CaCO3	mg/L	**66**	**69**	**66**	**57**
Residue, Dissolved @ 180°C	mg/L	**98**	**102**	**70**	**56**
Tritium	TU	NM	**10.3**	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
s Potential false positive value.
Compound present in blank sample.

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL020
Eagle Project

Parameter	Units	QAL020			
		Summer Baseflow	**Fall Rain Runoff**	**Winter Baseflow**	**Spring Snowmelt Runoff**
		8/18/04	10/21/04	2/23/05	5/3/05
Field Parameters					
Temperature	^{o}C	**9.6**	**8.4**	NM	**5.1**
Specific Conductance	µmhos/cm @ 25^{o}C	**34**	**38**	NM	**34**
pH	SU	**6.2**	**6.2**	NM	**6.4**
D.O.	ppm	**3**	**4.5**	NM	**4**
Ferrous Iron	mg/L	<0.1	<0.1	NM	<0.1
Metals/Inorganics					
Aluminum, Dissolved	µg/L	<100	<100	<50	<50
Lithium, Dissolved	µg/L	<10	<10	<10	<10
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	<20	<20	<20	<20
Iron, Dissolved	µg/L	**110**	**29**	<20	<20
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	<100	<100	<100	<100
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<10	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	**21**	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	<10	<10
Nickel, Dissolved	µg/L	<25	<25	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	**10**	<10	<10	<10
Mercury, Dissolved	ng/L	**0.723 a**	**0.887 a,s**	**0.670**	**0.819 s**

Table 18
Groundwater Quality Data
Quaternary Deposit Monitoring Location QAL020
Eagle Project

Parameter	Units	QAL020			
		Summer Baseflow	Fall Rain Runoff	Winter Baseflow	Spring Snowmelt Runoff
		8/18/04	10/21/04	2/23/05	5/3/05
Major Anions					
Alkalinity, Bicarbonate	mg/L	**12**	**13 a**	**10**	**11**
Alkalinity, Carbonate	mg/L	<2.0	<2.0	<2.0	<2.0
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0
Fluoride	mg/L	<0.10	<0.10	<0.10	<0.10
Nitrogen, Nitrate	mg/L	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	<5.0	<5.0	<5.0	<5.0
Major Cations					
Calcium, Dissolved	mg/L	**3.7**	**3.8**	**3.9**	**3.8**
Potassium, Dissolved	mg/L	**1.2**	**1.3**	**1.1**	**1.0**
Magnesium, Dissolved	mg/L	**0.82**	**0.83**	**0.84**	**0.88**
Sodium, Dissolved	mg/L	**0.63**	<0.50	**0.65**	**0.76**
General Chemistry					
Hardness, (calculated) as CaCO3	mg/L	**13**	**13**	**13**	**13**
Residue, Dissolved @ 180°C	mg/L	**52**	**106**	<50	<50
Tritium	TU	NM	**9.79**	NM	NM

a Estimated value. Duplicate precision for this parameter exceeded quality control limit.
NM Not measured.
s Potential false positive value. Compound present in blank sample.

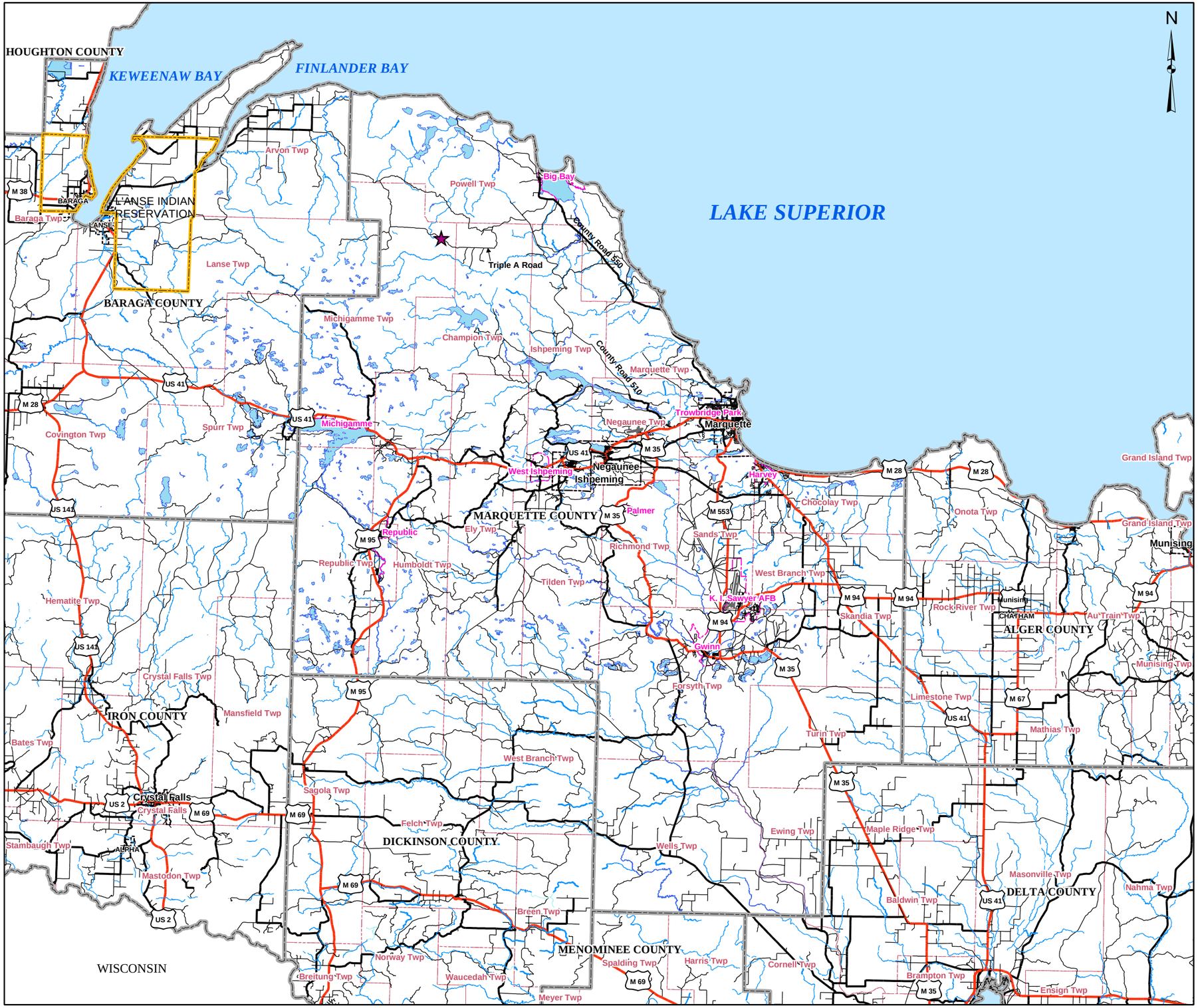
Table 19
Groundwater Quality Data
Bedrock Monitoring Location 04EA054
August 2004 Pump Test
Eagle Project

Parameter	Units	04EA054A	04EA054B	04EA054D	04EA054E
Field Parameters					
Temperature	°C	**15**	**16**	**16**	**11**
Specific Conductance	µmhos/cm @ 25°C	**173**	**233**	**183**	**321**
pH	SU	**9.4**	**9.7**	**9.7**	**10.2**
D.O.	ppm	NM	NM	NM	NM
Ferrous Iron	mg/L	NM	NM	NM	NM
Metals/Inorganics					
Aluminum, Dissolved	µg/L	<100	<100	<100	<100
Lithium, Dissolved	µg/L	<10	**14**	**23**	**14**
Antimony, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Arsenic, Dissolved	µg/L	<2.0	<2.0	<2.0	<2.0
Barium, Dissolved	µg/L	**27**	**60**	<20	<20
Iron, Dissolved	µg/L	**22**	<20	**130**	**61**
Beryllium, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Boron, Dissolved	µg/L	**1,340**	**1,370**	**2,720**	**3,910**
Cadmium, Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5
Chromium, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Cobalt, Dissolved	µg/L	<10	<10	<10	<10
Copper, Dissolved	µg/L	<5.0	<5.0	<5.0	<5.0
Lead, Dissolved	µg/L	<1.0	<1.0	<1.0	<1.0
Manganese, Dissolved	µg/L	<20	<20	<20	<20
Molybdenum, Dissolved	µg/L	<10	<10	**11**	<10
Nickel, Dissolved	µg/L	<25	**29**	<25	<25
Selenium, Dissolved	µg/L	<1.0	<1.0	**1.1**	<1.0
Silver, Dissolved	µg/L	<0.2	<0.2	<0.2	<0.2
Zinc, Dissolved	µg/L	<10	<10	**11**	**12**
Mercury, Dissolved	ng/L	**0.653 s**	**0.428 s**	**0.651 s**	**4.950**
Major Anions					
Alkalinity, Bicarbonate	mg/L	**80**	<2.0	**72**	<2.0
Alkalinity, Carbonate	mg/L	<2.0	**2.2**	<2.0	**15**
Chloride	mg/L	**18**	**26**	**64**	**42**
Fluoride	mg/L	**0.17**	**0.19**	**0.14**	**0.12**
Nitrogen, Nitrate	mg/L	NM	NM	NM	NM
Sulfate	mg/L	**5.6**	**6.3**	**28**	**12**
Major Cations					
Calcium, Dissolved	mg/L	**8.9**	**34**	**25**	**19**
Potassium, Dissolved	mg/L	**2.0**	**8.1**	**7.1**	**4.3**
Magnesium, Dissolved	mg/L	**3.6**	**2.5**	**4.1**	**3.8**
Sodium, Dissolved	mg/L	**24**	**27**	**41**	**40**
General Chemistry					
Hardness, (calculated) as CaCO3	mg/L	**37**	**95**	**79**	**63**
Residue, Dissolved @ 180°C	mg/L	**124**	**128**	**272**	**210**
Tritium	TU	**1.32**	**2.23**	**7.86**	**7.02**

NM Not measured.

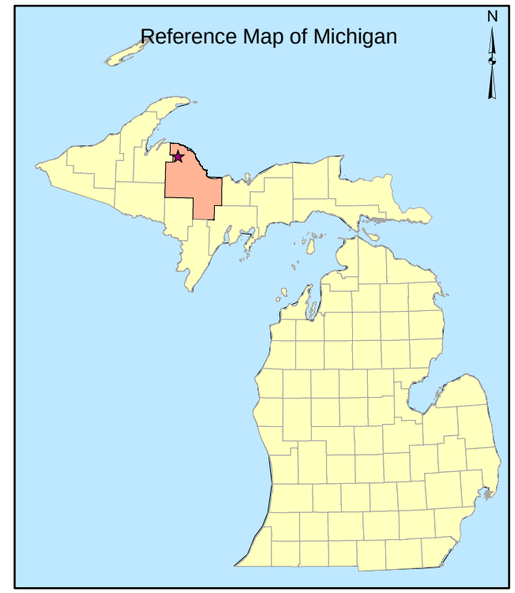
s Potential false positive value. Compound present in field blank.

FIGURES



LEGEND

- PROPOSED EAGLE PROJECT
- US HIGHWAY
- COUNTY ROAD
- MINOR ROAD
- AIRPORT
- HYDROGRAPHY
- MUNICIPAL BOUNDARY
- CENSUS DESIGNATED PLACE
- TOWNSHIP
- COUNTY
- INDIAN RESERVATION



REFERENCE

Digital data provided by Michigan Center for Geographic Information (CGI) (http://www.michigan.gov/cgi) and ESRI.
Datum: NAD 83 Projection: Michigan GeoRef (Meters)

10 5 0 10
SCALE: 1:500,000 MILES

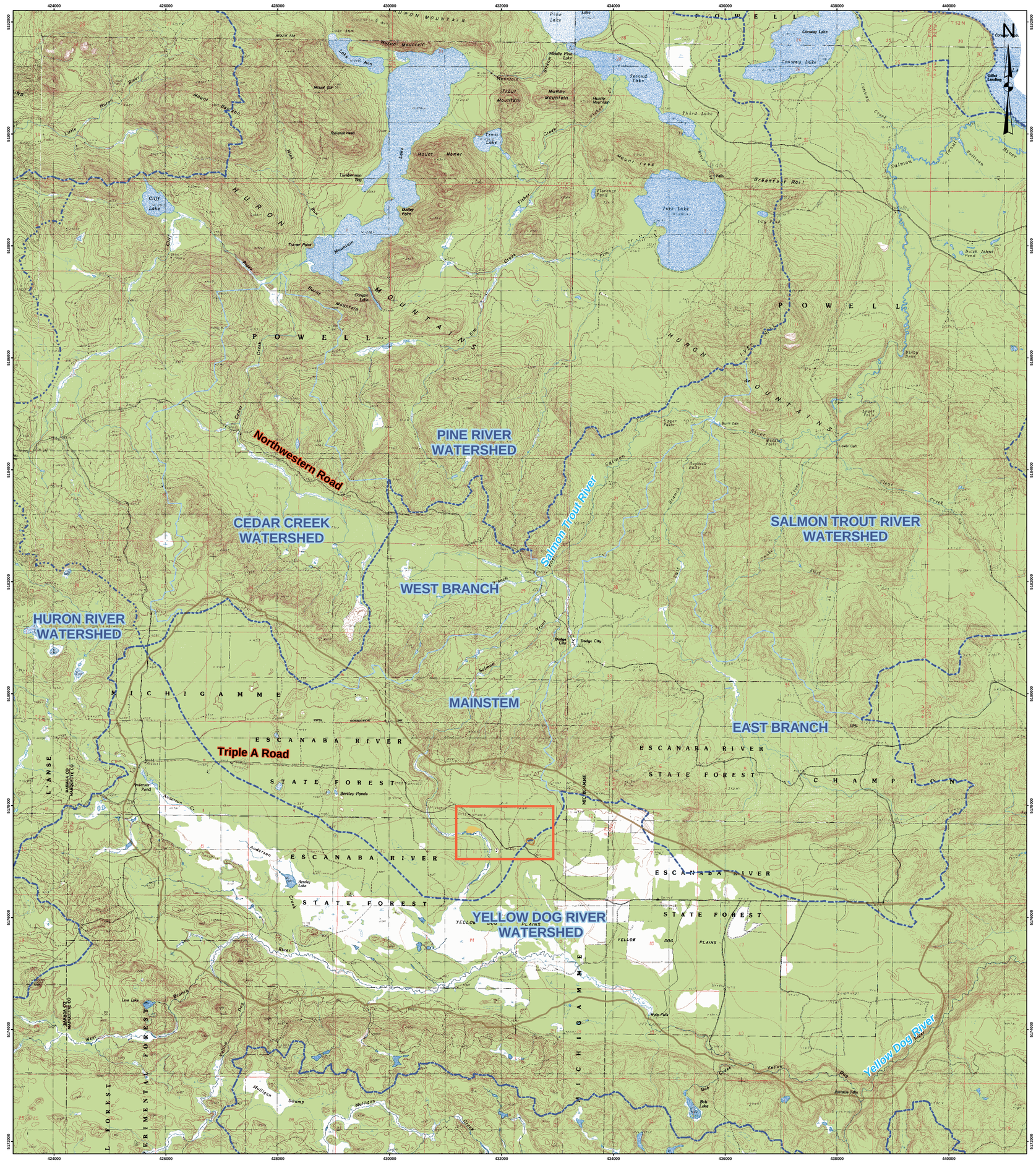
PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company
SITE LOCATION MAP

Golder Associates

PROJECT No. 033-2156C			SCALE: 1:500,000	REV. 0
DESIGN	KG	19 Aug. 2004	**FIGURE: 1**	
GIS	CHW	29 Jun. 2004		
CHECK	KG	24 Aug. 2004		
REVIEW	JM	25 Aug. 2004		

I:/2003/033-2156/mapping/MXD/Stage2 Hydrology Report/FIG 1 11x17.mxd



LEGEND

- STATE DEFINED SURFACE WATERSHED BOUNDARY
- PRELIMINARY SURFACE SUB-WATERSHED BOUNDARY
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- YELLOW DOG PLAINS

REFERENCE

DRG and quaternary geology provided by Michigan DNR. Sub-watersheds delineated by Golder Associates Ltd. from Michigan DNR digital elevation model. Watersheds provided by Michigan DNR.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1:40,000 MILE

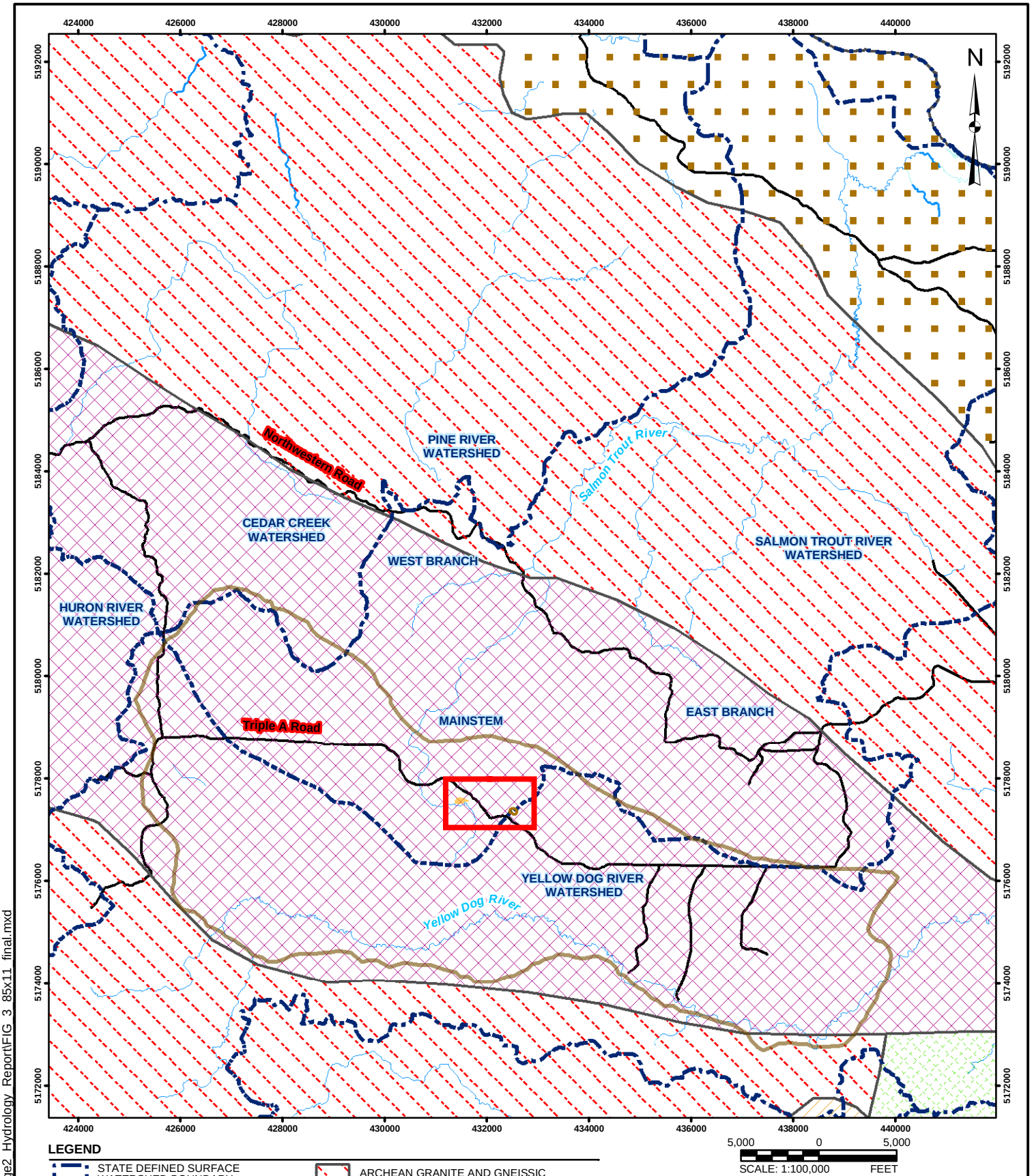
PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY
REGIONAL OVERVIEW

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Mar. 2005	**FIGURE: 2**	
GIS	CHW	29 Jun. 2005		
CHECK	JM	27 May 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_2_22x28.mxd



LEGEND

- STATE DEFINED SURFACE WATERSHED BOUNDARY
- ORE BODY
- OUTCROP
- YELLOW DOG PLAINS
- EAGLE PROJECT
- ROAD
- HYDROGRAPHY
- ARCHEAN GRANITE AND GNEISSIC
- ARCHEAN VOLCANIC AND SEDIMENTARY
- JACOBSVILLE SANDSTONE
- MICHIGAMME FORMATION
- OAK BLUFF FORMATION

REFERENCE

Digital data provided by Michigan DNR.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company

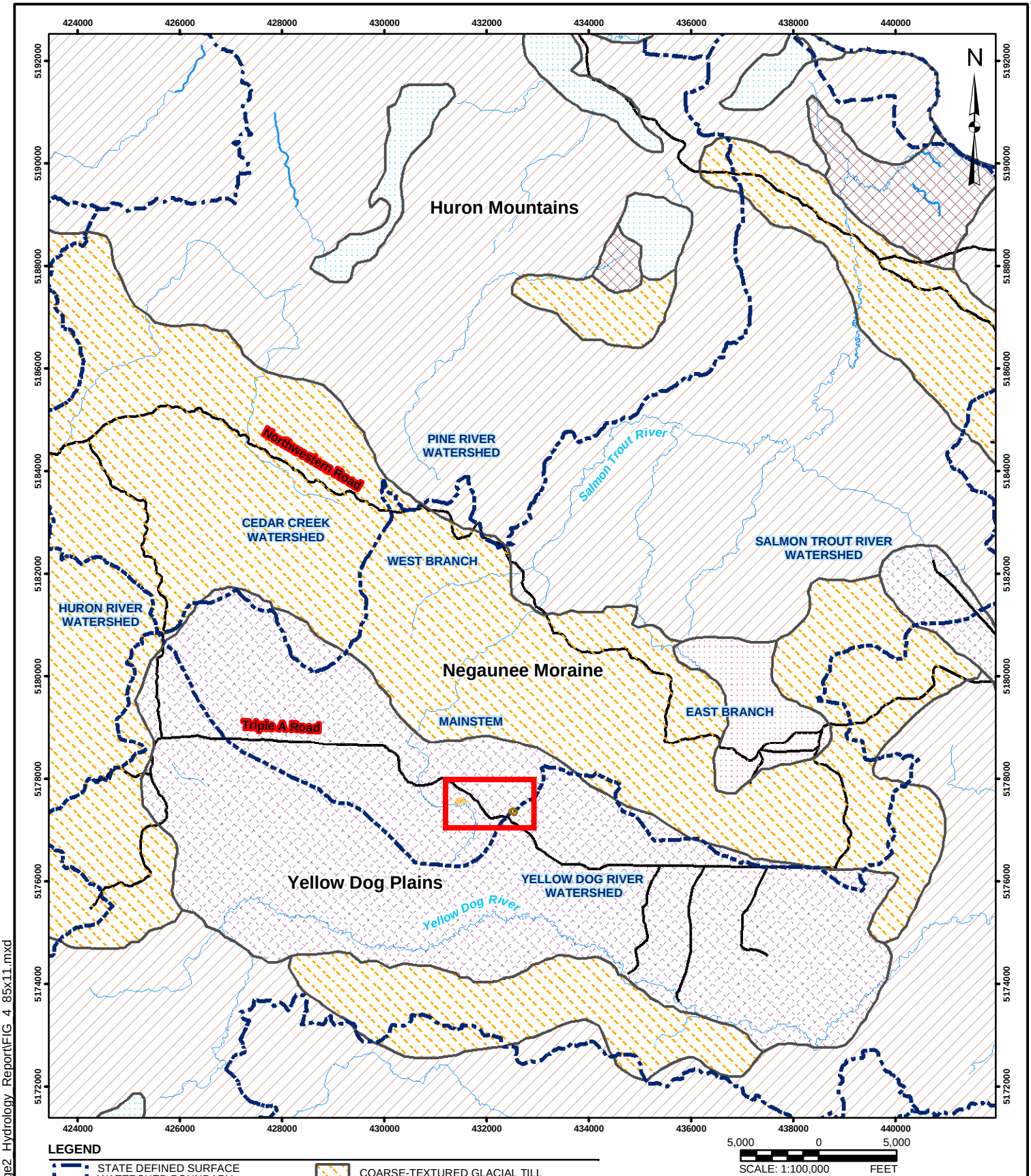
BEDROCK GEOLOGY OF THE EAGLE PROJECT AREA

Golder Associates

PROJECT No. 033-2156c			SCALE AS SHOWN	REV. 0
DESIGN	KP	2 Jun. 2005		
GIS	CHW	29 Jun. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 3

I:\2003\033-2156\mapping\MXD\Stage2 Hydrology Report\FIG 3 85x11 final.mxd



LEGEND

- STATE DEFINED SURFACE WATERSHED BOUNDARY
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- ROAD
- HYDROGRAPHY
- COARSE-TEXTURED GLACIAL TILL
- GLACIAL OUTWASH SAND AND GRAVEL AND POST-GLACIAL ALLUVIUM
- PEAT
- POST-GLACIAL ALLUVIUM
- THIN TO DISCONTINUOUS GLACIAL TILL OVER BEDROCK
- WATER

REFERENCE

Digital data provided by Michigan DNR.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

PROJECT: Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE: North Jackson Company

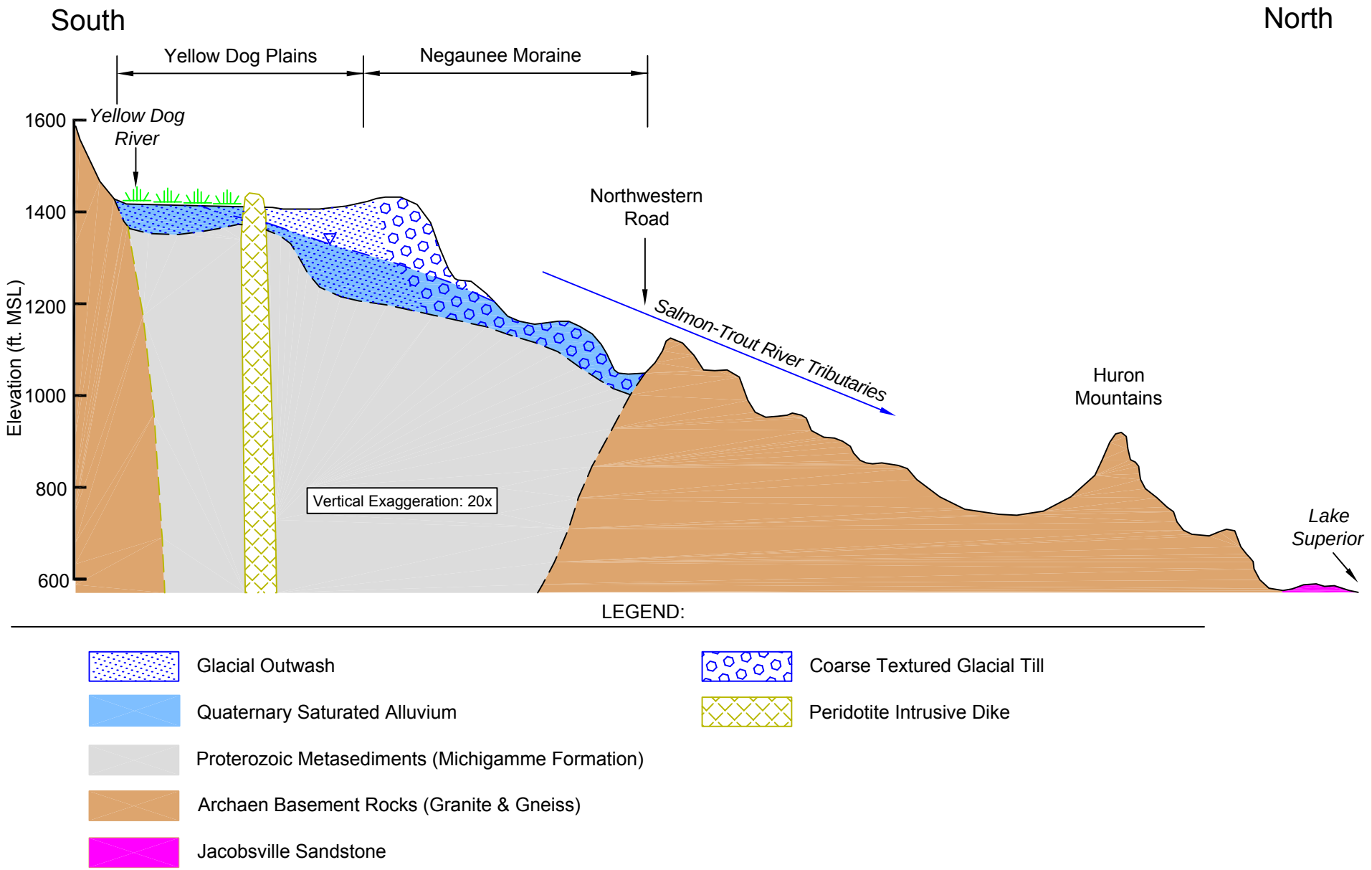
QUATERNARY GEOLOGY OF THE EAGLE PROJECT AREA

Golder Associates

PROJECT No. 033-2156c			SCALE AS SHOWN	REV. 0
DESIGN	KG	17 May 2004		
GIS	CHW	29 Jun. 2005		
CHECK	JM	14 Jun. 2005		
REVIEW				

FIGURE: 4

I:\2003\033-2156\mapping\MXD\Stage2 Hydrology Report\FIG 4 85x11.mxd

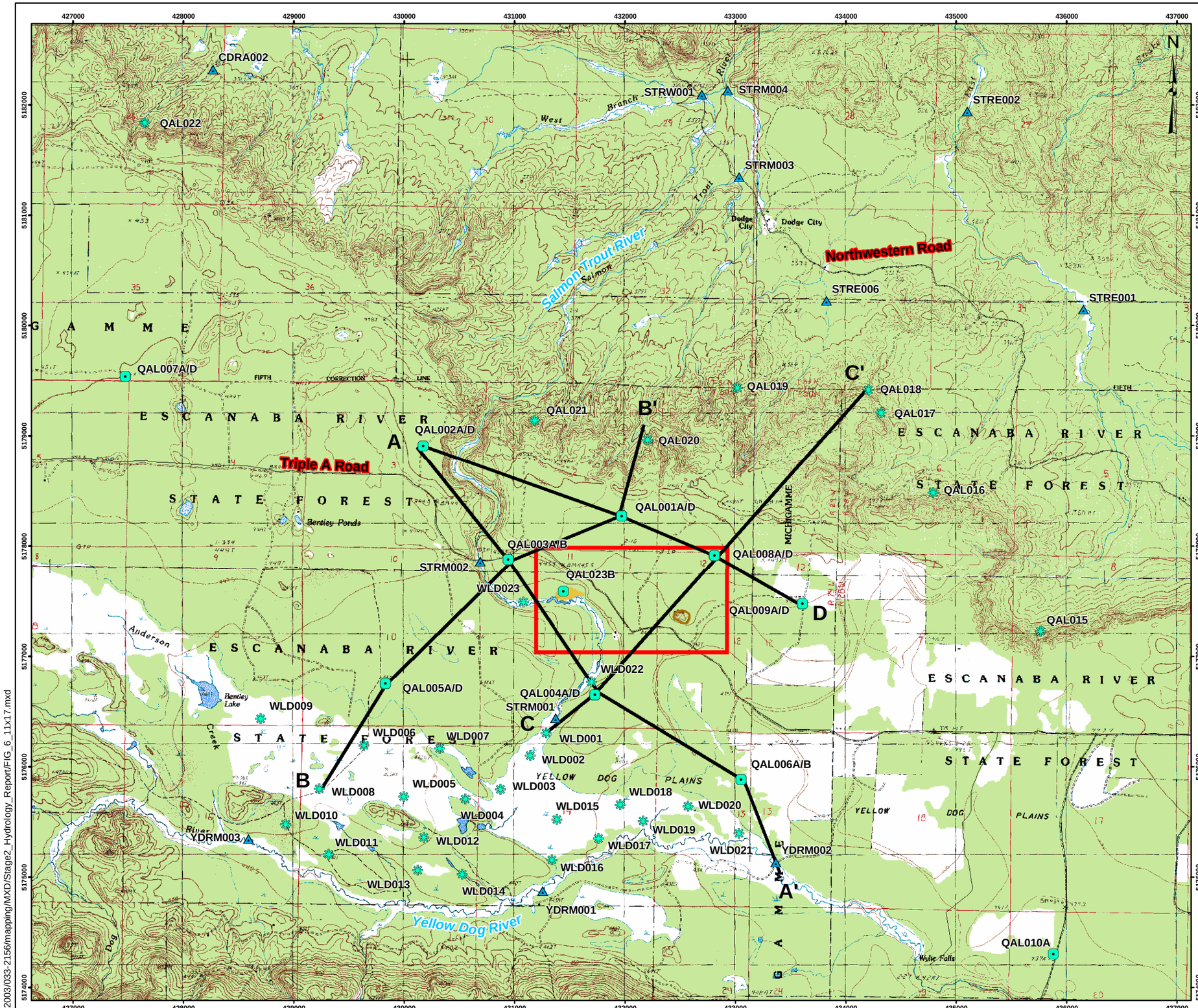


NORTH JACKSON COMPANY
1004 Harbor Hills Drive, Suite 102
Marquette, MI 49855

0 6,000
Feet
Vertical Exaggeration: 20x

FIGURE 5
GENERALIZED GEOLOGIC CROSS SECTION
Eagle Project

C:\GIS - Business\Projects\North Jackson\Eagle\2005 Work\EAG - 05 - 05.dwg 08/03/2005 10:43:59 PM



LEGEND

- ORE BODY
- OUTCROP
- EAGLE PROJECT
- CROSS-SECTION
- MONITORING WELL
- PIEZOMETER
- SELECT SURFACE WATER MONITORING LOCATIONS

REFERENCE

DRG provided by Michigan DNR. Monitoring locations and cross-sections from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1: 35,000 FEET

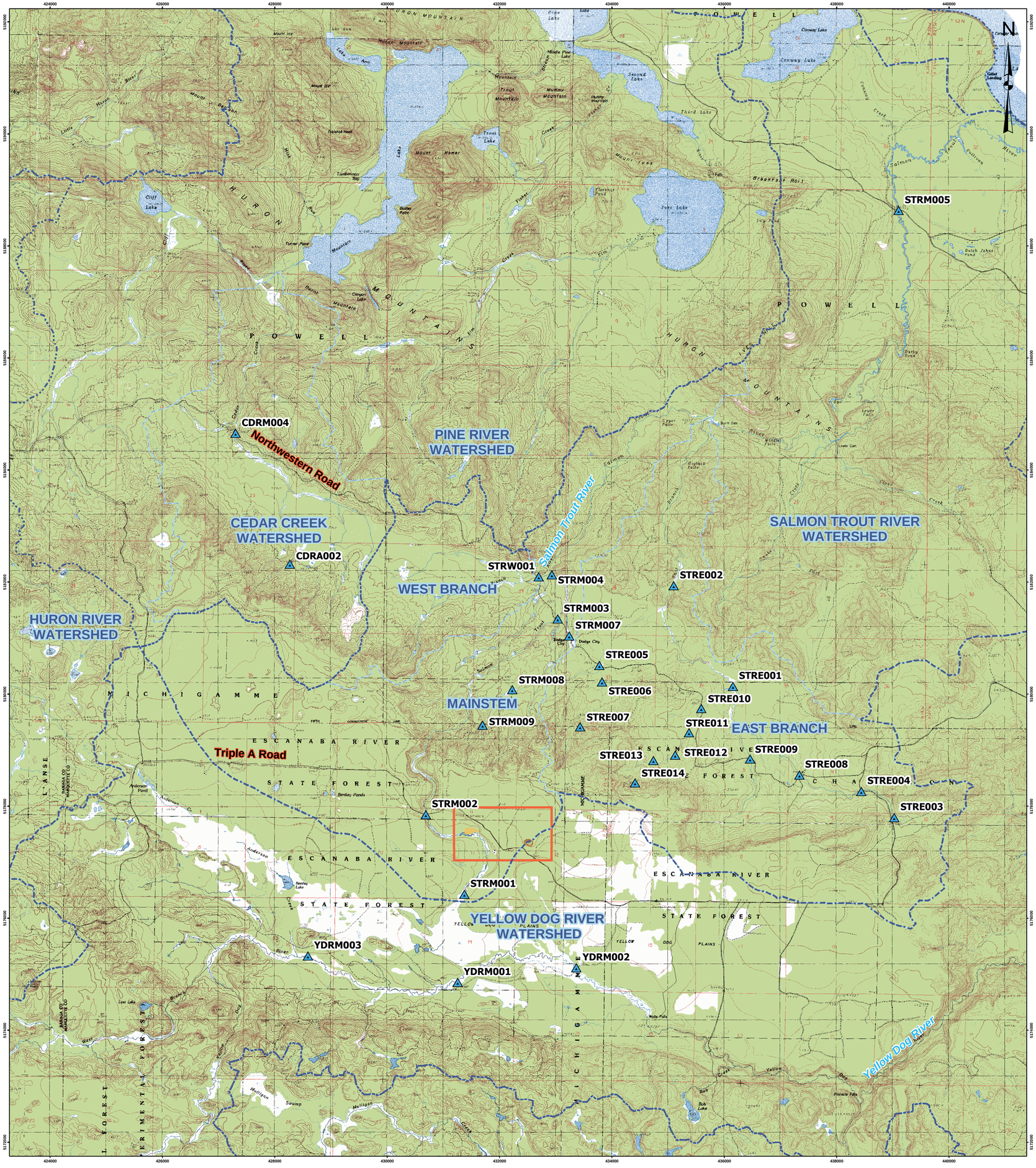
PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY
GROUNDWATER MONITORING LOCATIONS

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004	**FIGURE: 6**	
GIS	CHW	30 June. 2005		
CHECK	JM	8 Apr. 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_6_11x17.mxd



LEGEND

- STATE DEFINED SURFACE WATERSHED BOUNDARY
- PRELIMINARY SURFACE SUB-WATERSHED BOUNDARY
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- SURFACE WATER MONITORING LOCATION

REFERENCE

DRG and watersheds provided by Michigan DNR. Sub-watersheds delineated by Golder Associates Ltd. from Michigan DNR digital elevation model. Surface water data from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1:40,000 MILE

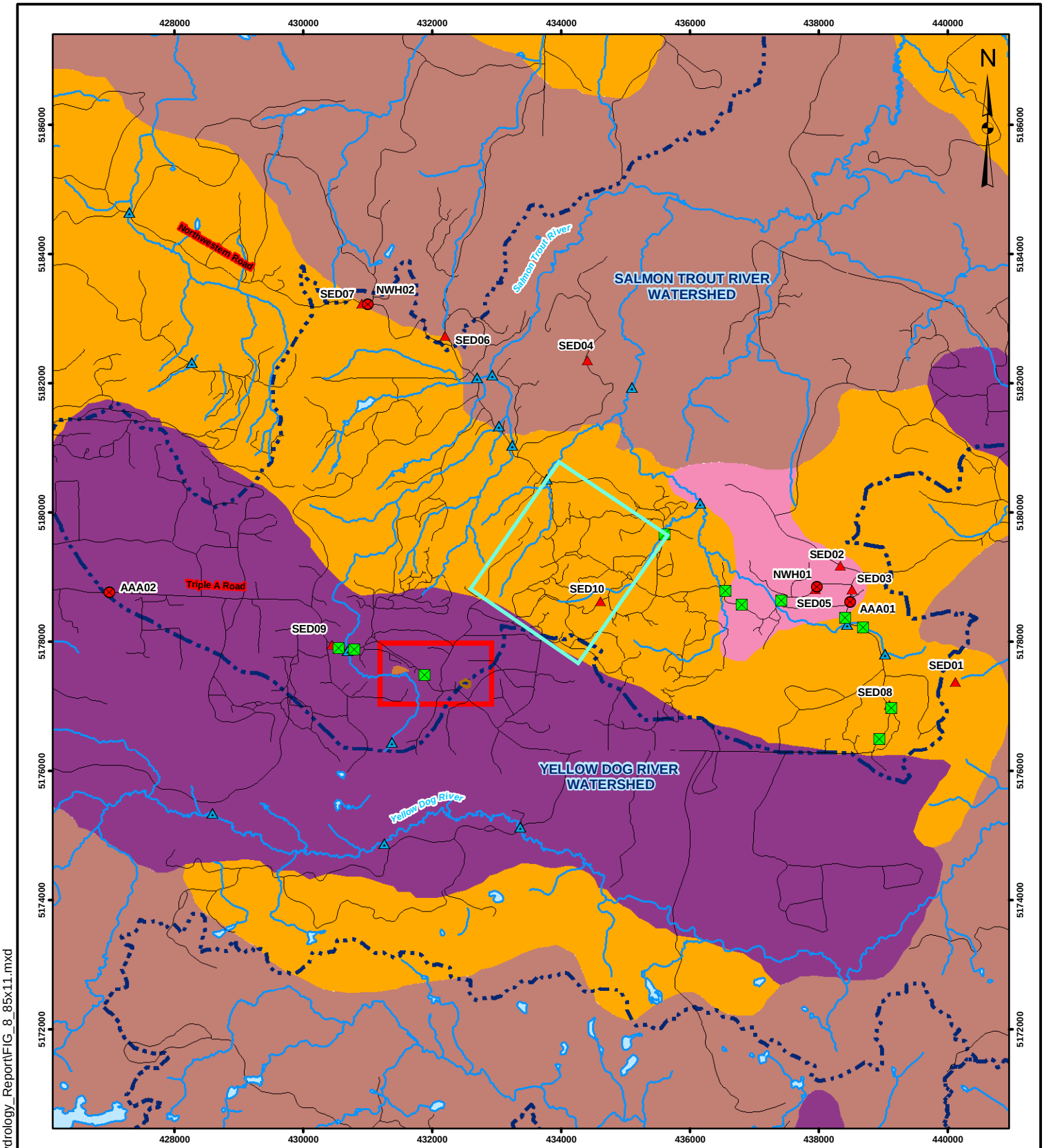
PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY
SURFACE WATER MONITORING LOCATIONS

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	15 Jun. 2005	**FIGURE: 7**	
GIS	TN	16 Jun. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_7_22x28.mxd



LEGEND

- TRAFFIC COUNTER
- SEDIMENT TRAP
- ROAD CROSS SECTION
- SURFACE WATER MONITORING LOCATION
- ROAD
- HYDROGRAPHY
- AREA OF DETAILED ROAD MAPPING
- EAGLE PROJECT
- STATE DEFINED SURFACE WATERSHED BOUNDARY
- ORE BODY
- OUTCROP
- COARSE-TEXTURED GLACIAL TILL
- GLACIAL OUTWASH SAND AND GRAVEL AND POST-GLACIAL ALLUVIUM
- POST-GLACIAL ALLUVIUM
- THIN TO DISCONTINUOUS GLACIAL TILL OVER BEDROCK

REFERENCE

Quaternary geology and watershed provided by Michigan DNR. Surface water data from North Jackson Company. Road data updated by North Jackson Company with GPS.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

PROJECT: Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE: North Jackson Company

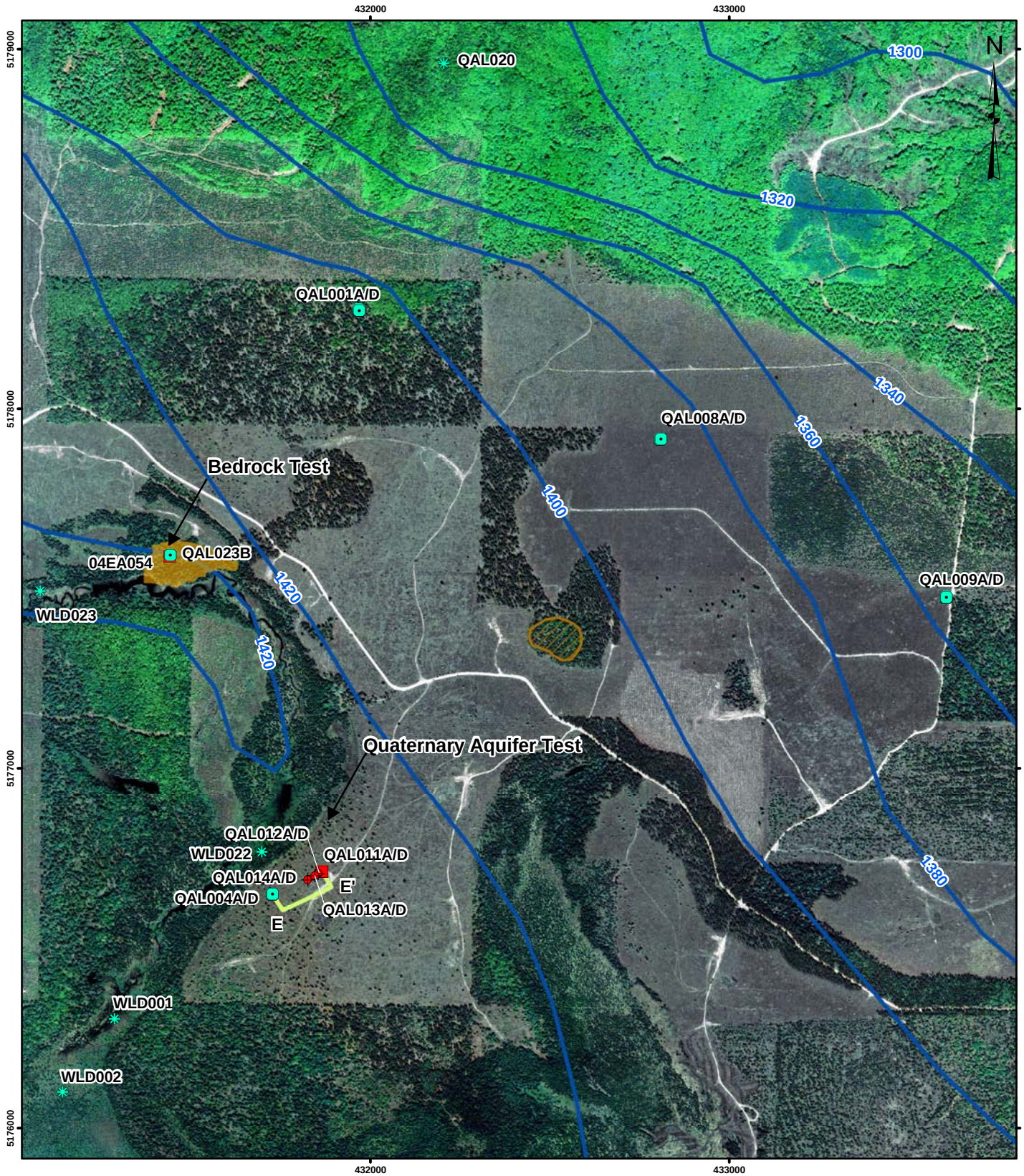
SURFACE EROSION MONITORING LOCATIONS

Golder Associates

PROJECT No. 033-2156c			SCALE AS SHOWN	REV. 0
DESIGN	KP	07 Sep. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	15 Mar. 2005		
REVIEW				

FIGURE: 8

I:\2003\033-2156\mapping\MXD\Stage2_Hydrology_Report\FIG_8_85x11.mxd



LEGEND

- ORE BODY
- OUTCROP
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, A ZONE OCTOBER 2004)
- CROSS-SECTION
- MONITORING WELL
- PIEZOMETER
- PUMP WELL
- OBSERVATION WELL

750 0 750

SCALE: 1:15,000 FEET

REFERENCE

Quickbird image provided by Digital Globe. Ground and surface water data from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

PROJECT: Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE: North Jackson Company

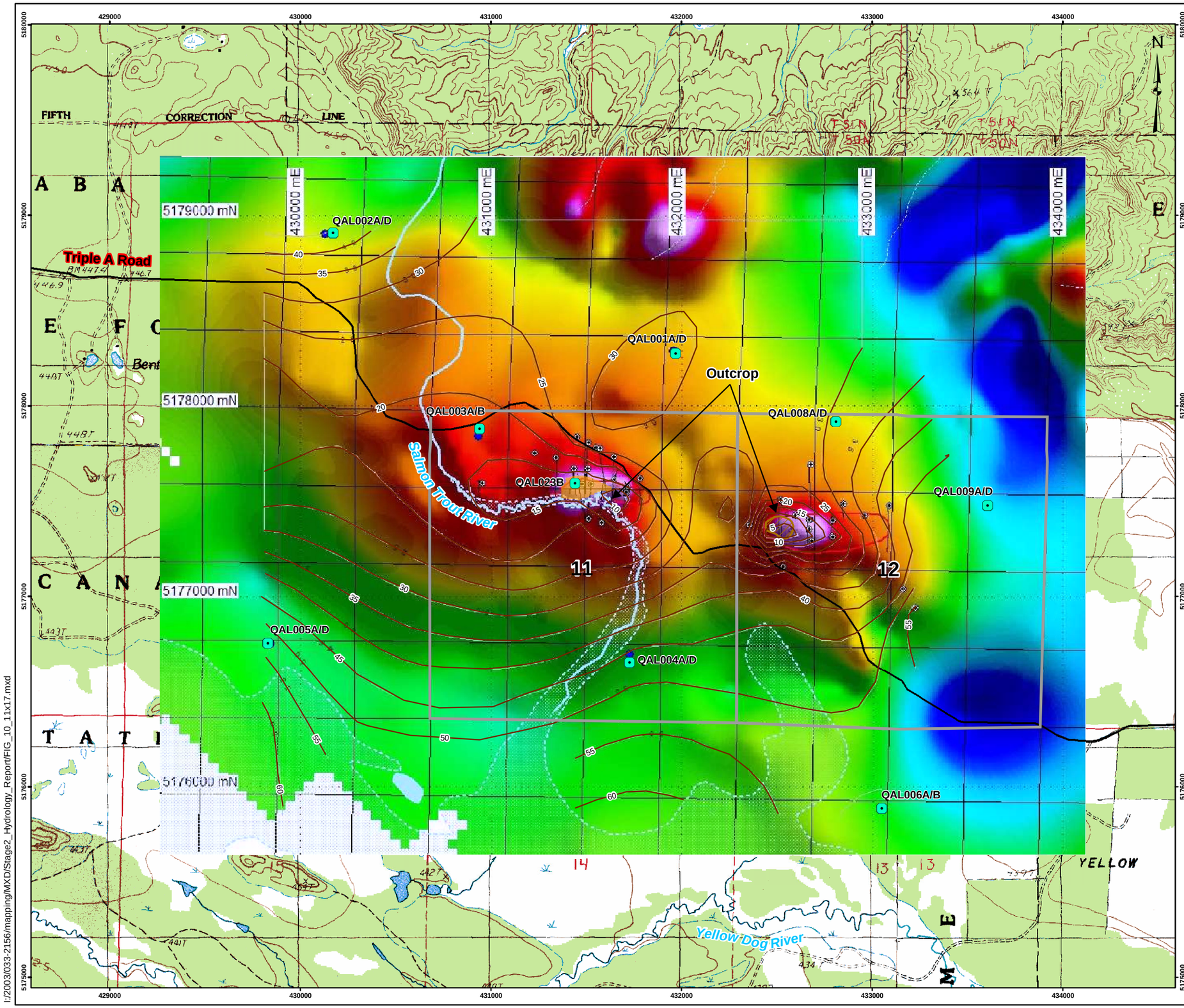
PUMPING TEST LOCATIONS

Golder Associates

PROJECT No. 033-2156c			SCALE AS SHOWN	REV. 0
DESIGN	KP	29 Sept. 2004		
GIS	CHW	29 Jun. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 9

I:\2003\033-2156\mapping\MXD\Stage2_Hydrology_Report\FIG_9_85x11.mxd



LEGEND

- ORE BODY
- OUTCROP
- UNCONSOLIDATED THICKNESS CONTOUR - METERS (CI = 5 m)
- MONITORING WELL
- EXPLORATION WELL
- SECTION

GRAVITY (mGal)

-3.11 -1.09 -0.52 -0.07 0.30 0.65 0.94 1.37 2.96

REFERENCE

DRG provided by Michigan DNR. Monitoring locations from North Jackson Company.
Gravity data from Kennecott Exploration Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

2,000 0 2,000
SCALE: 1:20,000 FEET

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY

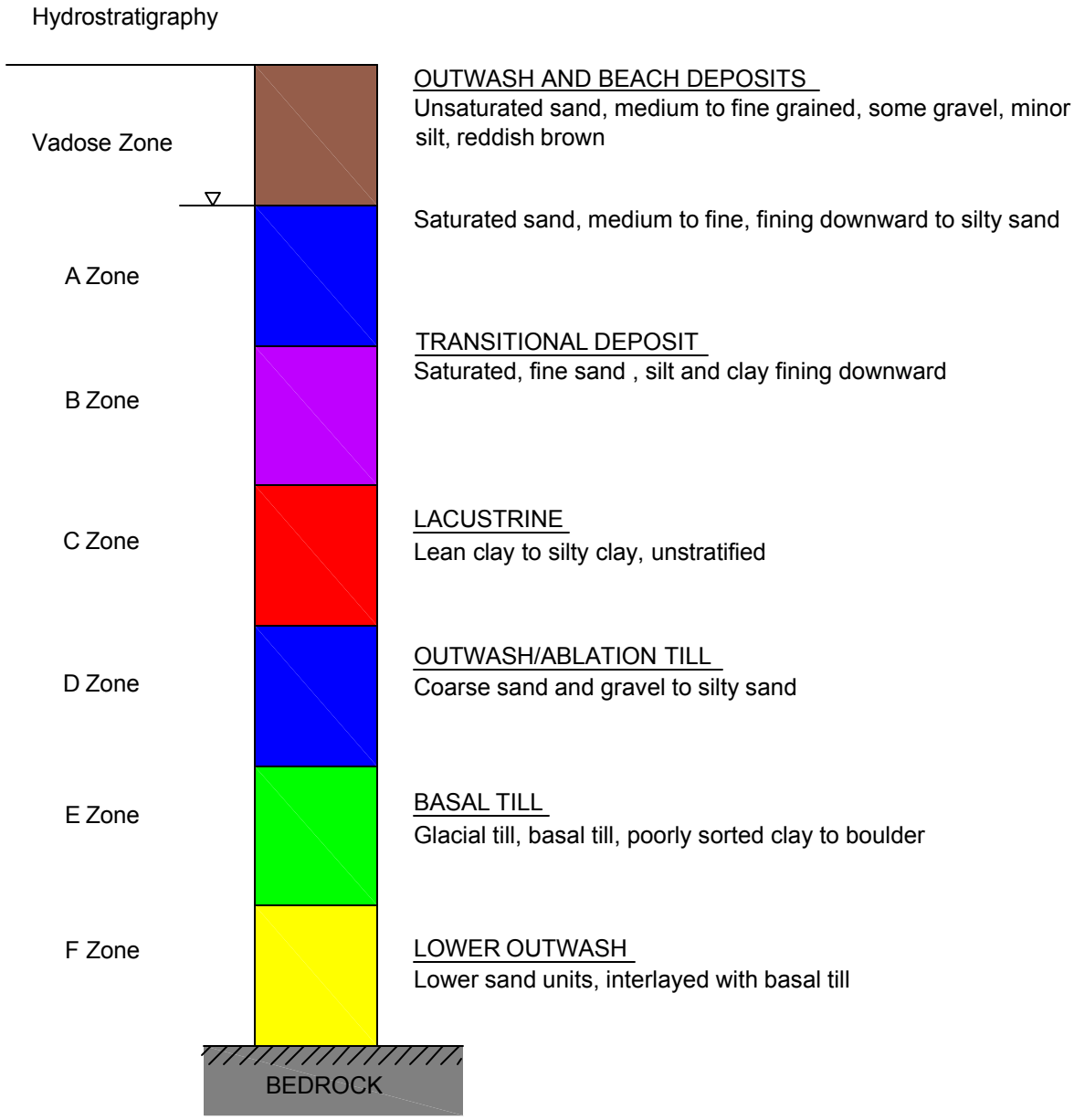
GRAVITY ANOMALY MAP

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	13 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 10

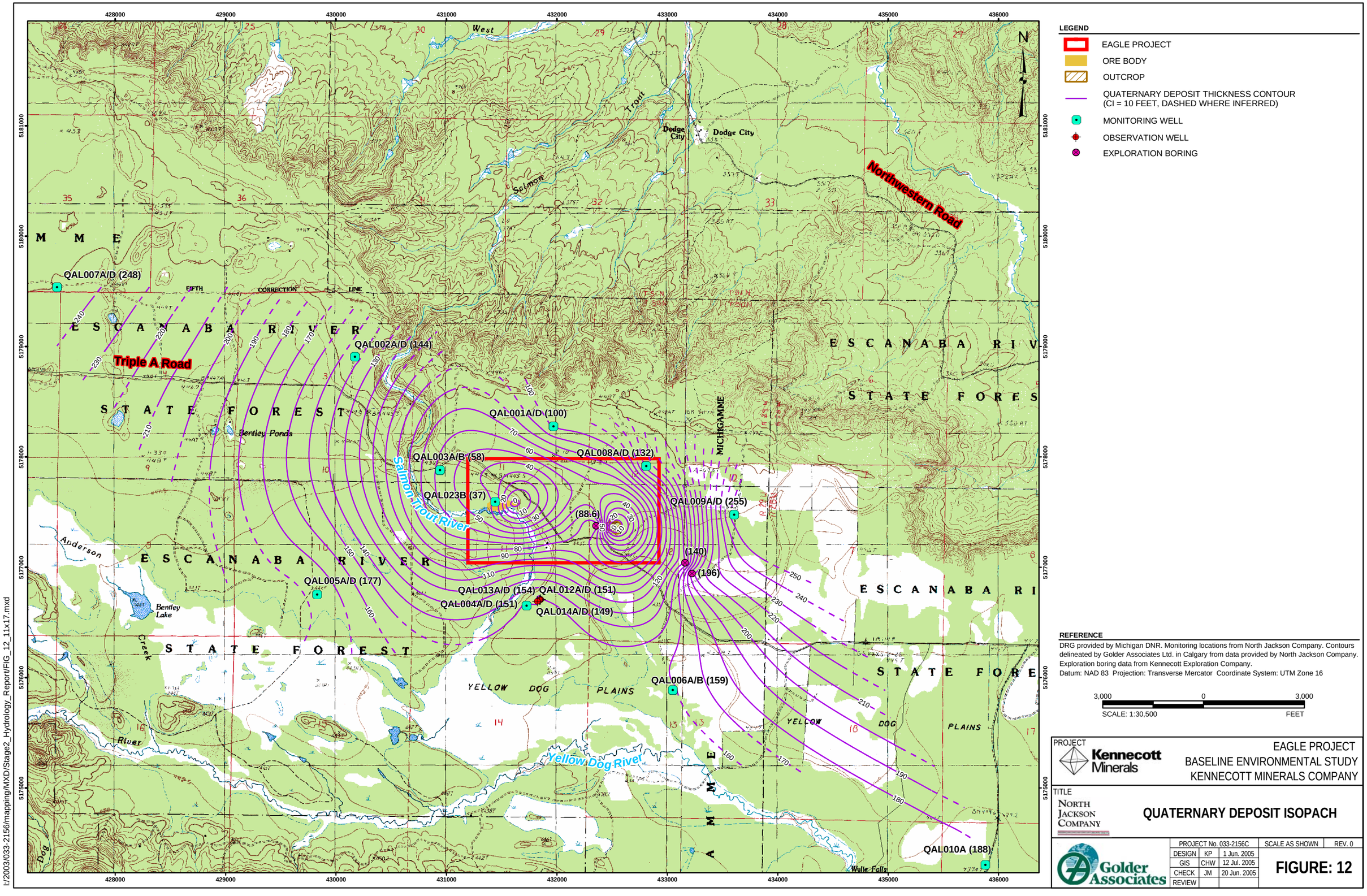
I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_10_11x17.mxd



NORTH JACKSON COMPANY
1004 Harbor Hills Drive, Suite 102
Marquette, MI 49855

Figure 11

QUATERNARY STRATIGRAPHIC COLUMN



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- QUATERNARY DEPOSIT THICKNESS CONTOUR (CI = 10 FEET, DASHED WHERE INFERRED)
- MONITORING WELL
- OBSERVATION WELL
- EXPLORATION BORING

REFERENCE

DRG provided by Michigan DNR. Monitoring locations from North Jackson Company. Contours delineated by Golder Associates Ltd. in Calgary from data provided by North Jackson Company. Exploration boring data from Kennecott Exploration Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company

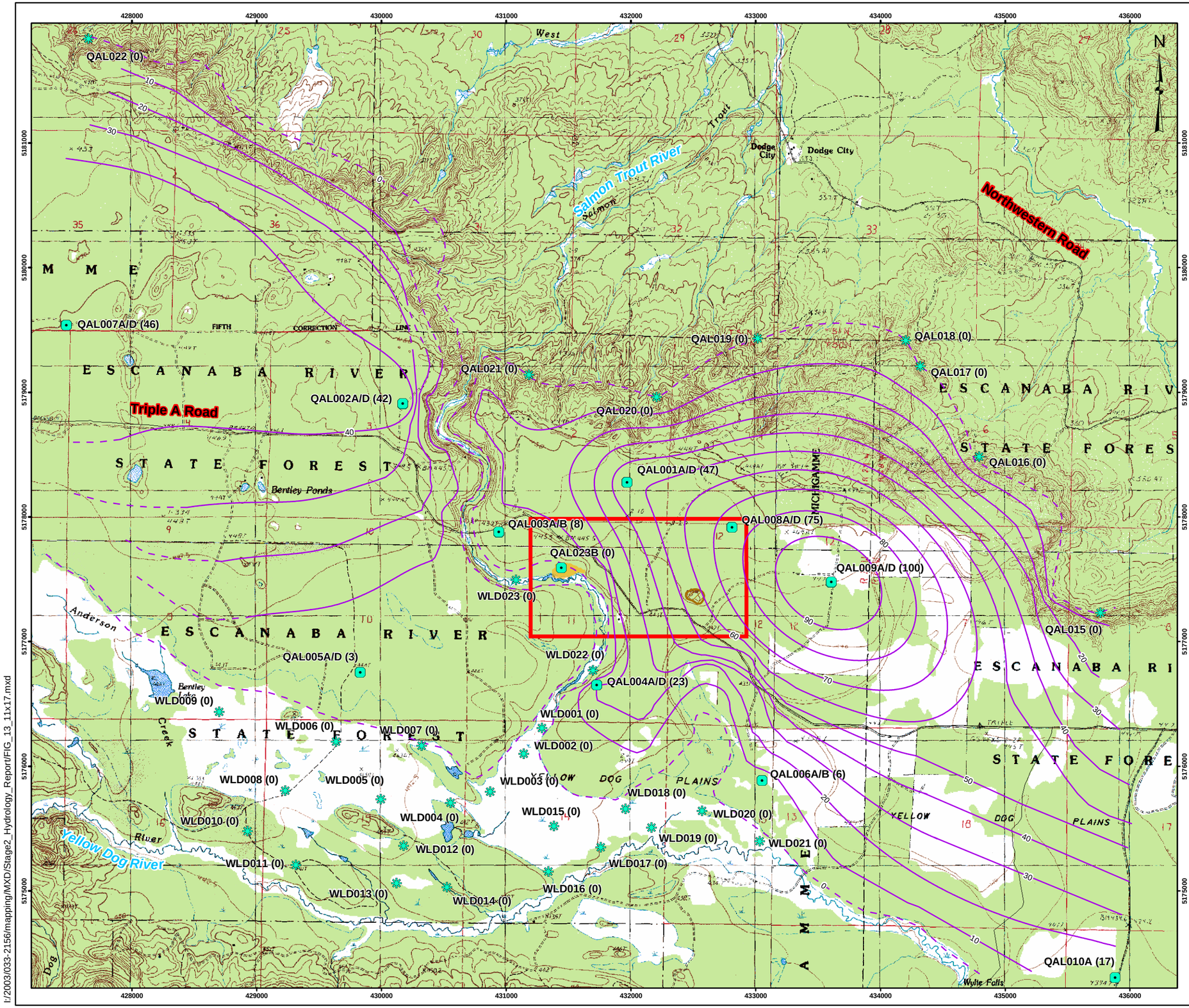
QUATERNARY DEPOSIT ISOPACH

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	1 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	20 Jun. 2005		
REVIEW				

FIGURE: 12

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_12_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- UNSATURATED THICKNESS CONTOUR (CI = 10 FEET, DASHED WHERE INFERRED)
- MONITORING WELL
- PIEZOMETER

Note:
Water elevation values from October 2004.

REFERENCE

DRG provided by Michigan DNR. Monitoring locations from North Jackson Company. Contours delineated by Golder Associates Ltd. in Calgary from data provided by North Jackson Company. Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

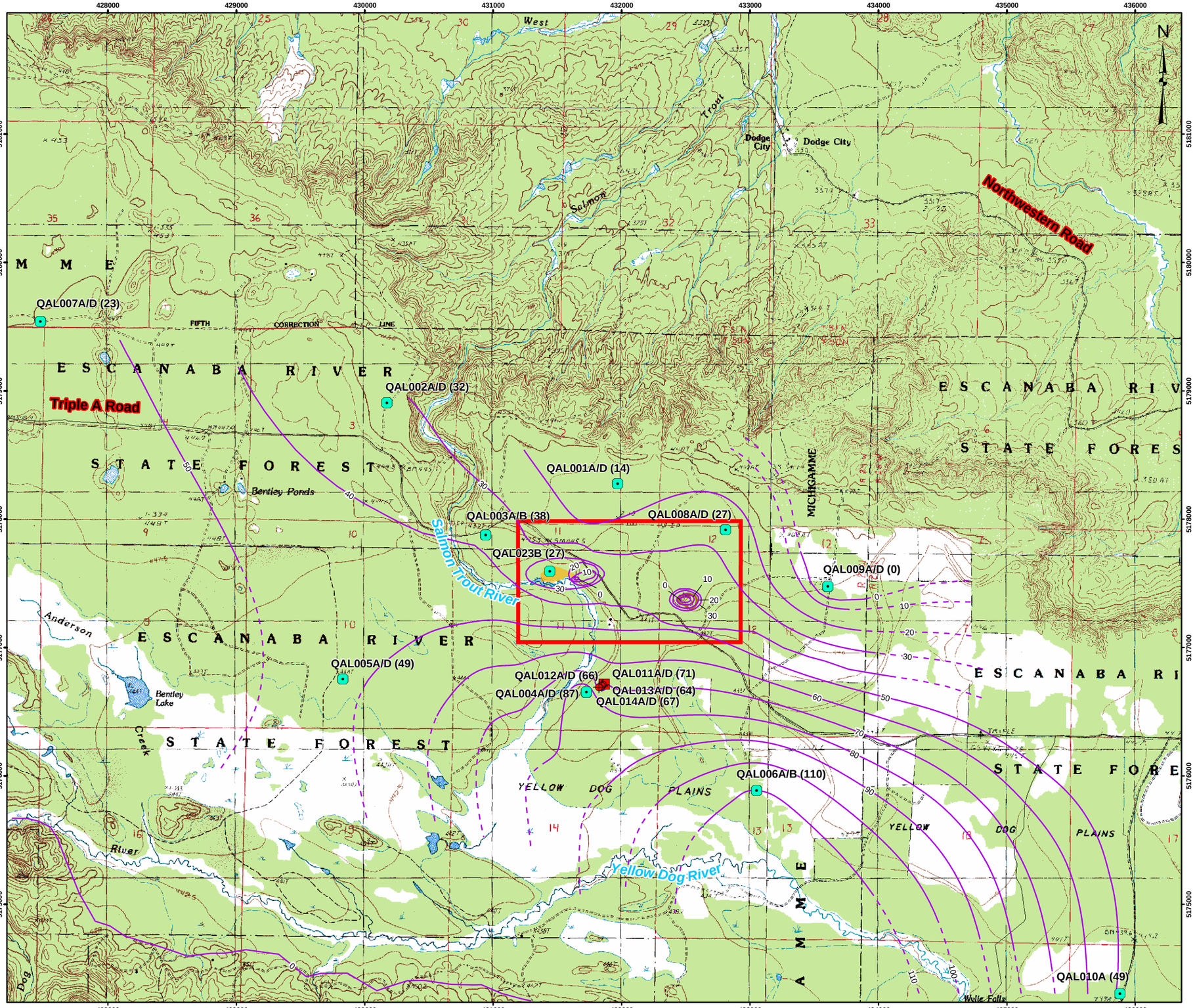
TITLE
NORTH JACKSON COMPANY
UNSATURATED ISOPACH

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	1 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 13

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_13_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP (CONFINING UNIT MISSING)
- CONFINING UNIT (B & C ZONE) THICKNESS CONTOUR (CI = 10 FEET, DASHED WHERE INFERRED)
- MONITORING WELL
- PUMP WELL
- OBSERVATION WELL

REFERENCE

DRG provided by Michigan DNR. Monitoring locations from North Jackson Company. Contours delineated by Golder Associates Ltd. in Calgary from data provided by North Jackson Company. Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

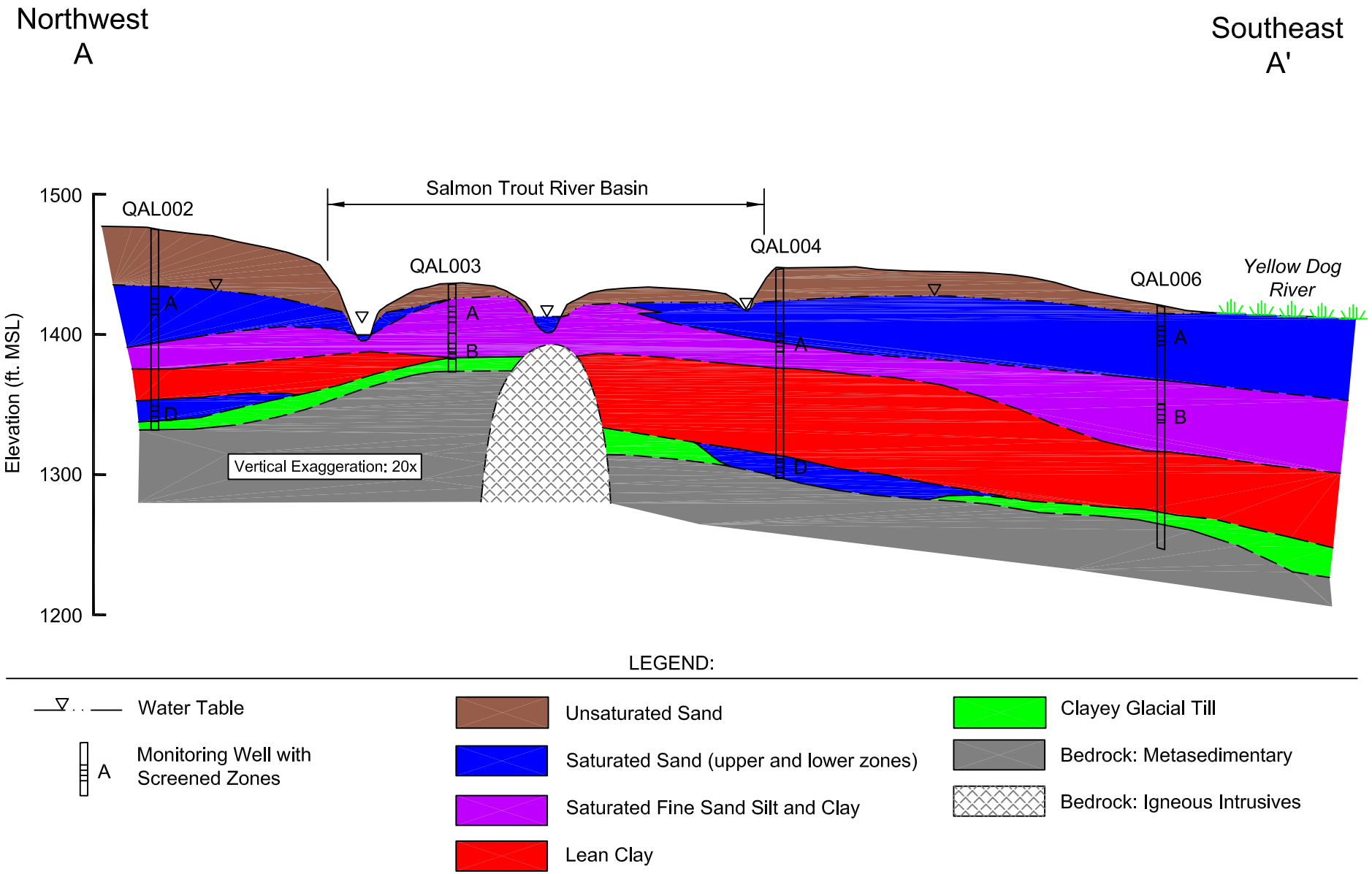
TITLE
NORTH JACKSON COMPANY
CONFINING UNIT (B & C ZONE) ISOPACH

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	1 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

FIGURE: 14

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_14_11x17.mxd



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Marquette, MI 49855

0 2,000
Feet
Vertical Exaggeration: 20x

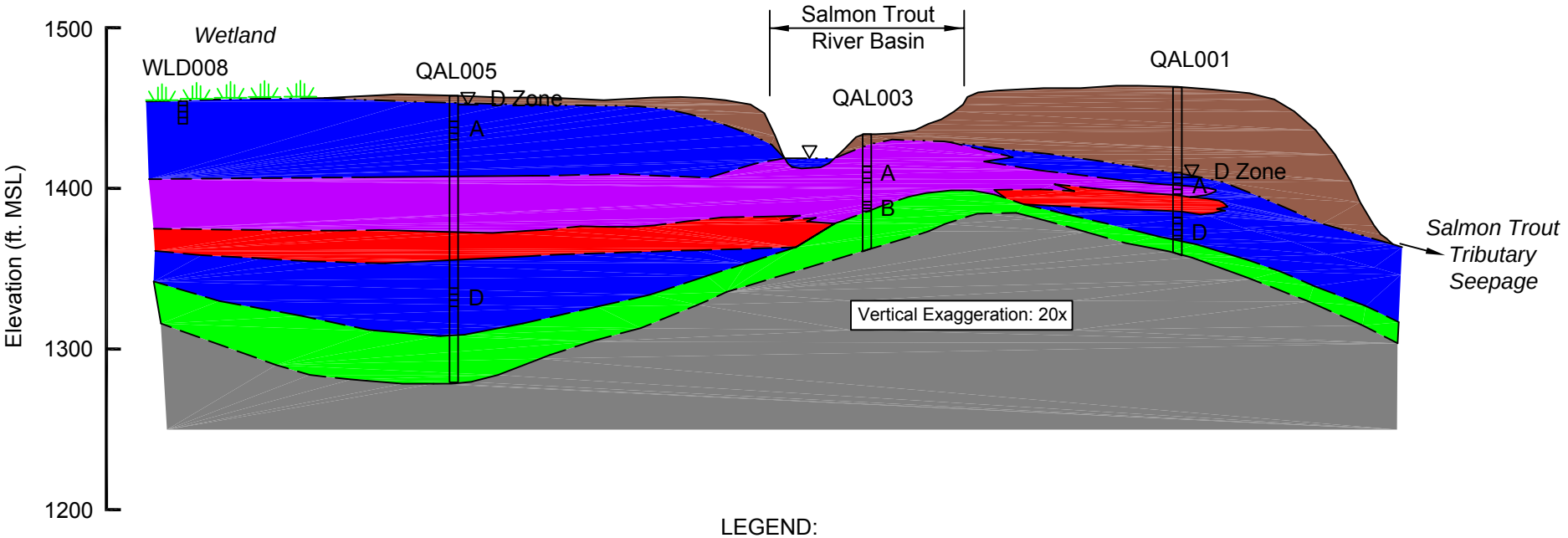
FIGURE 15

CONCEPTUAL HYDROGEOLOGIC CROSS SECTION A-A'

Eagle Project

Southwest
B

Northeast
B'



LEGEND:

- Water Table
- A — Monitoring Well with Screened Zones
- D Zone — Water Elevation D Zone
- Unsaturated Sand
- Saturated Sand (upper and lower zones)
- Saturated Fine Sand Silt and Clay
- Lean Clay
- Clayey Glacial Till
- Bedrock: Metasedimentary

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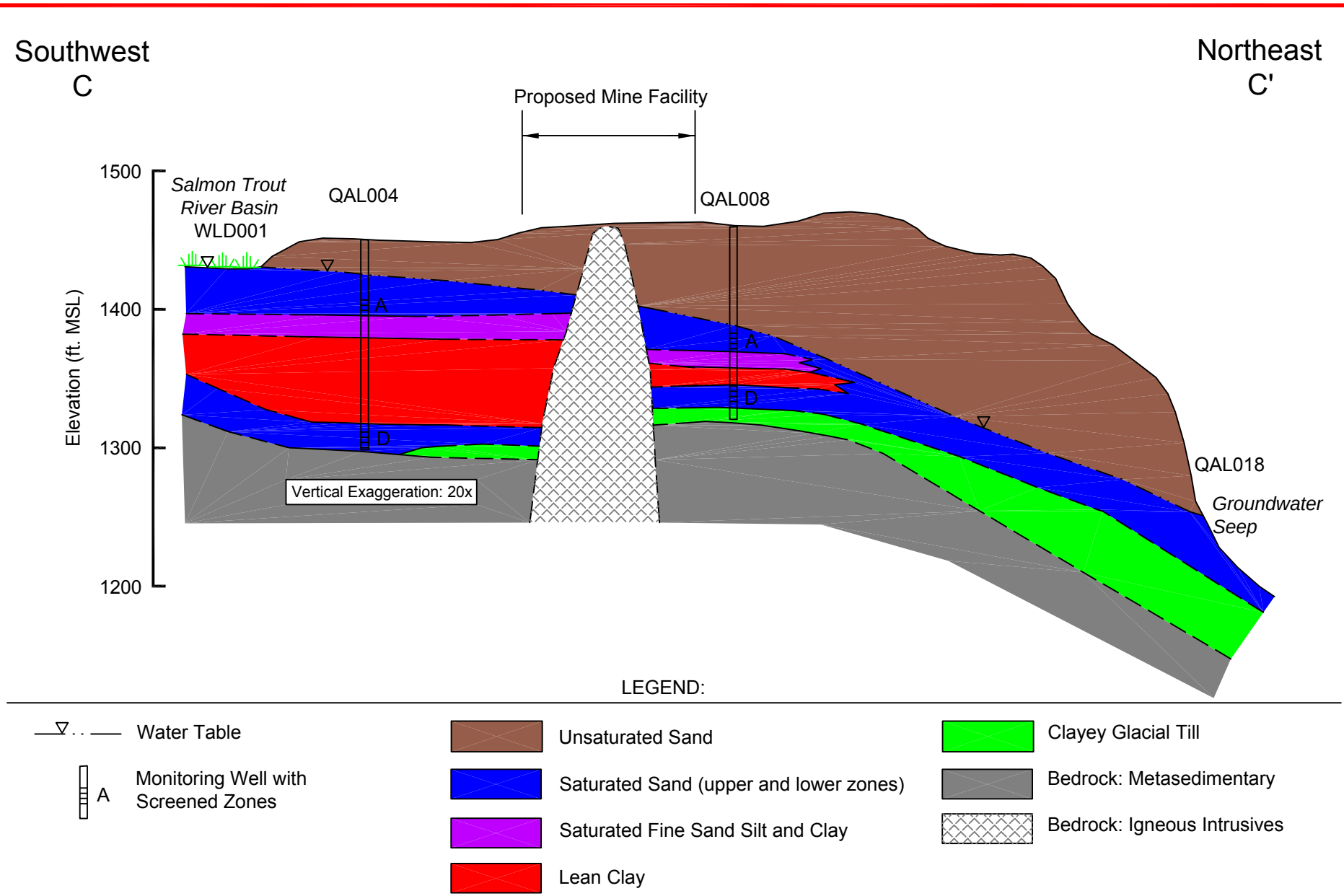
0 2,000
Feet
Vertical Exaggeration: 20x

FIGURE 16

CONCEPTUAL HYDROGEOLOGIC CROSS SECTION B-B'

Eagle Project

C:\GIS - Business\Projects\North Jackson\Eagle\2005 Work\Figure 16 - 05.dwg 09/19/2005 05:46:29 AM



NORTH JACKSON COMPANY
1004 Harbor Hills Drive, Suite 102
Marquette, MI 49855

0 2,000
Feet
Vertical Exaggeration: 20x

FIGURE 17

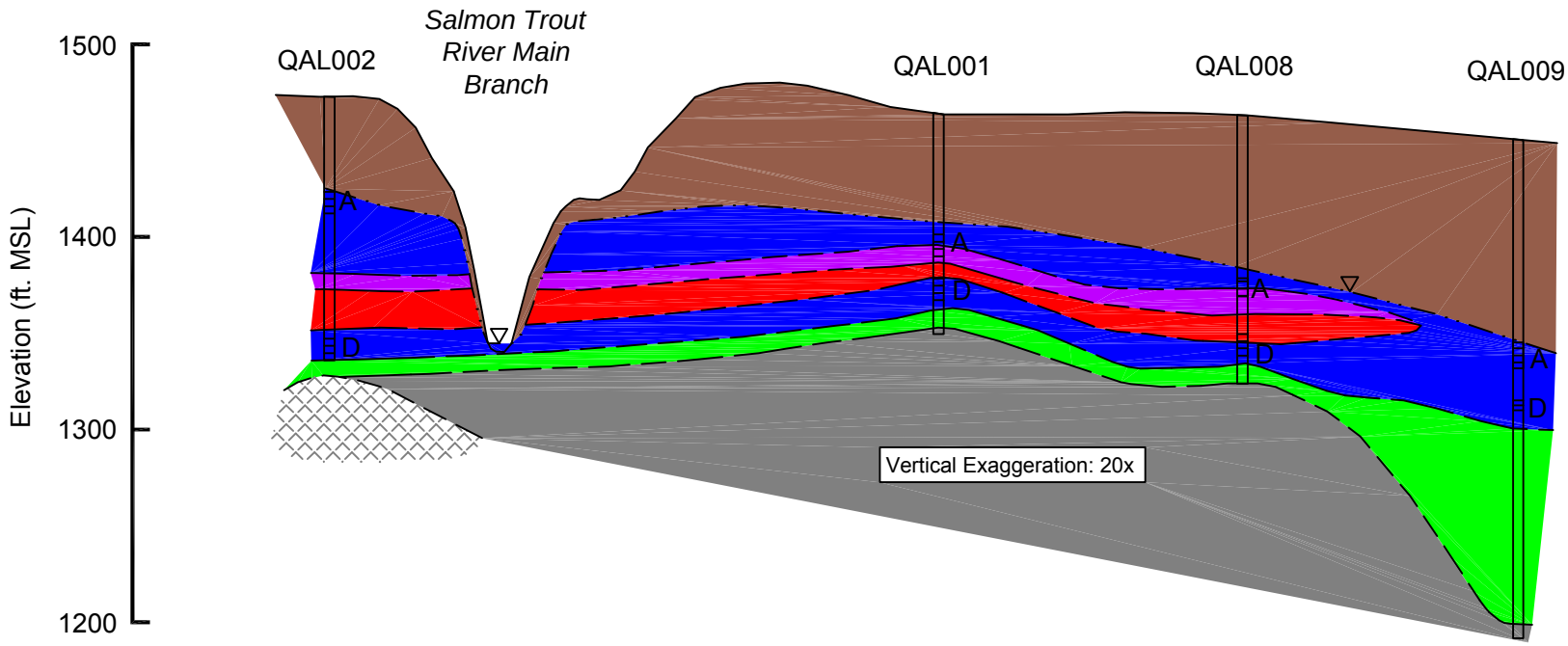
CONCEPTUAL HYDROGEOLOGIC CROSS SECTION C-C'

Eagle Project

C:\GIS - Business\Projects\North Jackson\Eagle\2005 Work\Figure 17 - 05.dwg 09/19/2005 02:52:36 PM

Northwest
D

Southeast
D'



LEGEND:

- Water Table A-Zone
- A — Monitoring Well with Screened Zones
- Unsaturated Sand
- Saturated Sand (upper and lower zones)
- Saturated Fine Sand Silt and Clay
- Lean Clay
- Clayey Glacial Till
- Bedrock: Metasedimentary
- Bedrock: Igneous Intrusives

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Marquette, MI 49855

0 2,000
Feet
Vertical Exaggeration: 20x

FIGURE 18

CONCEPTUAL HYDROGEOLOGIC CROSS SECTION D-D'

Eagle Project

C:\CIS - Business\Projects\North Jackson\Eagle\2005 Work\Figure 18 - 05.dwg, 09/19/2005 05:46:05 AM

Figure 19
Monthly Precipitation from June 2004 to May 2005 at the Marquette National Weather Service Monitoring Station
Compared to Average Monthly Precipitation from 1979 to 1998
Eagle Project

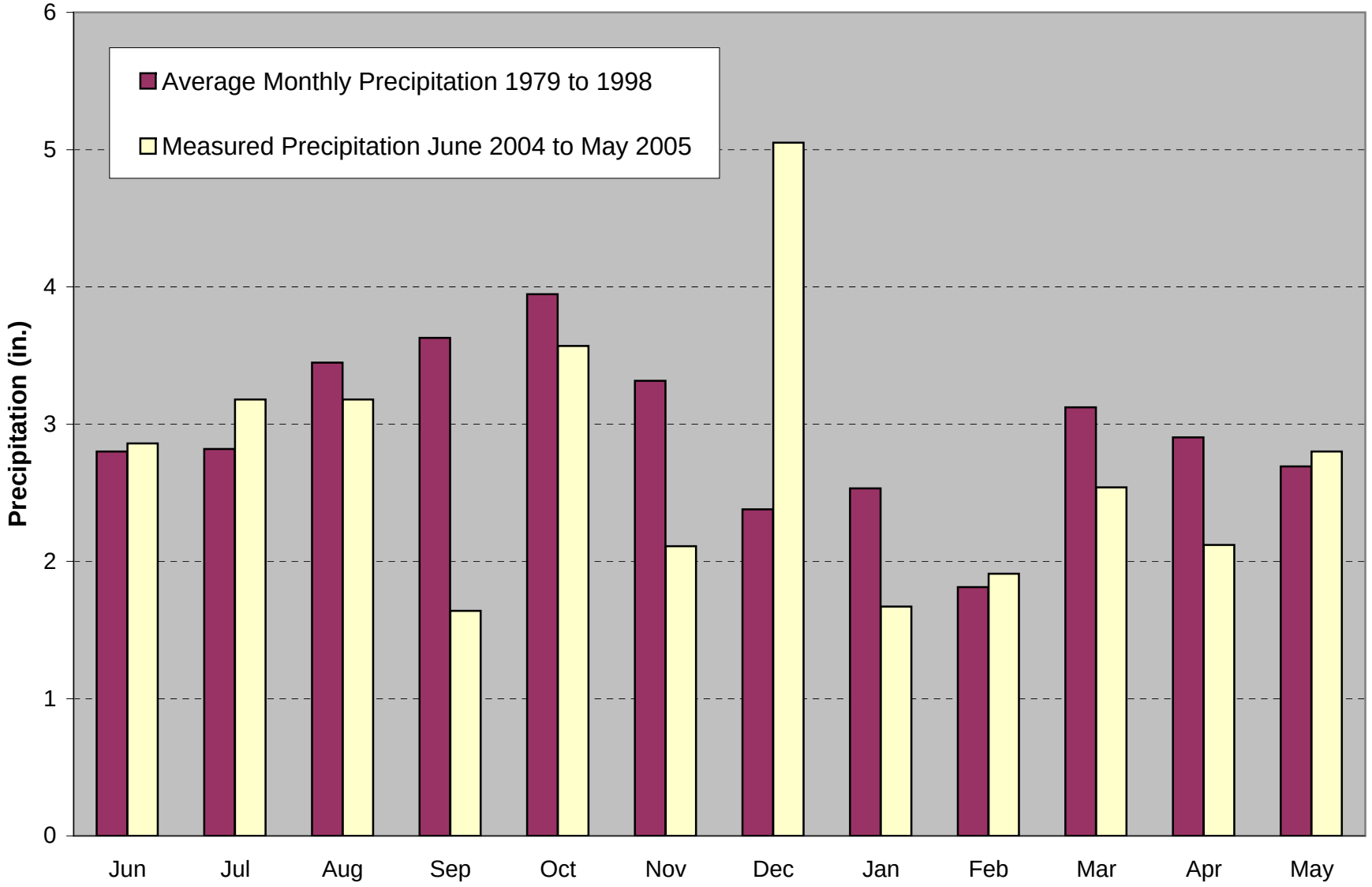


Figure 19: Regional Precipitation Plot

Figure 20
Hydrographs of Mean Daily Flow for Salmon Trout River and Yellow Dog River Continuous Monitoring Locations
(September 2004-May 2005)
Eagle Project

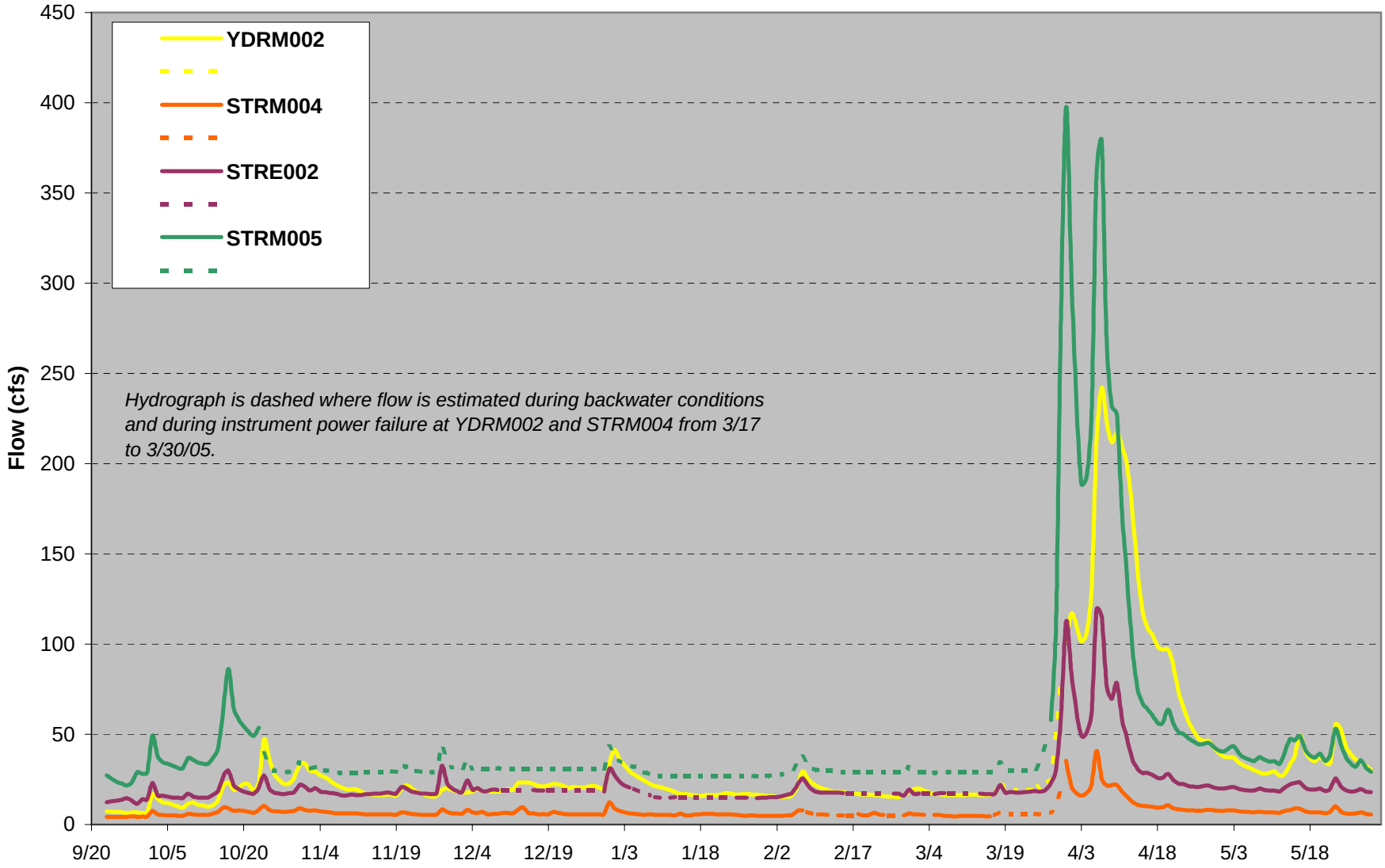
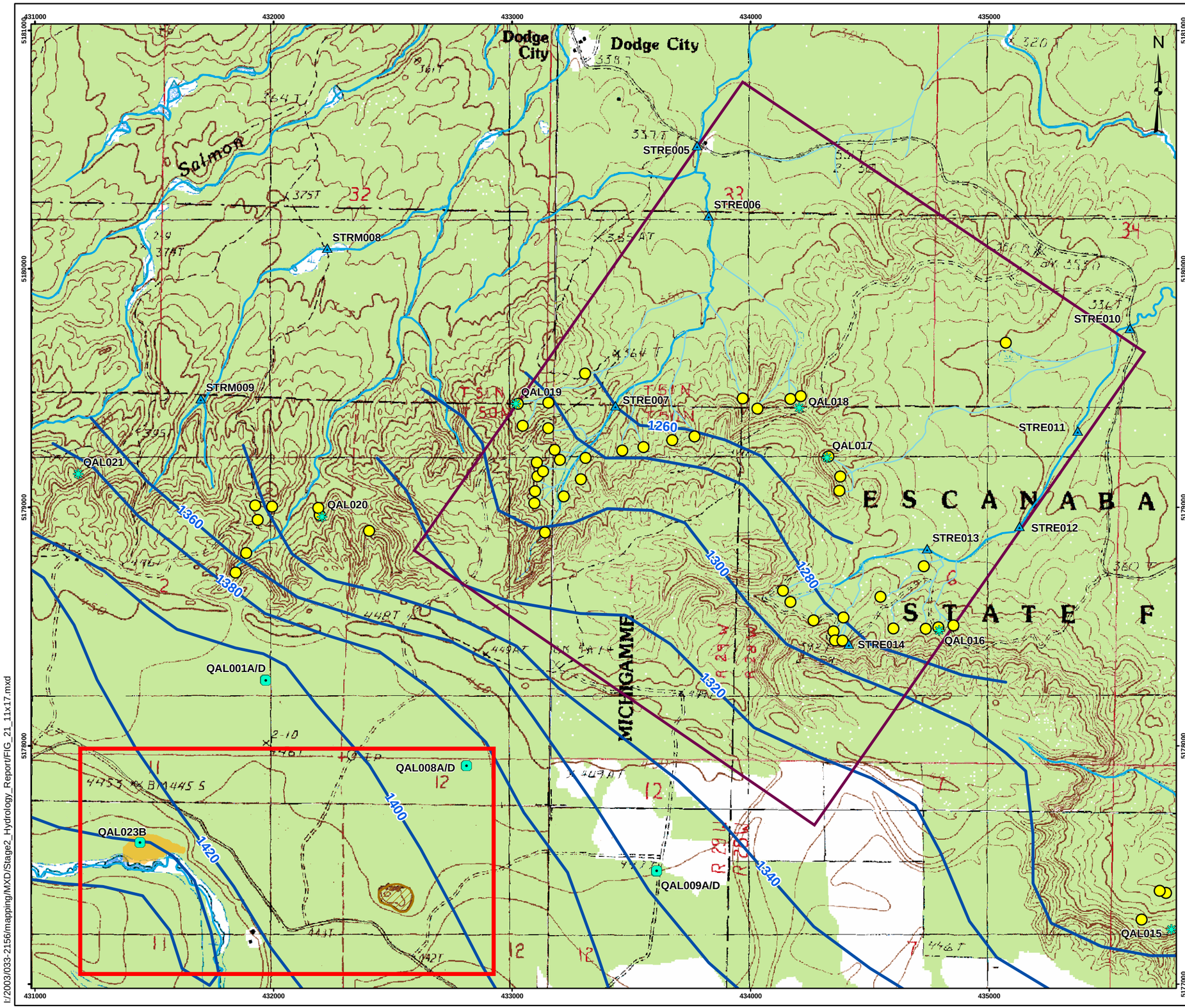


Figure 20: Hydrographs



LEGEND

- AREA OF DETAILED SEEP AND SURFACE WATER MAPPING
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- GROUNDWATER CONTOUR - FEET (CI = 20 FEET, A ZONE SPRING SNOWMELT RUNOFF, MAY 2005)
- STREAM
- MONITORING WELL
- SURFACE WATER MONITORING LOCATION
- SEEP (MAPPED MAY-JUNE 2005)

REFERENCE

DRG provided by Michigan DNR. Modeling data North Jackson Company and Fletcher Driscoll & Associates. Monitoring locations from North Jackson Company. Hydrological data updated by North Jackson Company with GPS. Source data for update provided by Golder Associates.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

2,000 0 2,000
SCALE: 1: 16,000 FEET

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY

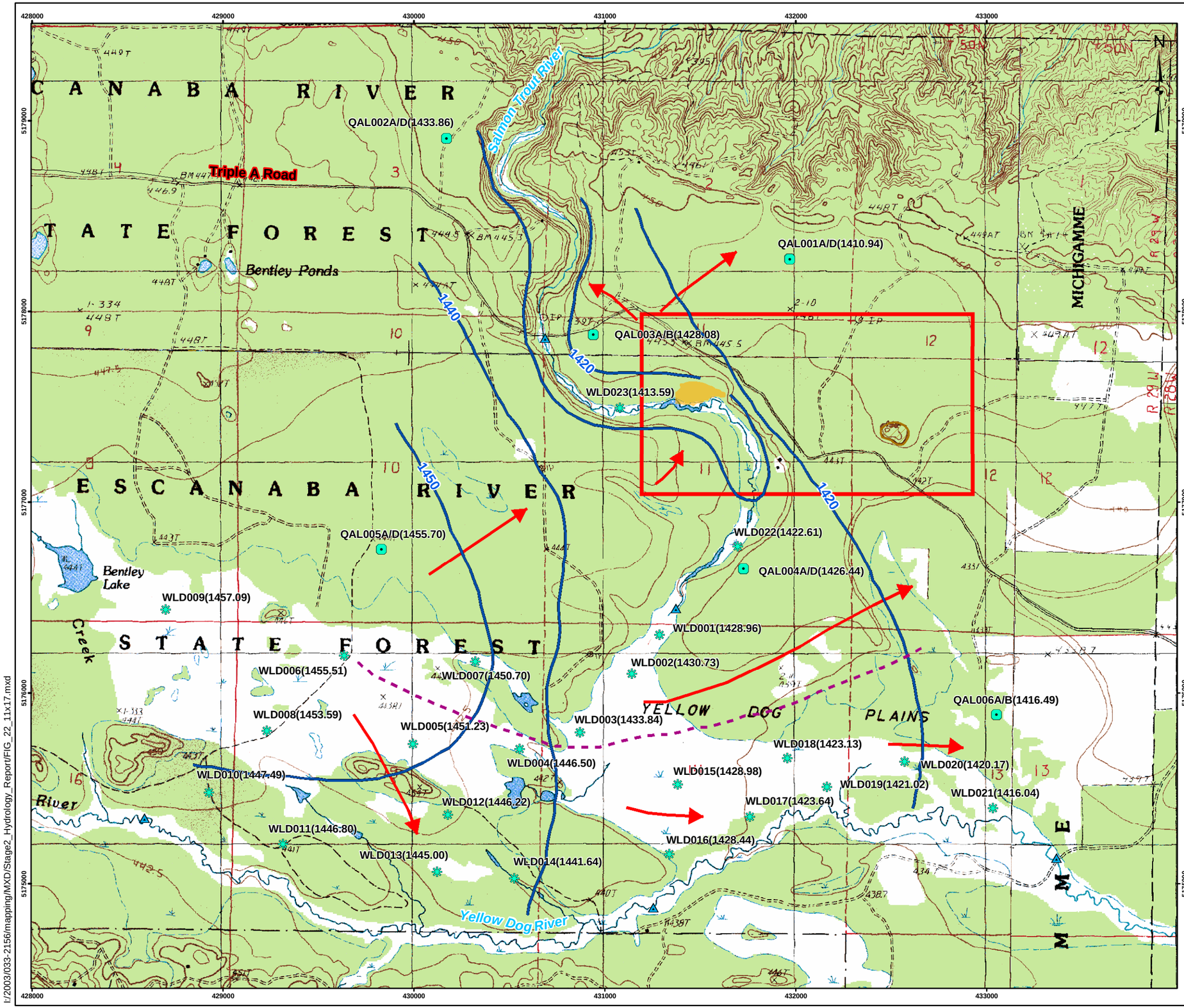
DETAILED SEEP AND SURFACE WATER MAPPING DOWNGRADIENT OF EAGLE PROJECT AREA

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005		
GIS	CHW	30 Jun. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

FIGURE: 21

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_21_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- GROUNDWATER FLOWLINE
- GROUNDWATER DRAINAGE DIVIDE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOURS AT 1450 ft)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION
- **(1416.49)** GROUNDWATER ELEVATION (ft MSL on 5/11/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

2,000 0 2,000
SCALE: 1: 20,000 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

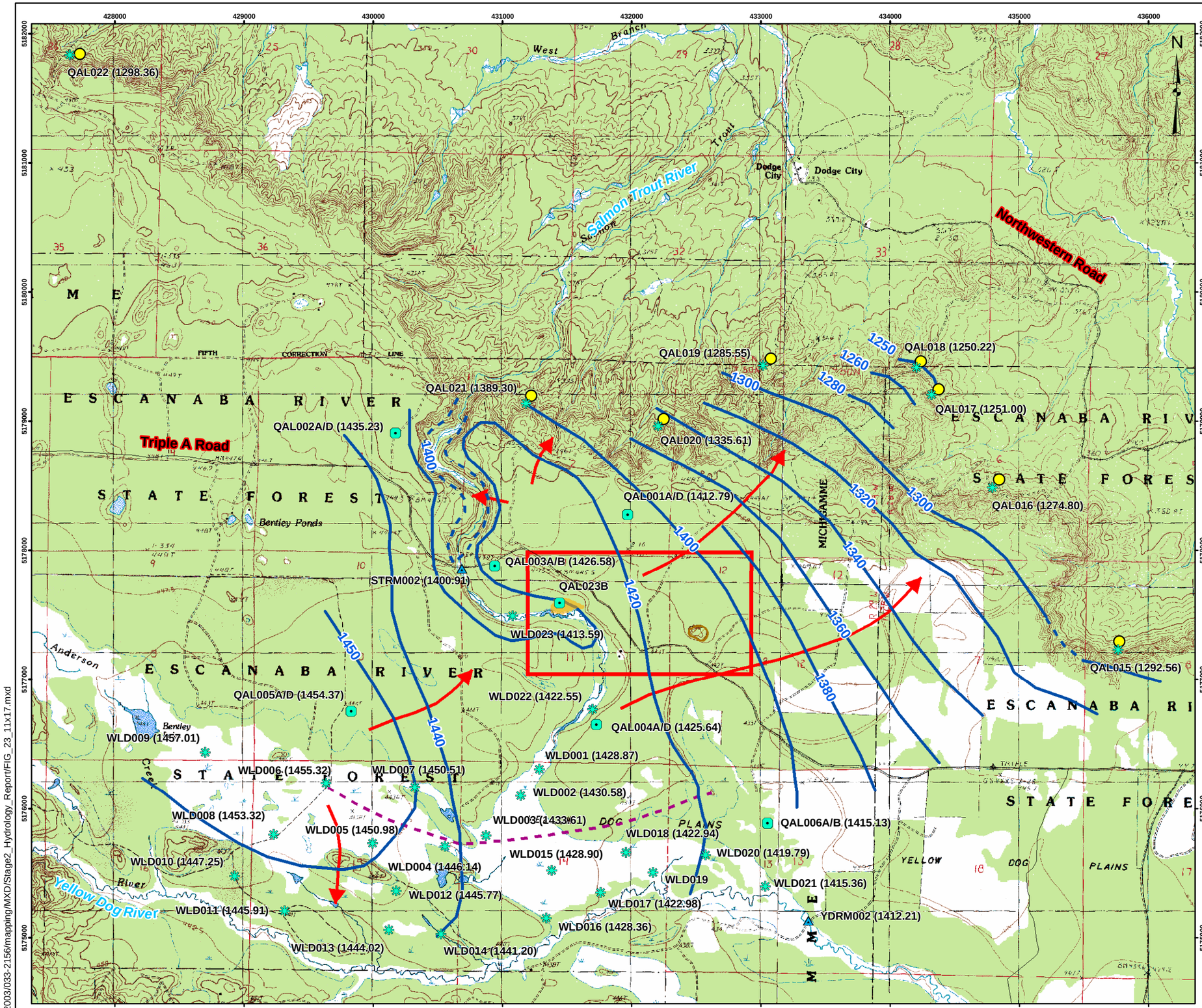
TITLE
North Jackson Company
A ZONE GROUNDWATER ELEVATION CONTOURS (SPRING SNOWMELT RUNOFF, MAY 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 22

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_22_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- GROUNDWATER FLOWLINE
- GROUNDWATER DRAINAGE DIVIDE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOURS AT 1250 AND 1450 ft)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION
- SEEP
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 8/26/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1: 30,000 FEET

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY

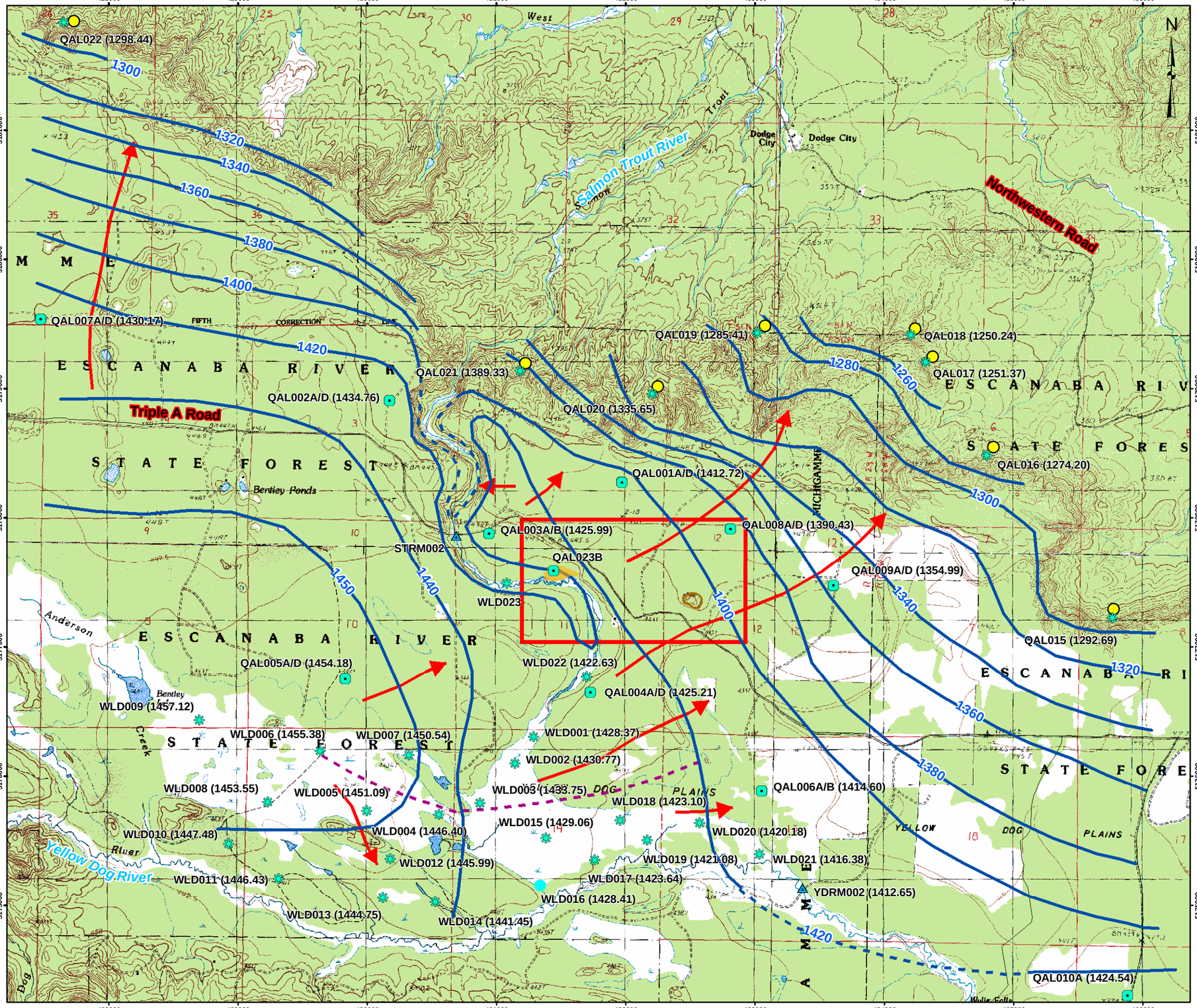
A ZONE GROUNDWATER ELEVATION CONTOURS (SUMMER BASEFLOW, AUGUST 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	8 Jun. 2005		
REVIEW				

FIGURE: 23

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_23_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- GROUNDWATER FLOWLINE
- GROUNDWATER DRAINAGE DIVIDE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOURS AT 1450 ft)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION
- SEEP
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 10/27/04 or 11/10/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY

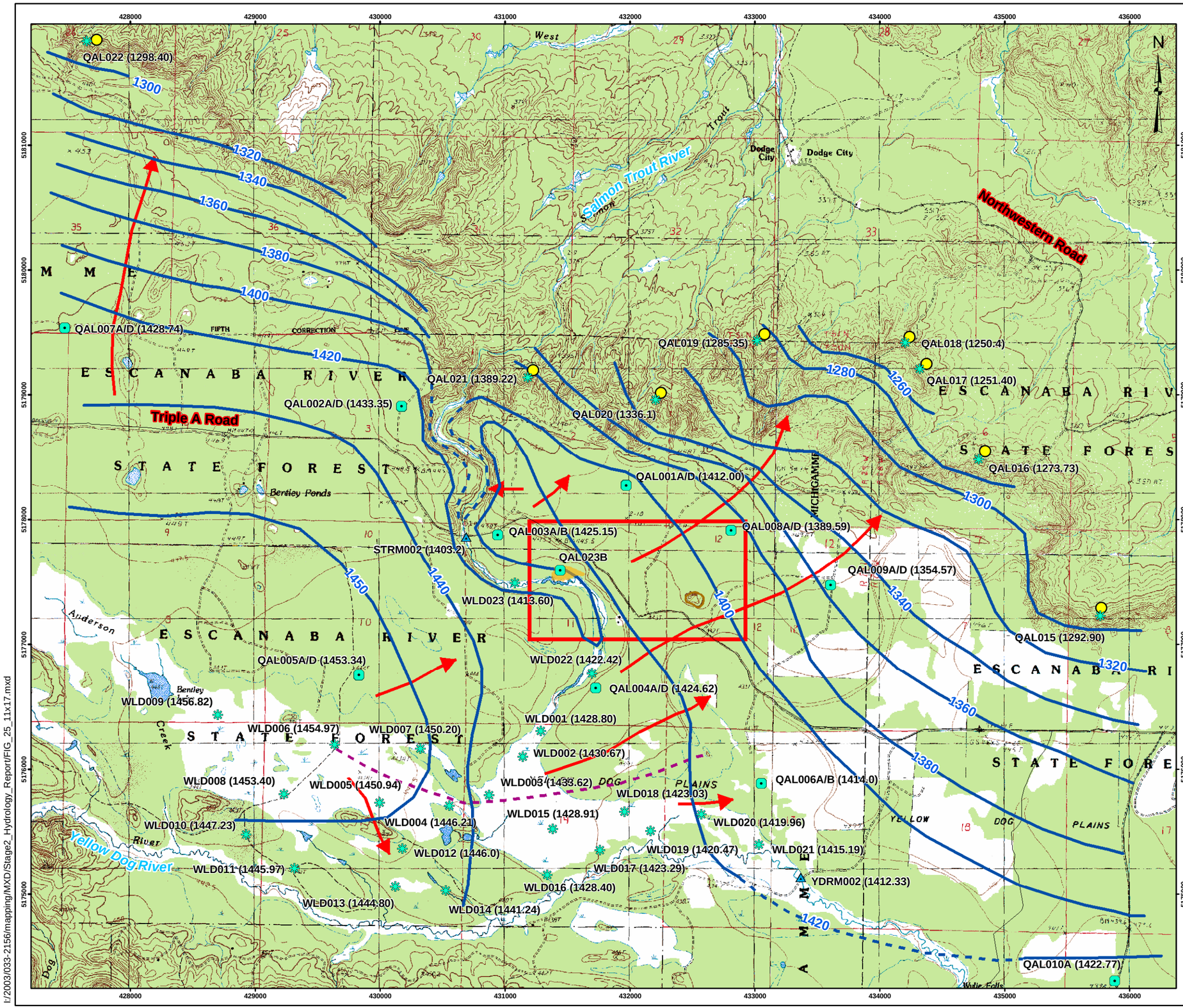
A ZONE GROUNDWATER ELEVATION CONTOURS (FALL RAIN RUNOFF, OCTOBER 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	8 Jun. 2005		
REVIEW				

FIGURE: 24

t:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_24_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- GROUNDWATER FLOWLINE
- GROUNDWATER DRAINAGE DIVIDE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOURS AT 1450 ft)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION
- SEEP
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 3/15/05)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

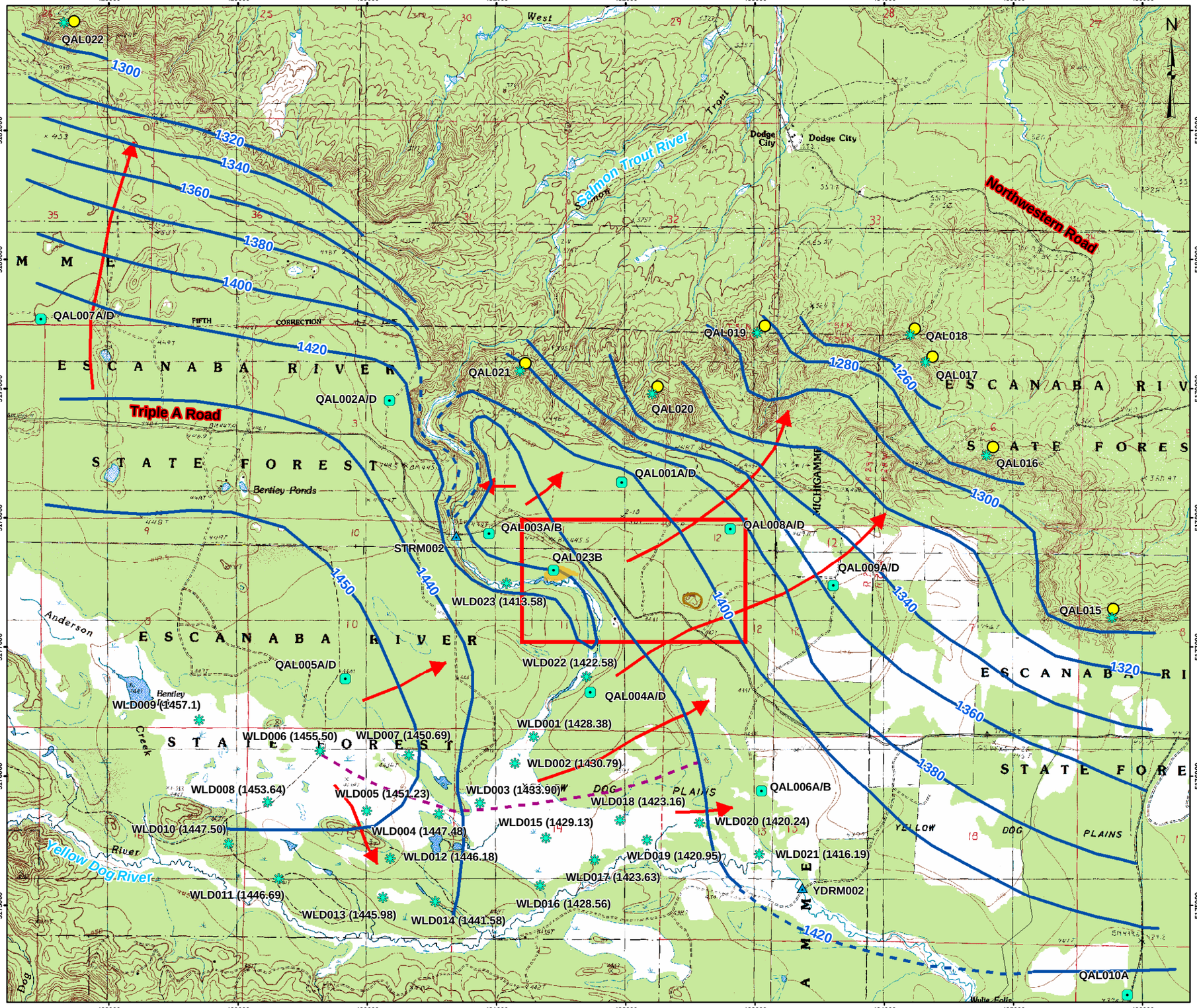
PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY
A ZONE GROUNDWATER ELEVATION CONTOURS (WINTER BASEFLOW, MARCH 2005)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	2 Jun. 2005	**FIGURE: 25**	
GIS	CHW	12 Jul. 2005		
CHECK	JM	14 Jun. 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_25_11x17.mxd



LEGEND

- EAGLE PROJECT
- ORE BODY
- OUTCROP
- GROUNDWATER FLOWLINE
- GROUNDWATER DRAINAGE DIVIDE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOURS AT 1450 ft)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION
- SEEP
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 5/4/05)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE: 1:30,500 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

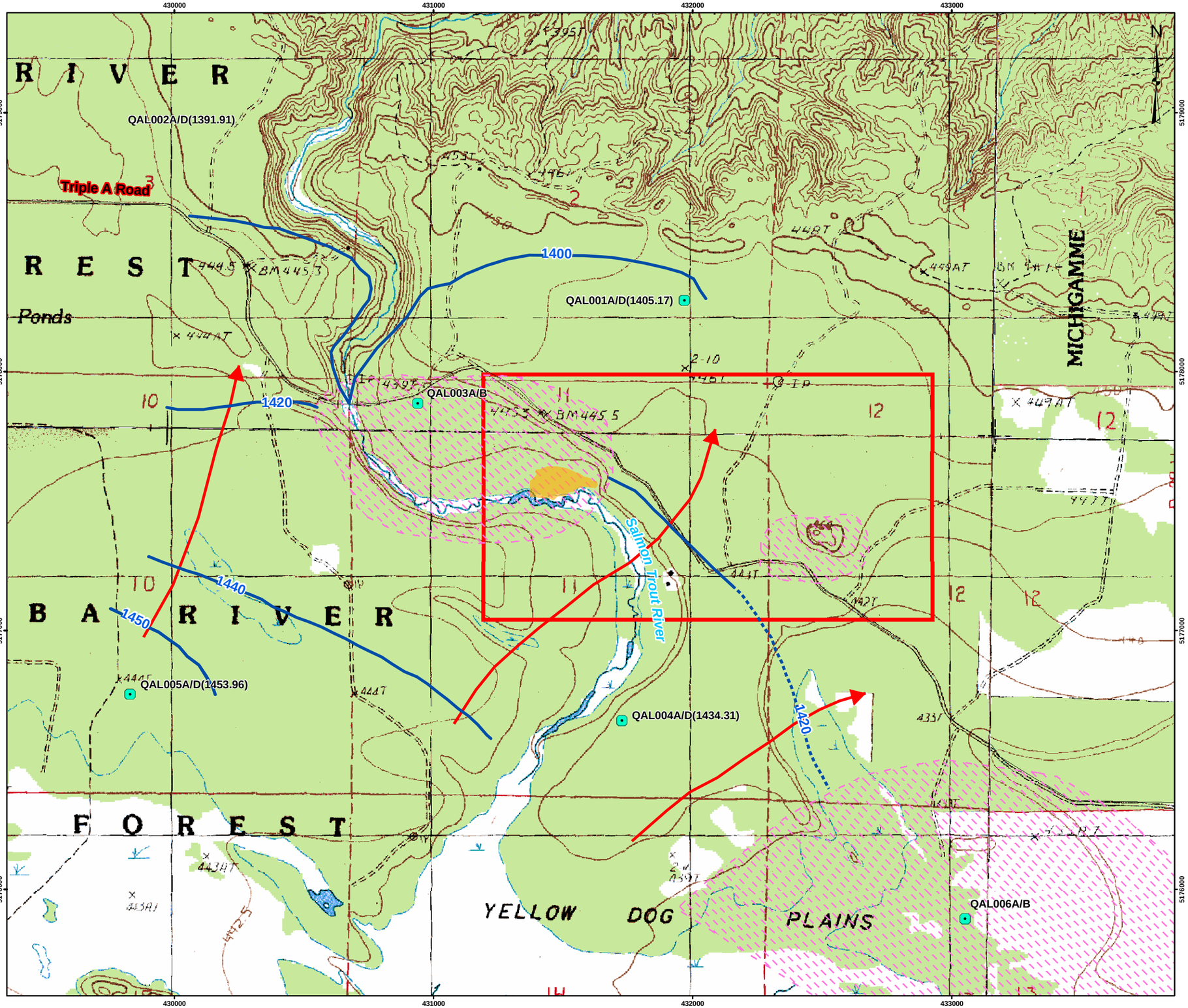
TITLE
North Jackson Company
A ZONE GROUNDWATER ELEVATION CONTOURS (SPRING SNOWMELT RUNOFF, MAY 2005)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	2 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	13 Jun. 2005		
REVIEW				

FIGURE: 26

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_26_11x17.mxd



LEGEND

- EAGLE PROJECT
- D-ZONE DISCONTINUITY
- ORE BODY
- GROUNDWATER FLOWLINE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOUR AT 1450 ft)
- MONITORING WELL
- **(1416.49)** GROUNDWATER ELEVATION (ft MSL on 5/11/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1,500 0 1,500
SCALE: 1:15,000 FEET

PROJECT
Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company

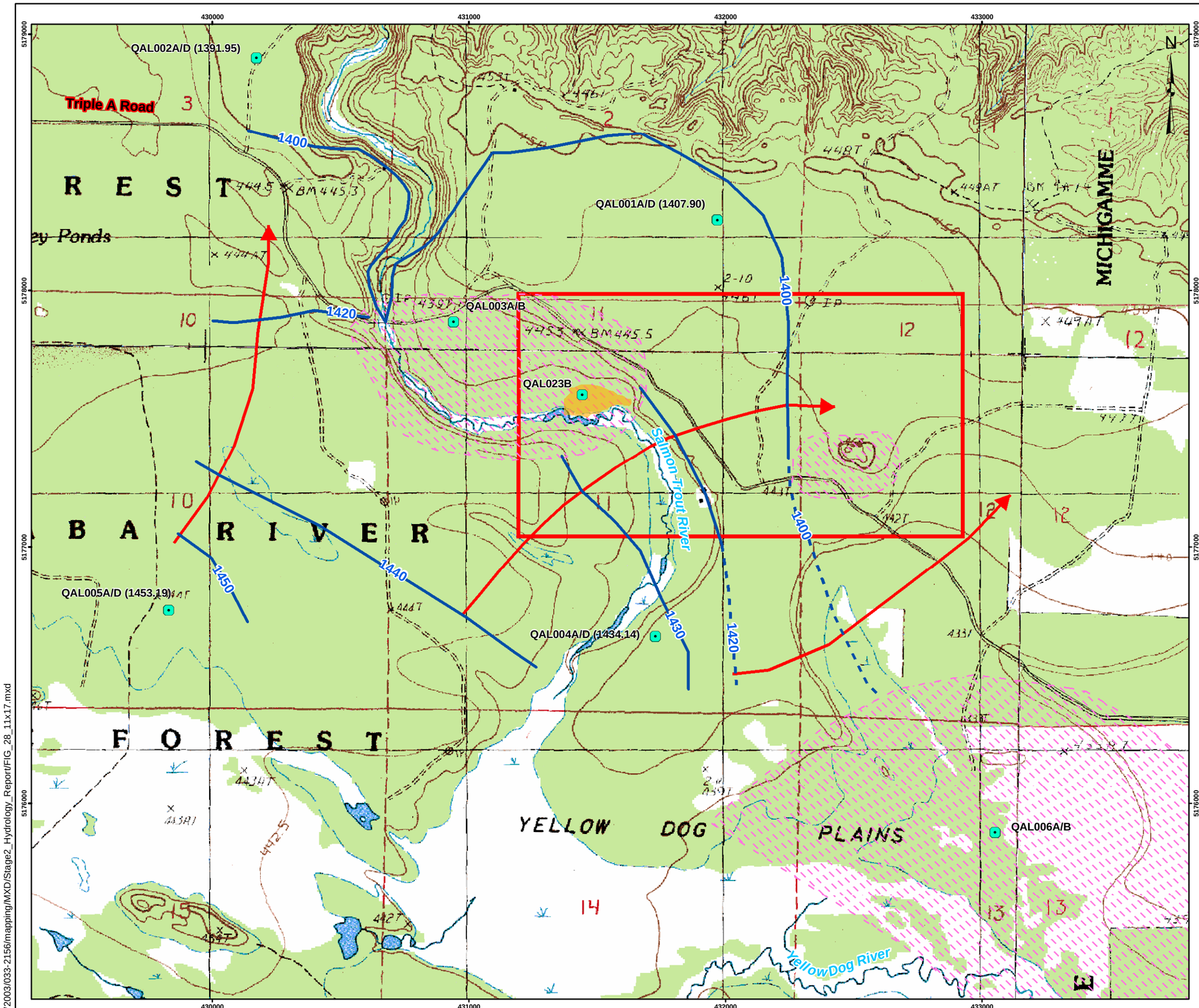
D ZONE GROUNDWATER ELEVATION CONTOURS (SPRING SNOWMELT RUNOFF, MAY 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	8 Jun. 2005		
REVIEW				

FIGURE: 27

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_27_11x17.mxd



LEGEND

- EAGLE PROJECT
- D-ZONE DISCONTINUITY
- ORE BODY
- GROUNDWATER FLOWLINE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOUR AT 1430 and 1450 ft)
- MONITORING WELL
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 8/26/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1,500 0 1,500
SCALE: 1:15,000 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

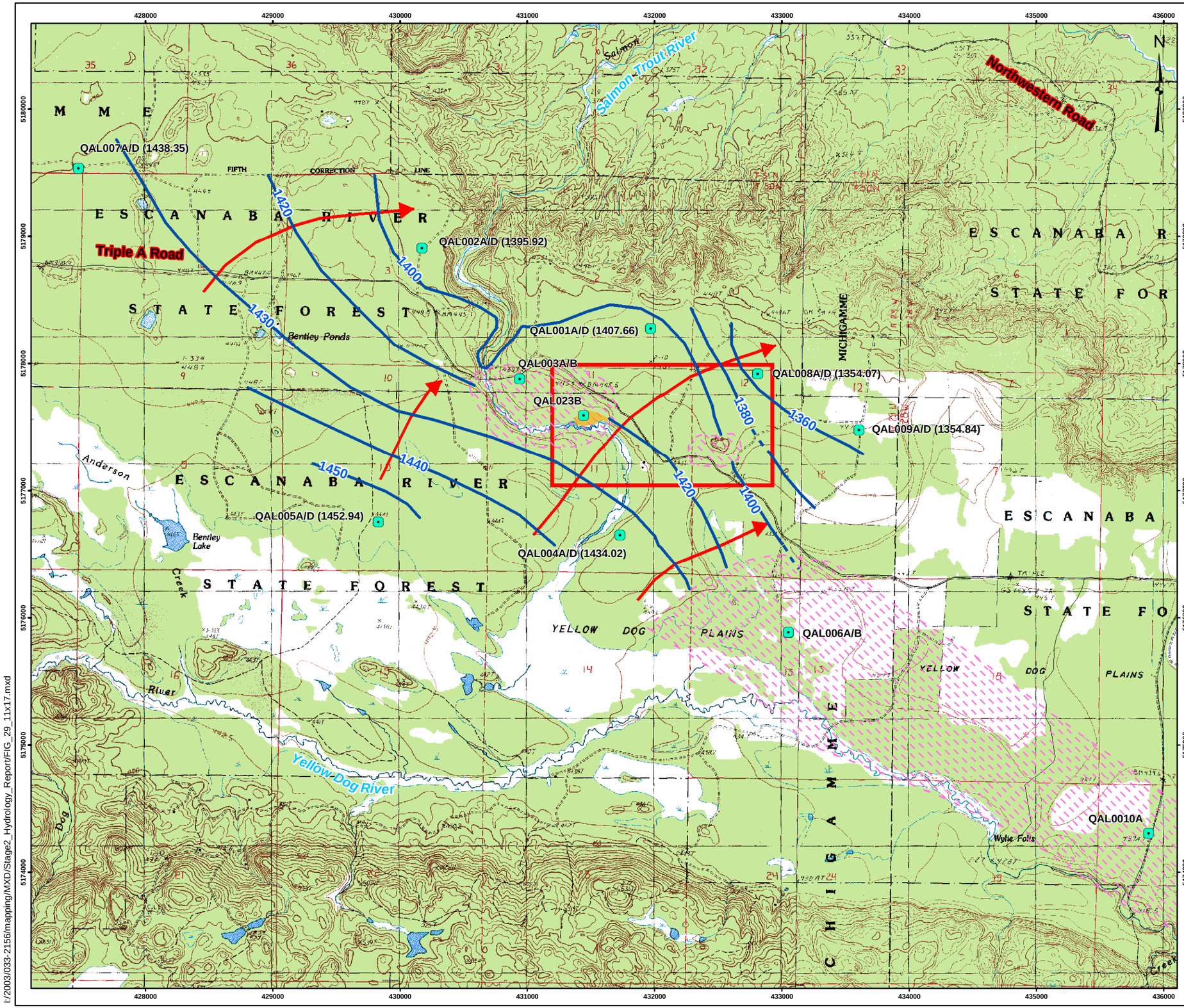
TITLE
North Jackson Company
D ZONE GROUNDWATER ELEVATION CONTOURS (SUMMER BASEFLOW, AUGUST 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	8 Jun. 2005		
REVIEW				

FIGURE: 28

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_28_11x17.mxd



LEGEND

- EAGLE PROJECT
- D-ZONE DISCONTINUITY
- ORE BODY
- GROUNDWATER FLOWLINE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOUR AT 1430 AND 1450 ft)
- MONITORING WELL
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 10/27/04 or 11/10/04)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE 1:30,000 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

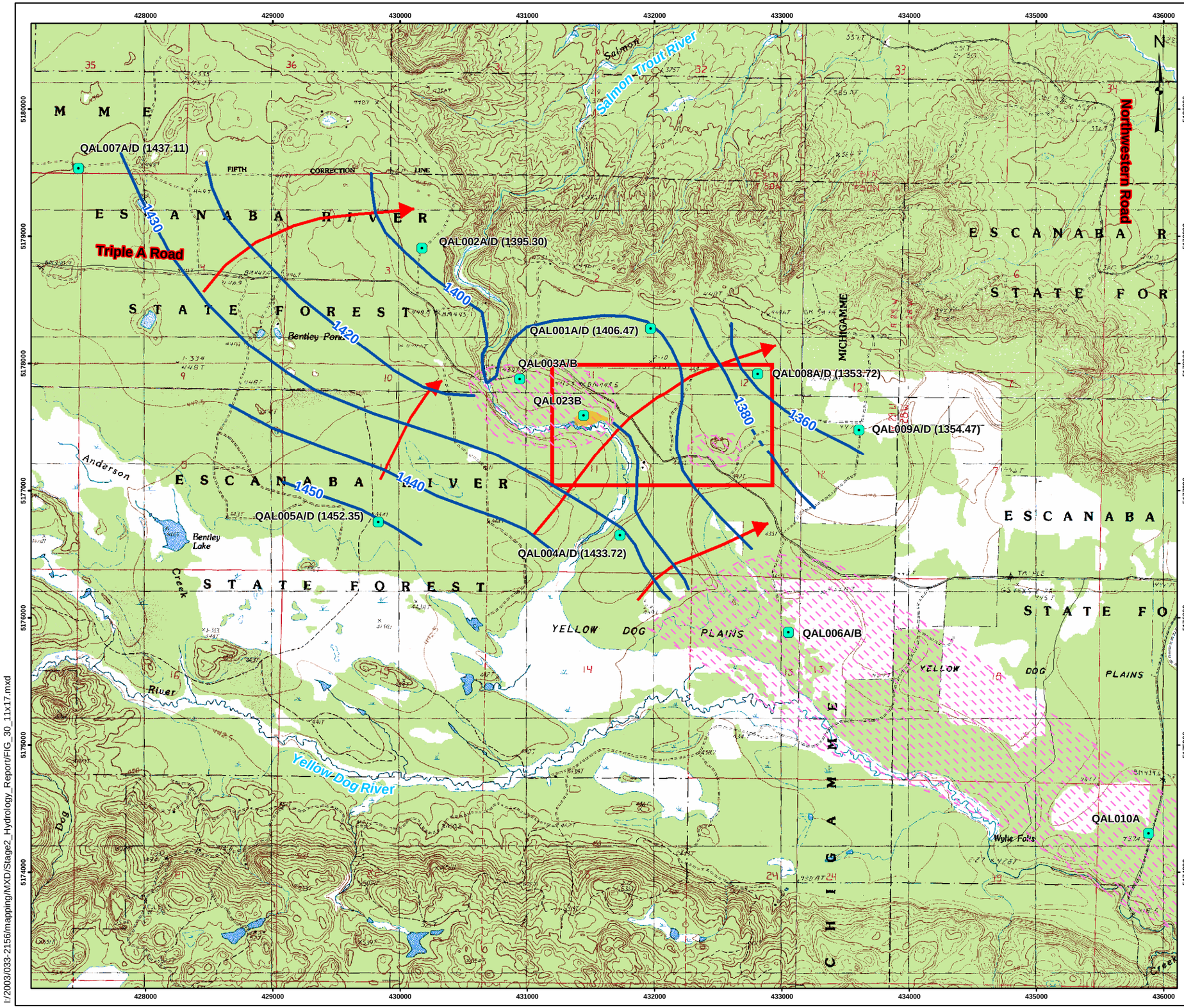
TITLE
North Jackson Company
D ZONE GROUNDWATER ELEVATION CONTOURS (FALL RAIN RUNOFF, OCTOBER 2004)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	14 Dec. 2004		
GIS	CHW	12 Jul. 2005		
CHECK	JM	16 Jun. 2005		
REVIEW				

FIGURE: 29

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_29_11x17.mxd



LEGEND

- EAGLE PROJECT
- D-ZONE DISCONTINUITY
- ORE BODY
- GROUNDWATER FLOWLINE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOUR AT 1430 AND 1450 ft)
- MONITORING WELL
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 3/15/05)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE 1:30,000 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

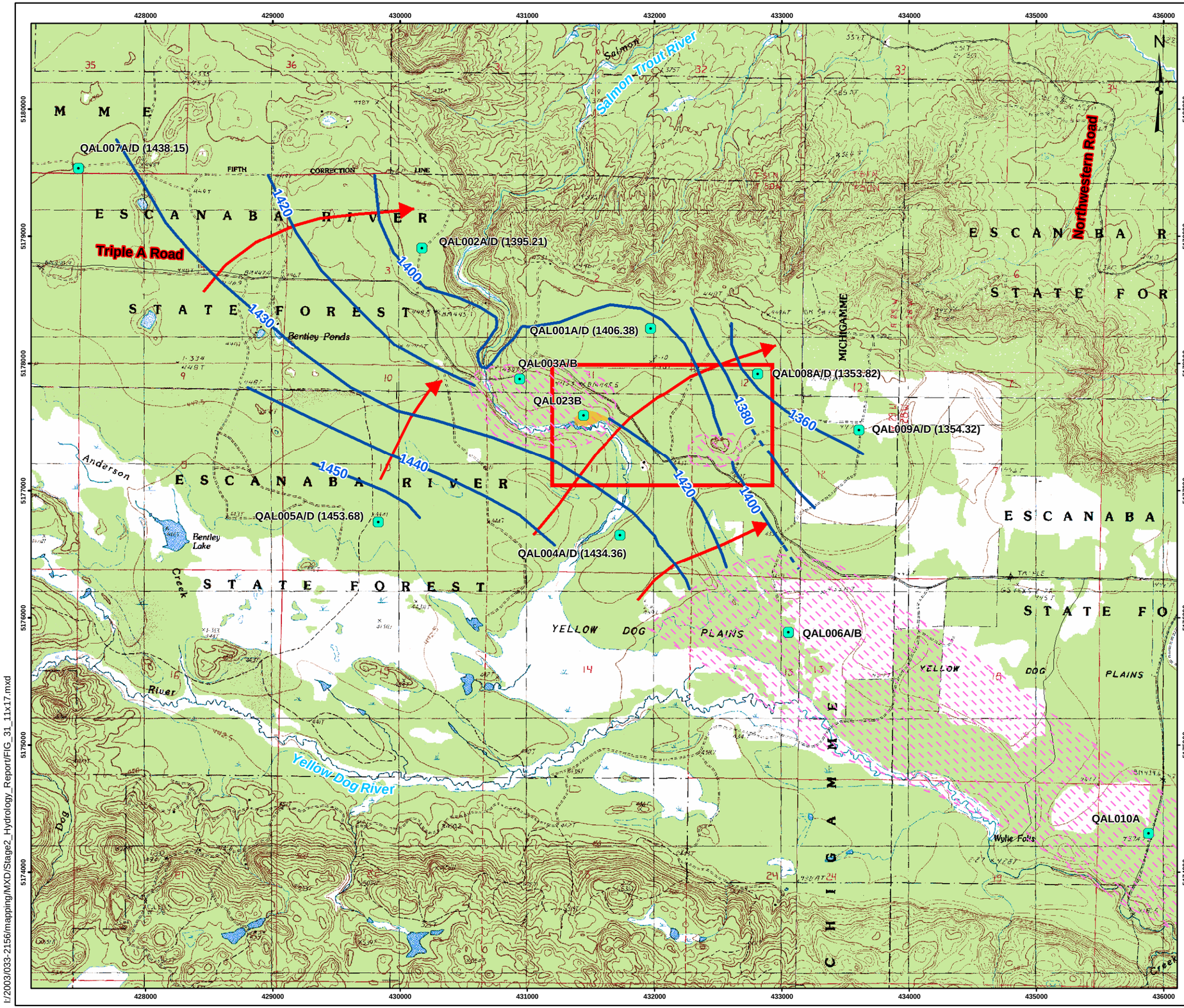
TITLE
NORTH JACKSON COMPANY
D ZONE GROUNDWATER ELEVATION CONTOURS (WINTER BASEFLOW, MARCH 2005)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	2 Jun. 2005		
GIS	CHW	12 Jul. 2005		
CHECK	JM	8 Jun. 2005		
REVIEW				

FIGURE: 30

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_30_11x17.mxd



LEGEND

- EAGLE PROJECT
- D-ZONE DISCONTINUITY
- ORE BODY
- GROUNDWATER FLOWLINE
- GROUNDWATER CONTOUR - FEET (CI = 20 ft, DASHED WHERE INFERRED, SUPPLEMENTAL CONTOUR AT 1430 AND 1450 ft)
- MONITORING WELL
- (1416.49) GROUNDWATER ELEVATION (ft MSL on 5/4/05)

REFERENCE

DRG provided by Michigan DNR. Monitoring locations, contours and flowlines from North Jackson Company.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

3,000 0 3,000
SCALE 1:30,000 FEET

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

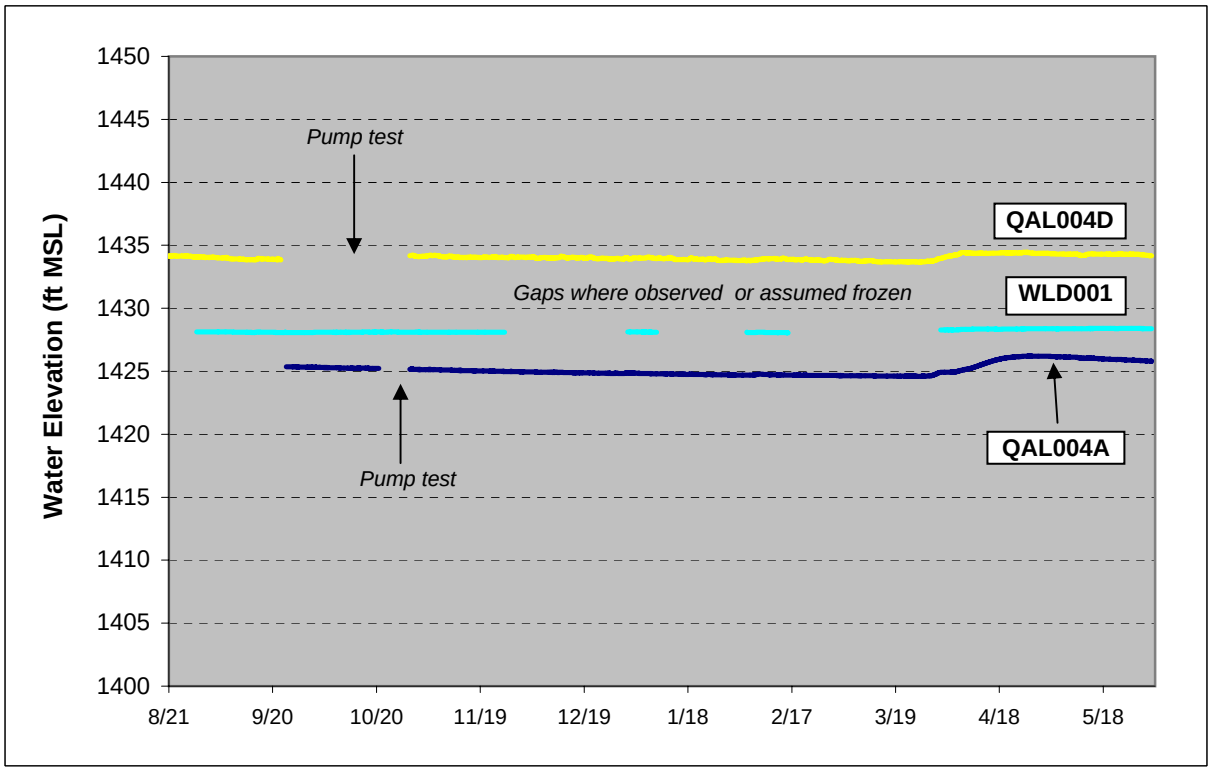
TITLE
North Jackson Company
D ZONE GROUNDWATER ELEVATION CONTOURS (SPRING SNOWMELT RUNOFF, MAY 2005)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	2 Jun. 2005	FIGURE: 31	
GIS	CHW	12 Jul. 2005		
CHECK	JM	15 Jun. 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_31_11x17.mxd

Figure 32
Hourly Groundwater Elevation Data for Selected Monitoring Locations
Eagle Project



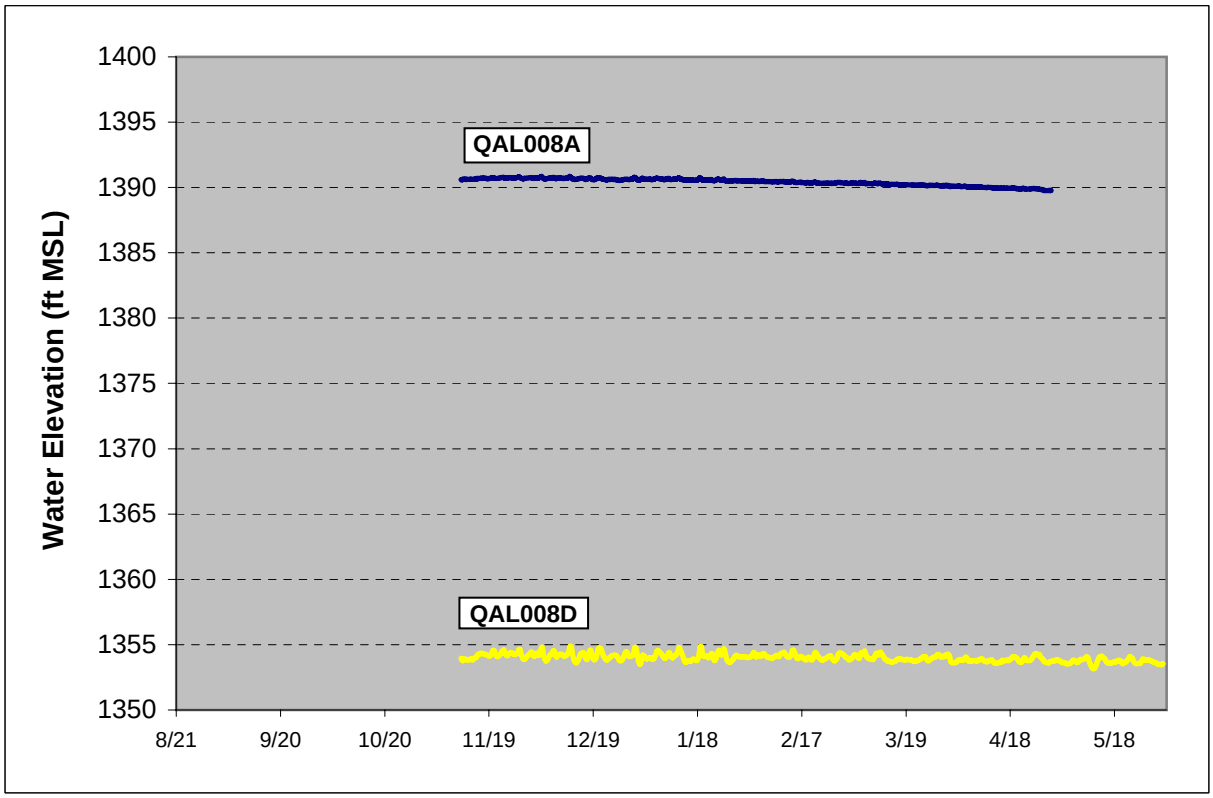


Figure 32: Water Elevation Plot

Figure 32
Hourly Groundwater Elevation Data for Selected Monitoring Locations
Eagle Project

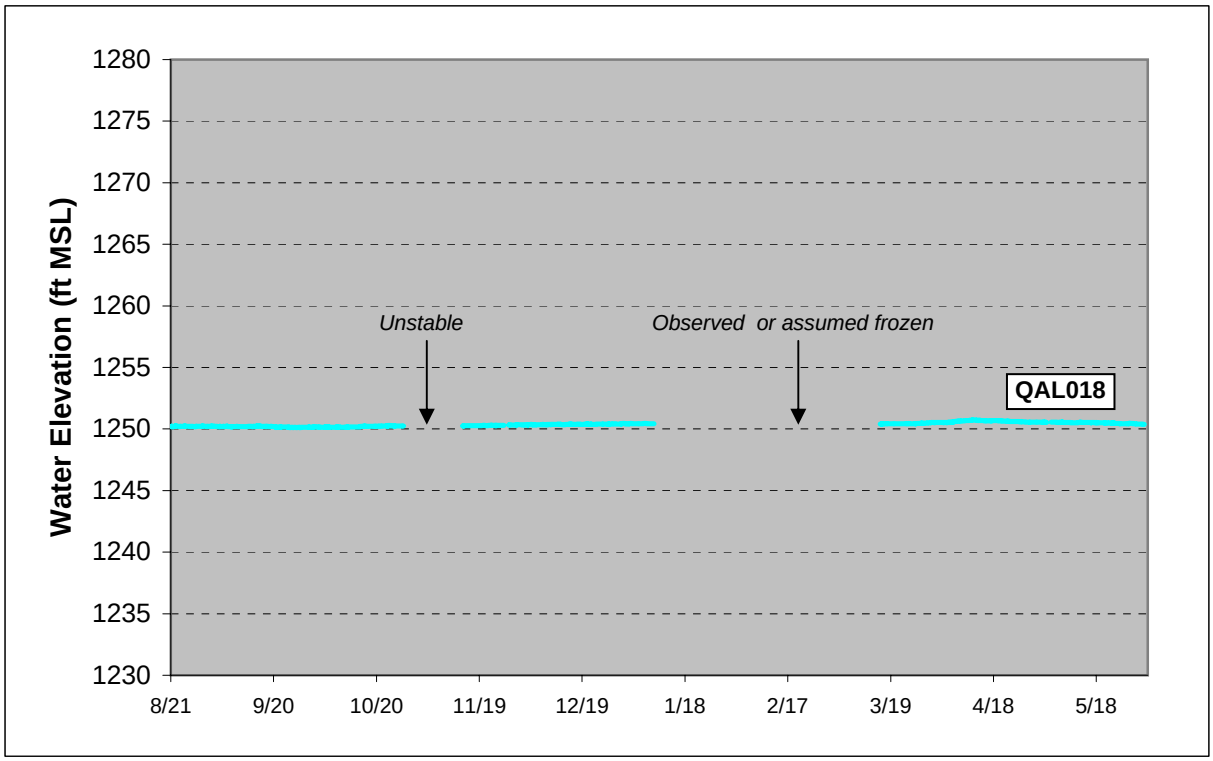
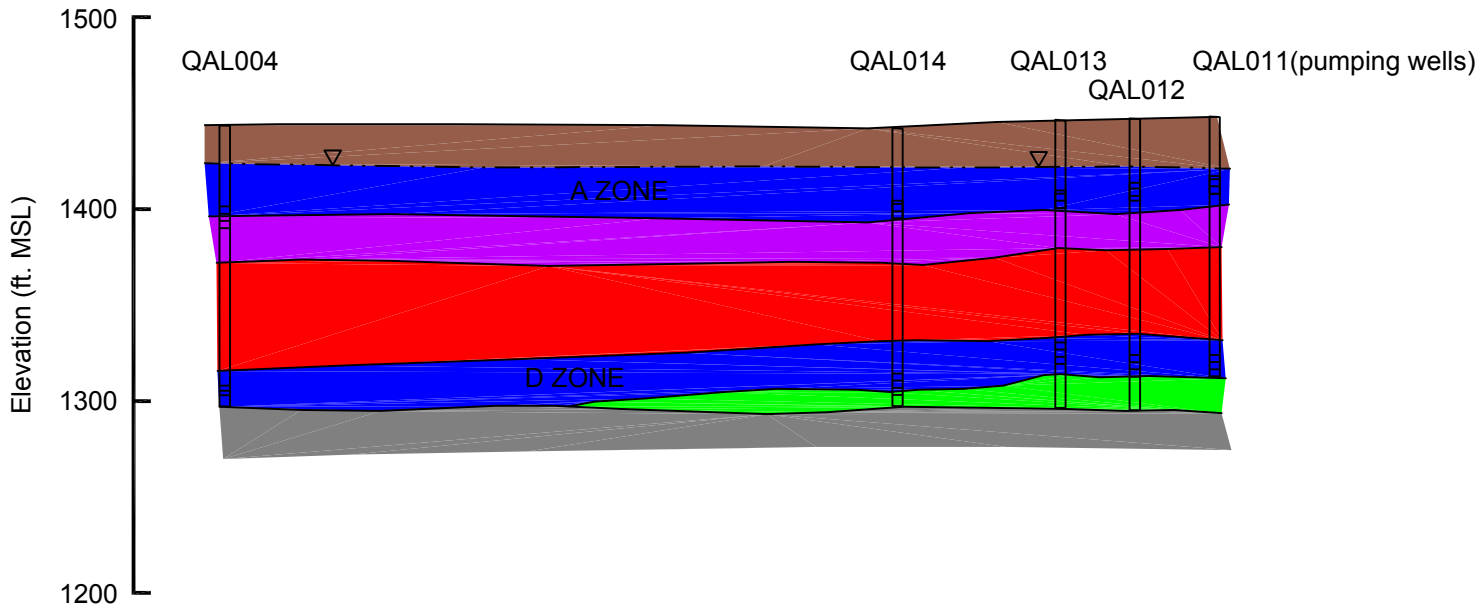


Figure 32: Water Elevation Plot, Continued

Southwest
E

Northeast
E'



LEGEND:

Water Table

A Monitoring Well with Screened Zones

Unsaturated Sand

Saturated Sand (upper and lower zones)

Saturated Fine Sand Silt and Clay

Lean Clay

Clayey Glacial Till

Bedrock: Metasedimentary

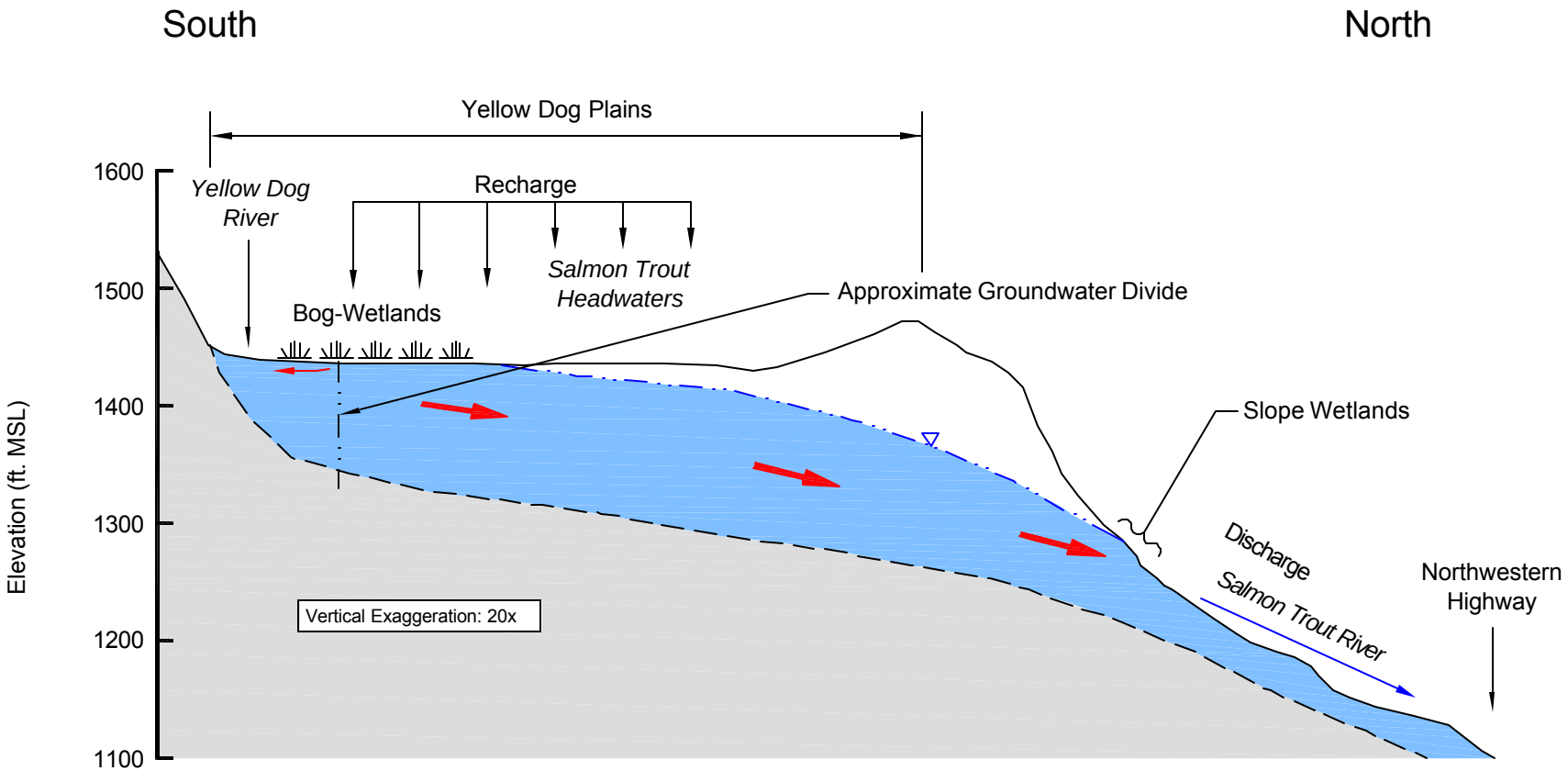
NORTH JACKSON COMPANY
1004 Harbor Hills Drive, Suite 102
Marquette, MI 49855

0 100
Feet
No Vertical Exaggeration

FIGURE 33

QUATERNARY PUMPING TEST
HYDROGEOLOGIC CROSS SECTION E-E'

Eagle Project



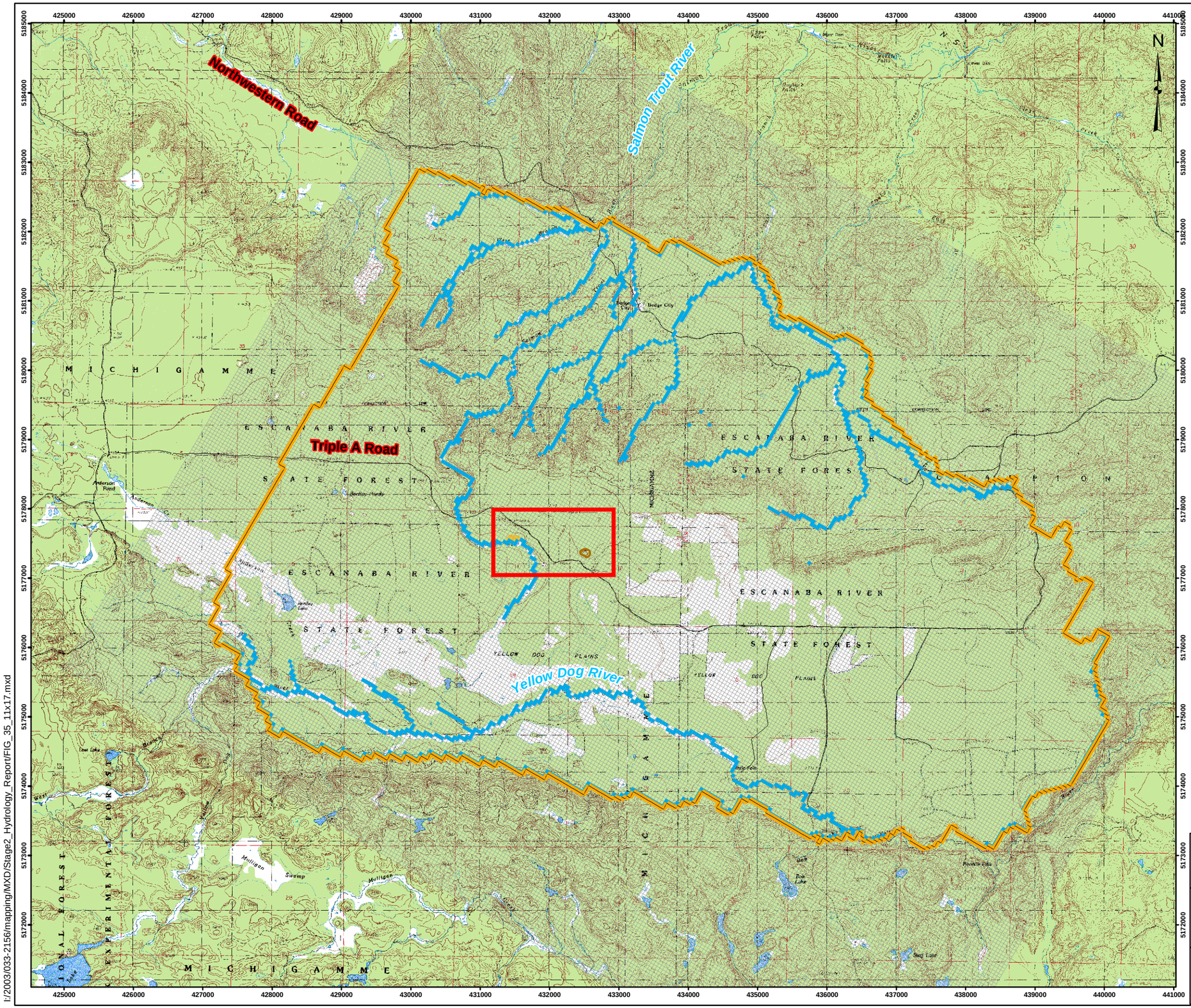
LEGEND:

- Quaternary Alluvial Aquifer
- Proterozoic Metasediments/Intrusives
- Groundwater Flow

NORTH JACKSON COMPANY
1004 Harbor Hills Drive, Suite 102
Marquette, MI 49855

0 3,000
Feet
Vertical Exaggeration: 20x

FIGURE 34
CONCEPTUAL HYDROGEOLOGIC CROSS SECTION
Eagle Project



LEGEND

- ORE BODY
- OUTCROP
- EAGLE PROJECT
- RIVER CELL
- APPROXIMATE LIMIT OF ACTIVE MODEL AREA
- MODEL GRID

NOTES

1. Active area of domain and presence of boundary conditions differs by model layer.
2. Specified head boundary along southern limit of domain is present only in model layer 5 (D Zone).

REFERENCE

DRG provided by Michigan DNR. Modeling data provided by North Jackson Company and Fletcher Driscoll & Associates.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1: 55,000 MILE

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company
GENERALIZED GROUNDWATER FLOW MODEL DOMAIN, BOUNDARIES AND GRID SPACING

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005	**FIGURE: 35**	
GIS	CHW	12 Jul. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_35_11x17.mxd

Figure 36
Comparison of Model Calculated Heads to Measured Heads
Eagle Project

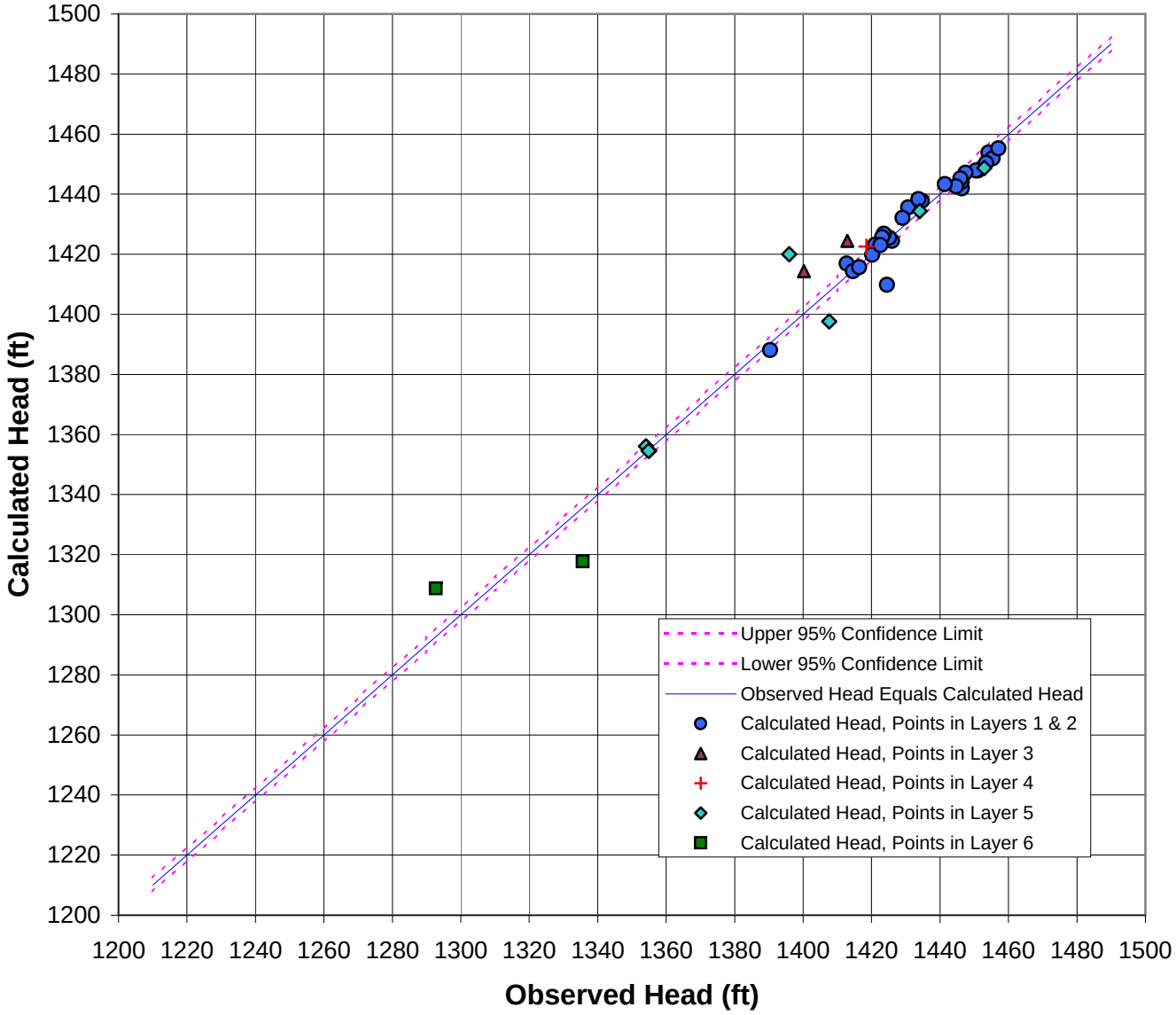
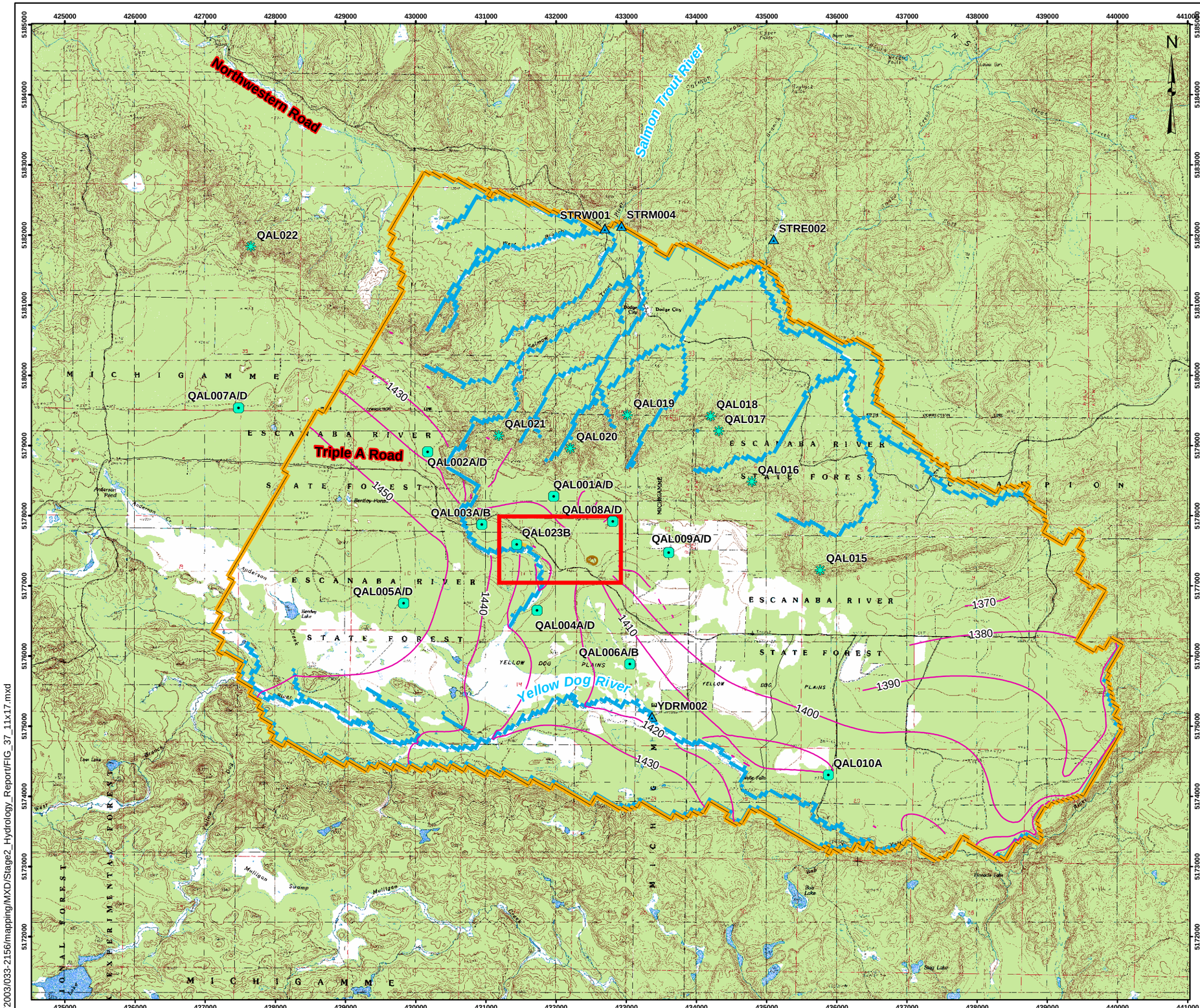


Figure 36: Compare Calc to Meas
Fletcher Driscoll & Associates LLC



LEGEND

- APPROXIMATE LIMIT OF ACTIVE MODEL AREA
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- EQUIPOTENTIAL
- RIVER CELL
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION

REFERENCE

DRG provided by Michigan DNR. Modeling data North Jackson Company and Fletcher Driscoll & Associates. Monitoring locations from North Jackson Company. Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1

SCALE: 1: 55,000 MILE

PROJECT

Kennecott Minerals

EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE

North Jackson Company

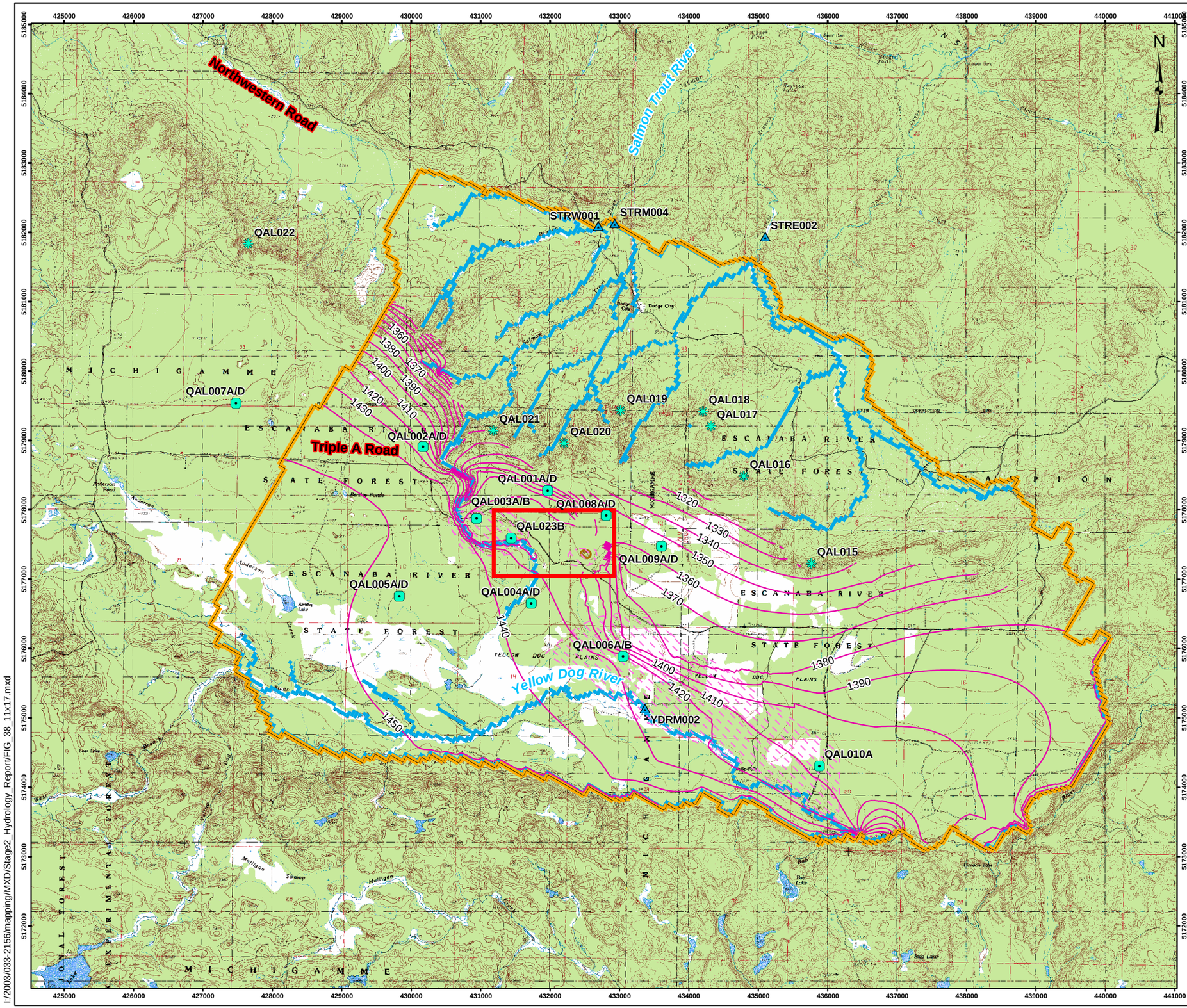
MODEL HEAD EQUIPOTENTIALS FOR LAYER 2 (A ZONE)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005		
GIS	CHW	30 Jun. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

FIGURE: 37

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_37_11x17.mxd



LEGEND

- APPROXIMATE LIMIT OF ACTIVE MODEL AREA
- D-ZONE DISCONTINUITY
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- EQUIPOTENTIAL
- RIVER CELL
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION

NOTES

Areas of D Zone discontinuity where model layer 5 equipotentials do not represent D Zone stratigraphic unit.

REFERENCE

DRG provided by Michigan DNR. Modeling data provided by North Jackson Company and Fletcher Driscoll & Associates. Monitoring locations from North Jackson Company. Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1: 55,000 MILE

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
NORTH JACKSON COMPANY
MODEL HEAD EQUIPOTENTIALS FOR LAYER 5 (D ZONE)

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005		
GIS	CHW	30 Jun. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

FIGURE: 38

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_38_11x17.mxd

Figure 39
Simulated River Outflow by Groundwater Basin Compared to Stream Baseflow at Key Gaging Locations
Eagle Project

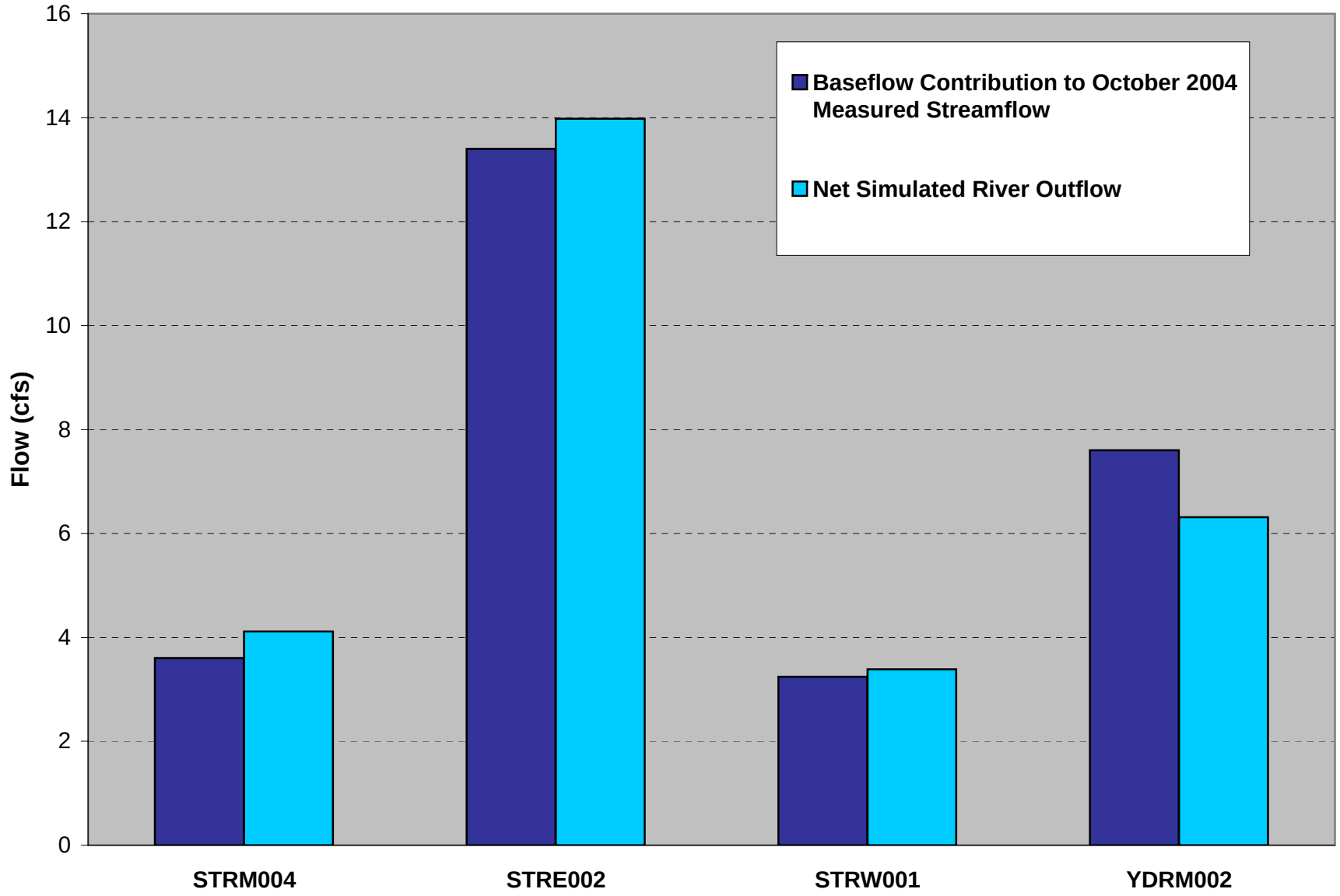


Figure 39: Model v Stream--Rate
Fletcher Driscoll & Associates LLC

Figure 40
Model Mass Balance by Hydraulic Feature
Eagle Project

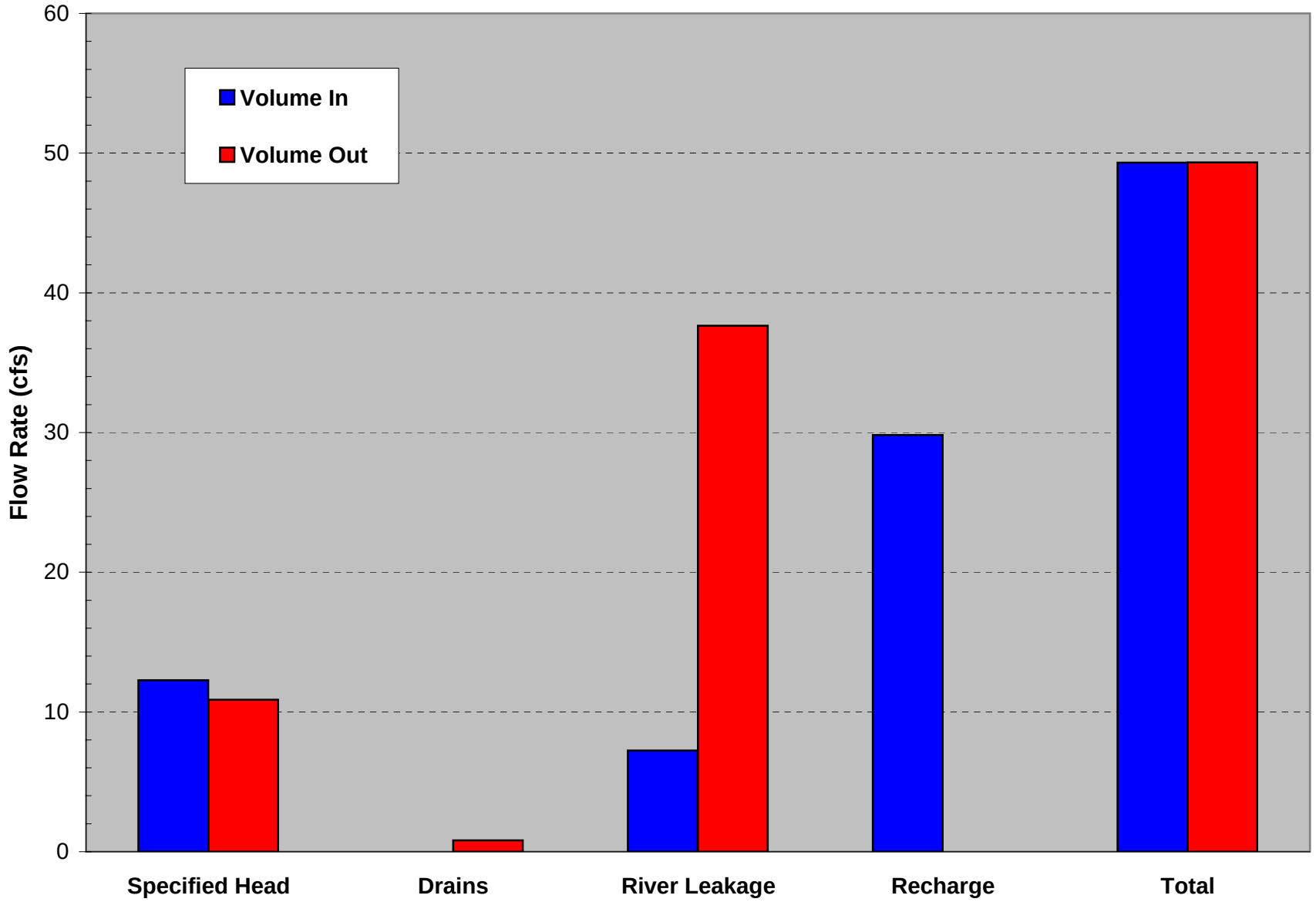
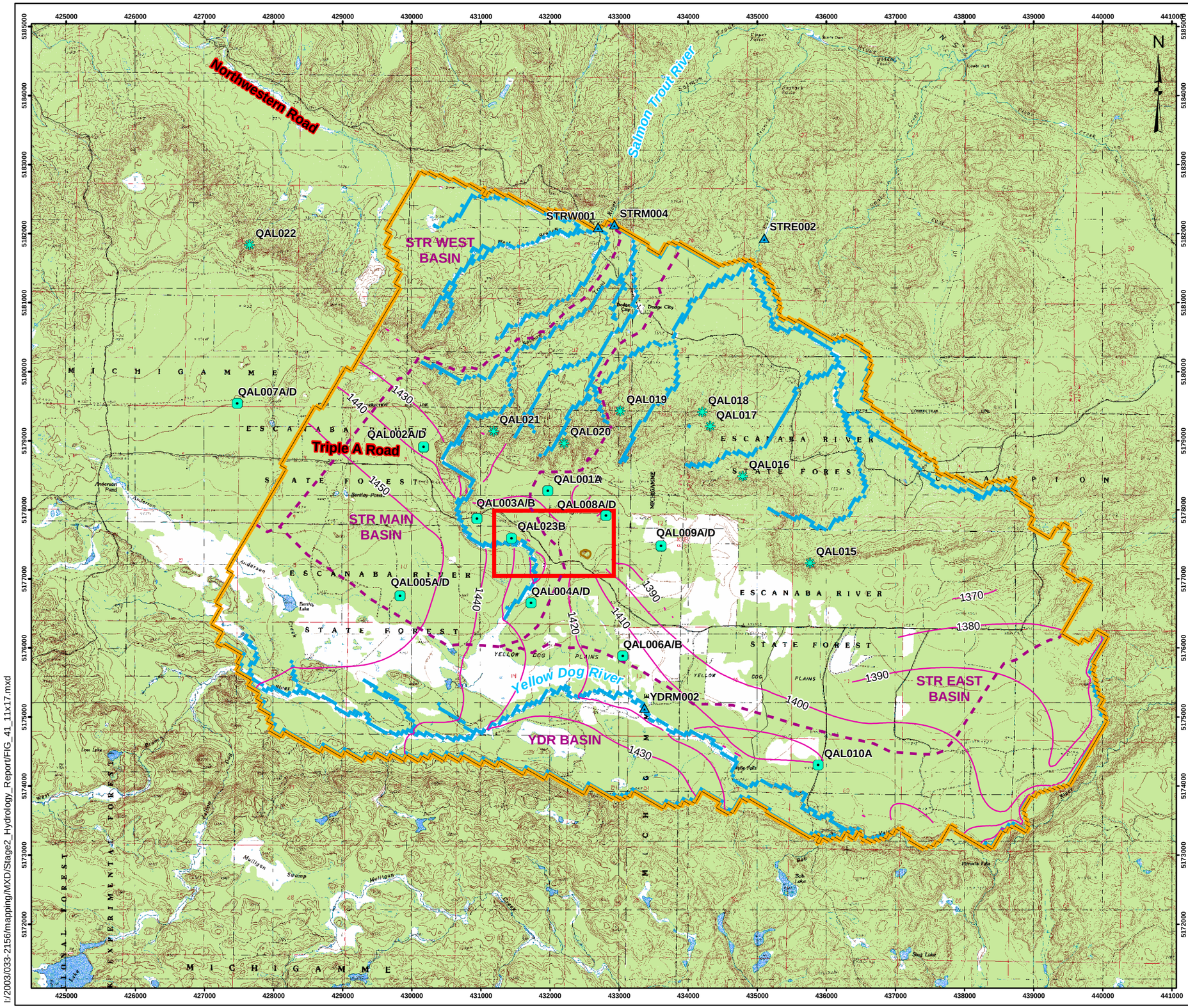


Figure 40: Model Mass Balance
Fletcher Driscoll & Associates LLC



LEGEND

- APPROXIMATE LIMIT OF ACTIVE MODEL AREA
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- EQUIPOTENTIAL
- GROUNDWATER BASIN DIVIDE
- STR - SALMON TROUT RIVER
- YDR - YELLOW DOG RIVER
- RIVER CELL
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION

REFERENCE

DRG provided by Michigan DNR. Modeling data North Jackson Company and Fletcher Driscoll & Associates.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1: 55,000 MILE

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

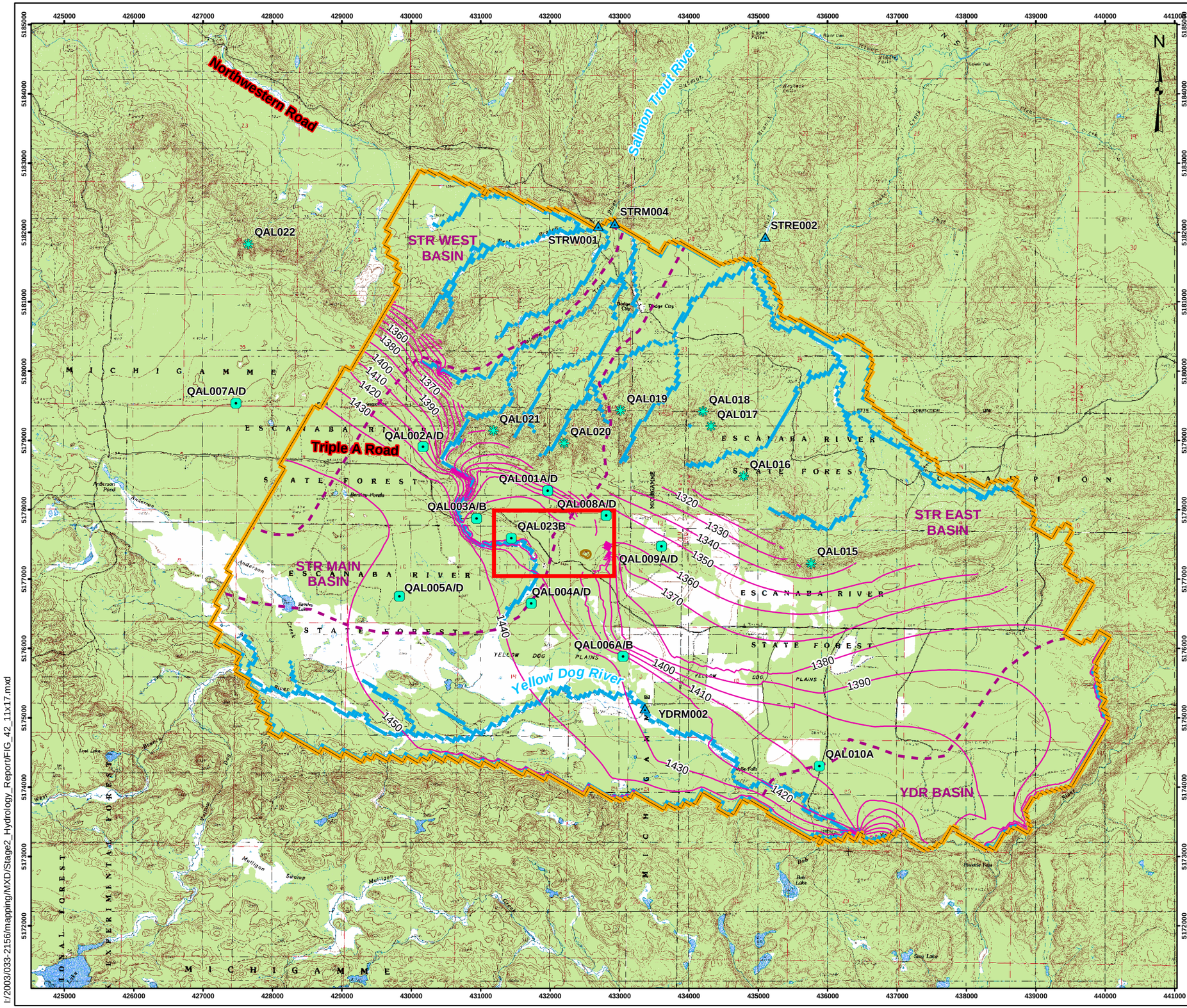
TITLE
NORTH JACKSON COMPANY
LAYER 2 (A ZONE) MODEL EQUIPOTENTIAL SIMULATION WITH GROUNDWATER BASIN DIVIDES

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005		
GIS	CHW	06 Jul. 2005		
CHECK	JM	23 Jun. 2005		
REVIEW				

FIGURE: 41

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_41_11x17.mxd



LEGEND

- APPROXIMATE LIMIT OF ACTIVE MODEL AREA
- ORE BODY
- OUTCROP
- EAGLE PROJECT
- EQUIPOTENTIAL
- GROUNDWATER DRAINAGE DIVIDE
- STR - SALMON TROUT RIVER
- YDR - YELLOW DOG RIVER
- RIVER CELL
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING LOCATION

REFERENCE

DRG provided by Michigan DNR. Modeling data provided by North Jackson Company and Fletcher Driscoll & Associates.
Datum: NAD 83 Projection: Transverse Mercator Coordinate System: UTM Zone 16

1 0 1
SCALE: 1: 55,000 MILE

PROJECT
Kennecott Minerals
EAGLE PROJECT
BASELINE ENVIRONMENTAL STUDY
KENNECOTT MINERALS COMPANY

TITLE
North Jackson Company
LAYER 5 (D ZONE) MODEL EQUIPOTENTIAL SIMULATION WITH GROUNDWATER BASIN DIVIDES

Golder Associates

PROJECT No. 033-2156C			SCALE AS SHOWN	REV. 0
DESIGN	KP	17 Jun. 2005		
GIS	CHW	06 Jul. 2005		
CHECK	JM	18 Jun. 2005		
REVIEW				

FIGURE: 42

I:/2003/033-2156/mapping/MXD/Stage2_Hydrology_Report/FIG_42_11x17.mxd

Figure 43
Mean Daily Temperature at Continuous Monitoring Locations
on the Salmon Trout River and Yellow Dog River
(September 2004 - May 2005)
Eagle Project

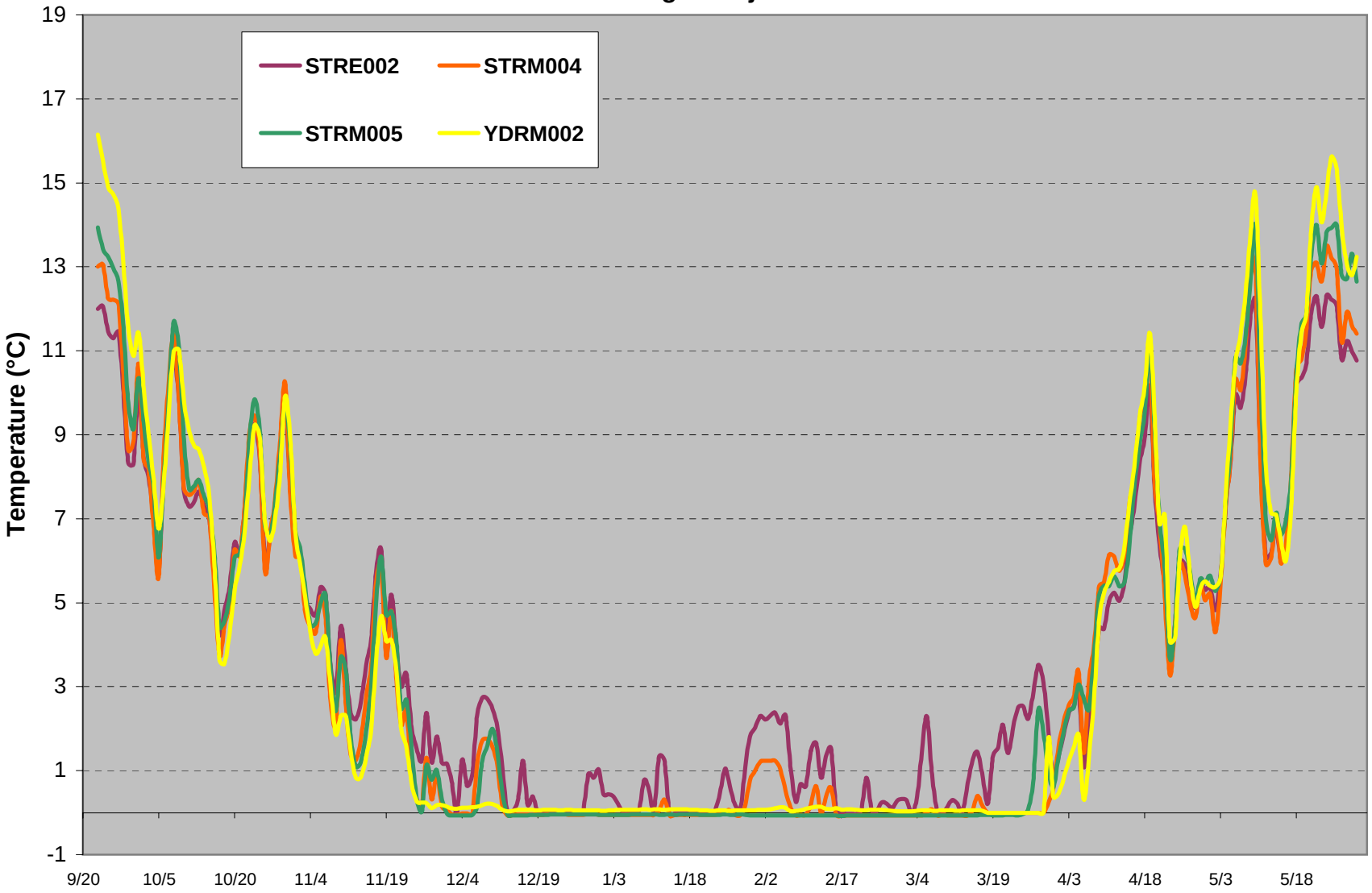


Figure 43: Temperature Plot

Figure 44
Continuous Surface Water Temperature Data
for Additional Salmon Trout River Monitoring Locations
(September 2004 - May 2005)
Eagle Project

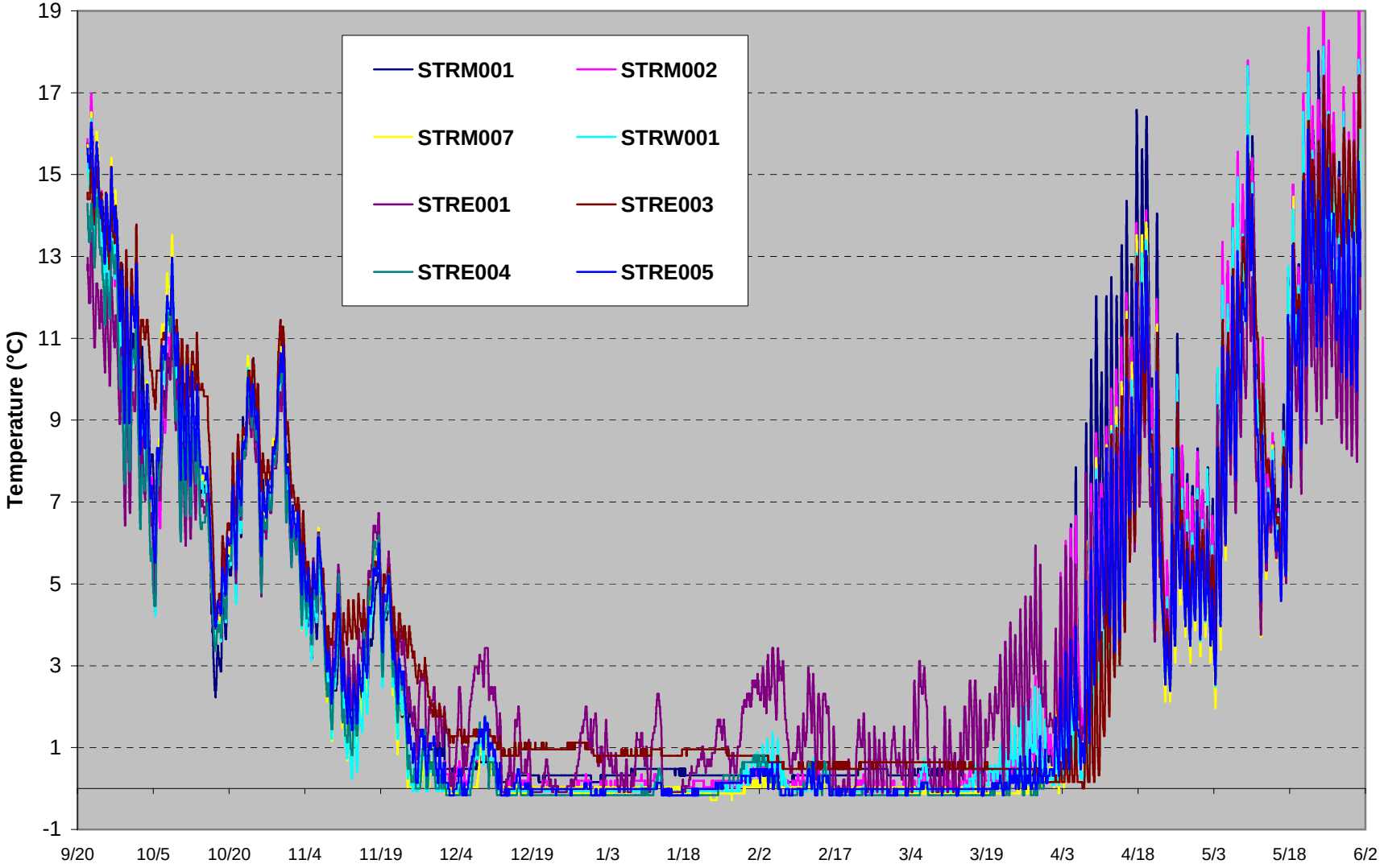


Figure 44: Surface Water Temperature

Figure 45
Mean Daily Specific Conductance at Continuous Monitoring Locations
on the Salmon Trout River and Yellow Dog River
(September 2004 - May 2005)
Eagle Project

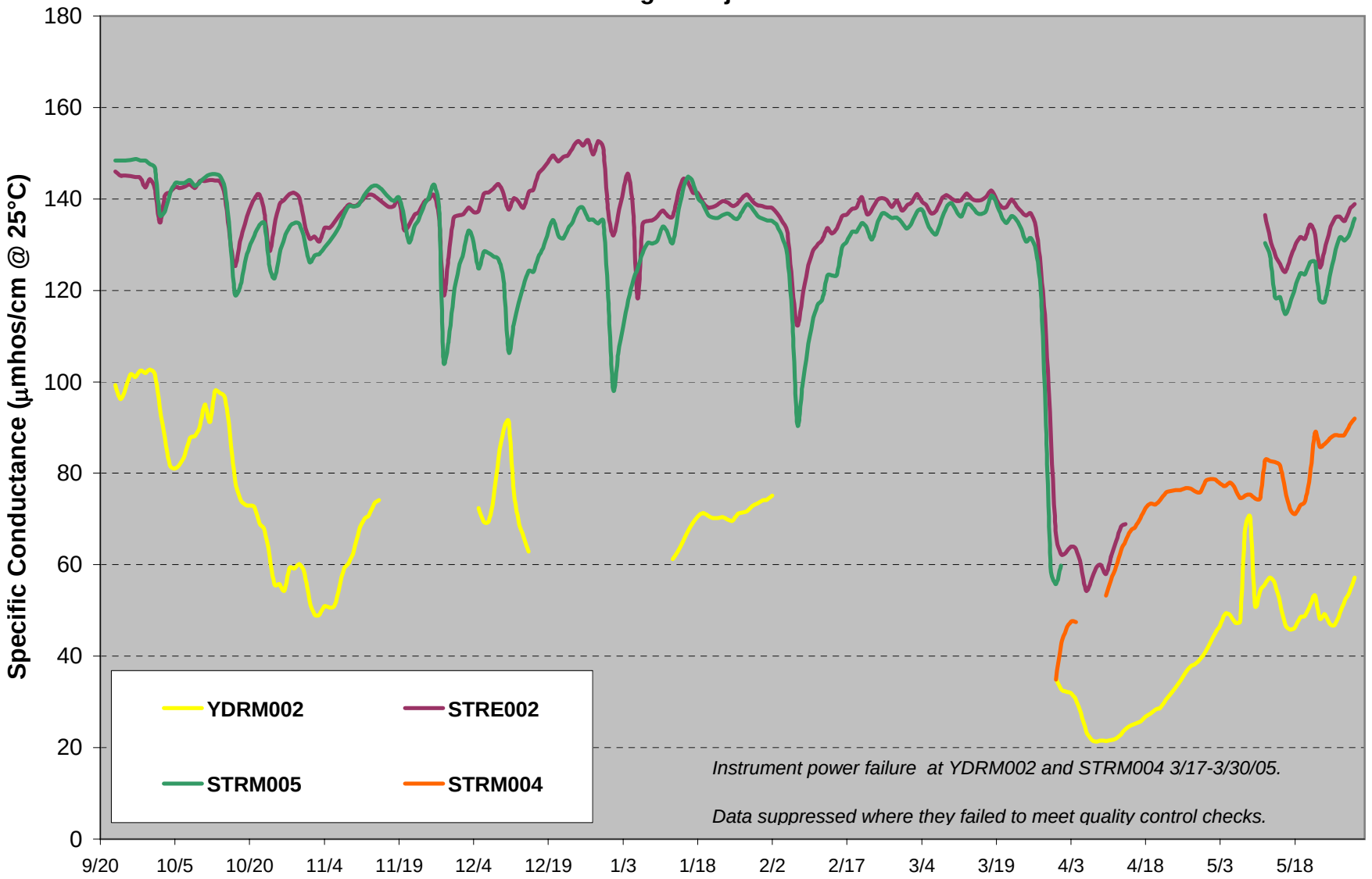


Figure 45: Mean Daily Spec Cond Plot

Figure 46
Hardness at Selected Surface Water Monitoring Locations
(Fall Rain Runoff 2004)
Eagle Project

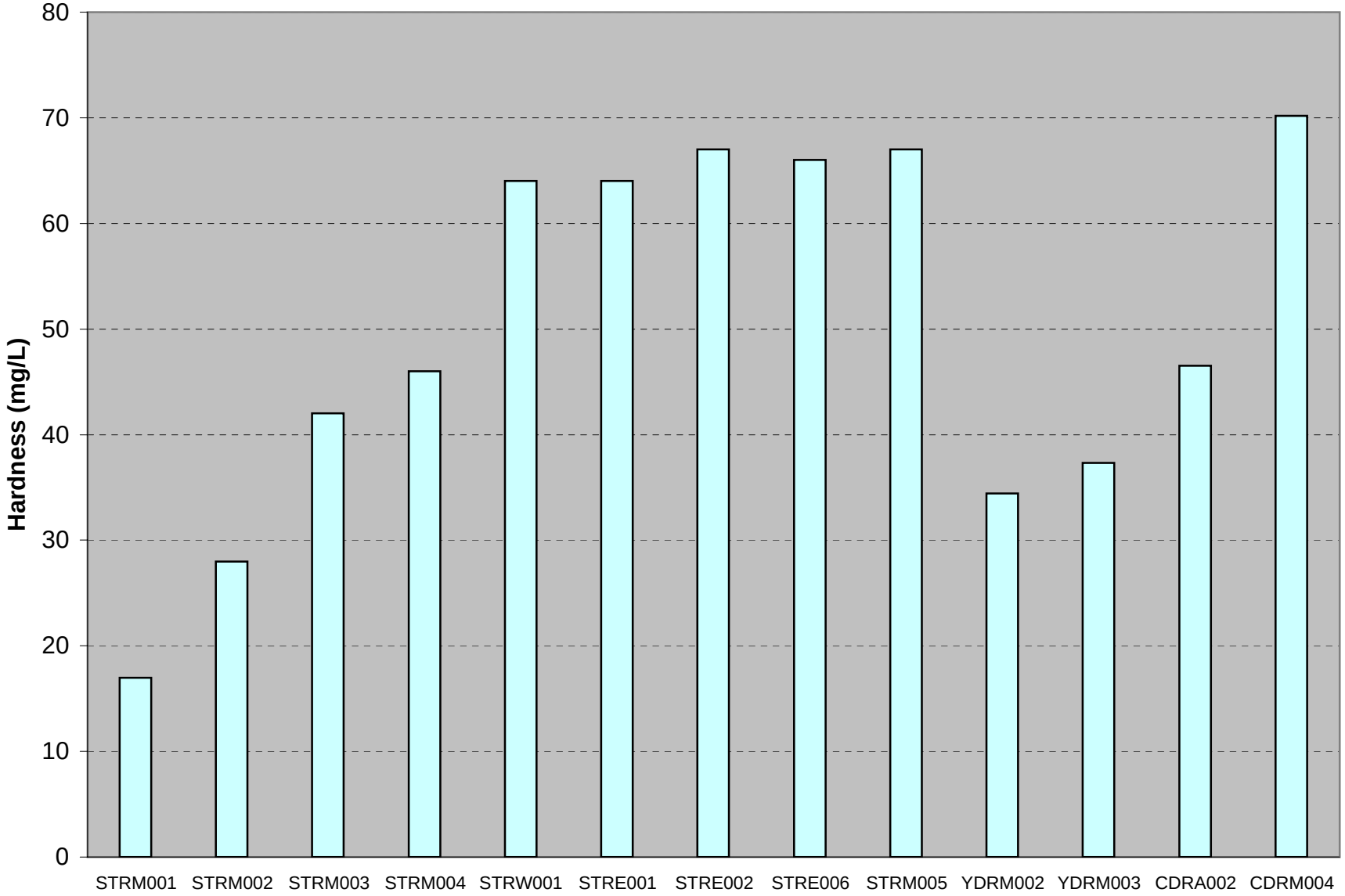


Figure 46: Hardness at SW Stations

Figure 47
Seasonal Variation of Hardness at Selected
Surface Water Monitoring Locations
Eagle Project

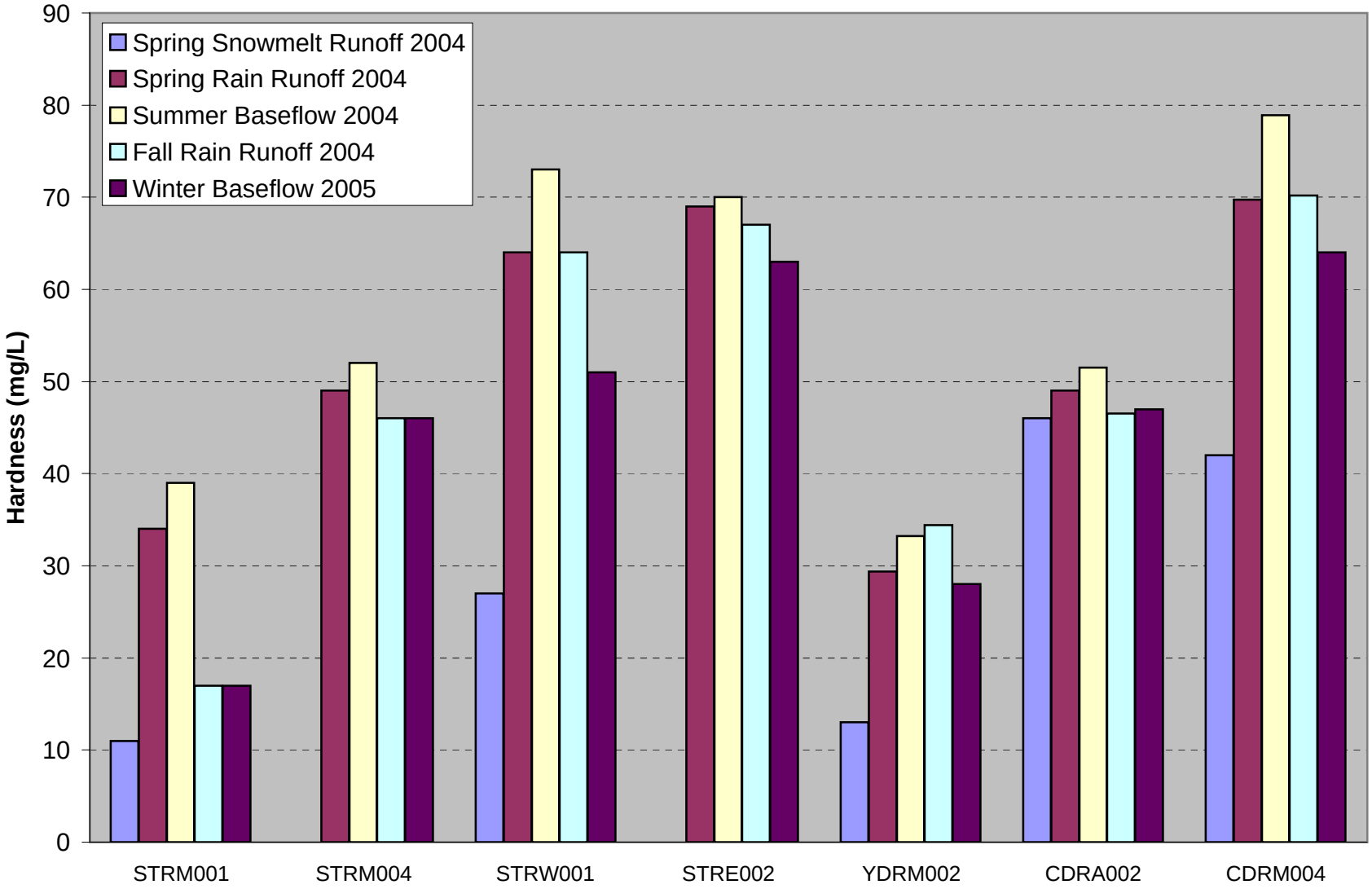


Figure 47: Hardness at Selected Stns

Figure 48 Piper Diagram

Surface Water (Winter Baseflow 2004)

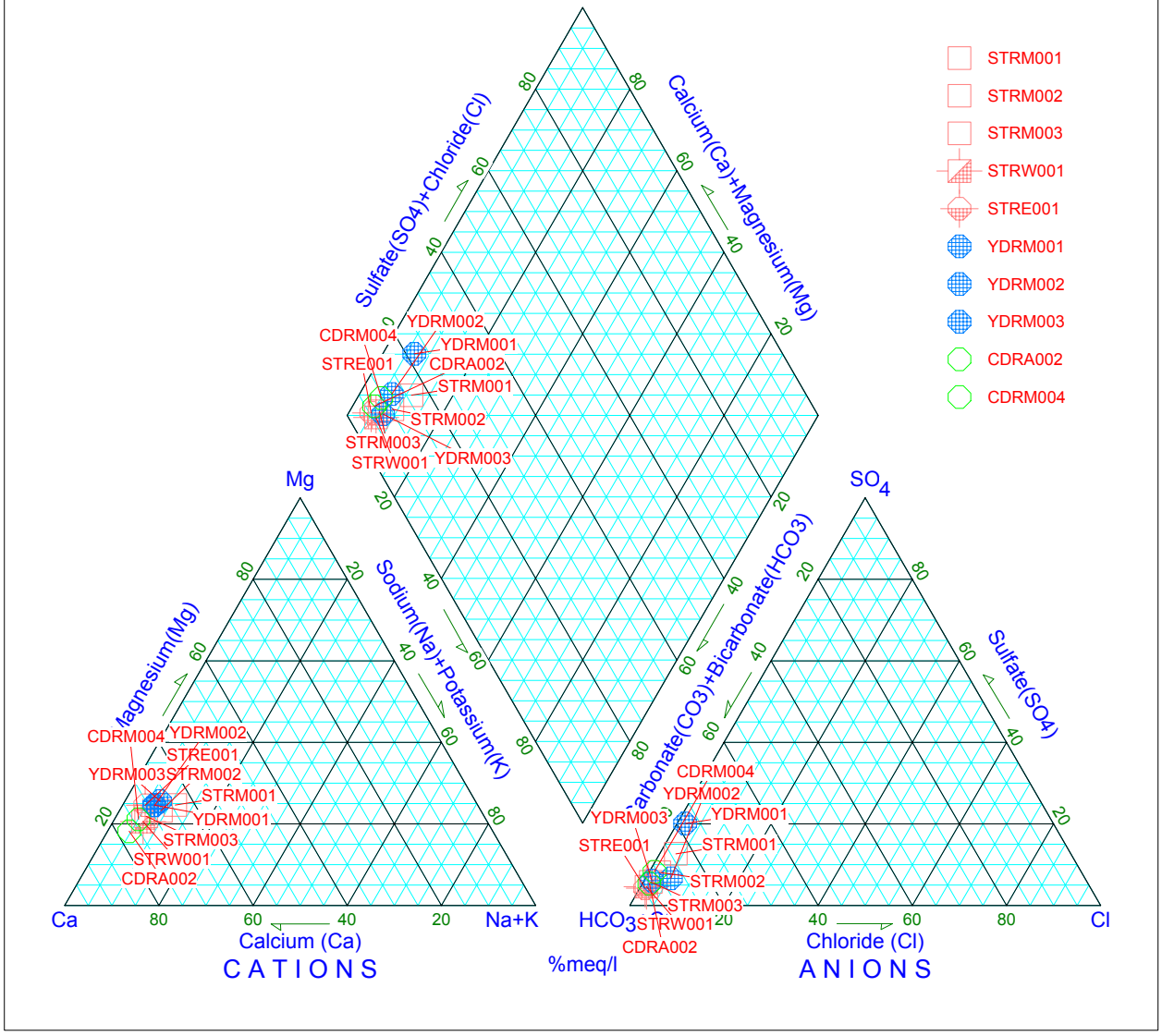


Figure 49 Piper Diagram

Surface Water (Spring Snowmelt Runoff 2004)

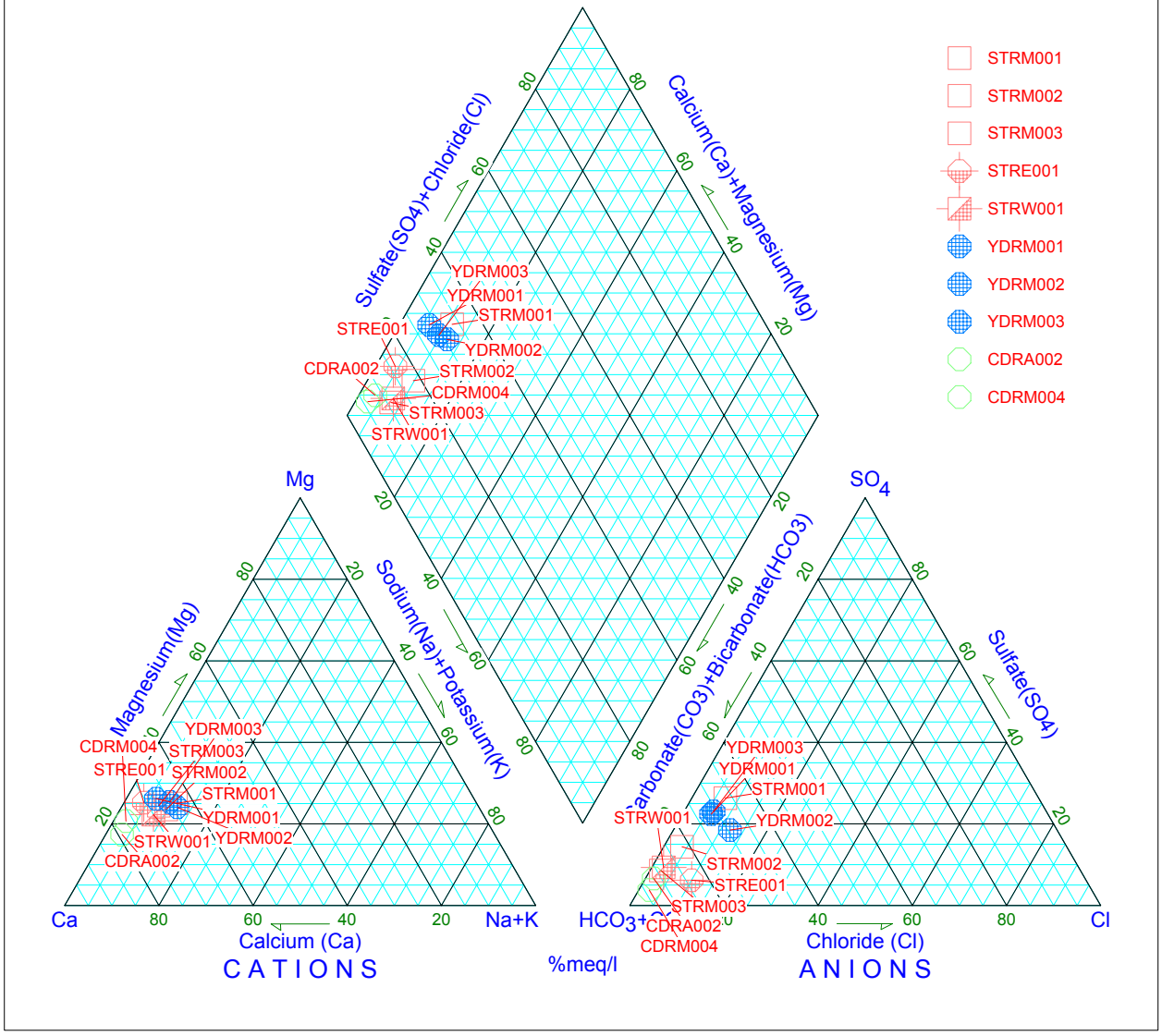


Figure 50 Piper Diagram

Surface Water (Spring Rain Runoff 2004)

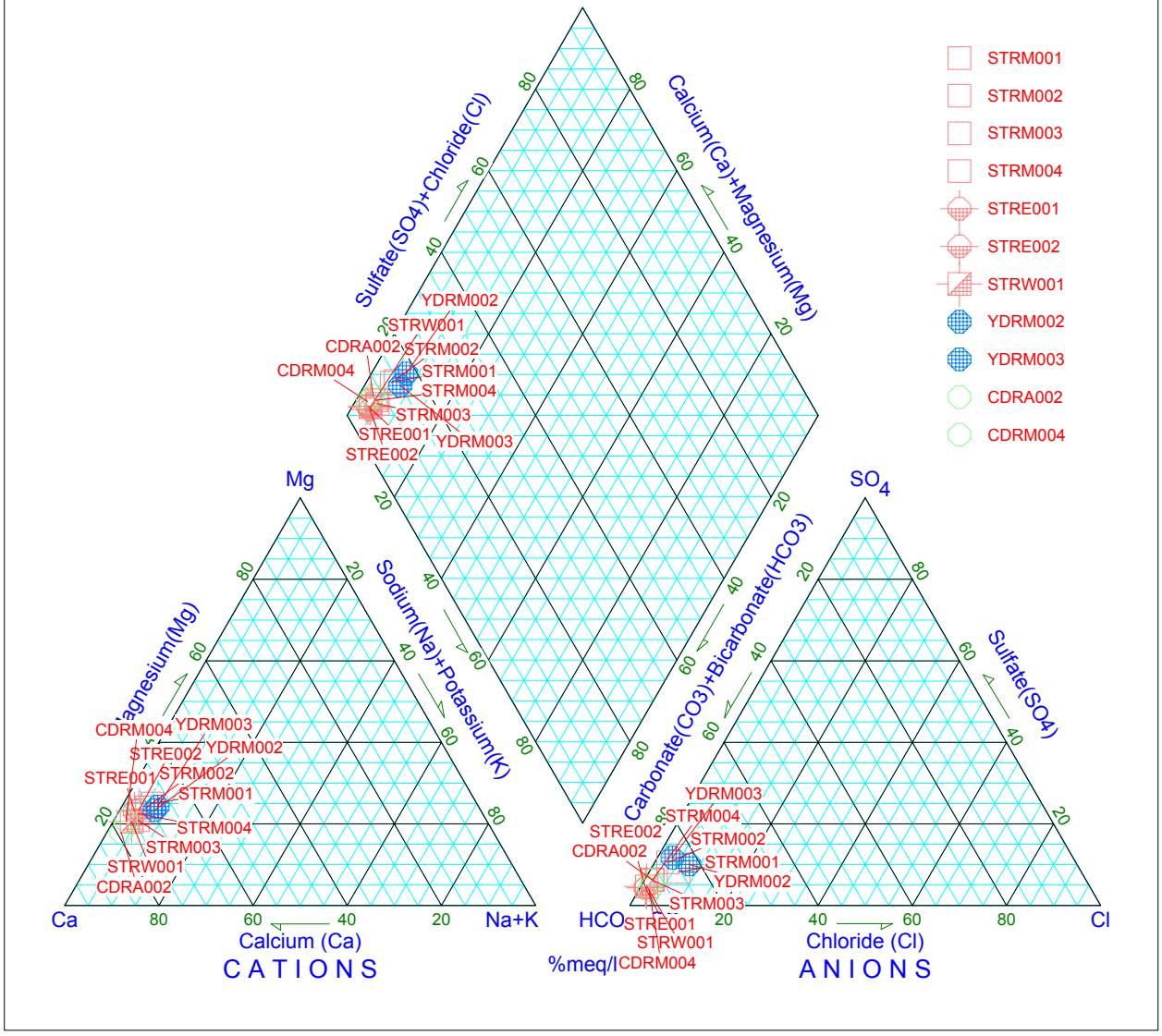


Figure 51 Piper Diagram

Surface Water (Summer Baseflow 2004)

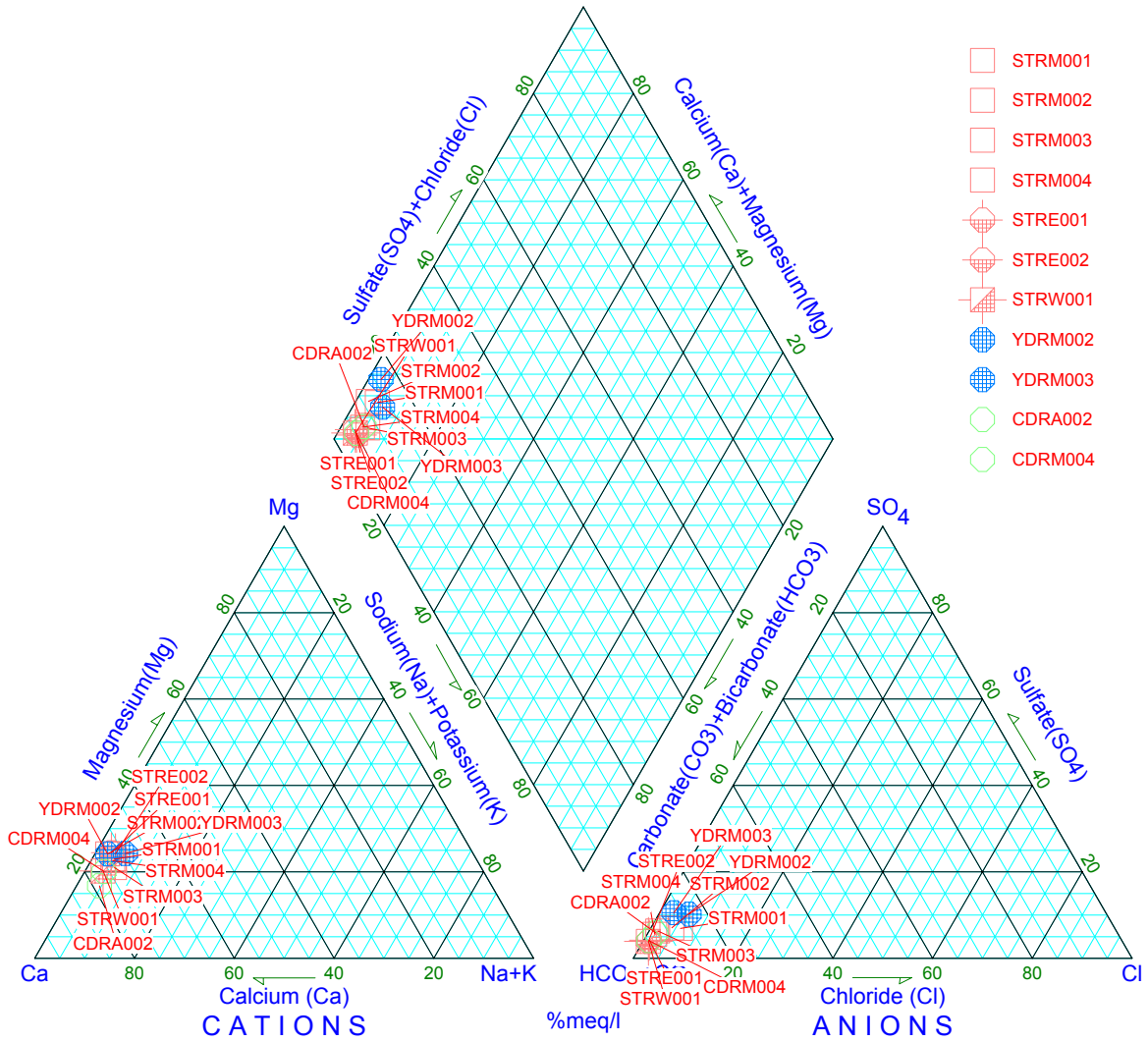


Figure 52 Piper Diagram

Surface Water (Fall Rain Runoff 2004)

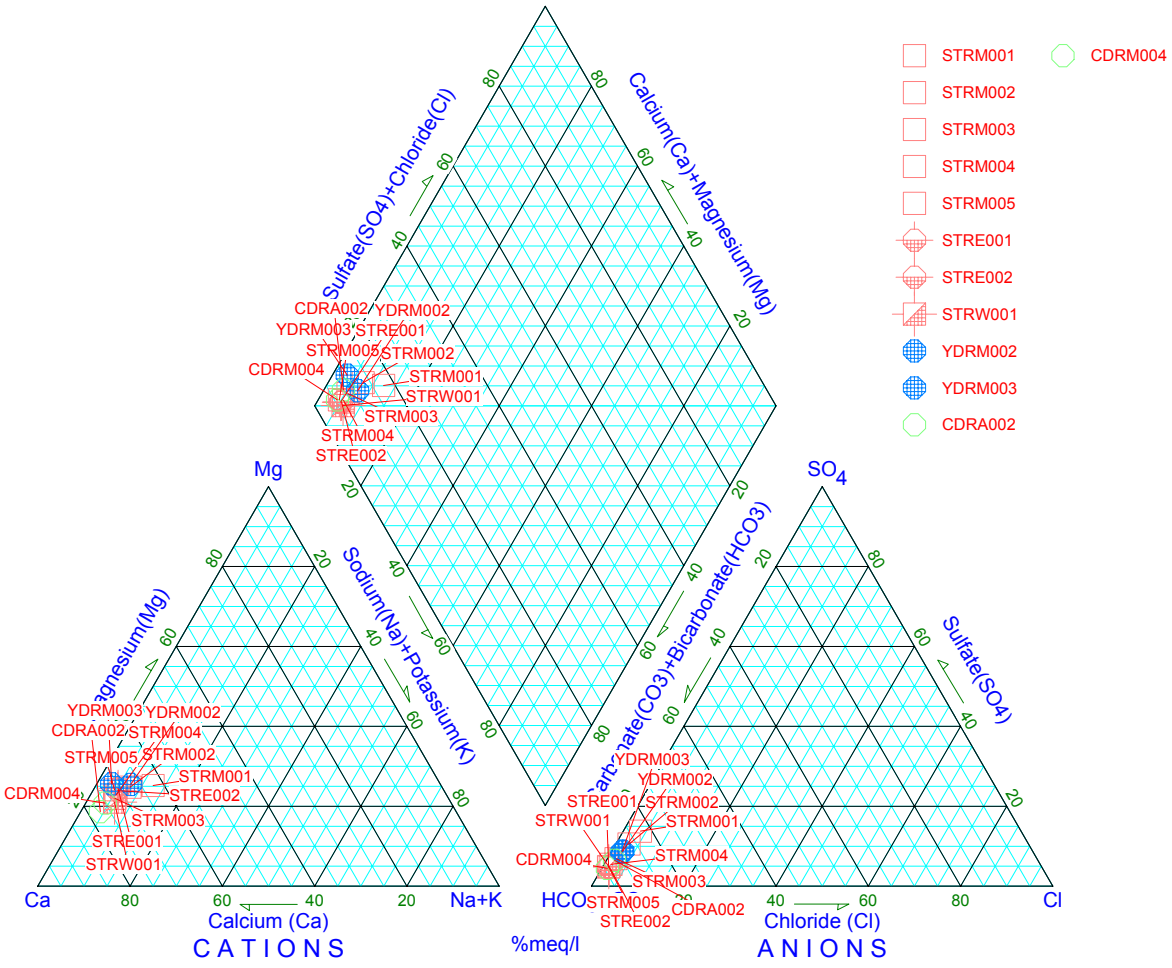


Figure 53 Piper Diagram

Surface Water (Winter Baseflow 2005)

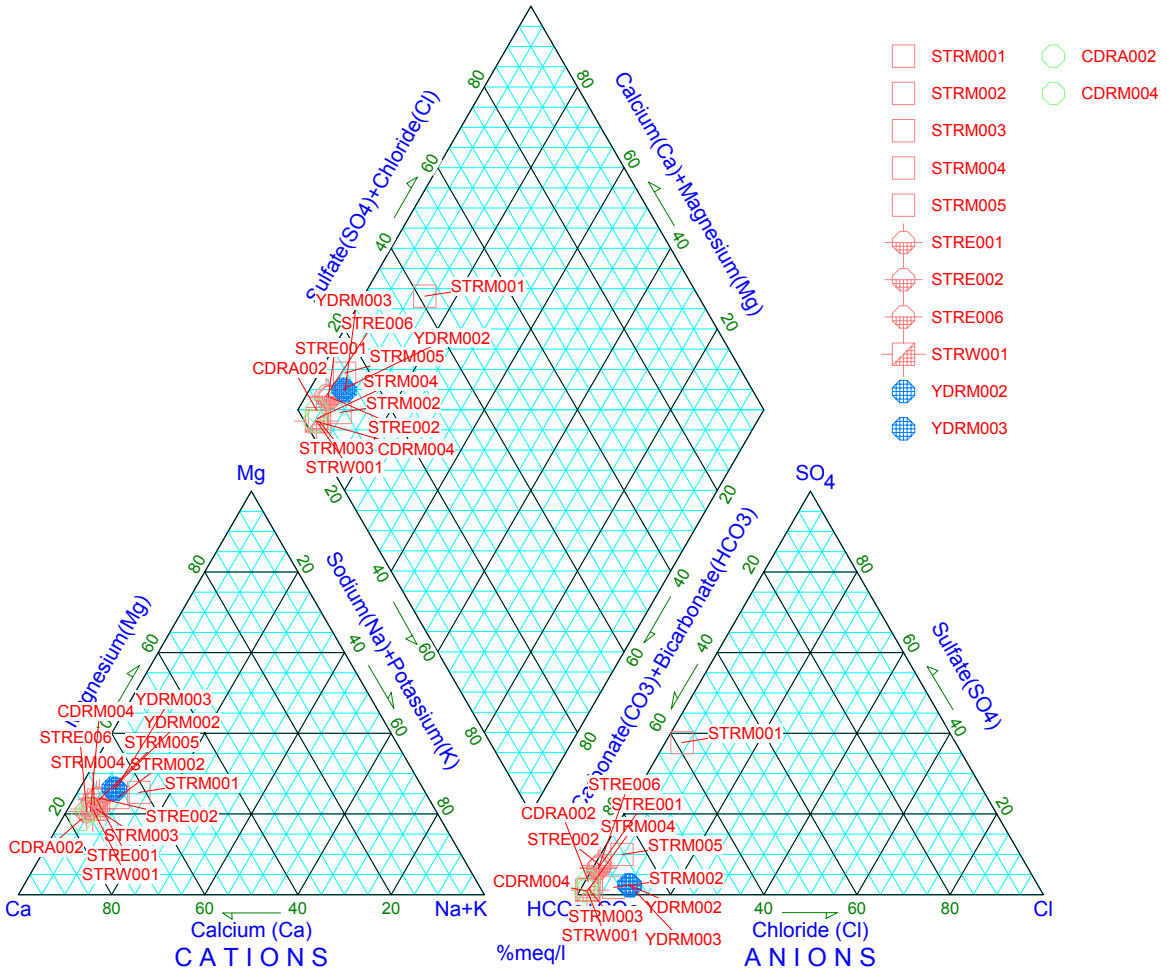


Figure 54 Piper Diagram

Surface Water (Spring Snowmelt Runoff 2005)

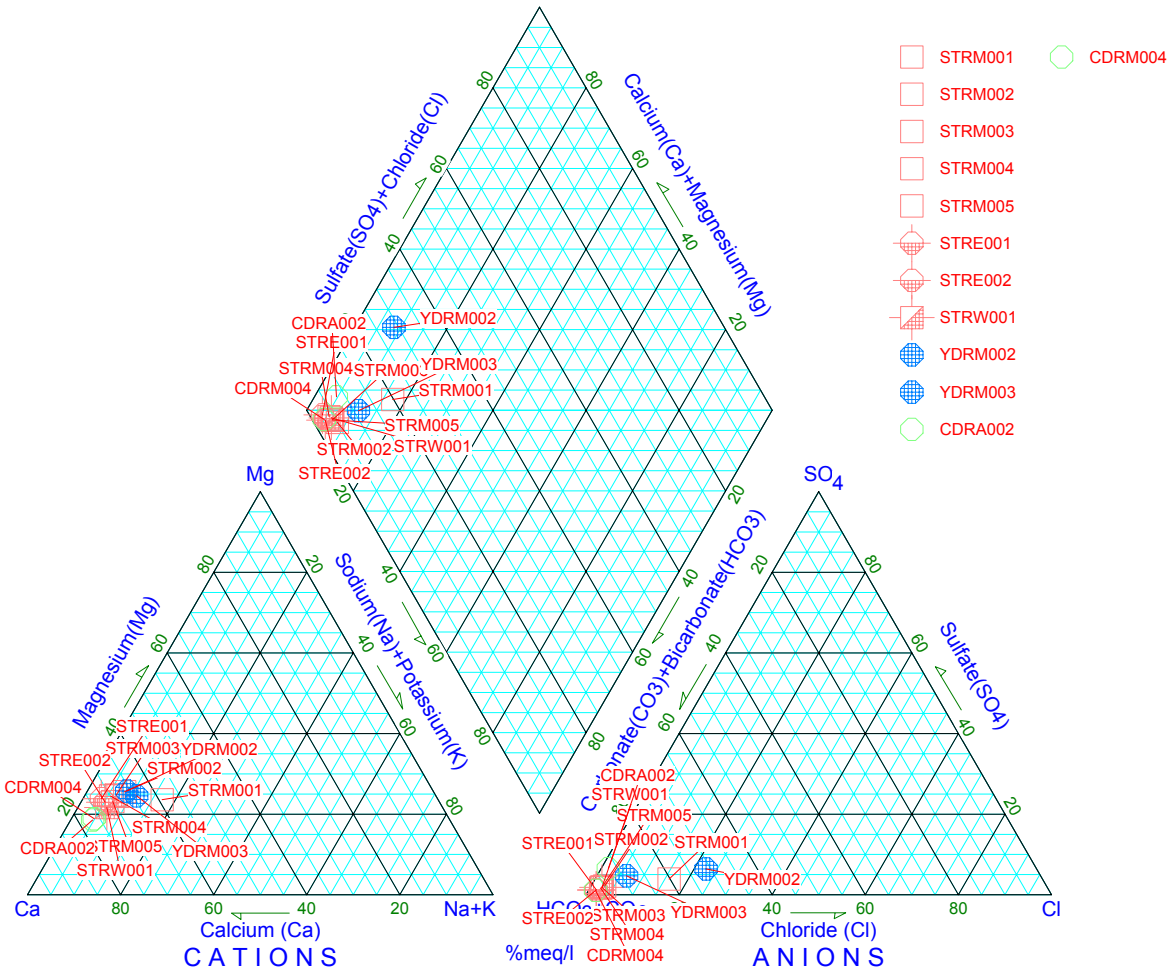


Figure 55
Seasonal Variation of Flow and Mercury Concentration
in the Salmon Trout River Watershed
Eagle Project

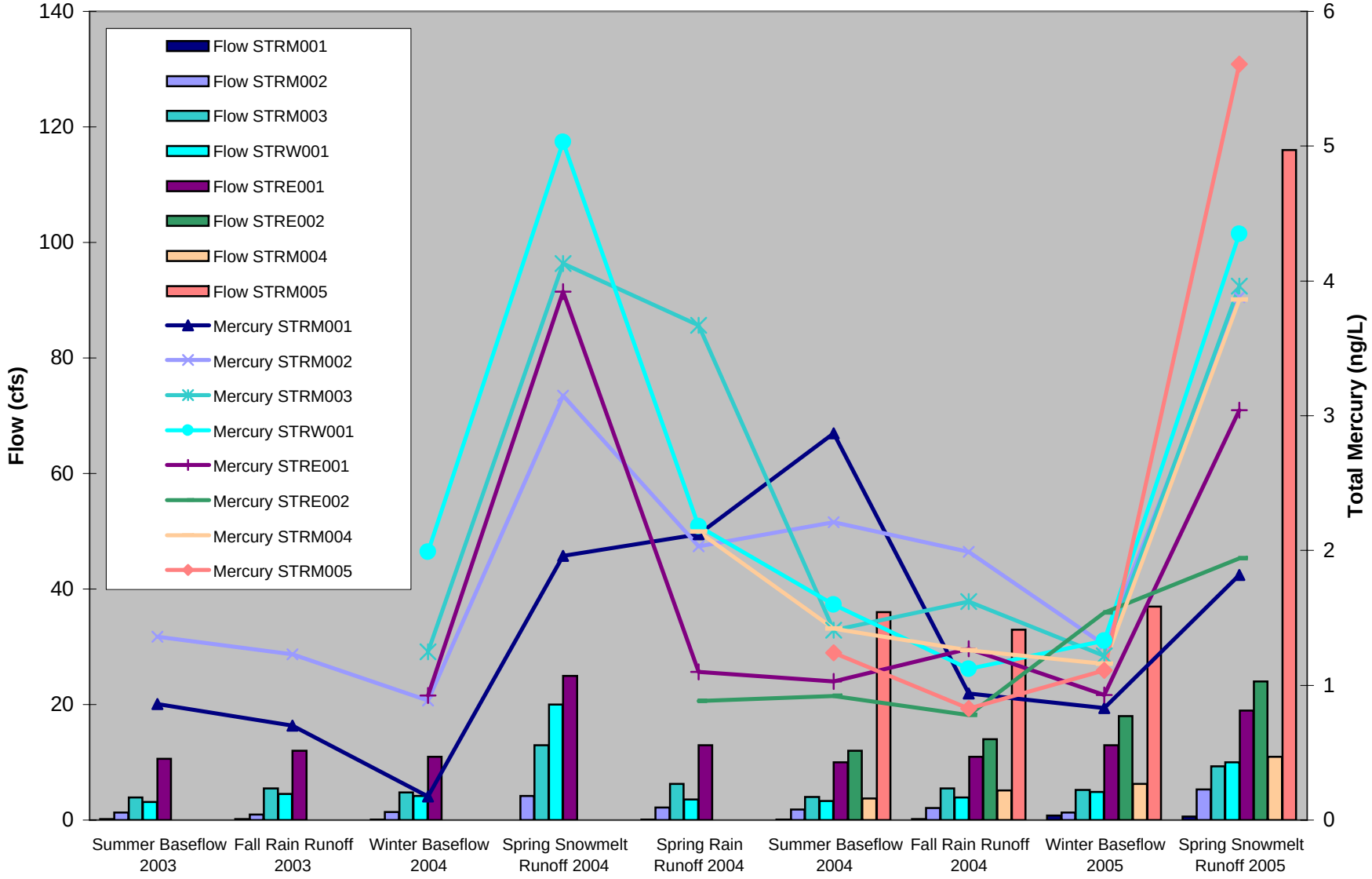


Figure 55: Mercury and Flow

Figure 56 Piper Diagram

Groundwater (Spring Snowmelt Runoff 2004)

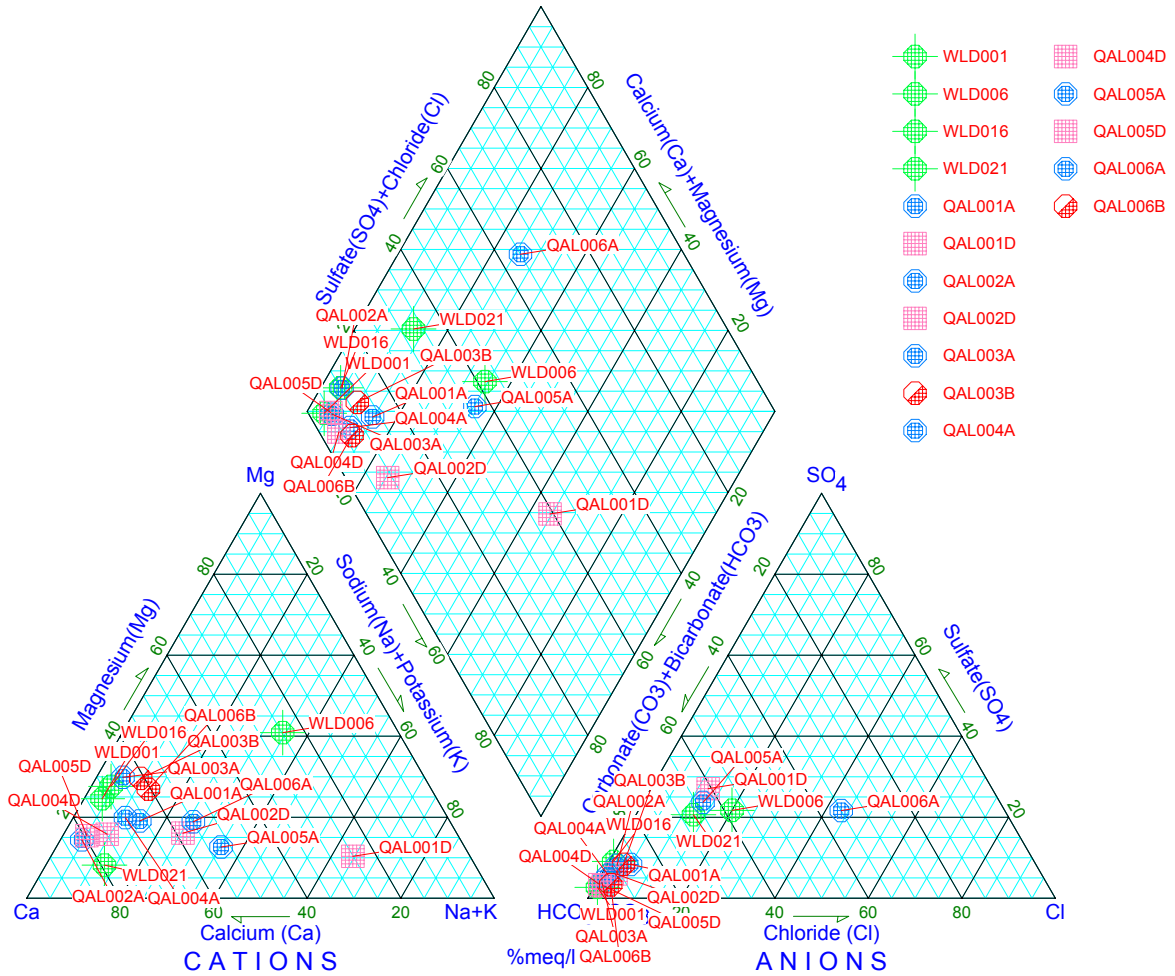


Figure 57 Piper Diagram

Groundwater (Summer Baseflow 2004)

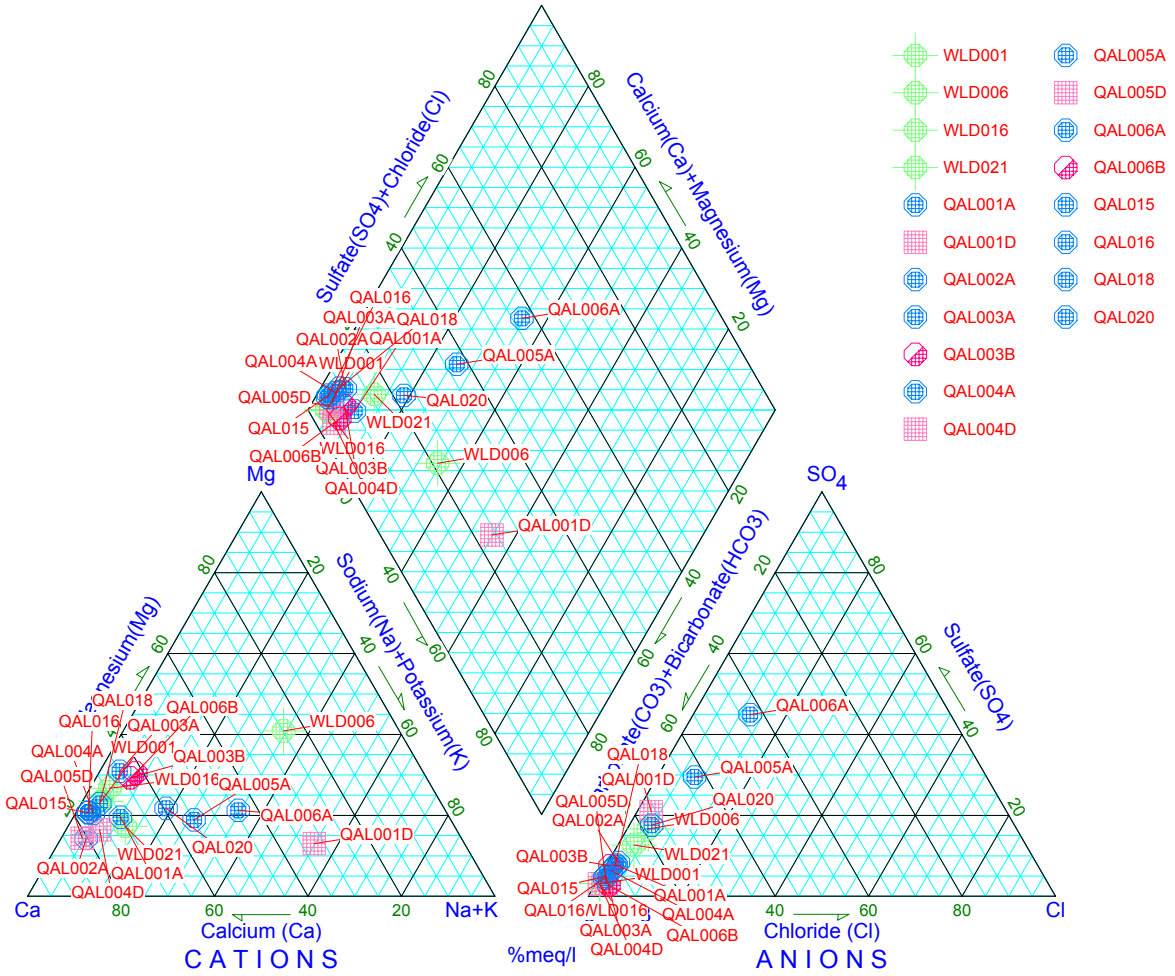


Figure 58 Piper Diagram

Groundwater (Fall Rain Runoff 2004)

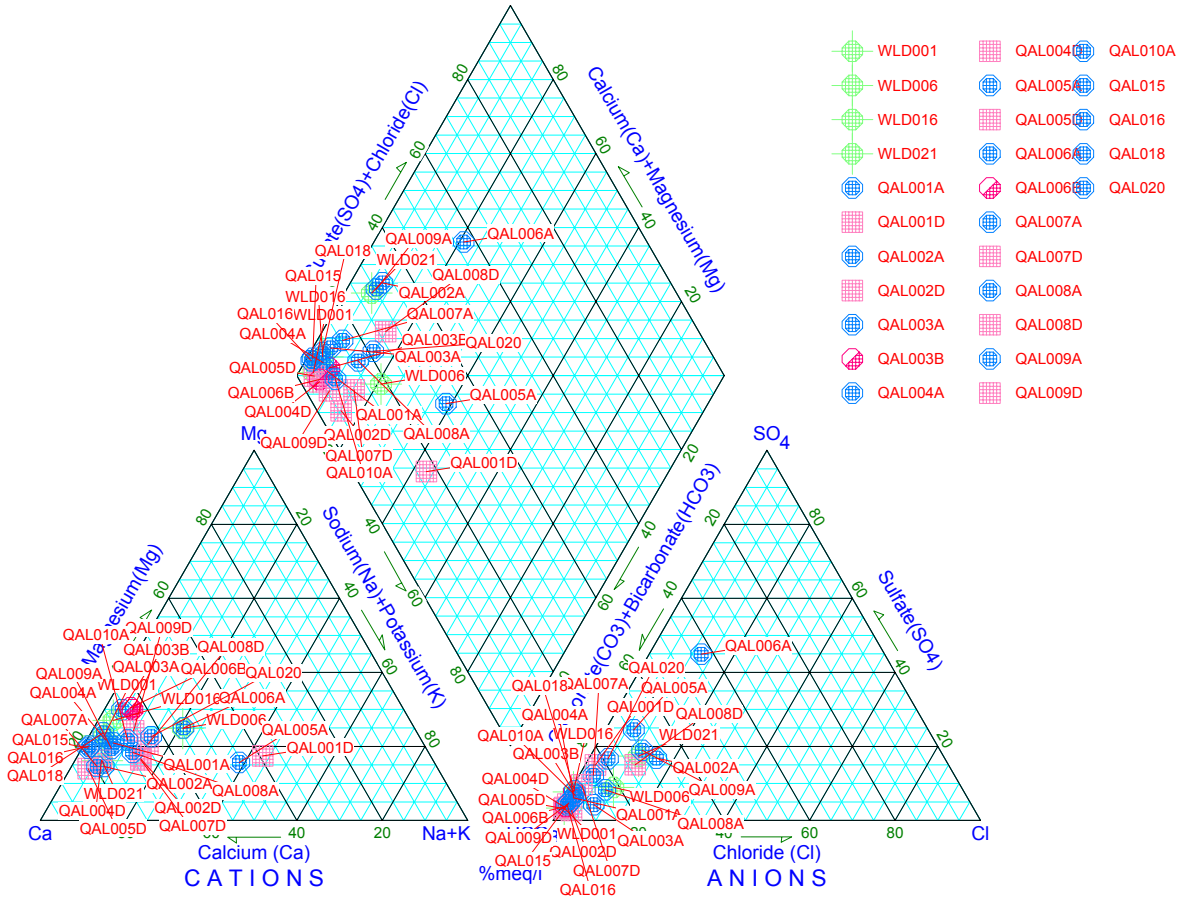


Figure 59 Piper Diagram

Groundwater (Winter Baseflow 2005)

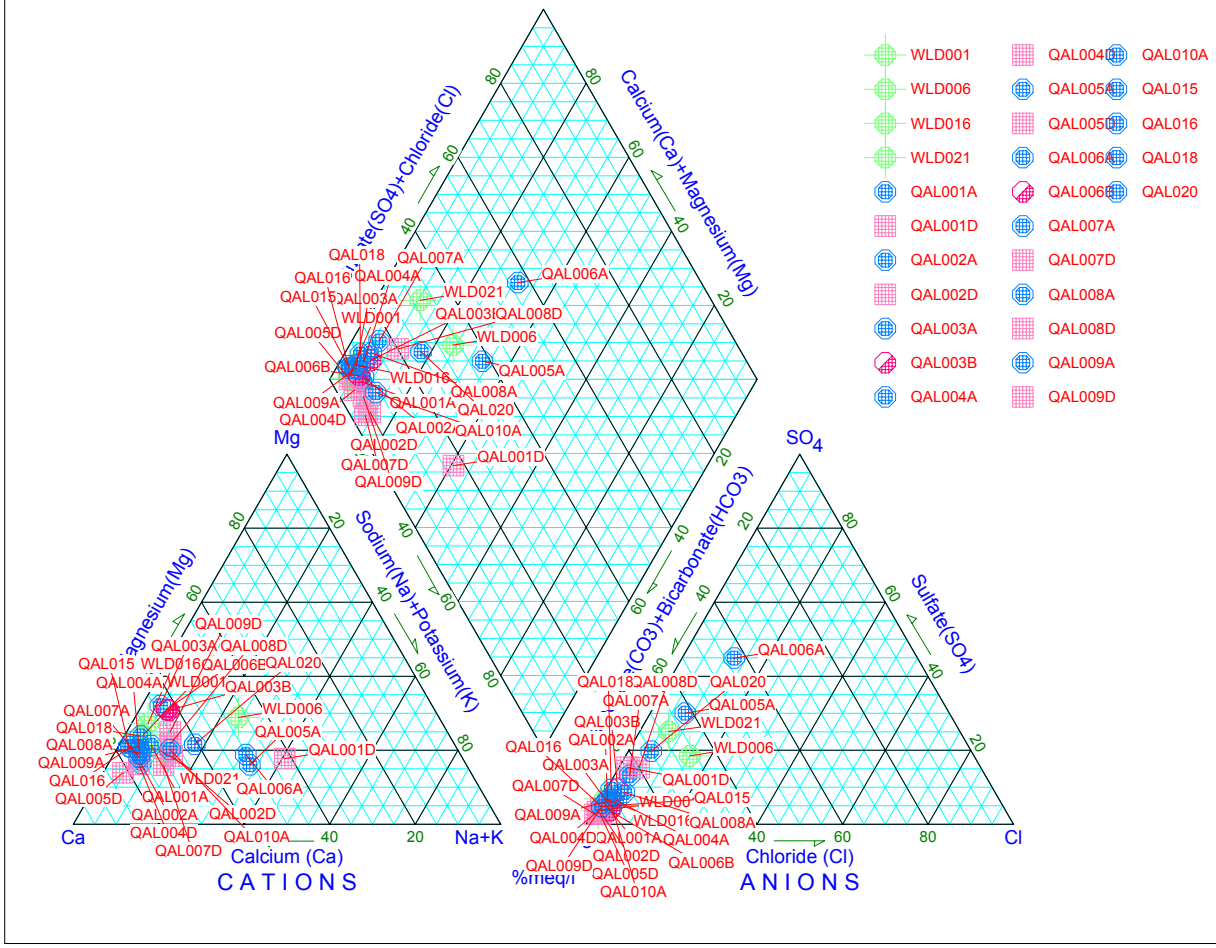


Figure 60 Piper Diagram

Groundwater (Spring Snowmelt Runoff 2005)

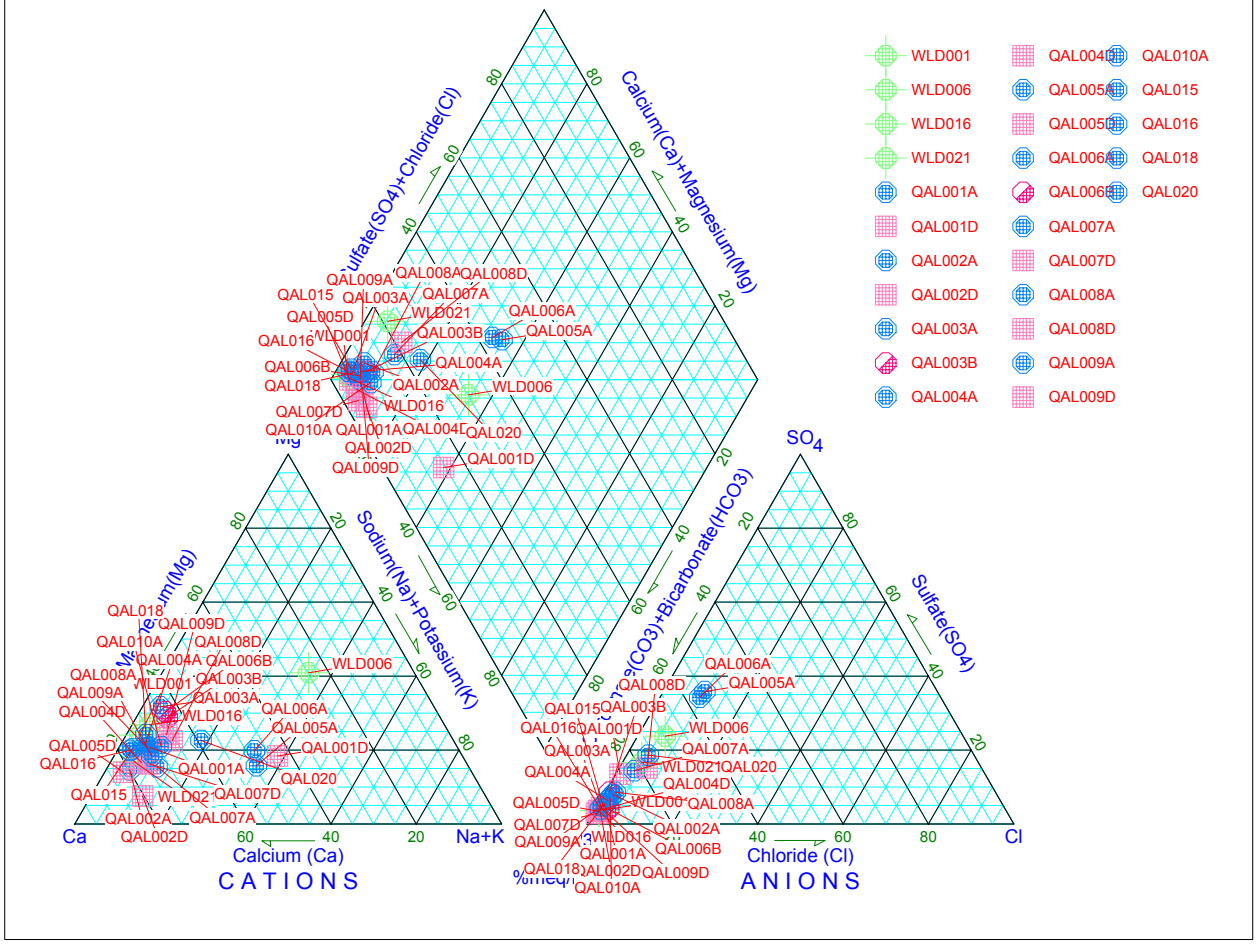


Figure 61 Piper Diagram

Surface Water/Groundwater B-B' (Fall Rain Runoff 2004)

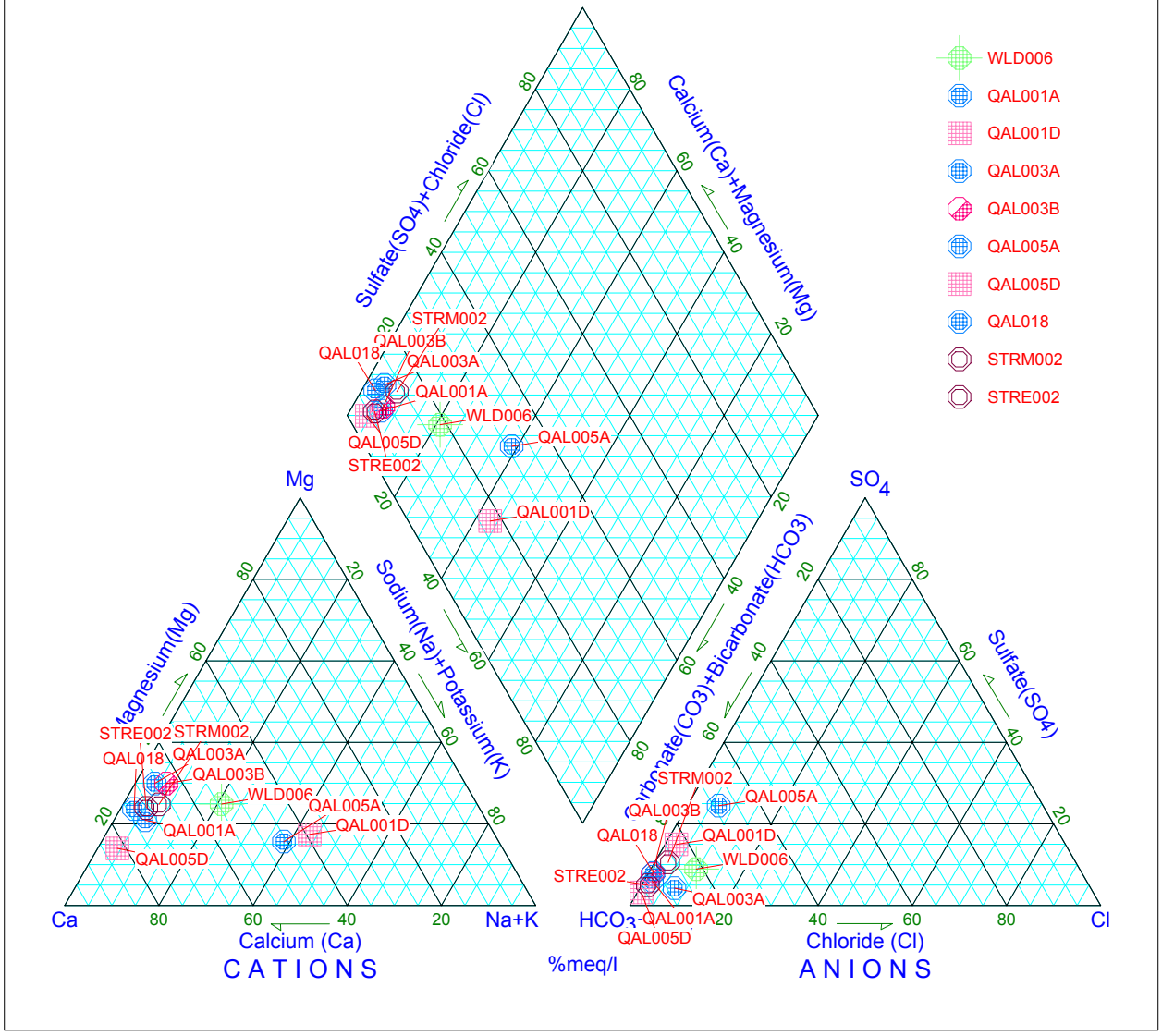


Figure 62 Piper Diagram

Surface Water/Groundwater C-C' (Fall Rain Runoff 2004)

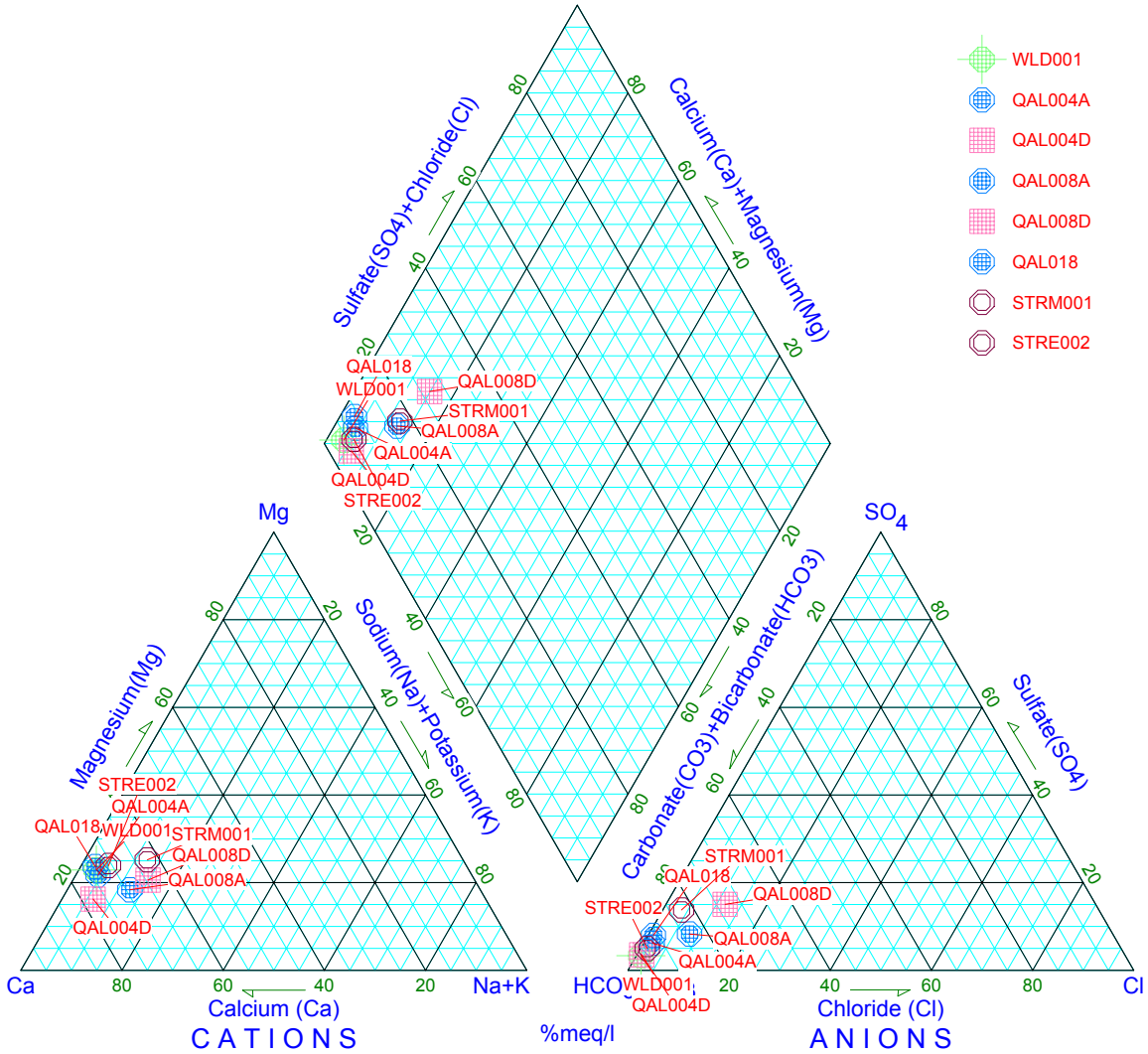


Figure 63 Piper Diagram

Comparison of Quaternary Formation and Bedrock Water Quality

