State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Don A. Ostler, P.E.
Director

TO: Larry Mize, Manager
Ground Water Protection Section

FROM: Loren Morton

DATE: August 8, 1994

SUBJECT: Basis for Revised Ground Water Protection Levels: New Parameters and Revised Shallow Ground Water Quality Statistics.

Attached is a copy of my report on the ground water quality conditions and proposed Ground Water Protection Levels for the Envirocare facility. This analysis includes a determination of the applicable Ground Water Quality Standards or other health based criteria that should be applied to Envirocare, with special emphasis on the new contaminants in the 11e.(2) waste.

A new approach to compliance monitoring is also proposed herein. This report also includes an evaluation of concentration trends, statistics and in some cases the spatial distribution of the inorganic, organic, and radiologic contaminants in the uppermost aquifer at Envirocare.

Of special note is the proposed GWPLs for radiologics found in the 11e.(2) wells. Several radiologic parameters used at the LARW Cell have been found not to be applicable to the 11e.(2) wells. Also, due to the restrictions imposed by the Atomic Energy Act, the numeric values proposed for the radiologics at the 11e.(2) Cells are recommendations only, the final determination of which will be left up to the U.S. Nuclear Regulatory Commission.

If you have any questions or comments, please call me.

Attachments

LBM:lm

cc: Dane Finerfrock, DRC (w/attach.)
Latif Hamden, NRC-Washington, D.C. (w/attach.)
Fred Ross, NRC-Washington, D.C. (w/attach.)

P:ECGWPL6.MEM
FILE:GW-ENVIROCARE

Printed on recycled paper

DWQ Staff Report:

Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels:

Envirocare of Utah Inc.
Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility
near Clive, Tooele County, Utah.

Ground Water Discharge Permit No. UGW450005

Date: August 8, 1994

by

Loren Morton
Environmental Scientist
Utah Division of Water Quality

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

I. INTRODUCTION 2
A. Addition of New 11e.(2) Waste Parameters 2
B. Adjustments in Response to Additional Ground Water Quality Data 3

II. DETERMINATION OF GROUND WATER QUALITY STANDARDS 3
A. New 11e.(2) Waste Parameters 3
B. Revised Utah GWQS Caused by Regulatory Changes 6

III. GROUND WATER QUALITY STATISTICS: APPROACH AND DEFINITIONS 6
A. Approach to Statistics 6
B. Definitions 7

IV. STATISTICAL ANALYSIS AND PROPOSED GWPLS: INORGANICS 9
A. Inorganic Parameters Found Below GWQS 10
B. Beryllium 10
C. Chromium, Molybdenum and Nickel 11
D. Cadmium 12
E. Mercury 13
F. Arsenic 14
G. Fluoride 15
H. Field pH 16
I. Total Dissolved Solids (TDS) 16

V. STATISTICAL ANALYSIS AND PROPOSED GWPLS: ORGANICS 19
A. General Approach 19
B. Available Information 19
C. Organic Parameters Required for all LARW and 11e.(2) Cells 20
D. Organic Parameters Required Only at the 11e.(2) Cells 23

VI. STATISTICAL ANALYSIS AND PROPOSED GWPLS: RADIOLOGICS 25
A. Radiologic Parameters Found Below GWQS 26
B. Gross Alpha Activity 27
C. Radium-226 + Radium-228 29
D. Potassium-40 30
E. Thorium-230 31
F. Total Uranium 32
G. Total Radioactive Iodine 33
H. Gross Beta Activity 35

VII. CONCLUSIONS 36

LIST OF TABLES

TABLE 1: New Ground Water Quality Standards 4
TABLE 2: Revised GWQS for Envirocare's Permit 6
TABLE 3: Culled TOC Data from Pre-March, 1992 21
TABLE 4: TOC Outliers Collected After March 1, 1992 21
TABLE 5: DWQ Rejected Thorium-230 Data 31
TABLE 6: Rejected Total Radioactive Iodine Data 34

LIST OF ATTACHMENTS

Attachment 1: Derivation of GWQS and Human Health Criteria for New Organic Contaminants Found in 11e.(2) Waste.

Attachment 2A: Statistical Analysis: Inorganic Parameters with $\bar{x} \pm 2\sigma$ Concentrations Greater than GWQS.

Attachment 2B: Summary of Statistical Data: Inorganic Parameters with $\bar{x} \pm 2\sigma$ Concentrations Greater than GWQS.

Attachment 3: Chromium Concentration Trends.

Attachment 4: Molybdenum Concentration Trends.

Attachment 5: Nickel Concentration Trends.

Attachment 6: Cadmium Concentration Trends and Comparison of Cadmium/Chromium Concentration Trends.

Attachment 7: Arsenic Concentration Trends and Isoconcentration Map.

Attachment 8: Fluoride Concentration Trends and Isoconcentration Map.

Attachment 9: Summary of Field pH Data.

Attachment 10: Summary of Statistical Data: Total Dissolved Solids, Total Organic Carbon, and Total Organic Halogens.

Attachment 11: Total Dissolved Solids Data: Trilinear Diagram, Isoconcentration Map, and Concentration Trends.

Attachment 12: Total Organic Carbon Concentration Trends: Raw and Culled Data Sets.

Attachment 13: Total Organic Halogens Concentration Data.

LIST OF ATTACHMENTS - continued

Attachment 14: 11e.(2) Organic Contaminants: Summary Concentration Data.

Attachment 15: Statistical Analysis of Radiologic Contaminants: Adjusted Raw Data.

Attachment 16: Summary of Radiologic Contaminants with $\bar{x} \pm 2\sigma$ Concentrations Greater than GWQS.

Attachment 17: Extrapolation of Gross Alpha Statistics and GWPLs from Historic Total Uranium Data.

Attachment 18: Radium-226 + Radium-228 Composite Concentration Plots.

Attachment 19: Potassium-40 Concentration Trends and Stable Potassium Statistics.

Attachment 20: Thorium-230 Concentration Trends.

Attachment 21: Total Uranium Concentration Trends and Isoconcentration Map.

Attachment 22: Total Radioactive Iodine Concentration Trends.

Attachment 23: Gross Beta Concentration Trends, Statistics, and Isoconcentration Map.

EXECUTIVE SUMMARY

Ground water quality conditions have been evaluated and revised Ground Water Protection Levels (GWPLs) have been proposed for the Envirocare Low-Level and 11e.(2) radioactive waste disposal facility by Division of Water Quality (DWQ) staff after review of more than 14,290 individual sample results from 25 wells, collected during the period of April, 1991 thru February, 1994.

Ground Water Quality Standards (GWQS), were first determined for 12 new 11e.(2) contaminants, including beryllium, cyanide, molybdenum, acetone, 2-butanone, carbon disulfide, chloroform, 1,2-dichloroethane, methylene chloride, naphthalene, diethyl phthalate, and 2-methylnaphthalene. In addition, the GWQS for seven heavy metal contaminants had recently been modified in the Utah Ground Water Quality Protection (GWQP) Regulations, including: barium, chromium, copper, selenium, and silver, cadmium and lead. These new and modified GWQS were reflected in all calculations and comparisons made in this report.

It is proposed that background concentration for the Envirocare facility be modified to denote the mean concentration of any contaminant plus its second standard deviation ($\bar{x} \pm 2\sigma$). GWPLs should then be set as either the GWQS or the background concentration, whichever is greater.

In order to simplify the ground water compliance determination process, previous categories of Probable-Out-of-Compliance and Out-of-Compliance have been consolidated into one category. Out-of-compliance status will now be triggered when two (2) consecutive samples exceed the GWPL in the permit.

Of the 18 inorganic parameters considered in this report, eight (8) were found to have background concentrations ($\bar{x} \pm 2\sigma$) in all wells below their corresponding GWQS, including: barium, copper, cyanide, lead, nitrite + nitrate, selenium, silver and zinc. As a result, DWQ staff recommend that the GWPLs for these eight parameters be set equal to their corresponding GWQS.

Eight other inorganic parameters had background ($\bar{x} \pm 2\sigma$) concentrations which exceeded their corresponding GWQS, including: arsenic, beryllium, cadmium, chromium, fluoride, mercury, molybdenum, and nickel. Due to a problem with the beryllium analytical method chosen by Envirocare, additional sampling will be required and an interim GWPL used. As a result of apparent leaching of cadmium, chromium, nickel, and molybdenum from the former stainless steel pumps in the wells, much of the historic water quality data will be held suspect and the GWPLs will be set at their corresponding GWQS. A new approach is proposed for pH, using the range established by the GWQS in lieu of the current single numeric criteria. Based on background concentrations ($\bar{x} \pm 2\sigma$), GWPLs are also proposed for total dissolved solids.

Two organic parameters will be required of all wells at the facility, total organic carbon (TOC) and total organic halogens (TOX). No GWQS is available for either of these contaminants, however, TOC was found to be detectable and background concentrations

($\bar{x}\pm2\sigma$) were calculated for GWPLs. TOX results from all wells at the facility were found to be undetectable. Consequently, the TOX GWPLs will take a detection monitoring approach and be assigned as the minimum detection limit.

All nine of the new 11e.(2) organic parameters were found to be at undetectable levels in all wells at the 11e.(2) Cells. As a result, their GWPLs will be set equal to their corresponding GWQS, with the exception of 2-methylnaphthalene, which has no GWQS. Consequently, the GWPL for 2-methylnaphthalene will be set at the minimum detection limit.

State authority to regulate 11e.(2) disposal sites has been limited to only the inorganic and organic contaminants by the U.S. Atomic Energy Act. As a result, GWPLs determined by the staff in this report for the radiologic parameters in the 11e.(2) wells are solely recommendations to the NRC.

Of the 11 radiologic parameters with GWQS evaluated in this report, five (5) were found to have background ($\bar{x}\pm2\sigma$) concentrations in all wells that were less than their corresponding GWQS, including: carbon-14, strontium-90, technetium-99, thorium-232, and neptunium-237. As a result, the GWPL will be set at the GWQS for all wells at the LARW Cell. The thorium-232 GWQS is recommended as the GWPL for all wells at the 11e.(2) Cells.

Six other radiologic parameters had background ($\bar{x}\pm2\sigma$) concentrations in excess of their GWQS, including: gross alpha, radium-226 + radium-228, potassium-40, thorium-230, total uranium, and total radioactive iodine. Due to a quality assurance problems, all gross alpha data provided by Envirocare has been rejected, and gross alpha values have been extrapolated from total uranium data, which was found to be more reliable. Potassium-40 and total radioactive iodine are not applicable to the 11e.(2) Cells, hence GWPLs are recommended for only wells at the LARW Cell. A seventh parameter, gross beta activity, had no GWQS but its $\bar{x}\pm2\sigma$ concentration should be used as a GWPL and indicator to assess any change in background quality that might be caused by other beta emitting contaminants.

I. INTRODUCTION

The purpose of this report is to detail the basis for revision of Ground Water Protection Levels (GWPL) in Envirocare's Ground Water Discharge Permit (Permit). These revisions can be categorized into two general groups, as follows:

A. Addition of New 11e.(2) Waste Parameters - with authorization of disposal of 11e.(2) waste in the April 29, 1994 Permit has come the need to add several new contaminants to the list of ground water monitoring parameters. These include three inorganics, beryllium, molybdenum, and cyanide; and nine organic compounds, acetone, 2-butanone (methyl ethyl ketone), carbon disulfide, chloroform, 1,2-dichloroethane, methylene chloride, naphthalene, diethyl phthalate, and 2-methylnaphthalene.

B. Adjustments in Response to Additional Ground Water Quality Data - previous GWPLs set in the September 10, 1993 Permit were based on approximately 6 to 9 ground water quality data points per well from Envirocare's uppermost aquifer collected up thru November, 1992. Since that time, additional information has been submitted by Envirocare and reviewed by Division of Water Quality (DWQ) staff, resulting in about twice as much information as was previously available. Review of this data suggests that revisions are needed in the GWPLs to reflect our improved knowledge of ground water quality conditions.

During the course of making these changes, it was necessary to determine if Utah Ground Water Quality Standards were available for the new contaminants. In addition, the statistical approach to the data and compliance determinations was renegotiated with the permittee and modified herein. Discussion of the statistical analysis and proposed GWPLs are then provided for each general category of contaminants, inorganics, organics and radiologic parameters.

II. DETERMINATION OF GROUND WATER QUALITY STANDARDS

A. New 11e.(2) Waste Parameters - before GWPLs could be established for any new monitoring parameters, it was critical to determine State Ground Water Quality Standards (GWQS) or other appropriate health based limits for each of the new contaminants. Table 1, below, summarizes the State GWQS or health based limits determined for each of the new 11e.(2) contaminants.

It has been DWQ practice to look to the EPA Drinking Water Program for human health limits for use as GWQS or permit limits. For the new inorganic contaminants, beryllium, cyanide, and molybdenum, State GWQS, EPA Drinking Water Maximum Contaminant Levels (MCL) or EPA Drinking Water lifetime heath advisories (LHA) were available to draw upon as Permit standards, in order of descending priority.

However, such was not the case for all of the organic contaminants, in that only one of the nine, 1,2-dichloroethane, had an established GWQS. Final EPA MCLs and LHAs were located for only three other organic contaminants: methylene chloride (0.005 mg/l), naphthalene (0.02 mg/l), and diethyl phthalate (5.0 mg/l).

TABLE 1: New Ground Water Quality Standards

Contaminant	Permit Standard (mg/l)	Source
Inorganics		
Beryllium	0.004	EPA Drinking Water MCL
Cyanide (free)	0.2	Utah GWQS
Molybdenum	0.04	Draft EPA Drinking Water LHA
Organics		
Acetone	0.7	DWQ calculated drinking water LHA
2-Butanone	4.2	DWQ calculated drinking water LHA
Carbon disulfide	0.7	DWQ calculated drinking water LHA
Chloroform	0.1	Tentative EPA Drinking Water MCL
1,2-dichloroethane	0.005	Utah GWQS
Methylene chloride	0.005	EPA Drinking Water MCL
Naphthalene	0.02	Final EPA Drinking Water LHA
Diethyl phthalate	5.0	Draft EPA Drinking Water LHA
2-Methylnaphthalene	none	Detection Monitoring (to be determined at a later date)

A tentative EPA MCL value was located for chloroform, 0.1 mg/l. However, this value represents a measurement of total trihalomethane (THM) compounds, which also include bromoform, dichlorobromomethane, and dibromochloromethane. As a result, use of this value as a GWPL assumes that the entire THM concentration that might be measured in the shallow ground water is composed of only chloroform, when in fact it may not be. This issue is further complicated by the fact that chloroform is a known carcinogen, and therefore one cannot easily refer to an oral reference dose (RfD) and calculate a LHA. In fact, to set a human health drinking water criteria for this or any other carcinogen requires much more extensive risk analysis (personal communication, Bob Benson, EPA Region VIII Drinking Water Toxicologist). As a result, DWQ staff were forced to use the total THM MCL of 0.1 mg/l as an analog for chloroform. However, since the shallow ground water at Envirocare will not be used for drinking water without extensive treatment, it may be reasonable to use the 0.1 mg/l value as

an estimate of a human health criteria for chloroform, and employ it as a GWPL in the Permit.

Of the remaining four organics that could occur in the 11e.(2) waste, no GWQS, EPA Drinking Water MCLs or LHAs could be located for acetone, 2-butanone (methyl ethyl ketone or MEK), carbon disulfide, and 2-methylnaphthalene. After determination that none of these four remaining contaminants were known carcinogens it was possible to calculate equivalent drinking water lifetime health advisories (ibid.). Of these remaining four contaminants, RfD values were located for acetone, MEK, and carbon disulfide. With the assistance of EPA Region VIII staff, these calculated LHA values were derived as follows (ibid.):

Calculated LHA = DWEL * RSC

, where: DWEL = Drinking Water Equivalent Level
= RfD * adult body weight * daily water consumption
= mg/kg-day * 70 kg * 1 day / 2 liters
= mg/l

RSC = Relative Source Contribution (unitless)
= fraction of total exposure via drinking water, where the relative source contribution for a contaminant is not known, this value is assumed to be 0.2.

For additional specifics on how these calculated LHA values were derived, please refer to Attachment 1, DWQ spreadsheet, GWQS_ORG.XLS.

Envirocare had previously recommended that EPA Region III Superfund human health criteria for tap water be used as Permit standards for all the organic contaminants. However, the Superfund tap water values include other vectors of human exposure to tap water, e.g. exposure via inhalation of tap water or dermal contact, and as a result may be over-conservative in comparison standard EPA Drinking Water standards protocol. Unlike the EPA Drinking Water MCLs, the Superfund values do not take into account the ability of technology to detect the contaminant, a critical assessment for compliance determinations (ibid.). As a result, DWQ staff determined that calculated LHA values, based on the same procedure used in the EPA Drinking Water Program would be used to set Permit limits for the Envirocare facility instead of those proposed by Envirocare. Comparison of Envirocare's proposed values shows that the DWQ calculated LHA values are lower acetone and MEK, and higher for carbon disulfide (see Attachment 1).

No human health criteria could be found for 2-methylnaphthalene, including a lack of EPA Drinking Water MCLs, LHA, or RfD values, or any EPA Superfund recommended health criteria. Consequently, DWQ staff recommend that a detection

monitoring approach be taken for this contaminant. This means that ground water monitoring will be required for 2-methylnaphthalene for the life of the permit. Upon its detection when concentrations in the ground water at the facility are measured above the analytical detection limit, the Executive Secretary will determined a GWQS for the Permit. It is hoped that at such time human toxicology information will be available to allow determination of a GWQS for 2-methylnaphthalene.

B. Revised Utah GWQS Caused by Regulatory Changes - on April 15, 1994 the Utah Water Quality Board revised the Ground Water Quality Protection Regulations, resulting in changes to the GWQS for a number of heavy metals. Said changes are summarized in Table 2 below, and which must be reflected in Envirocare's permit:

TABLE 2: Revised GWQS for Envirocare's Permit

Contaminant	GWQS (mg/l)		Effect to GWQS
	Former	April 15, 1994	
Barium	1.0	2.0	increase
Cadmium	0.01	0.005	decrease
Chromium	0.05	0.1	increase
Copper	1.0	1.3	increase
Lead	0.05	0.015	decrease
Selenium	0.01	0.05	increase
Silver	0.05	0.1	increase

As can be seen in Table 2, above, two parameters, cadmium and lead, saw decreases in their GWQS; while five others, barium, chromium, copper, selenium, and silver saw increases in their GWQS. During revision of the Permit, the GWPLs will be revised to reflect these changes. No such changes were experienced for the radionuclides, consequently GWQS established earlier for the radioisotopes will remain in force.

III. GROUND WATER QUALITY STATISTICS: APPROACH AND DEFINITIONS

A. Approach to Statistics - ground water quality data reported by Envirocare has been entered into a database managed by DWQ. Statistics were then generated from this data for those samples collected for compliance monitoring. After negotiation with Envirocare, it was agreed that duplicate samples, collected for quality assurance

purposes, would be ignored for the purpose of these statistics. Also, ignored were those samples rejected by Envirocare during their quality assurance review process.

As a first cut and in order to expedite the review process, the sum of the mean concentration and the second standard deviation ($\bar{x}+2\sigma$ concentration) for each contaminant in each well was compared against its corresponding GWQS. Those contaminants found with a $\bar{x}+2\sigma$ concentration that was greater than its corresponding GWQS were then examined further. Parameters without GWQS were handled in a different manner, as described in their corresponding sections below. For those parameters where the $\bar{x}+2\sigma$ concentration was found below the corresponding GWQS, the GWQS was assigned as the GWPL.

In order to assure that the data was representative of field conditions and the statistics derived therefrom as valid as possible, those parameters with a $\bar{x}+2\sigma$ concentration in excess of the GWQS were further scrutinized. Such scrutiny included review of the individual data points and their concentration trends. From this examination, certain outliers were identified and investigated by DWQ staff. Data points found to be more than one order of magnitude greater than the remainder of a data set were considered suspect and culled. One example of this action is found in the silver concentration in wells GW-25 and GW-38, where samples collected in March, 1992 were about 100 times greater in concentration than the remainder of the data set, which was undetectable.

For the radiologic parameters, many data points were culled by DWQ staff had been flagged as estimated quantities by Envirocare (quality assurance flag = J), but had reported concentrations below the lower limit of detection (LLD) reported by the laboratory for the method. These included 21 cases from three parameters: gross beta, thorium-230, and radioactive iodine; with the majority occurring with radioactive iodine. In another case, DWQ staff found Envirocare had neglected to reject an extremely high thorium-230 sample in well GW-23 (February 11, 1993), although they had rejected an equally high sample in another well the following month.

After the culled values were removed from their corresponding data sets, the $\bar{x}+2\sigma$ concentrations were re-calculated and once again compared to their GWQS. In many cases, the adjustment of the data set caused the $\bar{x}+2\sigma$ values to fall below the corresponding GWQS; consequently, the GWQS then became the GWPL.

B. Definitions - based on previous negotiations with Envirocare, it has been agreed that compliance for ground water quality monitoring would be based on the following definitions and approach:

1. Background Concentration - previously the background concentration for any contaminant was defined as the mean concentration. However, in order to recognize the variability in ground water quality at the facility, the background

concentration should be defined as the $\bar{x}+2\sigma$ concentration. This new approach will help avoid false positive violations by requiring that the 95% confidence interval be exceeded before any non-compliance is triggered.

Due to the high spatial variability of the ground water quality at the Envirocare facility, these statistics must be generated on a well-by-well basis for each contaminant. For further information on this issue, the reader is referred to the March 23, 1994 DWQ memorandum regarding Envirocare's March 9, 1994 proposal for "pool" statistics.

As established in earlier permits, the total dissolved solids (TDS) content of the ground water at the Envirocare facility continues to be between 20,000 and 60,000 mg/l. As a result, the shallow ground water at the facility will continue to be classified as a Class IV ground water.

2. Consolidation of the Former Two Phases of Non-Compliance - the former permit contained two phases of non-compliance, Probable Out-of-Compliance and Out-of-Compliance. In order to simplify the compliance status of the facility, both of these non-compliance phases will be consolidated into a single phase, Out-of-Compliance. As a result of this change only two compliance status possibilities will exist: in-compliance and out-of-compliance. As described below, the out-of-compliance threshold will be defined as the $\bar{x}+2\sigma$ concentration. As a result, this change will help avoid unnecessary enforcement action that may result due to false positive violations. Monthly sampling or other enforcement action will be initiated after it is confirmed that an out-of-compliance situation exists.

3. GWPLs Where Background Concentration $\leq$ GWQS - where the background or $\bar{x}+2\sigma$ concentration for a parameter is less than or equal to the GWQS, the GWPL will be set equal to the GWQS. This approach is consistent with the Ground Water Quality Protection Regulations, UAC R317-6-4.7, which requires that Class IV ground water have protection levels set to protect human health and the environment.

4. GWPLs Where Background Concentration > GWQS - where the $\bar{x}+2\sigma$ concentration for any contaminant is greater than the GWQS, the GWPL will be set at the $\bar{x}+2\sigma$ concentration. In the case of TDS, where no specific GWQS is defined in the regulations, the GWPL will be set at the $\bar{x}+2\sigma$ concentration for each well at the facility.

5. Out-of-Compliance Status - out-of-compliance status for ground water monitoring will exist when two consecutive samples exceed the GWPL. For those parameters where the GWPL has been set equal to the GWQS, this means that Envirocare will be allowed to pollute up to the GWQS. This is the same approach as in former

Permits, and is reasonable considering the limited beneficial use of Class IV ground water at the site.

For those parameters where the GWPL has been set equal to the $\bar{x}+2\sigma$ concentration, this means that out-of-compliance status will not be triggered until a 99% confidence threshold is exceeded. This approach should help both Envirocare and the DWQ avoid unnecessary enforcement actions for false positive violations.

Similar to previous Permits, the Executive Secretary will reserve the right to determine out-of-compliance status by trend and/or spatial analysis of ground water quality data at the facility. This will allow early intervention and corrective action, if necessary, in the event a contaminant is observed with increasing temporal trends or after comparison of up and downgradient wells. Thanks to this alternative, the Executive Secretary may take enforcement action without having to wait for a GWPL to be exceeded by two consecutive samples. This approach would be most useful for parameters whose GWPL was set at the GWQS.

IV. STATISTICAL ANALYSIS AND PROPOSED GWPLS: INORGANICS

Approximately 8,000 individual ground water monitoring data for the inorganic parameters were examined for the period of record between December, 1991 and February, 1994. For each parameter in each well, the $\bar{x}+2\sigma$ concentration was calculated and compared with the GWQS, see Attachment 2A, DWQ spreadsheet IOGWPL.XLS. Consistent with the discussion above, parameters with $\bar{x}+2\sigma$ concentrations that did not exceed their GWQS were not given any further attention, but instead assigned the GWQS as the GWPL. A summary of the inorganic parameters found to have an $\bar{x}+2\sigma$ concentration greater than the GWQS are listed in Attachment 2B, DWQ spreadsheet IOGWPL.XLS. Review of this data shows 99 separate parameters have $\bar{x}+2\sigma$ concentrations greater than the GWQS.

Three other inorganic parameters do not have corresponding GWQS, but will be used as compliance monitoring parameters anyway. These include total dissolved solids, total organic carbon, and total organic halogens, and are discussed separately below. Special considerations will also be discussed for field pH.

In previous Envirocare permits, detailed normality analysis of each well's data set was completed in order to justify the statistics used to set GWPLs for the permit. However, in order to expedite the review normality testing was only conducted on two inorganic parameters, arsenic and fluoride. Additional testing although helpful, does not appear to warrant the time and effort that would be required, in light of the high total dissolved solids content of the ground water and Class IV status of the shallow-most aquifer. As a result, the evaluation of the remaining inorganic, organic, and radiologic parameters was

limited to the raw statistics calculated by DWQ staff and any apparent trends observed in time-concentration plots of the ground water quality data.

It is also important to note that former wells GW-16 and GW-56 have been replaced in the compliance monitoring well network by wells GW-16R and GW-56R. As a result, all statistical information regarding the former wells found in the attachments heretofore can be ignored.

Compliance Monitoring Parameters WITH GWQS

A. Inorganic Parameters Found Below GWQS - after review of the ground water quality data collected thru February, 1994, DWQ staff have determined that all the wells at the facility exhibit $\bar{x} \pm 2\sigma$ concentrations which were below the GWQS, for the following parameters (see Attachment 2A):

Barium	Nitrite + Nitrate
Copper	Selenium
Cyanide	Silver
Lead	Zinc

As a result, the GWPLs for these parameters will be assigned as their corresponding GWQS, for all wells at the LARW Cell, SE 11e.(2) Cell, and the NW 11e.(2) Cell.

The remaining parameters discussed below, were all found to have background ($\bar{x} \pm 2\sigma$) concentrations in excess of their GWQS.

B. Beryllium - all beryllium results reported by Envirocare failed to demonstrate a minimum detection limit (MDL) which was equal to or below the assigned GWQS, 0.004 mg/l. For this reason, all beryllium results reported by Envirocare, some 14 samples from each of 21 wells (294 analyses) show a mean concentration of 0.005 mg/l and standard deviation of 0. As a result, the revised Permit will include:

1) A requirement that Envirocare select analytical methods for all compliance monitoring that have a MDL which is preferably lower than, but at least equal to the GWQS, and

2) The beryllium GWPL will be assigned equal to the GWQS of 0.004 mg/l for each well. After a number of samples have been collected, Envirocare may petition the Executive Secretary for revision of the assigned GWPLs at a future date.

It is important to note that the criteria that all analytical methods utilized for compliance monitoring under the permit must have MDL which were less than the GWPLs was once a permit requirement, see Part I.F.6.b.2.ii of the March 20, 1992

Permit. However, during preparation of the September 10, 1993 Permit, Envirocare requested that this condition be dropped, citing the fact that the approved methods all met this requirement and were already listed in the Ground Water Monitoring Quality Assurance (GWMQA) Plan in Appendix B of the Permit. In retrospect, it is clear that this criteria must be maintained in the Permit so as to provide Envirocare clear directives for selecting analytical methods for new parameters. Without these permit guidelines, Envirocare may be vulnerable to repeat this mistake.

C. Chromium, Molybdenum and Nickel - during recent months, Envirocare has encountered Probable and Out-of-Compliance difficulties with respect to chromium, molybdenum, and nickel, and been required to undertake monthly ground water sampling for these metals. After review both Envirocare and DWQ of all the data available, it has been concluded that the source of these elevated metal concentrations appears to be the stainless steel pumps, in that chromium, molybdenum, and nickel are known constituents of 316L stainless steel. For additional information on this issue see the March 29, 1994 Bingham Environmental submittal on corrosion of the sampling pumps and the April 22, 1994 DWQ letter to Envirocare regarding Probable and Out-of-Compliance status. As a result of this non-compliance situation, Envirocare has agreed to replace all the stainless steel pumps at the facility with pumps made of PVC. Consequently, the bias that apparently has been caused in the chromium, molybdenum, and nickel results by the pumps should be removed in the near future.

However, this does not remove the bias in the current data set from which we must determine GWPLs today. In order to avoid this bias issue in determination of GWPLs, DWQ staff recommend that it be assumed that the baseline conditions were below the MDL for each of these metals before the stainless steel pumps were installed. Review of the chromium, molybdenum, and nickel ground water quality data support this assumption, as discussed below:

1. Chromium Concentration Trends - chromium concentration plots for all the wells at the facility show that particularly during the early portion of the accelerated monitoring period, from June, 1992 to May, 1993 that chromium concentrations were at or below MDL values, see Attachment 3, CRALL.XLS Charts 1 thru 5. As seen on these charts across the later sampling periods, after May, 1993, the chromium concentrations generally increase dramatically for all the wells in questions. This period corresponds to when the sampling frequency was relaxed from monthly to quarterly sampling. Which would suggest that the longer ground water contact time with the stainless steel pump contributed to an increased release of chromium to the ground water.

   It is also interesting to note that chromium concentrations across the period of record reflect similar direction of change, be it increases or decreases for all wells at the facility. This would suggest that the chromium concentrations measured are

a result of some common factor, one that effects all the wells in question. Only two such possibilities are apparent: 1) bias caused by the analytical laboratory, or 2) bias caused by the sampling train, i.e., sampling equipment or pumps. If we are able to discount bias by the laboratory, then the pumps become the most likely suspect. This is further reinforced by the fact that chromium is a known component of 316L stainless steel.

Based on this information, DWQ staff have concluded that the high chromium concentrations seen in the ground water quality data are likely due to bias by the stainless steel pumps. Review of the available data indicate that during periods of frequent sampling, when ground water contact time was minimized, that chromium concentrations were found to be at or below the MDL for most of the wells. Therefore, DWQ staff deem it reasonable to assume that the native, undisturbed ground water quality conditions at the facility may have been at or below the 0.005 mg/l MDL concentrations for chromium. As a result, the GWPLs for the chromium for all wells at the facility should be set equal to the GWQS, 0.1 mg/l.

2. Molybdenum Concentration Trends - the molybdenum concentrations are much more difficult to interpret, primarily because over the period of record, Envirocare has used analytical methods with varying MDL values, see Attachment 4, MOALL.XLS Charts 1 thru 4. This makes it extremely difficult to determine any statistics from the available data. However, because some values have been measured below a reported MDL of 0.005 mg/l, and because molybdenum is a known constituent of 316L stainless steel, DWQ staff recommend that the native or undisturbed molybdenum concentration in the ground water be assumed to be at or below 0.005 mg/l. As a result, the molybdenum GWPLs for all wells at the facility should be assigned as the GWQS, 0.04 mg/l.

   In addition, it must be noted that several MDL values reported for molybdenum analysis by Envirocare were greater than the GWQS. This reinforces the conclusion made above that the Permit must clearly require all analytical methods used under authority of the Permit, to have MDL values which are below the GWQS.

3. Nickel Concentration Trends - the nickel concentration trends in all the wells mimic those seen above for chromium, see Attachment 5, DWQ charts NIALL.XLS Charts 1 thru 4. As with chromium, the early results for nickel, collected during frequent monthly sampling, suggest that the native background concentration may have been at or below the MDLs reported, 0.005 mg/l and 0.01 mg/l. As a result and based on the bias discussion above, the nickel GWPLs for all wells at the facility should be assigned as the GWQS, 0.1 mg/l.

D. Cadmium - cadmium concentrations in all the wells at the facility have for the most part been at or below MDL values over most of the period of record, December, 1991

to May, 1993, see Attachment 6, CDALL.XLS Charts 1 thru 5. However, after completion of the monthly accelerated sampling in May, 1993, and the start of quarterly sampling, cadmium concentrations dramatically increased. Thereafter, when Envirocare re-initiated monthly sampling cadmium concentrations have once again fallen to at or below MDL values.

In addition, it has been observed that although cadmium is not a known constituent of 316L stainless steel, that its concentration response has somewhat mimicked that of chromium, a known component suggesting that it may be caused by the stainless steel pumps, see Attachment 6, CRALL.XLS Charts 6 thru 9. Based on these observations, the DWQ in its April 22, 1994 letter to Envirocare allowed the pump change-out proposal as a possible interim solution to the cadmium incidences of non-compliance. If after completion of the replacement of the pumps, cadmium concentrations fall again to MDL values, said non-compliance issues may be resolved.

Based on the most recent samples which shows that monthly sampling once again may have caused the cadmium concentrations to return to MDL values, it appears reasonable to assume that the native undisturbed background cadmium concentrations were at or below MDL values, 0.004 mg/l. Consequently, the cadmium GWPLs for all wells at the facility should be assigned as the GWQS, 0.005 mg/l.

E. Mercury - mercury has been found with $\bar{x}+2\sigma$ concentrations in excess of the GWQS in two wells, GW-20 and GW-29. Review of the data set for each of these wells shows that the data population from each of these wells consists of a vast majority of undetectable values, composed of 77.78% and 72.22%, respectively, of values that were below the MDL, see Attachment 2B. As a result, both data sets would fail a normality distribution test, and any mean or standard deviation constructed using parametric methods would be invalid since these statistical representations require the data to be normally distributed.

Consequently, DWQ staff have concluded that both data sets are essentially undetectable. The staff therefore have fashioned an approach to determine a GWPL for mercury in these wells using the Class III GWPL criteria from the Ground Water Quality Protection Regulations, UAC R317-6-4.6.B.2. This GWPL for Class IV ground water would be determined from the greater of either:

1. 1.0 * GWQS, 0.002 mg/l, or

2. the MDL, 0.0002 mg/l,

which results in a GWPL which is equal to the GWQS, 0.002 mg/l, for both wells GW-20 and GW-29.

F. Arsenic - six wells at Envirocare had $\bar{x}+2\sigma$ arsenic concentrations in excess of the GWQS, including wells: GW-25, GW-26, GW-27, GW-28, GW-36, and GW-58, see Attachment 2B. In order to ensure that each of the data sets were normally distributed and the reported statistics therefore reliable, DWQ staff completed analysis of each wells data set using the statistical software SAS and its Univariate procedure (Shapiro-Wilk test). All six data sets passed the normality test; therefore DWQ staff determined that the $\bar{x}+2\sigma$ arsenic values for these wells were reliable.

After review of the DWQ arsenic concentration trend graphs and the isoconcentration map in Attachment 7, DWQ staff have reached the following conclusions:

1. Lowest Arsenic Concentrations in Unit 2 Clay - arsenic concentrations in those wells completed across the Unit 2 clay tend to be lower than those wells completed in the Unit 3 sand at the 11e.(2) Cells, compare the arsenic values in those wells at eastern portion of the facility, around the Low-Activity Radioactive Waste (LARW) Cell, with other wells located in the central and western areas of the facility, see Attachment 7, charts and isoconcentration map. The highest average arsenic concentrations were found near the Northwest 11e.(2) Cell in wells GW-3 and GW-26, 0.0923 and 0.0965 mg/l, respectively. Whereas the lowest detectable average concentration was found in well I-2-30 at 0.0127 mg/l (the two samples collected from well GW-64 were both below MDL).

2. Spatial Control - appears to effect the arsenic concentration at the facility, as shown by concentration "bull's-eyes" at 3 or 4 wells near the Northwest 11e.(2) Cell, see Attachment 7, isoconcentration map. For this reason it was necessary to set GWPLs on a well-by-well basis.

3. Seasonal Variations - the arsenic concentrations appear to vary seasonally, in that concentration variations in many of the wells occurs in tandem, see Attachment 7, ASALL.XLS Charts 1 thru 3. The cause of this seasonality is as yet unknown.

4. Possible Increasing Trend in Wells GW-19A, GW-36, GW-37, and GW-38 - an apparent increasing arsenic trend has been observed in wells near the Southeast 11e.(2) Cell, see Attachment 7, ASALL.XLS, Chart 2. However, because this cell has not yet been constructed and the wells in question are located at a significant distance from the LARW Cell, DWQ staff have concluded that this variation may be natural. Another explanation may be that said increase is a result of increased leaching of arsenic entrained in the Unit 3 sand due to artificial recharge caused by the storm water impounded recently near these wells.

5. Possible Decreasing Trend in Well GW-3 - a decreasing trend in arsenic concentration has been observed in well GW-3. The cause of this decrease is unknown at this time, however, because GW-3 is not a part of the compliance well

network its trend is not pertinent to GWPLs. However, the decrease seen reinforces the need to determine ground water compliance on a well-by-well basis.

After review of the arsenic data and consideration of the above conclusions, DWQ staff have determined that it is appropriate to use the $\bar{x}+2\sigma$ arsenic concentrations to set GWPLs for the wells GW-25, GW-26, GW-27, GW-28, GW-36, and GW-58.

G. Fluoride - nine wells at the facility were found to have $\bar{x}+2\sigma$ fluoride values that exceeded the GWQS, including wells: GW-19A, GW-20, GW-25, GW-26, GW-27, GW-28, GW-29, GW-57, GW-63, see Attachment 2B. Once again each of these nine data sets were tested by the SAS Univariate procedure and the Shapiro-Wilk test. All nine data sets passed the normality test, and DWQ staff determined that the fluoride statistics were acceptable.

After review of the fluoride trend graphs and the isoconcentration map found in Attachment 8, DWQ staff have reached the following conclusions regarding the fluoride concentration data:

1. Lowest Fluoride Concentrations in Unit 2 Clay - similar to the trend seen in arsenic, the lowest average fluoride concentrations occur in wells completed in the Unit 2 clay, while the largest average concentrations are found in wells screened across the Unit 3 sand, see Attachment 8, isoconcentration map. The highest average fluoride concentration was found in well GW-19A (4.4352 mg/l), while the lowest average concentrations were found in wells I-2-30 and GW-64 (2.3277 and 2.45 mg/l, respectively).

2. Seasonal Variation - the fluoride concentrations appear to follow a seasonal trend, in that variations in many of the wells occur in tandem with one another, see Attachment 8, DWQ graphs F_ALL.XLS, Charts 2 thru 4. The cause for such seasonality is unknown at this time.

3. Apparent Increasing Fluoride Trends - review of the wells at both of the 11e.(2) Cells shows an apparent increasing trend in fluoride concentration, with the exception of GW-19A which has remained consistently high in fluoride content. Because these cells have not yet been constructed and the wells in question are located at a significant distance from the LARW Cell, DWQ staff have concluded that this variation may be natural. Increases seen in wells at the LARW Cell demonstrate a variation of about 2 fold, well within the possibility of natural variation. In the event that any further increases in fluoride concentration invalidate this assumption, the on-going compliance monitoring for fluoride, required under the Permit, will identify future violations.

As a result, DWQ staff deem it reasonable to use the fluoride data and the $\bar{x}\pm2\sigma$ concentrations in Attachment 2B to establish revised GWPLs for the nine wells in question. The GWQS should be used as GWPLs for the remaining wells at the Envirocare facility.

H. Field pH - in Envirocare's previous Ground Water Discharge Permit, the statistics for field pH were based on the mean concentration plus one standard deviation ($\bar{x}+\sigma$). This approach assumed that the pH variation only occurs to the high side of the mean, and not across both sides, i.e., $\bar{x}\pm\sigma$.

Upon further review, DWQ staff determined it appropriate to consider both additive and subtractive variability in the pH data. In addition, it is important to have a consistent statistical approach for field pH and all the other compliance monitoring parameters. Hence, the GWPL for field pH should be based on the mean concentration plus or minus the second standard deviation ($\bar{x}\pm2\sigma$).

A summary of the field pH statistics is found in Attachment 9, spreadsheet PHFSUM.XLS. As can be seen there, the $\bar{x}\pm2\sigma$ variability window does not exceed the Utah GWQS for any of the wells; as illustrated by the fact that the lowest $\bar{x}-2\sigma$ value is still greater than 6.5 and the highest $\bar{x}+2\sigma$ value is less than 8.5. As a result, DWQ staff determined that the background or $\bar{x}\pm2\sigma$ field pH values did not exceed the GWQS, and therefore chose to set the GWPL for each well equal to the GWQS.

Compliance Monitoring Parameters **WITHOUT** GWQS

I. Total Dissolved Solids (TDS) - since no GWQS exists specifically for TDS, we are left to a statistical basis for setting GWPLs. In Envirocare's previous Ground Water Discharge Permits, the TDS GWPL has been set at the mean concentration plus one standard deviation ($\bar{x}+\sigma$). However, in keeping with the new approach discussed above, the new TDS GWPLs should be set at the $\bar{x}+2\sigma$ concentration value (95% confidence limit).

A summary of the TDS statistical data is found in Attachment 10, DWQ Spreadsheet IOGWPL.XLS. For the compliance monitoring wells, which exclude wells GW-3, GW-16 and GW-56, the average TDS concentration ranged from 33,000 to 49,588 mg/l. The standard deviation for these same compliance monitoring wells ranged from 1,000 to 5,272 mg/l.

1. Major TDS Components - a trilinear plot of the average concentration of the major ions in each of the compliance monitoring wells shows that the shallow ground water at the facility continues to be dominated by sodium chloride, see Attachment 11, trilinear diagram. It also appears that many of the 11e.(2) wells completed in the Unit 3 sand, as designated by a small circle, may have a slightly greater

relative percentage of bicarbonate + carbonate than many of the LARW wells completed in the Unit 2 clay, designated by a + symbol.

2. Spatial TDS Distribution - the distribution of the average TDS concentration in the shallow aquifer is also noteworthy. Review of the isoconcentration map in Attachment 11, shows the majority of the site has a TDS on the order of about 42,000 mg/l or more. However, low TDS concentrations are found at the southeastern margin of the LARW Cell in wells I-2-30 and GW-64 at approximately 33,000 mg/l; compare isoconcentration map in Attachment 11 with Attachment 10. This may be explained by a greater portion of upward recharge from the lower TDS ground water from the Unit 1 sand into the Unit 2 clay.

   The highest average TDS concentrations are found near well GW-19A, with an average TDS of 49,588 mg/l. This higher concentration appears to be spatially controlled, however, its cause is yet to be identified.

   Another TDS concentration low is apparent near well GW-38, with an average of 37,277 mg/l. This is the same location where artificial recharge has been created by the accumulation of storm water in a borrow pit excavated in the Unit 4 clay. Hence dilution of the shallow ground water in the vicinity of GW-38 is apparent.

   A concentration low is also found in well GW-3, which poses somewhat of an anomaly, in that the average TDS at 30,500 mg/l, is much lower than in any of the adjoining wells completed in the Unit 3 sand. However, the standard deviation for this well is larger than any other at the facility, 6,473 mg/l, suggesting that additional data may need to be collected before the cause for this low concentration can be determined.

   The TDS isoconcentration map shows a high degree of variability occurs in the shallow ground water at the facility. This variability is similar to that seen for other parameters at the facility, see isoconcentration maps for arsenic and fluoride in Attachments 7 and 8, respectively. Such variability and spatial control of the ground water quality at the facility supports the determination of GWPLs on a well-by-well basis.

3. TDS Concentration Trends - Review of the concentration trends for these wells shows the same pattern as the isoconcentration maps at the LARW Cell, in that wells I-2-30 and GW-64 appear to have a consistently lower TDS content than the remaining wells at that facility, see Attachment 11, graph TDSALL.XLS Chart 1. Some seasonality may also be apparent in this data, however, additional analysis may be needed to confirm it.

   Wide swings in concentration are also apparent in wells GW-20 and GW-29. These variations may be explained by the fact that these wells are screened across

both the Unit 2 clay and the Unit 3 sand and are found along the west side of the LARW Cell near the "hinge" point in the Unit 3 sand. Near this "hinge" point the more saline water in the Unit 3 sand may fluctuate significantly laterally with small changes in the hydraulic head. For additional information on this "hinge" point, compare Envirocare's water table equipotential maps found in their quarterly ground water monitoring reports with the structural contour maps of the top of the Unit 2 clay found in their January, 1992 Hydrogeological Report, Addendum No. 1, Figure 12, and their November 4, 1993 submittal of As-built Report for the suction lysimeters, Figure 2.

At the Southeast and Northwest 11e.(2) Cells, wider swings in TDS concentration are evident, see Attachment 11, TDSALL.XLS Charts 2 and 3. This may be explained by:

a) Higher Permeability of the Unit 3 Sand - which in combination with spatial variation of ground water quality and meteoric recharge may cause more extreme fluctuations in TDS in those wells completed primarily in the Unit 3 sand. In contrast, those wells completed primarily in the Unit 2 clay, at the LARW Cell, appear to have a more stable TDS trend, see wells GW-16R, GW-22 thru GW-24, GW-56R, I-2-30, and GW-64 on Chart 1 in Attachment 11.

b) Analytical Error and/or Limitations - error and/or a lack of analytical sensitivity on the part of the analytical laboratory may be a contributing factor to the wide TDS fluctuations. However, if this were the sole cause, one would expect similar fluctuations to be seen all wells at the facility and not primarily in those completed in the Unit 3 sand. Lack of sensitivity in the TDS analysis, caused by the high TDS content of the ground water, is evident in the laboratory results which are reported even units of 1,000 mg/l. This lack of sensitivity may be a contributing factor to the wide swings observed.

4. TDS and Freshwater Equivalent Head Relationships - It is also interesting to note the relationship between freshwater equivalent head and TDS seen in wells GW-37 and GW-38, see Attachment 11, graph TDSALL.XLS Chart 7. As has been established previously, both GW-37 and GW-38 are located near a borrow pit in the Unit 4 clay which impounds storm water runoff from the Vitro Embankment and the LARW Cell, resulting in artificial recharge to the shallow aquifer.

Comparison of the freshwater equivalent heads with Envirocare's TDS results in wells GW-37 and GW-38 shows that an increasing TDS trend began in these two wells shortly after a surge of artificial recharge in early April, 1993. Such an increase is anti-intuitive, in that one would expect that this surge of additional water added to the shallow ground water would cause a dilution effect and lower TDS concentrations.

Although additional data must be collected before conclusions can be drawn, it may be that the increased TDS concentration was caused by "flushing" of salts from the vadose zone into the water table system. If true, this may suggest that salts in the unsaturated zone may be a significant source of the dissolved solids found in the uppermost aquifer in the Unit 3 sand. Such a scenario is consistent with the hydrogeologic history of the Clive site, in that about 10,000 years ago the waning stages of Lake Bonneville produced a saline lake in this area which eventually thru evaporation became the Great Salt Lake we know today. In addition, the Salt Flats found about 12 miles west of Clive are also an evaporite remnant of this ancient lake.

V. STATISTICAL ANALYSIS AND PROPOSED GWPLS: ORGANICS

A. General Approach - the discussion below for organic monitoring parameters is organized into two groups: 1) organics required for monitoring at the LARW Cell, and 2) organics required for the 11e.(2) Cells. This distinction is necessary because of discrete monitoring approach imposed by the U.S. Nuclear Regulatory Commission (NRC) at the 11e.(2) disposal cells. Such a discrete approach is possible at the 11e.(2) Cells, thanks in part to a more uniform character of uranium mill wastes and the NRC's knowledge of uranium mill processes, which has allowed definition of organic compounds which could occur in the 11e.(2) waste.

This is not the case at the LARW Cell, where the waste will be derived from many and various types of nuclear related industries and generators, making prediction of the possible organic content of the waste impractical at this time. Consequently, DWQ staff have decided to rely on two general screening parameters to represent the possible population of organics compounds that could occur in the LARW waste, Total Organic Carbon (TOC) and Total Organic Halogens (TOX). For the sake of consistency, monitoring of both TOC and TOX will be required in monitoring wells at the 11e.(2) Cells.

B. Available Information - the amount of TOC and TOX data available from the compliance monitoring wells is significant, between 2 to 18 samples per well with the vast majority of wells with 14 to 18 samples each. Those wells completed most recently exhibit the fewest samples available, including wells GW-16R (7 samples), GW-56R (7 samples), GW-60 (3 samples), GW-63 (3 samples), and GW-64 (2 samples). As additional data is collected, Envirocare may request that the statistics be re-evaluated and the GWPLs modified.

In contrast, very little data is available for the 11e.(2) organic parameters, in that only 2 samples per well are available at this time. As a result, the power of the statistics calculated herein is rather limited, and the Executive Secretary would be well advised to review additional data as it is collected and adjust the GWPLs as necessary. However, based on the review of the available data DWQ staff have determined that

this lack of information should not impede the setting of GWPLs, for the following reasons:

1. Non-detectable Concentrations - all samples that have been collected, for all 9 11e.(2) organic parameters, show non-detectable concentrations. Consequently, it appears that these contaminants do not exist in the shallow ground water.

2. Man-Made Contaminants - all 9 of the 11e.(2) organic contaminants are man-made and do not naturally occur in the environment.

3. Low MDLs Compared to GWQS - review of the data shows that the MDLs used for 5 of the 9 parameters were between 35 and 1,250 times lower than the corresponding GWQS, see Attachment 14, spreadsheet IOGWPL.XLS, acetone, 2-butanone, carbon disulfide, chloroform, and diethyl phthalate. The use of such low detection limits provides an extra margin of safety for these parameters, thus providing a greater degree of freedom in determination of GWPLs based on limited data.

C. Organic Parameters Required for all LARW and 11e.(2) Cells - organic parameters required for all disposal cells at Envirocare include total organic carbon and total organic halogens. Because no GWQS is available for these parameters, the GWPL was simply set equal to the $\bar{x}+2\sigma$ concentration for each compliance monitoring well at the facility.

1. Total Organic Carbon, TOC - early sample results in the period of record, those collected before March, 1992, were analyzed by Envirocare using EPA Method 415.1, and show extremely high results, one the order of about 10 times higher than the rest of the data which was analyzed using EPA Method 415.2, see Attachment 12, DWQ Charts TOCALL.XLS Charts 1 thru 3, Raw Data. In a letter of November 4, 1992, Envirocare acknowledged that Method 415.1 is a technique that is subject to interference from bicarbonate. Therefore, in order to eliminate this source of potential bias, all analyses done before March, 1992 were culled from the data set by DWQ staff, including the data points listed in Table 3, below.

   As seen in Table 3, not all the data points appear extremely high, in that 4 of 15 points were found to be below MDL values, and 2 others near 3 mg/l. However, for the sake of consistency all data points analyzed before March, 1992, by EPA Method 415.1 were culled from the data set before statistics were generated for the GWPLs.

TABLE 3: Culled TOC Data from Pre-March, 1992

Well ID No.	Sample Date	Reported Value (mg/l)
GW-19A	4/3/91	49.0
	12/20/91	2.6
GW-20	1/8/92	29
GW-22	1/8/92	<1
GW-23	1/8/92	28
GW-24	1/8/92	12
GW-25	1/6/92	18
GW-26	1/6/92	19
GW-27	1/6/92	<1
GW-28	1/6/92	3
GW-29	1/8/92	18
GW-36	1/8/92	39
GW-37	1/6/92	<1
GW-38	1/6/92	<1
I-2-30	12/19/91	15

In addition to these 15 data points, three other TOC test results performed after March, 1992 appear to be anomalously high, as follows:

TABLE 4: TOC Outliers Collected After March 1, 1992

Well ID No.	Sample Date	Reported Value (mg/l)	T_n Statistic
GW-25	4/2/92	43.3	3.8713
GW-19A	8/6/92	25	3.5723
GW-37	8/6/92	23	3.6053

Because the TOC data is to be used as an indicator of many other organic contaminants at the LARW Cell, it was important to ensure that the data used for GWPL statistics be as accurate and representative as possible. First, DWQ staff

checked the laboratory reports provided by Envirocare and found they were indeed reported values. Next, each of the three anomalous data points above, were then tested to determine if they were statistical outliers, in accordance with EPA guidance, after calculation of the T_n statistic, as follows (see "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities", February, 1989, Section 8.2, p. 8-11):

$T_n = (x_n - \bar{x})/s$, where: x_n = largest observed data point
$\bar{x}$ = sample mean
s = sample standard deviation

In each case, the T_n statistic was calculated from all available data collected after March 1, 1992. The resulting T_n value for each data point in question was found to exceed the critical values provided by the EPA guidance at all significance levels for the corresponding sample size, including the most rigorous 99.9 % confidence interval (upper 0.1% significance level, ibid., Appendix B, Table 8).

As a result, DWQ staff concluded that these 3 data points were statistical outliers, and removed them from the data set. These 3 points were culled because: 1) TOC is to be used as an indicator of many other organic contaminants, and 2) culling them would result in an earlier warning of possible contamination. After removal of all the culled values from the data sets, including those data sampled before March, 1992 and the 3 statistical outliers mentioned above, a modified average and standard deviation were calculated. The effect of removing these outliers from the data set dramatically decreased the variability in the data and the $\bar{x}+2\sigma$ concentration, see Attachment 12 and compare Charts 1, 2, and 3 with Charts 1A, 2A, and 3A.

The resulting statistics show that the adjusted average TOC concentrations in all the compliance monitoring wells, excluding GW-3 and GW-16, range from 0.99 to 1.52. The standard deviation for these same wells ranges from 0 for those wells where all the values were below minimum detection levels (MDL) to as high as 0.97, see Attachment 10.

As a result of this adjustment of the data, the $\bar{x}+2\sigma$ values derived for many of the wells here are much lower, on the order of 4 to 9 times lower, than would be achieved had the raw reported data been used in the statistics. Although this may seem an extreme adjustment, it is at the same time liberal after you consider the large proportion values in each data set that were reported below the MDL. Such proportions ran between about 56 to 100% of the individual data sets and constitute valid measurements of the ground water quality at the facility, see Attachment 10. If the analytical technology were improved and these values could be quantified and included in the statistics, they would certainly result in lower average concentrations than have been calculated here. Nevertheless, DWQ staff

chose to ignore this consideration and give Envirocare a benefit in the statistics by using the direct MDL values in the calculations. DWQ staff also belief that the use of such values for the GWPLs will not cause false positive violations, in that under the revised permit, out-of-compliance conditions will not occur until after two consecutive samples exceed the $\bar{x}+2\sigma$ concentration, a 99% confidence interval.

Because no variation was seen in wells GW-16R, GW-56R, GW-60, GW-63, and GW-64, probably due to their small sample size, the corresponding $\bar{x}+2\sigma$ concentration value is no more than the MDL reported for the TOC method, see Attachment 10. However, as more data is made available to the Executive Secretary, the GWPLs for these wells may be adjusted.

After review of Envirocare's historic reported data, the GWPLs for TOC ($\bar{x}+2\sigma$ values) were accordingly rounded to two significant figures.

DWQ staff recommend that the TOC GWPLs for all wells at the facility be assigned the corresponding $\bar{x}+2\sigma$ concentration value found in Attachment 10.

2. Total Organic Halogens (TOX) - similar to TOC, the parameter TOX is to be used as a screening parameter for a large number of halogenated organic compounds at the LARW Cell. As a result, it is critical to ensure that the statistics and GWPLs are as accurate and representative as possible if this parameter is to be used to protect human health and the environment.

   Review of the TOX data shows that 100% of each well's data set was composed of values reported to be below the MDL, see Attachment 10. Variation in the TOX data is shown by non-zero standard deviation values, and has been observed in compliance monitoring wells GW-19A, GW-25, GW-38, and I-2-30. Review of the data indicates that this variability was caused by differing MDL values reported by Envirocare, and not by measurable field data. This pseudo-variability has been as great as 2-orders of magnitude, for example see well GW-25 where the MDL has been reported as 0.5 and 0.005 (Attachment 13, spreadsheet TOXALL.DIF).

   As a result, DWQ staff have determined that it would be inappropriate to include these higher MDL values in derivation of any statistics or calculation of the GWPLs. Accordingly these high MDL values were dropped from the data set, which resulted in a 0 standard deviation for each well. Consequently, the GWPLs were set equal to the MDL, 0.005 mg/l, for each well at the facility.

D. Organic Parameters Required Only at the 11e.(2) Cells - these organic contaminants can be categorized into two groups: 1) volatile organics: acetone, 2-butanone, carbon disulfide, chloroform, 1,2-dichloroethane, methylene chloride, and naphthalene; and 2) semi-volatile compounds: diethyl phthalate and 2-methylnaphthalene.

To determine the GWPL for these organic parameters the $\bar{x}+2\sigma$ concentration for each contaminant was compared against its corresponding GWQS, as available. Thanks to their very low concentrations; all were found at less than MDL values, the GWPLs were set equal to their corresponding GWQS. For those parameters without GWQS, the GWPLs were set equal to the MDL. Please refer to Attachment 14 for additional details.

1. Acetone - all the samples collected for acetone were reported to have concentrations below MDL values. However, a false sense of variability is evident in the data thanks to Envirocare's use of two different MDLs, 10 and 20 ug/l. However, because acetone appears to be undetectable and in order to be consistent with the approach taken with other parameters, the GWPL in all wells will be set equal to the GWQS, 0.7 mg/l.

2. 2-Butanone - similar to acetone, Envirocare has employed two different MDL values causing a false sense of variability. Since this contaminant appears undetectable, the GWPL in all wells will be set equal to the GWQS, 4.2 mg/l.

3. Carbon Disulfide - only one MDL was employed by Envirocare, hence no variability is present in the data. Once again, because the background concentration appears to be undetectable, the GWPL in all wells will be set at the GWQS, 0.7 mg/l.

4. Chloroform - similar to carbon disulfide, chloroform also displayed no variability in the data, and was found to be undetectable. Consequently, the GWPL in all wells will be set equal to the GWQS, 0.1 mg/l.

5. 1,2 Dichloroethane - thanks to the lack of variability in the data and due to the fact that this contaminant was also found to be undetectable, the GWPL in all wells will be set equal to the GWQS, 0.005 mg/l.

6. Methylene Chloride - was also found to be undetectable in background concentrations. Consequently, the GWPL in all wells will be set equal to the GWQS, 0.005 mg/l.

7. Naphthalene - false variability is also evident in the naphthalene data due to the use of varying MDL values. Regardless, because this compound was found to be undetectable, the GWPL in all wells will be set equal to the GWQS, 0.02 mg/l.

8. Diethyl Phthalate - because diethyl phthalate was also found to be undetectable in the shallow ground water, the GWPL in all wells will be set equal to the GWQS, 5.0 mg/l.

9. 2-Methylnaphthalene - this compound was also found to be undetectable in all wells at the facility. However, no GWQS has been established for 2-methylnaphthalene under the Utah Ground Water Quality Protection Regulations. In addition, both DWQ and EPA Region VIII staff were unable to determine an appropriate human health based limit for this compound, see discussion above.

   Consequently, DWQ staff have determined to use the MDL, 0.004 mg/l, as the GWPL in all wells at the facility. This approach is taken with the intent of re-evaluating the GWPL at a future date after:

   a) The compound is found to be detectable in the background ground water quality at the facility, and

   b) Additional human health risk and related concentration limit information becomes available in the technical literature.

   In addition, Envirocare may petition the Executive Secretary for a change in the GWPL for 2-methylnaphthalene, upon submittal of the appropriate technical justification, including the necessary human health risk data.

VI. STATISTICAL ANALYSIS AND PROPOSED GWPLS: RADIOLOGICS

Based on Section 2021(K) of the U.S. Atomic Energy Act and the Kerr-McGee case, it is clear that the State of Utah has no regulatory jurisdiction over radiologic contaminants, but is limited to the non-radiologic pollutants that might be found in the compliance monitoring wells located at the 11e.(2) Cells. These wells include:

1) NW 11e.(2) Cell: GW-26, GW-27, GW-28, GW-57, and GW-58.

2) SE 11e.(2) Cell: GW-19A, GW-36, GW-37, GW-38, and GW-60.

Wells GW-20, GW-24, and GW-29 are found between the LARW Cell and the 11e.(2) Cells, and although designated by the U.S. Nuclear Regulatory Commission (NRC) as 11e.(2) compliance monitoring wells, they are shared as compliance monitoring points for the LARW Cell. Consequently, the State will establish GWPLs for all relative contaminants, including inorganic, organic, and radiologic parameters for these three wells, with the intent that the numeric values proposed will be adopted by the NRC.

Wells GW-25 and GW-63, also designated as 11e.(2) compliance monitoring wells by the NRC, are located along the potential pathway that a perched leachate may take from the LARW Cell. Consequently, these two wells have also been specified as LARW compliance monitoring wells. As a result, the State will also establish GWPLs for all relevant contaminants for these wells, including radiologic parameters.

For those wells solely dedicated to 11e.(2) compliance monitoring, as listed above, the State will establish GWPLs for only the inorganic and organic contaminants. All GWPLs proposed for radiologic parameters are recommended values for consideration by the U.S. Nuclear Regulatory Commission, and are not enforceable under the Ground Water Discharge Permit.

Statistics for the radiologic parameters were prepared in the same manner as the other contaminants examined in this report. The $\bar{x}+2\sigma$ concentrations were calculated and compared with their corresponding GWQS. Concentration trends were examined and outliers identified. As needed, outliers were culled from the data sets and the statistics recalculated from the adjusted data sets before GWPLs were determined, see Attachment 15, DWQ spreadsheet RADGWPL.XLS. Those parameters found to still exceed their GWQS, even after adjustment, are summarized in Attachment No. 16, DWQ spreadsheet RADGWPL.XLS, and discussed in detail below.

In general, the radiologic parameters are divided into two groups, those with GWQS defined by regulation and those with GWQS that were calculated according to the formula defined in the regulations. Detailed discussion is also included for the parameter gross beta, which does not have a GWQS, but whose $\bar{x}+2\sigma$ concentration will be used as a GWPL as a aggregate measurement of all beta emitting contaminants.

Radiologic Parameters With Defined GWQS

A. Radiologic Parameters Found Below GWQS - after review of the ground water quality data collected thru February, 1994, DWQ staff have determined that all the wells at the facility exhibit $\bar{x}\pm2\sigma$ concentrations which were below the GWQS, for the following five parameters (see Attachment 15):

Parameter	GWQS (pCi/l)
Carbon-14	2,133
Strontium-90	8
Technetium-99	800
Thorium-232	5
Neptunium-237	8

As a result, the GWPLs for these parameters will be assigned as their corresponding GWQS, for all wells at the LARW Cell. Of these five parameters, only thorium-232 has been authorized for disposal in the 11e.(2) cells. Consequently, it is recommended that the corresponding GWQS, 5 pCi/l, be established as the GWPL for thorium-232 in all wells at the 11e.(2) Cells. However, DWQ staff also recommend that Envirocare continue ground water quality monitoring for the remaining parameters above, due to the close proximity

of the 11e.(2) Cells to and in the event that additional data is needed to interpret data collected at the LARW Cell.

The remaining radiologic parameters were found to have background concentrations ($\bar{x} \pm 2\sigma$) which exceeded the GWQS.

B. Gross Alpha Activity - gross alpha analysis has been used at Envirocare as an indicator of many other alpha emitting isotopes that are or may be included in the disposal inventory, but have not been selected as target monitoring parameters at this time. After review of all of the data collected thru February, 1994, DWQ staff have determined that the gross alpha data is fraught with significant quality assurance problems, as described below:

1. Analytical Method - starting with the February, 1994 sampling event, Envirocare switched to a new analytical method, EPA Method 00-02, Gross Alpha by Co-precipitation. Prior to this change, all gross alpha analysis was conducted by a method which was prone to interference by self-adsorption, thanks to the high total dissolved solids content of the ground water. As a result, the older gross alpha data has been reported with very large error terms, e.g., consider the July 7, 1992 sample from well GW-19A, reported as 120 +/- 280 pCi/l. Such large error terms lend very little confidence in the reported values and are cause to reject them for use in statistics for the determination of GWPLs.

2. Re-analysis of February, 1994 Data - review of the February, 1994 gross alpha data has shown that the reported gross alpha activity is about half as much as the alpha activity that would be caused by the total uranium concentrations measured in the same samples (personal communication, Mr. Vern Andrews, July 22, 1994). As a result, Envirocare has requested that their contract laboratory re-analyze the gross alpha samples collected in February, 1994. Unfortunately, final results had not been made available to DWQ at the time of this writing, although tentative results have been made available to Envirocare by their laboratory.

As a result of these difficulties, DWQ staff chose to use any of the gross alpha data available at this time in determining GWPLs. However, in two submittals of July 28 and August 2, 1994 Envirocare proposed that the gross alpha concentrations be extrapolated from historical total uranium data. This approach has been found as an acceptable means to estimate the gross alpha data, for purposes of determining GWPLs, as outlined by the following reasons:

1. Greater Reliability of Uranium Data - review of the total uranium data by both Envirocare and DWQ has shown it to be reliable, more so than the gross alpha data.

2. Underestimation of Gross Alpha Activity - uranium decay is not the only source or potential source of alpha activity in the ground water at the facility. Other radioisotopes, both naturally occurring and others authorized for disposal at Envirocare, can contribute to the alpha activity in the ground water, including: lead-210, neptunium-237, thorium-230, thorium-232, and others. As a result, use of the total uranium activity to extrapolate a gross alpha activity will underestimate the true alpha activity of the sample. This will be conservative for regulatory purposes, in that the resulting mean concentration will be lower than had gross alpha counting measurements been made directly on the samples.

   In addition, the total uranium analysis is the product of "wet" chemistry techniques that measure the actual mass of uranium in the ground water sample. Consequently, the extrapolated gross alpha values will not be subject to statistical variability normally found in the alpha counting process. Hence, the standard deviation estimated by uranium data extrapolation will likely be less than would be achieved thru direct counting of alpha particle activity in the samples.

3. Lack of Other Alternatives - it is impossible to re-analyze all the past samples for gross alpha again by the new co-precipitation method. Hence, the DWQ staff would be forced to apply the 15 pCi/l GWQS to each well as a GWPL, and require Envirocare to collect more gross alpha data derived from the co-precipitation method. However, based on the extrapolation above and the tentative gross alpha data collected by Envirocare in April, 1994, it appears that such a limit would cause the facility to go into non-compliance unnecessarily, in that background values in all the wells appear to be greater than the GWQS, 15 pCi/l.

Consequently, DWQ staff decided to accept Envirocare's proposal and utilize the historic uranium data to extrapolate gross alpha activity and in turn estimate the natural variability of this radiologic parameter. Unfortunately, no trend analysis of the data will be possible at this time. However, at a later date, when more gross alpha by co-precipitation data is available, Envirocare may request a re-evaluation of the gross alpha statistics and GWPLs. At that time DWQ staff will evaluate any concentration trends that may be apparent and examine the data for possible outliers.

Using tentative re-analysis data from the February, 1994 sampling event and final results from their April, 1994 sampling episode, Envirocare completed a regression fit of 48 total uranium and gross alpha by co-precipitation data pairs. From this regression analysis two equations were developed to extrapolate gross alpha activity from previous total uranium results, including a linear equation for uranium concentrations above 0.025 mg/l, and a logarithmic equation for uranium

concentrations below 0.025 mg/l. For additional information see Envirocare's July 28, 1994 submittal.

DWQ staff then calculated the mean total uranium concentration for each well at the facility using data collected between December 19, 1991 and February, 1994. This resulted in statistics based on as few as two samples for the newest well at the facility (GW-64), and as many as 19 samples from wells GW-20 thru GW-23, GW-25, GW-29, GW-38, and I-2-30. The mean gross alpha activity was then calculated from the mean total uranium concentration using Envirocare's regression equations. The standard deviation for the gross alpha activity was also calculated on a well-by-well basis, as follows:

$$\text{Standard Deviation (pCi/l)} = \frac{S_u \text{ (mg/l)}}{X_u \text{ (mg/l)}} * X_{ga\text{-}e} \text{ (pCi/l)}$$

, where: S_u = total uranium standard deviation
X_u = total uranium mean concentration
$X_{ga\text{-}e}$ = extrapolated mean gross alpha activity

The results of gross alpha extrapolation are found in Attachment 17, DWQ spreadsheet U_ALPHA.XLS. In all cases, the extrapolated $\bar{x}+2\sigma$ concentrations were greater than the GWQS, 15 pCi/l, suggesting that even by these conservatively low estimates of background concentration exceed the GWQS. In addition, comparison of the extrapolated $\bar{x}+2\sigma$ concentrations with $\bar{x}+2\sigma$ values derived from the raw gross alpha data, shows that the extrapolated values are significantly lower in all cases, with the exception of well GW-56R, which increased slightly by 1 pCi/l (about 3%), see Columns L, M, and N in Attachment 17. In four cases, the extrapolation approach reduced the GWPL by more than an order of magnitude (GW-19A, GW-24, GW-28, GW-57), but on average generated values which were about 1/3 of those generated by the raw data.

Consequently, DWQ staff concluded that the extrapolation approach used to estimate gross alpha activity was an acceptable and necessary step to establish GWPLs at the facility. Gross alpha GWPLs proposed for all wells at the Envirocare facility are found in Attachment 17, Column L.

C. Radium-226 + Radium-228 - the GWQS for radium isotopes is based on the sum of the radium-226 and radium-228 concentrations. In order to accommodate a statistical analysis of the composite concentration, the statistical results for each isotope had to be manipulated on a well-by-well basis. The composite $\bar{x}+2\sigma$ concentration was determined by: 1) summation of the mean concentrations for each of the radium isotopes, and 2) calculation of an equivalent standard deviation, as follows:

$$Seq=\sqrt{S_1^2+S_2^2}$$

, where: S_1 = standard deviation for radium-226
S_2 = standard deviation for radium-228

Once the equivalent standard deviation was calculated and the composite $\bar{x}+2\sigma$ concentration determined, a comparison was made with the GWQS to determine how to set the GWPL. Results of these calculations are summarized for each well in Attachment 15.

Review of radium-226 + radium-228 concentration trends in all wells at the facility indicated that no increasing trends were apparent, see Attachment 18, DWQ (RADIUM.XLW)RASUMALL.XLS Charts 1 thru 4. Some apparent outliers were identified and later verified as real, although extreme values. Consequently, no adjustment was necessary to Envirocare's raw radium-226 or radium-228 data.

A decreasing trend was apparent in well GW-37, see Attachment 18 DWQ chart (RADIUM.XLW)RASUMALL.XLS, Chart 2. This was important to note, due to the artificial recharge of storm water that has been created by a clay borrow pit in the general vicinity of wells GW-37 and GW-38. However, no trend was apparent in Well GW-38. Perhaps additional data will need to be collected before any conclusions can be reached for this well.

The composite $\bar{x}+2\sigma$ concentrations for radium-226 + radium-228 were found to exceed the GWQS at 5 LARW compliance monitoring wells: GW-20, GW-24, GW-29, GW-56R, and GW-64, see Attachment 16, DWQ spreadsheet RADGWPL.XLS. At the SE 11e.(2) Cell the same was true in 5 other wells: GW-20, GW-24, GW-29, GW-37, and GW-38. While at the NW 11e.(2) Cell, this was only true at two wells: GW-25 and GW-58. As a result, it is recommended that the radium-226 + radium-228 GWQS for these wells be set at their $\bar{x}+2\sigma$ concentrations, in Attachment 16. For the remaining wells at the facility it is recommended that the GWPLs be set at the GWQS, 5 pCi/l.

Radiologic Parameters with Calculated GWQS

D. Potassium-40 - almost all the ground water quality data collected at the Envirocare facility was in excess of the GWQS, 48 pci/l, see Attachment 19, DWQ graphs K40ALL.XLS, Charts 1, 2, 4, and 9. This is likely caused by the elevated content of stable potassium in the ground water at the Envirocare site. As seen in Attachment 19, DWQ database output, page 5, shows that the stable potassium concentration across all the wells at the site averages about 481 mg/l. This is higher than the average potassium content commonly reported for seawater, 390 mg/l (J. D. Hem, "Study and Interpretation of the Chemical Characteristics of

Natural Water", USGS Water Supply Paper 2254, 3rd Ed., p. 105). It is not surprising, therefore, to see potassium-40 data and statistical derivatives that are greatly above the GWQS.

Of those wells at the LARW Cell, a possible increasing trend may also be apparent in wells GW-22, GW-23 and I-2-30, see Attachment 19, Chart 2. However, due to the very long contaminant transport times that have been predicted for the facility, the staff believe the trend to be subtle and the likelihood remote that it has been caused by a release from the embankment. Further study may be needed to determine the cause of this trend, however, in the meantime the available data can be used without reservation in the determination of $\bar{x}+2\sigma$ concentrations and GWPLs at the LARW Cell.

Similar increasing trends have been observed for wells GW-19A, GW-36, and GW-37 at the SE 11e.(2) Cell and wells GW-26, GW-27, GW-28 at the NW 11e.(2) Cell, see Attachment 19, Charts 4 and 9. However, these cells have not yet been constructed and potassium-40 is not anticipated in the 11e.(2) waste inventory. Consequently, the trends are deemed natural and the data can be used to determine $\bar{x}+2\sigma$ concentrations and GWPLs without reservation.

For all the wells at the LARW Cell, the GWPLs should be set at the $\bar{x}+2\sigma$ concentrations found in Attachment 16. Since potassium-40 has not been authorized nor is it expected to become a part of the 11e.(2) disposal inventory, no GWPLs are recommended for the 11e.(2) compliance monitoring wells. However, DWQ staff do suggest that Envirocare continue to monitor for potassium-40 at the 11e.(2) wells, due to their close proximity to and in the event that additional information is needed to interpret data collected at the LARW Cell.

E. Thorium-230 - no increasing trends were observed in the thorium-230 data for any of the wells at the facility, see Attachment 20, DWQ charts TH230ALL.XLS Charts 1 thru 5. However, several outliers were apparent and investigated by DWQ staff, as outlined in the Table 5 below:

TABLE 5: DWQ Rejected Thorium-230 Data

Well ID	Sample Date	Reported Concentration (pCi/l)
GW-23	2/11/93	18
GW-26	2/10/93	11 +/- 5
I-2-30	2/11/93	8 +/- 4.5

After close review DWQ staff determined that the GW-23 sample had not been rejected by Envirocare, even though a month later a sample with the same

concentration had been rejected for having an anomalously high value (3/10/93 sample from GW-24). After discussion with Envirocare both the company and DWQ staff agreed to cull this value from the data set, resulting in a much lower mean concentration and standard deviation for well GW-23.

Two other samples also analyzed with the February, 1993 sampling event were found with quality assurance problems. In the case of wells GW-26 and I-2-30, the reported thorium-230 results were below the lower limit of detection reported by Envirocare's contract laboratory, 15 pCi/l (see 3/19/93 Barringer Laboratory Quality Assurance Report, p. Q-7). Consequently, these two samples were also culled from the data set by DWQ staff, resulting in a lower mean concentration and standard deviation. All other thorium-230 samples were found to have been reported at concentrations above their lower limits of detection.

The data displayed in Attachment 20 and the statistics found in Attachments 15 and 16 reflect the adjustments made by DWQ staff. After review of the data, it is worthy to note its "spiked" nature, characterized by sharp increases and decreases across very short spaces of time. This may indicative of analytical instrument bias or difficulty in analysis of concentrations near or just above the lower limit of detection. Such bias may prejudice the statistics for these wells by increasing the mean concentration and the standard deviation. However, looking beyond these few extreme values, the vast majority of the data set is found below the GWQS, 5 pCi/l, see Attachment 20, Chart 5. As a result, only 5 wells were found with $\bar{x}+2\sigma$ concentrations in excess of the GWQS, including wells GW-16R, GW-27, GW-56R, GW-57, and GW-60. Three of these wells, however, have less than 8 samples, and may therefore be found with lower $\bar{x}+2\sigma$ concentrations in the future as additional data becomes available for these wells (GW-16R, GW-56R, and GW-60).

Consequently, the thorium-230 GWPL for wells GW-16R and GW-56R, found at the LARW Cell, will be set at the $\bar{x}+2\sigma$ values found Attachment 16. The remainder of the LARW wells will have their thorium-230 GWPLs set equal to the GWQS, 5 pCi/l. For those wells at the SE and NW 11e.(2) Cells, it is recommended that the thorium-230 GWPL in wells GW-27, GW-57, and GW-60 be set equal to the $\bar{x}+2\sigma$ values found in Attachment 16. Whereas, for the remainder of the 11e.(2) wells, the thorium-230 GWPL should be set equal to the GWQS.

F. Total Uranium - review of the total uranium data shows fairly consistent data in all the wells at the facility, i.e., no increasing trends were observed, see Attachment 21, DWQ charts UALL.XLS Charts 1 thru 4. However, at the LARW Cell, one well, GW-29, has a total uranium concentration that although consistent, is above the GWQS, 0.02 mg/l. The same is true for wells GW-36 and GW-38 at the SE 11e.(2) Cell and wells GW-25, GW-26, and GW-58 at the NW 11e.(2) Cell.

It is also interesting to note the spatial distribution of total uranium concentration in the uppermost aquifer at the facility. Concentration highs are readily apparent in wells GW-3, GW-25, and GW-36, the greatest of which are found in well GW-25, see Attachment 21, DWQ total uranium isoconcentration map. Concentration lows are seen at most of the wells at the LARW Cell, particularly along its eastern margin in wells GW-16R, GW-56R, I-2-30, and GW-64. Concentration lows are also seen in wells GW-28 and GW-57 along the western margin of the NW 11e.(2) Cell, and in wells GW-19A, GW-63, and GW-60 along the southern margin of the SE 11e.(2) Cell. This variable distribution may suggest that the total uranium concentration is spatially controlled, perhaps by the occurrence of uranium in the aquifer matrix.

It is also worthwhile to note the apparent vertical distribution of uranium at the facility. It has been established previously that an upward hydraulic gradient exists between the Unit 4 sand and the uppermost aquifer. Well GW-16, which was partially completed across the Unit 4 sand shows lower total uranium concentrations than its replacement well, GW-16R, which is completed solely in the uppermost aquifer, see Attachment 21, Chart 1. This same relationship has also been observed in the case of potassium-40, see Attachment 19, Chart 1. Both of these phenomenon may suggest that solutes are concentrated in the uppermost aquifer, as ground water rises from deeper systems.

As for GWPLs, the $\bar{x}+2\sigma$ concentration in wells GW-20, GW-22, GW-24, and GW-29 at the LARW Cell, exceed the GWQS and should be used as the GWPLs, see Attachment 16. The same is also true for wells GW-36, GW-38, and GW-60 at the SE 11e.(2) Cell, and for wells GW-25, GW-26, GW-27, and GW-58 at the NW 11e.(2) Cell. Consequently, it is recommended that the $\bar{x}+2\sigma$ concentrations found in Attachment 16, be used as GWPLs for these 11e.(2) wells. For all the remaining wells at the facility, it is recommended that the GWPLs be set equal to the GWQS, 0.02 mg/l.

G. Total Radioactive Iodine - less total radioactive iodine data is available than other parameters because Envirocare did not begin to analyze for it until September, 1992. Review of the data also shows that all the reported values collected during this first sampling event were reported at concentrations below the lower limit of detection, 25 pCi/l, see December 22, 1992 Barringer Laboratories Quality Assurance Report, p. Q-4. As a result, DWQ staff culled all samples collected during September, 1992 from the data set used to calculate $\bar{x}+2\sigma$ concentrations and GWPLs, including:

TABLE 6: Rejected Total Radioactive Iodine Data

Well ID	Sample Date	Reported Concentration (pCi/l)
GW-16	9/30/92	3.6 +/- 3
GW-19A	9/29/92	7.2 +/- 2.8
GW-20	9/30/92	8.2 +/- 3.4
GW-22	9/30/92	5.3 +/- 4.5
GW-23	9/30/92	3.8 +/- 2.9
GW-24	9/30/92	11+/- 5
GW-25	9/29/92	2 +/- 3.1
GW-26	9/29/92	3 +/- 3.2
GW-27	9/29/92	1.3 +/- 2.4
GW-28	9/29/92	4.6 +/- 3.3
GW-29	9/30/92	4.9 +/- 3.7
GW-36	9/30/92	4.6 +/- 3.2
GW-37	9/30/92	1.3 +/- 3.1
GW-38	9/30/92	4.4 +/- 3
GW-56	9/30/92	3.9 +/- 3
GW-57	9/29/92	3.6 +/- 4.1
GW-58	9/29/92	3.5 +/- 3
I-2-30	9/30/92	1.6 +/- 2.8

Review of the adjusted data shows no apparent increasing trends, see Attachment 22, DWQ charts IRADALL.XLS, Charts 1 thru 5. All apparent outliers were verified and maintained in the data set. These outliers may be related to the presence of stable iodine in the ground water, although no information has been collected to confirm this; or they may be analytical noise caused by the difficulty of achieving such low limits of detection required by a GWQS of 1 pCi/l. In any case, the $\bar{x}+2\sigma$ concentrations were calculated for every well at the facility, and two wells at the LARW Cell were determined to be in excess of the GWQS, GW-20 and GW-23. Consequently, it is recommended that the GWPLs for these two wells be set at the $\bar{x}+2\sigma$ concentrations found in Attachment 22.

With regard to the 11e.(2) Cells, radioactive iodine has not been authorized for disposal, nor is it expected to become a part of the 11e.(2) disposal inventory. Consequently, no GWPLs are recommended for the 11e.(2) compliance monitoring wells. However, DWQ staff do recommend that Envirocare continue to monitor ground water quality at the 11e.(2) Cells for this parameter due to its close proximity to and in the event that additional information is needed to interpret data collected at the LARW Cell.

One Radiologic Parameter **Without** a Defined GWQS

H. Gross Beta Activity - gross beta analysis has been used as a ground water monitoring parameter at Envirocare as an indicator of many other beta emitting isotopes that are or may be included in the disposal inventory, but have not been selected as target monitoring parameters at this time. Review of the data collected thru February, 1994 shows no apparent increasing trends in any of the wells at the facility, see Attachment 23, DWQ charts GBALL.XLS, Charts 1, 2, 3, and 5. Consequently, the available data is considered representative of background conditions at the facility.

Because no GWQS has been established for gross beta analysis in and of itself, one cannot resort to the GWQP Regulations to derive a GWPL. However, the DWQ has decided that a simple statistical criteria can be used to determine if the gross beta concentration of the ground water has exceeded background concentrations. It is recommended that the $\bar{x}\pm2\sigma$ concentration be used for this purpose. Although not founded on any human health criteria, as all GWPLs established by the GWQP Regulations are, this concentration limit will perform as a GWPL in that it will be used to determine compliance at the facility. Consequently, this criteria is referred to as the gross beta GWPL in the ground water discharge permit.

Review of the gross beta statistics shows that the mean concentrations range from about 307 to 606 pCi/l, see Attachment 23, DWQ spreadsheet RADGWPL.XLS. It is interesting to note that the largest average gross beta concentration occurs in well GW-25, where also the largest average uranium concentration was found. As for GWPLs, review of the $\bar{x}\pm2\sigma$ concentrations shows a range of 418 to 980 pCi/l, the largest of which is found in well GW-24, followed by GW-26 and GW-25 at 959 and 953 pCi/l, respectively.

It is interesting to note the spatial distribution of gross beta activity in the uppermost aquifer at Envirocare. The lowest average concentrations, once again, are seen along the east margin of the LARW Cell in wells GW-16R, GW-56R, I-2-30, and GW-64; and along the south margin of the SE 11e.(2) Cell in wells GW-60 and GW-63, see Attachment 23, DWQ gross beta isoconcentration map. The largest average concentrations are found in a band across wells GW-24 to GW-26,

with the highest values found in well GW-25, compare this well in the uranium isoconcentration map in Attachment 21. In contrast to the uranium distribution, however, larger gross beta concentrations are found in well GW-29, while much lower gross beta concentrations were found in well GW-3. Further study may allow explanation of these distributions.

As for GWPLs, it is recommended that all the wells at the facility, including those at the 11e.(2) Cells have their GWPLs set equal to the $\bar{x}\pm2\sigma$ concentrations listed in Attachment 23, DWQ spreadsheet RADGWPL.XLS.

VII. CONCLUSIONS

After review of 14,290 individual sample results from 25 wells, collected between April, 1991 and February, 1994, DWQ staff have reached the following conclusions regarding ground water quality conditions in the uppermost aquifer and proposed GWPLs at the Envirocare facility:

A. GWQS for New 11e.(2) Contaminants - ground water quality standards were determined for the new 11e.(2) contaminants, including three inorganics and 9 organics. Of these 11, two were derived from the existing GWQP Regulations, three from EPA drinking water maximum contaminant levels, and three others from EPA health advisories. GWQS for three others had to be developed by DWQ staff from reference doses available in the technical literature. No GWQS could be found or derived for 2-methylnaphthalene; therefore, a detection monitoring approach is recommended by assigning the GWPL equal to the MDL.

B. Revised GWQS - since the last modification of Envirocare's permit, the State's GWQS have been modified. This effected seven heavy metal parameters, five of these parameters saw increased GWQS values (barium, chromium, copper, selenium, and silver), while two saw decreases in their GWQS (cadmium and lead). These changes were reflected in all calculations and comparisons made in this report.

C. Revised Definition of Background Concentration - the definition of background concentration for the Envirocare facility was modified to denote the mean concentration of any contaminant plus its second standard deviation ($\bar{x}\pm2\sigma$).

D. Revised Definition of Non-Compliance - the previous categories of Probable-Out-of-Compliance and Out-of-Compliance have been consolidated into one. In the future, monthly confirmation monitoring will be required of Envirocare after one (1) sample exceeds the GWPL in the permit, i.e., the $\bar{x}\pm2\sigma$ concentration or the GWQS, whichever is greatest. Out-of-Compliance will occur only after two (2) consecutive samples exceed this concentration.

E. GWPLs for Inorganic Parameters - of the 18 inorganic parameters considered in this report, eight (8) were found to have background concentrations ($\bar{x}\pm2\sigma$) below their corresponding GWQS (barium, copper, cyanide, lead, nitrite + nitrate, selenium, silver and zinc). As a result, DWQ staff recommend that the GWPLs for these eight parameters, in all the wells at the facility, be set equal to their corresponding GWQS.

Eight other inorganic parameters had background ($\bar{x}\pm2\sigma$) concentrations which exceeded their corresponding GWQS. Two other parameters, pH and total dissolved solids (TDS) were also examined, each of these 10 is briefly summarized below:

1. Beryllium - all values provided by Envirocare were found undetectable, however, the MDL used by Envirocare was greater than the GWQS. Consequently, the GWPL will be assigned as the GWQS and Envirocare will be required to conduct all future monitoring with an acceptable analytical method.

2. Chromium, Nickel, Molybdenum - it was determined that previously high values for these metals were caused by leaching of the stainless steel submersible pumps installed in the ground water monitoring wells at the facility. These pumps have reportedly been replaced by inert PVC equipment, and ground water quality data submitted by Envirocare suggests that their concentrations have since fallen. Consequently, the GWPLs will be set equal to the GWQS.

3. Cadmium - alleged by Envirocare to be also have been leached from the stainless steel pumps, and based on apparent declines in cadmium concentration, the GWPLs will be set equal to the GWQS.

4. Mercury - two wells at the LARW cell have background ($\bar{x}\pm2\sigma$) concentrations in excess of the GWQS (GW-20 and GW-29). However, more than 77% of the data from each of these wells was found to be undetectable. Consequently, DWQ staff concluded mercury to be generally undetectable in these two wells and using the GWQP Regulations as a guide, set the GWPL equal to the GWQS. GWPLs for all other wells at the facility should also be set equal to the GWQS.

5. Arsenic - background ($\bar{x}\pm2\sigma$) concentrations of arsenic exceed GWQS in six (6) wells at the Envirocare facility (GW-25, GW-26, GW-27, GW-28, GW-36, GW-58). As a result, the GWPLs for these wells should be assigned as the $\bar{x}\pm2\sigma$ concentration. The remaining wells at Envirocare should have their GWPLs set at the GWQS.

6. Fluoride - background ($\bar{x}\pm2\sigma$) fluoride concentrations exceed the GWQS in nine wells at the facility (GW-19A, GW-20, GW-25, GW-26, GW-27, GW-28, GW-29, GW-57, and GW-63). GWPLs at these wells should also be set at their background concentrations. The remaining wells should have their fluoride GWPLs set at the GWQS.

7. pH - in the previous permit the GWPL was represented by the mean plus the first standard deviation ($\bar{x} \pm \sigma$), ignoring the fact that pH can vary either above or below the average concentration. Review of the available data shows that no well at the facility has exceeded the GWQS range for pH, 6.5 to 8.5. Consequently, pH GWPLs should be redefined for each well as the GWQS range.

8. TDS - no GWQS is available for TDS, consequently the GWPL will be assigned as the background concentration ($\bar{x} \pm 2\sigma$) in each well at the facility.

F. GWPLs for Organic Parameters -

1. TOC and TOX - no GWQS is available for either of these contaminants, consequently, GWPLs will be based on ad-hoc criteria. For TOC, detectable concentrations were found and background concentrations could be calculated. As a result, their GWPLs will be assigned as their corresponding $\bar{x} \pm 2\sigma$ concentrations. All TOX results from all wells at the facility were found to be undetectable. Consequently, the TOX GWPLs will take a detection monitoring approach and be assigned as the minimum detection limit.

2. New 11e.(2) Organics - all nine of the new 11e.(2) organic parameters were found to be at undetectable levels in all wells at the facility. As a result, their GWPLs will be set equal to their corresponding GWQS, with the exception of 2-methylnaphthalene, which has not GWQS. Consequently, the GWPL for 2-methylnaphthalene will be set at the minimum detection limit.

G. GWPLs for Radiologic Parameters - the State's authority to regulate 11e.(2) disposal sites has been limited to only the inorganic and organic contaminants by the U.S. Atomic Energy Act. As a result, applicable GWPLs determined by the staff in this report for the radiologic parameters are solely recommendations to the NRC.

Of the 11 radiologic parameters with GWQS evaluated in this report, five (5) were found to have background ($\bar{x} \pm 2\sigma$) concentrations that were less than their corresponding GWQS, including: carbon-14, strontium-90, technetium-99, thorium-232, and neptunium-237. As a result, the GWQS is recommended as the GWPL for all wells at the LARW Cell. The thorium-232 GWQS is recommended as the GWPL for all wells at the 11e.(2) Cells.

Six other radiologic parameters had background ($\bar{x} \pm 2\sigma$) concentrations in excess of their GWQS. A seventh parameter had no GWQS but will be used to assess any change in background quality, each is briefly summarized below:

1. Gross Alpha - due to difficulties caused by self-adsorption and a quality assurance problem with the February, 1994 sampling event, all gross alpha data submitted by Envirocare has been rejected by DWQ staff. However, gross alpha concentrations

were extrapolated from total uranium data which was found to be reliable and was available for each well at the facility. After extrapolation, all wells were determined to have background ($\bar{x}\pm2\sigma$) concentrations in excess of the GWQS. Therefore, the recommended GWPLs were based on $\bar{x}\pm2\sigma$ concentrations derived from extrapolated data.

2. Radium-226 + Radium-228 - five (5) wells at the LARW Cell (GW-20, GW-24, GW-29, GW-56R, GW-64) and four (4) wells at the 11e.(2) Cells (GW-25, GW-37, GW-38, and GW-58) were found to have background concentrations in excess of the GWQS. Consequently, it is recommended that the GWPLs for these wells be set equal to their $\bar{x}\pm2\sigma$ concentrations. GWPLs for the remaining wells at the facility should be set at the GWQS.

3. Potassium-40 - all the wells at the facility were found to have background concentrations in excess of the GWQS. However, because potassium-40 is only applicable to the LARW Cell, it is recommended that only the LARW wells have their GWPLs set equal to their corresponding $\bar{x}\pm2\sigma$ concentrations.

4. Thorium-230 - Two wells (2) at the LARW Cell (GW-16R and GW-56R) and three (3) wells at the 11e.(2) Cells (GW-27, GW-57, and GW-60) were found to have background concentrations above the GWQS. Consequently, it is recommended that their GWPLs be set equal to their corresponding $\bar{x}\pm2\sigma$ concentrations. GWQS should be used as GWPLs for the remaining wells at the facility.

5. Total Uranium - four (4) wells at the LARW Cell (GW-20, GW-22, GW-24, and GW-29) and seven (7) wells at the 11e.(2) Cells (GW-25, GW-26, GW-27, GW-36, GW-38, GW-58, and GW-60) were found to have background concentrations above the GWQS. Hence it is recommended that their GWPLs be set equal to their corresponding $\bar{x}\pm2\sigma$ concentrations. For the remaining wells at the facility, the GWQS should be used as GWPLs.

6. Total Radioactive Iodine - only two (2) wells at the LARW Cell (GW-20 and GW-23) were found to have background concentrations above the GWQS; hence it is recommended that their GWPLs be set equal to their corresponding $\bar{x}\pm2\sigma$ concentrations. Although background concentrations exceeded the GWQS in five (5) 11e.(2) wells (GW-27, GW-36, GW-37, GW-58, and GW-60), total radioactive iodine is not applicable to the 11e.(2) Cells.

7. Gross Beta - no GWQS exists for gross beta, but it is used as an indicator parameter for other radioisotopes that have not been targeted for monitoring. Consequently the GWPLs should be assigned as the background ($\bar{x}\pm2\sigma$) concentration in each well at the facility.

BM

ATTACHMENT 1

Derivation of GWQS
and
Human Health Criteria
for
New Organic Contaminants
Found in 11e.(2) Waste

DWQ Spreadsheet GWQS_ORG.XLS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	**Envirocare Ground Water Quality Standards: Organics - Regulatory & Derived Values**															
2					EPA Drinking Water								EPA Region III Superfund (10/15/93)			
3					Standards		Health Advisory: 70 Kg Adult								Tap Water Levels	
4	Contaminant	CAS No.	Synonym	Utah GWQS (mg/l)	Status	MCL (mg/l)	Status	RfD (mg/kg /day)	DWEL (mg/l)	Lifetime (mg/l)	@ 10^-4 Cancer Risk (mg/l)		Oral RfD (mg/kg /day)	Source	ug/l	mg/l
5	Acetone	67-64-1		n/a	-	n/a	-	n/a	n/a	n/a	n/a		0.1	IRIS	3700	3.7
6	2-Butanone	78-93-3	Methyl ethyl ketone	n/a	-	n/a	-	n/a	n/a	n/a	n/a		0.6	IRIS	22000	22
7	Carbon Disulfide	75-15-0		n/a	-	n/a	-	n/a	n/a	n/a	n/a		0.1	IRIS	21	0.021
8	Chloroform	67-66-3		n/a	T	0.1	D	0.01	0.4	n/a	0.6		0.01	IRIS	0.15	0.00015
9	1,2-Dichloroethane	107-06-2		0.005	F	0.005	F	n/a	n/a	n/a	0.04		n/a		0.12	0.00012
10	Methylene Chloride	75-09-2	Dichloromethane	n/a	F	0.005	F	0.06	2	n/a	0.5		0.06	IRIS	4.1	0.0041
11	Naphthalene	91-20-3		n/a	-	n/a	F	0.004	0.1	0.02	n/a		n/a	n/a	n/a	n/a
12	Diethyl Phthalate	84-66-2		n/a	-	n/a	D	0.8	30	5	n/a		0.8	IRIS	29000	29
13	2-Methylnaphthalene	91-57-6		n/a	-	n/a	-	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a

	A	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Envirocare Ground Wc												
2			MDL Comparisons										
3									Summary			TEST	
4	Contaminant	Calculated D. W. Health Advisory (mg/l)	EPA Method	Method MDL (ug/l)	AWAL Reported MDL (ug/l)	Method MDL < Calc. DW HAs or Stds?	Comparison Source		DWQ Proposed GWQS (mg/l)	EPA Region III Superfund Tap Water Levels (mg/l)	EPA RCRA Land Ban Treatment Stds (wastewater) mg/l	Land Ban > Proposed GWQS?	Land Ban > Region III Superfund Tap Water ?
5	Acetone	0.7	8240	100	20	yes	Calc. HA		0.7	3.7	0.28	no	no
6	2-Butanone	4.2	8240	100	20	yes	Calc. HA		4.2	22	0.28	no	no
7	Carbon Disulfide	0.7	8240	100	2	yes	Calc. HA		0.7	0.021	0.014	no	no
8	Chloroform		8240	5	2	yes	MCL		0.1	0.00015	0.046	no	yes
9	1,2-Dichloroethane		8240	5	2	yes	GWQS		0.005	0.00012	0.21	yes	yes
10	Methylene Chloride		8240	5	2	yes	MCL		0.005	0.0041	0.089	yes	yes
11	Naphthalene		8270	10	4	yes	HA		0.02	n/a	0.059	yes	no
12	Diethyl Phthalate		8270	10	4	yes	HA		5	29	0.2	no	no
13	2-Methylnaphthalene		8270	10	4	n/a			n/a	n/a	n/a	no	no

= Region III → DWQ

	A	AC	AD	AE	AF	AG	AH	AI
1	**Envirocare Ground Wc**							
2		STF Database (USU, 4/91)						
3					**Back-calculate**			
4	Contaminant	Cancer Risk RfD (mg/kg/day)	Source	Calc. DWEL (mg/l)	Rel. Source Contrib.	Calc. Lifetime H.A. (mg/l)	Compare To	
5	Acetone	0.1	EPA Heast	3.5	1.06	3.7	EPA Region III	
6	2-Butanone	0.05	EPA Heast	1.75				
7	Carbon Disulfide	0.1	MEPAS	3.5	0.006	0.021	EPA Region III	
8	Chloroform	0.01	EPA Heast	0.35	0.00043	0.00015	EPA Region III	
9	1,2-Dichloroethane	n/a	n/a	n/a	n/a	n/a		
10	Methylene Chloride	0.06	EPA Heast	2.1	0.00195	0.0041	EPA Region III	
11	Naphthalene	0.4	EPA Heast	14	0.00143	0.02	EPA DW HA	
12	Diethyl Phthalate	0.8	EPA Heast	28	1.037	29	EPA Region III	
13	2-Methylnaphthalene	n/a	n/a	n/a	n/a	n/a		

ATTACHMENT 2A

Statistical Analysis:
Inorganic Parameters with
$\bar{x}+2\sigma$ Concentrations Greater than GWQS

DWQ Spreadsheet IOGWPL.XLS

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-3	Arsenic	0.05	6	0.0923	0.0372	0.1667	YES	0
GW-3	Barium	2	6	0.015	0.0115	0.038	no	16.67
GW-3	Beryllium	0.004	6	0.005	0	0.005	YES	100
GW-3	Bicarbonate		6	131.66	7.5277	146.7154		0
GW-3	Cadmium	0.005	6	0.0088	0.0096	0.028	YES	66.67
GW-3	Calcium		6	466.66	113.78	694.22		0
GW-3	Carbonate		6	10	0	10		100
GW-3	Chloride		6	17833	3600.9	25034.8		0
GW-3	Chromium	0.1	6	0.0375	0.0258	0.0891	no	16.67
GW-3	Copper	1.3	6	0.0111	0.0086	0.0283	no	50
GW-3	Cyanide	0.2	6	0.005	0	0.005	no	100
GW-3	Fluoride	4	6	3.0166	0.8681	4.7528	YES	0
GW-3	Lead	0.015	6	0.0071	0.0053	0.0177	YES	83.33
GW-3	Magnesium		6	573.33	152.4	878.13		0
GW-3	Mercury	0.002	6	0.0004	0.0004	0.0012	no	66.67
GW-3	Molybdenum	0.04	6	0.3333	0.1966	0.7265	YES	0
GW-3	Nickel	0.1	6	0.0311	0.0323	0.0957	no	33.33
GW-3	Nitrate-N	10	6	0.1383	0.2096	0.5575	no	50
GW-3	Nitrate/Nitrite-N	10	6	0.1433	0.2062	0.5557	no	50
GW-3	Potassium		6	456.66	189.8	836.26		0
GW-3	Selenium	0.05	6	0.0055	0.0012	0.0079	no	83.33
GW-3	Silver	0.1	6	0.005	0	0.005	no	100
GW-3	Sodium		6	10800	2641.9	16083.8		0
GW-3	Sulfate		6	2600	1007.9	4615.8		0
GW-3	TDS		6	30500	6473	43446		0
GW-3	TOC		6	1.1666	0.4082	1.983		83.33
GW-3	TOX		6	0.005	0	0.005		100
GW-3	Zinc	5	6	0.0188	0.0178	0.0544	no	33.33
GW-16	Arsenic	0.05	14	0.0063	0.0029	0.0121	no	57.14
GW-16	Barium	2	14	0.0263	0.025	0.0763	no	35.71
GW-16	Beryllium	0.004	9	0.005	0	0.005	YES	100
GW-16	Bicarbonate		13	224.61	33.817	292.244		0
GW-16	Cadmium	0.005	14	0.004	0.0002	0.0044	no	100
GW-16	Calcium		14	205.07	70.567	346.204		0
GW-16	Carbonate		14	10	0	10		100
GW-16	Chloride		14	13071	1141.1	15353.2		0
GW-16	Chromium	0.1	14	0.0093	0.0076	0.0245	no	71.43
GW-16	Copper	1.3	14	0.0104	0.0163	0.043	no	85.71
GW-16	Cyanide	0.2	7	0.005	0	0.005	no	100
GW-16	Fluoride	4	14	1.3357	0.2205	1.7767	no	0
GW-16	Lead	0.015	14	0.0082	0.012	0.0322	YES	100
GW-16	Magnesium		14	285.71	50.186	386.082		0
GW-16	Mercury	0.002	14	0.0003	0.0002	0.0007	no	92.86
GW-16	Molybdenum	0.04	9	0.09	0.03	0.15	YES	66.67
GW-16	Nickel	0.1	13	0.0088	0.0021	0.013	no	92.31
GW-16	Nitrate-N	10	14	0.2442	0.7372	1.7186	no	28.57
GW-16	Nitrate/Nitrite-N	10	13	0.0561	0.0423	0.1407	no	7.69
GW-16	Potassium		14	340.71	85.706	512.122		0

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-16	Selenium	0.05	14	0.005	0.0002	0.0054	no	92.86
GW-16	Silver	0.1	13	0.0112	0.0195	0.0502	no	92.31
GW-16	Sodium		14	8307.1	921.92	10150.94		0
GW-16	Sulfate		14	878.57	67.693	1013.956		0
GW-16	TDS		14	23142	1167.3	25476.6		0
GW-16	TOC		13	1.9184	3.6363	9.191		76.92
GW-16	TOX		13	0.043	0.1372	0.3174		100
GW-16	Zinc	5	14	0.0081	0.0169	0.0419	no	85.71
GW-19A	Arsenic	0.05	17	0.0181	0.0095	0.0371	no	11.76
GW-19A	Barium	2	17	0.0065	0.0071	0.0207	no	52.94
GW-19A	Beryllium	0.004	14	0.005	0	0.005	YES	92.86
GW-19A	Bicarbonate		17	171.76	37.953	247.666		0
GW-19A	Cadmium	0.005	17	0.0071	0.0103	0.0277	YES	88.24
GW-19A	Calcium		17	764.7	71.686	908.072		0
GW-19A	Carbonate		17	9.4705	2.1828	13.8361		100
GW-19A	Chloride		17	24117	1615.6	27348.2		0
GW-19A	Chromium	0.1	17	0.0342	0.0318	0.0978	no	41.18
GW-19A	Copper	1.3	17	0.0083	0.0087	0.0257	no	82.35
GW-19A	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-19A	Fluoride	4	17	4.4352	0.7088	5.8528	YES	0
GW-19A	Lead	0.015	17	0.0054	0.0017	0.0088	no	94.12
GW-19A	Magnesium		17	1102.9	117.67	1338.24		0
GW-19A	Mercury	0.002	17	0.0003	0.0003	0.0009	no	76.47
GW-19A	Molybdenum	0.04	14	0.4571	0.1554	0.7679	YES	7.14
GW-19A	Nickel	0.1	17	0.0224	0.0364	0.0952	no	64.71
GW-19A	Nitrate-N	10	17	0.0147	0.0117	0.0381	no	82.35
GW-19A	Nitrate/Nitrite-N	10	16	0.0125	0.0077	0.0279	no	81.25
GW-19A	Potassium		17	503.52	116.56	736.64		0
GW-19A	Selenium	0.05	17	0.005	0	0.005	no	100
GW-19A	Silver	0.1	17	0.0055	0.0016	0.0087	no	100
GW-19A	Sodium		17	15764	1300.4	18364.8		0
GW-19A	Sulfate		17	5013.5	863.99	6741.48		0
GW-19A	TDS		17	49588	2717	55022		0
GW-19A	TOC		16	3.0562	5.9274	14.911		62.5
GW-19A	TOX		16	0.078	0.011	0.10063		100
GW-19A	Zinc	5	17	0.0084	0.0109	0.0302	no	64.71
GW-19A	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-19A	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-19A	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-19A	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-19A	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-19A	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-19A	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-19A	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-19A	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-20	Arsenic	0.05	18	0.0225	0.01	0.0425	no	0
GW-20	Barium	2	18	0.0075	0.008	0.0235	no	44.44
GW-20	Beryllium	0.004	14	0.005	0	0.005	YES	100

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-20	Bicarbonate		18	220	14.95	249.9		0
GW-20	Cadmium	0.005	20	0.0071	0.0084	0.0239	YES	85
GW-20	Calcium		18	422.22	37.03	496.28		0
GW-20	Carbonate		18	10	0	10		100
GW-20	Chloride		18	24444	1580.1	27604.2		0
GW-20	Chromium	0.1	20	0.0334	0.0541	0.1416	YES	45
GW-20	Copper	1.3	18	0.0066	0.0065	0.0196	no	88.89
GW-20	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-20	Fluoride	4	18	2.9666	0.5698	4.1062	YES	0
GW-20	Lead	0.015	18	0.005	0	0.005	no	94.44
GW-20	Magnesium		18	727.22	70.86	868.94		0
GW-20	Mercury	0.002	18	0.0007	0.0023	0.0053	YES	77.78
GW-20	Molybdenum	0.04	15	0.1866	0.0639	0.3144	YES	26.67
GW-20	Nickel	0.1	20	0.0325	0.0621	0.1567	YES	70
GW-20	Nitrate-N	10	18	0.0916	0.0871	0.2658	no	0
GW-20	Nitrate/Nitrite-N	10	18	0.094	0.0874	0.2688	no	0
GW-20	Potassium		18	533.88	69.208	672.296		0
GW-20	Selenium	0.05	18	0.0053	0.0008	0.0069	no	77.78
GW-20	Silver	0.1	18	0.0052	0.0011	0.0074	no	100
GW-20	Sodium		18	16111	2111.2	20333.4		0
GW-20	Sulfate		18	3711.1	321.55	4354.2		0
GW-20	TDS		19	48421	3436.9	55294.8		0
GW-20	TOC		18	2.7366	6.5758	15.8882		72.22
GW-20	TOX		18	0.005	0	0.005		100
GW-20	Zinc	5	18	0.0058	0.0076	0.021	no	77.78
GW-20	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-20	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-20	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-20	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-20	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-20	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-20	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-20	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-20	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-22	Arsenic	0.05	18	0.0141	0.006	0.0261	no	0
GW-22	Barium	2	18	0.0221	0.0216	0.0653	no	44.44
GW-22	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-22	Bicarbonate		18	327.22	53.666	434.552		0
GW-22	Cadmium	0.005	20	0.0066	0.0072	0.021	YES	85
GW-22	Calcium		18	438.88	50.746	540.372		0
GW-22	Carbonate		18	10	0	10		100
GW-22	Chloride		18	23222	1555	26332		0
GW-22	Chromium	0.1	20	0.0245	0.0262	0.0769	no	45
GW-22	Copper	1.3	18	0.009	0.0088	0.0266	no	72.22
GW-22	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-22	Fluoride	4	18	2.7222	0.3718	3.4658	no	0
GW-22	Lead	0.015	18	0.005	0	0.005	no	100
GW-22	Magnesium		18	640.55	79.296	799.142		0

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-22	Mercury	0.002	18	0.0002	0.0001	0.0004	no	88.89
GW-22	Molybdenum	0.04	14	0.0864	0.0345	0.1554	YES	50
GW-22	Nickel	0.1	18	0.0182	0.0276	0.0734	no	77.78
GW-22	Nitrate-N	10	18	0.0766	0.1863	0.4492	no	16.67
GW-22	Nitrate/Nitrite-N	10	18	0.0872	0.1846	0.4564	no	5.56
GW-22	Potassium		18	472.22	80.917	634.054		0
GW-22	Selenium	0.05	18	0.0051	0.0007	0.0065	no	94.44
GW-22	Silver	0.1	18	0.0074	0.0092	0.0258	no	94.44
GW-22	Sodium		18	21888	29513	80914		0
GW-22	Sulfate		18	2161.1	185.15	2531.4		0
GW-22	TDS		18	43388	1289.7	45967.4		0
GW-22	TOC		18	1.0433	0.3437	1.7307		77.78
GW-22	TOX		18	0.005	0	0.005		100
GW-22	Zinc	5	18	0.0047	0.0056	0.0159	no	72.22
GW-23	Arsenic	0.05	18	0.0155	0.0072	0.0299	no	0
GW-23	Barium	2	18	0.0171	0.0192	0.0555	no	44.44
GW-23	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-23	Bicarbonate		18	306.11	35.832	377.774		0
GW-23	Cadmium	0.005	20	0.0071	0.0087	0.0245	YES	85
GW-23	Calcium		18	456.66	48.749	554.158		0
GW-23	Carbonate		18	10	0	10		100
GW-23	Chloride		18	22166	1248.5	24663		0
GW-23	Chromium	0.1	20	0.0249	0.0272	0.0793	no	45
GW-23	Copper	1.3	18	0.0089	0.0089	0.0267	no	72.22
GW-23	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-23	Fluoride	4	20	3.055	0.4358	3.9266	no	0
GW-23	Lead	0.015	18	0.005	0	0.005	no	100
GW-23	Magnesium		18	650	68.255	786.51		0
GW-23	Mercury	0.002	18	0.0002	0.0001	0.0004	no	88.89
GW-23	Molybdenum	0.04	14	0.1289	0.0603	0.2495	YES	35.71
GW-23	Nickel	0.1	18	0.0193	0.0272	0.0737	no	72.22
GW-23	Nitrate-N	10	18	0.0572	0.0296	0.1164	no	5.56
GW-23	Nitrate/Nitrite-N	10	18	0.0549	0.034	0.1229	no	5.56
GW-23	Potassium		18	470.55	81.707	633.964		0
GW-23	Selenium	0.05	18	0.0052	0.0009	0.007	no	94.44
GW-23	Silver	0.1	18	0.0084	0.0134	0.0352	no	94.44
GW-23	Sodium		18	14666	1644.9	17955.8		0
GW-23	Sulfate		18	2922.2	264.69	3451.58		0
GW-23	TDS		18	42611	1195	45001		0
GW-23	TOC		18	2.7155	6.3236	15.3627		66.67
GW-23	TOX		18	0.005	0	0.005		100
GW-23	Zinc	5	18	0.0043	0.0051	0.0145	no	77.78
GW-24	Arsenic	0.05	18	0.0177	0.0075	0.0327	no	0
GW-24	Barium	2	18	0.013	0.0121	0.0372	no	44.44
GW-24	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-24	Bicarbonate		18	227.22	15.645	258.51		0
GW-24	Cadmium	0.005	20	0.0068	0.0079	0.0226	YES	85
GW-24	Calcium		18	472.77	44.431	561.632		0

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-24	Carbonate		18	10	0	10		100
GW-24	Chloride		18	24111	1843.5	27798		0
GW-24	Chromium	0.1	20	0.0253	0.0285	0.0823	no	45
GW-24	Copper	1.3	18	0.0075	0.0073	0.0221	no	77.78
GW-24	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-24	Fluoride	4	18	3.0833	0.4514	3.9861	no	0
GW-24	Lead	0.015	18	0.005	0	0.005	no	94.44
GW-24	Magnesium		18	728.33	64.008	856.346		0
GW-24	Mercury	0.002	18	0.0002	0.0001	0.0004	no	83.33
GW-24	Molybdenum	0.04	14	0.1857	0.0663	0.3183	YES	28.57
GW-24	Nickel	0.1	18	0.0237	0.0361	0.0959	no	72.22
GW-24	Nitrate-N	10	18	0.0644	0.0311	0.1266	no	5.56
GW-24	Nitrate/Nitrite-N	10	18	0.0705	0.0333	0.1371	no	0
GW-24	Potassium		18	518.88	52.679	624.238		0
GW-24	Selenium	0.05	18	0.0062	0.0021	0.0104	no	50
GW-24	Silver	0.1	18	0.0081	0.012	0.0321	no	94.44
GW-24	Sodium		18	16222	1864.7	19951.4		0
GW-24	Sulfate		18	4155.5	1214.7	6584.9		0
GW-24	TDS		18	47111	1875.1	50861.2		0
GW-24	TOC		18	1.8077	2.6239	7.0555		72.22
GW-24	TOX		18	0.005	0	0.005		100
GW-24	Zinc	5	18	0.0057	0.0078	0.0213	no	77.78
GW-24	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-24	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-24	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-24	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-24	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-24	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-24	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-24	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-24	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-25	Arsenic	0.05	18	0.0593	0.0238	0.1069	YES	0
GW-25	Barium	2	18	0.0141	0.0158	0.0457	no	38.89
GW-25	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-25	Bicarbonate		18	213.88	36.321	286.522		0
GW-25	Cadmium	0.005	18	0.0074	0.0089	0.0252	YES	77.78
GW-25	Calcium		18	523.88	61.657	647.194		0
GW-25	Carbonate		18	10	0	10		100
GW-25	Chloride		18	24388	1577	27542		0
GW-25	Chromium	0.1	18	0.033	0.0369	0.1068	YES	38.89
GW-25	Copper	1.3	18	0.0158	0.0295	0.0748	no	66.67
GW-25	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-25	Fluoride	4	18	3.45	0.5113	4.4726	YES	0
GW-25	Lead	0.015	18	0.0052	0.0009	0.007	no	94.44
GW-25	Magnesium		18	858.88	52.456	963.792		0
GW-25	Mercury	0.002	18	0.0002	0.0002	0.0006	no	88.89
GW-25	Molybdenum	0.04	14	0.1785	0.0578	0.2941	YES	14.29
GW-25	Nickel	0.1	18	0.0227	0.0328	0.0883	no	72.22

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-25	Nitrate-N	10	18	0.0366	0.0259	0.0884	no	33.33
GW-25	Nitrate/Nitrite-N	10	18	0.0405	0.0231	0.0867	no	16.67
GW-25	Potassium		18	512.77	88.037	688.844		0
GW-25	Selenium	0.05	18	0.005	0	0.005	no	100
GW-25	Silver	0.1	17	0.0053	0.0012	0.0077	no	100
GW-25	Sodium		18	16444	1616.9	19677.8		0
GW-25	Sulfate		18	4333.3	385.01	5103.32		0
GW-25	TDS		18	47111	2541.1	52193.2		0
GW-25	TOC		18	4.7244	10.404	25.5324		55.56
GW-25	TOX		18	0.0325	0.1166	0.2657		100
GW-25	Zinc	5	18	0.0048	0.0067	0.0182	no	66.67
GW-25	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-25	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-25	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-25	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-25	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-25	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-25	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-25	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-25	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-26	Arsenic	0.05	16	0.0965	0.0518	0.2001	YES	0
GW-26	Barium	2	16	0.0172	0.0142	0.0456	no	37.5
GW-26	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-26	Bicarbonate		16	114.25	21.439	157.128		0
GW-26	Cadmium	0.005	16	0.0068	0.0091	0.025	YES	81.25
GW-26	Calcium		16	633.12	53.754	740.628		0
GW-26	Carbonate		16	10	0	10		100
GW-26	Chloride		16	23500	1549.1	26598.2		0
GW-26	Chromium	0.1	16	0.0311	0.0319	0.0949	no	37.5
GW-26	Copper	1.3	16	0.0082	0.0088	0.0258	no	75
GW-26	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-26	Fluoride	4	16	3.65	0.5842	4.8184	YES	0
GW-26	Lead	0.015	16	0.0051	0.0005	0.0061	no	93.75
GW-26	Magnesium		16	929.37	49.053	1027.476		0
GW-26	Mercury	0.002	16	0.0002	0.0001	0.0004	no	87.5
GW-26	Molybdenum	0.04	14	0.2952	0.2496	0.7944	YES	28.57
GW-26	Nickel	0.1	16	0.0235	0.034	0.0915	no	62.5
GW-26	Nitrate-N	10	16	1.015	0.0873	1.1896	no	0
GW-26	Nitrate/Nitrite-N	10	16	1.0187	0.0824	1.1835	no	0
GW-26	Potassium		16	475	78.993	632.986		0
GW-26	Selenium	0.05	16	0.0071	0.0031	0.0133	no	43.75
GW-26	Silver	0.1	16	0.0053	0.0012	0.0077	no	100
GW-26	Sodium		16	15250	1341.6	17933.2		0
GW-26	Sulfate		16	4718.7	625.26	5969.22		0
GW-26	TDS		16	45562	5059.2	55680.4		0
GW-26	TOC		16	2.4937	4.443	11.3797		62.5
GW-26	TOX		16	0.005	0	0.005		100
GW-26	Zinc	5	16	0.0088	0.0145	0.0378	no	62.5

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-26	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-26	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-26	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-26	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-26	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-26	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-26	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-26	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-26	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-27	Arsenic	0.05	16	0.0281	0.0148	0.0577	YES	0
GW-27	Barium	2	16	0.0213	0.0166	0.0545	no	31.25
GW-27	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-27	Bicarbonate		16	160.62	12.365	185.35		0
GW-27	Cadmium	0.005	16	0.0066	0.0084	0.0234	YES	87.5
GW-27	Calcium		16	523.12	48.403	619.926		0
GW-27	Carbonate		16	10	0	10		100
GW-27	Chloride		16	21062	1388.9	23839.8		0
GW-27	Chromium	0.1	16	0.0264	0.0275	0.0814	no	37.5
GW-27	Copper	1.3	16	0.0076	0.0074	0.0224	no	75
GW-27	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-27	Fluoride	4	16	3.5062	0.5052	4.5166	YES	0
GW-27	Lead	0.015	16	0.005	0	0.005	no	100
GW-27	Magnesium		16	816.25	70.887	958.024		0
GW-27	Mercury	0.002	16	0.0004	0.0008	0.002	no	81.25
GW-27	Molybdenum	0.04	14	0.4571	0.1016	0.6603	YES	0
GW-27	Nickel	0.1	16	0.02	0.0292	0.0784	no	62.5
GW-27	Nitrate-N	10	16	0.0537	0.0809	0.2155	no	31.25
GW-27	Nitrate/Nitrite-N	10	16	0.0556	0.0817	0.219	no	25
GW-27	Potassium		16	499.37	41.226	581.822		0
GW-27	Selenium	0.05	16	0.005	0	0.005	no	100
GW-27	Silver	0.1	16	0.0053	0.0012	0.0077	no	93.75
GW-27	Sodium		16	13687	1400.8	16488.6		0
GW-27	Sulfate		16	3993.7	560.32	5114.34		0
GW-27	TDS		16	41937	5272.1	52481.2		0
GW-27	TOC		16	1.3375	0.6849	2.7073		75
GW-27	TOX		16	0.005	0	0.005		100
GW-27	Zinc	5	16	0.0061	0.0087	0.0235	no	75
GW-27	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-27	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-27	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-27	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-27	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-27	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-27	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-27	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-27	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-28	Arsenic	0.05	16	0.0422	0.0173	0.0768	YES	0
GW-28	Barium	2	16	0.0117	0.0109	0.0335	no	37.5

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-28	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-28	Bicarbonate		16	150.62	11.236	173.092		0
GW-28	Cadmium	0.005	16	0.0061	0.0073	0.0207	YES	87.5
GW-28	Calcium		16	441.25	27.778	496.806		0
GW-28	Carbonate		16	10	0	10		100
GW-28	Chloride		16	22500	1366.2	25232.4		0
GW-28	Chromium	0.1	16	0.0233	0.0253	0.0739	no	37.5
GW-28	Copper	1.3	16	0.0086	0.0088	0.0262	no	75
GW-28	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-28	Fluoride	4	16	3.2187	0.4929	4.2045	YES	0
GW-28	Lead	0.015	16	0.0053	0.0015	0.0083	no	93.75
GW-28	Magnesium		16	709.37	42.656	794.682		0
GW-28	Mercury	0.002	16	0.0002	0.0002	0.0006	no	81.25
GW-28	Molybdenum	0.04	14	0.2642	0.1008	0.4658	YES	7.14
GW-28	Nickel	0.1	16	0.0206	0.0319	0.0844	no	75
GW-28	Nitrate-N	10	16	0.3375	0.1048	0.5471	no	0
GW-28	Nitrate/Nitrite-N	10	16	0.3406	0.1082	0.557	no	0
GW-28	Potassium		16	508.12	61.883	631.886		0
GW-28	Selenium	0.05	16	0.005	0	0.005	no	93.75
GW-28	Silver	0.1	16	0.0056	0.0017	0.009	no	100
GW-28	Sodium		16	14437	1314.9	17066.8		0
GW-28	Sulfate		16	3793.7	402.44	4598.58		0
GW-28	TDS		16	43687	2301.2	48289.4		0
GW-28	TOC		16	1.35	0.6643	2.6786		68.75
GW-28	TOX		16	0.005	0	0.005		100
GW-28	Zinc	5	16	0.0091	0.015	0.0391	no	62.5
GW-28	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-28	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-28	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-28	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-28	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-28	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-28	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-28	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-28	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-29	Arsenic	0.05	18	0.0135	0.005	0.0235	no	0
GW-29	Barium	2	18	0.0121	0.0136	0.0393	no	44.44
GW-29	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-29	Bicarbonate		18	323.33	27.653	378.636		0
GW-29	Cadmium	0.005	20	0.0068	0.0083	0.0234	YES	85
GW-29	Calcium		18	523.88	52.707	629.294		0
GW-29	Carbonate		18	10	0	10		100
GW-29	Chloride		18	24666	1495	27656		0
GW-29	Chromium	0.1	20	0.0254	0.0293	0.084	no	35
GW-29	Copper	1.3	18	0.0078	0.0077	0.0232	no	72.22
GW-29	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-29	Fluoride	4	18	3.3722	0.6027	4.5776	YES	0
GW-29	Lead	0.015	18	0.005	0	0.005	no	100

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-29	Magnesium		18	805.55	68.532	942.614		0
GW-29	Mercury	0.002	18	0.004	0.015	0.034	YES	72.22
GW-29	Molybdenum	0.04	15	0.194	0.0868	0.3676	YES	26.67
GW-29	Nickel	0.1	19	0.0161	0.0265	0.0691	no	84.21
GW-29	Nitrate-N	10	18	0.0211	0.0202	0.0615	no	55.56
GW-29	Nitrate/Nitrite-N	10	18	0.0244	0.0225	0.0694	no	44.44
GW-29	Potassium		18	540.55	78.1	696.75		0
GW-29	Selenium	0.05	18	0.005	0	0.005	no	100
GW-29	Silver	0.1	18	0.0067	0.0061	0.0189	no	94.44
GW-29	Sodium		18	16166	1723.5	19613		0
GW-29	Sulfate		18	4105.5	618.79	5343.08		0
GW-29	TDS		18	46166	3666.2	53498.4		0
GW-29	TOC		18	2.1633	3.9905	10.1443		66.67
GW-29	TOX		17	0.005	0	0.005		100
GW-29	Zinc	5	18	0.0062	0.0085	0.0232	no	77.78
GW-29	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-29	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-29	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-29	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-29	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-29	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-29	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-29	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-29	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-36	Arsenic	0.05	16	0.0333	0.0145	0.0623	YES	0
GW-36	Barium	2	16	0.0149	0.014	0.0429	no	37.5
GW-36	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-36	Bicarbonate		16	153.75	23.909	201.568		0
GW-36	Cadmium	0.005	16	0.006	0.007	0.02	YES	87.5
GW-36	Calcium		16	473.75	48.836	571.422		0
GW-36	Carbonate		16	10	0	10		100
GW-36	Chloride		16	21937	1436.1	24809.2		0
GW-36	Chromium	0.1	16	0.0271	0.0251	0.0773	no	37.5
GW-36	Copper	1.3	16	0.008	0.0081	0.0242	no	68.75
GW-36	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-36	Fluoride	4	16	2.875	0.5531	3.9812	no	0
GW-36	Lead	0.015	16	0.005	0	0.005	no	100
GW-36	Magnesium		16	644.37	65.214	774.798		0
GW-36	Mercury	0.002	16	0.0004	0.0008	0.002	no	68.75
GW-36	Molybdenum	0.04	14	0.2428	0.1016	0.446	YES	21.43
GW-36	Nickel	0.1	16	0.032	0.0574	0.1468	YES	75
GW-36	Nitrate-N	10	16	0.5668	0.0554	0.6776	no	0
GW-36	Nitrate/Nitrite-N	10	16	0.5831	0.0651	0.7133	no	0
GW-36	Potassium		16	479.37	40.078	559.526		0
GW-36	Selenium	0.05	16	0.0056	0.001	0.0076	no	68.75
GW-36	Silver	0.1	16	0.0053	0.0012	0.0077	no	100
GW-36	Sodium		16	14187	1515.2	17217.4		0
GW-36	Sulfate		16	3625	349.28	4323.56		0

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-36	TDS		16	41000	1932.1	44864.2		0
GW-36	TOC		16	3.5375	9.463	22.4635		75
GW-36	TOX		16	0.005	0	0.005		100
GW-36	Zinc	5	16	0.006	0.0078	0.0216	no	68.75
GW-36	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-36	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-36	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-36	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-36	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-36	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-36	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-36	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-36	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-37	Arsenic	0.05	16	0.0222	0.0111	0.0444	no	0
GW-37	Barium	2	16	0.0167	0.0155	0.0477	no	37.5
GW-37	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-37	Bicarbonate		16	133.5	18.366	170.232		0
GW-37	Cadmium	0.005	16	0.0064	0.0082	0.0228	YES	87.5
GW-37	Calcium		16	482.5	54.589	591.678		0
GW-37	Carbonate		16	10	0	10		100
GW-37	Chloride		16	23875	1668.3	27211.6		0
GW-37	Chromium	0.1	16	0.0261	0.0339	0.0939	no	50
GW-37	Copper	1.3	16	0.0076	0.0077	0.023	no	81.25
GW-37	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-37	Fluoride	4	16	3	0.4397	3.8794	no	0
GW-37	Lead	0.015	16	0.005	0	0.005	no	93.75
GW-37	Magnesium		16	735	79.916	894.832		0
GW-37	Mercury	0.002	16	0.0004	0.0004	0.0012	no	62.5
GW-37	Molybdenum	0.04	14	0.25	0.1091	0.4682	YES	21.43
GW-37	Nickel	0.1	16	0.0376	0.0684	0.1744	YES	68.75
GW-37	Nitrate-N	10	16	0.3575	0.3249	1.0073	no	0
GW-37	Nitrate/Nitrite-N	10	16	0.3625	0.3216	1.0057	no	0
GW-37	Potassium		16	526.25	51.234	628.718		0
GW-37	Selenium	0.05	16	0.0056	0.0018	0.0092	no	75
GW-37	Silver	0.1	16	0.0053	0.0012	0.0077	no	100
GW-37	Sodium		16	15687	1778.3	19243.6		0
GW-37	Sulfate		16	3837.5	399.79	4637.08		0
GW-37	TDS		16	46500	2221.1	50942.2		0
GW-37	TOC		16	2.5562	5.4661	13.4884		75
GW-37	TOX		16	0.005	0	0.005		100
GW-37	Zinc	5	16	0.0053	0.0078	0.0209	no	68.75
GW-37	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-37	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-37	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-37	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-37	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-37	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-37	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-37	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-37	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-38	Arsenic	0.05	18	0.0228	0.0118	0.0464	no	5.56
GW-38	Barium	2	18	0.0246	0.0308	0.0862	no	33.33
GW-38	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-38	Bicarbonate		18	186.66	35.645	257.95		0
GW-38	Cadmium	0.005	18	0.0067	0.0075	0.0217	YES	83.33
GW-38	Calcium		18	399.44	39.178	477.796		0
GW-38	Carbonate		18	10	0	10		100
GW-38	Chloride		18	20111	1450.7	23012.4		0
GW-38	Chromium	0.1	18	0.025	0.0333	0.0916	no	44.44
GW-38	Copper	1.3	18	0.0163	0.0346	0.0855	no	72.22
GW-38	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-38	Fluoride	4	18	2.5388	0.416	3.3708	no	0
GW-38	Lead	0.015	18	0.005	0	0.005	no	100
GW-38	Magnesium		18	580.55	52.184	684.918		0
GW-38	Mercury	0.002	18	0.0003	0.0004	0.0011	no	72.22
GW-38	Molybdenum	0.04	14	0.2	0.0784	0.3568	YES	21.43
GW-38	Nickel	0.1	18	0.019	0.0269	0.0728	no	77.78
GW-38	Nitrate-N	10	18	0.3172	0.21	0.7372	no	0
GW-38	Nitrate/Nitrite-N	10	18	0.3283	0.2028	0.7339	no	0
GW-38	Potassium		18	458.33	56.802	571.934		0
GW-38	Selenium	0.05	18	0.0068	0.0031	0.013	no	38.89
GW-38	Silver	0.1	17	0.0053	0.0012	0.0077	no	94.44
GW-38	Sodium		18	13000	1188.1	15376.2		0
GW-38	Sulfate		18	3061.1	371.22	3803.54		0
GW-38	TDS		18	37277	1964.5	41206		0
GW-38	TOC		18	1.18	0.5054	2.1908		72.22
GW-38	TOX		18	0.0325	0.1166	0.2657		100
GW-38	Zinc	5	18	0.0095	0.0185	0.0465	no	77.78
GW-38	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-38	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-38	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-38	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-38	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-38	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-38	Napthalene	0.02	2	0.003	0.001414	0.005828	no	100
GW-38	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-38	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-56	Arsenic	0.05	13	0.0079	0.0034	0.0147	no	23.08
GW-56	Barium	2	13	0.041	0.0645	0.17	no	38.46
GW-56	Beryllium	0.004	9	0.005	0	0.005	YES	100
GW-56	Bicarbonate		13	328.46	53.361	435.182		0
GW-56	Cadmium	0.005	13	0.0056	0.0058	0.0172	YES	84.62
GW-56	Calcium		13	380	39.791	459.582		0
GW-56	Carbonate		13	10	0	10		100
GW-56	Chloride		13	23846	1863.9	27573.8		0
GW-56	Chromium	0.1	13	0.0179	0.0317	0.0813	no	61.54

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-56	Copper	1.3	13	0.0176	0.0381	0.0938	no	84.62
GW-56	Cyanide	0.2	7	0.005	0	0.005	no	100
GW-56	Fluoride	4	13	2.5076	0.3546	3.2168	no	0
GW-56	Lead	0.015	13	0.005	0	0.005	no	100
GW-56	Magnesium		13	553.07	70.991	695.052		0
GW-56	Mercury	0.002	13	0.0002	0.0001	0.0004	no	92.31
GW-56	Molybdenum	0.04	9	0.09	0.03	0.15	YES	44.44
GW-56	Nickel	0.1	13	0.0142	0.0198	0.0538	no	92.31
GW-56	Nitrate-N	10	13	0.027	0.0272	0.0814	no	46.15
GW-56	Nitrate/Nitrite-N	10	13	0.0269	0.0298	0.0865	no	38.46
GW-56	Potassium		13	437.69	88.896	615.482		0
GW-56	Selenium	0.05	13	0.005	0	0.005	no	100
GW-56	Silver	0.1	11	0.005	0	0.005	no	100
GW-56	Sodium		13	15461	1853.6	19168.2		0
GW-56	Sulfate		13	2192.3	206	2604.3		0
GW-56	TDS		13	44692	1601.2	47894.4		0
GW-56	TOC		14	1.2832	0.8964	3.076		71.43
GW-56	TOX		12	0.0462	0.1428	0.3318		100
GW-56	Zinc	5	13	0.0024	0.0016	0.0056	no	92.31
GW-57	Arsenic	0.05	15	0.0126	0.0065	0.0256	no	6.67
GW-57	Barium	2	15	0.0198	0.0146	0.049	no	33.33
GW-57	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-57	Bicarbonate		15	126	8.2807	142.5614		0
GW-57	Cadmium	0.005	15	0.0067	0.0082	0.0231	YES	86.67
GW-57	Calcium		15	642.66	74.014	790.688		0
GW-57	Carbonate		15	10	0	10		100
GW-57	Chloride		15	20600	1502.3	23604.6		0
GW-57	Chromium	0.1	15	0.03	0.0281	0.0862	no	40
GW-57	Copper	1.3	15	0.0098	0.0108	0.0314	no	73.33
GW-57	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-57	Fluoride	4	15	3.34	0.366	4.072	YES	0
GW-57	Lead	0.015	15	0.005	0	0.005	no	100
GW-57	Magnesium		15	789.33	74.495	938.32		0
GW-57	Mercury	0.002	15	0.0002	0.0001	0.0004	no	73.33
GW-57	Molybdenum	0.04	14	0.3285	0.1069	0.5423	YES	0
GW-57	Nickel	0.1	15	0.0269	0.0432	0.1133	YES	66.67
GW-57	Nitrate-N	10	15	0.324	0.0608	0.4456	no	0
GW-57	Nitrate/Nitrite-N	10	15	0.3261	0.0621	0.4503	no	0
GW-57	Potassium		15	486.66	76.032	638.724		0
GW-57	Selenium	0.05	15	0.005	0	0.005	no	100
GW-57	Silver	0.1	15	0.005	0	0.005	no	93.33
GW-57	Sodium		15	13333	1234.4	15801.8		0
GW-57	Sulfate		15	4260	697.75	5655.5		0
GW-57	TDS		15	41266	2344.1	45954.2		0
GW-57	TOC		15	1.3133	0.6749	2.6631		66.67
GW-57	TOX		15	0.005	0	0.005		100
GW-57	Zinc	5	15	0.0088	0.0119	0.0326	no	60
GW-57	Acetone	0.7	2	0.015	0.007	0.029	no	100

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-57	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-57	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-57	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-57	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-57	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-57	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-57	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-57	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-58	Arsenic	0.05	15	0.0654	0.027	0.1194	YES	0
GW-58	Barium	2	15	0.0204	0.0144	0.0492	no	33.33
GW-58	Beryllium	0.004	14	0.005	0	0.005	YES	100
GW-58	Bicarbonate		15	144.66	11.254	167.168		0
GW-58	Cadmium	0.005	15	0.006	0.0067	0.0194	YES	86.67
GW-58	Calcium		15	411.33	39.617	490.564		0
GW-58	Carbonate		15	10	0	10		100
GW-58	Chloride		15	20400	1121.2	22642.4		0
GW-58	Chromium	0.1	15	0.0232	0.0234	0.07	no	40
GW-58	Copper	1.3	15	0.084	0.0899	0.2638	no	40
GW-58	Cyanide	0.2	12	0.005	0	0.005	no	100
GW-58	Fluoride	4	15	2.9	0.4488	3.7976	no	0
GW-58	Lead	0.015	15	0.005	0	0.005	no	100
GW-58	Magnesium		15	630.66	55.737	742.134		0
GW-58	Mercury	0.002	15	0.0003	0.0002	0.0007	no	73.33
GW-58	Molybdenum	0.04	14	0.2	0.0784	0.3568	YES	14.29
GW-58	Nickel	0.1	15	0.0222	0.0353	0.0928	no	66.67
GW-58	Nitrate-N	10	15	0.6786	0.1655	1.0096	no	0
GW-58	Nitrate/Nitrite-N	10	15	0.682	0.1679	1.0178	no	0
GW-58	Potassium		15	470	50.849	571.698		0
GW-58	Selenium	0.05	15	0.005	0.0002	0.0054	no	93.33
GW-58	Silver	0.1	15	0.005	0	0.005	no	100
GW-58	Sodium		15	13066	1032.8	15131.6		0
GW-58	Sulfate		15	2946.6	306.74	3560.08		0
GW-58	TDS		15	39533	2614.9	44762.8		0
GW-58	TOC		15	1.14	0.3333	1.8066		80
GW-58	TOX		15	0.005	0	0.005		100
GW-58	Zinc	5	15	0.1178	0.1352	0.3882	no	40
GW-58	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-58	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-58	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-58	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-58	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-58	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-58	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-58	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-58	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
I-2-30	Arsenic	0.05	18	0.0127	0.005	0.0227	no	5.56
I-2-30	Barium	2	18	0.0395	0.1009	0.2413	no	33.33
I-2-30	Beryllium	0.004	14	0.005	0	0.005	YES	100

Envirocare GW Quality Data Statistics: Inorganics and Organics								
Adjusted Raw Statistics								
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
I-2-30	Bicarbonate		18	251.11	30.076	311.262		0
I-2-30	Cadmium	0.005	20	0.0063	0.006	0.0183	YES	85
I-2-30	Calcium		18	322.77	33.747	390.264		0
I-2-30	Carbonate		18	10	0	10		100
I-2-30	Chloride		18	18833	1248.5	21330		0
I-2-30	Chromium	0.1	20	0.0199	0.0193	0.0585	no	40
I-2-30	Copper	1.3	18	0.009	0.0109	0.0308	no	72.22
I-2-30	Cyanide	0.2	12	0.005	0	0.005	no	100
I-2-30	Fluoride	4	18	2.3277	0.3426	3.0129	no	0
I-2-30	Lead	0.015	18	0.005	0	0.005	no	100
I-2-30	Magnesium		18	434.44	50.084	534.608		0
I-2-30	Mercury	0.002	18	0.0002	0.0002	0.0006	no	83.33
I-2-30	Molybdenum	0.04	14	0.0935	0.024	0.1415	YES	71.43
I-2-30	Nickel	0.1	18	0.0147	0.0179	0.0505	no	83.33
I-2-30	Nitrate-N	10	18	0.015	0.0142	0.0434	no	66.67
I-2-30	Nitrate/Nitrite-N	10	18	0.0172	0.0148	0.0468	no	61.11
I-2-30	Potassium		18	416.11	103.53	623.17		0
I-2-30	Selenium	0.05	18	0.005	0	0.005	no	94.44
I-2-30	Silver	0.1	18	0.0089	0.0155	0.0399	no	94.44
I-2-30	Sodium		18	11916	1215.7	14347.4		0
I-2-30	Sulfate		18	1594.4	614.02	2822.44		0
I-2-30	TDS		18	33111	1450.7	36012.4		0
I-2-30	TOC		18	1.7711	3.3019	8.3749		83.33
I-2-30	TOX		18	0.0325	0.1166	0.2657		100
I-2-30	Zinc	5	18	0.0077	0.0091	0.0259	no	66.67
GW-16R	Arsenic	0.05	7	0.0118	0.0055	0.0228	no	14.29
GW-16R	Barium	2	7	0.0274	0.0108	0.049	no	0
GW-16R	Beryllium	0.004	7	0.005	0	0.005	YES	100
GW-16R	Bicarbonate		7	331.42	12.149	355.718		0
GW-16R	Cadmium	0.005	9	0.01	0.0113	0.0326	YES	66.67
GW-16R	Calcium		7	350	23.804	397.608		0
GW-16R	Carbonate		7	10	0	10		100
GW-16R	Chloride		7	22428	1272.4	24972.8		0
GW-16R	Chromium	0.1	9	0.0348	0.0308	0.0964	no	22.22
GW-16R	Copper	1.3	7	0.0112	0.0137	0.0386	no	57.14
GW-16R	Cyanide	0.2	7	0.005	0	0.005	no	100
GW-16R	Fluoride	4	9	2.9	0.3873	3.6746	no	0
GW-16R	Lead	0.015	7	0.005	0	0.005	no	100
GW-16R	Magnesium		7	492.85	34.016	560.882		0
GW-16R	Mercury	0.002	7	0.0002	0.0001	0.0004	no	71.43
GW-16R	Molybdenum	0.04	7	0.1142	0.0378	0.1898	YES	57.14
GW-16R	Nickel	0.1	7	0.0251	0.0319	0.0889	no	57.14
GW-16R	Nitrate-N	10	7	0.0314	0.0203	0.072	no	28.57
GW-16R	Nitrate/Nitrite-N	10	7	0.0307	0.0179	0.0665	no	14.29
GW-16R	Potassium		7	480	37.416	554.832		0
GW-16R	Selenium	0.05	7	0.005	0	0.005	no	100
GW-16R	Silver	0.1	7	0.005	0	0.005	no	100
GW-16R	Sodium		7	14142	690.06	15522.12		0

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-16R	Sulfate		7	1814.2	285.35	2384.9		0
GW-16R	TDS		8	40625	1187.7	43000.4		0
GW-16R	TOC		7	1	0	1		100
GW-16R	TOX		7	0.005	0	0.005		100
GW-16R	Zinc	5	7	0.011	0.0086	0.0282	no	28.57
GW-56R	Arsenic	0.05	7	0.0085	0.0028	0.0141	no	28.57
GW-56R	Barium	2	7	0.06	0.0215	0.103	no	0
GW-56R	Beryllium	0.004	7	0.005	0	0.005	YES	100
GW-56R	Bicarbonate		7	354.28	15.118	384.516		0
GW-56R	Cadmium	0.005	7	0.009	0.0108	0.0306	YES	71.43
GW-56R	Calcium		7	361.42	24.103	409.626		0
GW-56R	Carbonate		7	10	0	10		100
GW-56R	Chloride		7	21714	755.92	23225.84		0
GW-56R	Chromium	0.1	7	0.0312	0.0295	0.0902	no	28.57
GW-56R	Copper	1.3	7	0.01	0.0093	0.0286	no	71.43
GW-56R	Cyanide	0.2	7	0.005	0	0.005	no	100
GW-56R	Fluoride	4	7	2.7857	0.3579	3.5015	no	0
GW-56R	Lead	0.015	7	0.005	0	0.005	no	100
GW-56R	Magnesium		7	491.42	34.365	560.15		0
GW-56R	Mercury	0.002	7	0.0002	0.0001	0.0004	no	71.43
GW-56R	Molybdenum	0.04	7	0.1	0	0.1	YES	71.43
GW-56R	Nickel	0.1	7	0.0288	0.0377	0.1042	YES	71.43
GW-56R	Nitrate-N	10	7	0.0257	0.0127	0.0511	no	28.57
GW-56R	Nitrate/Nitrite-N	10	7	0.0285	0.0157	0.0599	no	14.29
GW-56R	Potassium		7	497.14	41.518	580.176		0
GW-56R	Selenium	0.05	7	0.005	0	0.005	no	100
GW-56R	Silver	0.1	7	0.005	0	0.005	no	85.71
GW-56R	Sodium		7	14142	1069	16280		0
GW-56R	Sulfate		7	1728.5	262.76	2254.02		0
GW-56R	TDS		7	41000	4203.1	49406.2		0
GW-56R	TOC		7	1	0	1		100
GW-56R	TOX		7	0.005	0	0.005		100
GW-56R	Zinc	5	7	0.0091	0.0092	0.0275	no	28.57
GW-60	Arsenic	0.05	3	0.0223	0.0041	0.0305	no	0
GW-60	Barium	2	3	0.019	0.011	0.041	no	0
GW-60	Beryllium	0.004	3	0.005	0	0.005	YES	100
GW-60	Bicarbonate		3	190	0	190		0
GW-60	Cadmium	0.005	3	0.0143	0.0138	0.0419	YES	33.33
GW-60	Calcium		3	423.33	40.414	504.158		0
GW-60	Carbonate		3	10	0	10		100
GW-60	Chloride		3	20000	1000	22000		0
GW-60	Chromium	0.1	3	0.0556	0.03	0.1156	YES	0
GW-60	Copper	1.3	3	0.0176	0.0109	0.0394	no	33.33
GW-60	Cyanide	0.2	3	0.005	0	0.005	no	100
GW-60	Fluoride	4	3	3.1	0.3605	3.821	no	0
GW-60	Lead	0.015	3	0.005	0	0.005	no	100
GW-60	Magnesium		3	620	70	760		0
GW-60	Mercury	0.002	3	0.0002	0.0001	0.0004	no	33.33

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-60	Molybdenum	0.04	3	0.2333	0.0577	0.3487	YES	0
GW-60	Nickel	0.1	3	0.0476	0.0433	0.1342	YES	33.33
GW-60	Nitrate-N	10	3	0.1633	0.0057	0.1747	no	0
GW-60	Nitrate/Nitrite-N	10	3	0.1633	0.0057	0.1747	no	0
GW-60	Potassium		3	463.33	15.275	493.88		0
GW-60	Selenium	0.05	3	0.0086	0.0035	0.0156	no	33.33
GW-60	Silver	0.1	3	0.005	0	0.005	no	100
GW-60	Sodium		3	13333	2081.6	17496.2		0
GW-60	Sulfate		3	3533.3	152.75	3838.8		0
GW-60	TDS		3	41000	1000	43000		0
GW-60	TOC		3	1	0	1		100
GW-60	TOX		3	0.005	0	0.005		100
GW-60	Zinc	5	3	0.0123	0.0105	0.0333	no	0
GW-60	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-60	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-60	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-60	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-60	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-60	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-60	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-60	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-60	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-63	Arsenic	0.05	3	0.016	0.0101	0.0362	no	33.33
GW-63	Barium	2	3	0.052	0.028	0.108	no	0
GW-63	Beryllium	0.004	3	0.005	0	0.005	YES	100
GW-63	Bicarbonate		3	143.33	5.7735	154.877		0
GW-63	Cadmium	0.005	3	0.0153	0.0155	0.0463	YES	33.33
GW-63	Calcium		3	390	17.32	424.64		0
GW-63	Carbonate		3	10	0	10		100
GW-63	Chloride		3	19333	577.35	20487.7		0
GW-63	Chromium	0.1	3	0.0566	0.0312	0.119	YES	0
GW-63	Copper	1.3	3	0.0193	0.0124	0.0441	no	33.33
GW-63	Cyanide	0.2	3	0.005	0	0.005	no	100
GW-63	Fluoride	4	3	3.1333	0.4509	4.0351	YES	0
GW-63	Lead	0.015	3	0.005	0	0.005	no	100
GW-63	Magnesium		3	686.66	145.71	978.08		0
GW-63	Mercury	0.002	3	0.0002	0.0001	0.0004	no	33.33
GW-63	Molybdenum	0.04	3	0.2333	0.0577	0.3487	YES	0
GW-63	Nickel	0.1	3	0.052	0.0453	0.1426	YES	33.33
GW-63	Nitrate-N	10	3	0.5366	0.0776	0.6918	no	0
GW-63	Nitrate/Nitrite-N	10	3	0.5366	0.0776	0.6918	no	0
GW-63	Potassium		3	446.66	15.275	477.21		0
GW-63	Selenium	0.05	3	0.005	0	0.005	no	100
GW-63	Silver	0.1	3	0.005	0	0.005	no	100
GW-63	Sodium		3	12333	1154.7	14642.4		0
GW-63	Sulfate		3	3166.6	503.32	4173.24		0
GW-63	TDS		3	41666	4725.8	51117.6		0
GW-63	TOC		3	1	0	1		100

Envirocare GW Quality Data Statistics: Inorganics and Organics

Adjusted Raw Statistics

Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-63	TOX		3	0.005	0	0.005		100
GW-63	Zinc	5	3	0.018	0.0103	0.0386	no	0
GW-63	Acetone	0.7	2	0.015	0.007	0.029	no	100
GW-63	2-Butanone	4.2	2	0.015	0.007	0.029	no	100
GW-63	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100
GW-63	Chloroform	0.1	2	0.002	0	0.002	no	100
GW-63	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100
GW-63	Methylene Chloride	0.005	2	0.002	0	0.002	no	100
GW-63	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100
GW-63	Diethyl Phthalate	5	2	0.004	0	0.004	no	100
GW-63	2-Methylnaphthalen	n/a	2	0.004	0	0.004	no	100
GW-64	Arsenic	0.05	2	0.005	0	0.005	no	100
GW-64	Barium	2	2	0.1205	0.0417	0.2039	no	0
GW-64	Beryllium	0.004	2	0.005	0	0.005	YES	100
GW-64	Bicarbonate		2	215	7.071	229.142		0
GW-64	Cadmium	0.005	2	0.0145	0.0148	0.0441	YES	50
GW-64	Calcium		2	310	70.71	451.42		0
GW-64	Carbonate		2	10	0	10		100
GW-64	Chloride		2	17500	707.1	18914.2		0
GW-64	Chromium	0.1	2	0.049	0.0339	0.1168	YES	0
GW-64	Copper	1.3	2	0.015	0.0141	0.0432	no	50
GW-64	Cyanide	0.2	2	0.005	0	0.005	no	100
GW-64	Fluoride	4	2	2.45	0.2121	2.8742	no	0
GW-64	Lead	0.015	2	0.005	0	0.005	no	100
GW-64	Magnesium		2	395	49.497	493.994		0
GW-64	Mercury	0.002	2	0.0002	0	0.0002	no	50
GW-64	Molybdenum	0.04	2	0.1	0	0.1	YES	50
GW-64	Nickel	0.1	2	0.047	0.0523	0.1516	YES	50
GW-64	Nitrate-N	10	2	0.01	0	0.01	no	100
GW-64	Nitrate/Nitrite-N	10	2	0.01	0	0.01	no	100
GW-64	Potassium		2	400	56.568	513.136		0
GW-64	Selenium	0.05	2	0.005	0	0.005	no	100
GW-64	Silver	0.1	2	0.005	0	0.005	no	100
GW-64	Sodium		2	10750	1767.7	14285.4		0
GW-64	Sulfate		2	1650	212.13	2074.26		0
GW-64	TDS		2	33000	1414.2	35828.4		0
GW-64	TOC		2	1	0	1		100
GW-64	TOX		2	0.005	0	0.005		100
GW-64	Zinc	5	2	0.03	0.0268	0.0836	no	0

›te: Beryllium GWQS = 0.004 mg/l = EPA Drinking Water Standard.

›te: Cadmium GWQS: with adoption of April 15, 1994 revised GW rules, cadmium standard has decreased 0.1 to 0.005 mg/l.

›te: Chromium GWQS: with adoption of April 15, 1994 revised GW rules, chromium standard has increased from 0.05 to 0.1 mg/l.

›te: Molybdenum GWQS = 0.04 mg/l = EPA Drinking Water Health Advisory (lifetime advisory for 70 kg adult).

›te: Nickel GWQS = 0.1 mg/l = EPA Drinking Water Standard. Formerly, EPA had a draft health advisory of 0.15 mg/l.

›te: GW-19A Zinc: mean and standard deviation modified after culling an outlier data point collected on 4/3/91. Thanks to this change x+2s value fell below the GWQS.

›te: GW-16R Fluoride: mean and standard deviation modified after correction of typo in database. Thanks to this change, x+2s value fell below GWQS.

ATTACHMENT 2B

Summary of Statistical Data:
Inorganic Parameters with
$\bar{x}+2\sigma$ Concentrations Greater than GWQS

DWQ Spreadsheet IOGWPL.XLS

	S	T	U	V	W	X	Y	Z	AA
1	**Envirocare GW Quality Data Statistics**								
2	*Wells & Parameters Where x+2s > GWQS: INORGANICS*								
3	Well ID	Parameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev (s)	x+2s	%<MDL	Qualifier
11	GW-16	Beryllium	0.004	9	0.005	0	0.005	100	Replaced by GW-16R
12	GW-16	Lead	0.015	14	0.0082	0.012	0.0322	100	Replaced by GW-16R
13	GW-16	Molybdenum	0.04	9	0.09	0.03	0.15	66.67	Replaced by GW-16R
14									
15	GW-19A	Beryllium	0.004	14	0.005	0	0.005	92.86	Need MDL < GWQS
16	GW-19A	Cadmium	0.005	17	0.0071	0.0103	0.0277	88.24	Pump Bias?
17	GW-19A	Fluoride	4	17	4.4352	0.7088	5.8528	0	
18	GW-19A	Molybdenum	0.04	14	0.4571	0.1554	0.7679	7.14	Pump Bias?
19									
20	GW-20	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
21	GW-20	Cadmium	0.005	20	0.0071	0.0084	0.0239	85	Pump Bias?
22	GW-20	Chromium	0.1	20	0.0334	0.0541	0.1416	45	Pump Bias?
23	GW-20	Fluoride	4	18	2.9666	0.5698	4.1062	0	
24	GW-20	Mercury	0.002	18	0.0007	0.0023	0.0053	77.78	Non-Dectectable
25	GW-20	Molybdenum	0.04	15	0.1866	0.0639	0.3144	26.67	Pump Bias?
26	GW-20	Nickel	0.1	20	0.0325	0.0621	0.1567	70	Pump Bias?
27									
28	GW-22	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
29	GW-22	Cadmium	0.005	20	0.0066	0.0072	0.021	85	Pump Bias?
30	GW-22	Molybdenum	0.04	14	0.0864	0.0345	0.1554	50	Pump Bias?
31									
32	GW-23	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
33	GW-23	Cadmium	0.005	20	0.0071	0.0087	0.0245	85	Pump Bias?
34	GW-23	Molybdenum	0.04	14	0.1289	0.0603	0.2495	35.71	Pump Bias?
35									
36	GW-24	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
37	GW-24	Cadmium	0.005	20	0.0068	0.0079	0.0226	85	Pump Bias?
38	GW-24	Molybdenum	0.04	14	0.1857	0.0663	0.3183	28.57	Pump Bias?
39									
40	GW-25	Arsenic	0.05	18	0.0593	0.0238	0.1069	0	
41	GW-25	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
42	GW-25	Cadmium	0.005	18	0.0074	0.0089	0.0252	77.78	Pump Bias?
43	GW-25	Chromium	0.1	18	0.033	0.0369	0.1068	38.89	Pump Bias?
44	GW-25	Fluoride	4	18	3.45	0.5113	4.4726	0	
45	GW-25	Molybdenum	0.04	14	0.1785	0.0578	0.2941	14.29	Pump Bias?
46									
47	GW-26	Arsenic	0.05	16	0.0965	0.0518	0.2001	0	
48	GW-26	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
49	GW-26	Cadmium	0.005	16	0.0068	0.0091	0.025	81.25	Pump Bias?
50	GW-26	Fluoride	4	16	3.65	0.5842	4.8184	0	
51	GW-26	Molybdenum	0.04	14	0.2952	0.2496	0.7944	28.57	Pump Bias?
52									
53	GW-27	Arsenic	0.05	16	0.0281	0.0148	0.0577	0	
54	GW-27	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
55	GW-27	Cadmium	0.005	16	0.0066	0.0084	0.0234	87.5	Pump Bias?
56	GW-27	Fluoride	4	16	3.5062	0.5052	4.5166	0	

	S	T	U	V	W	X	Y	Z	AA
1	**Envirocare GW Quality Data Statistics**								
2	*Wells & Parameters Where x+2s > GWQS: INORGANICS*								
3	Well ID	Parameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev (s)	x+2s	%<MDL	Qualifier
57	GW-27	Molybdenum	0.04	14	0.4571	0.1016	0.6603	0	Pump Bias?
58									
59	GW-28	Arsenic	0.05	16	0.0422	0.0173	0.0768	0	
60	GW-28	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
61	GW-28	Cadmium	0.005	16	0.0061	0.0073	0.0207	87.5	Pump Bias?
62	GW-28	Fluoride	4	16	3.2187	0.4929	4.2045	0	
63	GW-28	Molybdenum	0.04	14	0.2642	0.1008	0.4658	7.14	Pump Bias?
64									
65	GW-29	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
66	GW-29	Cadmium	0.005	20	0.0068	0.0083	0.0234	85	Pump Bias?
67	GW-29	Fluoride	4	18	3.3722	0.6027	4.5776	0	
68	GW-29	Mercury	0.002	18	0.004	0.015	0.034	72.22	Non-Dectectable
69	GW-29	Molybdenum	0.04	15	0.194	0.0868	0.3676	26.67	Pump Bias?
70									
71	GW-36	Arsenic	0.05	16	0.0333	0.0145	0.0623	0	
72	GW-36	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
73	GW-36	Cadmium	0.005	16	0.006	0.007	0.02	87.5	Pump Bias?
74	GW-36	Molybdenum	0.04	14	0.2428	0.1016	0.446	21.43	Pump Bias?
75	GW-36	Nickel	0.1	16	0.032	0.0574	0.1468	75	Pump Bias?
76									
77	GW-37	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
78	GW-37	Cadmium	0.005	16	0.0064	0.0082	0.0228	87.5	Pump Bias?
79	GW-37	Molybdenum	0.04	14	0.25	0.1091	0.4682	21.43	Pump Bias?
80	GW-37	Nickel	0.1	16	0.0376	0.0684	0.1744	68.75	Pump Bias?
81									
82	GW-38	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
83	GW-38	Cadmium	0.005	18	0.0067	0.0075	0.0217	83.33	Pump Bias?
84	GW-38	Molybdenum	0.04	14	0.2	0.0784	0.3568	21.43	Pump Bias?
85									
86	GW-56	Beryllium	0.004	9	0.005	0	0.005	100	Replaced by GW-56R
87	GW-56	Cadmium	0.005	13	0.0056	0.0058	0.0172	84.62	Replaced by GW-56R
88	GW-56	Molybdenum	0.04	9	0.09	0.03	0.15	44.44	Replaced by GW-56R
89									
90	GW-57	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
91	GW-57	Cadmium	0.005	15	0.0067	0.0082	0.0231	86.67	Pump Bias?
92	GW-57	Fluoride	4	15	3.34	-0.366	4.072	0	
93	GW-57	Molybdenum	0.04	14	0.3285	0.1069	0.5423	0	Pump Bias?
94	GW-57	Nickel	0.1	15	0.0269	0.0432	0.1133	66.67	Pump Bias?
95									
96	GW-58	Arsenic	0.05	15	0.0654	0.027	0.1194	0	
97	GW-58	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
98	GW-58	Cadmium	0.005	15	0.006	0.0067	0.0194	86.67	Pump Bias?
99	GW-58	Molybdenum	0.04	14	0.2	0.0784	0.3568	14.29	Pump Bias?
100									
101	I-2-30	Beryllium	0.004	14	0.005	0	0.005	100	Need MDL < GWQS
102	I-2-30	Cadmium	0.005	20	0.0063	0.006	0.0183	85	Pump Bias?

	S	T	U	V	W	X	Y	Z	AA
1	**Envirocare GW Quality Data Statistics**								
2	*Wells & Parameters Where x+2s > GWQS: INORGANICS*								
3	Well ID	Parameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev (s)	x+2s	%<MDL	Qualifier
103	I-2-30	Molybdenum	0.04	14	0.0935	0.024	0.1415	71.43	Pump Bias?
104									
105	GW-16R	Beryllium	0.004	7	0.005	0	0.005	100	Need MDL < GWQS
106	GW-16R	Cadmium	0.005	9	0.01	0.0113	0.0326	66.67	Pump Bias?
107	GW-16R	Molybdenum	0.04	7	0.1142	0.0378	0.1898	57.14	Pump Bias?
108									
109	GW-56R	Beryllium	0.004	7	0.005	0	0.005	100	Need MDL < GWQS
110	GW-56R	Cadmium	0.005	7	0.009	0.0108	0.0306	71.43	Pump Bias?
111	GW-56R	Molybdenum	0.04	7	0.1	0	0.1	71.43	Pump Bias?
112	GW-56R	Nickel	0.1	7	0.0288	0.0377	0.1042	71.43	Pump Bias?
113									
114	GW-60	Beryllium	0.004	3	0.005	0	0.005	100	Need MDL < GWQS
115	GW-60	Cadmium	0.005	3	0.0143	0.0138	0.0419	33.33	Pump Bias?
116	GW-60	Chromium	0.1	3	0.0556	0.03	0.1156	0	Pump Bias?
117	GW-60	Molybdenum	0.04	3	0.2333	0.0577	0.3487	0	Pump Bias?
118	GW-60	Nickel	0.1	3	0.0476	0.0433	0.1342	33.33	Pump Bias?
119									
120	GW-63	Beryllium	0.004	3	0.005	0	0.005	100	Need MDL < GWQS
121	GW-63	Cadmium	0.005	3	0.0153	0.0155	0.0463	33.33	Pump Bias?
122	GW-63	Chromium	0.1	3	0.0566	0.0312	0.119	0	Pump Bias?
123	GW-63	Fluoride	4	3	3.1333	0.4509	4.0351	0	
124	GW-63	Molybdenum	0.04	3	0.2333	0.0577	0.3487	0	Pump Bias?
125	GW-63	Nickel	0.1	3	0.052	0.0453	0.1426	33.33	Pump Bias?
126									
127	GW-64	Beryllium	0.004	2	0.005	0	0.005	100	Need MDL < GWQS
128	GW-64	Cadmium	0.005	2	0.0145	0.0148	0.0441	50	Pump Bias?
129	GW-64	Chromium	0.1	2	0.049	0.0339	0.1168	0	Pump Bias?
130	GW-64	Molybdenum	0.04	2	0.1	0	0.1	50	Pump Bias?
131	GW-64	Nickel	0.1	2	0.047	0.0523	0.1516	50	Pump Bias?

Cell: AA15
Note: Beryllium Analysis, All Wells: all values measured by Envirocare had a minimum detection limit (MDL) which was greater than the assigned Ground Water Protection Level (GWPL), 0.004 mg/l. As a result, the GWPL will remain as 0.004 mg/l, and Envirocare will be required to select a new analytical method with an appropriate MDL.

Cell: AA16
Note: Pump Bias: Cr, Mo, and Ni are all components of 316L stainless steel and therefore may have possibly biased the GW quality data. Based on arguments made by Envirocare Cd has also been tentatively added to this list as a possible component of 316L stainless steel.

Cell: AA24
Note: GW-20 Mercury: about 78% of the dataset was found to be below the minimum detection limit (MDL) and therefore unmeasurable. As a result, the data population is not normally distributed and group statistics by parametric methods would be meaningless. Consequently, the dataset will be classified as undetectable and the GWPL set equal to the GWQS.

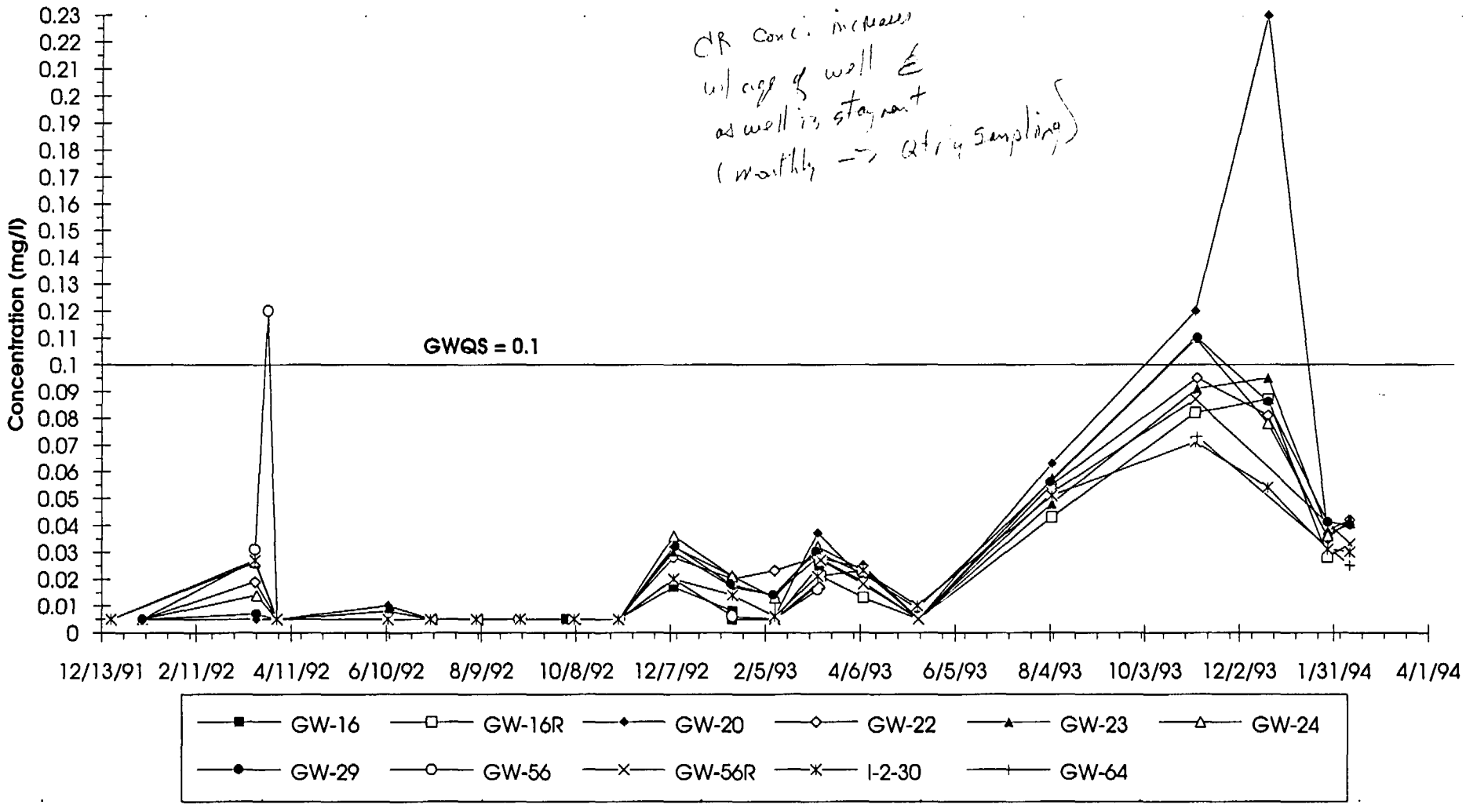
Cell: AA68
Note: GW-29 Mercury: about 72% of the dataset was found to be below the minimum detection limit (MDL) and therefore unmeasurable. As a result, the data population is not normally distributed and group statistics by parametric methods would be meaningless. Consequently, the dataset will be classified as undetectable and the GWPL set equal to the GWQS.

ATTACHMENT 3

Chromium Concentration Trends

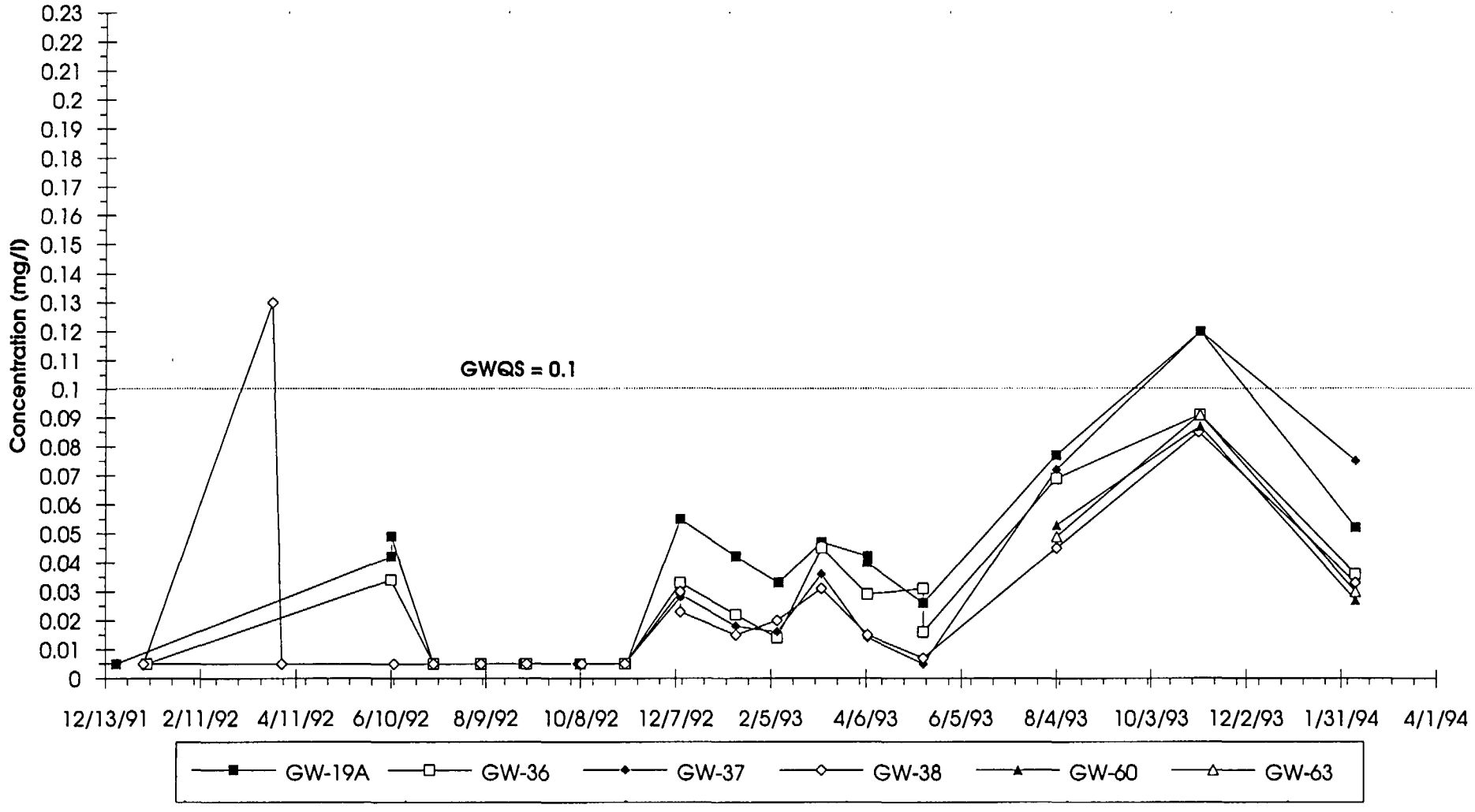
DWQ Charts CRALL.XLS, Charts 1 thru 5

Envirocare LARW Cell: Chromium

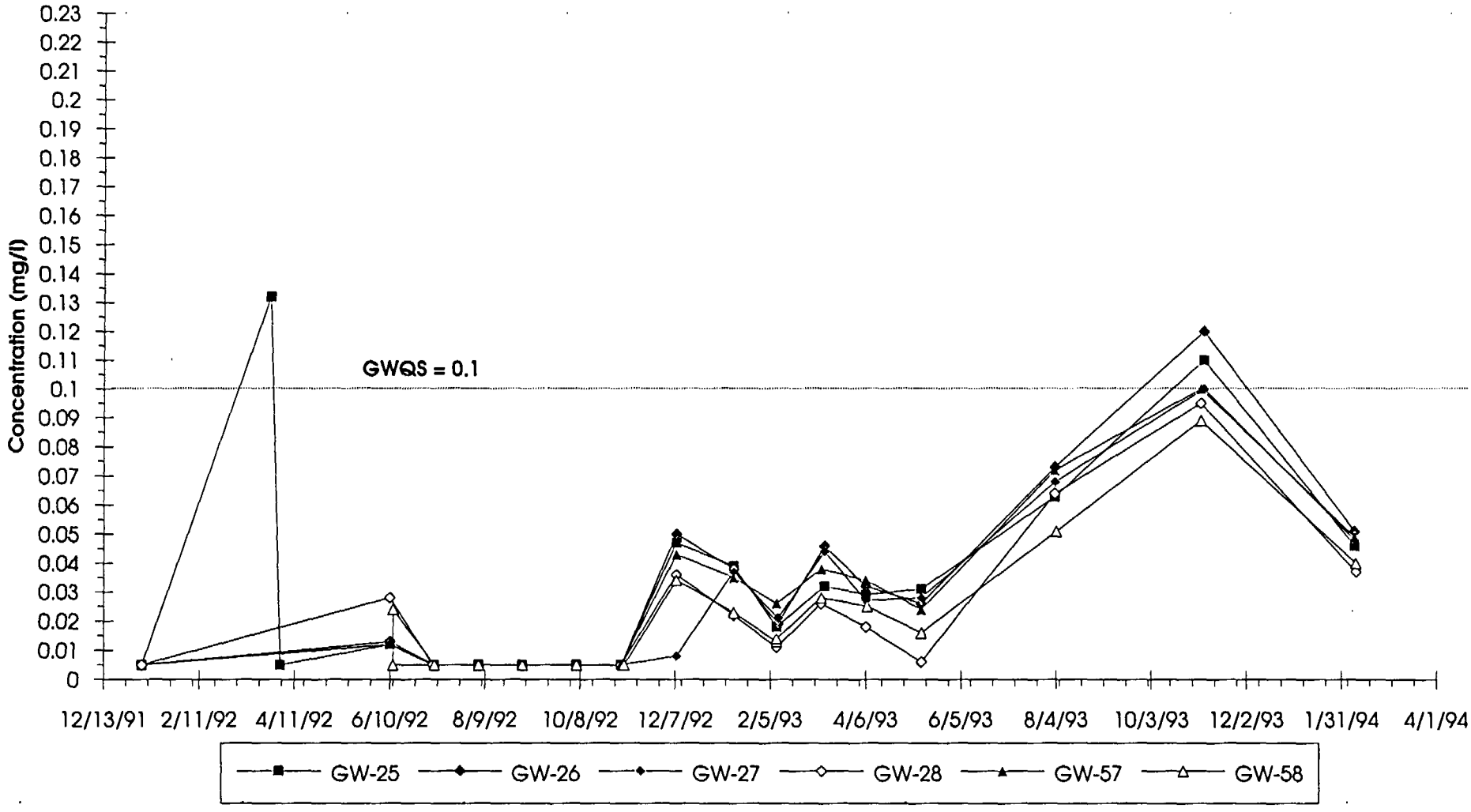


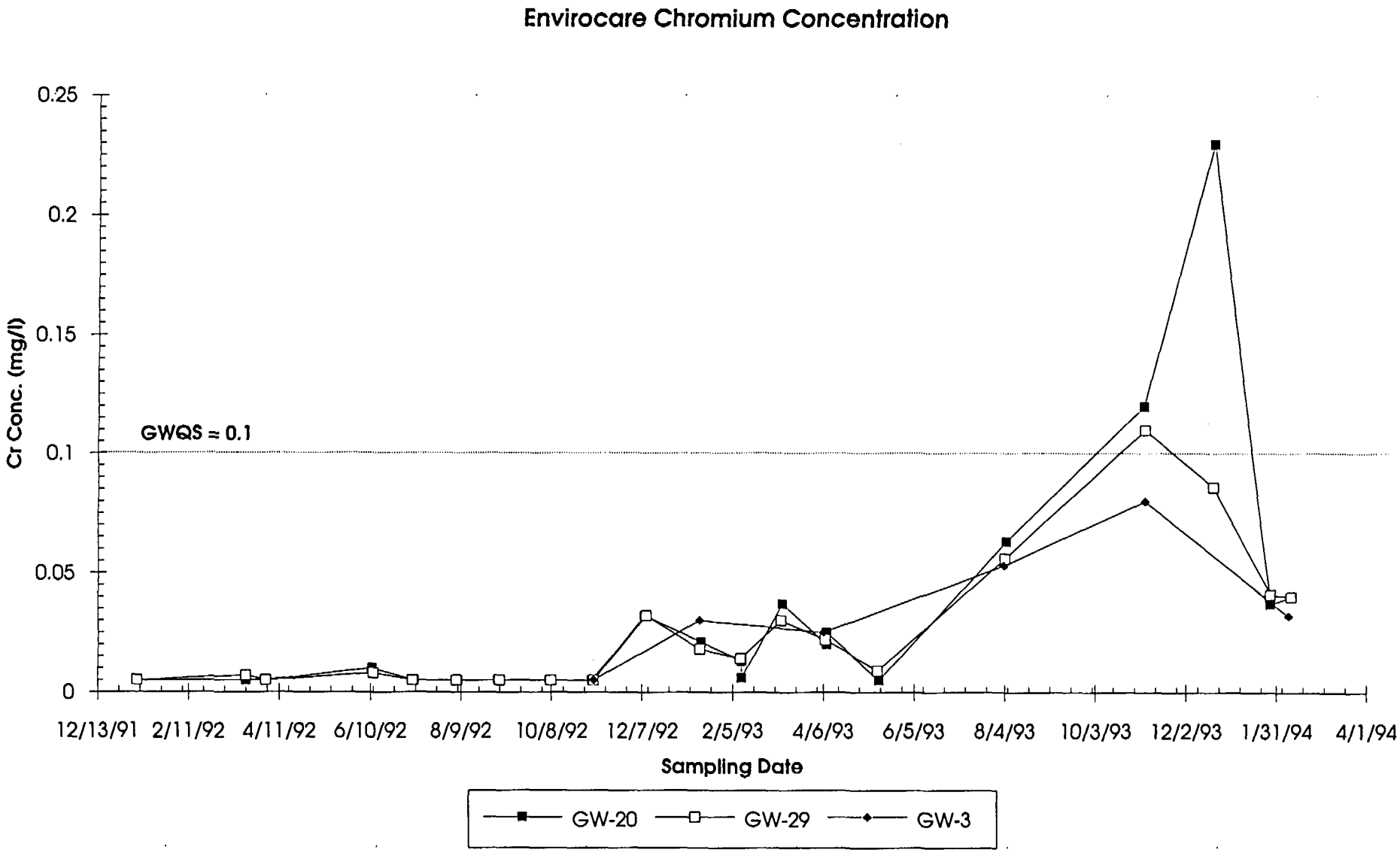
Cr conc. increases w/ age of well & as well is stagnant (monthly → qtrly sampling)

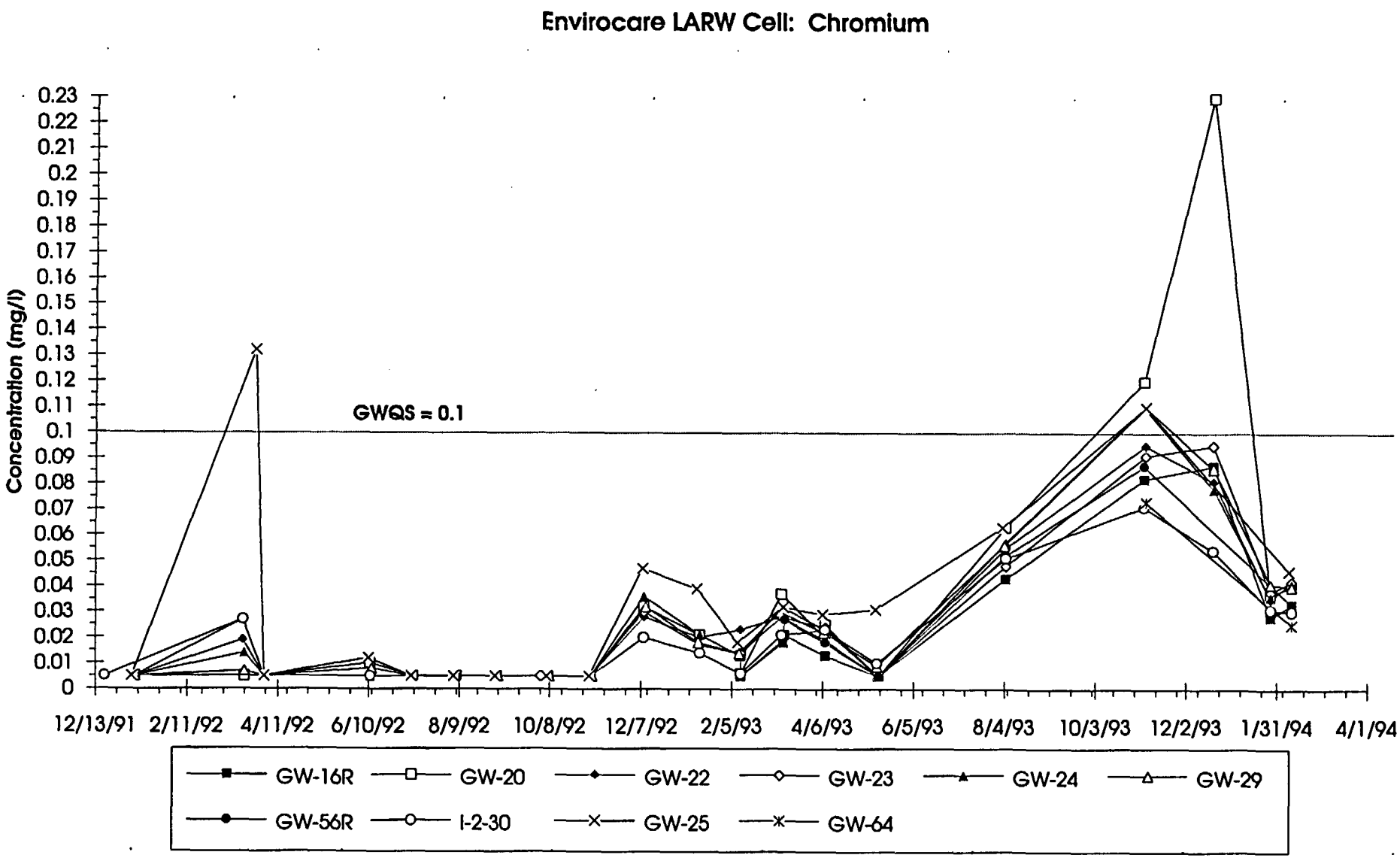
Envirocare SE 11e.(2) Cell: Chromium



Envirocare NW 11e.(2) Cell: Chromium




Envirocare Chromium Concentration
Cr Conc. (mg/l)
0.25
0.2
0.15
0.1
0.05
0
GWQS = 0.1
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sampling Date
GW-20
GW-29
GW-3


Envirocare LARW Cell: Chromium
Concentration (mg/l)
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
GWQS = 0.1
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16R
GW-20
GW-22
GW-23
GW-24
GW-29
GW-56R
I-2-30
GW-25
GW-64

ATTACHMENT 4

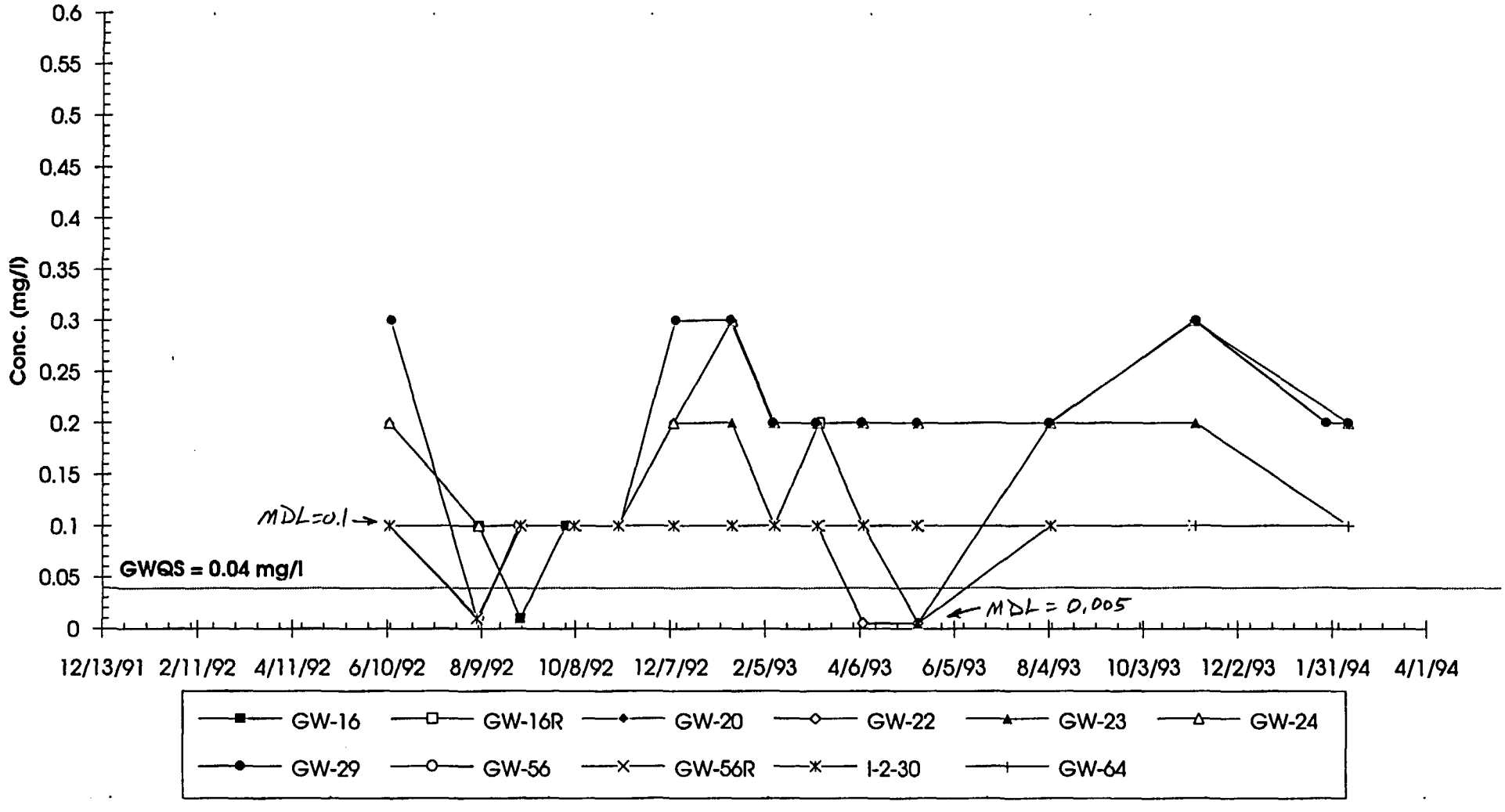
Molybdenum Concentration Trends

DWQ Charts MOALL.XLS, Charts 1 thru 4

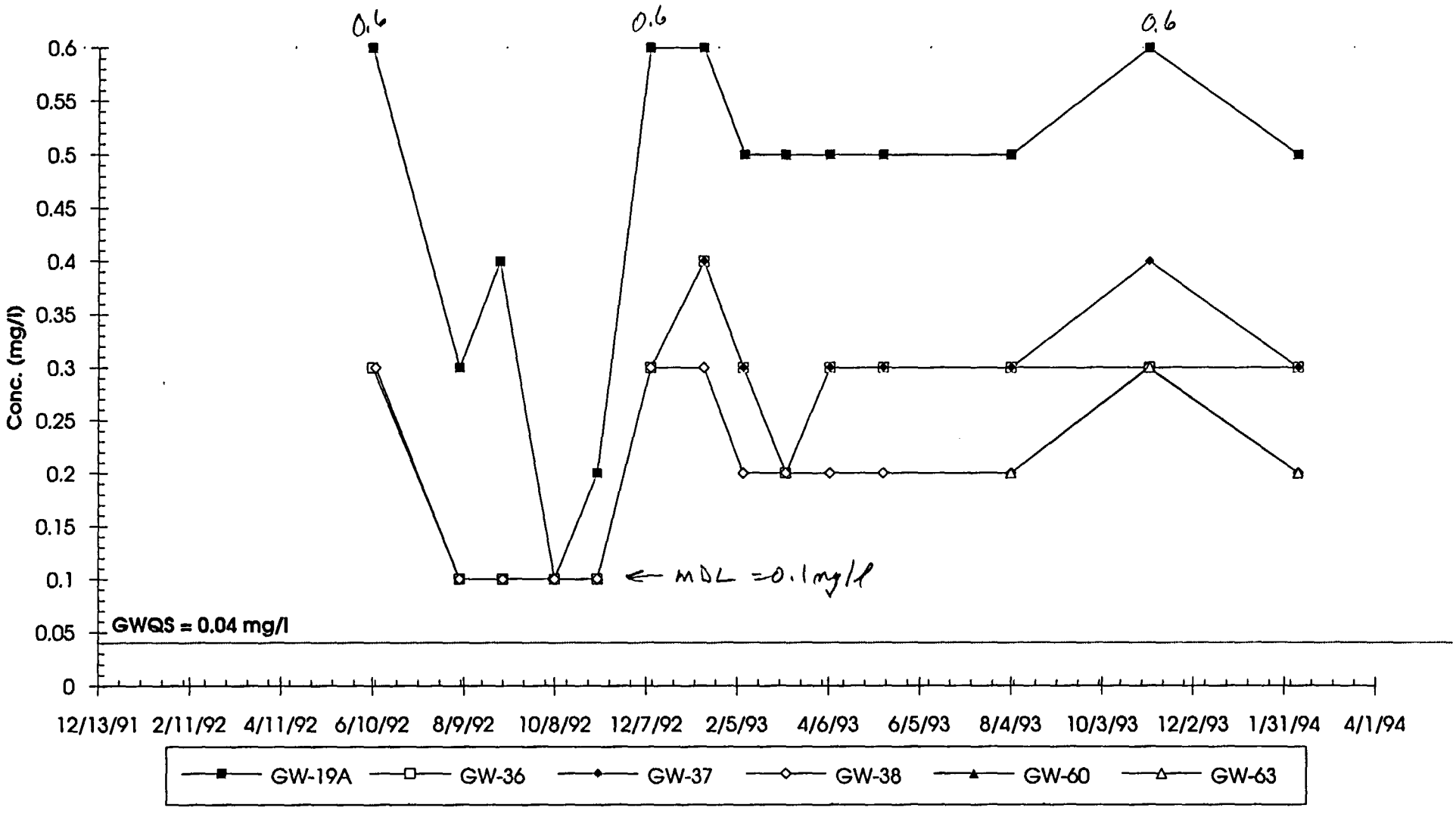
Need MDL < GWQS

Envirocare LARW Cell GW Data: Molybdenum

MDL's vary

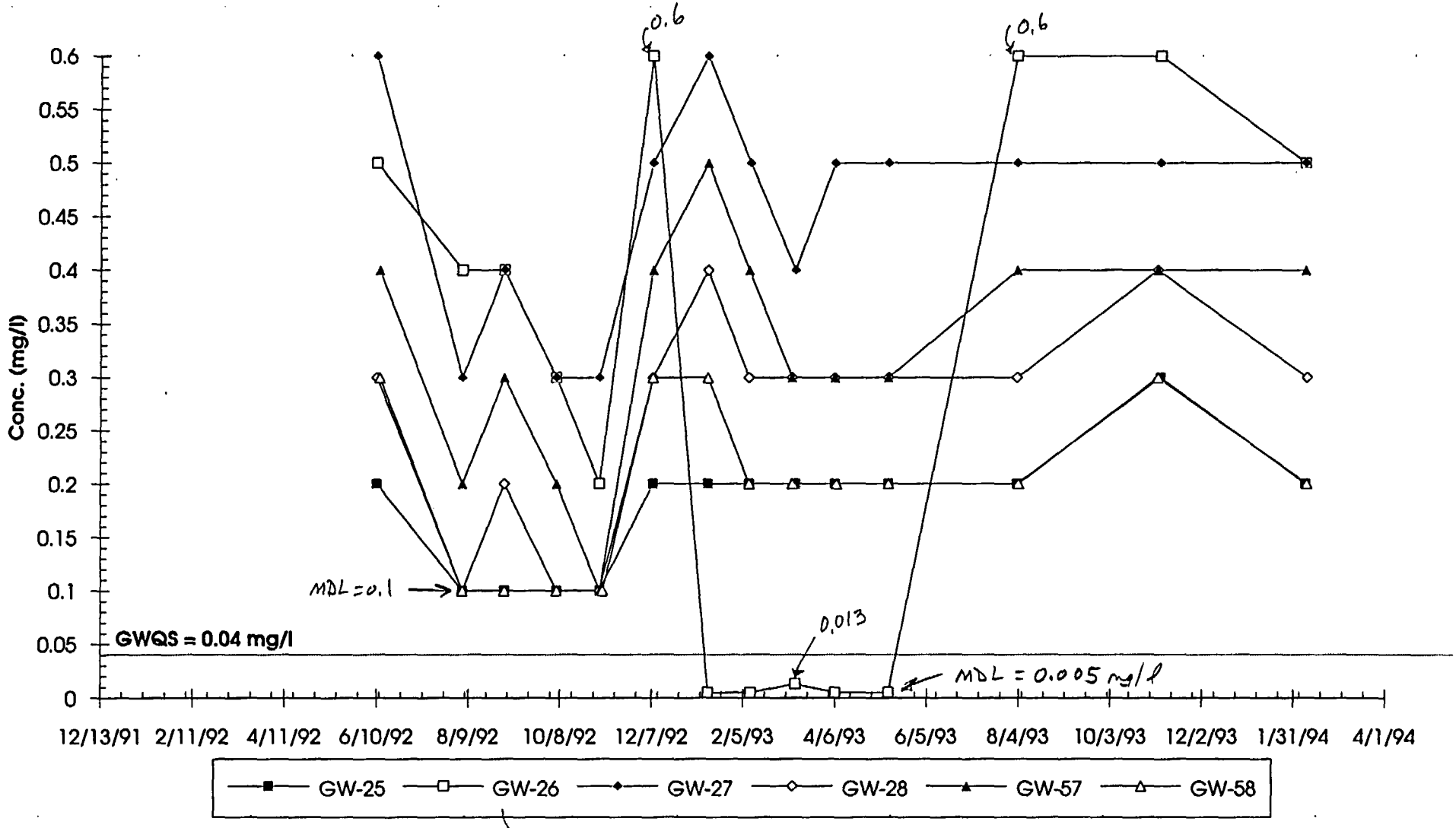


Envirocare SE 11e.(2) Cell GW Data: Molybdenum



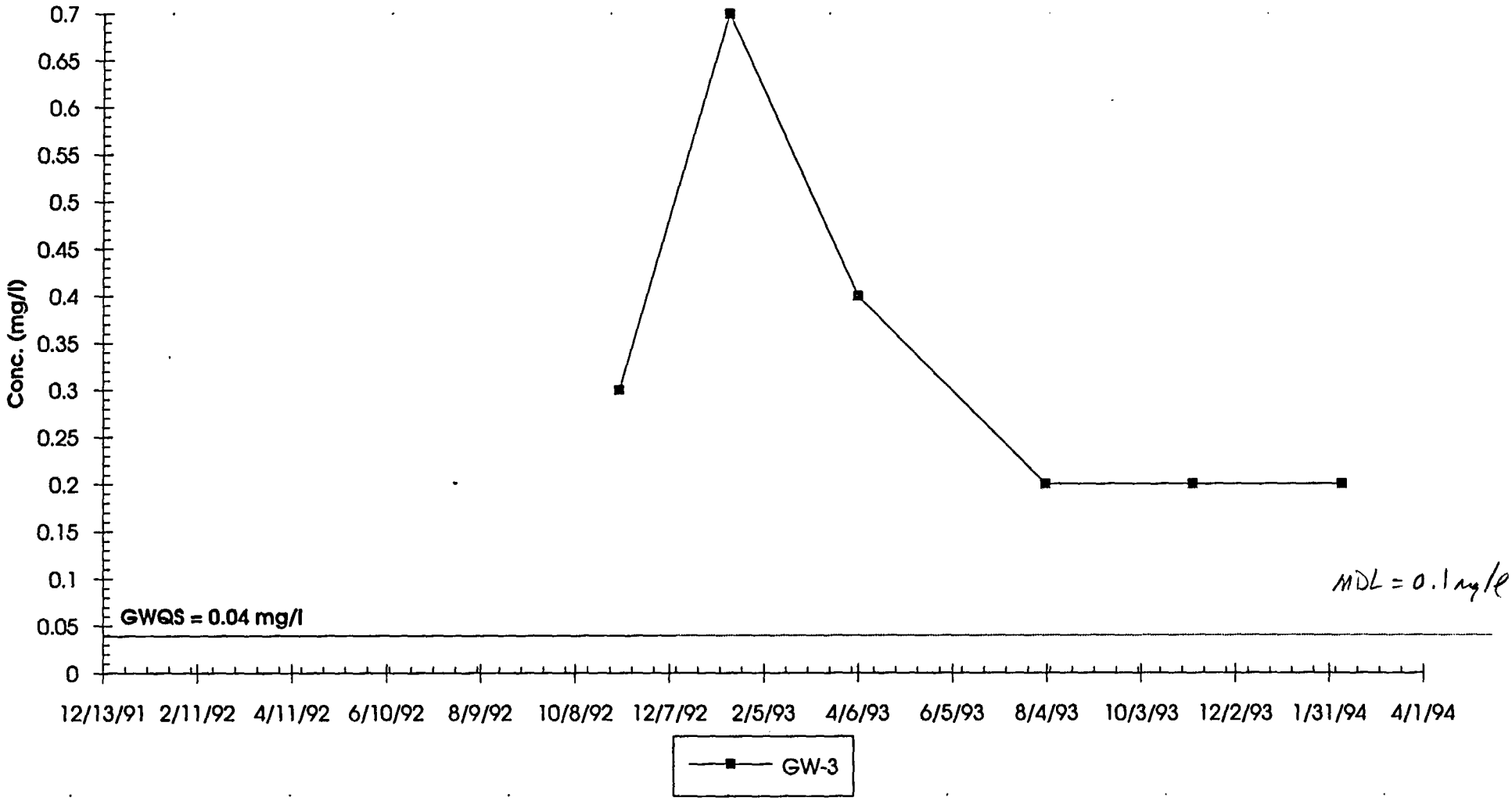
MDL's change

Envirocare NW 11e.(2) Cell GW Data: Molybdenum



two-order variation = odd!

Envirocare Well GW-3 GW Data: Molybdenum

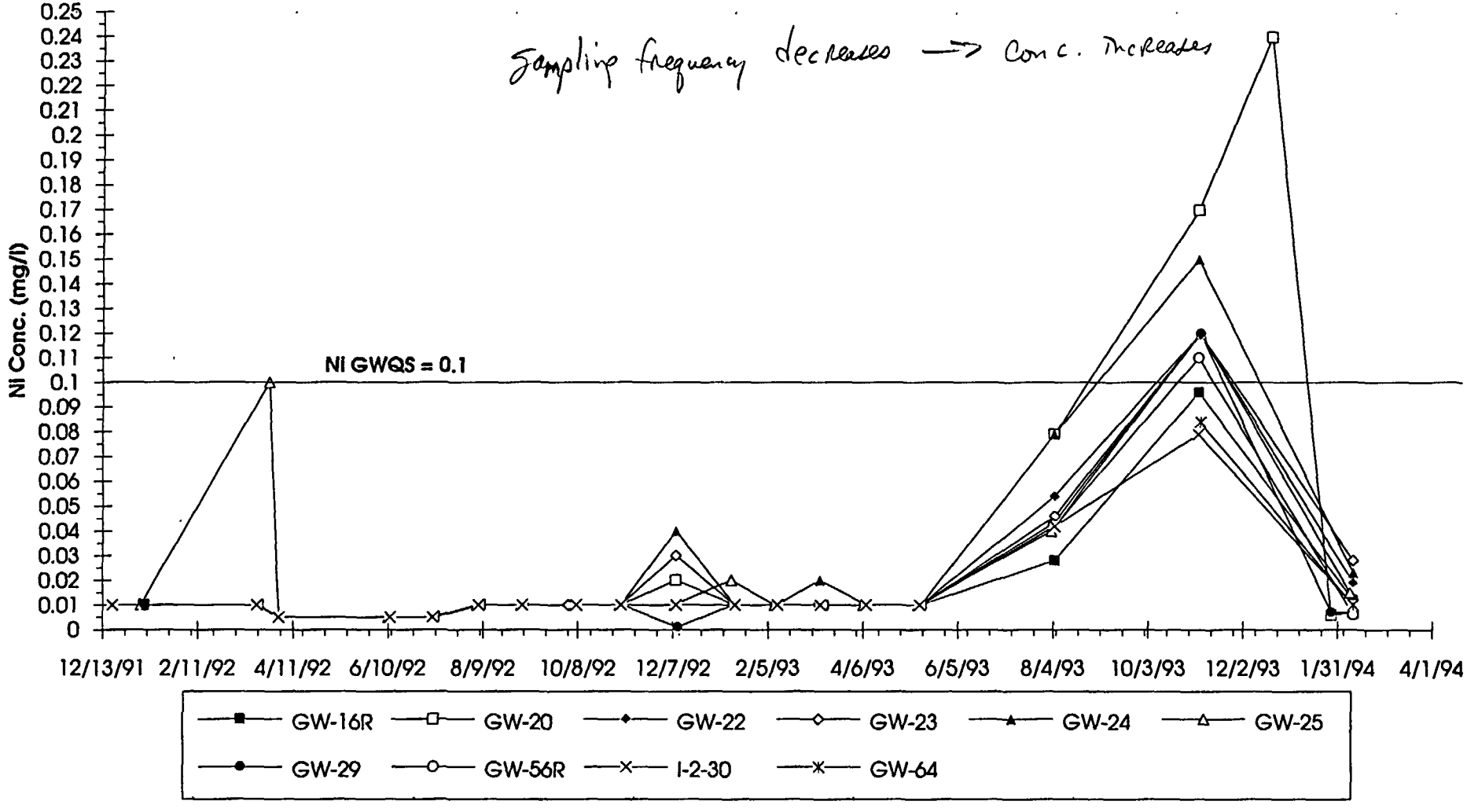


ATTACHMENT 5

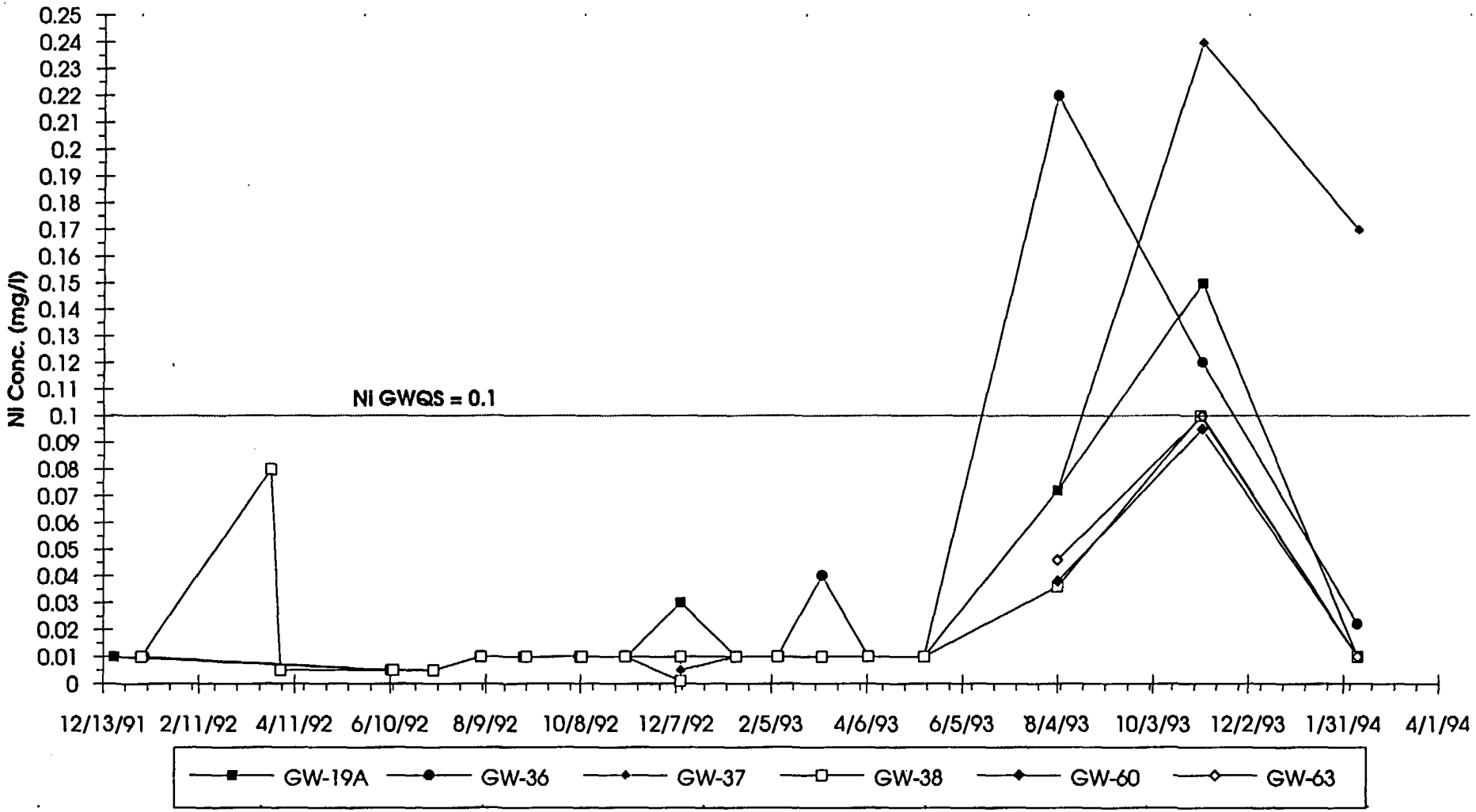
Nickel Concentration Trends

DWQ Charts NIALL.XLS, Charts 1 thru 4

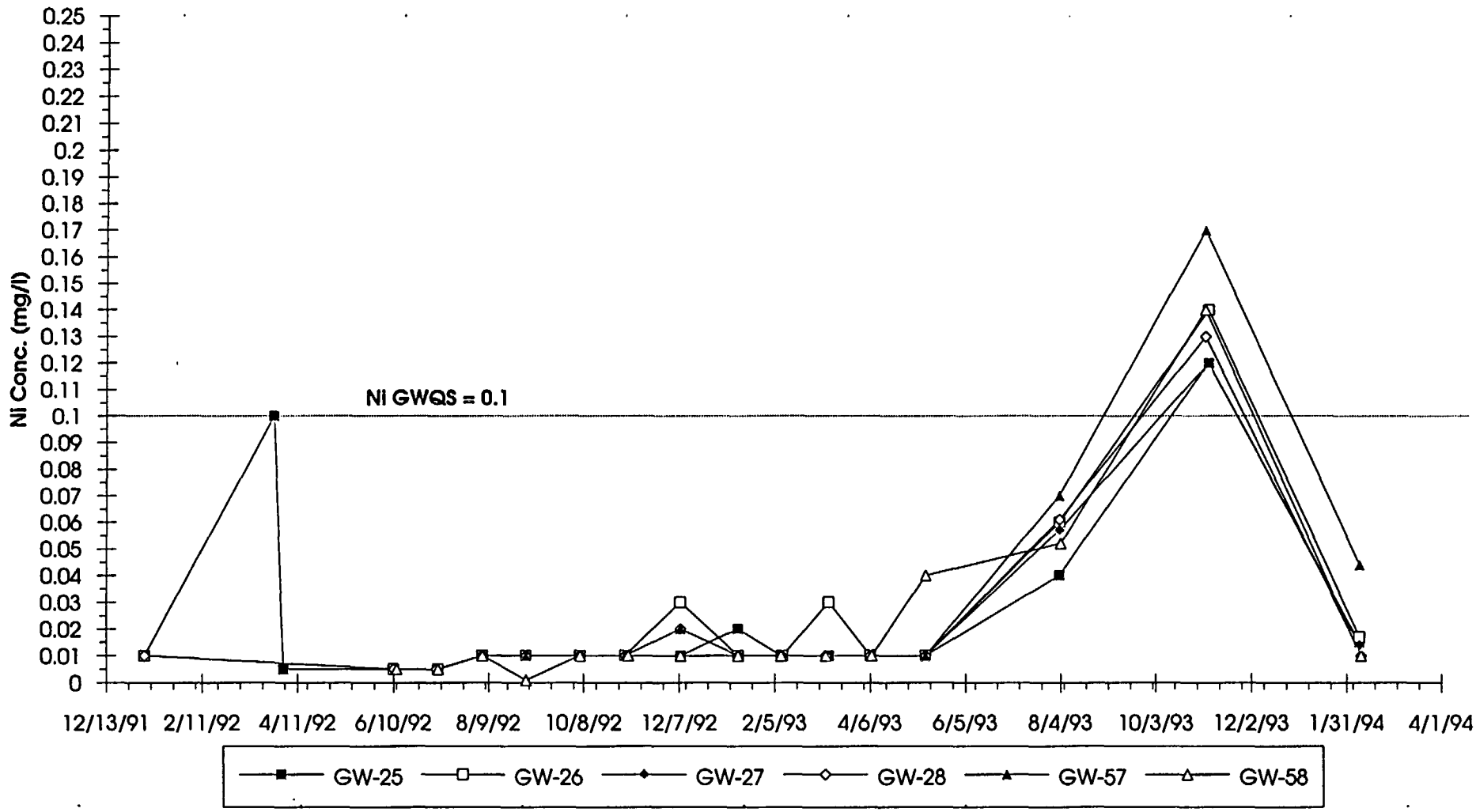
Envirocare LARW Cell: Nickel



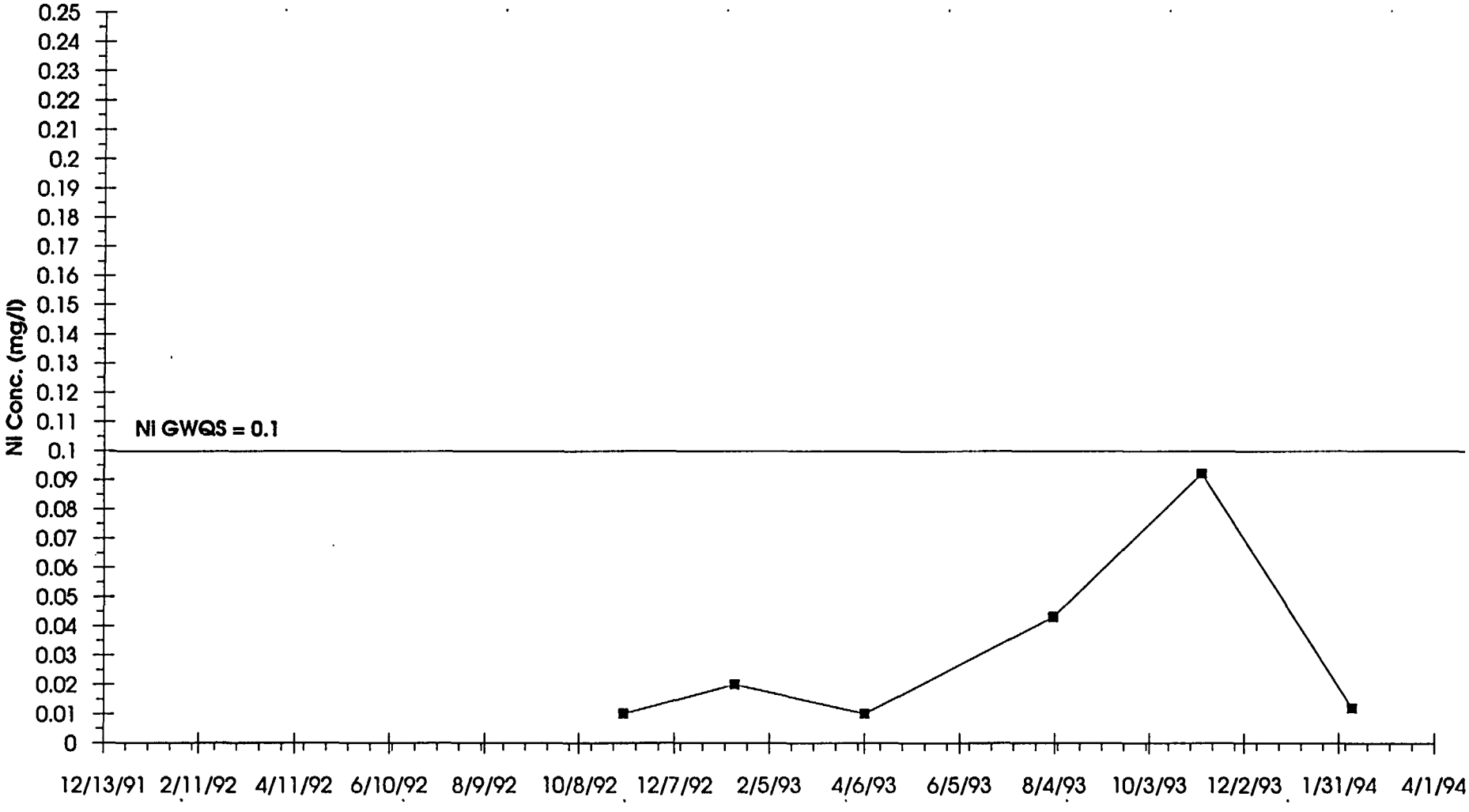
Envirocare SE 11e.(2) Cell: Nickel



Envirocare NW 11e.(2) Cell: Nickel



Envirocare Well GW-3: Nickel



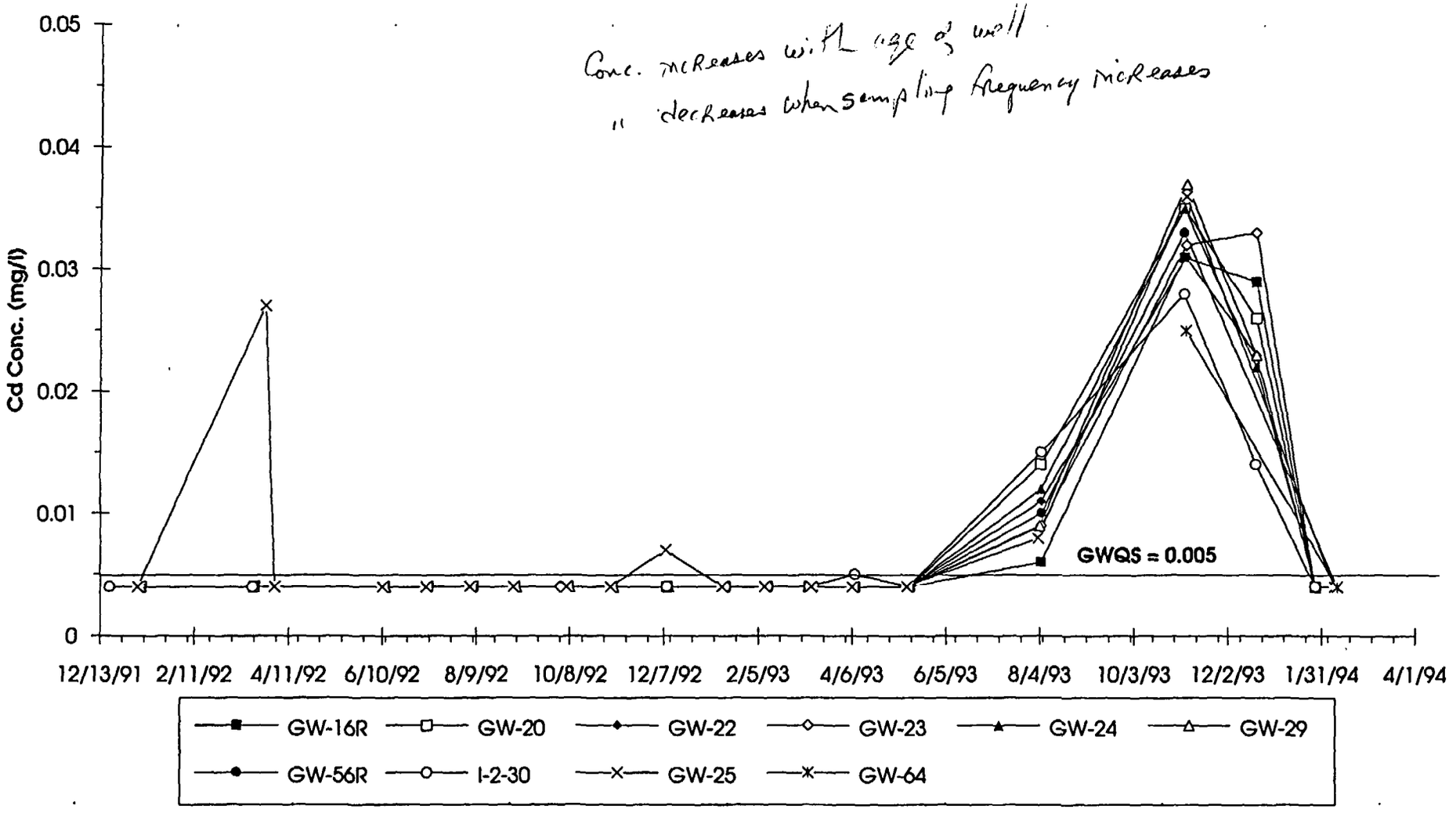
ATTACHMENT 6

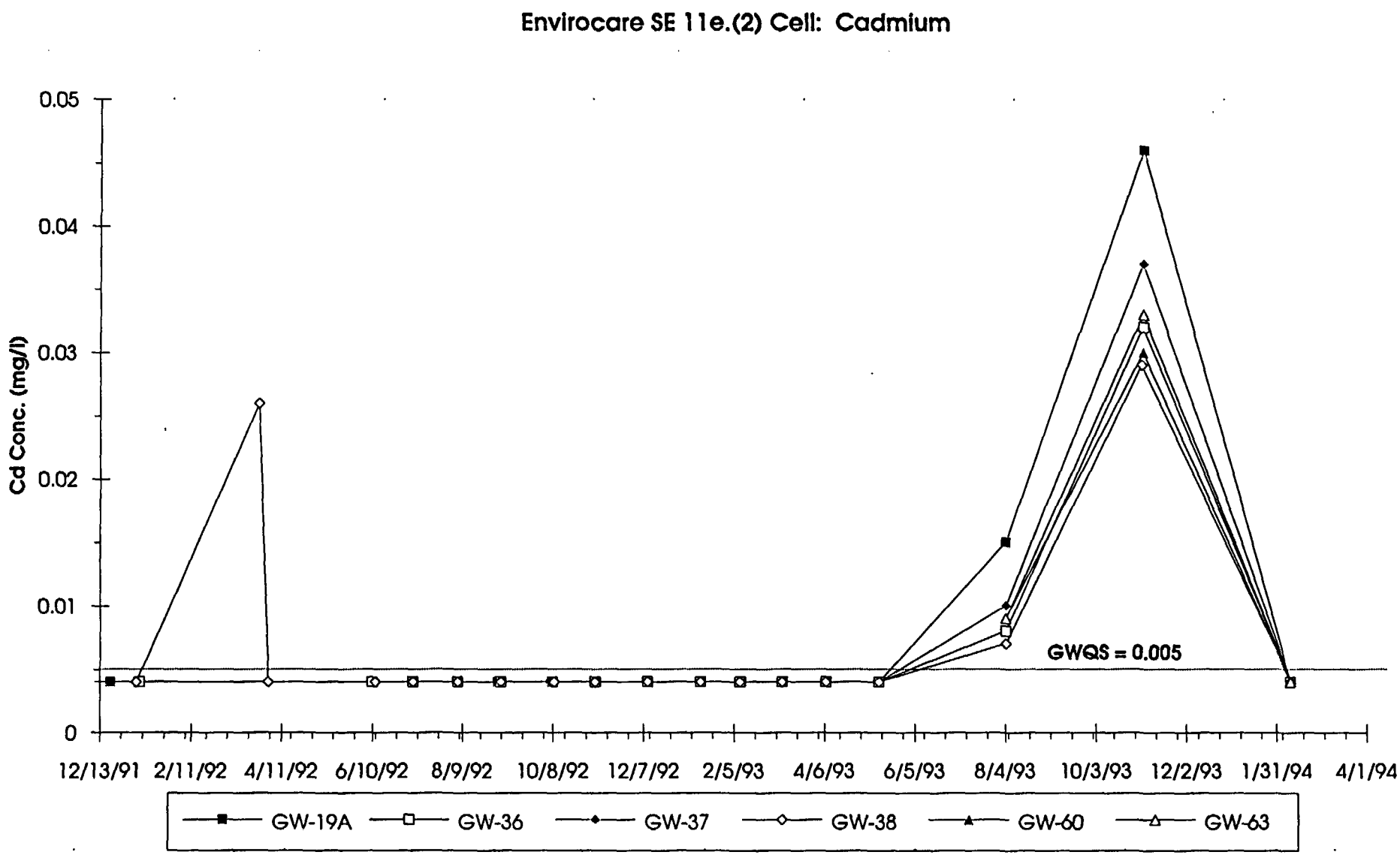
Cadmium Concentration Trends
DWQ Charts CDALL.XLS, Charts 1 thru 5

and

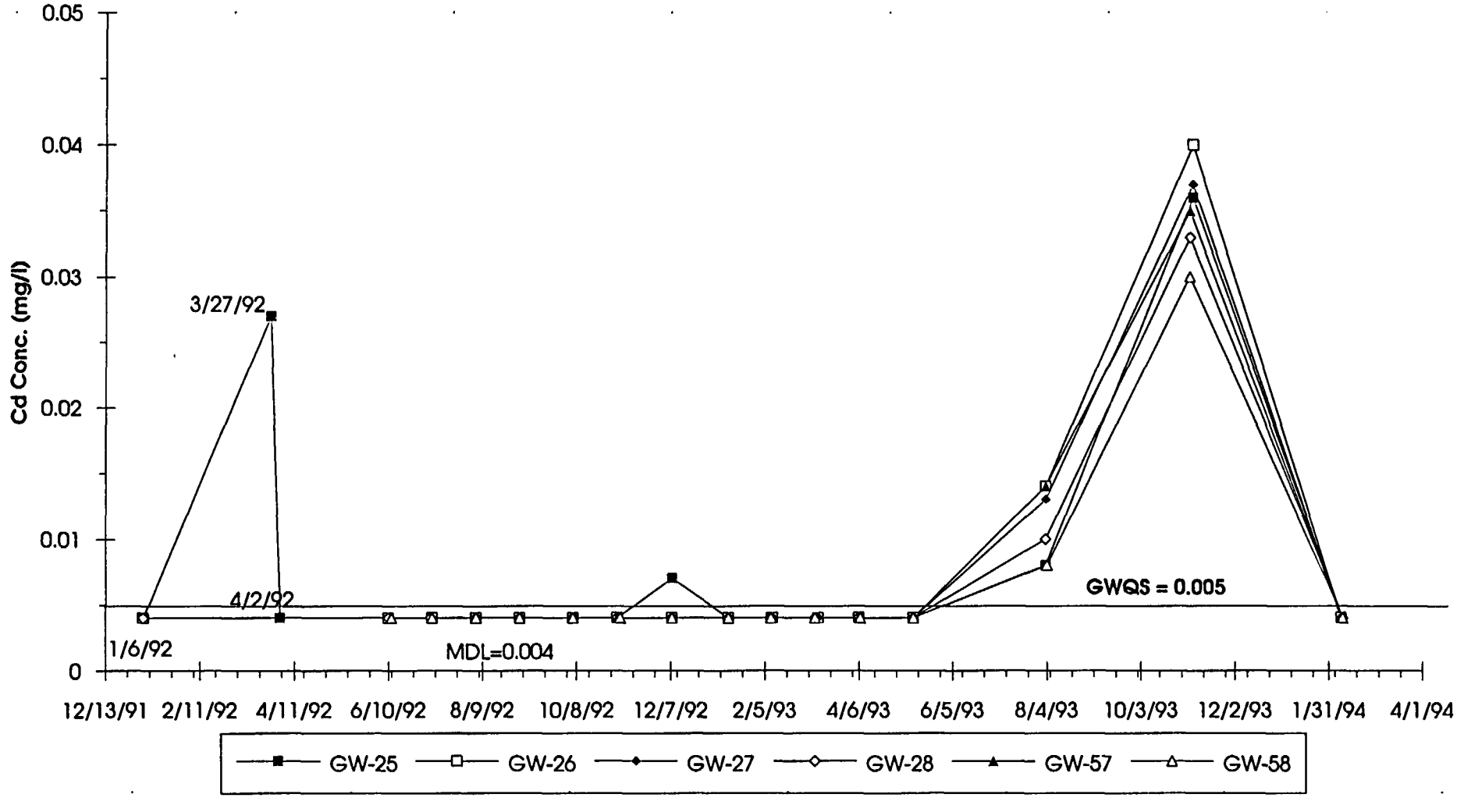
Comparison of Cadmium and Chromium Concentration Trends
DWQ Charts CRALL.XLS, Charts 6 thru 9

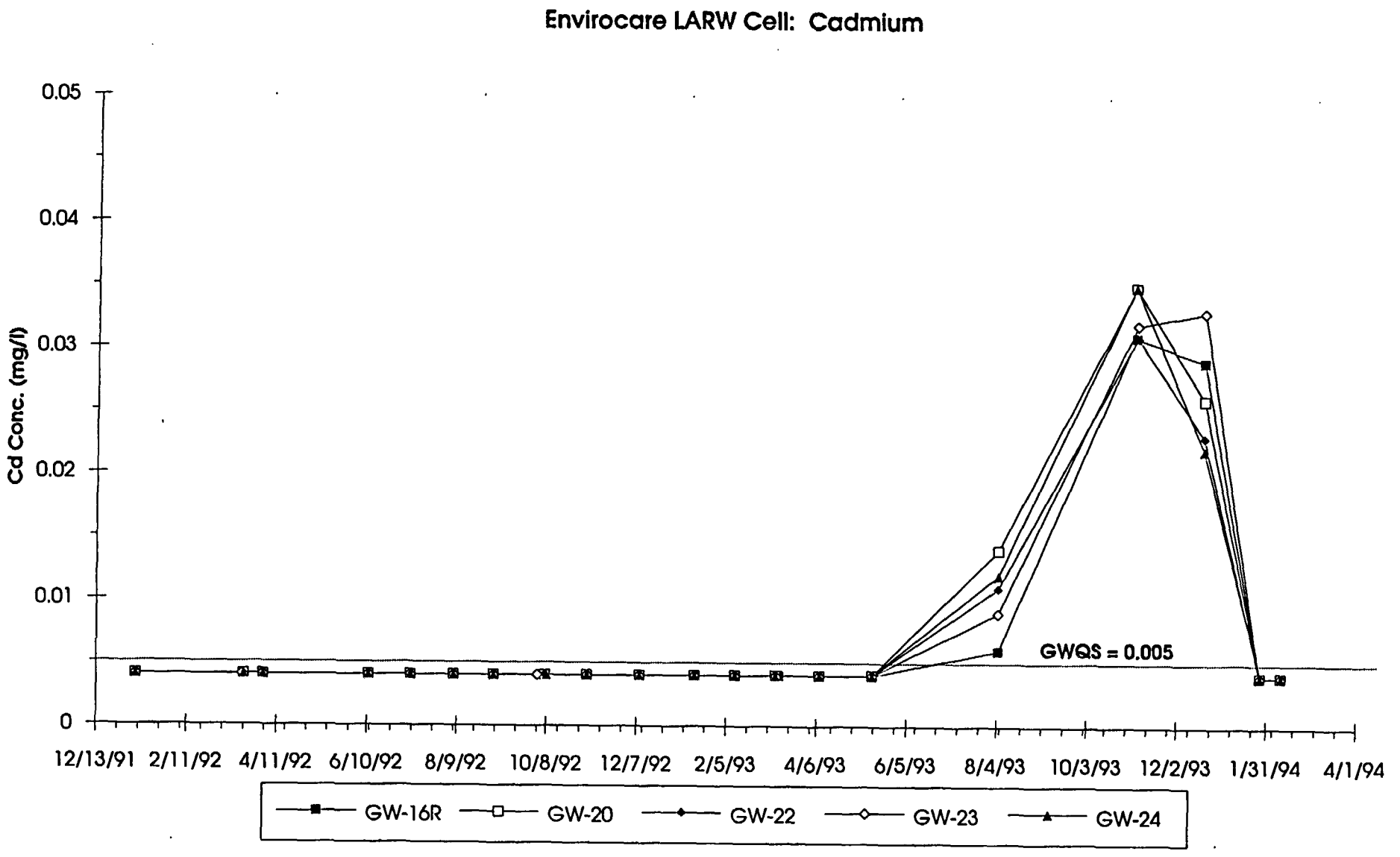
Envirocare LARW Cell: Cadmium

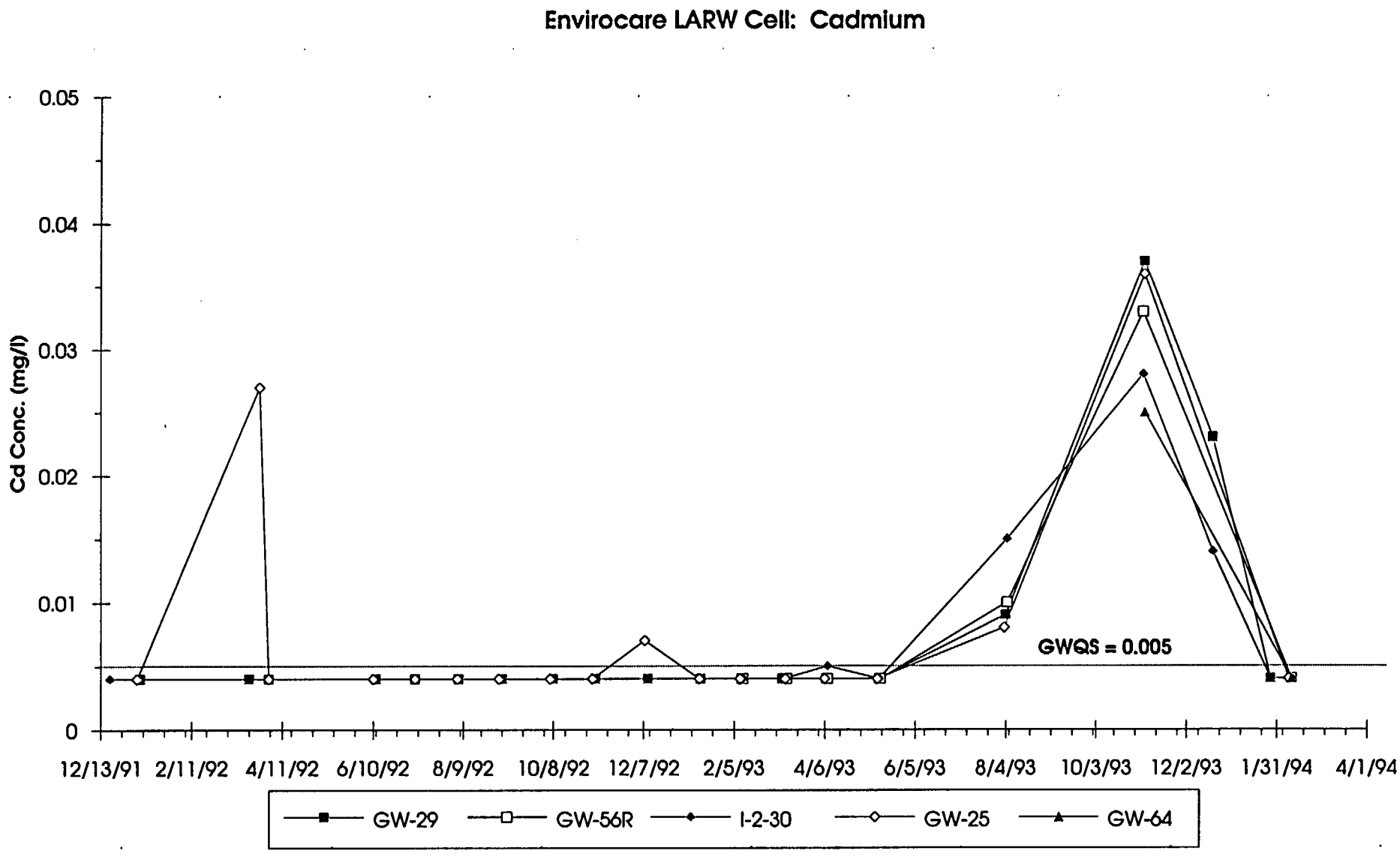



Envirocare SE 11e.(2) Cell: Cadmium
Cd Conc. (mg/l)
0.05
0.04
0.03
0.02
0.01
0
GWQS = 0.005
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63

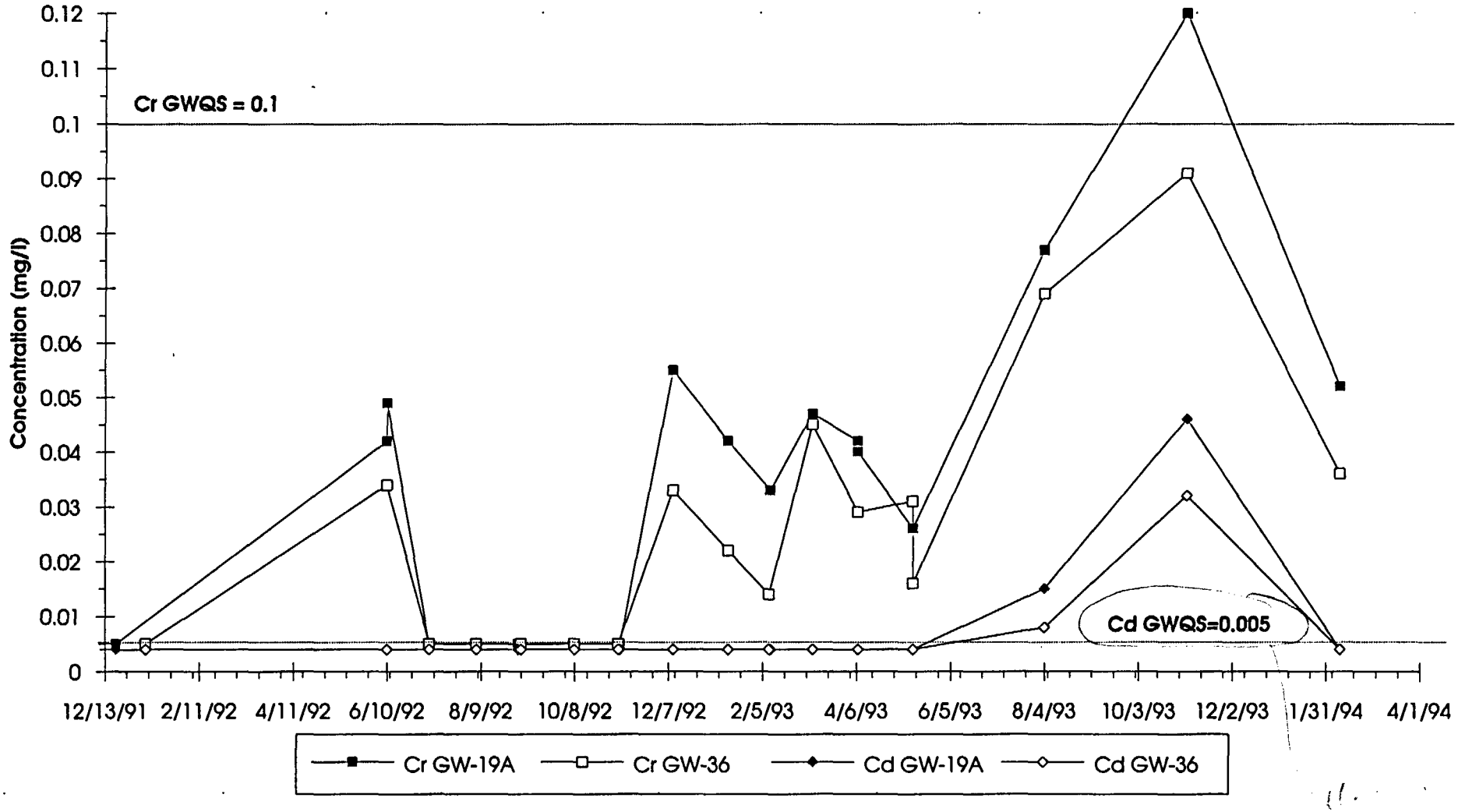
Envirocare NW 11e.(2) Cell: Cadmium

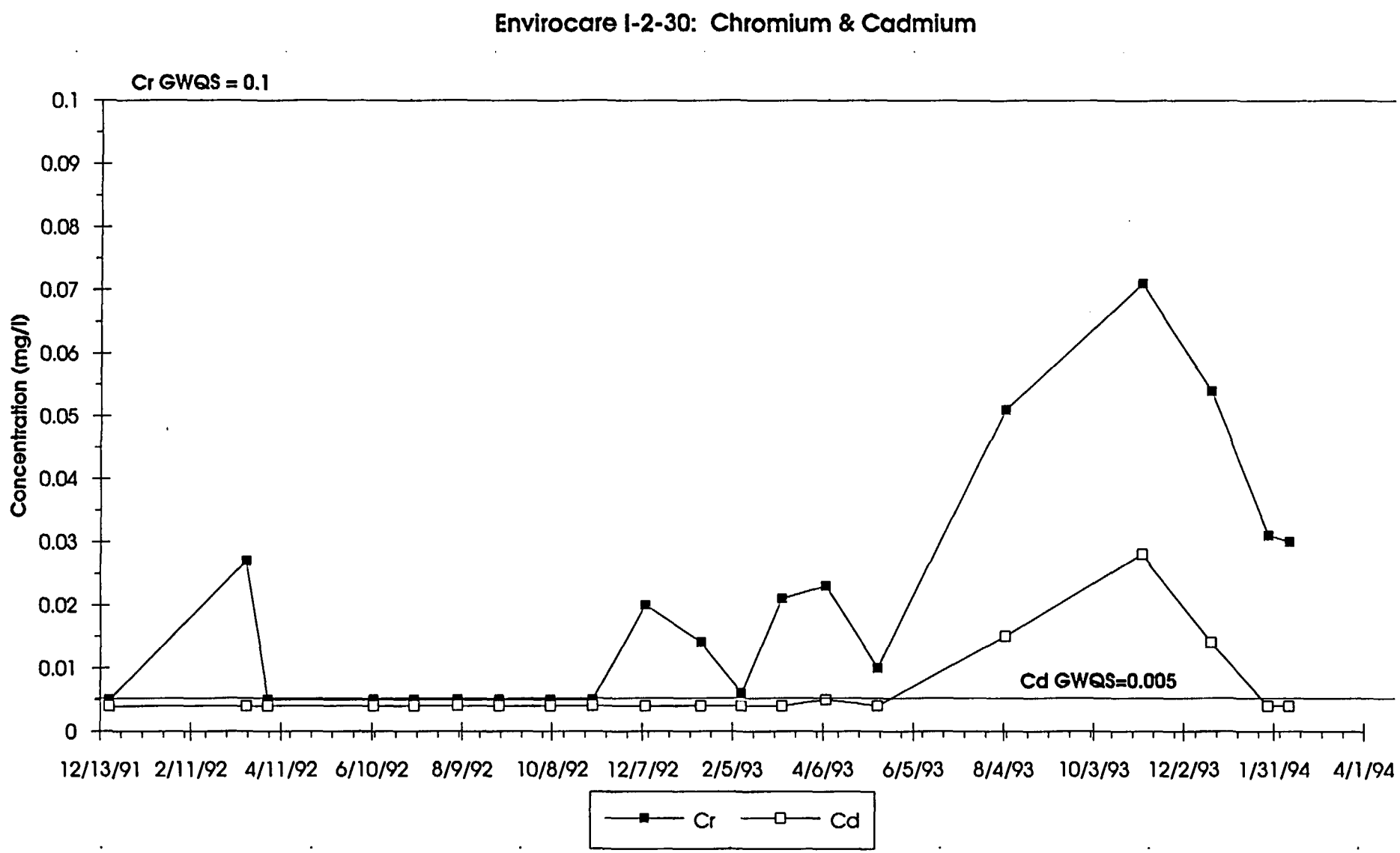


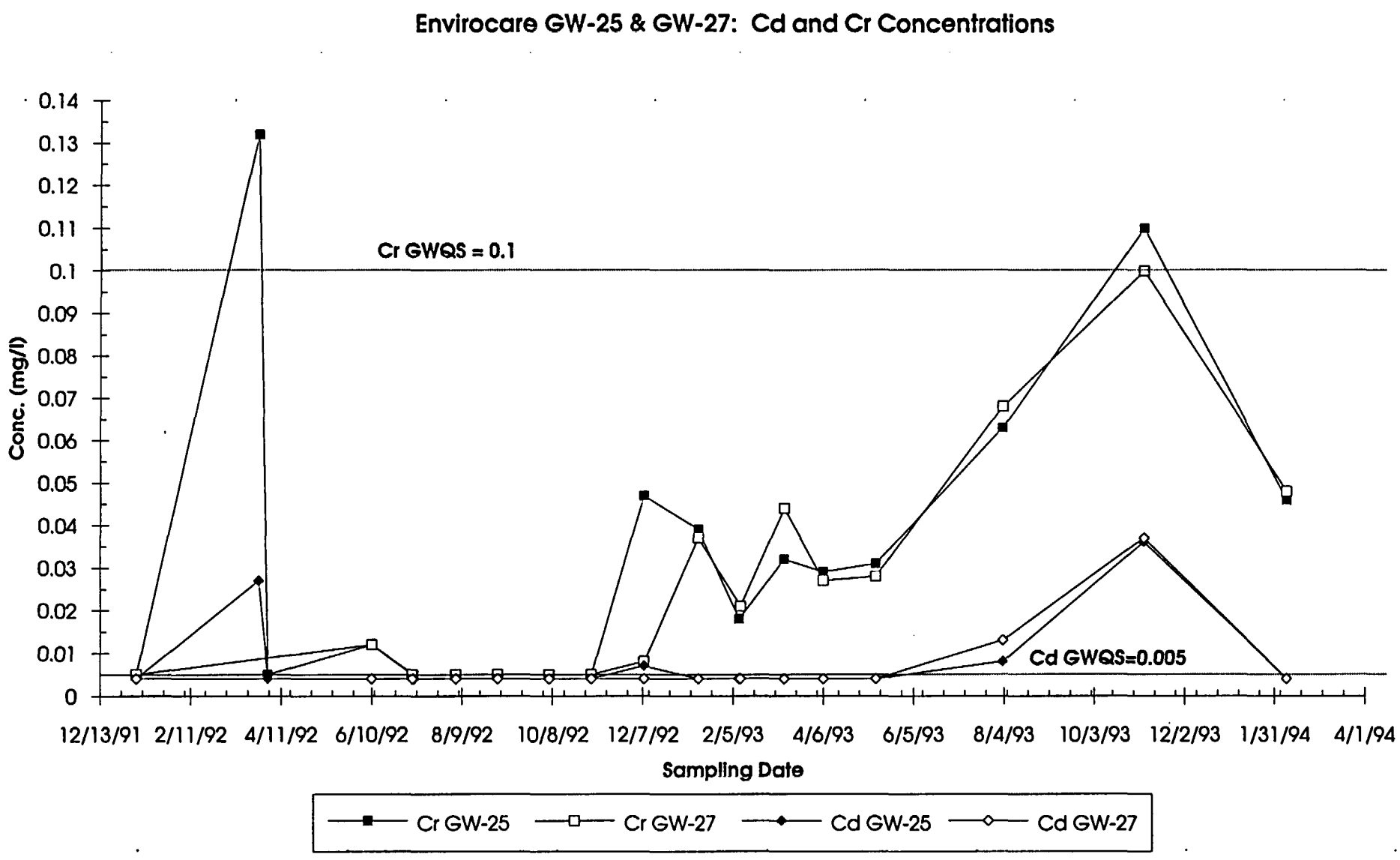

Envirocare LARW Cell: Cadmium
Cd Conc. (mg/l)
0.05
0.04
0.03
0.02
0.01
0
GWQS = 0.005
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16R
GW-20
GW-22
GW-23
GW-24

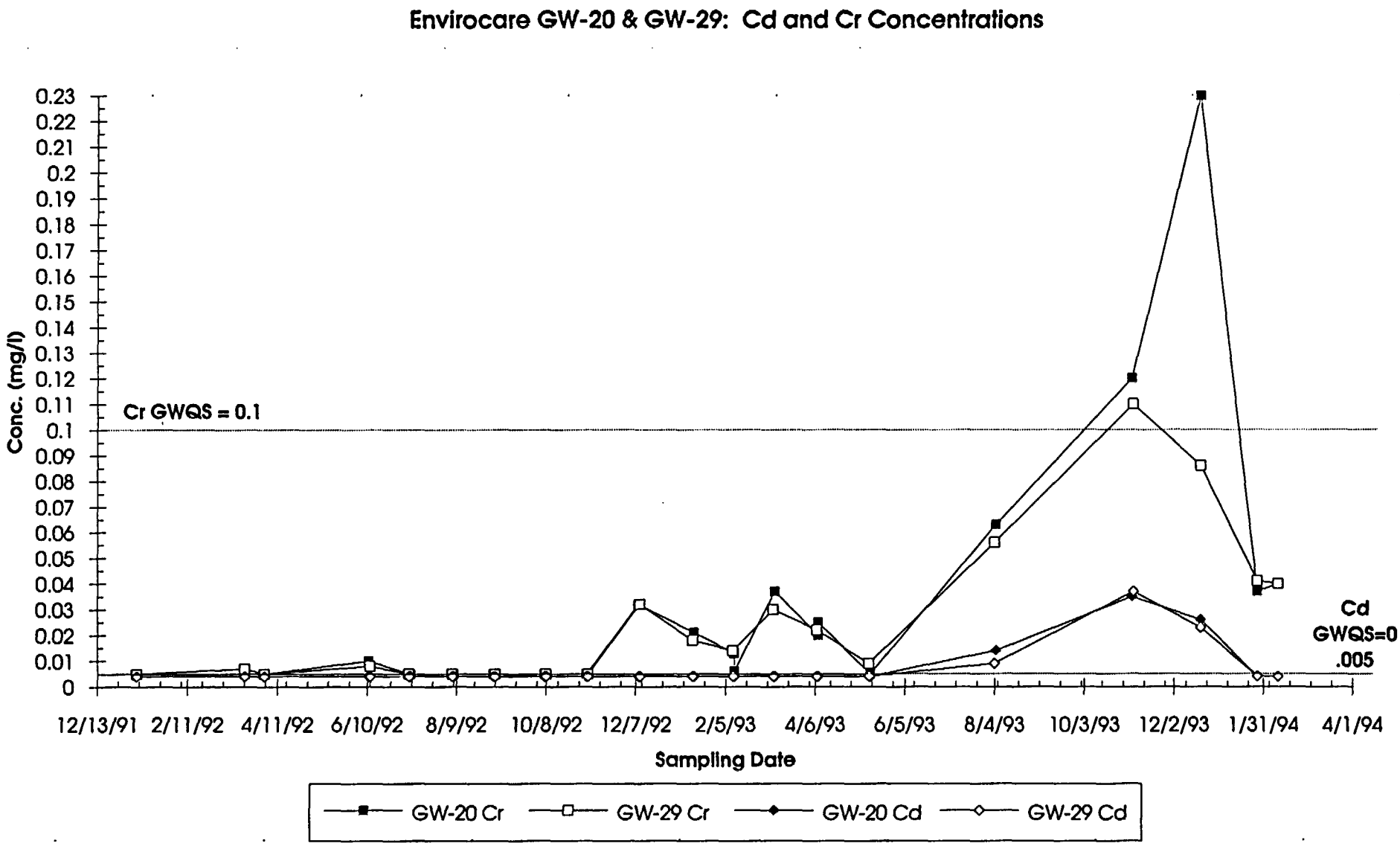

Envirocare LARW Cell: Cadmium
Cd Conc. (mg/l)
0.05
0.04
0.03
0.02
0.01
0
GWQS = 0.005
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-29
GW-56R
I-2-30
GW-25
GW-64

Envirocare GW-19A & GW-36: Chromium & Cadmium




Envirocare I-2-30: Chromium & Cadmium
Cr GWQS = 0.1
Cd GWQS=0.005
Concentration (mg/l)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Cr
Cd


Envirocare GW-25 & GW-27: Cd and Cr Concentrations
Conc. (mg/l)
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Cr GWQS = 0.1
Cd GWQS=0.005
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sampling Date
Cr GW-25
Cr GW-27
Cd GW-25
Cd GW-27

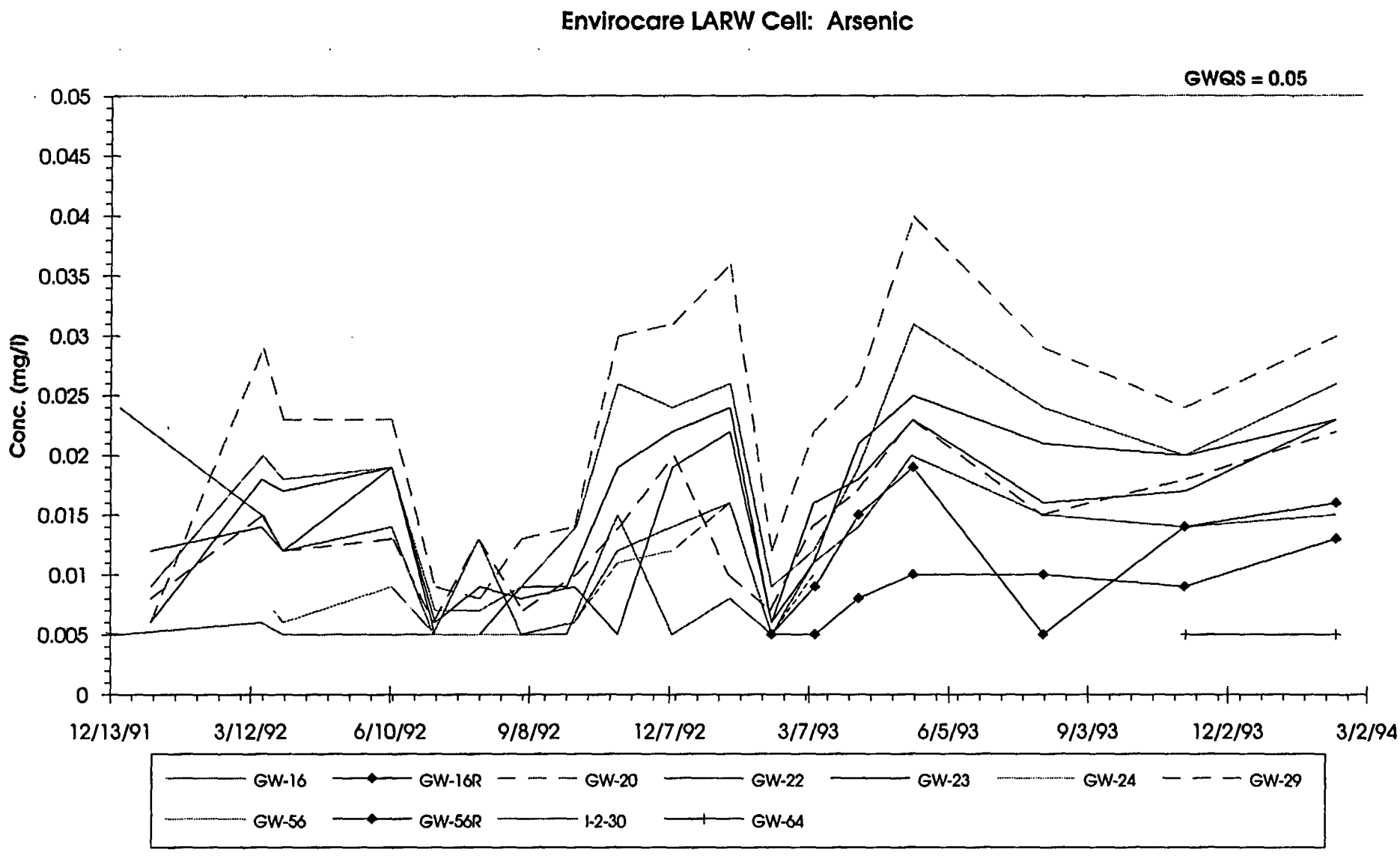

Envirocare GW-20 & GW-29: Cd and Cr Concentrations
Conc. (mg/l)
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Cr GWQS = 0.1
Cd GWQS=0 .005
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sampling Date
GW-20 Cr
GW-29 Cr
GW-20 Cd
GW-29 Cd

ATTACHMENT 7

Arsenic Concentration Trends
DWQ Charts ASALL.XLS, Charts 1 thru 4

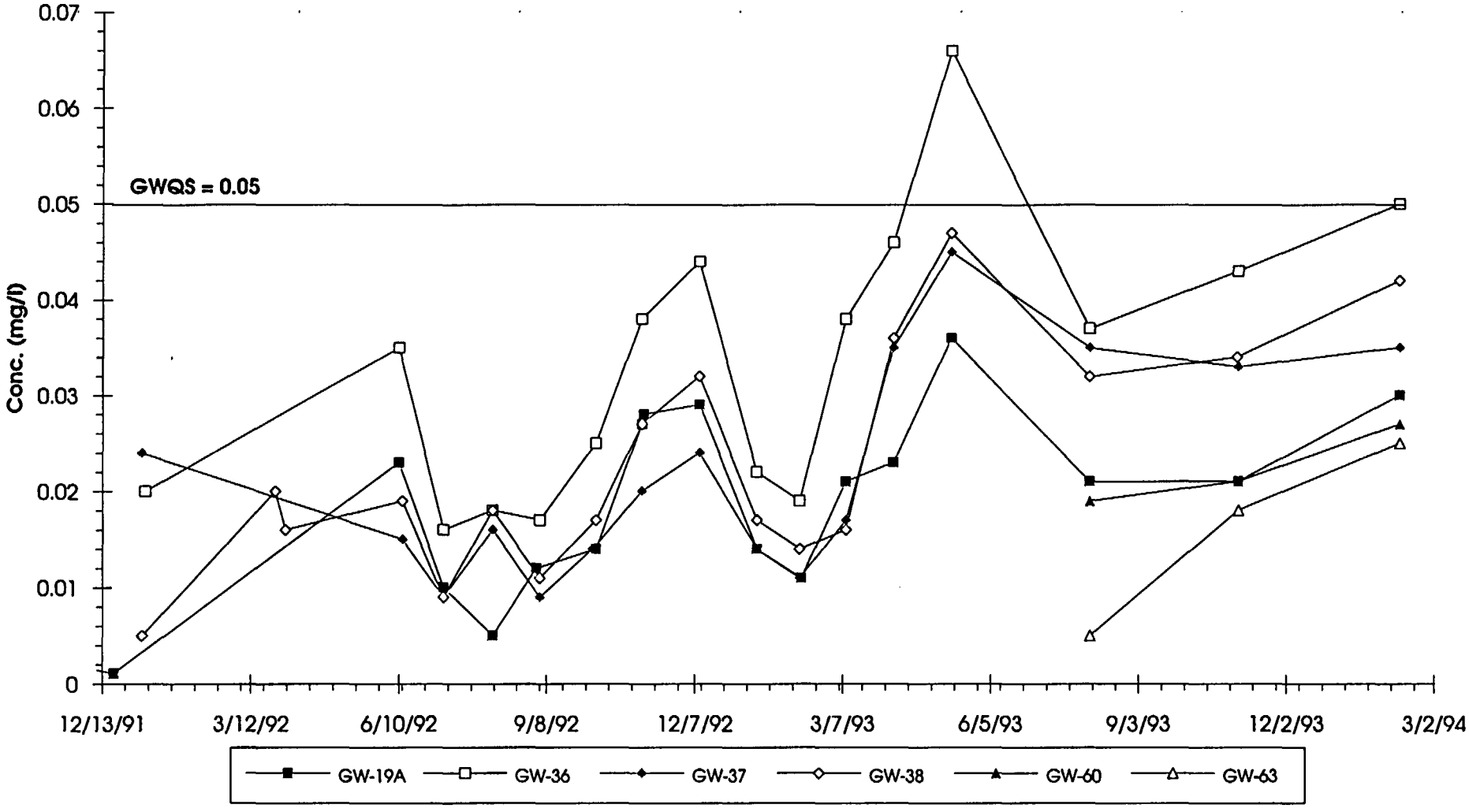
and

DWQ Isoconcentration Map of
Average Arsenic Concentrations at Envirocare


Envirocare LARW Cell: Arsenic
GWQS = 0.05
Conc. (mg/l)
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
12/13/91
3/12/92
6/10/92
9/8/92
12/7/92
3/7/93
6/5/93
9/3/93
12/2/93
3/2/94
GW-16
GW-16R
GW-20
GW-22
GW-23
GW-24
GW-29
GW-56
GW-56R
I-2-30
GW-64

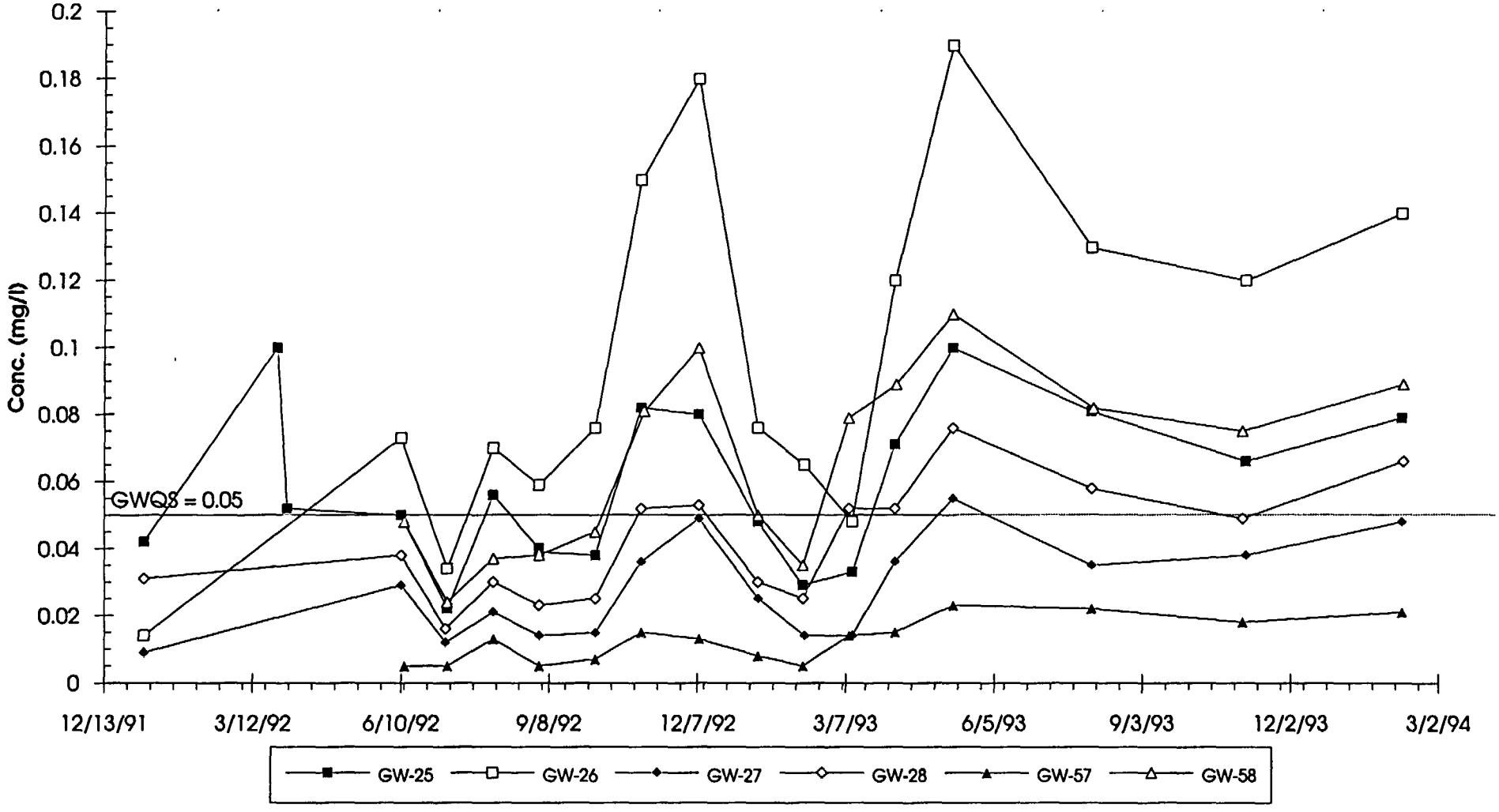
Increasing trend?

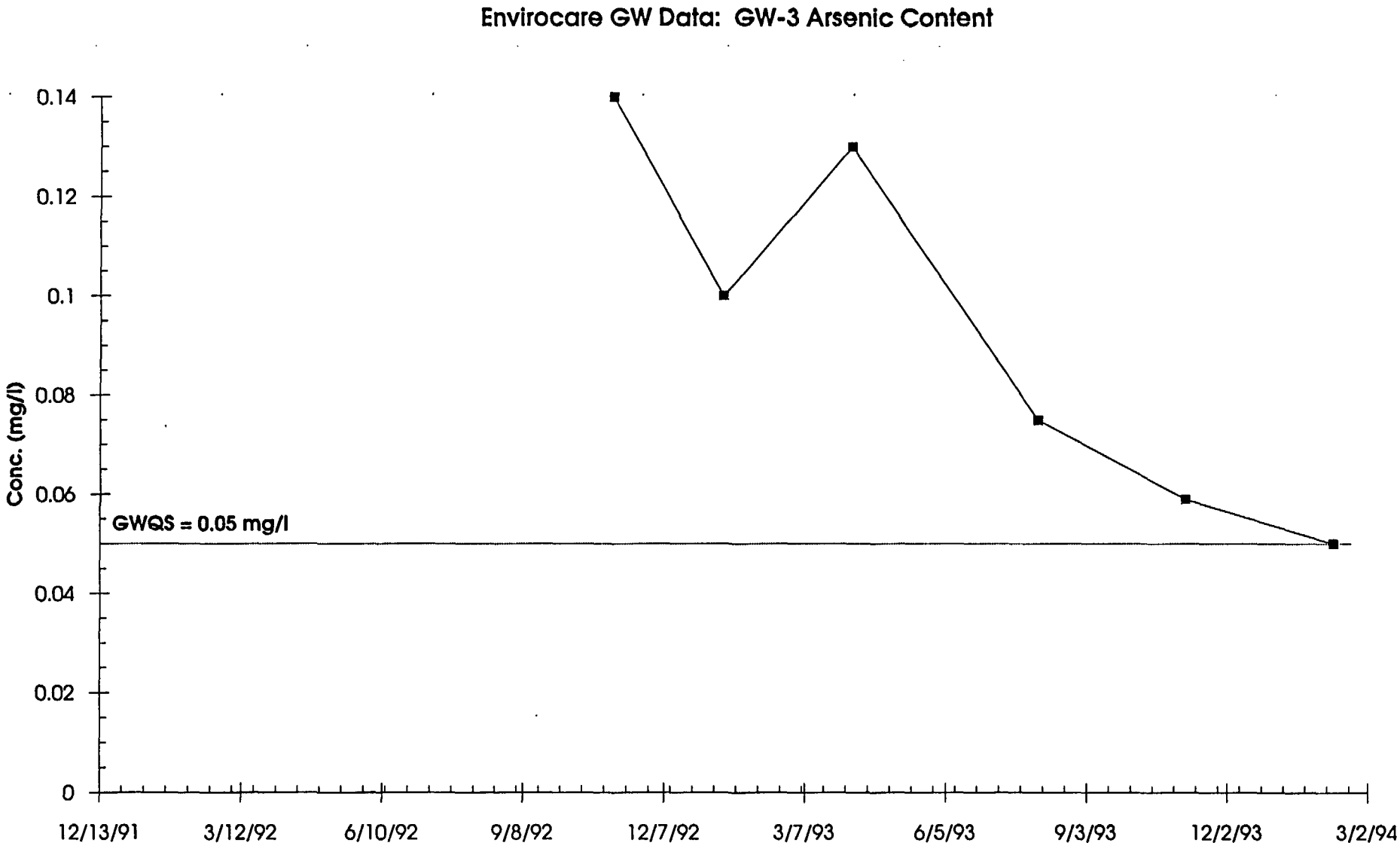
Envirocare SE Future Cell: Arsenic



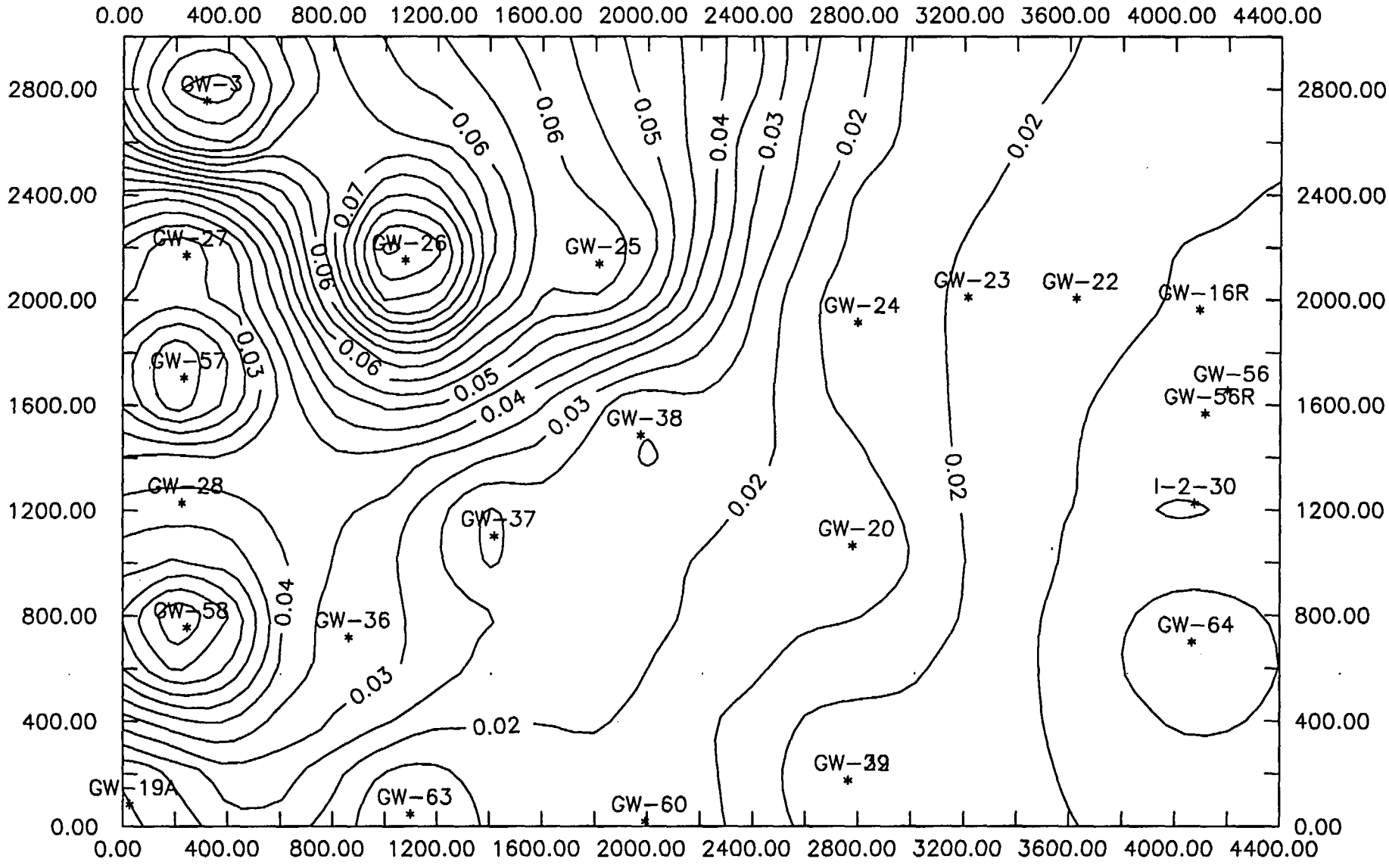
GW-26 - increasing trend

Envirocare NW Future Cell: Arsenic




Envirocare GW Data: GW-3 Arsenic Content
Conc. (mg/l)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
GWQS = 0.05 mg/l
12/13/91
3/12/92
6/10/92
9/8/92
12/7/92
3/7/93
6/5/93
9/3/93
12/2/93
3/2/94

Envirocare Avg. Arsenic Conc. (mg/l)



ATTACHMENT 8

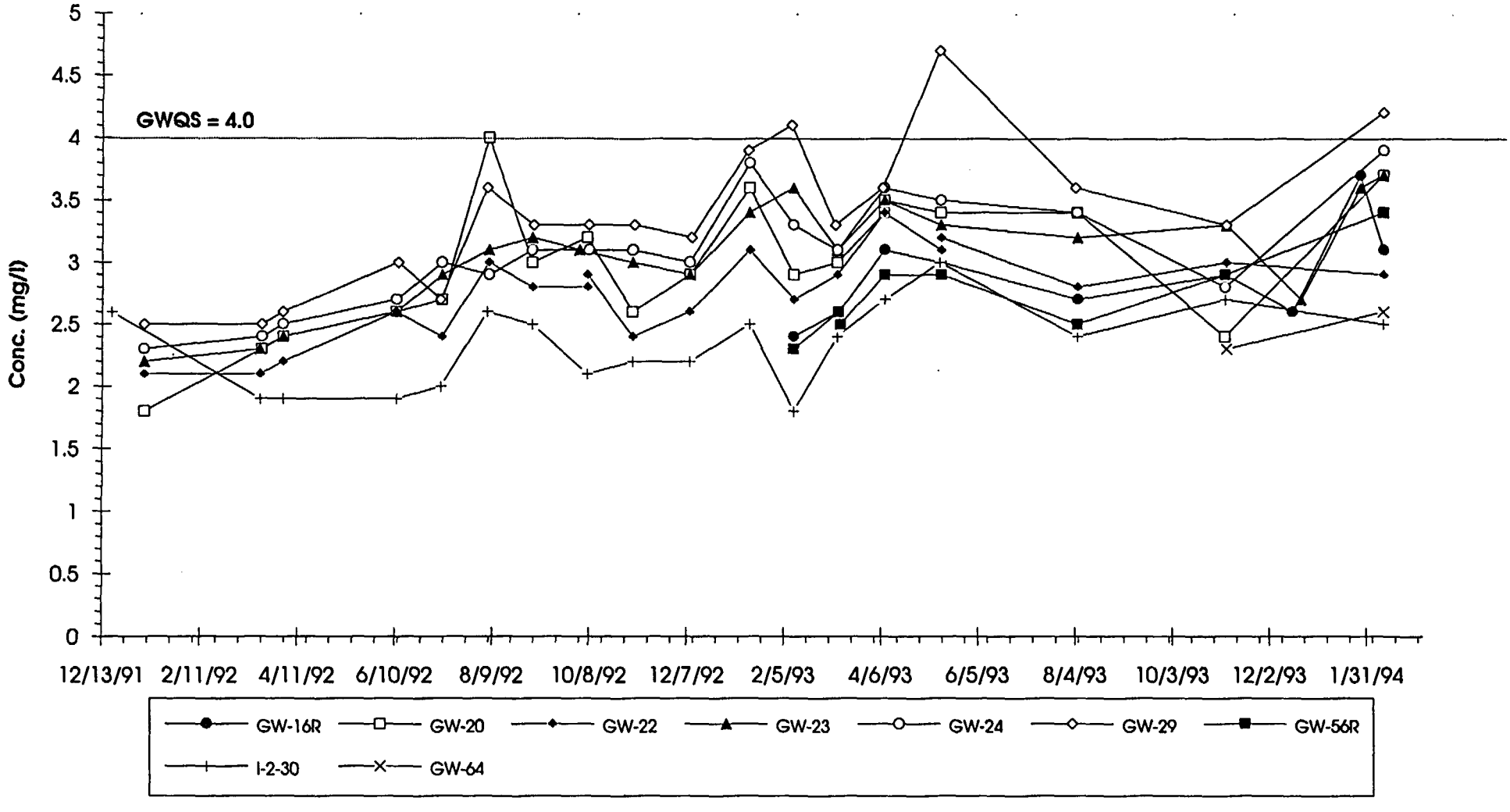
Fluoride Concentration Trends
DWQ Charts F_ALL.XLS, Charts 2 thru 4

and

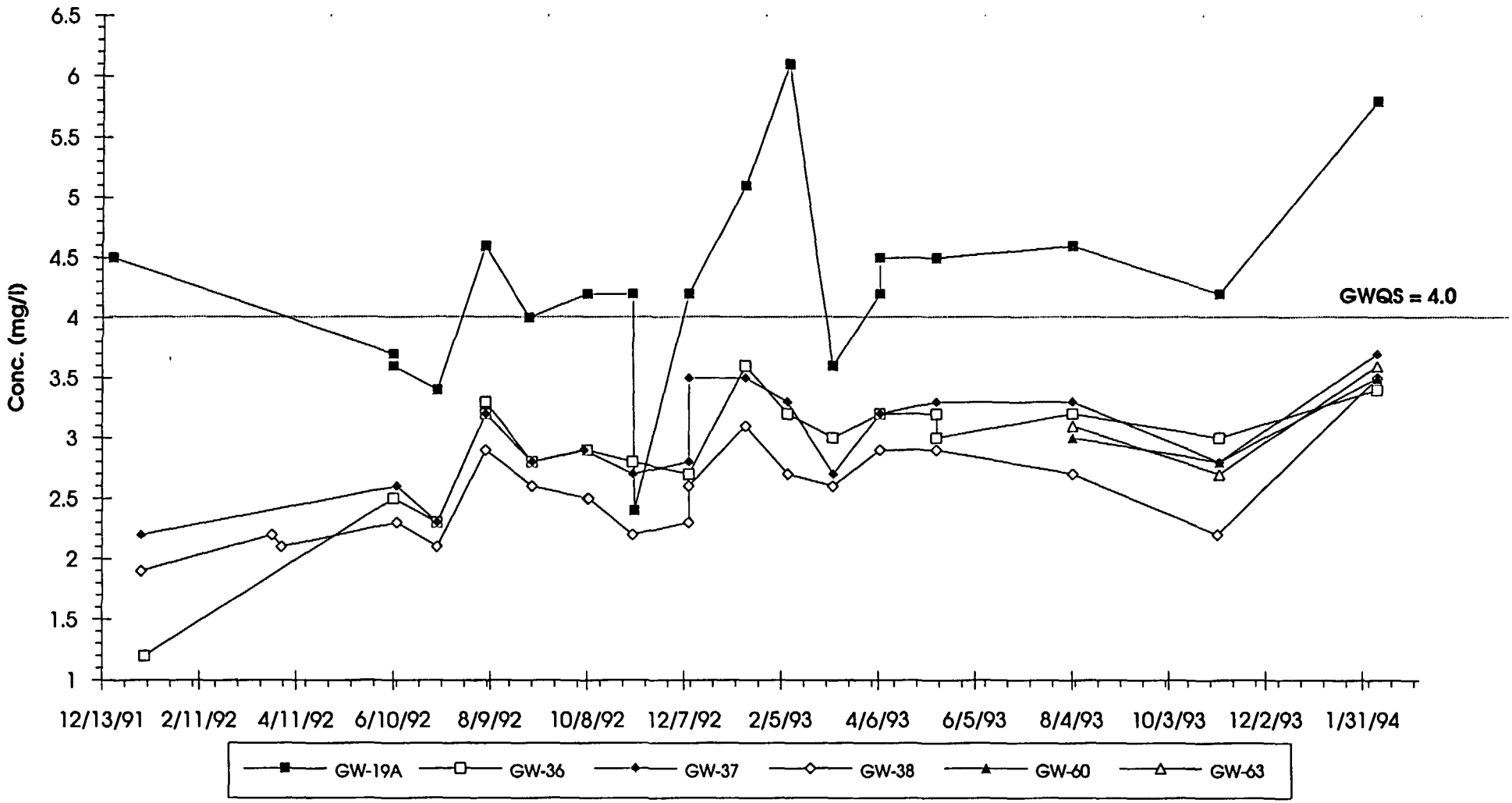
DWQ Isoconcentration Map of
Average Fluoride Concentrations at Envirocare

Some seasonal fluctuation?

Envirocare LARW Cell: Fluoride

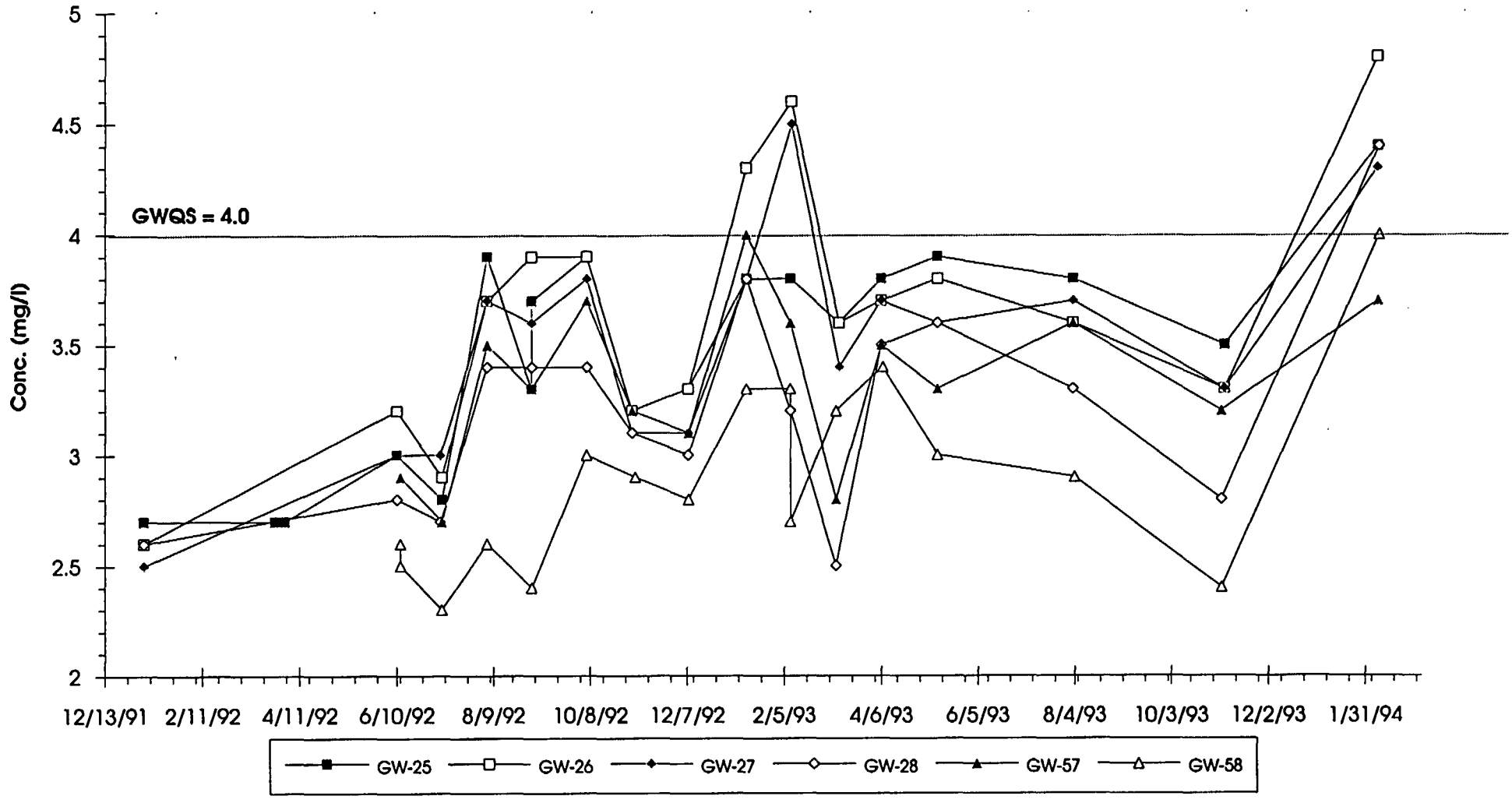


- Some seasonal fluctuation
- outliers in GW-19A

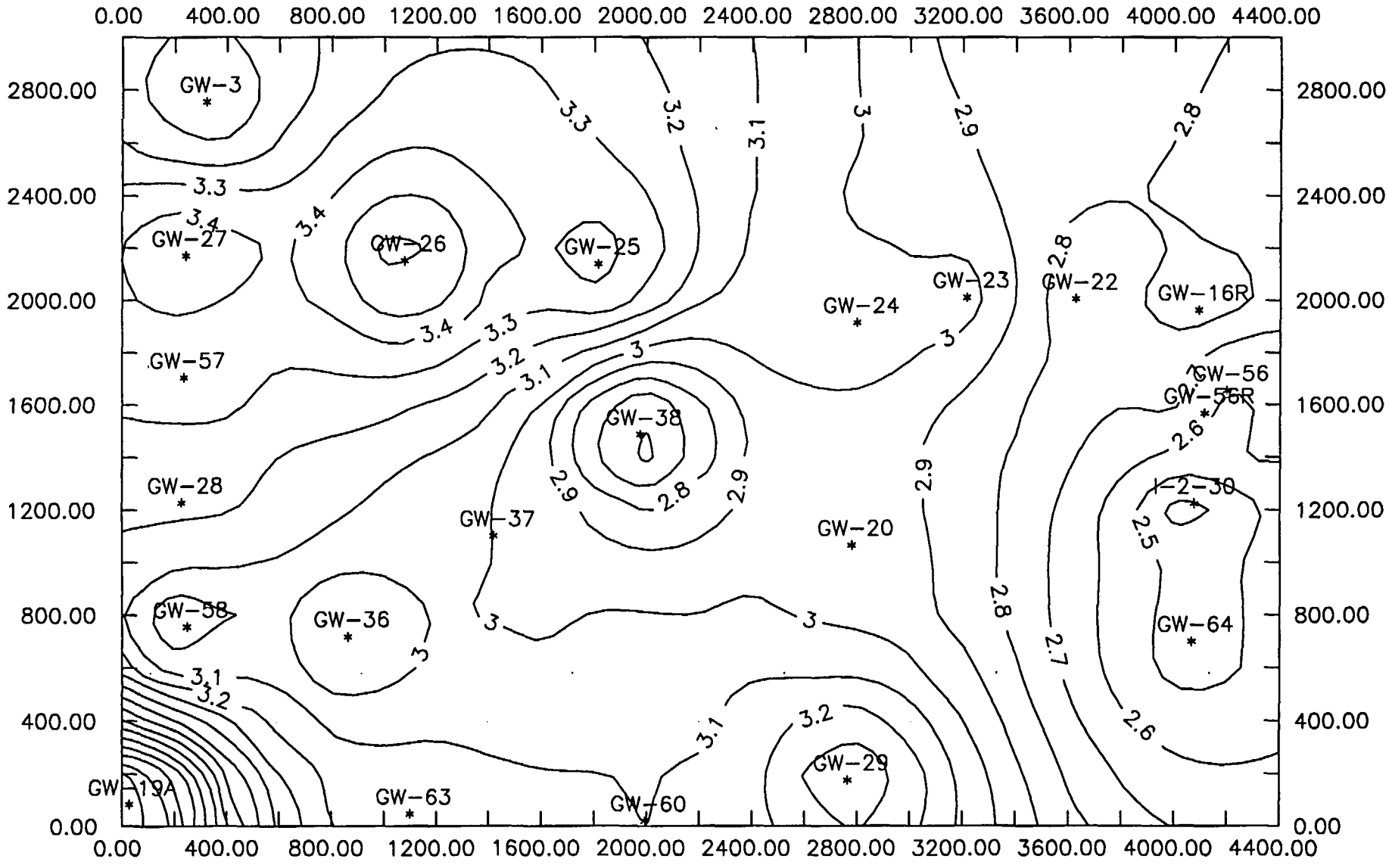


Envirocare NW 11e.(2) Cell: Fluoride

seasonal fluctuations?



Envirocare Avg. Fluoride Conc. (mg/l)



ATTACHMENT 9

Summary of Field pH Data:

DWQ Spreadsheet PHFSUM.XLS

Envirocare Field pH Summary									
Well ID	Count	Mean pH	Std.Dev, s	x-2s	x+2s				
GW-3	7	7.56	0.13	7.3	7.82				
GW-16	14	7.63	0.14	7.35	7.91				
GW-19A	16	7.23	0.16	6.91	7.55				
GW-20	21	7.37	0.14	7.09	7.65				
GW-22	20	7.24	0.14	6.96	7.52				
GW-23	20	7.23	0.09	7.05	7.41				
GW-24	21	7.33	0.14	7.05	7.61				
GW-25	18	7.32	0.08	7.16	7.48				
GW-26	16	7.49	0.12	7.25	7.73				
GW-27	16	7.41	0.14	7.13	7.69				
GW-28	16	7.51	0.09	7.33	7.69				
GW-29	21	7.18	0.08	7.02	7.34				
GW-36	16	7.51	0.13	7.25	7.77				
GW-37	16	7.46	0.11	7.24	7.68				
GW-38	18	7.42	0.13	7.16	7.68				
GW-56	13	7.28	0.04	7.2	7.36				
GW-57	15	7.43	0.08	7.27	7.59				
GW-58	15	7.53	0.11	7.31	7.75				
I-2-30	20	7.35	0.2	6.95	7.75				
GW-16R	10	7.22	0.2	6.82	7.62				
GW-56R	7	7.11	0.22	6.67	7.55				
GW-60	3	7.22	0.14	6.94	7.5				
GW-63	3	7.39	0.18	7.03	7.75				
GW-64	2	7.17	0.06	7.05	7.29				
	Min:	7.11	0.04	6.67	7.29		Utah GWQS = 6.5 to 8.5		
	Max:	7.63	0.22	7.35	7.91				

ATTACHMENT 10

Summary of Statistical Data:
Total Dissolved Solids, Total Organic Carbon, and Total Organic Halogens
DWQ Spreadsheet IOGWPL.XLS

	AC	AD	AE	AF	AG	AH	AI
1	**Envirocare GW Quality Data Statistics**						
2	*Compliance Monitoring Parameters w/o GWQS*						
3	Well ID	IOparameter	Count	Mean (mg/l)	Std.Dev (mg/l)	x+2s (mg/l)	%<MDL
4	GW-3	TDS	6	30,500	6,473	43,446	0
5	GW-16	TDS	14	23,142	1,167	25,477	0
6	GW-19A	TDS	17	49,588	2,717	55,022	0
7	GW-20	TDS	19	48,421	3,437	55,295	0
8	GW-22	TDS	18	43,388	1,290	45,967	0
9	GW-23	TDS	18	42,611	1,195	45,001	0
10	GW-24	TDS	18	47,111	1,875	50,861	0
11	GW-25	TDS	18	47,111	2,541	52,193	0
12	GW-26	TDS	16	45,562	5,059	55,680	0
13	GW-27	TDS	16	41,937	5,272	52,481	0
14	GW-28	TDS	16	43,687	2,301	48,289	0
15	GW-29	TDS	18	46,166	3,666	53,498	0
16	GW-36	TDS	16	41,000	1,932	44,864	0
17	GW-37	TDS	16	46,500	2,221	50,942	0
18	GW-38	TDS	18	37,277	1,965	41,206	0
19	GW-56	TDS	13	44,692	1,601	47,894	0
20	GW-57	TDS	15	41,266	2,344	45,954	0
21	GW-58	TDS	15	39,533	2,615	44,763	0
22	I-2-30	TDS	18	33,111	1,451	36,012	0
23	GW-16R	TDS	8	40,625	1,188	43,000	0
24	GW-56R	TDS	7	41,000	4,203	49,406	0
25	GW-60	TDS	3	41,000	1,000	43,000	0
26	GW-63	TDS	3	41,666	4,726	51,118	0
27	GW-64	TDS	2	33,000	1,414	35,828	0
28							
29	GW-3	TOC	6	1.17	0.41	2.0	83.33
30	GW-16	TOC	13	0.91	0.22	1.4	76.92
31	GW-19A	TOC	16	1.52	0.97	3.5	62.5
32	GW-20	TOC	18	1.19	0.55	2.3	72.22
33	GW-22	TOC	18	1.05	0.35	1.8	77.78
34	GW-23	TOC	18	1.23	0.42	2.1	66.67
35	GW-24	TOC	18	1.21	0.66	2.5	72.22
36	GW-25	TOC	18	1.48	0.72	2.9	55.56
37	GW-26	TOC	16	1.39	0.63	2.6	62.5
38	GW-27	TOC	16	1.36	0.70	2.8	75
39	GW-28	TOC	16	1.24	0.52	2.3	68.75
40	GW-29	TOC	18	1.23	0.57	2.4	66.67
41	GW-36	TOC	16	1.17	0.36	1.9	75
42	GW-37	TOC	16	1.21	0.42	2.1	75
43	GW-38	TOC	18	1.19	0.52	2.2	72.22
44	GW-56	TOC	14	1.28	0.90	3.1	71.43
45	GW-57	TOC	15	1.31	0.67	2.7	66.67
46	GW-58	TOC	15	1.14	0.33	1.8	80
47	I-2-30	TOC	18	0.99	0.05	1.1	83.33
48	GW-16R	TOC	7	1.00	0.00	1.0	100
49	GW-56R	TOC	7	1.00	0.00	1.0	100

	AC	AD	AE	AF	AG	AH	AI
1	**Envirocare GW Quality Data Statistics**						
2	*Compliance Monitoring Parameters w/o GWQS*						
3	Well ID	IOparameter	Count	Mean (mg/l)	Std.Dev (mg/l)	x+2s (mg/l)	%<MDL
50	GW-60	TOC	3	1.00	0.00	1.0	100
51	GW-63	TOC	3	1.00	0.00	1.0	100
52	GW-64	TOC	2	1.00	0.00	1.0	100
53							
54	GW-3	TOX	6	0.005	0.000	0.005	100
55	GW-16	TOX	13	0.043	0.137	0.317	100
56	GW-19A	TOX	16	0.078	0.011	0.101	100
57	GW-20	TOX	18	0.005	0.000	0.005	100
58	GW-22	TOX	18	0.005	0.000	0.005	100
59	GW-23	TOX	18	0.005	0.000	0.005	100
60	GW-24	TOX	18	0.005	0.000	0.005	100
61	GW-25	TOX	18	0.033	0.117	0.266	100
62	GW-26	TOX	16	0.005	0.000	0.005	100
63	GW-27	TOX	16	0.005	0.000	0.005	100
64	GW-28	TOX	16	0.005	0.000	0.005	100
65	GW-29	TOX	17	0.005	0.000	0.005	100
66	GW-36	TOX	16	0.005	0.000	0.005	100
67	GW-37	TOX	16	0.005	0.000	0.005	100
68	GW-38	TOX	18	0.033	0.117	0.266	100
69	GW-56	TOX	12	0.046	0.143	0.332	100
70	GW-57	TOX	15	0.005	0.000	0.005	100
71	GW-58	TOX	15	0.005	0.000	0.005	100
72	I-2-30	TOX	18	0.033	0.117	0.266	100
73	GW-16R	TOX	7	0.005	0.000	0.005	100
74	GW-56R	TOX	7	0.005	0.000	0.005	100
75	GW-60	TOX	3	0.005	0.000	0.005	100
76	GW-63	TOX	3	0.005	0.000	0.005	100
77	GW-64	TOX	2	0.005	0.000	0.005	100

ATTACHMENT 11

Total Dissolved Solids Data:

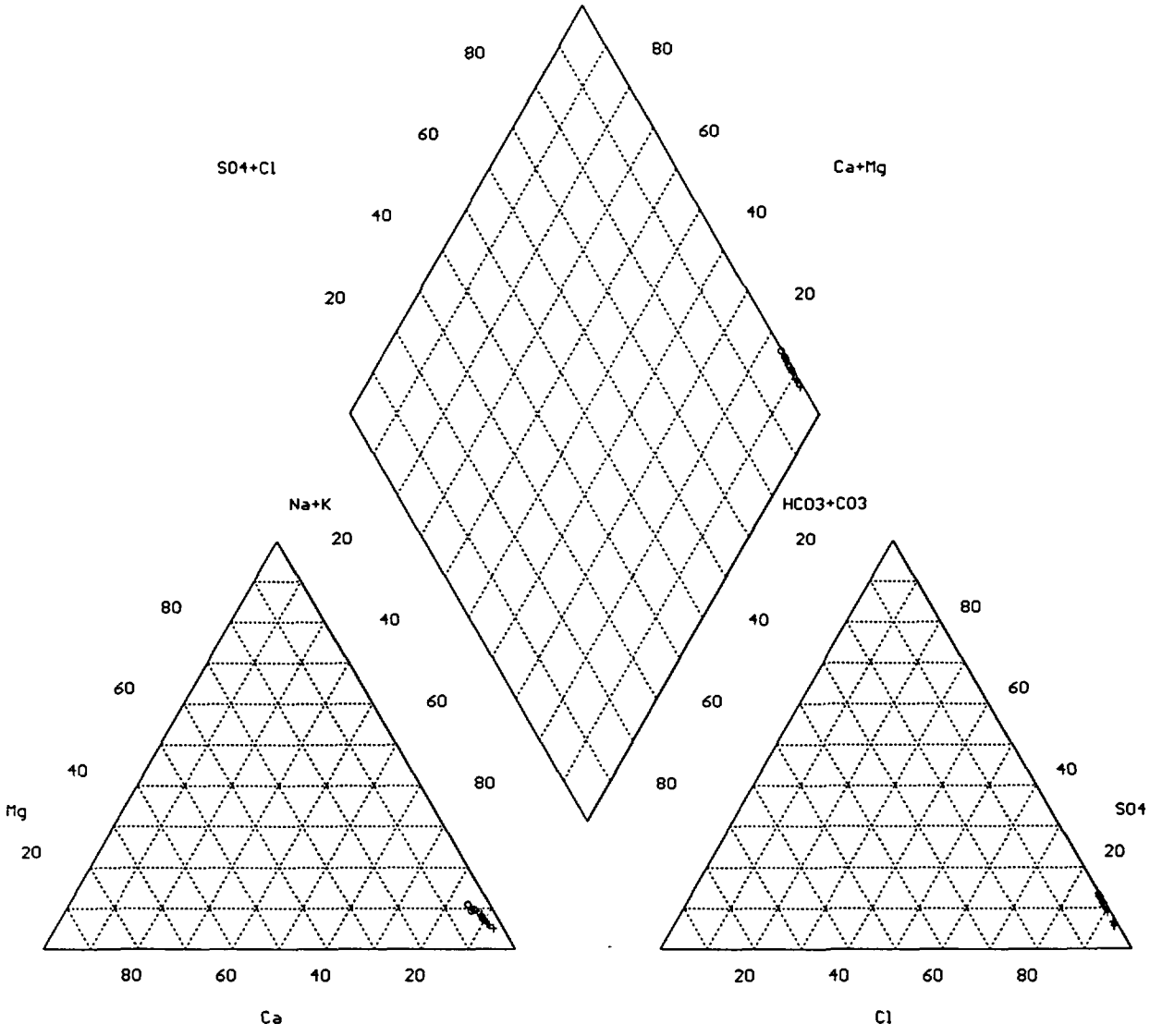
DWQ Trilinear Diagram of Major Ions,
DWQ Isoconcentration Map,
and
TDS Concentration Trends (DWQ Spreadsheet TDSALL.XLS, Charts 1, 2, 3, and 7)

Envirocare Average Concentrations thru 2/94

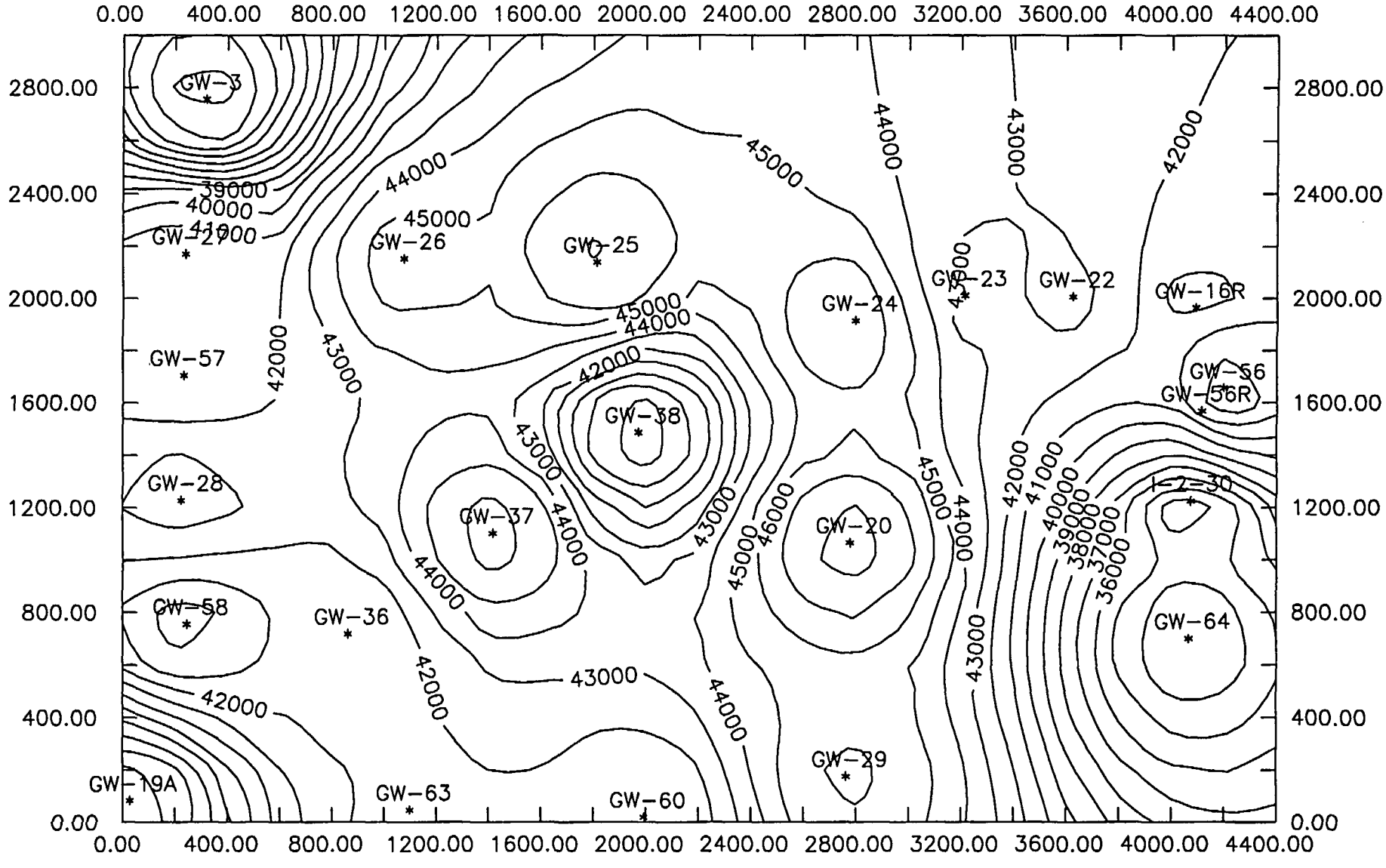
07/01/1994

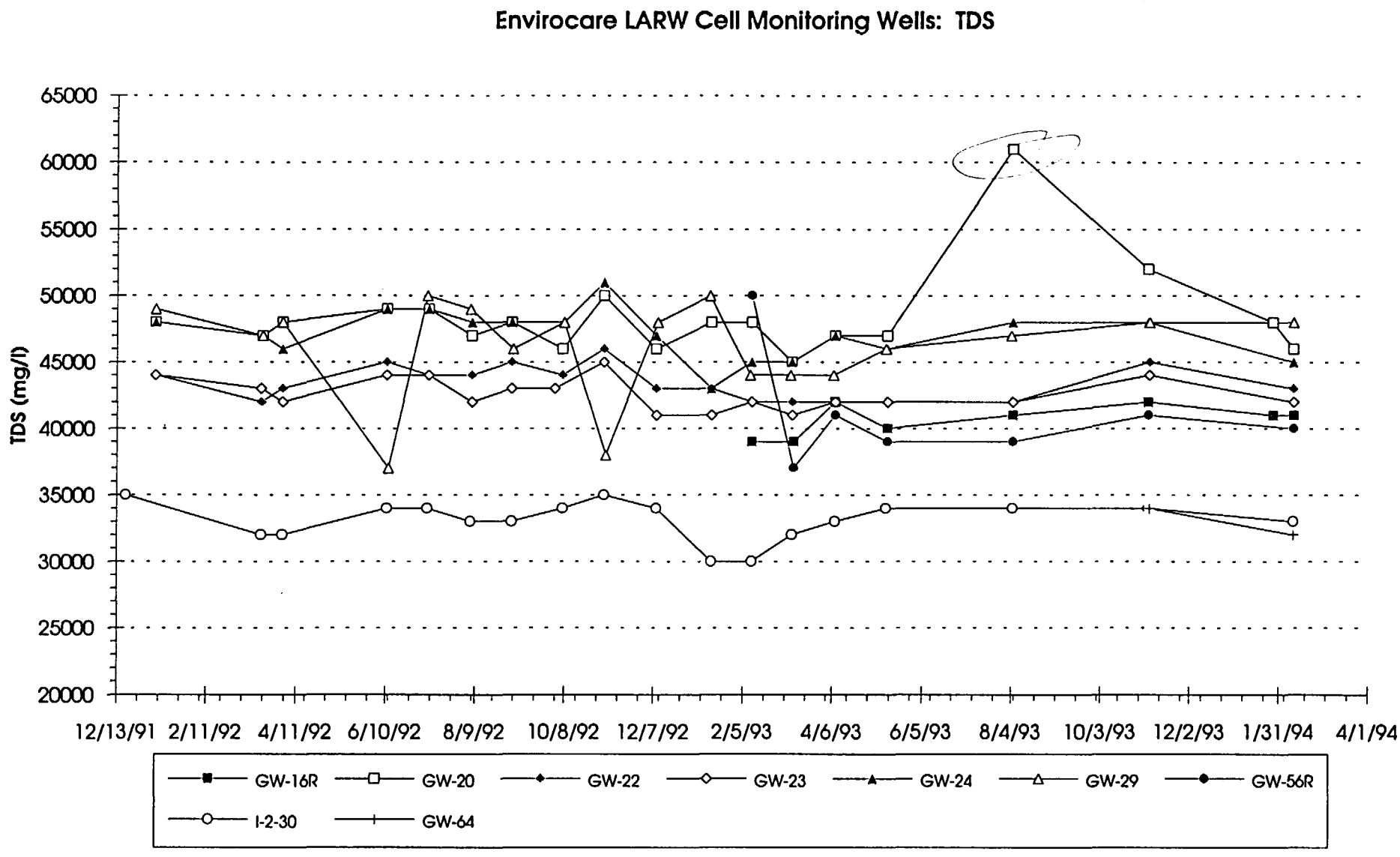
Diamond=«» Square=■ Circle=°

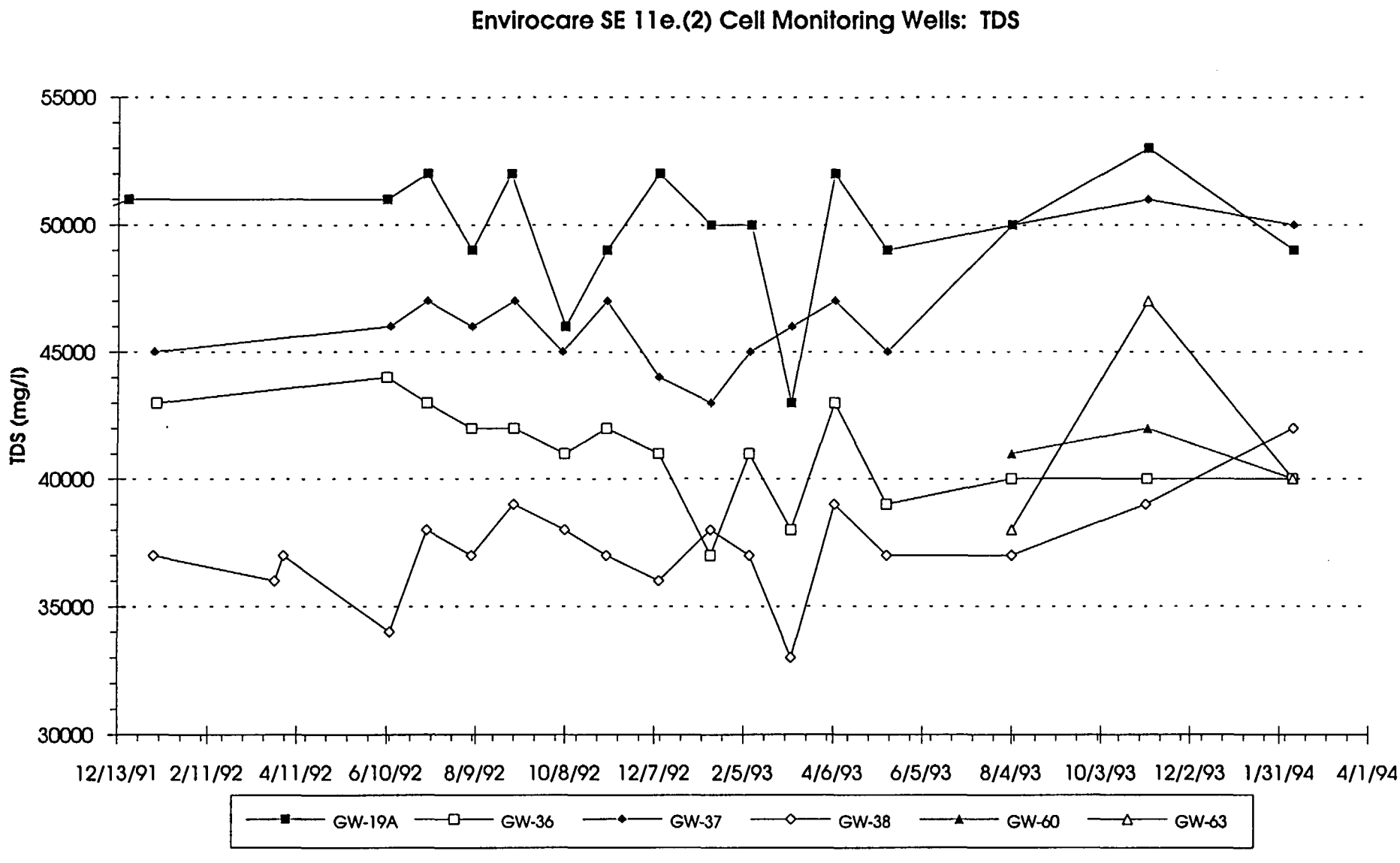
GW-19A 01/01/1900-°	GW-20 01/01/1900-+	GW-22 01/01/1900-+	GW-23 01/01/1900-+
GW-24 01/01/1900-+	GW-25 01/01/1900-°	GW-26 01/01/1900-°	GW-27 01/01/1900-°
GW-28 01/01/1900-°	GW-29 01/01/1900-+	GW-36 01/01/1900-°	GW-37 01/01/1900-°
GW-38 01/01/1900-°	GW-57 01/01/1900-°	GW-58 01/01/1900-°	I-2-30 01/01/1900-+
GW-16R 01/01/1900-+	GW-56R 01/01/1900-+	GW-60 01/01/1900-°	GW-63 01/01/1900-°
GW-64 01/01/1900-+			

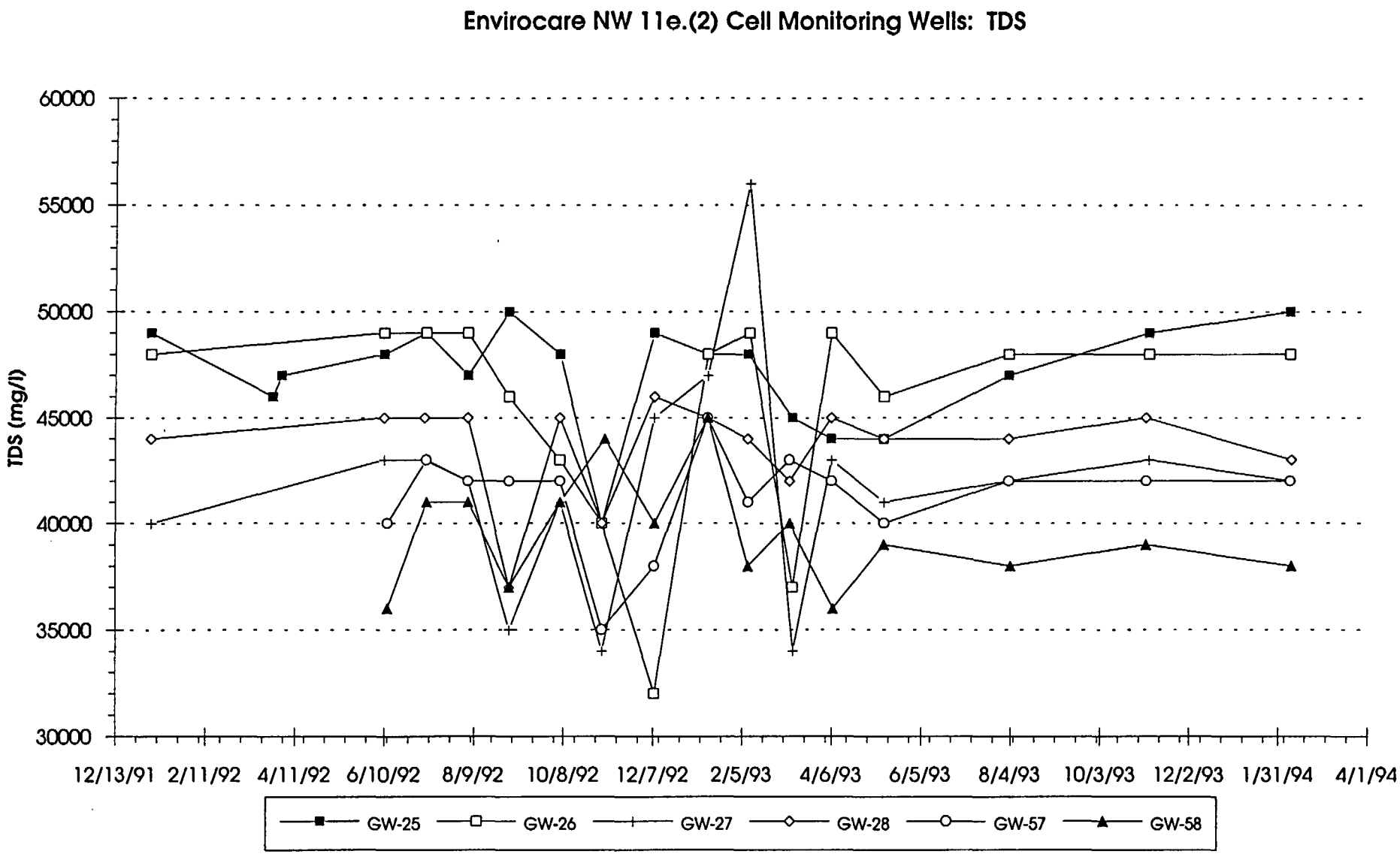


Envirocare Average TDS Conc. (mg/l)

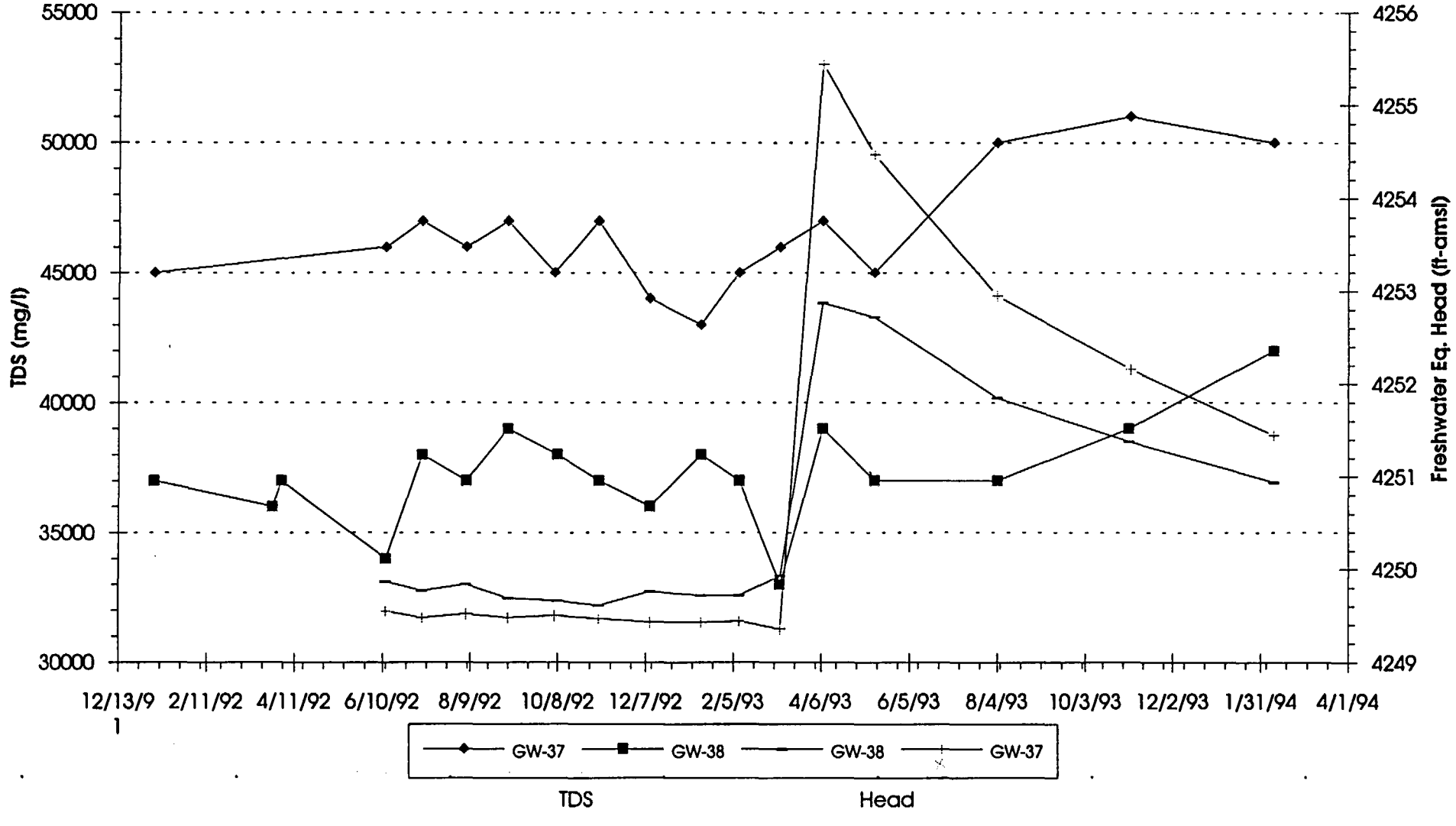



Envirocare LARW Cell Monitoring Wells: TDS
TDS (mg/l)
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16R
GW-20
GW-22
GW-23
GW-24
GW-29
GW-56R
I-2-30
GW-64


Envirocare SE 11e.(2) Cell Monitoring Wells: TDS
TDS (mg/l)
55000
50000
45000
40000
35000
30000
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63


Envirocare NW 11e.(2) Cell Monitoring Wells: TDS
TDS (mg/l)
60000
55000
50000
45000
40000
35000
30000
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

Envirocare SE 11e.(2) Cell Monitoring Wells: TDS



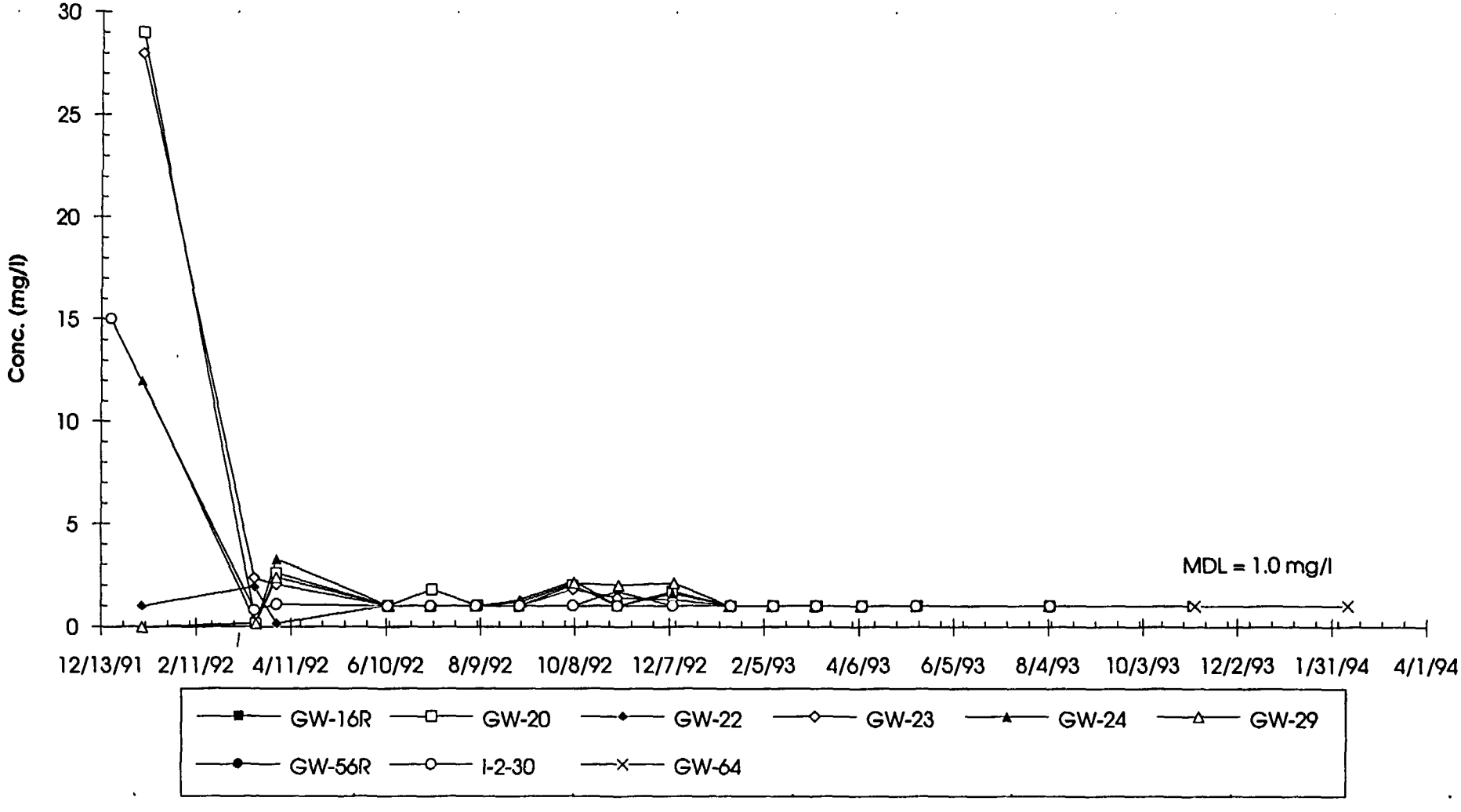
ATTACHMENT 12

Total Organic Carbon (TOC) Concentration Trends
DWQ Charts TOCALL.XLS, Charts 1 thru 3 (Raw Data)

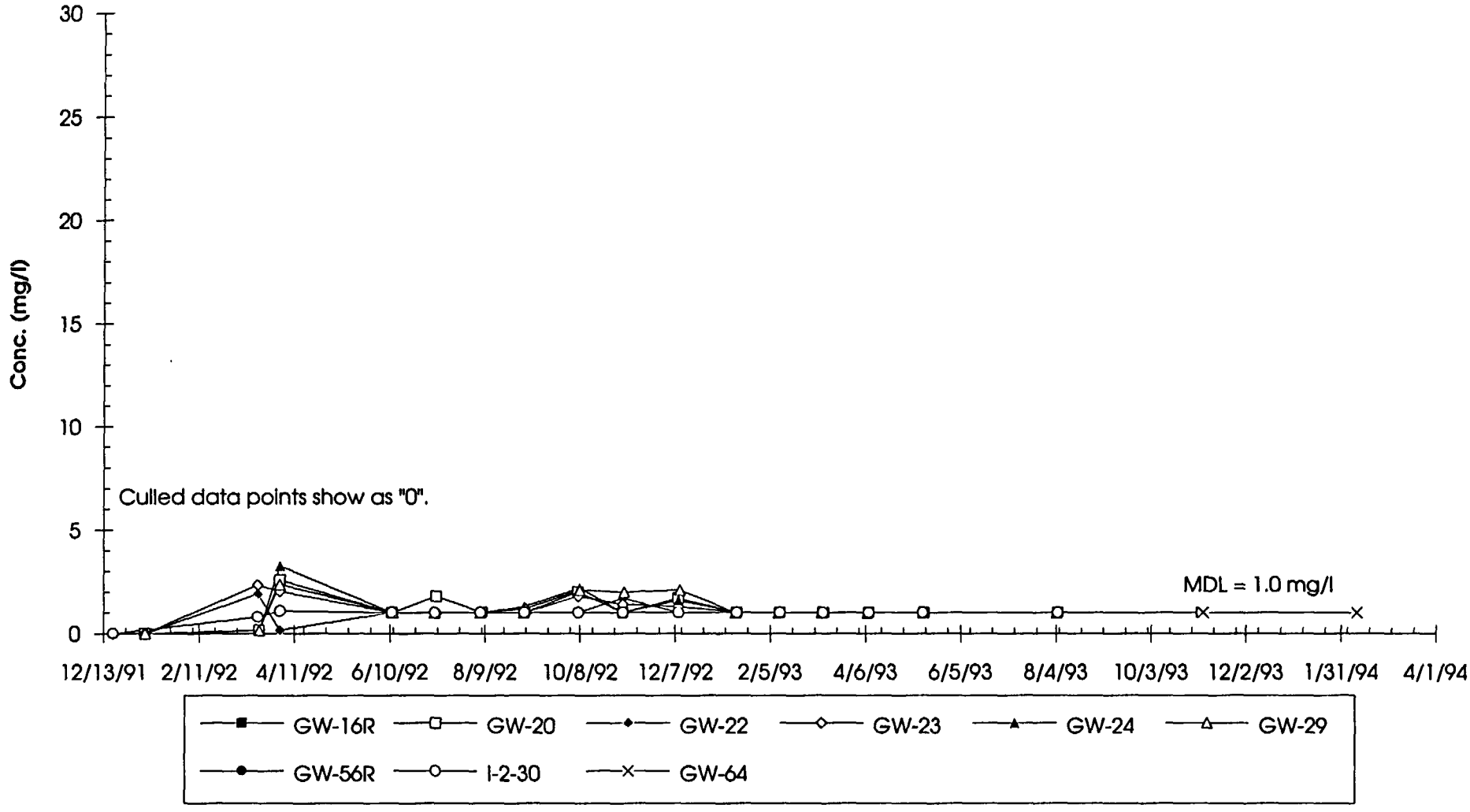
and

Charts 1A, 2A, and 3A (Outlier Values Culled)

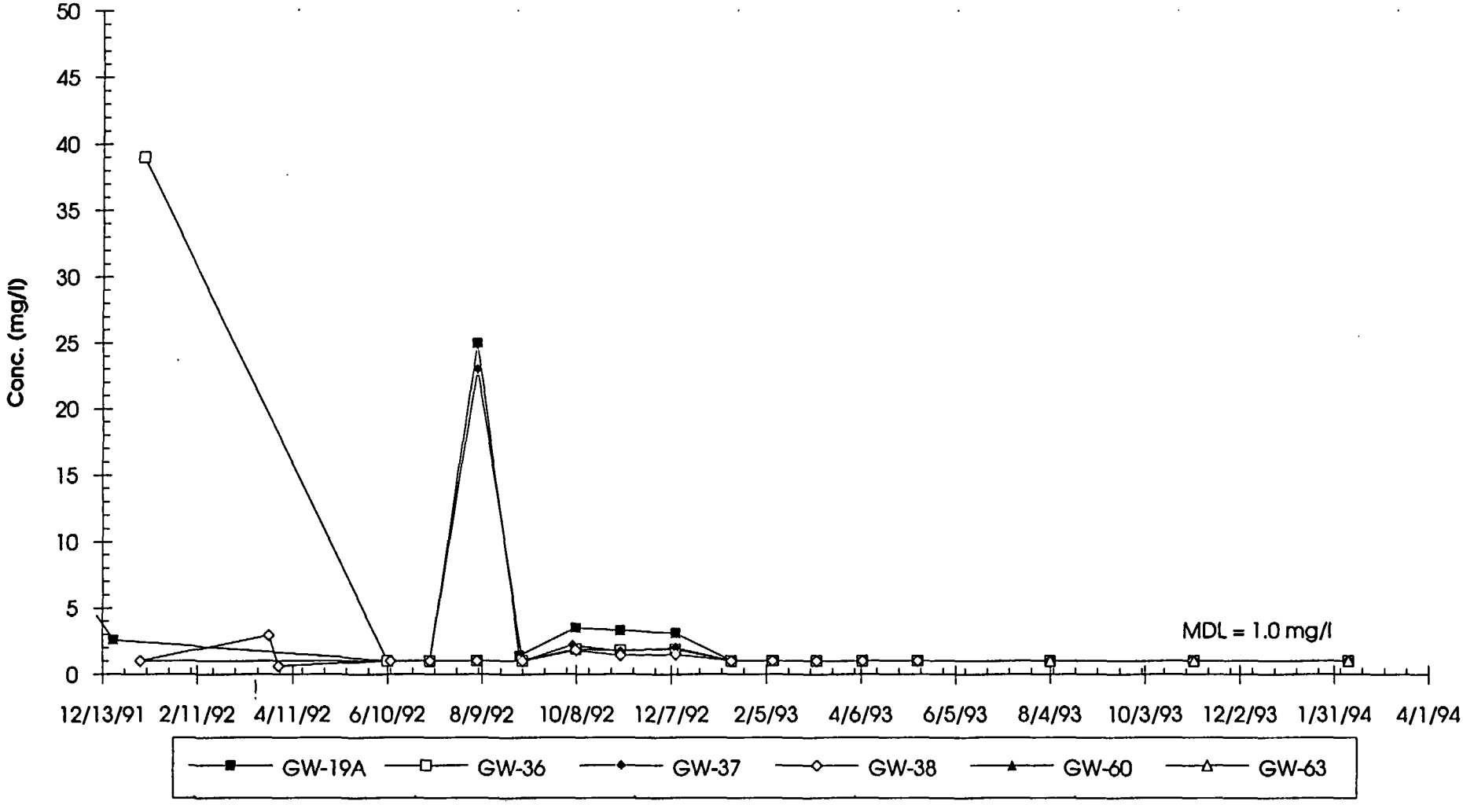
Envirocare LARW Cell GW Data: Total Organic Carbon (raw data)



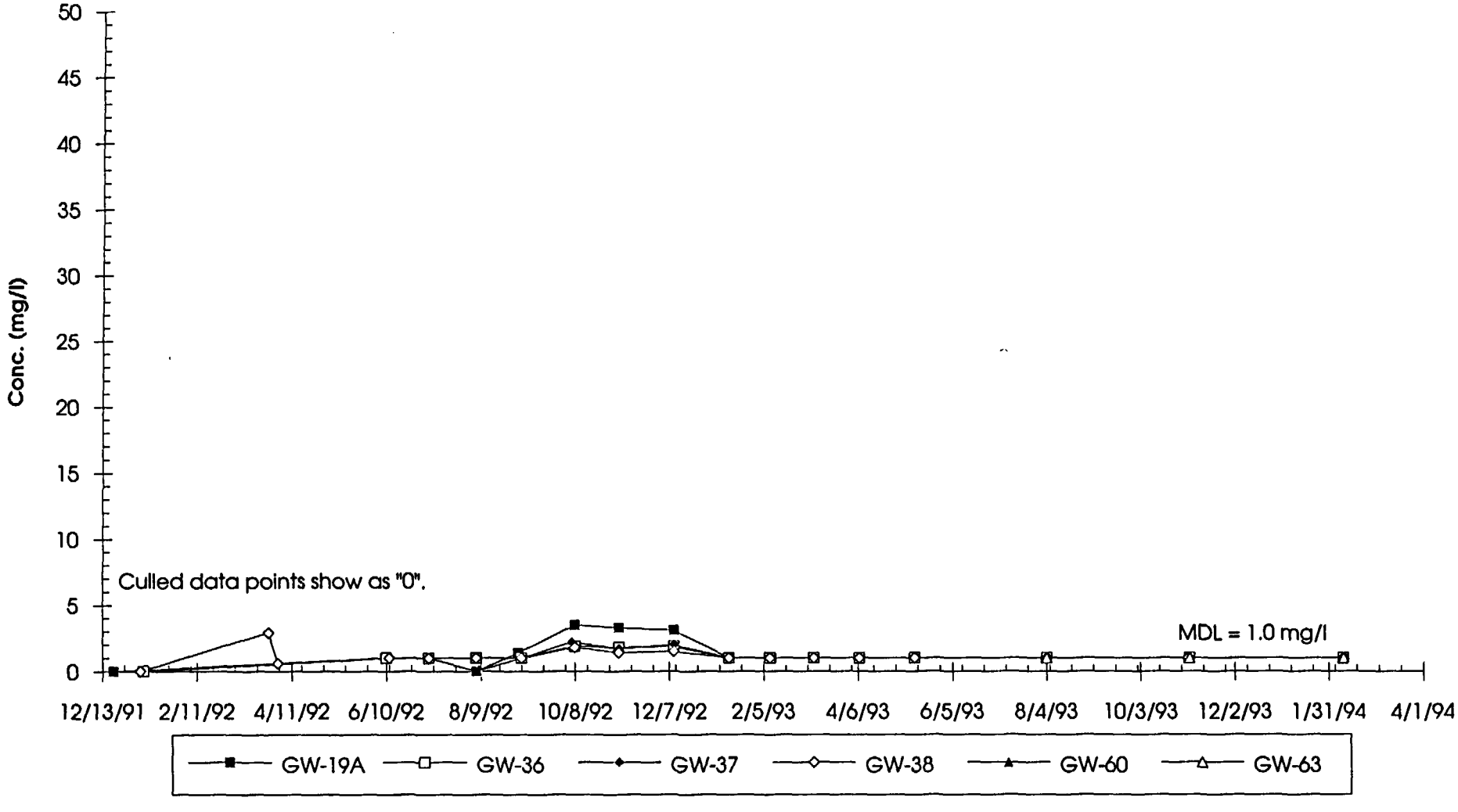
Envirocare LARW Cell GW Data: Total Organic Carbon (outliers culled)



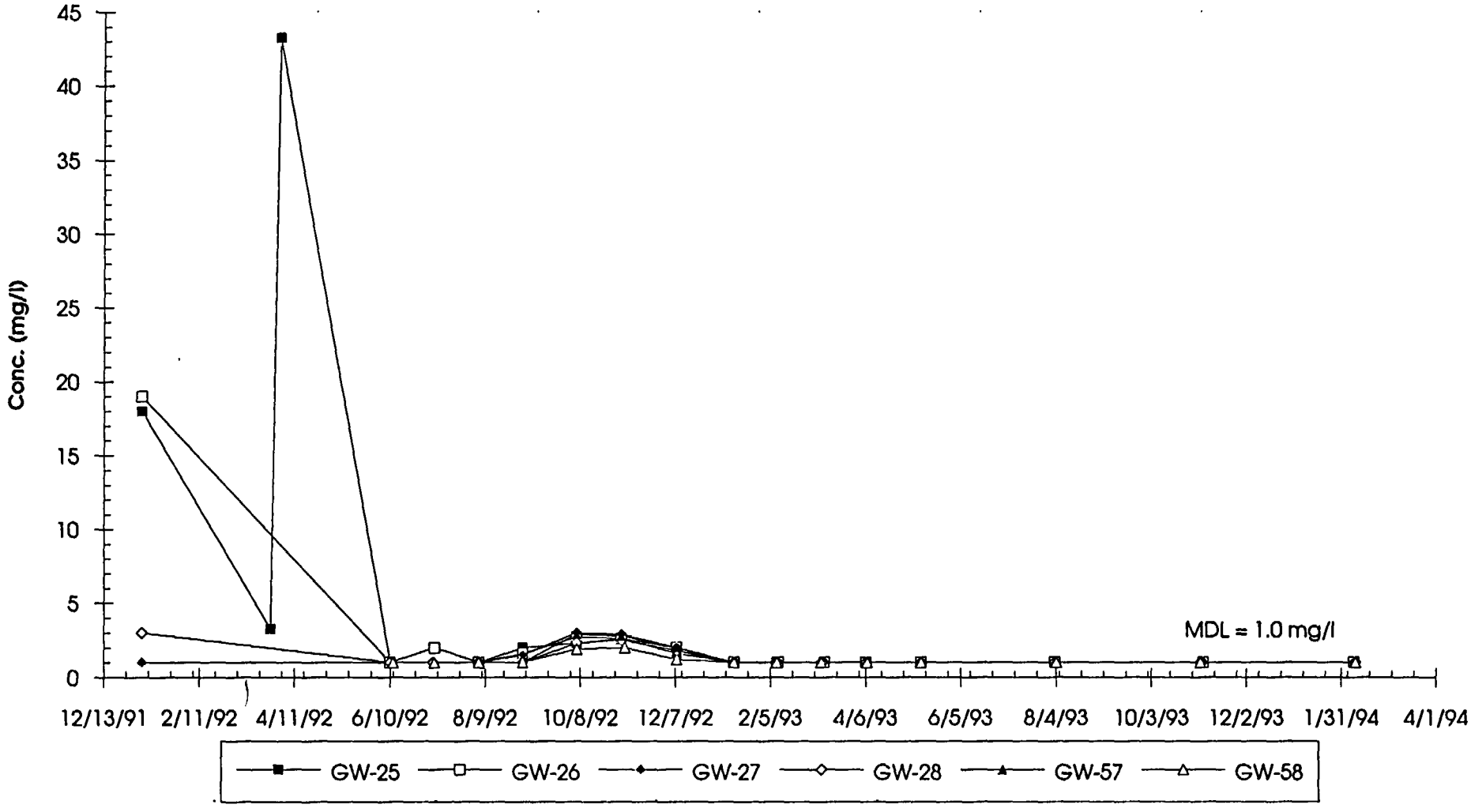
Envirocare SE 11e.(2) Cell GW Data: Total Organic Carbon (raw data)



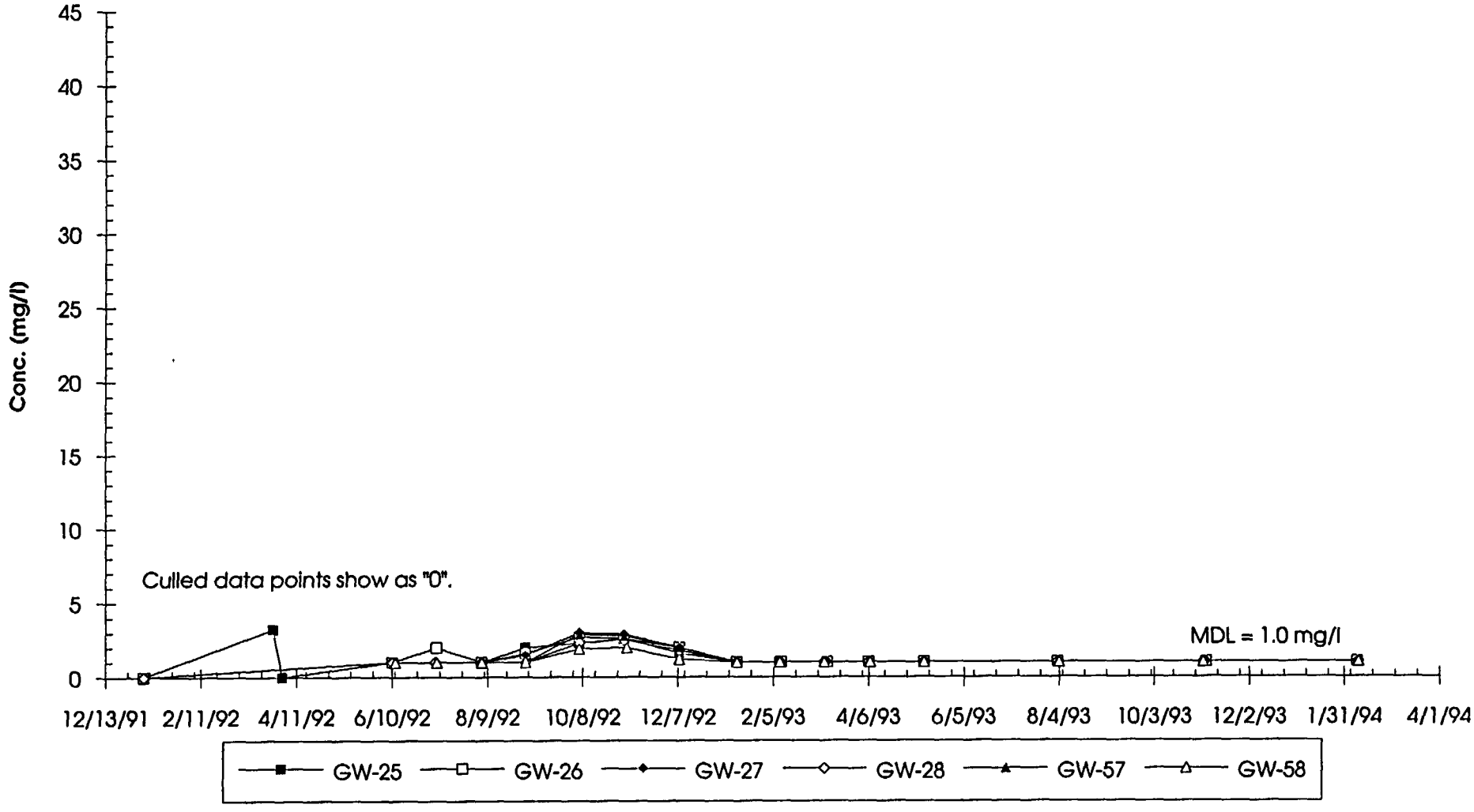
Envirocare SE 11e.(2) Cell GW Data: Total Organic Carbon (outliers culled)



Envirocare NW 11e.(2) Cell GW Data: Total Organic Carbon (raw data)



Envirocare NW 11e.(2) Cell GW Data: Total Organic Carbon (outliers culled)



ATTACHMENT 13

Total Organic Halogens (TOX) Concentration Data
DWQ Spreadsheet TOXALL.DIF

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX	GW-3	11/5/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/8/94	d	<	0.005	mg/l	
TOX	GW-16	12/19/91	d	<	0.5	mg/l	
TOX		3/19/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/2/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX	GW-19A	12/20/91	d	<	0.05	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/8/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/10/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		2/10/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	GW-20	1/8/92	d	<	0.005	mg/l	
TOX		3/20/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/7/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/f	lt	Conc.	units	QA Flag
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/4/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-22	1/8/92	d	<	0.005	mg/l	
TOX		3/19/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/7/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-23	1/8/92	d	<	0.005	mg/l	
TOX		3/19/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/7/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-24	1/8/92	d	<	0.005	mg/l	
TOX		3/20/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/8/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/4/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-25	1/6/92	d	<	0.005	mg/l	
TOX		3/27/92	d	<	0.5	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/3/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/8/94	d	<	0.005	mg/l	
TOX	GW-26	1/6/92	d	<	0.005	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/3/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/10/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/8/94	d	<	0.005	mg/l	
TOX	GW-27	1/6/92	d	<	0.005	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX		11/3/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/10/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/5/93	d	<	0.005	mg/l	
TOX		2/8/94	d	<	0.005	mg/l	
TOX	GW-28	1/6/92	d	<	0.005	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/3/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	JS
TOX	GW-29	1/8/92	d	<	0.005	mg/l	
TOX		3/20/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/12/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	
TOX		9/4/92	d	<	0.005	mg/l	
TOX		10/8/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/10/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		2/10/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/12/93	d	<	0.005	mg/l	RWQ
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-32	8/5/93	d	<	0.005	mg/l	
TOX	GW-36	1/8/92	d	<	0.005	mg/l	
TOX		6/10/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX		9/4/92	d	<	0.005	mg/l	
TOX		10/8/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/10/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	GW-37	1/6/92	d	<	0.005	mg/l	
TOX		6/12/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	
TOX		9/4/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/10/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	JS
TOX	GW-38	1/6/92	d	<	0.005	mg/l	
TOX		3/27/92	d	<	0.5	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/12/92	d	<	0.005	mg/l	
TOX		7/7/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	
TOX		9/4/92	d	<	0.005	mg/l	
TOX		10/8/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/10/92	d	<	0.005	mg/l	
TOX		1/14/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/2/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	GW-56	3/19/92	d	<	0.005	mg/l	
TOX		3/27/92	d	<	0.5	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/9/92	d	<	0.005	mg/l	
TOX		8/7/92	d	<	0.005	mg/l	
TOX		10/7/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX	GW-57	6/12/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/3/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/6/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/3/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/8/94	d	<	0.005	mg/l	
TOX	GW-58	6/12/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/5/92	d	<	0.005	mg/l	
TOX		9/2/92	d	<	0.005	mg/l	
TOX		10/6/92	d	<	0.005	mg/l	
TOX		11/5/92	d	<	0.005	mg/l	
TOX		12/8/92	d	<	0.005	mg/l	
TOX		1/13/93	d	<	0.005	mg/l	
TOX		2/9/93	d	<	0.005	mg/l	
TOX		3/9/93	d	<	0.005	mg/l	
TOX		4/7/93	d	<	0.005	mg/l	
TOX		5/11/93	d	<	0.005	mg/l	
TOX		8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	I-2-30	12/19/91	d	<	0.5	mg/l	
TOX		3/19/92	d	<	0.005	mg/l	
TOX		4/2/92	d	<	0.005	mg/l	
TOX		6/11/92	d	<	0.005	mg/l	
TOX		7/8/92	d	<	0.005	mg/l	
TOX		8/6/92	d	<	0.005	mg/l	
TOX		9/3/92	d	<	0.005	mg/l	
TOX		10/7/92	d	<	0.005	mg/l	
TOX		11/4/92	d	<	0.005	mg/l	
TOX		12/9/92	d	<	0.005	mg/l	

Envirocare Ground Water Quality Data: TOX							
Parameter	Well ID	Sample Date	d/t	lt	Conc.	units	QA Flag
TOX		1/15/93	d	<	0.005	mg/l	
TOX		2/11/93	d	<	0.005	mg/l	
TOX		3/10/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/12/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/4/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-16R	2/11/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/4/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-56R	2/11/93	d	<	0.005	mg/l	
TOX		3/11/93	d	<	0.005	mg/l	
TOX		4/8/93	d	<	0.005	mg/l	
TOX		5/13/93	d	<	0.005	mg/l	
TOX		8/5/93	d	<	0.005	mg/l	
TOX		11/4/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	
TOX	GW-60	8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	GW-63	8/4/93	d	<	0.005	mg/l	
TOX		11/3/93	d	<	0.005	mg/l	
TOX		2/9/94	d	<	0.005	mg/l	
TOX	GW-64	11/5/93	d	<	0.005	mg/l	
TOX		2/10/94	d	<	0.005	mg/l	

ATTACHMENT 14

11e.(2) Organic Contaminants: Summary Concentration Data
DWQ Spreadsheet IOGWPL.XLS

Envirocare GW Quality Data Statistics									
11e.(2) Organic Parameters									
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL	Reported MDL (mg/l)
GW-19A	Acetone	0.7	2	0.015	0.007	0.029	no	100	0.01, 0.02
GW-20	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-24	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-25	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-26	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-27	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-28	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-29	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-36	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-37	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-38	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-57	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-58	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-60	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-63	Acetone	0.7	2	0.015	0.007	0.029	no	100	
GW-19A	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	0.01, 0.02
GW-20	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-24	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-25	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-26	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-27	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-28	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-29	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-36	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-37	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-38	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-57	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-58	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-60	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-63	2-Butanone	4.2	2	0.015	0.007	0.029	no	100	
GW-19A	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	0.002
GW-20	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-24	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-25	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-26	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-27	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-28	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-29	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-36	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-37	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-38	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-57	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-58	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-60	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	
GW-63	Carbon Disulfide	0.7	2	0.002	0	0.002	no	100	

Envirocare GW Quality Data Statistics									
11e.(2) Organic Parameters									
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL	Reported MDL (mg/l)
GW-19A	Chloroform	0.1	2	0.002	0	0.002	no	100	0.002
GW-20	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-24	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-25	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-26	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-27	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-28	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-29	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-36	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-37	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-38	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-57	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-58	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-60	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-63	Chloroform	0.1	2	0.002	0	0.002	no	100	
GW-19A	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	0.002
GW-20	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-24	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-25	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-26	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-27	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-28	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-29	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-36	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-37	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-38	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-57	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-58	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-60	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-63	1,2-Dichloroethane	0.005	2	0.002	0	0.002	no	100	
GW-19A	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	0.002
GW-20	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-24	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-25	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-26	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-27	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-28	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-29	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-36	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-37	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-38	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-57	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-58	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-60	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	
GW-63	Methylene Chloride	0.005	2	0.002	0	0.002	no	100	

Envirocare GW Quality Data Statistics									
11e.(2) Organic Parameters									
Well ID	IOparameter	GWQS (mg/l)	Count	Mean (mg/l)	Std.Dev	x+2s	x+2s > GWQS?	%<MDL	Reported MDL (mg/l)
GW-19A	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	0.002, 0.004
GW-20	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-24	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-25	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-26	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-27	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-28	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-29	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-36	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-37	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-38	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-57	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-58	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-60	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-63	Napthalene	0.02	2	0.003	0.0014	0.0058	no	100	
GW-19A	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	0.004
GW-20	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-24	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-25	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-26	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-27	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-28	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-29	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-36	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-37	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-38	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-57	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-58	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-60	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-63	Diethyl Phthalate	5	2	0.004	0	0.004	no	100	
GW-19A	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	0.004
GW-20	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-24	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-25	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-26	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-27	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-28	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-29	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-36	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-37	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-38	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-57	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-58	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-60	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	
GW-63	2-Methylnaphthalene	n/a	2	0.004	0	0.004	no	100	

ATTACHMENT 15

Statistical Analysis of Radiologic Contaminants: Adjusted Raw Data
DWQ Spreadsheet RADGWPL.XLS

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-3	Beryllium-7	5333	5	24.4	4.3359	33.072	no	100
GW-3	Cadmium-109	533	5	46	15	76	no	100
GW-3	Cobalt-60	133	5	2.52	0.4324	3.3848	no	100
GW-3	Gross Alpha	15	6	72.7	137.27	347.24	YES	0
GW-3	Gross Beta		6	390	70.993	531.99		0
GW-3	Manganese-54	267	4	2.375	0.6238	3.6226	no	100
GW-3	Potassium-40	48	6	355.66	117.68	591.02	YES	0
GW-3	Radium-226		6	0.4833	0.1169	0.7171		0
GW-3	Radium-228		6	1.0666	0.5988	2.2642		0
GW-3	Ra-226+Ra-228	5	6	1.5499	0.6101	2.7701	no	
GW-3	Strontium-90	8	6	0.3666	0.2732	0.913	no	0
GW-3	Thorium-230	5	6	0.6166	0.9432	2.503	no	0
GW-3	Thorium-232	5	6	0	0	0	no	0
GW-3	Uranium-total	0.02	6	0.0736	0.0515	0.1766	YES	0
GW-3	Carbon-14	2133	6	3.3333	4.6332	12.6	no	0
GW-3	Technetium-99	800	4	0.45	0.8346	2.1192	no	0
GW-3	Iodine-total	1	4	0	0	0	no	0
GW-3	Neptunium-total	8	4	0.125	0.15	0.425	no	0
GW-16	Beryllium-7	5333	13	192.38	310.68	813.74	no	92.31
GW-16	Cadmium-109	533	13	78	20.493	118.99	no	92.31
GW-16	Cobalt-60	133	13	8.4769	4.2202	16.917	no	92.31
GW-16	Gross Alpha	15	13	36.538	37.493	111.52	YES	0
GW-16	Gross Beta		13	306.92	63.559	434.04		0
GW-16	Manganese-54	267	13	8.8692	3.8009	16.471	no	92.31
GW-16	Potassium-40	48	13	234.46	81.109	396.68	YES	7.69
GW-16	Radium-226		13	0.9307	0.3614	1.6535		0
GW-16	Radium-228		13	1.723	0.4781	2.6792		0
GW-16	Ra-226+Ra-228	5	13	2.6537	0.5993	3.8523	no	
GW-16	Strontium-90	8	13	0.3076	0.2782	0.864	no	0
GW-16	Thorium-230	5	13	0.2692	0.4837	1.2366	no	0
GW-16	Thorium-232	5	13	0.0153	0.0554	0.1261	no	0
GW-16	Uranium-total	0.02	13	0.0059	0.0014	0.0087	no	0
GW-16	Carbon-14	2133	8	4.25	3.3273	10.905	no	0
GW-16	Technetium-99	800	2	0.4	0.5656	1.5312	no	0
GW-16	Iodine-total	1	1	0	0	0	no	0
GW-16	Neptunium-total	8	2	0	0	0	no	0
GW-19A	Beryllium-7	5333	15	58.533	36.658	131.85	no	100
GW-19A	Cadmium-109	533	15	64.2	15.897	95.994	no	100
GW-19A	Cobalt-60	133	14	6.4785	3.1128	12.704	no	100
GW-19A	Gross Alpha	15	16	66.287	81.033	228.35	YES	0
GW-19A	Gross Beta		16	478.12	144.09	766.3		0
GW-19A	Manganese-54	267	15	6.1466	3.3727	12.892	no	100
GW-19A	Potassium-40	48	16	390	143.2	676.4	YES	6.25
GW-19A	Radium-226		16	0.4125	0.3283	1.0691		0
GW-19A	Radium-228		16	1.0062	0.8346	2.6754		0
GW-19A	Ra-226+Ra-228	5	16	1.4187	0.8968	3.2124	no	
GW-19A	Strontium-90	8	16	0.2375	0.3685	0.9745	no	0
GW-19A	Thorium-230	5	15	0.4066	0.9572	2.321	no	0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-19A	Thorium-232	5	16	0.0062	0.025	0.0562	no	0
GW-19A	Uranium-total	0.02	16	0.0016	0.0013	0.0042	no	12.5
GW-19A	Carbon-14	2133	13	4.7923	5.0177	14.828	no	7.69
GW-19A	Technetium-99	800	7	1.4428	2.1824	5.8076	no	0
GW-19A	Iodine-total	1	6	0.1166	0.2857	0.688	no	0
GW-19A	Neptunium-total	8	7	0.0142	0.0378	0.0898	no	0
GW-20	Beryllium-7	5333	17	141.23	252.88	646.99	no	100
GW-20	Cadmium-109	533	17	87.529	80.282	248.09	no	100
GW-20	Cobalt-60	133	17	8.8647	9.5443	27.953	no	88.24
GW-20	Gross Alpha	15	18	46.444	99.247	244.94	YES	0
GW-20	Gross Beta		18	508.88	143.48	795.84		0
GW-20	Manganese-54	267	17	9.6823	13.418	36.518	no	100
GW-20	Potassium-40	48	18	426.94	119.9	666.74	YES	5.56
GW-20	Radium-226		18	1.3944	0.7116	2.8176		0
GW-20	Radium-228		18	2.2388	0.9153	4.0694		0
GW-20	Ra-226+Ra-228	5	18	3.6332	1.1594	5.9519	YES	
GW-20	Strontium-90	8	18	0.3111	0.4751	1.2613	no	0
GW-20	Thorium-230	5	18	0.2111	0.4404	1.0919	no	0
GW-20	Thorium-232	5	18	0	0	0	no	0
GW-20	Uranium-total	0.02	18	0.0103	0.0054	0.0211	YES	0
GW-20	Carbon-14	2133	13	4.3846	4.9588	14.302	no	0
GW-20	Technetium-99	800	7	2.2142	4.7872	11.789	no	14.29
GW-20	Iodine-total	1	6	0.8666	1.8018	4.4702	YES	0
GW-20	Neptunium-total	8	7	0.0714	0.1496	0.3706	no	0
GW-22	Beryllium-7	5333	17	130.17	209.42	549.01	no	100
GW-22	Cadmium-109	533	17	73.647	25.918	125.48	no	100
GW-22	Cobalt-60	133	17	7.5529	6.1403	19.834	no	88.24
GW-22	Gross Alpha	15	18	103.21	134.25	371.71	YES	0
GW-22	Gross Beta		18	516.66	158.3	833.26		0
GW-22	Manganese-54	267	17	6.4941	3.6294	13.753	no	100
GW-22	Potassium-40	48	18	411.33	94.55	600.43	YES	11.11
GW-22	Radium-226		18	0.7111	0.3341	1.3793		0
GW-22	Radium-228		18	1.9388	0.5403	3.0194		0
GW-22	Ra-226+Ra-228	5	18	2.6499	0.6353	3.9204	no	
GW-22	Strontium-90	8	17	0.3882	0.6909	1.77	no	0
GW-22	Thorium-230	5	18	0.4888	1.0197	2.5282	no	0
GW-22	Thorium-232	5	18	0	0	0	no	0
GW-22	Uranium-total	0.02	18	0.0167	0.0018	0.0203	YES	0
GW-22	Carbon-14	2133	13	12.538	21.002	54.542	no	7.69
GW-22	Technetium-99	800	7	2.1142	1.3545	4.8232	no	14.29
GW-22	Iodine-total	1	6	0.15	0.3209	0.7918	no	0
GW-22	Neptunium-total	8	7	0.3	0.5196	1.3392	no	0
GW-23	Beryllium-7	5333	17	133.52	193.03	519.58	no	100
GW-23	Cadmium-109	533	17	78.941	28.875	136.69	no	100
GW-23	Cobalt-60	133	17	8.0882	5.3799	18.848	no	100
GW-23	Gross Alpha	15	18	54.305	91.674	237.65	YES	0
GW-23	Gross Beta		18	552.77	172.51	897.79		0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-23	Manganese-54	267	17	7.8117	4.8386	17.489	no	100
GW-23	Potassium-40	48	19	408.84	98.538	605.92	YES	0
GW-23	Radium-226		18	0.8055	0.294	1.3935		0
GW-23	Radium-228		18	2.0888	0.707	3.5028		0
GW-23	Ra-226+Ra-228	5	18	2.8943	0.7657	4.4257	no	
GW-23	Strontium-90	8	18	0.3	0.4186	1.1372	no	0
GW-23	Thorium-230	5	17	0.6235	1.1065	2.8366	no	0
GW-23	Thorium-232	5	18	0.05	0.1886	0.4272	no	0
GW-23	Uranium-total	0.02	18	0.0158	0.0019	0.0196	no	0
GW-23	Carbon-14	2133	12	4.25	6.3693	16.989	no	8.33
GW-23	Technetium-99	800	7	3.6571	4.9036	13.464	no	14.29
GW-23	Iodine-total	1	6	0.2166	0.5307	1.278	YES	0
GW-23	Neptunium-total	8	7	0.1	0.2645	0.629	no	0
GW-24	Beryllium-7	5333	16	113.25	160.46	434.17	no	100
GW-24	Cadmium-109	533	16	73.062	25.417	123.9	no	100
GW-24	Cobalt-60	133	16	7.3125	5.0069	17.326	no	93.75
GW-24	Gross Alpha	15	17	102.64	224.48	551.6	YES	0
GW-24	Gross Beta		17	580.58	199.73	980.04		0
GW-24	Manganese-54	267	16	6.625	3.9228	14.471	no	100
GW-24	Potassium-40	48	17	453.11	86.358	625.83	YES	0
GW-24	Radium-226		17	1.247	0.6124	2.4718		0
GW-24	Radium-228		17	2.5176	0.515	3.5476		0
GW-24	Ra-226+Ra-228	5	17	3.7646	0.8002	5.3649	YES	
GW-24	Strontium-90	8	17	0.2058	0.3287	0.8632	no	0
GW-24	Thorium-230	5	16	0.3375	0.7898	1.9171	no	0
GW-24	Thorium-232	5	17	0.0705	0.291	0.6525	no	0
GW-24	Uranium-total	0.02	17	0.0163	0.0022	0.0207	YES	0
GW-24	Carbon-14	2133	13	4.3076	5.0889	14.485	no	0
GW-24	Technetium-99	800	7	1.6	2.9552	7.5104	no	28.57
GW-24	Iodine-total	1	6	0.1666	0.4082	0.983	no	0
GW-24	Neptunium-total	8	7	0.0714	0.1253	0.322	no	0
GW-25	Beryllium-7	5333	17	93	105.11	303.22	no	100
GW-25	Cadmium-109	533	17	68.117	17.638	103.39	no	100
GW-25	Cobalt-60	133	17	6.9764	3.9745	14.925	no	88.24
GW-25	Gross Alpha	15	18	104.16	124.13	352.42	YES	0
GW-25	Gross Beta		18	606.22	173.39	953		0
GW-25	Manganese-54	267	17	6.5529	3.201	12.955	no	94.12
GW-25	Potassium-40	48	18	461.88	173.87	809.62	YES	5.56
GW-25	Radium-226		18	1.6166	0.651	2.9186		0
GW-25	Radium-228		18	2.4722	0.5879	3.648		0
GW-25	Ra-226+Ra-228	5	18	4.0888	0.8772	5.8431	YES	
GW-25	Strontium-90	8	18	0.3388	0.3164	0.9716	no	0
GW-25	Thorium-230	5	18	0.6277	1.043	2.7137	no	0
GW-25	Thorium-232	5	18	0	0	0	no	0
GW-25	Uranium-total	0.02	18	0.1093	0.0126	0.1345	YES	0
GW-25	Carbon-14	2133	13	9.6153	15.196	40.007	no	0
GW-25	Technetium-99	800	7	2.1857	2.4694	7.1245	no	28.57
GW-25	Iodine-total	1	6	0.1166	0.2857	0.688	no	0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-25	Neptunium-total	8	7	0.4428	0.8734	2.1896	no	0
GW-26	Beryllium-7	5333	15	54.333	33.258	120.85	no	100
GW-26	Cadmium-109	533	15	61.666	20.786	103.24	no	100
GW-26	Cobalt-60	133	15	5.9733	3.3044	12.582	no	100
GW-26	Gross Alpha	15	16	30.512	65.407	161.33	YES	0
GW-26	Gross Beta		16	573.75	192.69	959.13		0
GW-26	Manganese-54	267	15	5.22	3.0942	11.408	no	86.67
GW-26	Potassium-40	48	16	377.93	116.94	611.81	YES	0
GW-26	Radium-226		16	0.925	0.4538	1.8326		0
GW-26	Radium-228		16	2.2687	0.704	3.6767		0
GW-26	Ra-226+Ra-228	5	16	3.1937	0.8376	4.8689	no	
GW-26	Strontium-90	8	16	0.25	0.3759	1.0018	no	0
GW-26	Thorium-230	5	15	0.54	1.3048	3.1497	no	0
GW-26	Thorium-232	5	15	0	0	0	no	0
GW-26	Uranium-total	0.02	16	0.025	0.0042	0.0334	YES	0
GW-26	Carbon-14	2133	13	6.223	15.828	37.879	no	0
GW-26	Technetium-99	800	7	0.5142	0.474	1.4622	no	28.57
GW-26	Iodine-total	1	6	0.0666	0.1633	0.3932	no	14.29
GW-26	Neptunium-total	8	7	0.4142	0.5928	1.5998	no	0
GW-27	Beryllium-7	5333	15	47.733	27.652	103.04	no	100
GW-27	Cadmium-109	533	15	64.8	20.04	104.88	no	100
GW-27	Cobalt-60	133	15	6.04	3.44	12.92	no	93.33
GW-27	Gross Alpha	15	16	87	148.23	383.46	YES	0
GW-27	Gross Beta		16	558.75	138.46	835.67		0
GW-27	Manganese-54	267	15	5.0333	3.1766	11.387	no	100
GW-27	Potassium-40	48	16	399.75	149.27	698.29	YES	0
GW-27	Radium-226		16	0.525	0.3044	1.1338		0
GW-27	Radium-228		16	1.5	0.6762	2.8524		0
GW-27	Ra-226+Ra-228	5	16	2.025	0.7416	3.5081	no	
GW-27	Strontium-90	8	16	0.5	0.6033	1.7066	no	0
GW-27	Thorium-230	5	16	1.5437	2.5531	6.6499	YES	0
GW-27	Thorium-232	5	16	0.0062	0.025	0.0562	no	0
GW-27	Uranium-total	0.02	16	0.0108	0.0084	0.0276	YES	0
GW-27	Carbon-14	2133	13	4.1538	4.394	12.942	no	0
GW-27	Technetium-99	800	7	0.9857	1.5635	4.1127	no	28.57
GW-27	Iodine-total	1	6	0.45	1.1022	2.6544	YES	0
GW-27	Neptunium-total	8	7	0.2714	0.675	1.6214	no	0
GW-28	Beryllium-7	5333	15	50.2	30.526	111.25	no	100
GW-28	Cadmium-109	533	15	61.8	17.222	96.244	no	100
GW-28	Cobalt-60	133	15	6.1066	3.1949	12.496	no	100
GW-28	Gross Alpha	15	16	105.73	160.09	425.91	YES	0
GW-28	Gross Beta		16	497.5	128.34	754.18		0
GW-28	Manganese-54	267	15	5.2866	3.3161	11.919	no	100
GW-28	Potassium-40	48	16	394.87	78.665	552.2	YES	0
GW-28	Radium-226		16	0.5375	0.2578	1.0531		0
GW-28	Radium-228		16	1.5125	0.5572	2.6269		0
GW-28	Ra-226+Ra-228	5	16	2.05	0.6139	3.2779	no	

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-28	Strontium-90	8	16	0.25	0.2607	0.7714	no	0
GW-28	Thorium-230	5	16	0.225	0.5013	1.2276	no	0
GW-28	Thorium-232	5	16	0	0	0	no	0
GW-28	Uranium-total	0.02	16	0.0081	0.0014	0.0109	no	0
GW-28	Carbon-14	2133	13	4	5.5976	15.195	no	0
GW-28	Technetium-99	800	7	1.9857	2.5932	7.1721	no	0
GW-28	Iodine-total	1	6	0	0	0	no	0
GW-28	Neptunium-total	8	7	0.0571	0.0786	0.2143	no	0
GW-29	Beryllium-7	5333	17	140.64	252.28	645.2	no	100
GW-29	Cadmium-109	533	17	88.47	88.138	264.75	no	100
GW-29	Cobalt-60	133	17	9.5529	11.732	33.017	no	100
GW-29	Gross Alpha	15	18	62.333	95.533	253.4	YES	0
GW-29	Gross Beta		18	587.22	147.16	881.54		0
GW-29	Manganese-54	267	17	9.0529	15.598	40.249	no	100
GW-29	Potassium-40	48	18	478.88	106.2	691.28	YES	5.56
GW-29	Radium-226		18	1.1666	0.5667	2.3		0
GW-29	Radium-228		18	2.5055	0.758	4.0215		0
GW-29	Ra-226+Ra-228	5	18	3.6721	0.9464	5.5649	YES	
GW-29	Strontium-90	8	18	0.3333	0.4627	1.2587	no	0
GW-29	Thorium-230	5	18	0.5055	0.944	2.3935	no	0
GW-29	Thorium-232	5	18	0.0722	0.3064	0.685	no	0
GW-29	Uranium-total	0.02	18	0.0243	0.0081	0.0405	YES	0
GW-29	Carbon-14	2133	13	8.1692	9.2361	26.641	no	7.69
GW-29	Technetium-99	800	7	1.2285	1.3744	3.9773	no	14.29
GW-29	Iodine-total	1	6	0.1	0.2449	0.5898	no	14.29
GW-29	Neptunium-total	8	7	0.7571	1.8283	4.4137	no	0
GW-32	Beryllium-7	5333	1	34	0	34	no	100
GW-32	Cadmium-109	533	1	57	0	57	no	100
GW-32	Cobalt-60	133	1	2.4	0	2.4	no	100
GW-32	Gross Alpha	15	1	60	0	60	YES	0
GW-32	Gross Beta		1	350	0	350		0
GW-32	Manganese-54	267	1	2.7	0	2.7	no	100
GW-32	Potassium-40	48	1	320	0	320	YES	0
GW-32	Radium-226		1	1.6	0	1.6		0
GW-32	Radium-228		1	6	0	6		0
GW-32	Ra-226+Ra-228	5	1	7.6	0	7.6	YES	
GW-32	Strontium-90	8	1	0.5	0	0.5	no	0
GW-32	Thorium-230	5	1	1.2	0	1.2	no	0
GW-32	Thorium-232	5	1	0	0	0	no	0
GW-32	Uranium-total	0.02	1	0.0154	0	0.0154	no	0
GW-32	Carbon-14	2133	1	464	0	464	no	0
GW-32	Technetium-99	800	1	0	0	0	no	0
GW-32	Iodine-total	1	1	0	0	0	no	0
GW-32	Neptunium-total	8	1	0.1	0	0.1	no	0
GW-36	Beryllium-7	5333	15	60.266	53.424	167.11	no	100
GW-36	Cadmium-109	533	15	62.266	22.92	108.11	no	100
GW-36	Cobalt-60	133	15	6.0266	3.7156	13.458	no	100

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-36	Gross Alpha	15	16	79.125	126.59	332.31	YES	0
GW-36	Gross Beta		16	502.5	132.53	767.56		0
GW-36	Manganese-54	267	15	5.34	3.3602	12.06	no	100
GW-36	Potassium-40	48	16	390.93	136.4	663.73	YES	0
GW-36	Radium-226		16	0.8625	0.363	1.5885		0
GW-36	Radium-228		16	2.05	0.4442	2.9384		0
GW-36	Ra-226+Ra-228	5	16	2.9125	0.5737	4.0598	no	
GW-36	Strontium-90	8	16	0.2562	0.3482	0.9526	no	0
GW-36	Thorium-230	5	16	0.625	1.3208	3.2666	no	0
GW-36	Thorium-232	5	16	0	0	0	no	0
GW-36	Uranium-total	0.02	16	0.0457	0.0051	0.0559	YES	0
GW-36	Carbon-14	2133	13	5.5384	6.9476	19.434	no	0
GW-36	Technetium-99	800	7	1.4571	2.103	5.6631	no	0
GW-36	Iodine-total	1	6	0.7	1.5722	3.8444	YES	14.29
GW-36	Neptunium-total	8	7	0.1285	0.1799	0.4883	no	0
GW-37	Beryllium-7	5333	15	47.933	28.148	104.23	no	100
GW-37	Cadmium-109	533	15	59.933	20.214	100.36	no	100
GW-37	Cobalt-60	133	15	6.18	3.8859	13.952	no	93.33
GW-37	Gross Alpha	15	16	126.56	129.95	386.46	YES	0
GW-37	Gross Beta		16	545	153.66	852.32		0
GW-37	Manganese-54	267	15	5.2133	3.3953	12.004	no	100
GW-37	Potassium-40	48	16	413.31	120.04	653.39	YES	0
GW-37	Radium-226		16	1.2812	0.9758	3.2328		0
GW-37	Radium-228		16	2.6875	0.706	4.0995		0
GW-37	Ra-226+Ra-228	5	16	3.9687	1.2044	6.3775	YES	
GW-37	Strontium-90	8	16	0.4687	0.7939	2.0565	no	0
GW-37	Thorium-230	5	16	0.5187	0.9586	2.4359	no	0
GW-37	Thorium-232	5	16	0.075	0.2175	0.51	no	0
GW-37	Uranium-total	0.02	16	0.0128	0.0025	0.0178	no	0
GW-37	Carbon-14	2133	13	3.7153	5.4296	14.575	no	7.69
GW-37	Technetium-99	800	7	1.9571	2.3186	6.5943	no	28.57
GW-37	Iodine-total	1	6	0.6166	1.5105	3.6376	YES	0
GW-37	Neptunium-total	8	7	0.0857	0.1215	0.3287	no	0
GW-38	Beryllium-7	5333	17	85	108.92	302.84	no	94.12
GW-38	Cadmium-109	533	17	55.823	25.306	106.44	no	100
GW-38	Cobalt-60	133	17	5.2588	3.3408	11.94	no	100
GW-38	Gross Alpha	15	18	74.944	104.87	284.68	YES	0
GW-38	Gross Beta		18	458.33	92.815	643.96		0
GW-38	Manganese-54	267	17	5.447	3.8409	13.129	no	100
GW-38	Potassium-40	48	18	372.88	184.45	741.78	YES	11.11
GW-38	Radium-226		18	1.3444	0.3203	1.985		0
GW-38	Radium-228		18	2.8222	0.9873	4.7968		0
GW-38	Ra-226+Ra-228	5	18	4.1666	1.038	6.2425	YES	
GW-38	Strontium-90	8	18	0.4444	0.5669	1.5782	no	0
GW-38	Thorium-230	5	18	0.0888	0.1875	0.4638	no	0
GW-38	Thorium-232	5	18	0	0	0	no	0
GW-38	Uranium-total	0.02	18	0.0263	0.0043	0.0349	YES	0
GW-38	Carbon-14	2133	13	7.6307	11.763	31.157	no	0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-38	Technetium-99	800	7	1.2285	1.5041	4.2367	no	14.29
GW-38	Iodine-total	1	6	0.1166	0.2857	0.688	no	0
GW-38	Neptunium-total	8	7	0.0428	0.0786	0.2	no	14.29
GW-56	Beryllium-7	5333	13	206.38	319.79	845.96	no	100
GW-56	Cadmium-109	533	13	106.84	105.31	317.46	no	100
GW-56	Cobalt-60	133	13	12.384	11.995	36.374	no	92.31
GW-56	Gross Alpha	15	13	71.692	87.904	247.5	YES	0
GW-56	Gross Beta		13	510	132.53	775.06		0
GW-56	Manganese-54	267	13	10.038	11.351	32.74	no	92.31
GW-56	Potassium-40	48	13	389.69	74.992	539.67	YES	7.69
GW-56	Radium-226		13	1.4692	0.5963	2.6618		0
GW-56	Radium-228		13	2.6153	1.2468	5.1089		0
GW-56	Ra-226+Ra-228	5	13	4.0845	1.3821	6.8486	YES	
GW-56	Strontium-90	8	13	0.1923	0.206	0.6043	no	0
GW-56	Thorium-230	5	13	0.1615	0.2599	0.6813	no	0
GW-56	Thorium-232	5	13	0	0	0	no	0
GW-56	Uranium-total	0.02	13	0.0148	0.0021	0.019	no	0
GW-56	Carbon-14	2133	8	5.5	6.9282	19.356	no	0
GW-56	Technetium-99	800	2	8.6	1.697	11.994	no	0
GW-56	Iodine-total	1	1	0	0	0	no	0
GW-56	Neptunium-total	8	2	0.15	0.2121	0.5742	no	50
GW-57	Beryllium-7	5333	14	58.857	41.681	142.22	no	100
GW-57	Cadmium-109	533	14	68.071	29.068	126.21	no	100
GW-57	Cobalt-60	133	14	7.1785	4.6022	16.383	no	100
GW-57	Gross Alpha	15	15	66.453	75.925	218.3	YES	0
GW-57	Gross Beta		15	510	157.16	824.32		0
GW-57	Manganese-54	267	14	6.2285	5.002	16.233	no	100
GW-57	Potassium-40	48	15	421.6	81.388	584.38	YES	0
GW-57	Radium-226		15	0.58	0.3144	1.2088		0
GW-57	Radium-228		15	1.26	0.5315	2.323		0
GW-57	Ra-226+Ra-228	5	15	1.84	0.6175	3.0751	no	
GW-57	Strontium-90	8	15	0.3733	0.4697	1.3127	no	0
GW-57	Thorium-230	5	15	1.5066	2.3435	6.1936	YES	0
GW-57	Thorium-232	5	15	0.04	0.1549	0.3498	no	0
GW-57	Uranium-total	0.02	15	0.0044	0.0016	0.0076	no	0
GW-57	Carbon-14	2133	10	3.55	4.9815	13.513	no	0
GW-57	Technetium-99	800	4	1.95	1.9226	5.7952	no	0
GW-57	Iodine-total	1	3	0	0	0	no	0
GW-57	Neptunium-total	8	4	0.175	0.2362	0.6474	no	0
GW-58	Beryllium-7	5333	14	56.142	44.509	145.16	no	100
GW-58	Cadmium-109	533	14	61.857	24.933	111.72	no	100
GW-58	Cobalt-60	133	14	5.6642	3.7543	13.173	no	100
GW-58	Gross Alpha	15	15	91.293	89.869	271.03	YES	0
GW-58	Gross Beta		15	506.66	177.42	861.5		0
GW-58	Manganese-54	267	14	5.7214	3.8441	13.41	no	100
GW-58	Potassium-40	48	15	388.06	101.59	591.24	YES	0
GW-58	Radium-226		15	1.38	0.4039	2.1878		0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-58	Radium-228		15	2.54	0.7962	4.1324		0
GW-58	Ra-226+Ra-228	5	15	3.92	0.8928	5.7056	YES	
GW-58	Strontium-90	8	14	0.3642	0.3914	1.147	no	0
GW-58	Thorium-230	5	15	0.4466	1.0901	2.6268	no	0
GW-58	Thorium-232	5	15	0.1266	0.4905	1.1076	no	0
GW-58	Uranium-total	0.02	15	0.0304	0.0032	0.0368	YES	0
GW-58	Carbon-14	2133	13	3.3846	3.7977	10.98	no	0
GW-58	Technetium-99	800	7	1.0857	2.2821	5.6499	no	28.57
GW-58	Iodine-total	1	6	0.1833	0.449	1.0813	YES	0
GW-58	Neptunium-total	8	7	0.1857	0.376	0.9377	no	0
I-2-30	Beryllium-7	5333	17	137.88	241.43	620.74	no	100
I-2-30	Cadmium-109	533	17	69.823	24.492	118.81	no	100
I-2-30	Cobalt-60	133	17	7.3058	4.0748	15.455	no	94.12
I-2-30	Gross Alpha	15	18	21.916	42.199	106.31	YES	0
I-2-30	Gross Beta		18	389.44	227.14	843.72		0
I-2-30	Manganese-54	267	17	7.4058	4.5863	16.578	no	100
I-2-30	Potassium-40	48	18	343.77	108.61	560.99	YES	5.56
I-2-30	Radium-226		18	0.6722	0.3121	1.2964		5.56
I-2-30	Radium-228		18	1.6055	0.5482	2.7019		0
I-2-30	Ra-226+Ra-228	5	18	2.2777	0.6308	3.5393	no	
I-2-30	Strontium-90	8	17	0.5058	0.8317	2.1692	no	0
I-2-30	Thorium-230	5	17	0.8706	1.6046	4.0798	no	0
I-2-30	Thorium-232	5	18	0.1111	0.4714	1.0539	no	0
I-2-30	Uranium-total	0.02	18	0.0097	0.0014	0.0125	no	0
I-2-30	Carbon-14	2133	13	3.3846	4.6822	12.749	no	7.69
I-2-30	Technetium-99	800	7	2.4	5.1655	12.731	no	28.57
I-2-30	Iodine-total	1	6	0	0	0	no	0
I-2-30	Neptunium-total	8	7	0.0857	0.1215	0.3287	no	0
GW-16R	Beryllium-7	5333	6	24.666	8.1404	40.947	no	100
GW-16R	Cadmium-109	533	6	55	20.04	95.08	no	100
GW-16R	Cobalt-60	133	6	2.8	0.7615	4.323	no	100
GW-16R	Gross Alpha	15	7	19.442	35.2	89.842	YES	0
GW-16R	Gross Beta		6	430	125.54	681.08		0
GW-16R	Manganese-54	267	6	2.7833	0.796	4.3753	no	100
GW-16R	Potassium-40	48	8	473.75	92.263	658.28	YES	0
GW-16R	Radium-226		7	0.6285	0.3592	1.3469		0
GW-16R	Radium-228		7	1.5	0.4509	2.4018		0
GW-16R	Ra-226+Ra-228	5	7	2.1285	0.5765	3.2815	no	
GW-16R	Strontium-90	8	7	0.1714	0.2927	0.7568	no	0
GW-16R	Thorium-230	5	7	1.7714	2.4018	6.575	YES	0
GW-16R	Thorium-232	5	7	0	0	0	no	0
GW-16R	Uranium-total	0.02	7	0.014	0.0006	0.0152	no	0
GW-16R	Carbon-14	2133	7	3	4.546	12.092	no	0
GW-16R	Technetium-99	800	6	1.8833	2.8315	7.5463	no	16.67
GW-16R	Iodine-total	1	6	0.0333	0.0816	0.1965	no	0
GW-16R	Neptunium-total	8	6	0.25	0.4722	1.1944	no	0
GW-56R	Beryllium-7	5333	6	23.333	7.8909	39.115	no	100

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-56R	Cadmium-109	533	6	53.833	18.28	90.393	no	100
GW-56R	Cobalt-60	133	6	2.6166	0.5564	3.7294	no	100
GW-56R	Gross Alpha	15	7	6.3142	14.936	36.186	YES	0
GW-56R	Gross Beta		7	378.57	103.99	586.55		0
GW-56R	Manganese-54	267	6	2.2166	0.4792	3.175	no	100
GW-56R	Potassium-40	48	7	420	91.287	602.57	YES	0
GW-56R	Radium-226		7	1.2857	0.4525	2.1907		0
GW-56R	Radium-228		7	2.4571	0.896	4.2491		0
GW-56R	Ra-226+Ra-228	5	7	3.7428	1.0038	5.7504	YES	
GW-56R	Strontium-90	8	7	0.1714	0.2214	0.6142	no	0
GW-56R	Thorium-230	5	7	1.3428	2.3279	5.9986	YES	0
GW-56R	Thorium-232	5	7	0	0	0	no	0
GW-56R	Uranium-total	0.02	7	0.014	0.0012	0.0164	no	0
GW-56R	Carbon-14	2133	5	5.4	6.1887	17.777	no	0
GW-56R	Technetium-99	800	4	1.925	2.9364	7.7978	no	0
GW-56R	Iodine-total	1	4	0	0	0	no	0
GW-56R	Neptunium-total	8	4	0.225	0.3304	0.8858	no	0
GW-60	Beryllium-7	5333	2	22.5	4.9497	32.399	no	100
GW-60	Cadmium-109	533	2	44.5	14.849	74.198	no	100
GW-60	Cobalt-60	133	2	2.2	0.1414	2.4828	no	100
GW-60	Gross Alpha	15	3	28.833	44.43	117.69	YES	0
GW-60	Gross Beta		3	356.66	73.711	504.08		0
GW-60	Manganese-54	267	2	2.15	0.6364	3.4228	no	100
GW-60	Potassium-40	48	3	416.66	47.258	511.18	YES	0
GW-60	Radium-226		3	1.1	0.3	1.7		0
GW-60	Radium-228		3	1.8333	0.3214	2.4761		0
GW-60	Ra-226+Ra-228	5	3	2.9333	0.4397	3.8126	no	
GW-60	Strontium-90	8	3	0.3333	0.5773	1.4879	no	0
GW-60	Thorium-230	5	3	2.2	3.8105	9.821	YES	0
GW-60	Thorium-232	5	3	0	0	0	no	0
GW-60	Uranium-total	0.02	3	0.0166	0.0025	0.0216	YES	0
GW-60	Carbon-14	2133	3	1.6666	2.8867	7.44	no	0
GW-60	Technetium-99	800	3	2.6666	2.8095	8.2856	no	0
GW-60	Iodine-total	1	3	0.6	1.0392	2.6784	YES	0
GW-60	Neptunium-total	8	3	0.3333	0.4163	1.1659	no	0
GW-63	Beryllium-7	5333	2	21.5	7.7781	37.056	no	100
GW-63	Cadmium-109	533	2	44	15.556	75.112	no	100
GW-63	Cobalt-60	133	2	2.1	0.2828	2.6656	no	100
GW-63	Gross Alpha	15	3	14.466	22.177	58.82	YES	0
GW-63	Gross Beta		3	406.66	158.21	723.08		0
GW-63	Manganese-54	267	2	2.15	0.6364	3.4228	no	100
GW-63	Potassium-40	48	3	486.66	81.445	649.55	YES	0
GW-63	Radium-226		3	0.6333	0.4163	1.4659		0
GW-63	Radium-228		3	2.2666	0.3785	3.0236		0
GW-63	Ra-226+Ra-228	5	3	2.8999	0.5626	4.0252	no	
GW-63	Strontium-90	8	3	0.4666	0.5033	1.4732	no	0
GW-63	Thorium-230	5	3	1.1	1.0535	3.207	no	0
GW-63	Thorium-232	5	3	0	0	0	no	0

Envirocare Ground Water Quality Statistics: Radiologic Parameters								
Adjusted Raw Statistics								
Well ID	Radparameter	GWQS (pCi/l)	Count	Mean	Std.Dev	x+2s	x+2s > GWQS?	%<MDL
GW-63	Uranium-total	0.02	3	0.0096	0.0006	0.0108	no	0
GW-63	Carbon-14	2133	3	3.6666	1.5275	6.7216	no	0
GW-63	Technetium-99	800	3	0.7333	1.0214	2.7761	no	0
GW-63	Iodine-total	1	3	0	0	0	no	0
GW-63	Neptunium-total	8	3	0.0666	0.1154	0.2974	no	0
GW-64	Beryllium-7	5333	1	14	0	14	no	100
GW-64	Cadmium-109	533	1	30	0	30	no	100
GW-64	Cobalt-60	133	1	1.6	0	1.6	no	100
GW-64	Gross Alpha	15	2	62.6	81.175	224.95	YES	0
GW-64	Gross Beta		2	390	14.142	418.28		0
GW-64	Manganese-54	267	1	1.3	0	1.3	no	100
GW-64	Potassium-40	48	2	500	70.71	641.42	YES	0
GW-64	Radium-226		2	1.5	0.1414	1.7828		0
GW-64	Radium-228		2	3.2	1.2727	5.7454		0
GW-64	Ra-226+Ra-228	5	2	4.7	1.2805	7.2611	YES	
GW-64	Strontium-90	8	2	0.75	0.6364	2.0228	no	0
GW-64	Thorium-230	5	2	0.75	1.0606	2.8712	no	0
GW-64	Thorium-232	5	2	0.15	0.2121	0.5742	no	0
GW-64	Uranium-total	0.02	2	0.0113	0.0018	0.0149	no	0
GW-64	Carbon-14	2133	2	12.5	17.677	47.854	no	0
GW-64	Technetium-99	800	2	0.55	0.7778	2.1056	no	0
GW-64	Iodine-total	1	2	0	0	0	no	0
GW-64	Neptunium-total	8	2	0.15	0.2121	0.5742	no	0

Note: GW-16, Iodine-total: 3.6+/-3 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 1/2 samples for GWPLs.

Note: GW-19A, Iodine-total: 7.2+/-2.8 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-20, Iodine-total: 8.2+/-3.4 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-22, Iodine-total: 5.3+/-4.5 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-23, Thorium-230: value from 2/11/93 culled from data set, resulting in 17 samples available for GWPLs. Data point, 18 +/- 6 pCi/l, rejected by DWQ after consultation with Bingham, because a similar result reported from GW-24 from 3/10/93 was rejected by Bingham, reportedly for a problem with the aliquot volume (see 7/28/94 notes of telephone conversation with Mark Taggert, Bingham Environmental).

Note: GW-23, Iodine-total: 3.8+/-2.9 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-24, Iodine-total: 11+/-5 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-25, Iodine-total: 2+/-3.1 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-26, Thorium-230: 11 +/- 5 pCi/l value from 2/10/93 rejected by DWQ because 3/19/93 Barringer Lab QA Report, p.Q-7, said LLD = 15 pCi/l. Consequently, only 15 samples used for GWPLs.

Note: GW-26, Iodine-total: 3+/-3.2 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-27, Iodine-total: 1.3+/-2.4 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-28, Iodine-total: 4.6+/-3.3 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-29, Iodine-total: 4.9+/-3.7 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-36, Iodine-total: 4.6+/-3.2 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-37, Iodine-total: 1.3+/-3.1 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-38, Iodine-total: 4.4+/-3 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-56, Iodine-total: 3.9+/-3 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 1/2 sample for GWPLs.

Note: GW-57, Iodine-total: 3.6+/-4.1 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 3/4 samples for GWPLs.

Note: GW-58, Iodine-total: 3.5+/-3 pCi/l value from 9/29/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: I-2-30, Thorium-230: 8.2 +/-4.5 value from 2/11/93 rejected by DWQ because 3/19/93 Barringer Lab QA Report, p. Q-7. states that LLD = 15 pCi/l. Consequently, only 17 samples were used to determine GWPLs.

Note: I-2-30, Iodine-total: 1.6+/-2.8 pCi/l value from 9/30/92 rejected because LLD = 25 pCi/l, see 12/22/92 Barringer Lab QA Report, p.Q-4. Rejection resulted in 6/7 samples for GWPLs.

Note: GW-16R, Gross Beta: value collected on 8/5/93, 0 +/- 140 pCi/l was reported below the LLD, 4 pCi/l, see 9/15/93 Barringer Lab QA Report, p. Q-10. Consequently, value discounted for determination of GWPLs.

ATTACHMENT 16

Summary of Radiologic Contaminants
with
$\bar{x}+2\sigma$ Concentrations > GWQS

DWQ Spreadsheet RADGWPL.XLS

Envirocare GW Quality Data Statistics Summary							
Wells & Parameters Where x+2s > GWQS: Radiologics							
Well ID	Parameter	GWQS (pCi/l)*	Count	Mean (pCi/l)*	Std.Dev	x+2s	%<MDL
GW-3	Gross Alpha**	15	6	72.7	137.27	347.24	0
GW-3	Potassium-40	48	6	355.66	117.68	591.02	0
GW-3	Uranium-total	0.02	6	0.0736	0.0515	0.1766	0
GW-16	Gross Alpha	15	13	36.538	37.493	111.524	0
GW-16	Potassium-40	48	13	234.46	81.109	396.678	7.69
GW-16R	Gross Alpha	15	7	19.442	35.2	89.842	0
GW-16R	Potassium-40	48	8	473.75	92.263	658.276	0
GW-16R	Thorium-230	5	7	1.7714	2.4018	6.575	0
GW-19A	Gross Alpha	15	16	66.287	81.033	228.353	0
GW-19A	Potassium-40	48	16	390	143.2	676.4	6.25
GW-20	Gross Alpha	15	18	46.444	99.247	244.938	0
GW-20	Iodine-total	1	6	0.8666	1.8018	4.4702	0
GW-20	Potassium-40	48	18	426.94	119.9	666.74	5.56
GW-20	Ra-226+Ra-228	5	18	3.6332	1.15937	5.95195	0
GW-20	Uranium-total	0.02	18	0.0103	0.0054	0.0211	0
GW-22	Gross Alpha	15	18	103.21	134.25	371.71	0
GW-22	Potassium-40	48	18	411.33	94.55	600.43	11.11
GW-22	Uranium-total	0.02	18	0.0167	0.0018	0.0203	0
GW-23	Gross Alpha	15	18	54.305	91.674	237.653	0
GW-23	Iodine-total	1	6	0.2166	0.5307	1.278	0
GW-23	Potassium-40	48	19	408.84	98.538	605.916	0
GW-24	Gross Alpha	15	17	102.64	224.48	551.6	0
GW-24	Potassium-40	48	17	453.11	86.358	625.826	0
GW-24	Ra-226+Ra-228	5	17	3.7646	0.80016	5.36492	0
GW-24	Uranium-total	0.02	17	0.0163	0.0022	0.0207	0
GW-25	Gross Alpha	15	18	104.16	124.13	352.42	0
GW-25	Potassium-40	48	18	461.88	173.87	809.62	5.56
GW-25	Ra-226+Ra-228	5	18	4.0888	0.87717	5.84314	0
GW-25	Uranium-total	0.02	18	0.1093	0.0126	0.1345	0
GW-26	Gross Alpha	15	16	30.512	65.407	161.326	0
GW-26	Potassium-40	48	16	377.93	116.94	611.81	0
GW-26	Uranium-total	0.02	16	0.025	0.0042	0.0334	0
Footnotes:							
** Uranium-total values expressed in mg/l*							
*** Gross alpha statistics and GWPLs have been revised, see DWQ*							
spreadsheet U_ALPHA.XLS.							

Envirocare GW Quality Data Statistics Summary							
Wells & Parameters Where x+2s > GWQS: Radiologics							
Well ID	Parameter	GWQS (pCi/l)*	Count	Mean (pCi/l)*	Std.Dev	x+2s	%<MDL
GW-27	Gross Alpha	15	16	87	148.23	383.46	0
GW-27	Iodine-total	1	6	0.45	1.1022	2.6544	0
GW-27	Potassium-40	48	16	399.75	149.27	698.29	0
GW-27	Thorium-230	5	16	1.5437	2.5531	6.6499	0
GW-27	Uranium-total	0.02	16	0.0108	0.0084	0.0276	0
GW-28	Gross Alpha	15	16	105.73	160.09	425.91	0
GW-28	Potassium-40	48	16	394.87	78.665	552.2	0
GW-29	Gross Alpha	15	18	62.333	95.533	253.399	0
GW-29	Potassium-40	48	18	478.88	106.2	691.28	5.56
GW-29	Ra-226+Ra-228	5	18	3.6721	0.94642	5.56494	0
GW-29	Uranium-total	0.02	18	0.0243	0.0081	0.0405	0
GW-32	Gross Alpha	15	1	60	0	60	0
GW-32	Potassium-40	48	1	320	0	320	0
GW-32	Ra-226+Ra-228	5	1	7.6	0	7.6	0
GW-36	Gross Alpha	15	16	79.125	126.59	332.305	0
GW-36	Iodine-total	1	6	0.7	1.5722	3.8444	14.29
GW-36	Potassium-40	48	16	390.93	136.4	663.73	0
GW-36	Uranium-total	0.02	16	0.0457	0.0051	0.0559	0
GW-37	Gross Alpha	15	16	126.56	129.95	386.46	0
GW-37	Iodine-total	1	6	0.6166	1.5105	3.6376	0
GW-37	Potassium-40	48	16	413.31	120.04	653.39	0
GW-37	Ra-226+Ra-228	5	16	3.9687	1.20442	6.37754	0
GW-38	Gross Alpha	15	18	74.944	104.87	284.684	0
GW-38	Potassium-40	48	18	372.88	184.45	741.78	11.11
GW-38	Ra-226+Ra-228	5	18	4.1666	1.03796	6.24251	0
GW-38	Uranium-total	0.02	18	0.0263	0.0043	0.0349	0
GW-56	Gross Alpha	15	13	71.692	87.904	247.5	0
GW-56	Potassium-40	48	13	389.69	74.992	539.674	7.69
GW-56	Ra-226+Ra-228	5	13	4.0845	1.38206	6.84862	0
GW-56R	Gross Alpha	15	7	6.3142	14.936	36.1862	0
GW-56R	Potassium-40	48	7	420	91.287	602.574	0
GW-56R	Ra-226+Ra-228	5	7	3.7428	1.00378	5.75036	0
GW-56R	Thorium-230	5	7	1.3428	2.3279	5.9986	0
GW-57	Gross Alpha	15	15	66.453	75.925	218.303	0
GW-57	Potassium-40	48	15	421.6	81.388	584.376	0
GW-57	Thorium-230	5	15	1.5066	2.3435	6.1936	0

Envirocare GW Quality Data Statistics Summary							
Wells & Parameters Where x+2s > GWQS: Radiologics							
Well ID	Parameter	GWQS (pCi/l)*	Count	Mean (pCi/l)*	Std.Dev	x+2s	%<MDL
GW-58	Gross Alpha	15	15	91.293	89.869	271.031	0
GW-58	Iodine-total	1	6	0.1833	0.449	1.0813	0
GW-58	Potassium-40	48	15	388.06	101.59	591.24	0
GW-58	Ra-226+Ra-228	5	15	3.92	0.89279	5.70558	0
GW-58	Uranium-total	0.02	15	0.0304	0.0032	0.0368	0
GW-60	Gross Alpha	15	3	28.833	44.43	117.693	0
GW-60	Iodine-total	1	3	0.6	1.0392	2.6784	0
GW-60	Potassium-40	48	3	416.66	47.258	511.176	0
GW-60	Thorium-230	5	3	2.2	3.8105	9.821	0
GW-60	Uranium-total	0.02	3	0.0166	0.0025	0.0216	0
GW-63	Gross Alpha	15	3	14.466	22.177	58.82	0
GW-63	Potassium-40	48	3	486.66	81.445	649.55	0
GW-64	Gross Alpha	15	2	62.6	81.175	224.95	0
GW-64	Potassium-40	48	2	500	70.71	641.42	0
GW-64	Ra-226+Ra-228	5	2	4.7	1.28053	7.26106	0
I-2-30	Gross Alpha	15	18	21.916	42.199	106.314	0
I-2-30	Potassium-40	48	18	343.77	108.61	560.99	5.56

ATTACHMENT 17

Extrapolation of Gross Alpha Statistics and GWPLs from Historic Total Uranium Data

DWQ Spreadsheet U_ALPHA.XLS

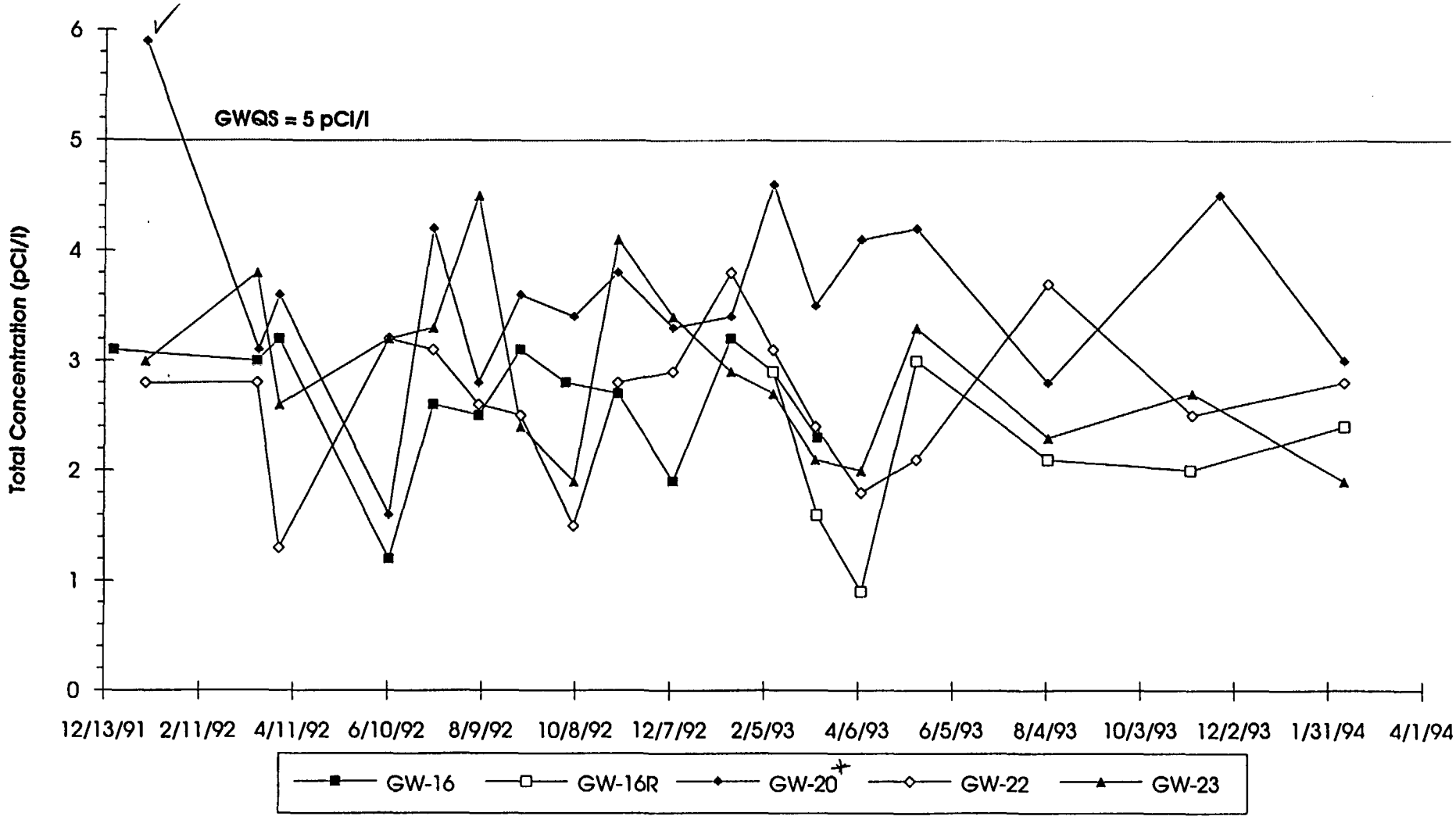
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Envirocare: Estimation of Gross Alpha from Uranium-total Data**												Statistics	
2	*Uranium Statistics: thru February, 1994*												based on	Ratio of
3		Uranium-total						Uranium		Est. Gross Alpha Conc.***			raw data	Estimated
4	Well ID	Count	Mean (mg/l)	Std. Dev.	Std.Dev. / Mean	x+2s		Mean <= 0.025		Mean* (pCi/l)	Std.Dev.** (pCi/l)	x+2s (pCi/l)	x+2s (pCi/l)	to Raw Stats
5	GW-3	6	0.0737	0.0515	0.6993	0.1767		no		124.6771	87.18087	299	347	0.86
6	GW-16	14	0.0060	0.0014	0.2272	0.0087		YES		16.62997	3.778071	24	112	0.22
7	GW-16R	8	0.0140	0.0006	0.0435	0.0153		YES		32.18427	1.40137	35	90	0.39
8	GW-19A	17	0.0016	0.0013	0.7933	0.0042		YES		6.128338	4.861421	16	228	0.07
9	GW-20	19	0.0103	0.0053	0.5095	0.0209		YES		25.42076	12.95134	51	245	0.21
10	GW-22	19	0.0167	0.0018	0.1070	0.0203		YES		36.85614	3.944992	45	372	0.12
11	GW-23	19	0.0159	0.0019	0.1218	0.0198		YES		35.39357	4.310217	44	238	0.19
12	GW-24	18	0.0163	0.0022	0.1331	0.0207		YES		36.14827	4.810818	46	552	0.08
13	GW-25	19	0.1093	0.0123	0.1126	0.1340		no		180.3476	20.3027	221	352	0.63
14	GW-26	17	0.0251	0.0041	0.1648	0.0334		no		48.89264	8.055981	65	161	0.40
15	GW-27	17	0.0109	0.0082	0.7490	0.0272		YES		26.44471	19.80654	66	383	0.17
16	GW-28	17	0.0082	0.0014	0.1671	0.0109		YES		21.1605	3.535862	28	426	0.07
17	GW-29	19	0.0244	0.0080	0.3267	0.0403		YES		49.2542	16.08978	81	253	0.32
18	GW-36	17	0.0457	0.0049	0.1083	0.0556		no		81.01178	8.771253	99	332	0.30
19	GW-37	17	0.0128	0.0025	0.1917	0.0178		YES		30.03052	5.756767	42	386	0.11
20	GW-38	19	0.0264	0.0042	0.1607	0.0348		no		50.78499	8.163366	67	285	0.24
21	GW-56	14	0.0149	0.0021	0.1391	0.0190		YES		33.66328	4.682101	43	248	0.17
22	GW-56R	8	0.0140	0.0011	0.0803	0.0162		YES		32.10844	2.57732	37	36	1.03
23	GW-57	16	0.0045	0.0016	0.3557	0.0076		YES		13.2952	4.729688	23	218	0.10
24	GW-58	16	0.0305	0.0031	0.1021	0.0367		no		57.22192	5.840828	69	271	0.25
25	I-2-30	19	0.0097	0.0014	0.1424	0.0125		YES		24.21095	3.448452	31	106	0.29
26	GW-60	3	0.0166	0.0026	0.1552	0.0218		YES		36.67663	5.691882	48	118	0.41
27	GW-63	3	0.0097	0.0007	0.0673	0.0110		YES		24.12538	1.623823	27	59	0.47
28	GW-64	2	0.0113	0.0018	0.1627	0.0150		YES		27.2147	4.427754	36	225	0.16
29													*min:*	0.07
30	**Footnotes:**												*max:*	1.03
31	* Mean gross alpha concentration derived as follows:												*avg.:*	0.30
32														
33		1) If mean uranium-total concentration < or = 0.025,												
34														
35			Mean Gross Alpha (pCi/l) = e ^ (6.7637 + 0.7718 * (ln (mean Uranium)))											
36														
37		2) If mean uranium-total concentration > 0.025,												
38														
39			Mean Gross Alpha (pCi/l) = 9.65 + 1561.1 (mean Uranium)											
40														
41	** Gross alpha standard deviation calculated as follows:													
42														
43		Std. Dev. (pCi/l) = Uranium Std. Dev. / Uranium Mean * Gross Alpha Mean (pCi/l)												
44														
45	*** Gross alpha GWQS = 15 pCi/l													

ATTACHMENT 18

Radium-226 + Radium-228 Composite Concentration Plots
DWQ Charts (RADIUM.XLW)RASUMALL.XLS Charts 1 thru 4

No increasing trends apparent

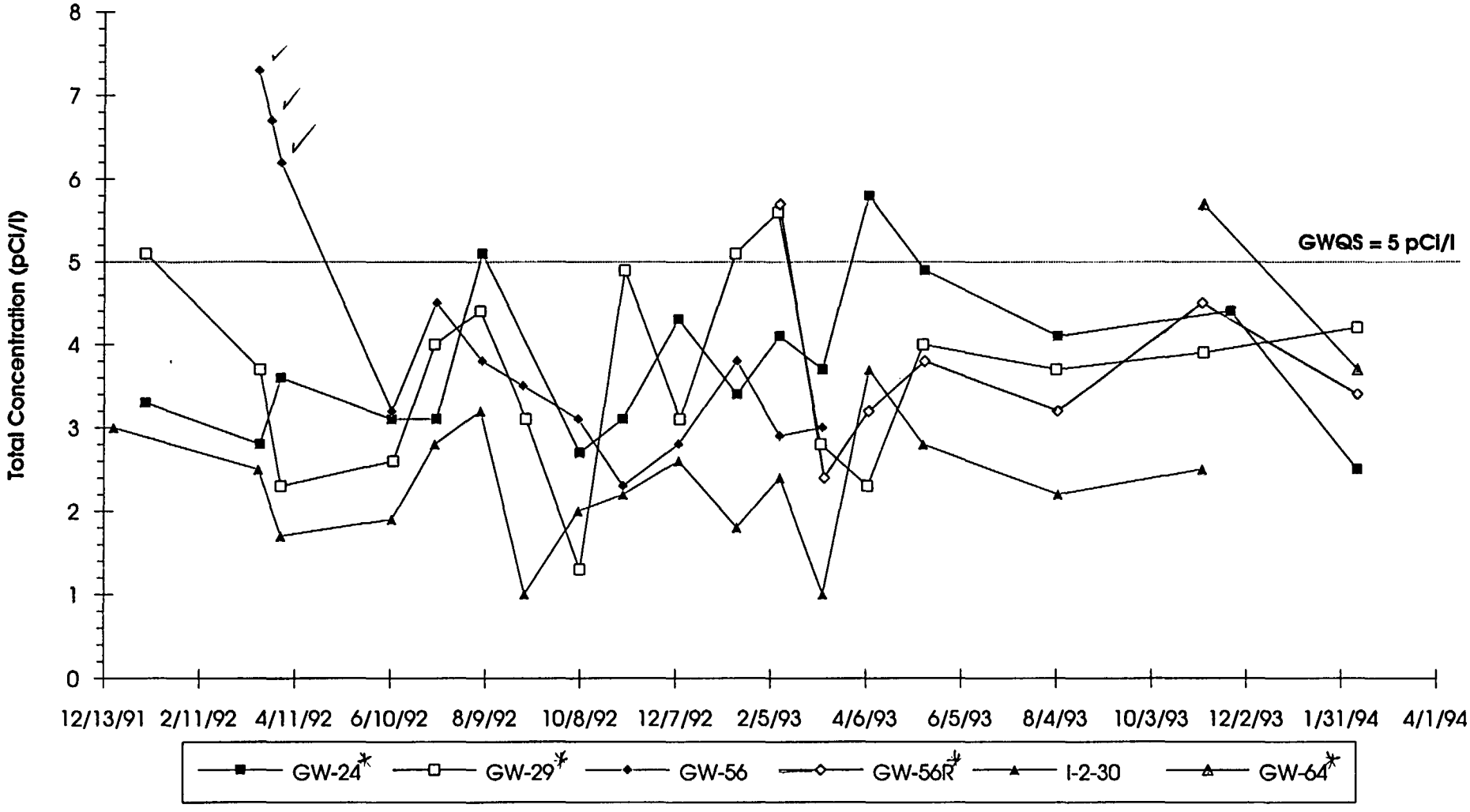
Envirocare LARW Cell: Ra-226 + Ra-228



* = $\bar{x} + 2\sigma > GWQS$

no increasing trends appear

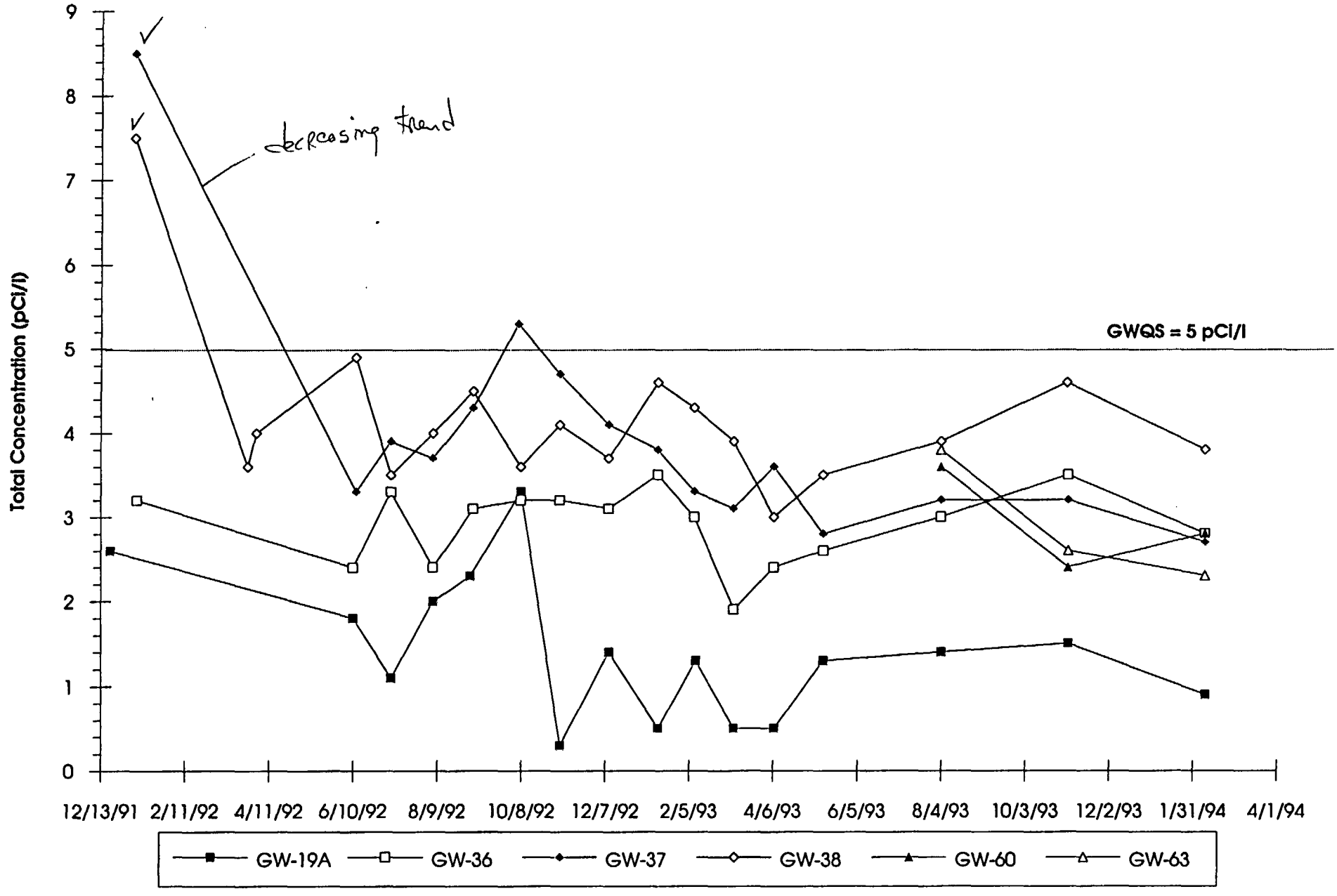
Envirocare LARW Cell: Ra-226 + Ra-228



* = $\bar{x} + 2\sigma > GWQS$

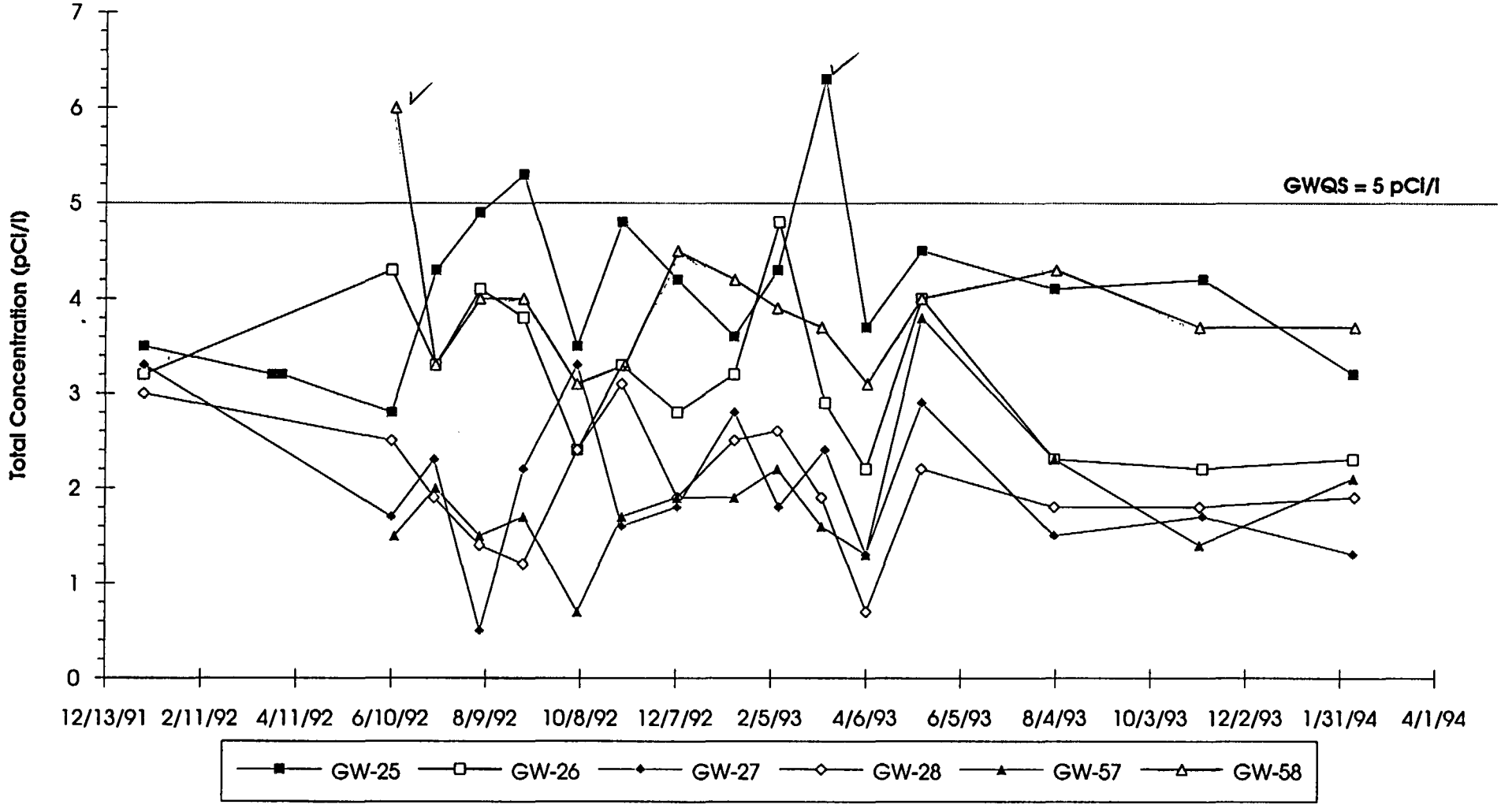
Envirocare SE 11e.(2) Cell: Ra-226 + Ra-228

No increasing trends



no increasing trends

Envirocare NW 11e.(2) Cell: Ra-226 + Ra-228

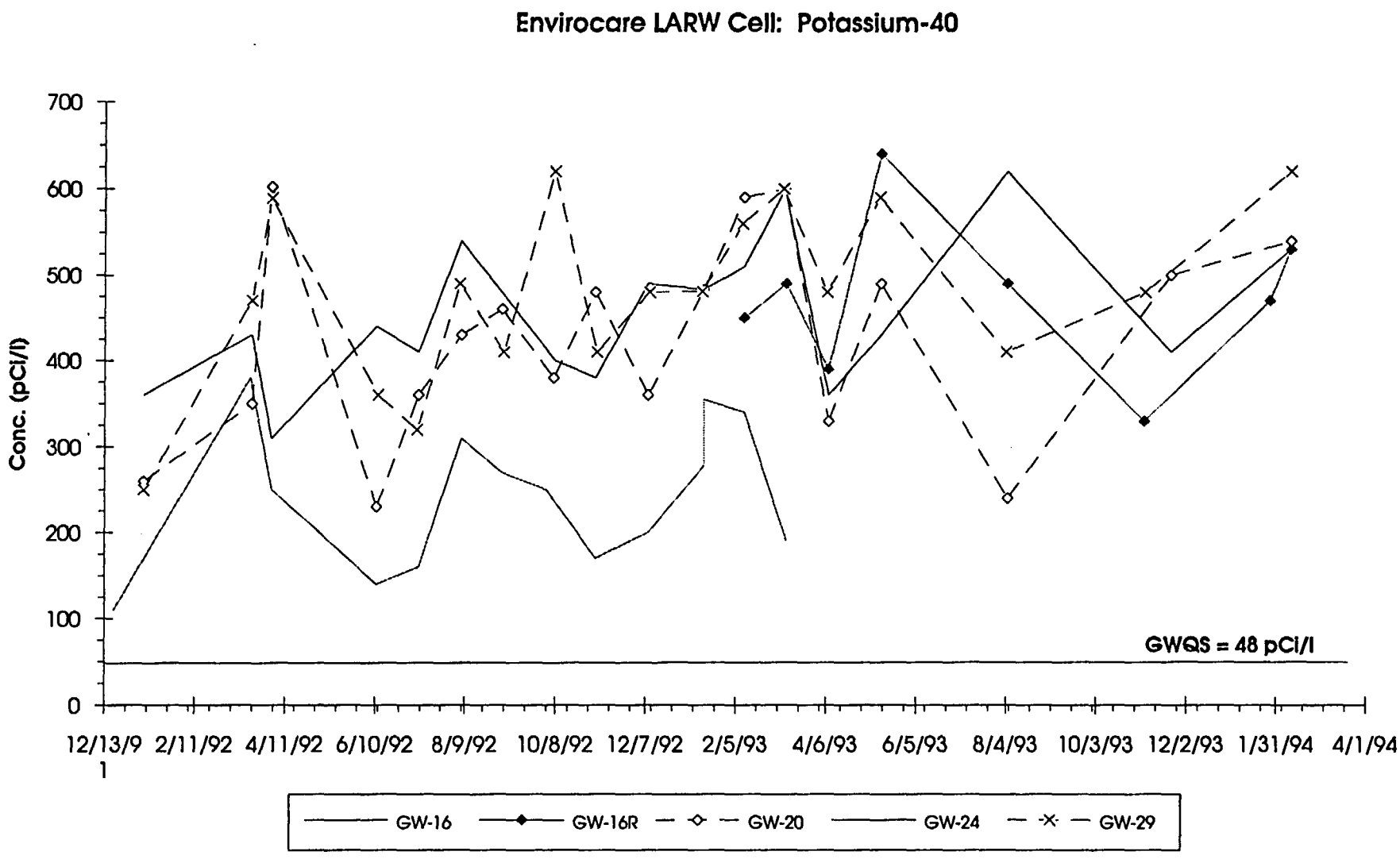


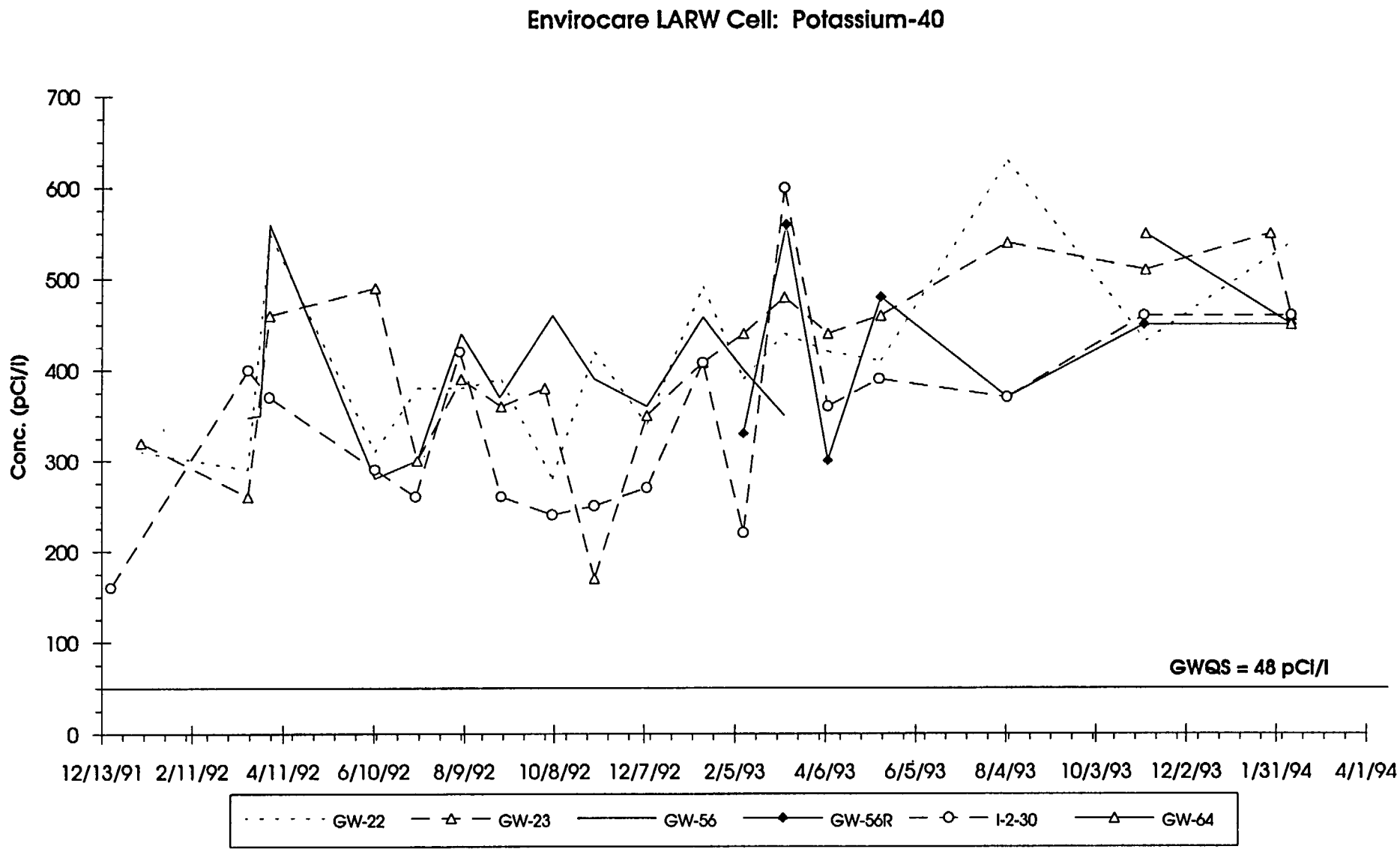
ATTACHMENT 19

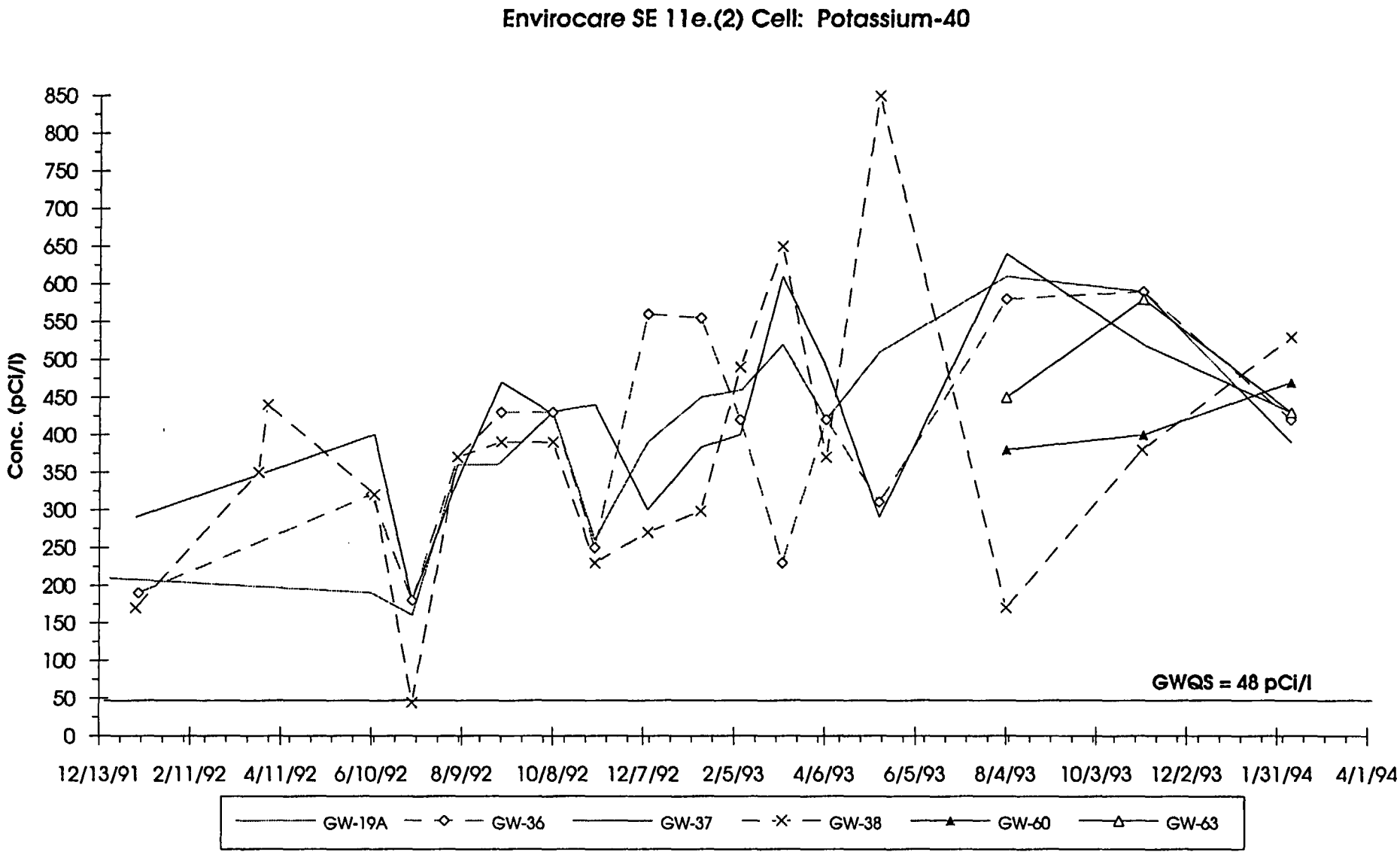
Potassium-40 Concentration Trends
DWQ Charts K40ALL.XLS Charts 1, 2, 4 and 9

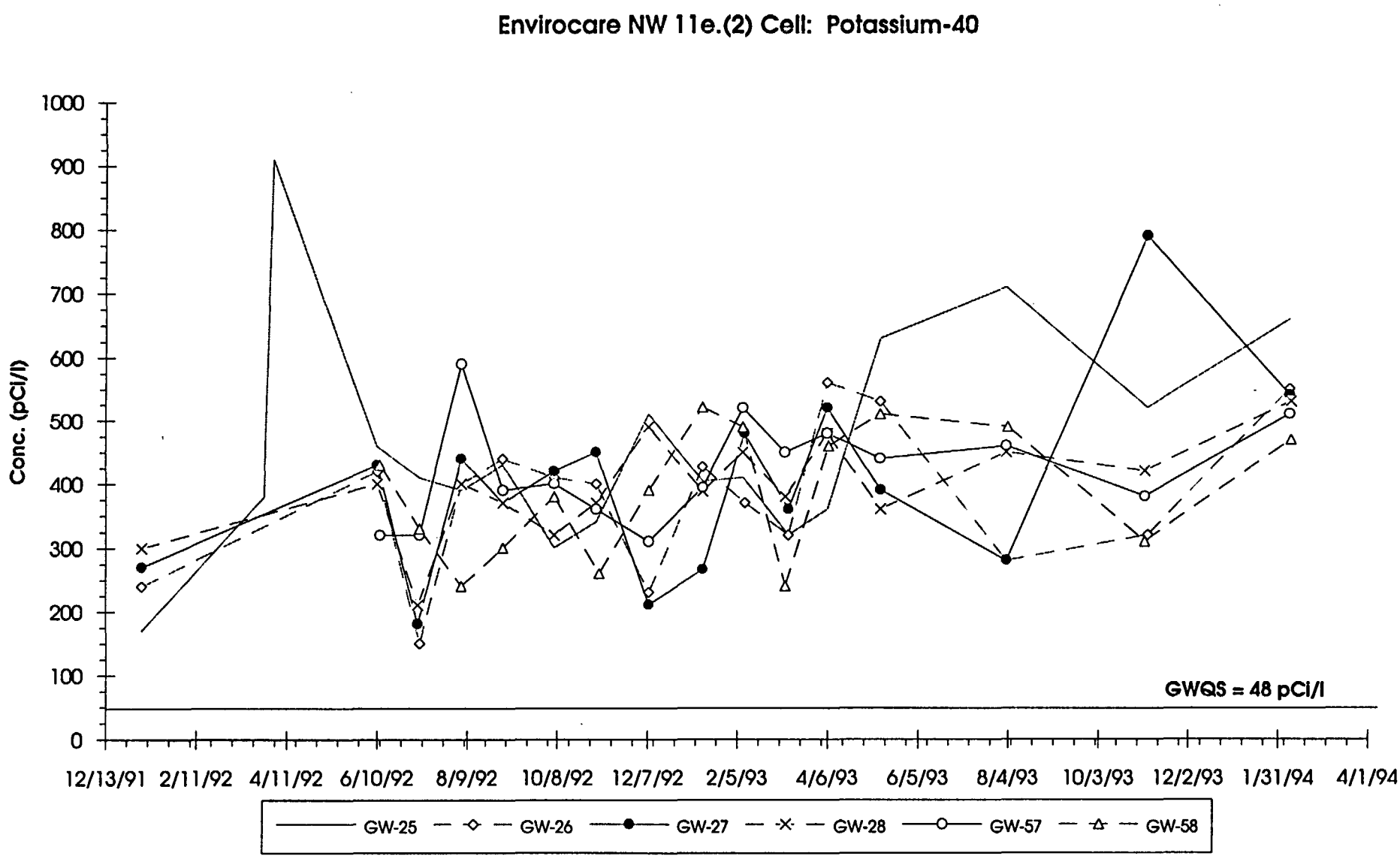
and

DWQ Database Output: Stable Potassium Statistics


Envirocare LARW Cell: Potassium-40
Conc. (pCi/l)
700
600
500
400
300
200
100
0
GWQS = 48 pCi/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16
GW-16R
GW-20
GW-24
GW-29


Envirocare LARW Cell: Potassium-40
Conc. (pCi/l)
700
600
500
400
300
200
100
0
GWQS = 48 pCi/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-22
GW-23
GW-56
GW-56R
I-2-30
GW-64


Envirocare SE 11e.(2) Cell: Potassium-40
Conc. (pCi/l)
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
GWQS = 48 pCi/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63


Envirocare NW 11e.(2) Cell: Potassium-40
Conc. (pCi/l)
1000
900
800
700
600
500
400
300
200
100
0
GWQS = 48 pCi/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

ENVIROCARE INORGANIC/ORGANIC BACKGROUND GROUND WATER QUALITY REPORT
1 PARAMETER / ALL WELLS - WITH MDL ADJUSTMENT
Parameter: Potassium
Sample Dates: From: 01/01/88 To: 04/01/94 Report Date: 08/04/94

Parameter	Report Conc.	Mod. Conc.			
Well ID: GW-3					
min:	300	300			
max:	830	830	Samples < MDL		Records Found
mean:	456.66	456.66			
std.dev.:	189.8	189.8	No.	Percent	From: 11/05/92
std.err.:	77.488	77.488			To: 02/08/94
Total Count:	6		0	0.00%	
Well ID: GW-16					
min:	270	270			
max:	610	610	Samples < MDL		Records Found
mean:	340.71	340.71			
std.dev.:	85.706	85.706	No.	Percent	From: 04/05/91
std.err.:	22.906	22.906			To: 03/11/93
Total Count:	14		0	0.00%	
Well ID: GW-19A					
min:	360	360			
max:	900	900	Samples < MDL		Records Found
mean:	503.52	503.52			
std.dev.:	116.56	116.56	No.	Percent	From: 04/03/91
std.err.:	28.27	28.27			To: 02/09/94
Total Count:	17		0	0.00%	
Well ID: GW-20					
min:	390	390			
max:	670	670	Samples < MDL		Records Found
mean:	533.88	533.88			
std.dev.:	69.208	69.208	No.	Percent	From: 01/08/92
std.err.:	16.312	16.312			To: 02/10/94
Total Count:	18		0	0.00%	
Well ID: GW-22					
min:	300	300			
max:	590	590	Samples < MDL		Records Found
mean:	472.22	472.22			
std.dev.:	80.917	80.917	No.	Percent	From: 01/08/92
std.err.:	19.072	19.072			To: 02/10/94
Total Count:	18		0	0.00%	
Well ID: GW-23					
min:	300	300			
max:	590	590	Samples < MDL		Records Found
mean:	470.55	470.55			
std.dev.:	81.707	81.707	No.	Percent	From: 01/08/92
std.err.:	19.258	19.258			To: 02/10/94
Total Count:	18		0	0.00%	
Well ID: GW-24					
min:	430	430			

ENVIROCARE INORGANIC/ORGANIC BACKGROUND GROUND WATER QUALITY REPORT
1 PARAMETER / ALL WELLS - WITH MDL ADJUSTMENT
Parameter: Potassium
Sample Dates: From: 01/01/88 To: 04/01/94 Report Date: 08/04/94

Parameter	Report Conc.	Mod. Conc.	Samples < MDL		Records Found
max:	610	610			
mean:	518.88	518.88			
std.dev.:	52.679	52.679	No.	Percent	From: 01/08/92
std.err.:	12.416	12.416			To: 02/10/94
Total Count:	18		0	0.00%	

Well ID: GW-25

min:	320	320			
max:	640	640	Samples < MDL		Records Found
mean:	512.77	512.77			
std.dev.:	88.037	88.037	No.	Percent	From: 01/06/92
std.err.:	20.75	20.75			To: 02/08/94
Total Count:	18		0	0.00%	

Well ID: GW-26

min:	300	300			
max:	600	600	Samples < MDL		Records Found
mean:	475	475			
std.dev.:	78.993	78.993	No.	Percent	From: 01/06/92
std.err.:	19.748	19.748			To: 02/08/94
Total Count:	16		0	0.00%	

Well ID: GW-27

min:	440	440			
max:	590	590	Samples < MDL		Records Found
mean:	499.37	499.37			
std.dev.:	41.226	41.226	No.	Percent	From: 01/06/92
std.err.:	10.306	10.306			To: 02/08/94
Total Count:	16		0	0.00%	

Well ID: GW-28

min:	320	320			
max:	620	620	Samples < MDL		Records Found
mean:	508.12	508.12			
std.dev.:	61.883	61.883	No.	Percent	From: 01/06/92
std.err.:	15.47	15.47			To: 02/09/94
Total Count:	16		0	0.00%	

Well ID: GW-29

min:	380	380			
max:	750	750	Samples < MDL		Records Found
mean:	540.55	540.55			
std.dev.:	78.1	78.1	No.	Percent	From: 01/08/92
std.err.:	18.408	18.408			To: 02/10/94
Total Count:	18		0	0.00%	

Well ID: GW-32

min:	400	400			
max:	400	400	Samples < MDL		Records Found
mean:	400	400			

ENVIROCARE INORGANIC/ORGANIC BACKGROUND GROUND WATER QUALITY REPORT
1 PARAMETER / ALL WELLS - WITH MDL ADJUSTMENT
Parameter: Potassium
Sample Dates: From: 01/01/88 To: 04/01/94 Report Date: 08/04/94

Parameter	Report Conc.	Mod. Conc.			
std.dev.:	0	0	No.	Percent	From: 08/05/93
std.err.:	0	0	-----	-------	To: 08/05/93
Total Count:	1		0	0.00%	

Well ID: GW-36

min:	400	400			
max:	550	550	Samples < MDL		Records Found
mean:	479.37	479.37	----------		----------
std.dev.:	40.078	40.078	No.	Percent	From: 01/08/92
std.err.:	10.019	10.019	-----	-------	To: 02/09/94
Total Count:	16		0	0.00%	

Well ID: GW-37

min:	410	410			
max:	620	620	Samples < MDL		Records Found
mean:	526.25	526.25	----------		----------
std.dev.:	51.234	51.234	No.	Percent	From: 01/06/92
std.err.:	12.808	12.808	-----	-------	To: 02/09/94
Total Count:	16		0	0.00%	

Well ID: GW-38

min:	390	390			
max:	620	620	Samples < MDL		Records Found
mean:	458.33	458.33	----------		----------
std.dev.:	56.802	56.802	No.	Percent	From: 01/06/92
std.err.:	13.388	13.388	-----	-------	To: 02/09/94
Total Count:	18		0	0.00%	

Well ID: GW-56

min:	250	250			
max:	530	530	Samples < MDL		Records Found
mean:	437.69	437.69	----------		----------
std.dev.:	88.896	88.896	No.	Percent	From: 03/19/92
std.err.:	24.655	24.655	-----	-------	To: 03/10/93
Total Count:	13		0	0.00%	

Well ID: GW-57

min:	290	290			
max:	670	670	Samples < MDL		Records Found
mean:	486.66	486.66	----------		----------
std.dev.:	76.032	76.032	No.	Percent	From: 06/12/92
std.err.:	19.631	19.631	-----	-------	To: 02/08/94
Total Count:	15		0	0.00%	

Well ID: GW-58

min:	380	380			
max:	610	610	Samples < MDL		Records Found
mean:	470	470	----------		----------
std.dev.:	50.849	50.849	No.	Percent	From: 06/12/92
std.err.:	13.129	13.129	-----	-------	To: 02/09/94

ENVIROCARE INORGANIC/ORGANIC BACKGROUND GROUND WATER QUALITY REPORT
1 PARAMETER / ALL WELLS - WITH MDL ADJUSTMENT
Parameter: Potassium
Sample Dates: From: 01/01/88 To: 04/01/94 Report Date: 08/04/94

Parameter	Report Conc.	Mod. Conc.			
Total Count:	15		0	0.00%	

Well ID: I-2-30

			Samples < MDL		Records Found
min:	190	190			
max:	700	700			
mean:	416.11	416.11			
std.dev.:	103.53	103.53	No.	Percent	From: 12/19/91
std.err.:	24.403	24.403			To: 02/10/94
Total Count:	18		0	0.00%	

Well ID: GW-16R

			Samples < MDL		Records Found
min:	430	430			
max:	530	530			
mean:	480	480			
std.dev.:	37.416	37.416	No.	Percent	From: 02/11/93
std.err.:	14.142	14.142			To: 02/10/94
Total Count:	7		0	0.00%	

Well ID: GW-56R

			Samples < MDL		Records Found
min:	440	440			
max:	570	570			
mean:	497.14	497.14			
std.dev.:	41.518	41.518	No.	Percent	From: 02/11/93
std.err.:	15.692	15.692			To: 02/10/94
Total Count:	7		0	0.00%	

Well ID: GW-60

			Samples < MDL		Records Found
min:	450	450			
max:	480	480			
mean:	463.33	463.33			
std.dev.:	15.275	15.275	No.	Percent	From: 08/04/93
std.err.:	8.8191	8.8191			To: 02/09/94
Total Count:	3		0	0.00%	

Well ID: GW-63

			Samples < MDL		Records Found
min:	430	430			
max:	460	460			
mean:	446.66	446.66			
std.dev.:	15.275	15.275	No.	Percent	From: 08/04/93
std.err.:	8.8191	8.8191			To: 02/09/94
Total Count:	3		0	0.00%	

Well ID: GW-64

			Samples < MDL		Records Found
min:	360	360			
max:	440	440			
mean:	400	400			
std.dev.:	56.568	56.568	No.	Percent	From: 11/05/93
std.err.:	40	40			To: 02/10/94
Total Count:	2		0	0.00%	

ENVIROCARE INORGANIC/ORGANIC BACKGROUND GROUND WATER QUALITY REPORT
1 PARAMETER / ALL WELLS - WITH MDL ADJUSTMENT
Parameter: Potassium
Sample Dates: From: 01/01/88 To: 04/01/94 Report Date: 08/04/94

Parameter	Report Conc.	Mod. Conc.

GRAND STATS

min:	190
max:	900
mean:	481.07
std.dev.:	86.36
std.err.:	4.7757
Total Count:	327

Samples < MDL	
No.	Percent
0	0.00%

Records Found
From: 04/03/91
To: 02/10/94

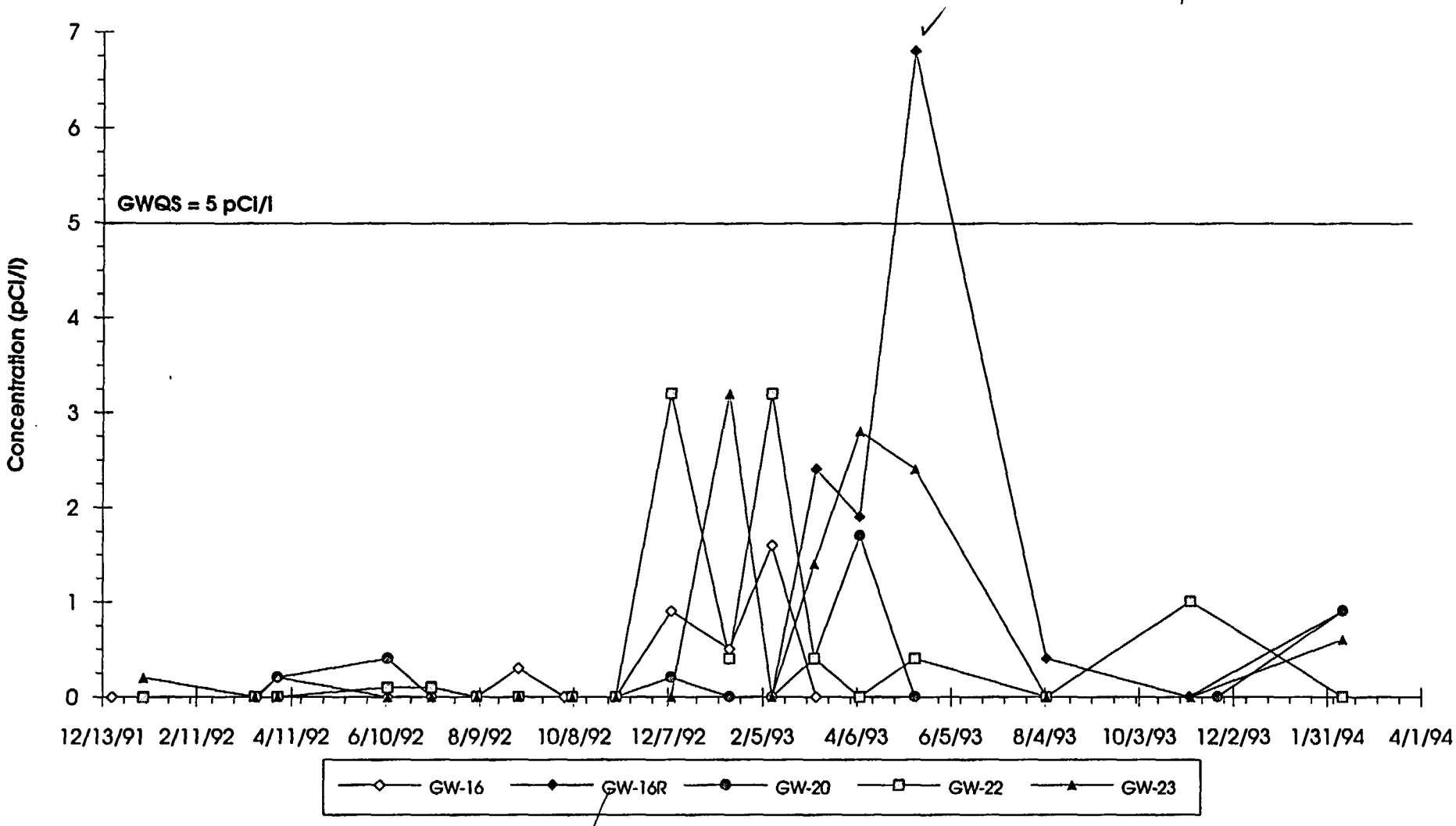
ATTACHMENT 20

Thorium-230 Concentration Trends
DWQ Charts TH230ALL.XLS Charts 1 thru 5

Adjusted Date

No increasing trends apparent

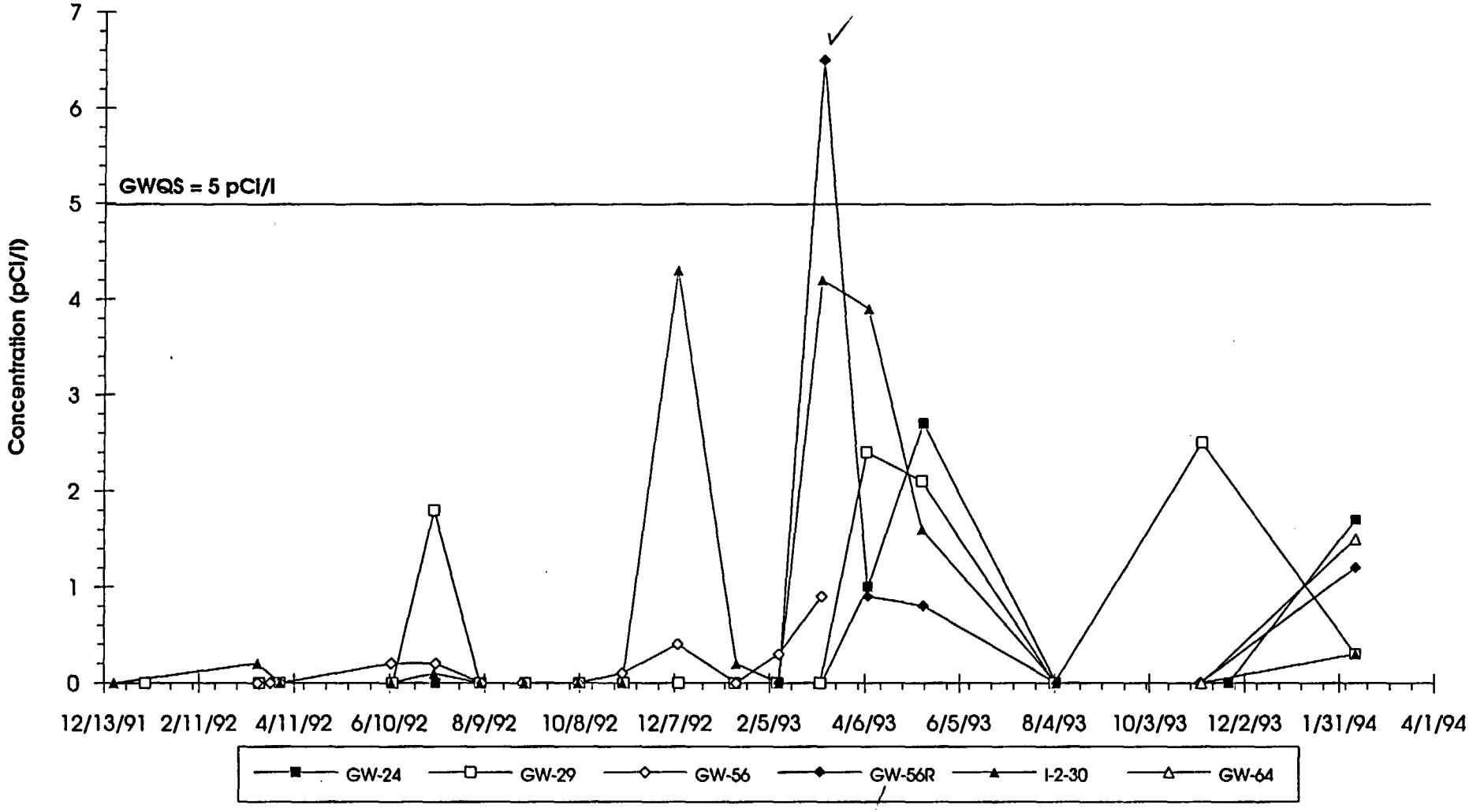
Envirocare LARW Cell: Thorium-230



One spike > GWQS

No increasing trends apparent

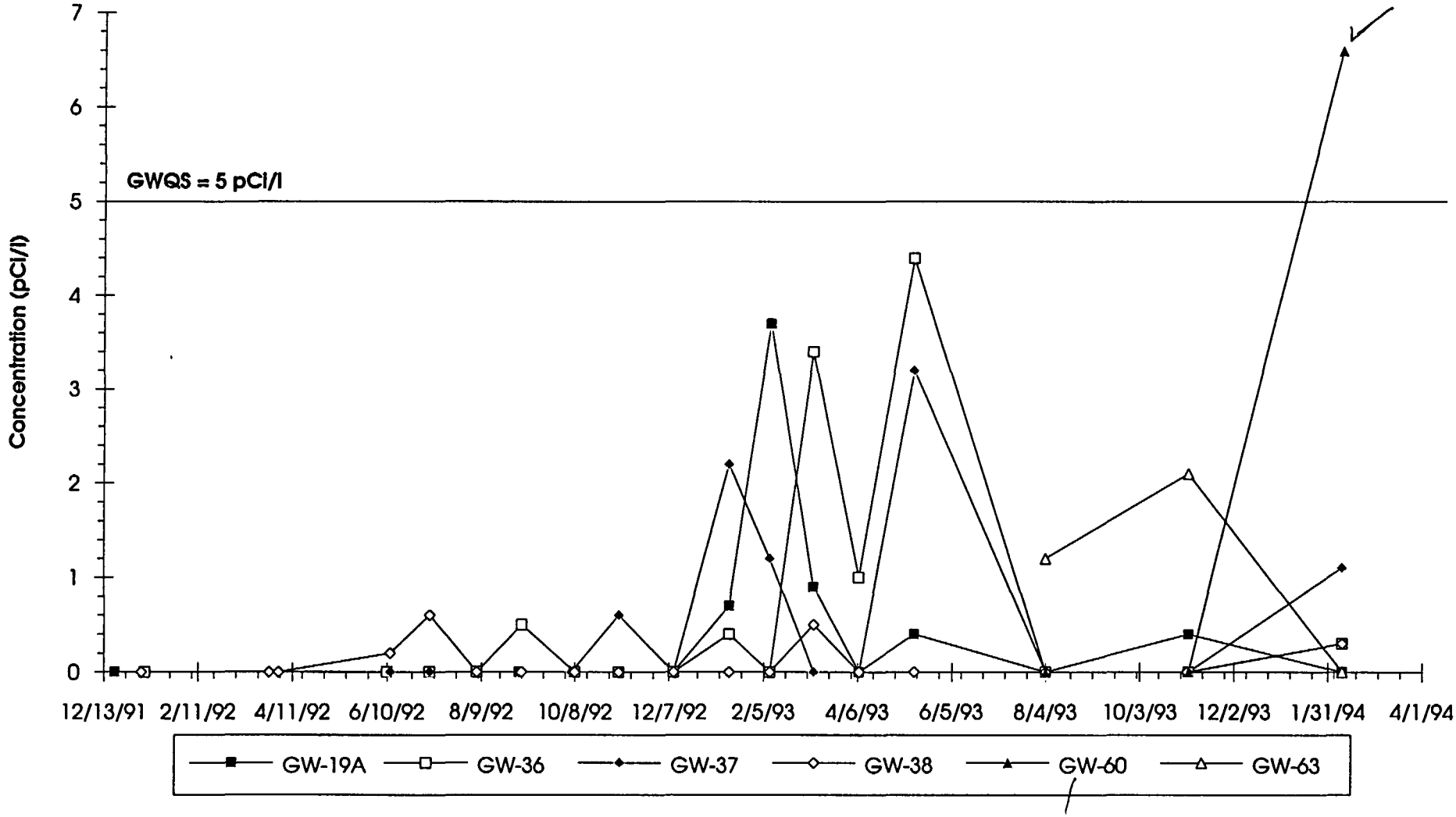
Envirocare LARW Cell: Thorium-230



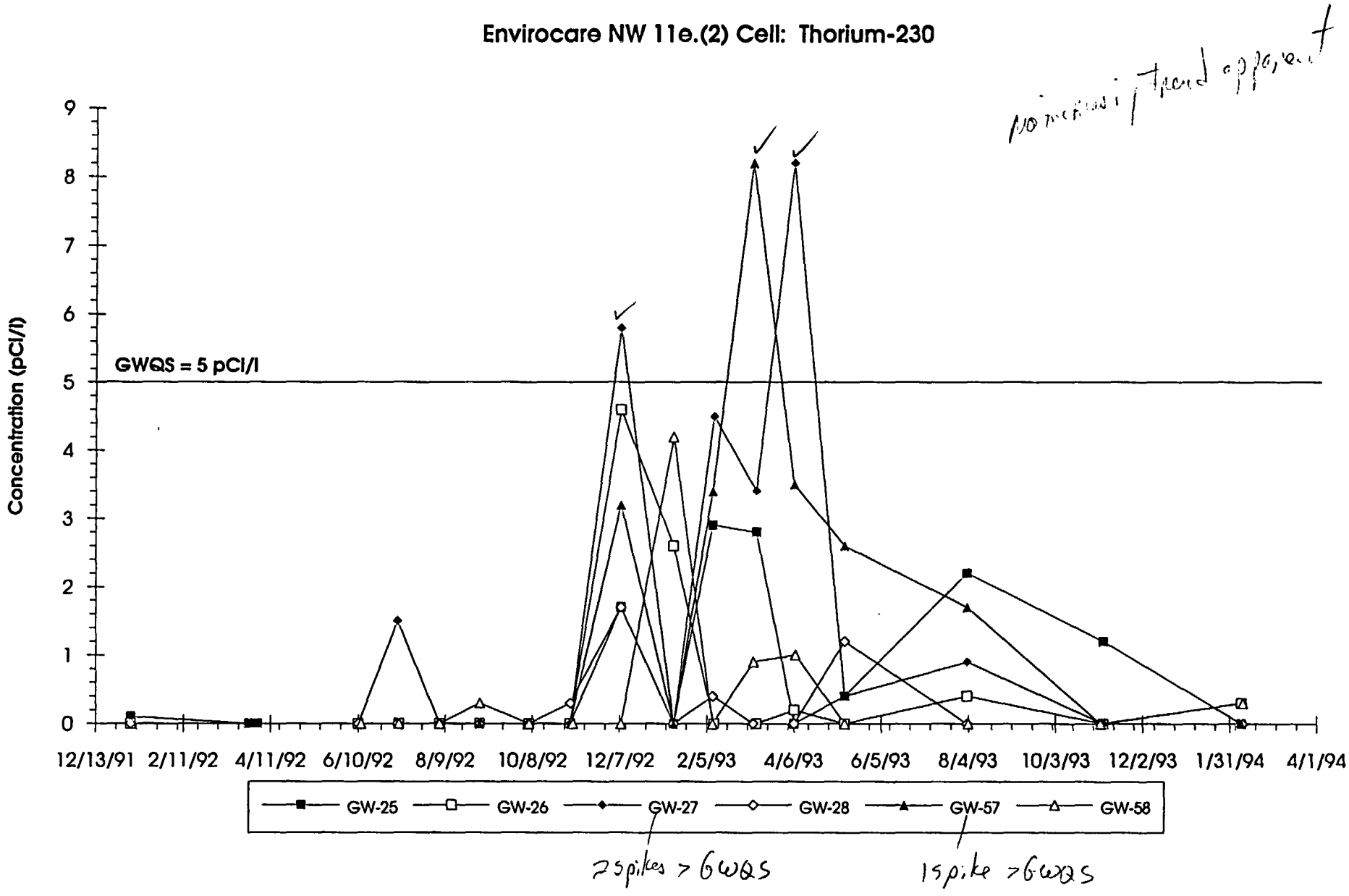
1 spike > GWQS

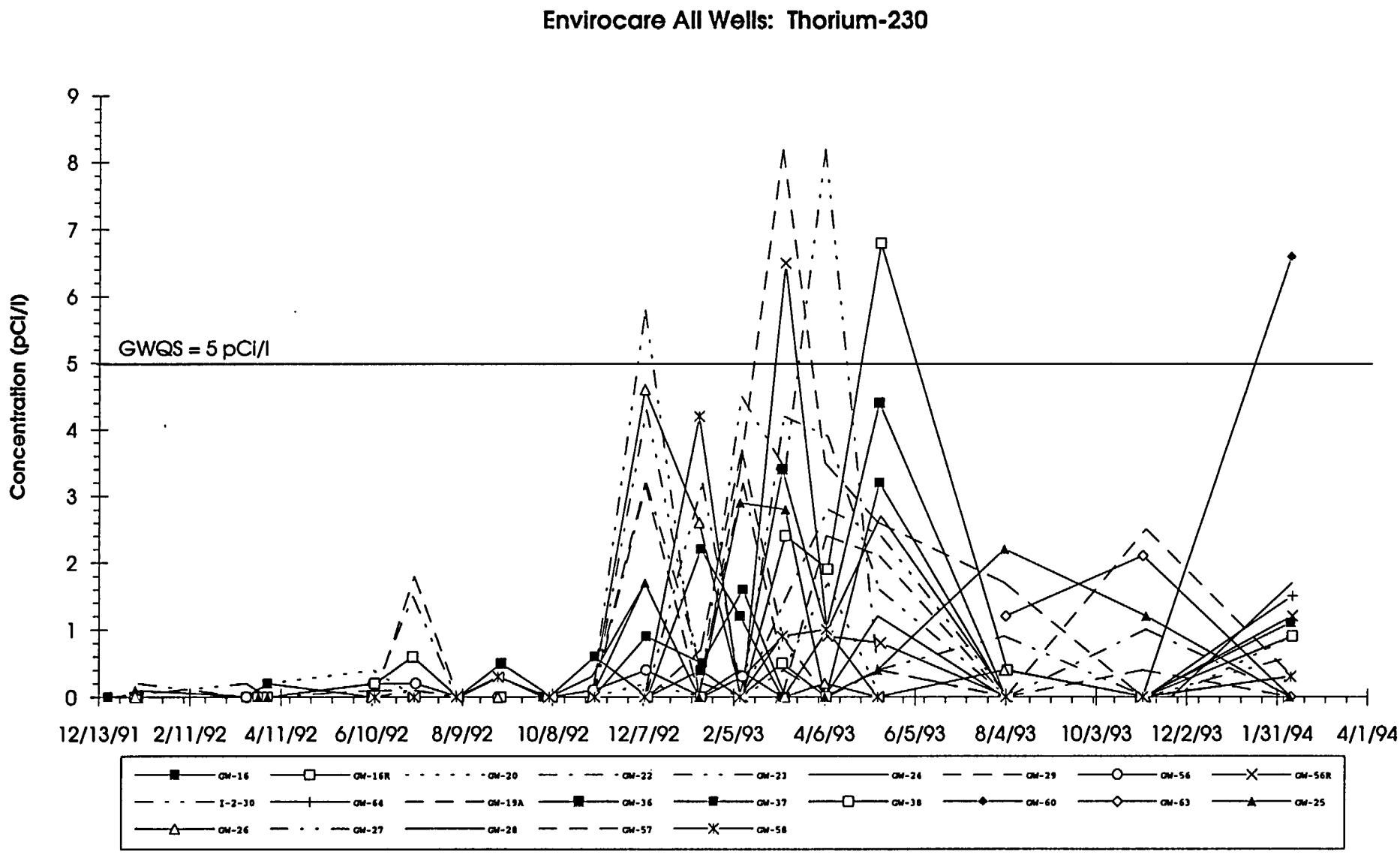
No apparent increasing trends

Envirocare SE 11e.(2) Cell: Thorium-230



1 spike > GWQS
watch further


Envirocare NW 11e.(2) Cell: Thorium-230
no increasing trend apparent
Concentration (pCi/l)
GWQS = 5 pCi/l
0
1
2
3
4
5
6
7
8
9
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58
2 spikes > GWQS
1 spike > GWQS

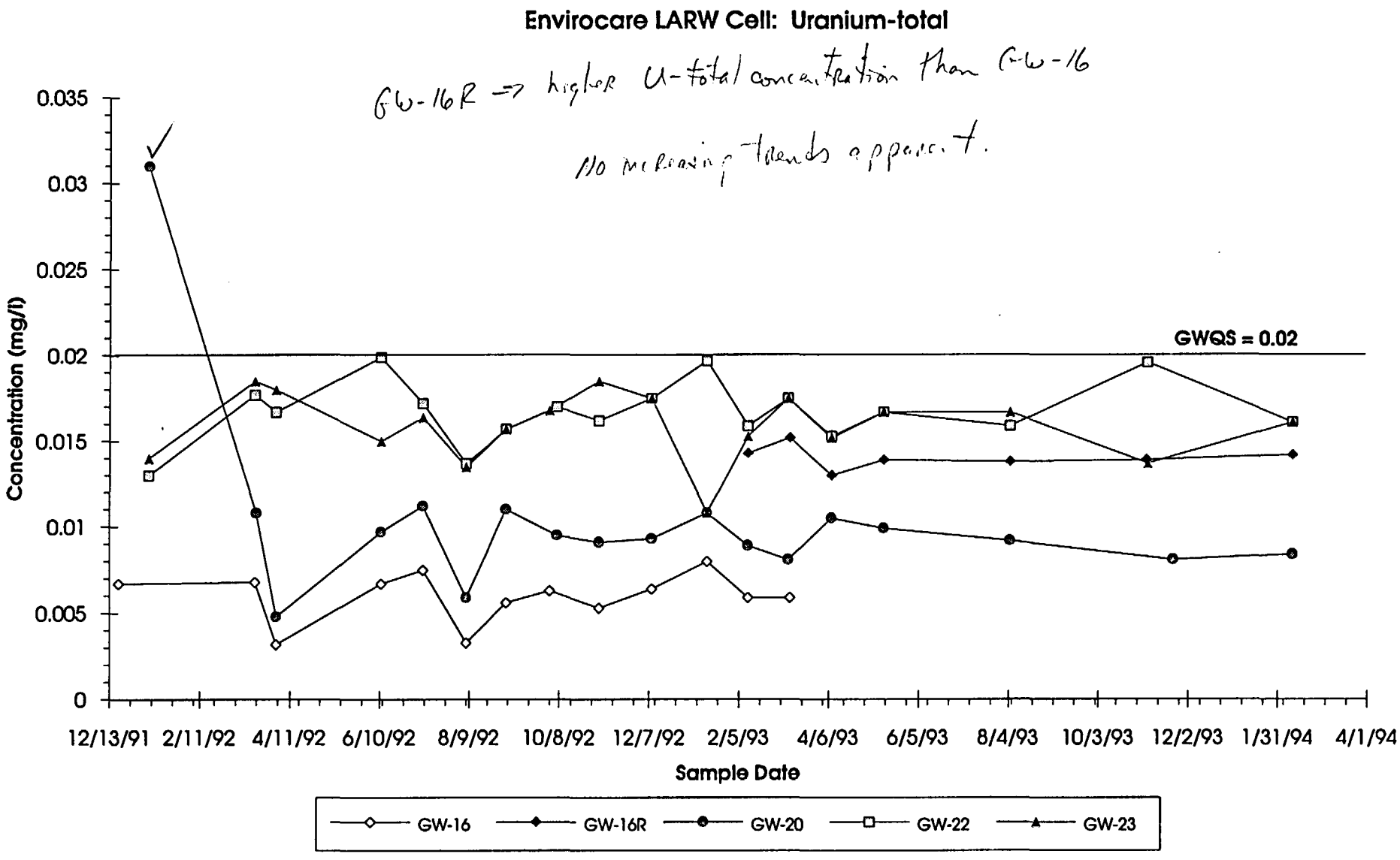

Envirocare All Wells: Thorium-230
Concentration (pCi/l)
GWQS = 5 pCi/l
0
1
2
3
4
5
6
7
8
9
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16
GW-16R
GW-20
GW-22
GW-23
GW-24
GW-29
GW-56
GW-56R
I-2-30
GW-64
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

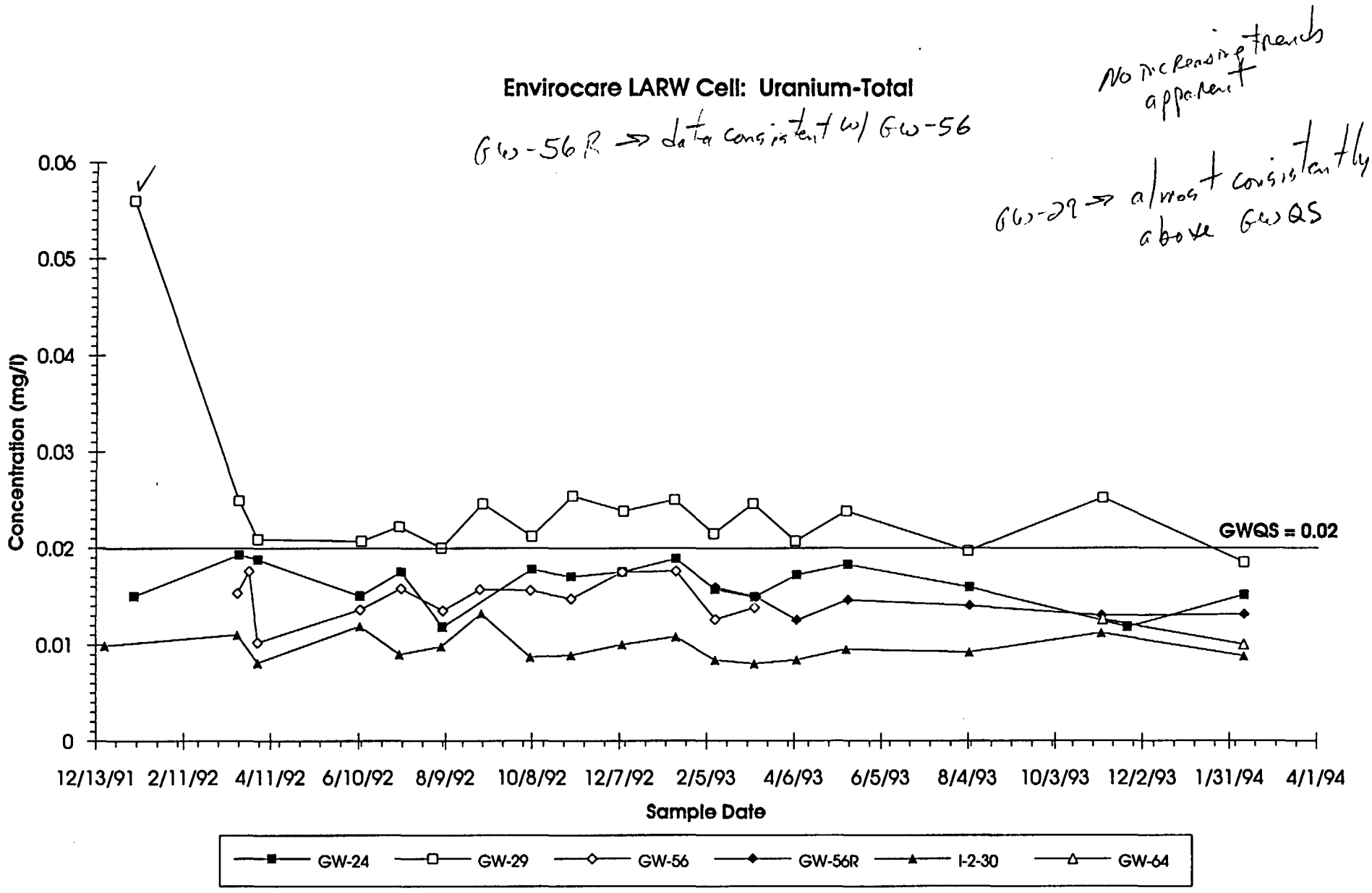
ATTACHMENT 21

Total Uranium Concentration Trends
DWQ Charts UALL.XLS Charts 1 thru 4

and

DWQ Average Total Uranium Isoconcentration Map:
Average Concentrations thru February, 1994

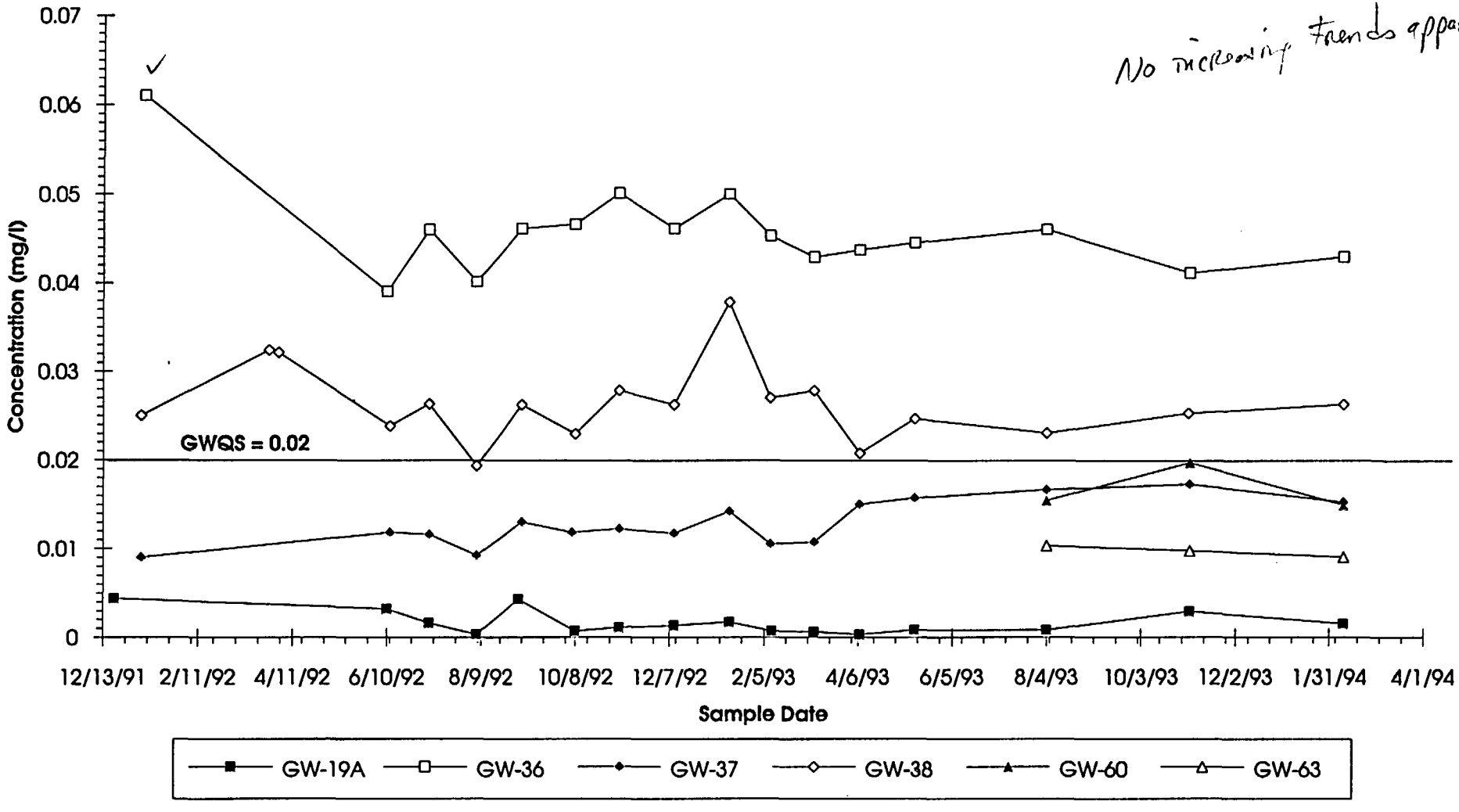

Envirocare LARW Cell: Uranium-total
GW-16R => higher U-total concentration than GW-16
No increasing trends apparent.
GWQS = 0.02
Concentration (mg/l)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sample Date
GW-16
GW-16R
GW-20
GW-22
GW-23

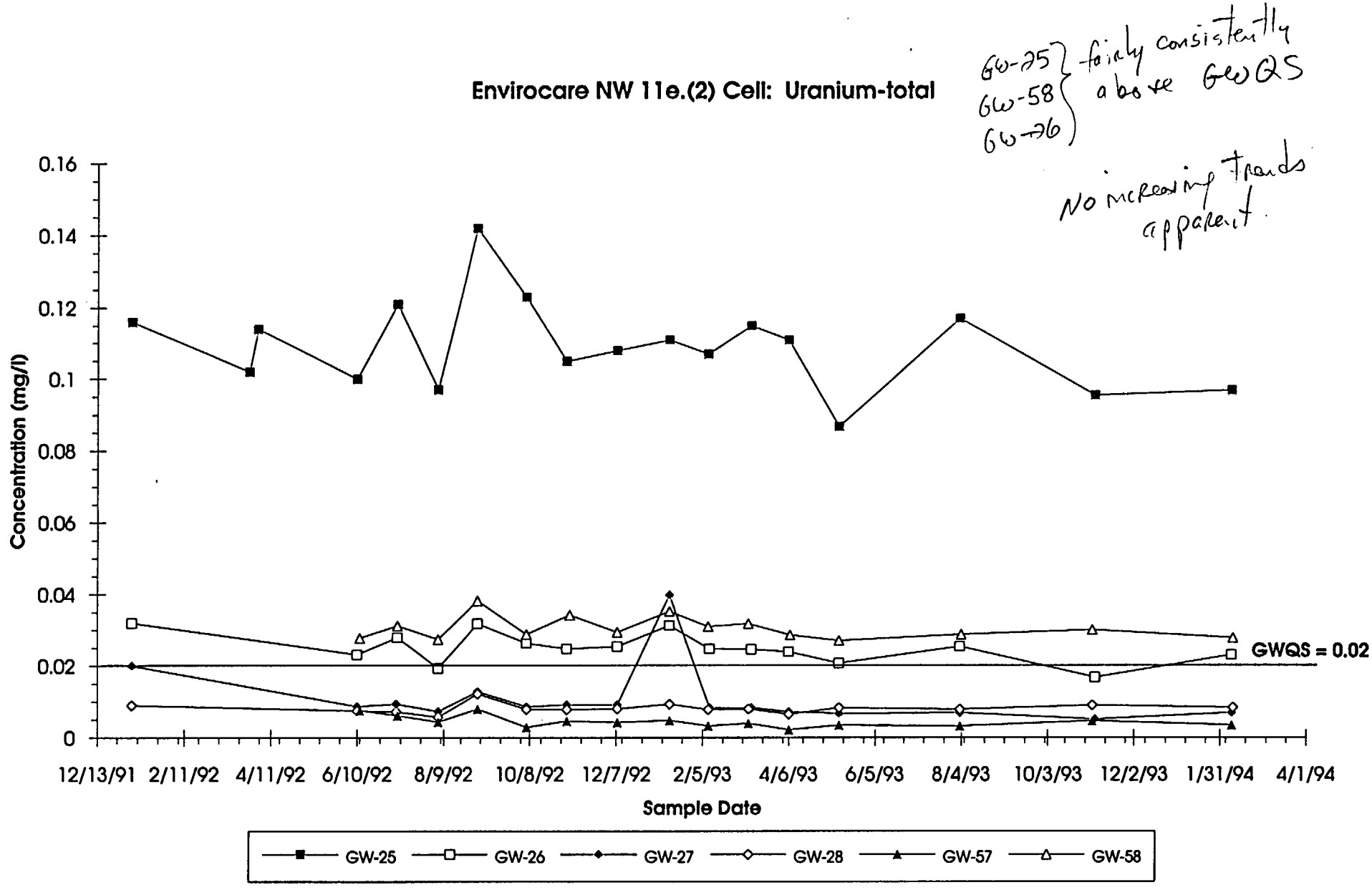

Envirocare LARW Cell: Uranium-Total
GW-56R → data consistent w/ GW-56
No increasing trends apparent
GW-29 → almost consistently above GWQS
Concentration (mg/l)
0.06
0.05
0.04
0.03
0.02
0.01
0
GWQS = 0.02
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sample Date
GW-24
GW-29
GW-56
GW-56R
I-2-30
GW-64

Envirocare SE 11e.(2) Cell: Uranium-total

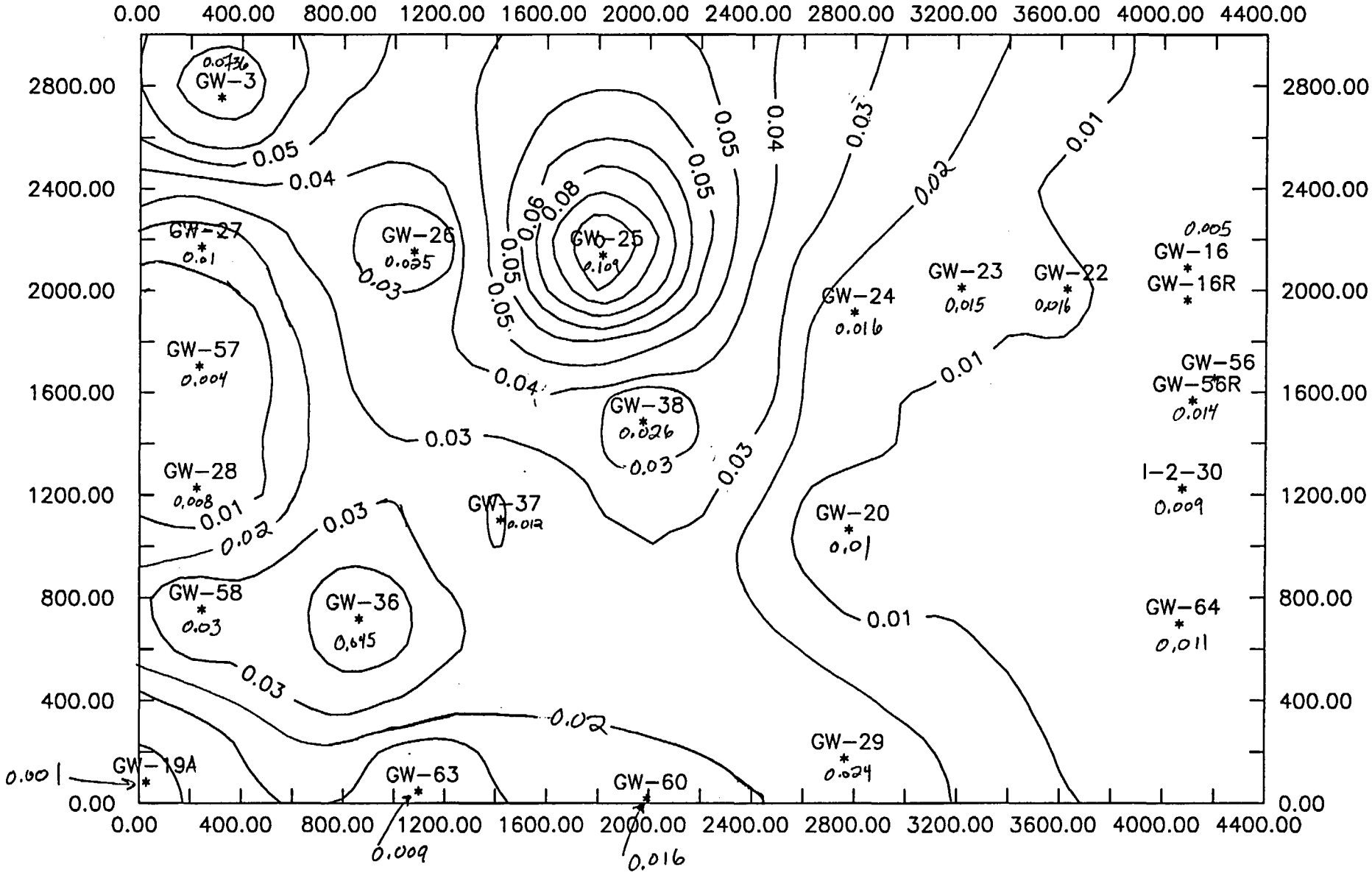
GW-36, GW-38 fairly consistently above GWQS

No increasing trends apparent




Envirocare NW 11e.(2) Cell: Uranium-total
GW-25
GW-58
GW-26
fairly consistently above GWQS
No increasing trends apparent.
Concentration (mg/l)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
GWQS = 0.02
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
Sample Date
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

Envirocare Avg. Uranium Conc.(mg/l) 2/94



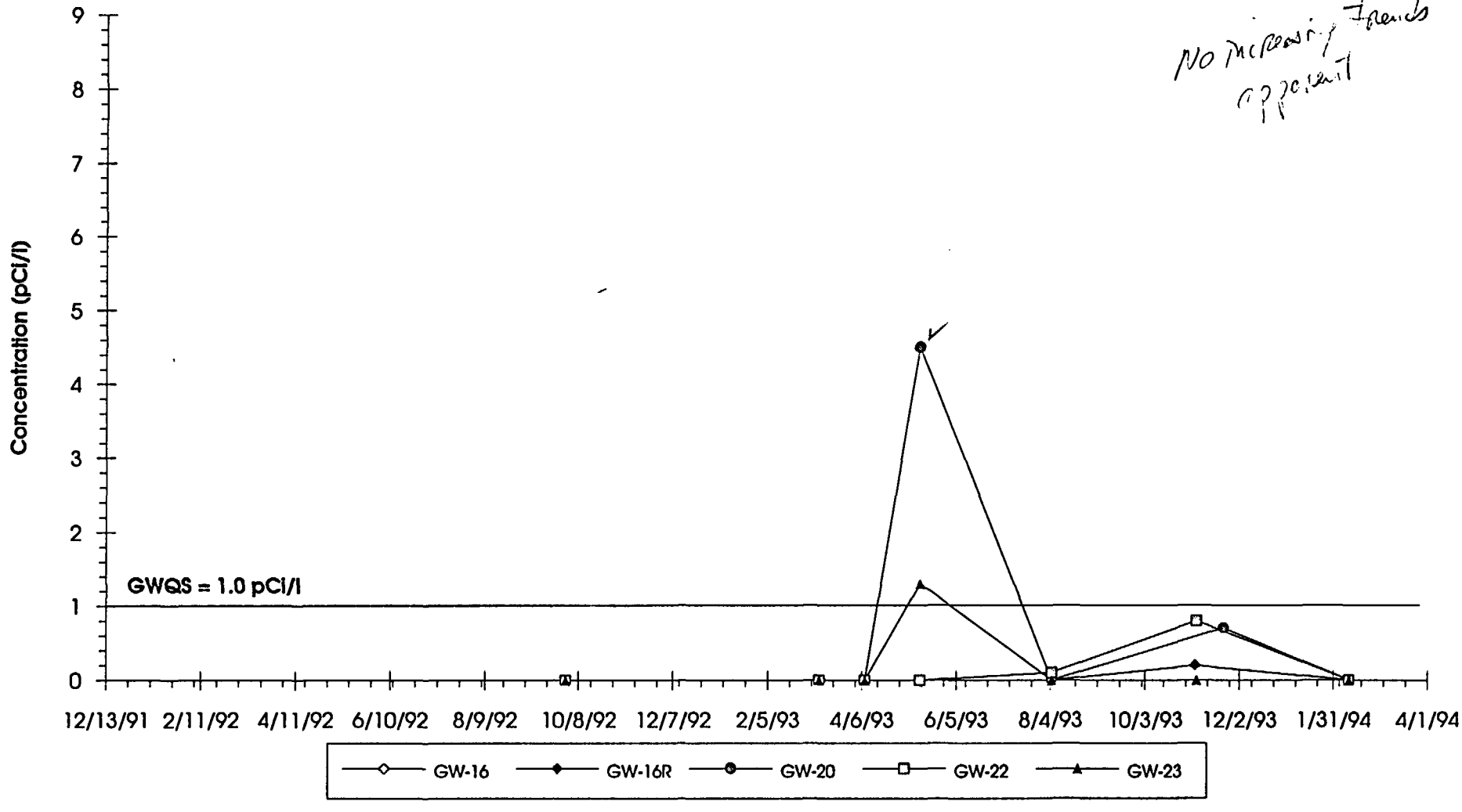
ATTACHMENT 22

Total Radioactive Iodine Concentration Trends
DWQ Charts IRADALL.XLS Charts 1 thru 5

Adjusted date w/ same scale

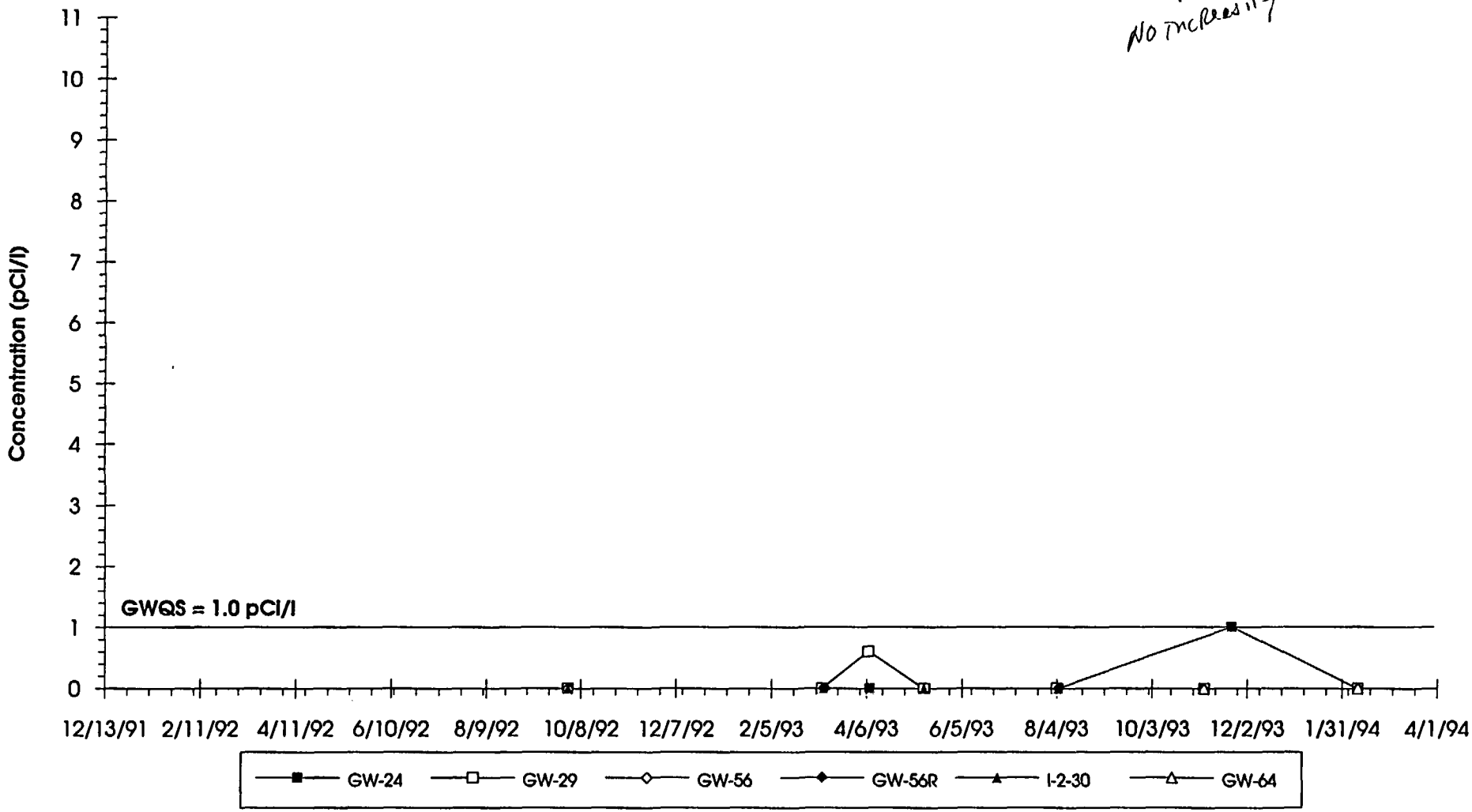
Envirocare LARW Cell: Radioactive Iodine-total

No increasing trends apparent



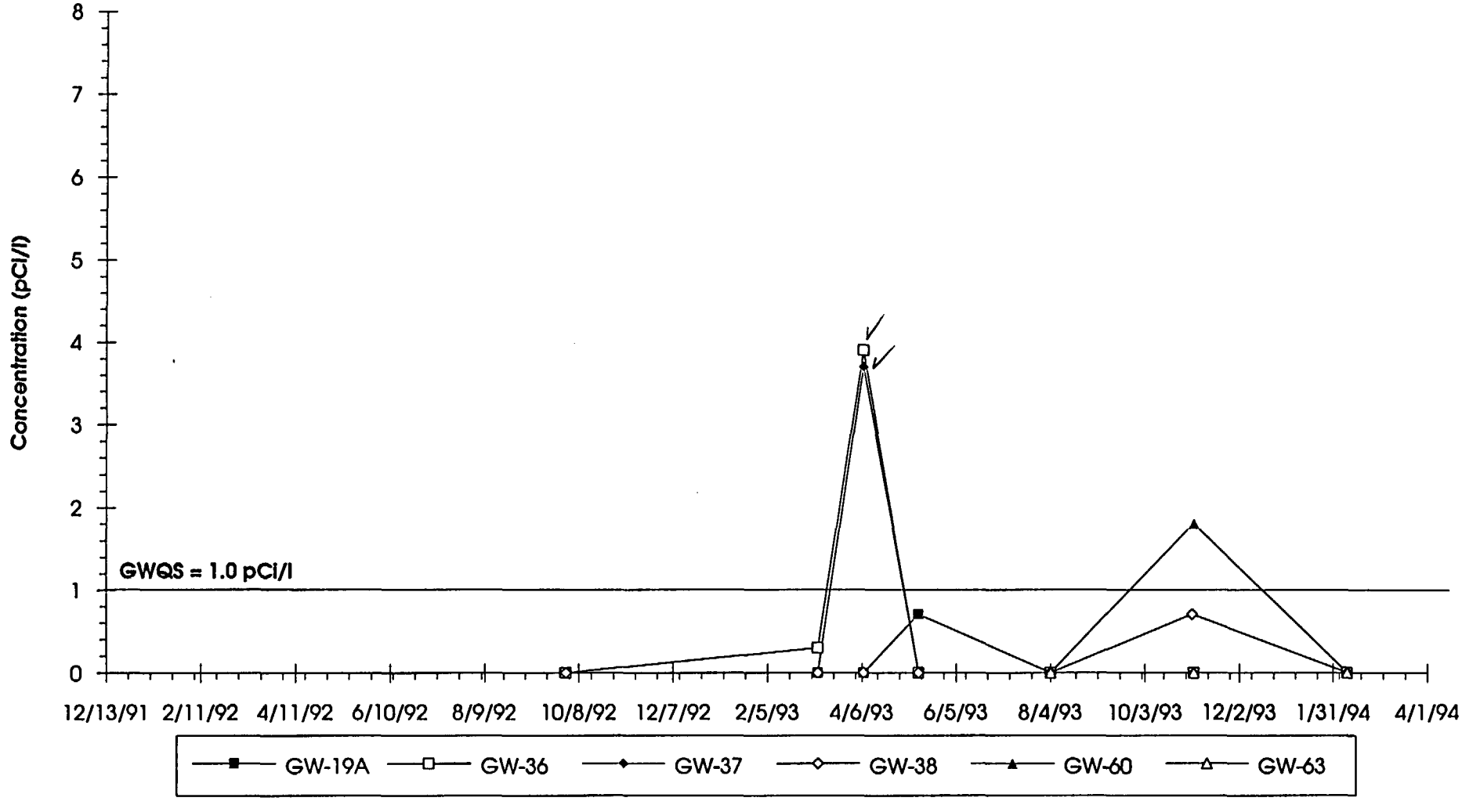
Envirocare LARW Cell: Radioactive Iodine-total

No increasing trends apparent



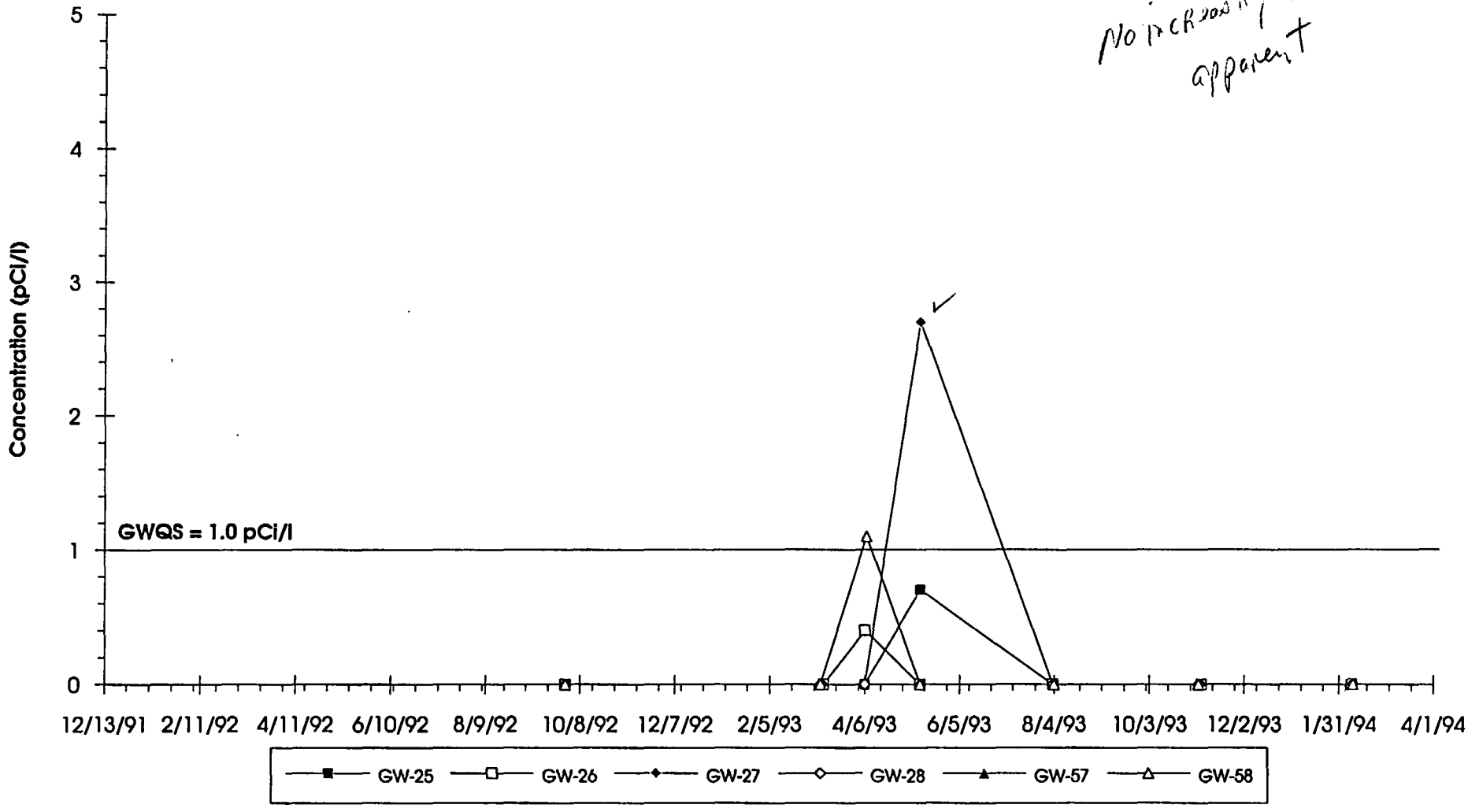
Envirocare SE 11e.(2) Cell: Radioactive Iodine-total

No increasing trends apparent

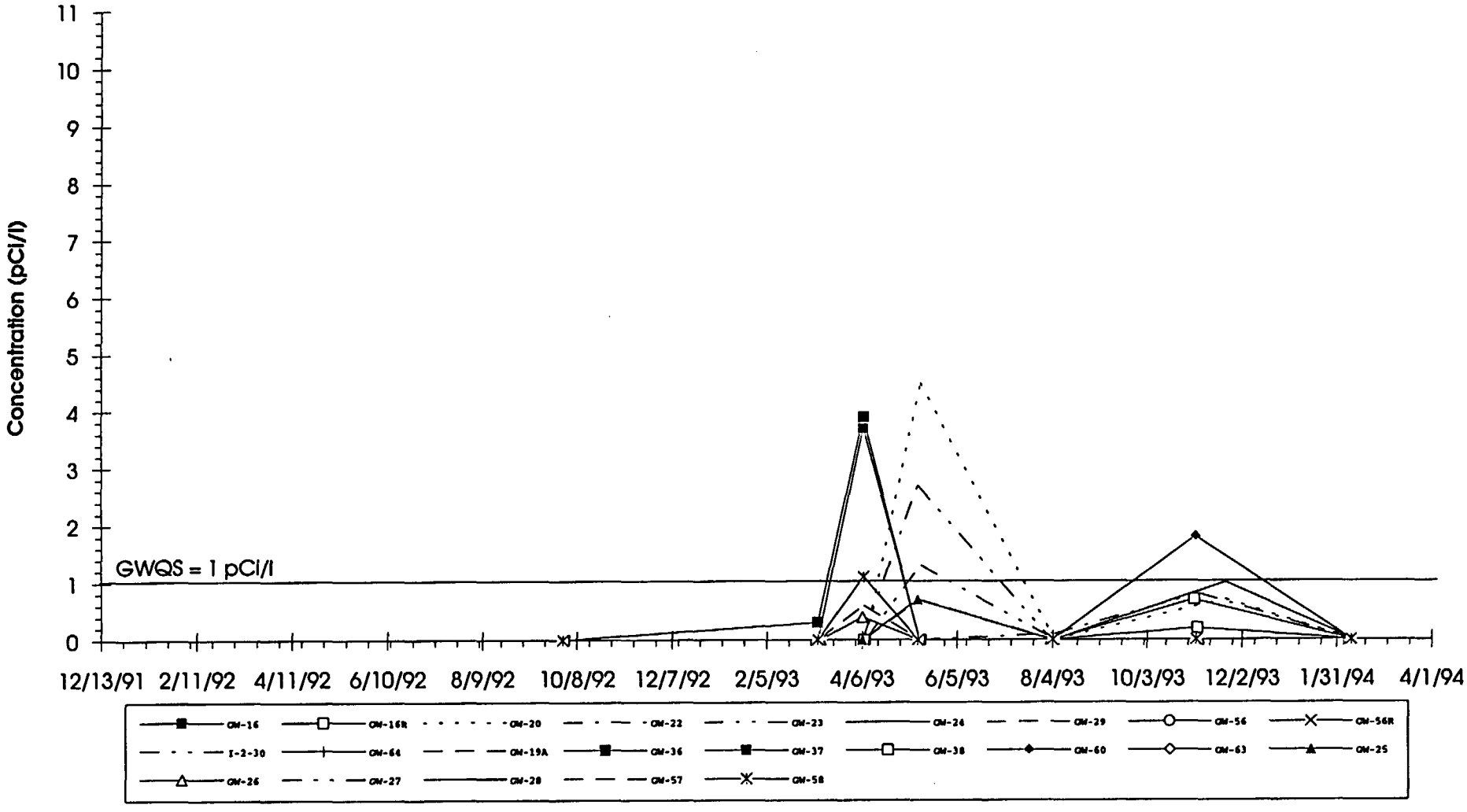


Envirocare NW 11e.(2) Cell: Radioactive Iodine-total

No increasing trends apparent



Envirocare All Wells: Radioactive Iodine-total



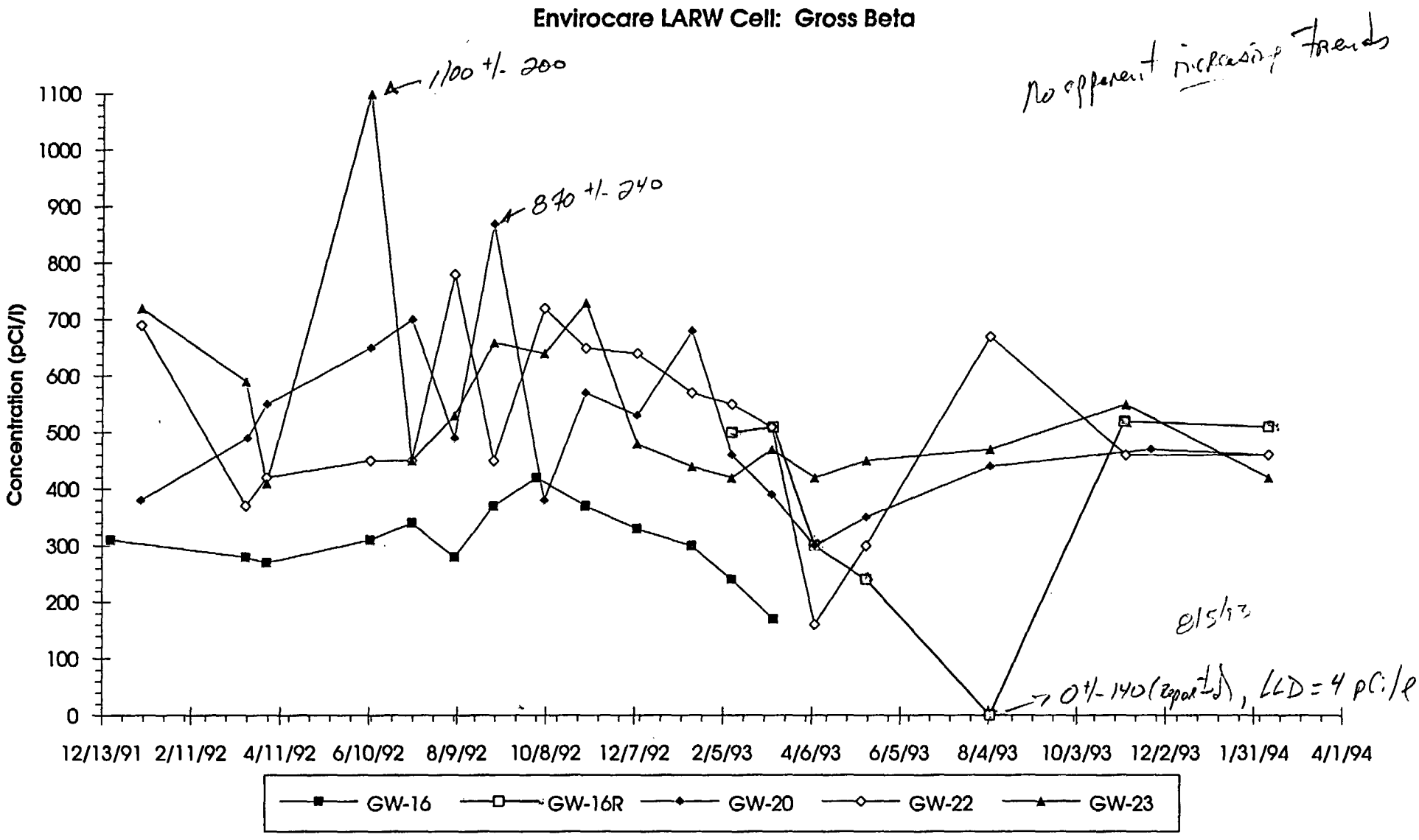
ATTACHMENT 23

Gross Beta Concentration Trends
DWQ Charts GBALL.XLS Charts 1, 2, 3, and 5;

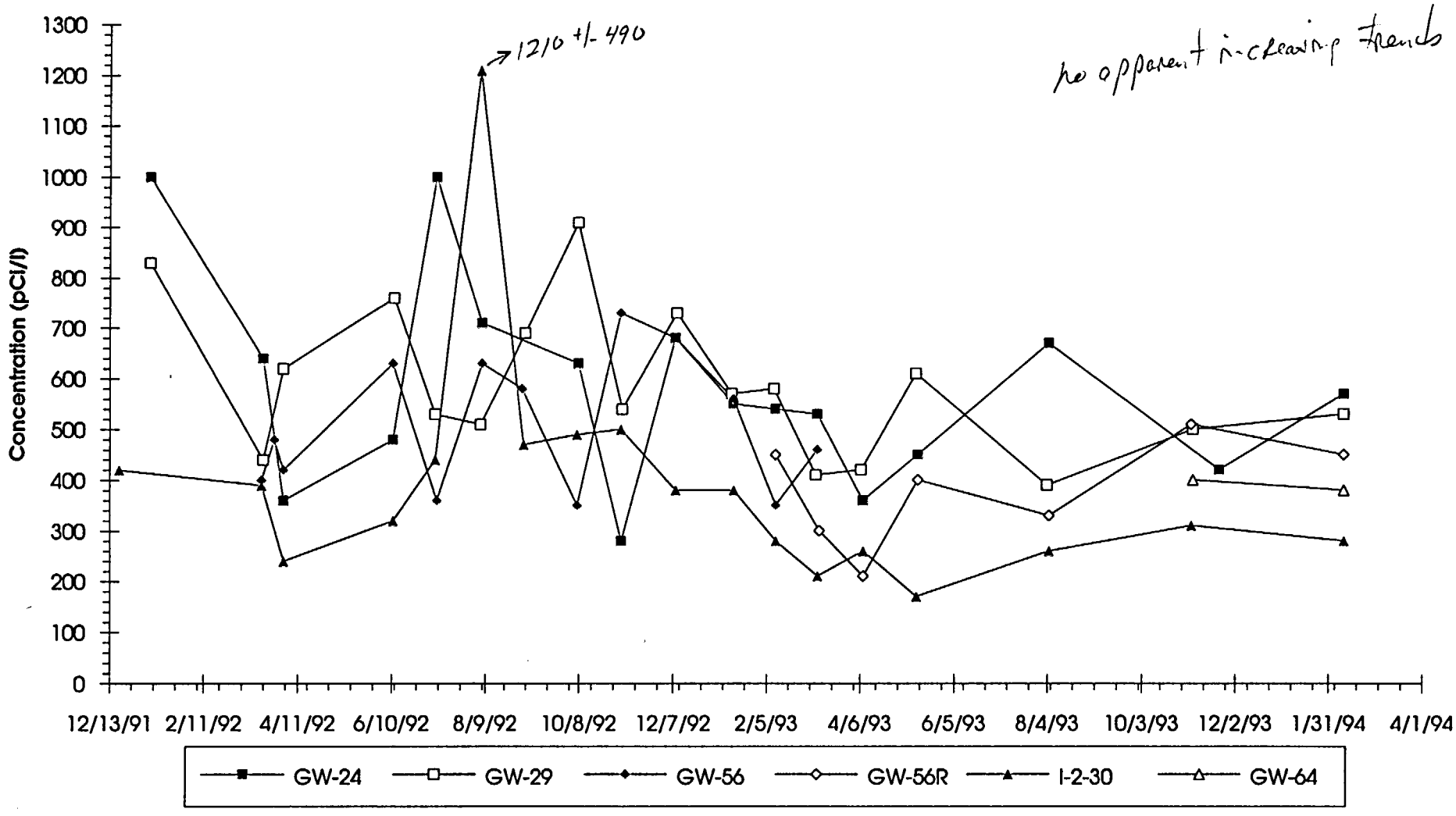
Gross Beta Concentration Statistics
DWQ Spreadsheet RADGWPL.XLS,

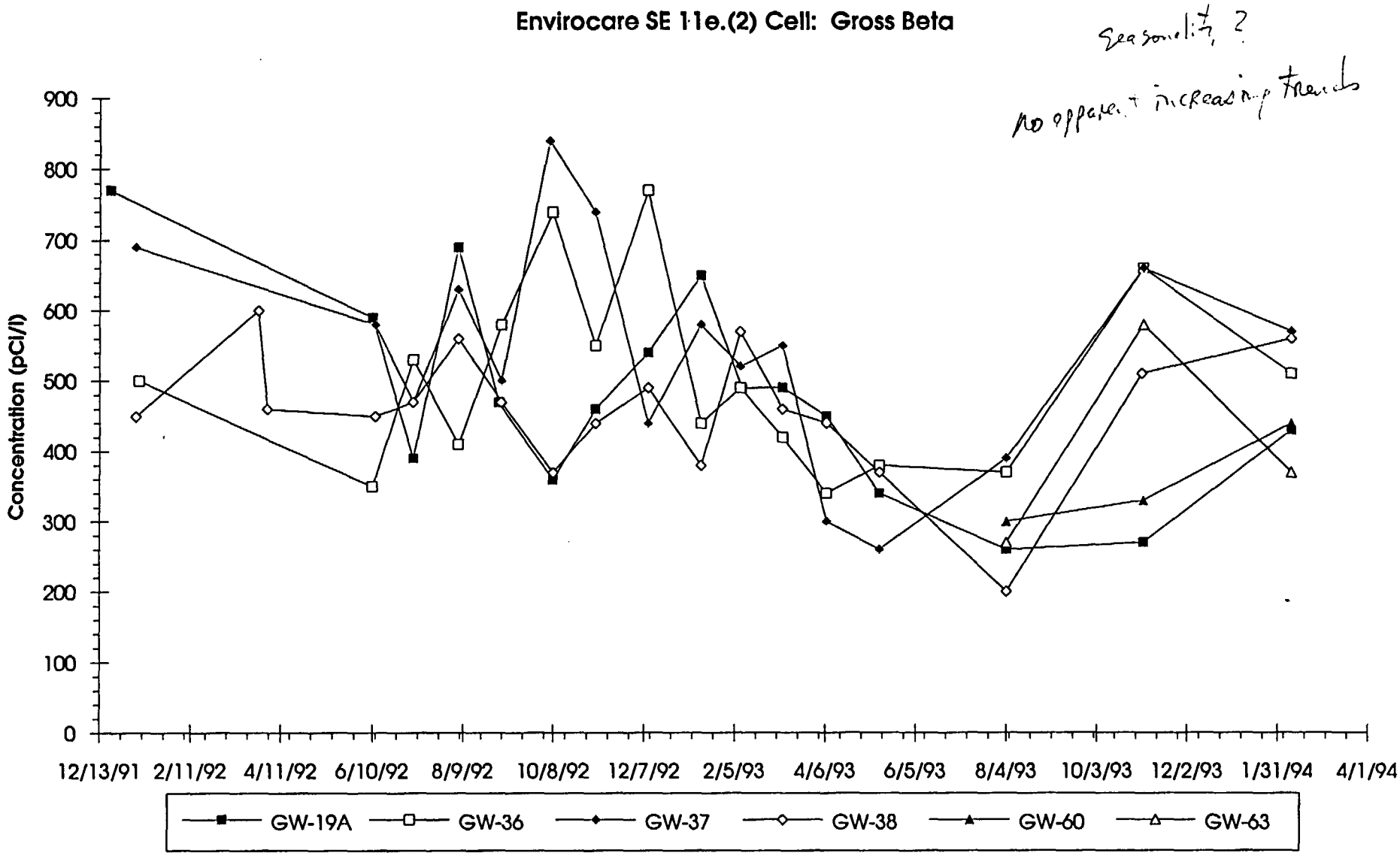
and

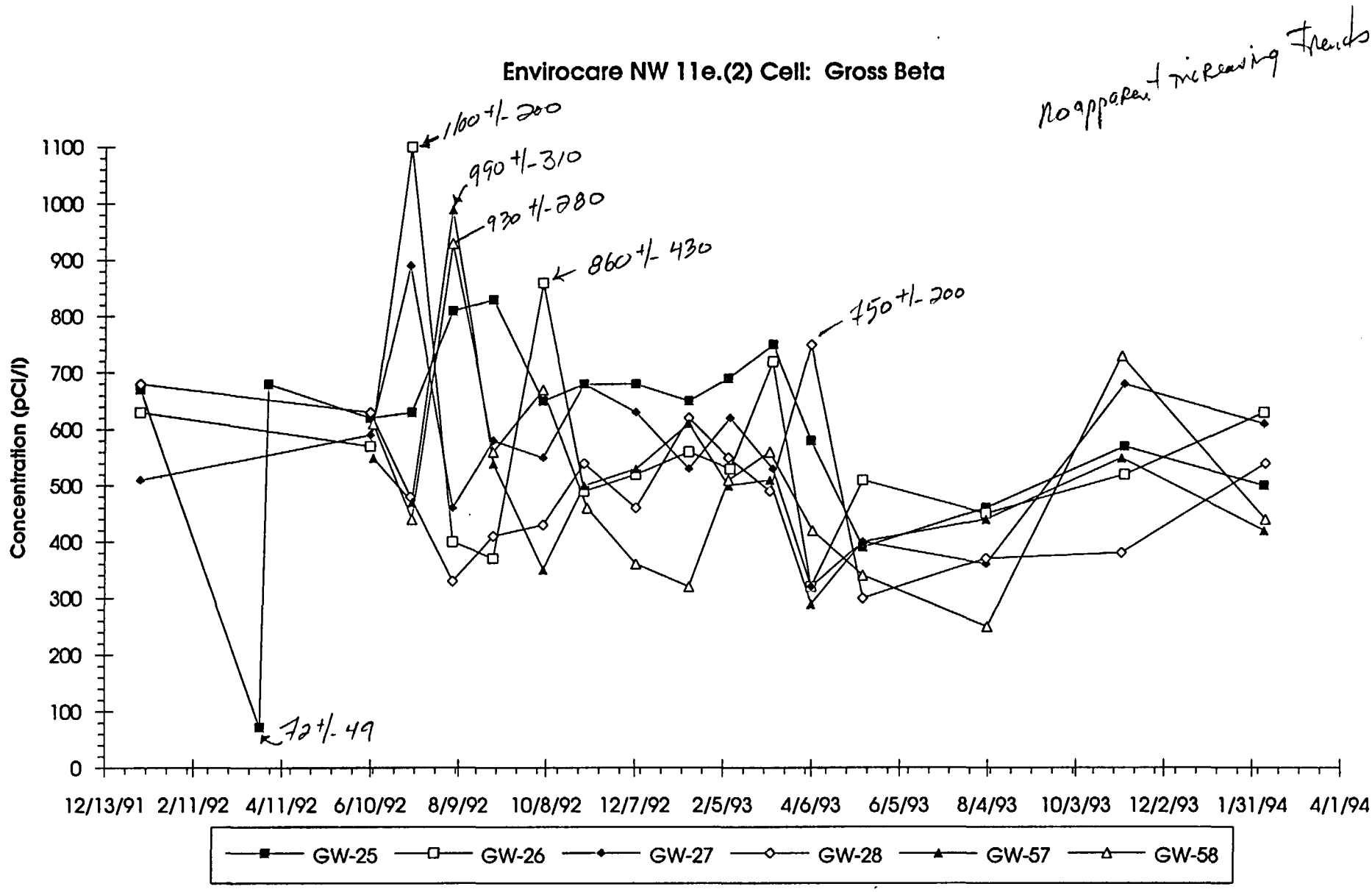
DWQ Average Gross Beta Isoconcentration Map


Envirocare LARW Cell: Gross Beta
Concentration (pCi/l)
1100
1000
900
800
700
600
500
400
300
200
100
0
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16
GW-16R
GW-20
GW-22
GW-23
1100 +/- 200
870 +/- 240
No apparent increasing trends
8/5/93
0 +/- 140 (reported), LLD = 4 pCi/l

Envirocare LARW Cell: Gross Beta

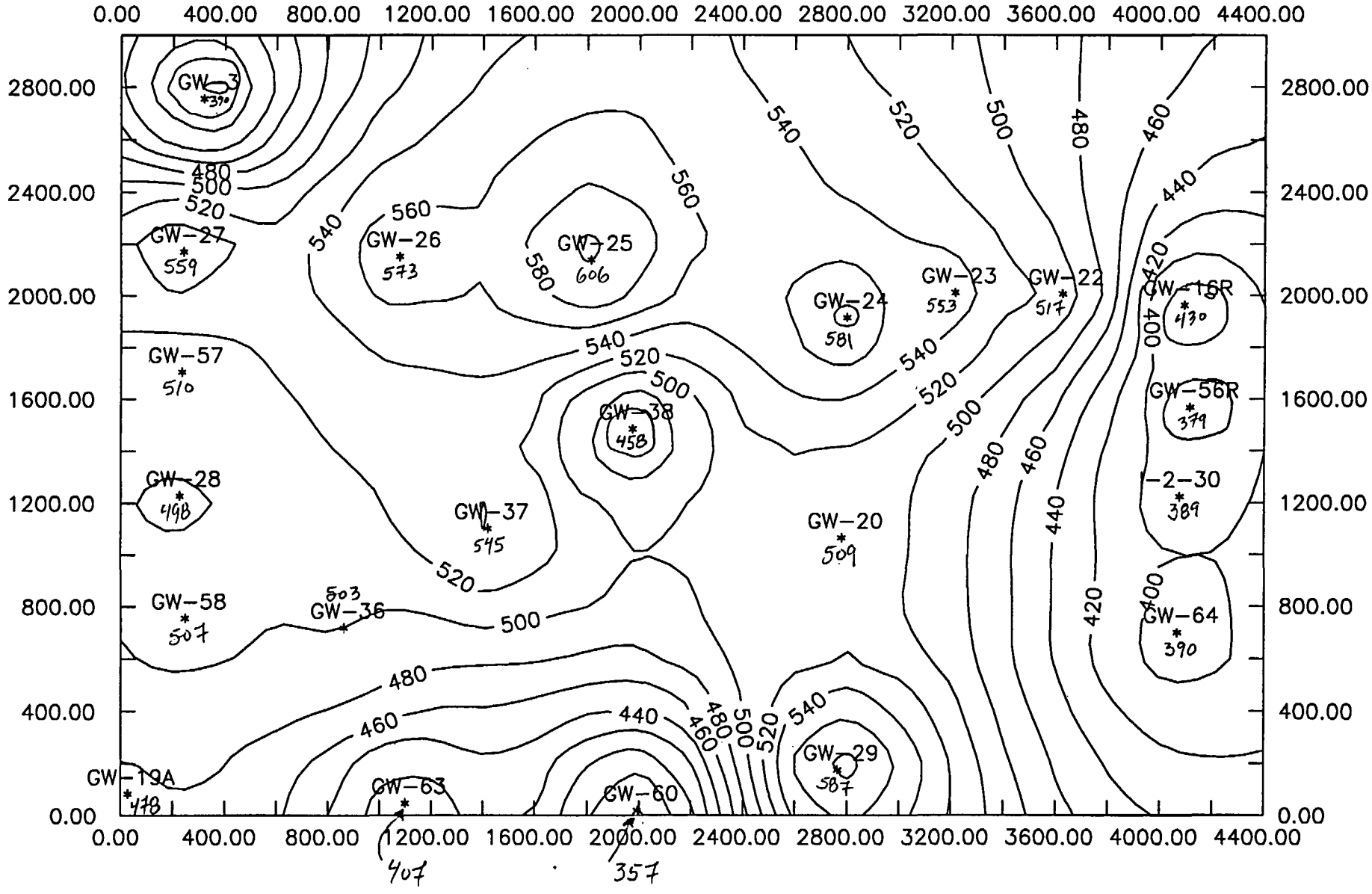



Envirocare SE 11e.(2) Cell: Gross Beta
Seasonality ?
no apparent increasing trends
Concentration (pCi/l)
900
800
700
600
500
400
300
200
100
0
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63


Envirocare NW 11e.(2) Cell: Gross Beta
No apparent increasing trends
1100 +/- 200
990 +/- 310
930 +/- 280
860 +/- 430
750 +/- 200
72 +/- 49
Concentration (pCi/l)
1100
1000
900
800
700
600
500
400
300
200
100
0
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

Envirocare GW Quality Data Statistics: Radiologics						
Compliance Monitoring Parameters w/o GWQS						
Well ID	Parameter	Count	Mean (mg/l)	Std.Dev (mg/l)	x+2s (mg/l)	%<MDL
GW-3	Gross Beta	6	390	70.993	532	0
GW-16	Gross Beta	13	306.92	63.559	434	0
GW-19A	Gross Beta	16	478.12	144.09	766	0
GW-20	Gross Beta	18	508.88	143.48	796	0
GW-22	Gross Beta	18	516.66	158.3	833	0
GW-23	Gross Beta	18	552.77	172.51	898	0
GW-24	Gross Beta	17	580.58	199.73	980	0
GW-25	Gross Beta	18	606.22	173.39	953	0
GW-26	Gross Beta	16	573.75	192.69	959	0
GW-27	Gross Beta	16	558.75	138.46	836	0
GW-28	Gross Beta	16	497.5	128.34	754	0
GW-29	Gross Beta	18	587.22	147.16	882	0
GW-36	Gross Beta	16	502.5	132.53	768	0
GW-37	Gross Beta	16	545	153.66	852	0
GW-38	Gross Beta	18	458.33	92.815	644	0
GW-56	Gross Beta	13	510	132.53	775	0
GW-57	Gross Beta	15	510	157.16	824	0
GW-58	Gross Beta	15	506.66	177.42	862	0
I-2-30	Gross Beta	18	389.44	227.14	844	0
GW-16R	Gross Beta	6	430	125.539	681	0
GW-56R	Gross Beta	7	378.57	103.99	587	0
GW-60	Gross Beta	3	356.66	73.711	504	0
GW-63	Gross Beta	3	406.66	158.21	723	0
GW-64	Gross Beta	2	390	14.142	418	0
	min:	2	306.92	14.142	418	
	max:	18	606.22	227.14	980	

Envirocare Avg. Gross Beta Conc. (pCi/l)



State of Utah
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Don A. Ostler, P.E.
Director

288 North 1460 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870
(801) 538-6146
(801) 538-6016 Fax
(801) 536-4414 T.D.D.

August 19, 1994

Mr. Dennis Romankowski
Envirocare of Utah, Inc.
46 W. Broadway, Suite 240
Salt Lake City, Utah 84101

Re: August 8, 1994 Division of Water Quality Staff Report, Ground Water Quality Conditions at Envirocare of Utah, Inc.: Ground Water Permit No. UGW450005.

Dear Mr. Romankowski:

This letter is to confirm and update an earlier transmittal of the August 8, 1994 Utah Division of Water Quality Staff Report entitled: "Ground Water Quality Conditions and Proposed Revision to Ground Water Protection Levels, Envirocare of Utah, Inc., Low-Level Radioactive Waste and 11e.(2) Waste Disposal Facility near Clive, Tooele County, Utah".

Since your receipt of this report your consultant, Bingham Environmental, has brought to our attention several errors in the molybdenum minimum detection limits (MDL) cited in our August 8, 1994 report. Concentrations we used previously indicated eight data points in the molybdenum data had below detectable values with a MDL or 0.005 mg/l. Unfortunately, we have discovered that these values were in fact typographical errors in our database. We have also discovered three other data points with erroneous MDL values in the molybdenum data. All of these errors have now been corrected, and we appreciate Bingham Environmental's efforts to bring them to our attention. For the record, the corrected data points are listed in the table below.

After these corrections, it is clear that all the molybdenum samples reported by Envirocare had a MDL of 0.1 mg/l. The corrections detailed in the table below are reflected in three new molybdenum concentration graphs, which are attached for your review.

Review of the revised molybdenum data has lead me to somewhat revise my discussion on the molybdenum data in the August 8, 1994 DWQ Staff Report, page 12, which is also summarized below.

Printed on recycled paper

were collected from each well in June and July of this year. We also acknowledge information from Bingham Environmental which indicates that a sample collected from well GW-19A in April, 1991, before installation of the stainless steel pumps, apparently indicates a 0.3 mg/l molybdenum concentration in the shallow ground water at that well and time.

When these data are made available to us, we may be able to determine an appropriate GWPL. However, it is possible that more will be needed to determine background conditions and GWPLs for molybdenum in every well at your facility. If so, additional information will be needed and required in the draft revision of your ground water discharge permit. While this additional information is being collected, if necessary, we may designate the molybdenum GWQS as an interim GWPL, and determine compliance based on a trend analysis. As you will recall, the use of trend analysis to determine compliance is already provided for in Parts I.F.1(c) and I.G.1(a)(3) of the existing permit. The final disposition of molybdenum compliance determinations will be specified in the upcoming draft revision of your ground water discharge permit.

In the meantime, the original GWPL proposed for molybdenum in our August 8, 1994 Report, 0.04 mg/l, still stands for all wells at the Envirocare facility, and we await the submittal of the promised information.

If you have any questions or comments on the revised molybdenum data, proposed GWPLs, or above discussion, please feel free to call me at (801) 538-6146. I appreciate your cooperation and assistance in this matter.

Sincerely,

Loren B. Morton

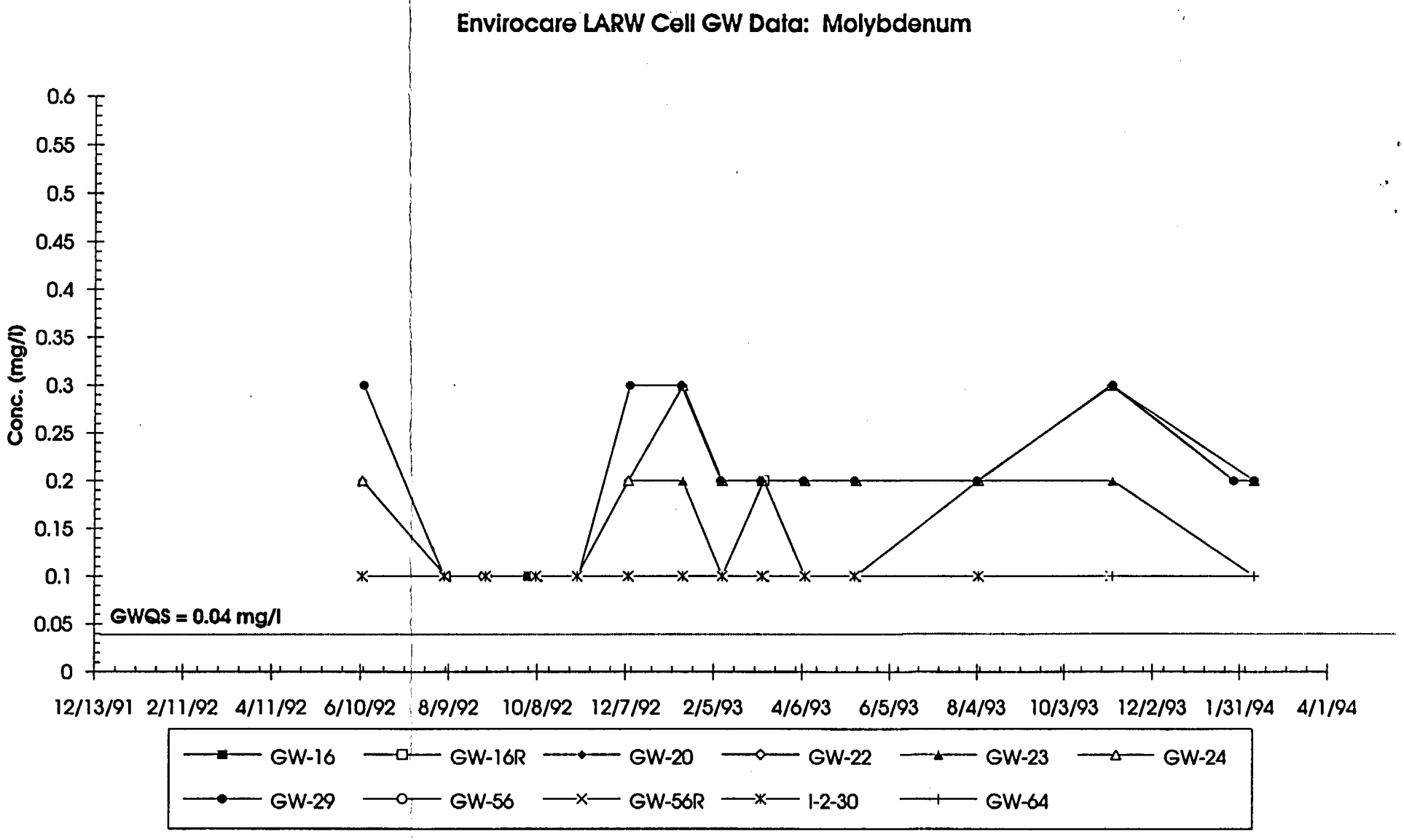
Loren B. Morton, Environmental Scientist
Ground Water Protection Section

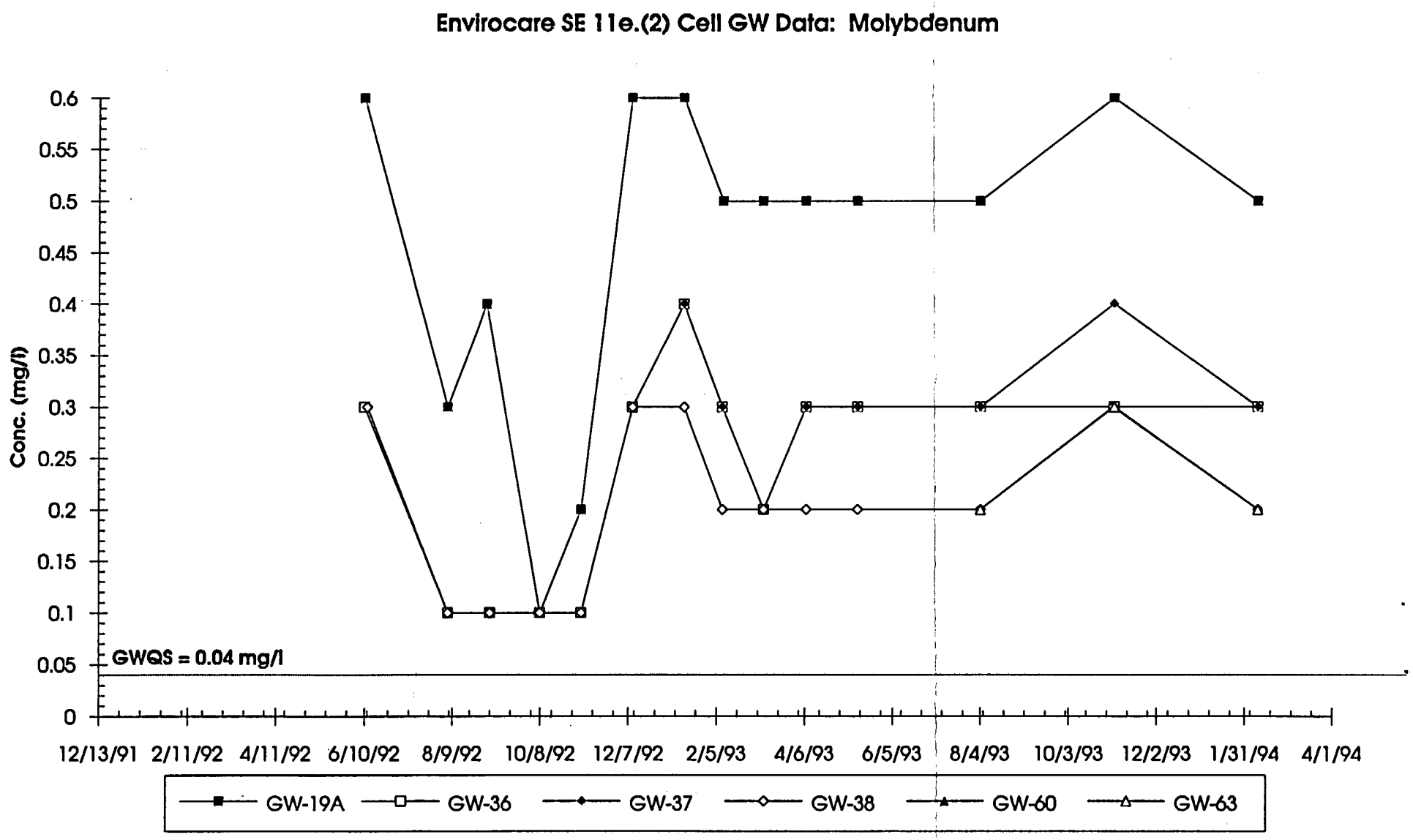
Enclosures

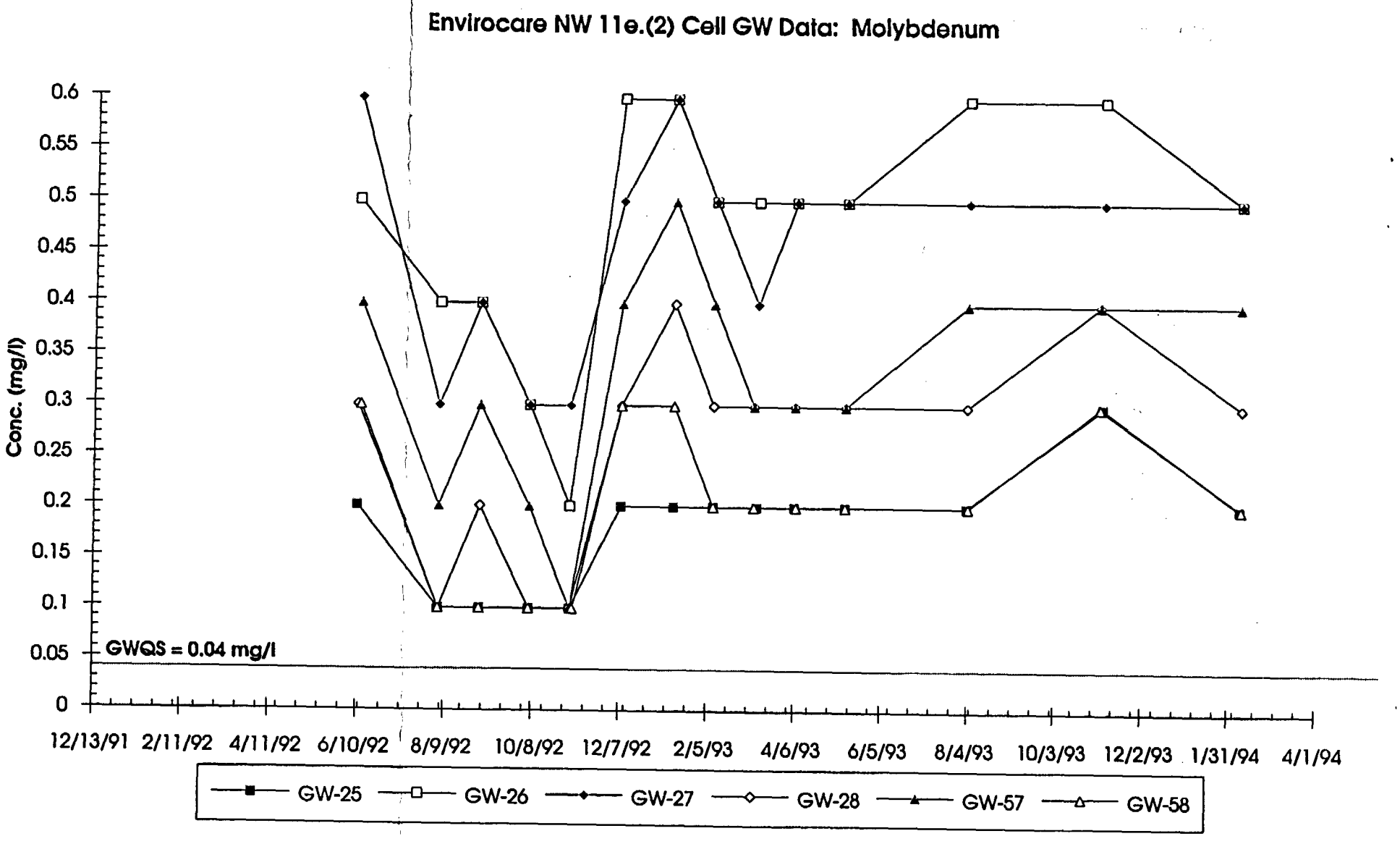
LBM:lm

cc: Dane Finerfrock, DRC (w/attach.)
Mark Taggert, Bingham Environmental (w/attach.)
Latif Hamden, NRC-Washington D.C. (w/attach.)
Fred Ross, NRC-Washington D.C (w/attach.)
Myron Bateman, Tooele Co. Health Dept.

P:ECmoly6.ltr
FILE:gw-Envirocare


Envirocare LARW Cell GW Data: Molybdenum
Conc. (mg/l)
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
GWQS = 0.04 mg/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-16
GW-16R
GW-20
GW-22
GW-23
GW-24
GW-29
GW-56
GW-56R
I-2-30
GW-64


Envirocare SE 11e.(2) Cell GW Data: Molybdenum
Conc. (mg/l)
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
GWQS = 0.04 mg/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-19A
GW-36
GW-37
GW-38
GW-60
GW-63


Envirocare NW 11e.(2) Cell GW Data: Molybdenum
Conc. (mg/l)
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
GWQS = 0.04 mg/l
12/13/91
2/11/92
4/11/92
6/10/92
8/9/92
10/8/92
12/7/92
2/5/93
4/6/93
6/5/93
8/4/93
10/3/93
12/2/93
1/31/94
4/1/94
GW-25
GW-26
GW-27
GW-28
GW-57
GW-58

FAX TRANSMITTAL

STATE OF UTAH
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY

Location Address:
Cannon Health Building-Third Floor
288 North 1460 West
Salt Lake City, Utah 84116

Reply to Address:
Department of Environmental Quality
Division of Water Quality
288 North 1460 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870

FROM: Loren Morton

AGENCY/FIRM: Utah Div. Water Quality

PHONE #: (801) 538-6146

TO: Latif Hamden FAX #: (301) 415-5399

AGENCY/FIRM: U.S. NRC

PHONE #: (301) 415-6639

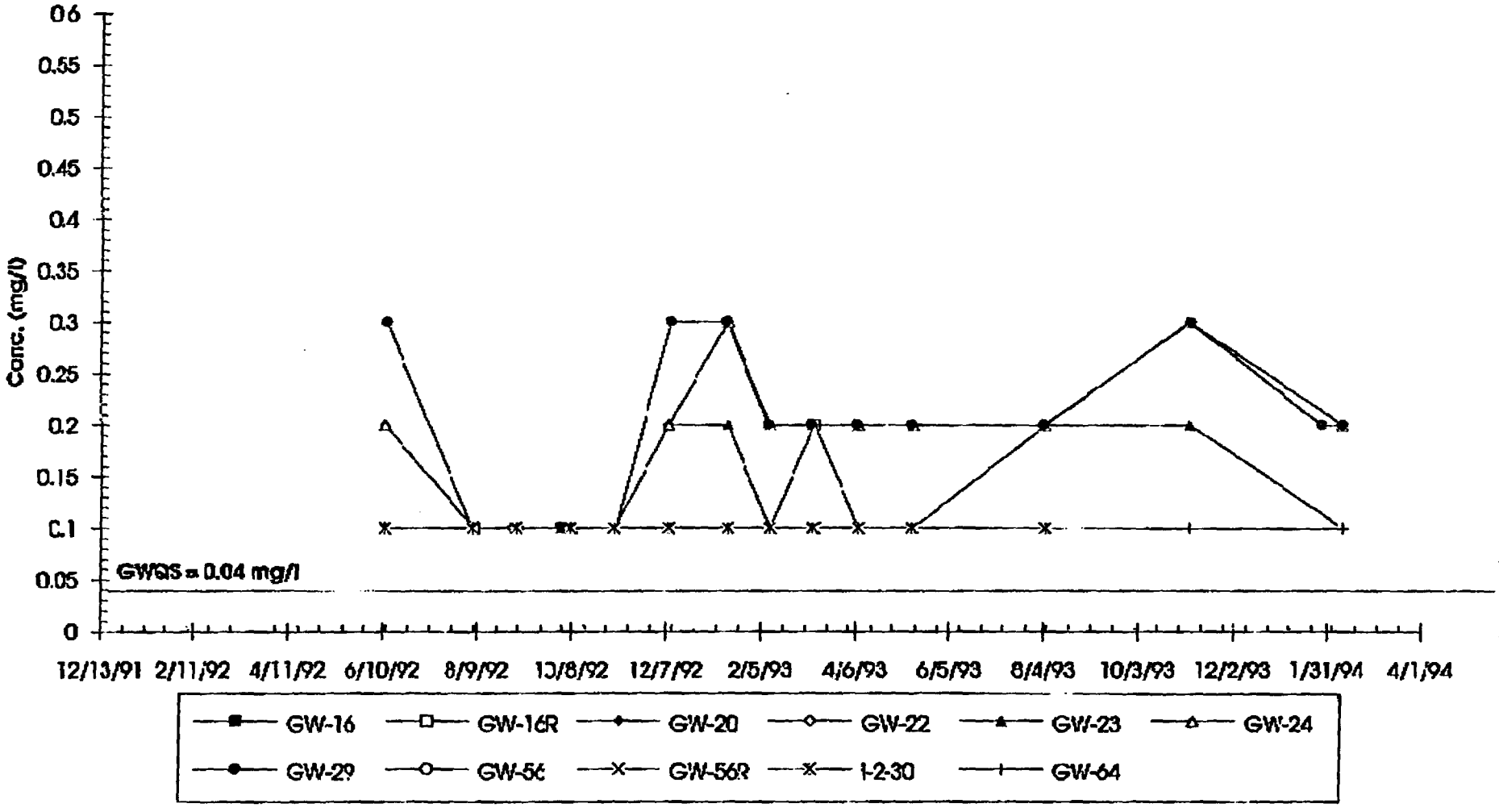
NUMBER OF PAGES TO FOLLOW: 3

SUBJECT: Graphs: Revised Molybdenum concentration data

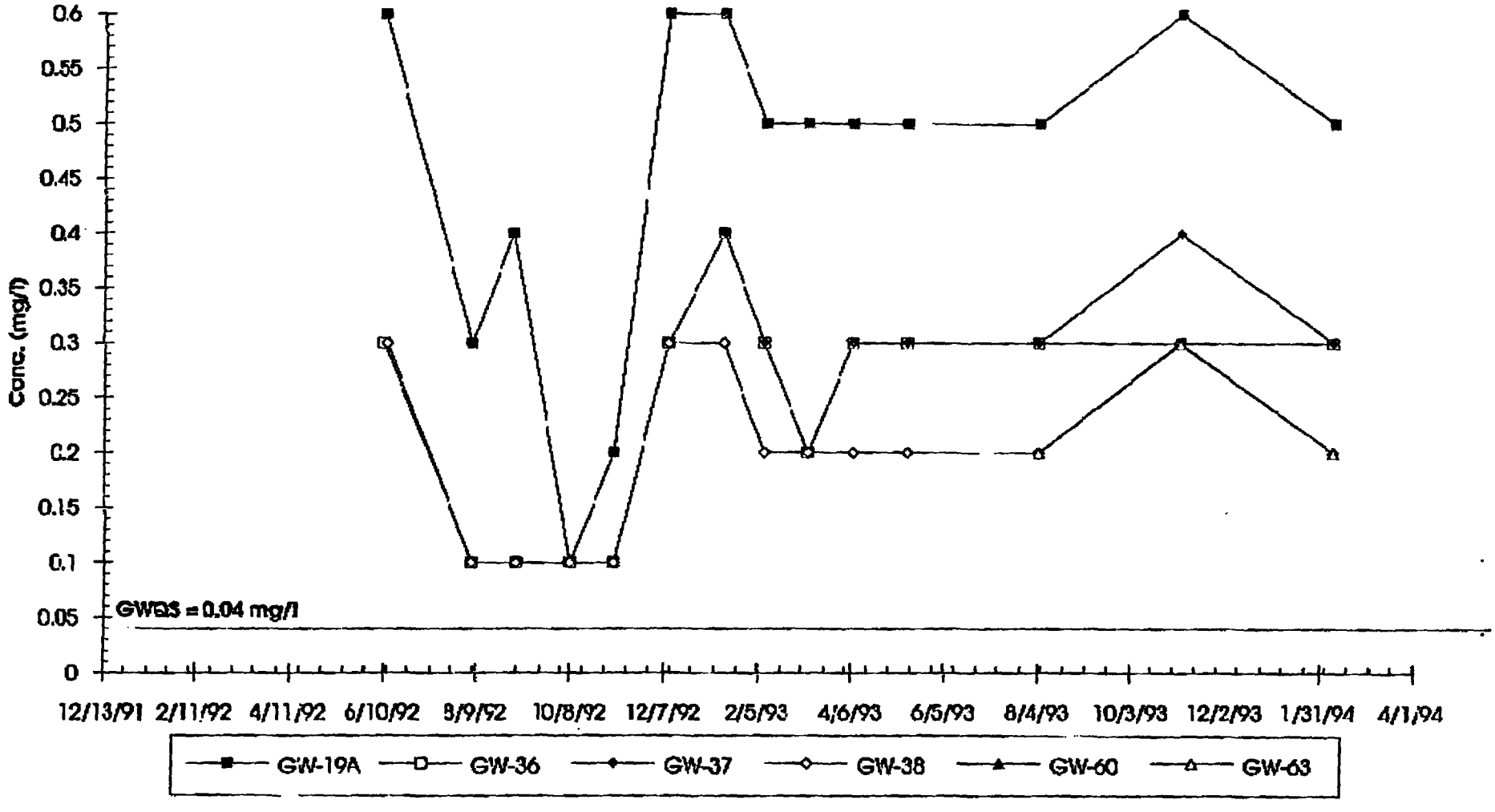
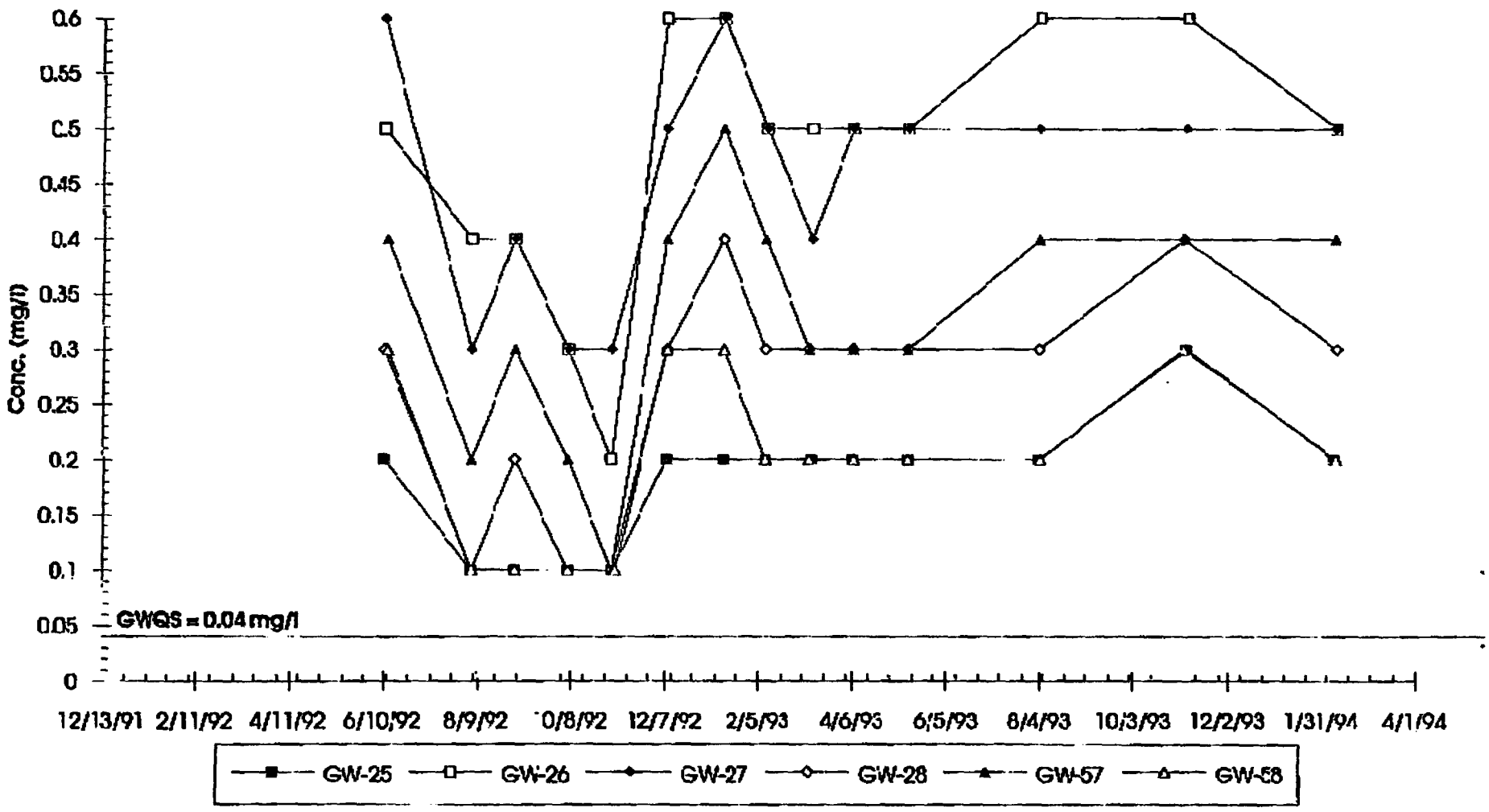
I look forward to your call tomorrow. Loren

CONFIRMATION #: (801) 538-6146
FAX #: (801) 538-6016

Envirocare LARW Cell GW Data: Molybdenum



Envirocare SE 11e.(2) Cell GW Data: Molybdenum



Envirocare NW 11e.(2) Cell GW Data: Molybdenum