

FINAL

**INTERIM REMEDIAL ACTION BENCH SCALE
TREATABILITY STUDY REPORT
VOLUME VI
LABORATORY REPORTS
VOLATILE ORGANIC COMPOUND ANALYSIS**

903 Pad Mound and
East Trenches Areas
(South Walnut Creek)

Operable Unit No 2

Environmental Restoration Program

May 22 1992

U S DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado

REVIEWED FOR CLASSIFICATION/UCM

By J. L. Johnson (UAA)

Date June 30, 1992

J. L. Johnson 8/19/92

22558/R7 TS 05 18-92/RPT/2

ADMIN RECORD

A-000-000373

FINAL
INTERIM REMEDIAL ACTION BENCH SCALE
TREATABILITY STUDY REPORT
VOLUME VI
LABORATORY REPORTS
VOLATILE ORGANIC COMPOUND ANALYSIS

903 Pad Mound and
East Trenches Areas
(South Walnut Creek)

Operable Unit No 2

Environmental Restoration Program

May 22, 1992

U S DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

REVIEWED FOR CLASSIFICATION/UCM

By J. L. [Signature] (LBA)

Date June 30, 1992

22538/RT TS 05-18-92/RPT/2

ADMIN RECORD



VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

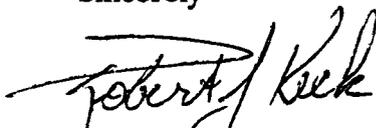
November 26 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3 Suite 612
4582 South Ulster Street Parkway
Denver, Colorado 80237

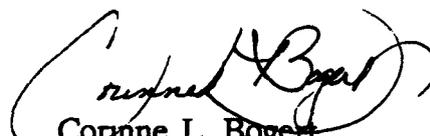
Dear Mr Baca

Enclosed are the results from the analysis of one water sample, received on November 14, 1990, for the determination of volatile organic compounds. Please feel free to call if you have any questions regarding this analysis.

Sincerely


Robert J Keck
Director
Organic Chemistry

Reviewed by,


Corinne L. Bogert
Technical Director

RJK/CLB lk
Enclosures

VISTA Project # 902919



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902919-001	O/CWC1001	Water	11/14/90

↓
I 6LS
11-7-91



Results and Discussion

VISTA Project # 902919

One water sample was received on November 14, 1990 for the determination of volatile organic compounds. The sample was analyzed according to the protocols described in USEPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Ed. Method 8240.

Volatiles quality control (QC) results are reported for another client's samples which were prepared and analyzed with this sample. Sample information for the QC samples is withheld to maintain client confidentiality.

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID O/CWC1001
 VISTA Sample ID 902919-001
 Date Sampled 11/13/90
 Date Analyzed 11/16/90

Sample Type Water
 Date Received 11/14/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	(4 3)*	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	(1 8)*	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	7 5	5	ug/L
1,1-Dichloroethane	(4 4)*	5	ug/L
1,2-Dichloroethenes, total	120	5	ug/L
Chloroform	41	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	22	5	ug/L
Carbon Tetrachloride	230	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	180	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	140	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	99	%	92-109
4-Bromofluorobenzene	99	%	88-112
1,2-Dichloroethane-d ₄	102	%	83-113

< = Compound not detected at or above the listed reporting limit
 * Detected below reporting limit quantitation may be unreliable

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants

Client Sample ID NA

VISTA Sample ID 902919-Blank

Sample Type Water

Date Sampled NA

Date Received NA

Date Analyzed 11/16/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	101	%	92-109
4-Bromofluorobenzene	103	%	88-112
1,2-Dichloroethane-d ₄	101	%	83-113

NA = Not Applicable

< = Compound not detected at or above the listed reporting limit

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants

Client Sample ID NA

VISTA Sample ID NA

Date Sampled NA

Date Analyzed 11/16/90

Sample Type Water

Date Received NA

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	41 3	83	63-115
Trichloroethene	50	ND	48 6	97	84-121
Benzene	50	ND	50 2	100	83-119
Toluene	50	ND	49 6	99	84-121
Chlorobenzene	50	ND	47 4	95	88-114

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits RPD % Rec</u>
1,1-Dichloroethene	50	39 5	79	5	14 63-115
Trichloroethene	50	49 4	99	2	14 84-121
Benzene	50	50 7	101	1	11 83-119
Toluene	50	49 0	98	1	13 84-121
Chlorobenzene	50	47 3	95	0	13 88-114

NA = Not Applicable
 ND = Not Detected
 MS = Matrix Spike
 MSD = Matrix Spike Duplicate
 RPD = Relative Percent Difference

902919

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 003

PROJECT NO			ANALYSES		NUMBER OF CONTAINERS	REMARKS (Sample preservation handling procedures)
DATE	TIME	SAMPLE NUMBER	Volatiles Suite			
22558 Task 500						For Vista Labs
SAMPLERS: (Signature) BR Clow						
11/13/90	1135	DLWC1001	2		2	001 Matrix - Water
		#1				All samples stored on ice
BR Clow 11/14/90						* Volatiles Suite. Contact Bob Keck for Questions
						- preserved w/HCl to pH < 2
						Contact personnel Brian Clow 279-4501 x205

TOTAL NUMBER OF CONTAINERS 2

RELINQUISHED BY (Signature) BR Clow	DATE/TIME 11/14/90 1700	RECEIVED BY (Signature) [Signature]	RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)
METHOD OF SHIPMENT Personal Delivery	SHIPPED BY (Signature)	COURIER (Signature)	RECEIVED FOR LAB BY (Signature)	DATE/TIME	



3830 High Court
 Wheat Ridge CO 80033
 (303) 467-0630

INVOICE

DATE 11/27/90
 INVOICE # 1963

TO:

CLIENT

WOODWARD-CLYDE CONSULTANTS
 STANFORD PLACE 3 SUITE 612
 4582 SOUTH ULSTER STREET PARKWAY
 DENVER COLORADO 80237
 ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
 STANFORD PLACE 3 SUITE 612
 4582 SOUTH ULSTER STREET PARKWAY
 DENVER COLORADO 80237
 ATTN MR STEVE BACA

CLIENT P O / PROJ # SUBCONTRACT 1032 VISTA # 902919 MANAGER RJK INV# 1963

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CODE</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
1	10A - 824U - water	10	200 00	200 00

Subcontract No 1032

I certify that the above bill is correct and just and that the amounts claimed represent fair charges against Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds

Robert J Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200 00

Due on or Before December 27 1990

UNPAID INVOICES OVER 60 DAYS WILL BE ASSESSED A 1.5% MONTHLY SERVICE CHARGE



VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

November 29, 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

Dear Mr Baca

Enclosed are the results from the analysis of one water sample, received on November 20, 1990, for the determination of volatile organic compounds. Please feel free to call if you have any questions regarding this analysis

Sincerely,

Robert J. Keck
Director
Organic Chemistry

Reviewed by,

Coranne L. Bogert
Technical Director

RJK/CLB/rt
Enclosures

VISTA Project # 902942



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902942-001	02CWC1003	Water	11/20/90



Results and Discussion

VISTA Project # 902942

One water sample was received on November 20 1990, for the determination of volatile organic compounds. The sample was analyzed according to the protocols described in USEPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Ed., Method 8240.

Volatile organics quality control (QC) results are reported for another client's samples which were prepared and analyzed with this sample. Sample information for the QC samples is withheld to maintain client confidentiality.

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID 02CWC1003
 VISTA Sample ID 902942-001 Sample Type Water
 Date Sampled 11/20/90 Date Received 11/20/90
 Date Analyzed 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	(2 7) *	5	ug/L
1,1-Dichloroethane	(3 7) *	5	ug/L
1,2-Dichloroethenes, total	90	5	ug/L
Chloroform	31	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	7 8	5	ug/L
Carbon Tetrachloride	59	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	32	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	5 8	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

OC Limits

Toluene-d ₈	105	%	92-109
4-Bromofluorobenzene	102	%	88-112
1,2-Dichloroethane-d ₄	102	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID NA
 VISTA Sample ID 902942-Blank Sample Type Water
 Date Sampled NA Date Received NA
 Date Analyzed 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

OC Limits

Toluene-d ₈	101	%	92-109
4-Bromofluorobenzene	101	%	88-112
1,2-Dichloroethane-d ₄	96	%	83-113

NA = Not Applicable

< = Compound not detected at or above the listed reporting limit

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants

Client Sample ID NA

VISTA Sample ID NA

Date Sampled NA

Date Analyzed 11/26/90

Sample Type Water

Date Received NA

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	35 0	70	63-115
Trichloroethene	50	ND	49 0	98	84-121
Benzene	50	ND	48 4	97	83-119
Toluene	50	ND	49 1	98	84-121
Chlorobenzene	50	ND	49 0	98	88-114

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits</u>	
					<u>RPD</u>	<u>% Rec</u>
1 1-Dichloroethene	50	34 7	69	1	14	63-115
Trichloroethene	50	49 1	98	0	14	84-121
Benzene	50	50 0	100	3	11	83-119
Toluene	50	51 1	102	4	13	84-121
Chlorobenzene	50	50 6	101	3	13	88-114

NA = Not Applicable
 ND = Not Detected
 MS = Matrix Spike
 MSD = Matrix Spike Duplicate
 RPD = Relative Percent Difference

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
 Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 019

PROJECT NO

22558 Task 500

ANALYSES

VOLATILES SUIZE*

NUMBER OF CONTAINERS

903013

REMARKS
 (Sample preservation
 handling procedures etc.)

SAMPLERS: (Signature)

BR Clow

For VISTA

DATE

TIME

SAMPLE NUMBER

12/7/90

1000

04CWC1006

2

001

Matrix - Water

All samples stored on ice

*Volatiles SUIZE:

See Bob Keck
 for Questions

- Samples Preserved
 with HCl to
 pH < 2

- LAST SHIPMENT

Contact personnel

Brian Clow

279-4501 x205

TOTAL NUMBER OF CONTAINERS

2

RELINQUISHED BY
 (Signature)

DATE/TIME

RECEIVED BY
 (Signature)

RELINQUISHED BY
 (Signature)

DATE/TIME

RECEIVED BY
 (Signature)

BR Clow

12/7/90 1615

METHOD OF SHIPMENT

SHIPPED BY
 (Signature)

COURIER
 (Signature)

RECEIVED FOR LAB BY
 (Signature)

DATE/TIME

[Signature] 12/7/90 1615



VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

INVOICE

DATE 12/19/90
INVOICE # 2062

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN MR STEVE BACA

CLIENT P O PROJ # * VISTA # 903013 MANAGER RJK INV# 2062

QUANTITY	DESCRIPTION	CODE	UNIT PRICE	TOTAL
10	Water	10	200 00	200 00

Subcontract No 1032

I certify that the above bill is correct and just that the amounts claimed represent fair charges and that Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds

Robert J. Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200 00

Due on or Before January 18 1991



3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

November 26 1990

Mr Brian Clow
Woodward Clyde Consultants
Sanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

Dear Mr Clow

This letter acknowledges receipt of one water sample. If you have any questions concerning the status of this work, please feel free to call

Robert J Keck Project Manager

refer to

VISTA Project # 902942

Thank you for selecting VISTA to meet your analytical needs

Sincerely,

A handwritten signature in cursive script that reads "Denise Malenck".

Denise Malenck
Sample Custodian

DM/rt



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902942 001	02CWC1003	Water	11/20/90

902942

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

PROJECT NO			ANALYSES				NUMBER OF CONTAINERS	REMARKS (Sample preservation handling procedure)
DATE	TIME	SAMPLE NUMBER	VOLICILES*					
22559 Task 500							For <u>Visia</u> 001 Matrix - Water All samples stored on ice <u>*Voliziles Suite*</u> - See Bob Keck for Questions - preserved w/HCl to pH < 2 Contact personnel Brian Clow 279-4501 x205	
SAMPLERS: (Signature) BR Clow			X			2		
11/27/90	1100	DZCWE.L003						

BR Clow / Keck

TOTAL NUMBER OF CONTAINERS 2

RELINQUISHED BY (Signature) BR Clow	DATE/TIME 11/27/90	RECEIVED BY (Signature)	RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)
METHOD OF SHIPMENT Personal Delivery		SHIPPED BY (Signature)	COURIER (Signature)	RECEIVED FOR LAB BY (Signature)	DATE/TIME 11/20/90 3:00p



3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

November 28, 1990

Mr Brian Clow
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

Dear Mr Clow

This letter acknowledges receipt of 11 water samples. If you have any questions concerning the status of this work, please feel free to call

Robert J Keck Project Manager

refer to

VISTA Project # 902964

Thank you for selecting VISTA to meet your analytical needs

Sincerely

A handwritten signature in cursive script that reads "Denise Malenck".

Denise Malenck
Sample Custodian

DM/rt



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902964-001	20GA07001	Water	11/26/90
902964-002	20GA05002	Water	11/26/90
902964-003	20GA06003	Water	11/26/90
902964-004	21GA01004	Water	11/26/90
902964-005	21GA01006	Water	11/26/90
902964-006	21GA02007	Water	11/26/90
902964-007	21GA08008	Water	11/26/90
902964-008	22GA01009	Water	11/26/90
902964-009	23GA01010	Water	11/26/90
902964-010	24GA01011	Water	11/26/90
902964-011	25GA01012	Water	11/26/90

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
 Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 011

PROJECT NO

22559 TASK 500

ANALYSES

VOLATILES & I.P.*

NUMBER OF CONTAINERS

902964

REMARKS
 (Sample preservation handling procedures etc.)

SAMPLERS (Signature)

BE Clow

For VISTA

DATE

TIME

SAMPLE NUMBER

11/26/90

20 GAO 7001

2

001

20 GAO 5002

2

002 Matrix Water

20 GAO 6003

1

003

21 GAO 1004

2

004 TIP Blank

~~21 GAO 2005~~

~~BEC 11/26/90~~

~~2~~

~~All samples stored on ice~~

21 GAO 1006

2

005

21 GAO 2007

2

006 Volatiles Suite

21 GAO 8008

4

007 See Bob Keck

22 GAO 1009

2

008 For Questions

23 GAO 1010

2

009

24 GAO 1011

2

010

25 GAO 1012

2

011 Samples Preserved

with HCl to

pH 2

Sample # 21GA08008

is a Matrix Spike/

Matrix Spike Duplicate

Contact personnel

Brian Clow

279-4501 x205

TOTAL NUMBER OF CONTAINERS

3
25

RELINQUISHED BY (Signature)

BE Clow

DATE/TIME

11/26/90
1700

RECEIVED BY (Signature)

RELINQUISHED BY (Signature)

DATE/TIME

RECEIVED BY (Signature)

METHOD OF SHIPMENT

SHIPPED BY (Signature)

COURIER (Signature)

RECEIVED FOR LAB BY (Signature)

DATE/TIME

11/26/90
1700

GM → SLB



VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

November 19, 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3 Suite 612
4582 South Ulster Street Parkway
Denver, Colorado 80237

Dear Mr Baca

This letter acknowledges receipt of one water sample. If you have any questions concerning the status of this work, please feel free to call

Robert J Keck Project Manager

refer to

VISTA Project # 902919

Thank you for selecting VISTA to meet your analytical needs

Sincerely

Denise Malenck
Sample Custodian

DM/rt



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902919 001	OLCWC1001	Water	11/14/90

902914

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 003

PROJECT NO

22558 TASK 500

ANALYSES

SAMPLERS: (Signature)

BR (low)

VOLATILES SUITE*

NUMBER OF CONTAINERS

REMARKS
(Sample preservation handling procedures)

For Vista Labs

DATE

TIME

SAMPLE NUMBER

11/13/90

1135

DLCWC L 001

2

2

001
Matrix - Water

All samples stored on ice

* Volatiles Suite.
Contact Bob Keck
for Questions

— preserved
w/HCl to pH < 2

BR (low) 11/13/90

Contact personnel
Brian Clow
279-4501 x 205

TOTAL NUMBER OF CONTAINERS

2

RELINQUISHED BY (Signature)

BR (low)

DATE/TIME

11/14/90 1700

RECEIVED BY (Signature)

[Signature]

RELINQUISHED BY (Signature)

[Signature]

DATE/TIME

[Signature]

RECEIVED BY (Signature)

[Signature]

METHOD OF SHIPMENT

Personal Delivery

SHIPPED BY (Signature)

[Signature]

COURIER (Signature)

[Signature]

RECEIVED FOR LAB BY (Signature)

[Signature]

DATE/TIME

[Signature]

902942

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

PROJECT NO

22558 Task 500

ANALYSES

SAMPLERS: (Signature)

BZ Clow

VOLATILES*

NUMBER OF CONTAINERS

REMARKS
(Sample preservation handling procedure etc.)

For Vista

DATE

TIME

SAMPLE NUMBER

11/20/90

1100

02CNR-1003

X

2

001

Matrix - Water

All samples stored on ice

*Volatiles Suite:

- See Bob Keck for Questions

- preserved w/HCl to pH < 2

BZ Clow 11/20/90

Contact personnel

Brian Clow

279-4501 x205

TOTAL NUMBER OF CONTAINERS

2

RELINQUISHED BY (Signature)

BZ Clow

DATE/TIME

11/20/90 1500

RECEIVED BY (Signature)

RELINQUISHED BY (Signature)

DATE/TIME

RECEIVED BY (Signature)

METHOD OF SHIPMENT

Personal Delivery

SHIPPED BY (Signature)

COURIER (Signature)

RECEIVED FOR LAB BY (Signature)

DATE/TIME

11/20/90 3:00p

VISTA
Laboratories Inc

1830 High Court
Wheat Ridge CO 80033
(303) 467-0630

INVOICE

DATE 1/30/90
INVOICE # 1091

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4502 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4502 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN MR STEVE BACA

CLIENT P O /PROJ # 2258 570 VISTA # 302942 MANAGER RJR _____ INV# 1991

QUANTITY	DESCRIPTION	CODE	UNIT PRICE	TOTAL
	10A - 8247 - 1 st	10	200 00	200 00

Subcontract No 1052

I certify that the above bill is correct and just and that the amounts claimed represent fair charges against Woodward-Clyde consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source or Government funds

Robert J. Keck
Robert J. Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200 00

Due on or Before December 30 1990



VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

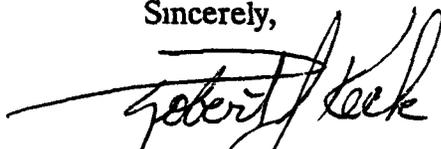
December 6, 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

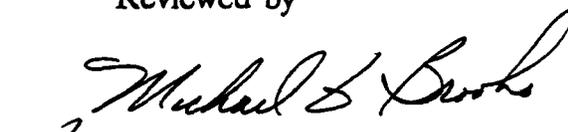
Dear Mr Baca

Enclosed are the results from the analysis of one water sample, received on November 28, 1990, for the determination of volatile organic compounds. Please feel free to call if you have any questions regarding this analysis.

Sincerely,


Robert J Keck
Director
Organic Chemistry

Reviewed by


for Corinne L. Bogert
Technical Director

RJK/CLB/rt
Enclosures

VISTA Project # 902972



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902972 001	03CWC1004	Water	11/28/90



Results and Discussion

VISTA Project # 902972

One water sample was received on November 28, 1990, for the determination of volatile organic compounds. The sample was analyzed according to the protocols described in USEPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Ed., Method 8240.

Volatile organics quality control (QC) results are reported for another client's samples which were prepared and analyzed with this sample. Sample information for the QC samples is withheld to maintain client confidentiality.

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID 03CWC1004
 VISTA Sample ID 902972-001 Sample Type Water
 Date Sampled 11/27/90 Date Received 11/28/90
 Date Analyzed 11/29/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	12	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	5 5	5	ug/L
1,1-Dichloroethane	(4 5) *	5	ug/L
1,2-Dichloroethenes, total	150	5	ug/L
Chloroform	33	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	13	5	ug/L
Carbon Tetrachloride	180	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	120	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	100	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

OC Limits

Toluene-d ₈	103	%	92-109
4-Bromofluorobenzene	99	%	88-112
1,2-Dichloroethane-d ₄	103	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID NA
 VISTA Sample ID 902972-Blank Sample Type Water
 Date Sampled NA Date Received NA
 Date Analyzed 11/29/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	101	%	92-109
4-Bromofluorobenzene	99	%	88-112
1,2-Dichloroethane-d ₄	95	%	83-113

NA = Not Applicable

< = Compound not detected at or above the listed reporting limit

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants
Client Sample ID NA
VISTA Sample ID NA
Date Sampled NA
Date Analyzed 11/29/90

Sample Type Water
Date Received NA

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	37 6	75	54-154
Trichloroethene	50	ND	48 5	97	85-128
Benzene	50	ND	50 7	101	72-134
Toluene	50	ND	50 3	101	78-128
Chlorobenzene	50	ND	49 0	98	85-122

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits</u>	
					<u>RPD</u>	<u>% Rec</u>
1,1-Dichloroethene	50	38 0	76	1	14	54-154
Trichloroethene	50	49 9	100	3	14	85-128
Benzene	50	52 1	104	3	11	72-134
Toluene	50	51 0	102	1	13	78-128
Chlorobenzene	50	50 1	100	2	13	85-122

NA = Not Applicable
ND = Not Detected
MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

902972

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 014

PROJECT NO			ANALYSES		NUMBER OF CONTAINERS	REMARKS (Sample preservation handling procedures etc.)
DATE	TIME	SAMPLE NUMBER				
22558 Task 500					2	For <u>VISTA</u>
SAMPLERS: (Signature) BE Clow						
11/27/90	1600	Q3CWL004	X			Matrix - <u>Water</u> 001
BE Clow 11/28/00 (Diagonal line across remaining rows)						All samples stored on ice
						* <u>Vadaviles Suite</u>
						See Bob Keck
						for Questions
						<u>Samples NOT Preserved</u>
			TOTAL NUMBER OF CONTAINERS		2	
RELINQUISHED BY (Signature) BE Clow		DATE/TIME 11/28/90 1600	RECEIVED BY (Signature)			
METHOD OF SHIPMENT		SHIPPED BY (Signature)	COURIER (Signature)		RECEIVED FOR LAB BY (Signature)	DATE/TIME 11/28/90 1600

Contact personnel
Brian Clow
279-4501 x205



3830 High Court
 Wheat Ridge CO 80033
 (303) 467-0630

INVOICE

DATE 12/03/90
 INVOICE # 2013

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
 STANFORD PLACE 3 SUITE 1000
 532 SOUTH ULSTER PARKWAY
 DENVER COLORADO 80257
 ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
 STANFORD PLACE 3 SUITE 1000
 4532 SOUTH ULSTER PARKWAY
 DENVER COLORADO 80257
 ATTN MR STEVE BACA

CLIENT P O /PROJ # 22557 TASK 500

VISTA # 902972

MANAGER RJY INV# 2013

QUANTITY	DESCRIPTION	CODE	UNIT PRICE	TOTAL
1	OA - 2.0 - Water	10	200.00	200.00

Subcontract # 1032

I certify that the above bill is correct and just and that the amounts claimed represent fair charges against Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds

Robert J. Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200.00

Due on or Before January 4 1990



3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

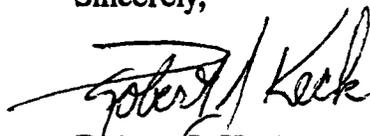
December 19, 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

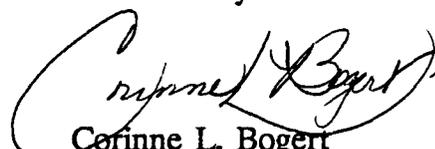
Dear Mr Baca

Enclosed are the results from the analysis of one water sample, received on December 7 1990, for the determination of volatile organic compounds. Please feel free to call if you have any questions regarding this analysis.

Sincerely,


Robert J Keck
Director
Organic Chemistry

Reviewed by


Corinne L. Bogert
Technical Director

RJK/CLB/rt
Enclosures

VISTA Project # 903013



Results and Discussion

VISTA Project # 903013

One water sample was received on December 7, 1990, for the determination of volatile organic compounds. The sample was analyzed according to the protocols described in USEPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Ed., Method 8240.

Volatile organics quality control (QC) results are reported for another client's samples which were prepared and analyzed with this sample. Sample information for the QC samples is withheld to maintain client confidentiality.

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID 04CWC1006
 VISTA Sample ID 903013-001
 Date Sampled 12/07/90
 Date Analyzed 12/10/90

Sample Type Water
 Date Received 12/07/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(1 3) *	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	(4 1) *	5	ug/L
1,2-Dichloroethenes, total	96	5	ug/L
Chloroform	25	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	8 3	5	ug/L
Carbon Tetrachloride	92	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	69	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1 2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	27	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	96	%	92-109
4-Bromofluorobenzene	94	%	88-112
1,2-Dichloroethane-d ₄	87	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID NA
 VISTA Sample ID 903013-Blank Sample Type Water
 Date Sampled NA Date Received NA
 Date Analyzed 12/10/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(2 7)*	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes total	<	5	ug/L
Chloroform	<	5	ug/L
1 2-Dichloroethane	<	5	ug/L
2-Butanone	(1 6)*	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>QC Limits</u>
Toluene-d ₈	96	%	92-109
4-Bromofluorobenzene	95	%	88-112
1,2-Dichloroethane-d ₄	93	%	83-113

NA = Not Applicable

* Detected below reporting limit quantitation may be unreliable

< = Compound not detected at or above the listed reporting limit

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants

Client Sample ID NA

VISTA Sample ID NA

Date Sampled NA

Date Analyzed 12/10/90

Sample Type Water

Date Received NA

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	35 5	71	63-115
Benzene	50	ND	53 0	106	84-121
Trichloroethene	50	ND	47 7	95	83-119
Toluene	50	ND	45 5	91	84-121
Chlorobenzene	50	ND	49 8	100	88-114

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits RPD % Rec</u>
1,1-Dichloroethene	50	31 6	63	12	14 63-115
Benzene	50	52 0	104	2	11 84-121
Trichloroethene	50	44 8	90	5	14 83-119
Toluene	50	44 7	89	2	13 84-121
Chlorobenzene	50	48 3	97	3	13 88-114

NA = Not Applicable

ND = Not Detected

MS = Matrix Spike

MSD = Matrix Spike Duplicate

RPD = Relative Percent Difference



770 05

3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

November 30 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

Dear Mr Baca

This letter acknowledges receipt of one water sample. If you have any questions concerning the status of this work, please feel free to call

Robert J Keck Project Manager

refer to

VISTA Project # 902972

Thank you for selecting VISTA to meet your analytical needs

Sincerely

A handwritten signature in cursive script that reads "Denise Malenck". The signature is written in black ink and is positioned above the printed name and title.

Denise Malenck
Sample Custodian

DM/rt



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902972 001	03CWC1004	Water	11/28/90



3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

12/31/90
Steve - Original to
Jo Ann for approval
Thru FYI Debra

INVOICE

DATE 11/27/90
INVOICE # 1963

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 612
4582 SOUTH ULSTER STREET PARKWAY
DENVER COLORADO 80237
ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 612
4582 SOUTH ULSTER STREET PARKWAY
DENVER COLORADO 80237
ATTN MR STEVE BACA

CLIENT P O / PROJ # SUBCONTRACT 1032 VISTA # 902919 MANAGER RJK INV# 1963

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CODE</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
1	VOA - 8240 - Water	10	200 00	200 00

Subcontract No 1032

I certify that the above bill is correct and just that the amounts claimed represent fair charges against Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds

Robert J. Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200 00

Due on or Before December 27 1990

UNPAID INVOICES OVER 60 DAYS WILL BE ASSESSED A 1 5% MONTHLY SERVICE CHARGE

VISTA
Laboratories Inc

3830 High Court
Wheat Ridge CO 80033
(303) 467 0630

INVOICE

DATE 11/30/90
INVOICE # 1997

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN MR STEVE BACA

CLIENT P O /PROJ # SUBCONTRACT # 1032

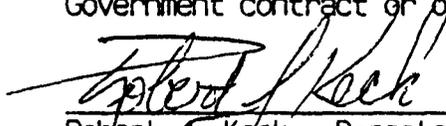
VISTA # 902964

MANAGER RJK____ INV# 1997

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CODE</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
11	VOA - 8240 - Water	10	200 00	2 200 00

Subcontract No 1032

I certify that the above bill is correct and just that the amounts claimed represent fair charges against Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds


Robert J Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 2 200 00

Due on or Before December 30 1990

UNPAID INVOICES OVER 60 DAYS WILL BE ASSESSED A 1 5% MONTHLY SERVICE CHARGE



3830 High Court
 Wheat Ridge CO 80033
 (303) 467-0630

I N V O I C E

DATE 11/30/90
 INVOICE # 1991

TO

CLIENT

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 DENVER COLORADO 80237
 ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
 STANFORD PLACE 3 SUITE 1000
 4582 SOUTH ULSTER PARKWAY
 DENVER COLORADO 80237
 ATTN MR STEVE BACA

CLIENT P O /PROJ # 22558 TASK 500

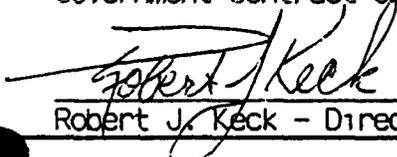
VISTA # 902942

MANAGER RJK____ INV# 1991

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CODE</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
1	VOA - 8240 - Water	10	200 00	200 00

Subcontract No 1032

I certify that the above bill is correct and just that the amounts claimed represent fair charges against Woodward-Clyde Consultants are in accordance with the terms and conditions of the subcontract and that reimbursement has not and will not be received under any other Government contract or other source of Government funds



Robert J. Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 200 00

Due on or Before December 30 1990



3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

1113
November 9, 1990

Mr Steven Baca
Woodward Clyde Federal Services
Stanford Place 3, Suite 612
4582 South Ulster Street Parkway
Denver Colorado 80237

Dear Mr Baca

This letter is in response to the findings and observations resulting from the laboratory audit of the VISTA Laboratories Inc facilities conducted by Mr Steven Baca of Woodward Clyde Federal Services (WCFS) on September 13 1990. The following corrective action has been implemented to remedy the deficiencies as noted.

Findings

- 1 VISTA has instituted a program of examination, review and sign off for each process with appropriate comments in the sample log in book, instrument logs or on analytical bench sheets. In that hundreds or possibly thousands of documents may be involved in a single days laboratory operation, the QA officer could not responsibly review all documents. To assume the documents are properly reviewed the supervisors in each area will review the laboratory documents and sign-off as is appropriate. The QA officer will review all records concerning sample storage and provide a secondary review of standards preparation documents.
- 2 VISTA has instituted an internal QA audit program. The statement of this policy, as added to VISTA's QA Program, is attached.

Observations

- 1 VISTA has developed an SOP for lab waste disposal. A copy is attached for your review.



Mr Steve Baca
November 9, 1990
Page

- 2 VISTA has contracted with Metro Mechanical Services Co (formerly WB Industries) to monitor fume hood performance The hoods were inspected on September 27 1990 and their report is enclosed The hoods are scheduled to be monitored every six months
- 3 Specific conductance of our deionized water is now monitored on a daily basis Log books with the analysts entries are available for review
- 4 As per the comments of Mr Baca at the time of the audit, VISTA now requires that all guests sign a visitors register I ve also enclosed a memo covering VISTA s policy on security
- 5 VISTA is in the process of constructing a ventilation system for the solvent storage cabinet
- 6 VISTA has instituted a system of written documentation of corrective action The new form is attached

Sincerely



Michael G Brooks
President

MGB/lk
Enclosures

Internal Quality Audits

The quality audit is conducted to qualitatively evaluate the details of the QA program. The quality assurance director will conduct internal quality audits periodically and aperiodically and report all findings to the president. The objective of the audits will be the degree of compliance with the laboratory quality assurance program. Audits may cover the full scope of the Contract Laboratory Program or they may be randomly selected spot audits.

Supervisors are responsible for assuring all SOPs are followed and are an important part of the audit. Laboratory notebook checks by the supervisor and quality assurance director may assure adherence to procedural details. All records should be kept in a satisfactory and readily understandable fashion. Randomly selected analytical records may be reviewed to see that all required documentation is available. Some analytical records may be examined in detail to determine the quality as well as the completeness of the information.

Handling and Disposal of Solvents

1 0 Definitions

- 1 1 Uncontaminated Solvent Solvent which has not been contaminated with toxic or hazardous chemicals does not exhibit an extreme pH and is not considered a toxic solvent (ie benzene) or a standard (ie pyridine)
- 1 2 Contaminated Solvent Solvent that may be contaminated with toxic or hazardous chemicals or is itself considered toxic

2 0 Handling of Solvents

- 2.1 As described in the Laboratory Safety Manual always use a poly container when transporting bottles of solvent across the laboratory
- 2 2 Never place a solvent bottle on the floor without a poly container
- 2 3 Cap and store all solvent bottles in the solvent storage cabinet when not in use

3 0 Disposal of Contaminated Solvent

- 3 1 Determine whether the solvent is contaminated
- 3 2 Allow the solvent to hood evaporate
- 3 3 Transfer the residue (liquid or solid) to a waste storage bottle
- 3 4 Store the waste bottle in a storage drum

DRAFT



Chemical Waste Disposal Procedure

All acidic and basic sample preparations are to be deposited into a carboy labelled as waste. Once the carboy is three quarters full, it is to be neutralized with technical flake sodium hydroxide and/or nitric acid. After each addition, the waste should be mixed and the pH checked using a pH strip. When neutralization is obtained (pH 7), the contents of the carboy is to be flushed down the sink with copious amounts of cold tap water.

All cyanide waste containing the reagent pyridine are to be placed in a waste container (labelled appropriately) in the fume hood and evaporated to dryness.


MEMORANDUM

TO: All VISTA Employees
FROM: Michael G. Brooks, Lab Director *MeB*
DATE: March 21, 1990
SUBJECT: Security

The work ongoing at VISTA Laboratories is often of a very serious nature. The analytical results are sometimes used in civil liability or in criminal cases. Regulators use the results to make important decisions on health effects from the disposal of solid waste. The results may determine whether a generator of waste needs to install a multi million dollar treatment facility. To ensure the data we produce is accurate, strict security at our facility is necessary to prevent the possibility of tampering with the samples we analyze.

The first priority is to limit access to the laboratory to only VISTA personnel. All visitors to VISTA including auditors must be escorted at all times. Under no circumstances should a visitor have unobserved access to samples. This includes clients who are delivering samples in the sample receiving areas. Contractors to VISTA who are performing building maintenance or instrument repairs must be identified before being allowed in the facility. They must never be allowed to work in an area where they have unobserved access to samples. All doors accessing the laboratory must remain closed and locked. Any door left open for reason of repeated ingress or egress must be stationed by a laboratory employee.

All samples and sample extracts will be stored in locked refrigerators. Access to the samples will be limited to only those persons who must have access. Those include Laboratory managers, supervisors, analysts and preparatory technicians. The refrigerators will remain locked when access is not required. All unused samples or sample extracts will be returned to the locked refrigerators when aliquoting for preparation or analysis is completed.

If you happen upon someone in the laboratory whom you do not recognize as a VISTA employee, stop them at once. Ask them "May I help you?" Do not leave them unescorted. Take them with you to find the VISTA employee who is responsible for them. If you do not get a satisfactory response from them, call your supervisor immediately. Notify me of any instance where an unescorted visitor is found in the laboratory.

Keep in mind that all analytical results are the sole property of our client and are to be kept confidential. No one is permitted to release data to a third party without written authorization from the client who submitted the samples.



No visitors may have unobserved access to data storage and file cabinets. Visitors should not be shown other client's data as an example of VISTA's reporting style. Client data should never be used in a publication without written authorization from the client.

Please keep in mind that we owe our clients these services. We never know when data may be used for litigation purposes and as such we must be able to assure our clients that our results are accurate and samples have not been tampered with while in VISTA's possession.

CORRECTIVE ACTION FORM

Date _____

Initials _____

Analytical Group _____

1) Identification of problem _____

2) Party responsible for investigation _____

3) Cause of problem _____

4) Corrective action _____

5) Party responsible for corrective action _____

6) Implementation and effectiveness of corrective action _____

7) Verification that corrective action has eliminated problem _____

Supervisor's Signature _____

Date _____

Please submit to the QA Director



3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

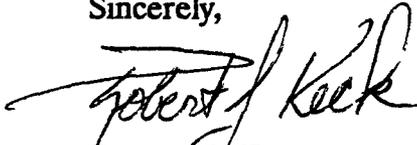
November 30, 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 1000
4582 South Ulster Parkway
Denver, Colorado 80237

Dear Mr Baca

Enclosed are the results from the analyses of 11 water samples, received on November 26, 1990 for the determination of volatile organic compounds. Please feel free to call if you have any questions regarding these analyses.

Sincerely,


Robert J. Keck
Director
Organic Chemistry

Reviewed by,


Corinne L. Bogert
Technical Director

RJK/CLB/rt
Enclosures

VISTA Project # 902964



Sample Description

<u>Laboratory ID</u>	<u>Client ID</u>	<u>Type</u>	<u>Date Received</u>
902964-001	20GA07001	Water	11/26/90
902964-002	20GA05002	Water	11/26/90
902964-003	20GA06003	Water	11/26/90
902964-004	21GA01004	Water	11/26/90
902964-005	21GA01006	Water	11/26/90
902964-006	21GA02007	Water	11/26/90
902964-007	21GA08008	Water	11/26/90
902964-008	22GA01009	Water	11/26/90
902964-009	23GA01010	Water	11/26/90
902964-010	24GA01011	Water	11/26/90
902964-011	25GA01012	Water	11/26/90



Results and Discussion

VISTA Project # 902964

Eleven water samples were received on November 26, 1990, for the determination of volatile organic compounds. The samples were analyzed according to the protocols described in USEPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Ed., Method 8240.

Volatile organics quality control (QC) results are reported for another client's samples which were prepared and analyzed with these samples. Sample information for the QC samples is withheld to maintain client confidentiality.

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants

Client Sample ID 20GA07001

VISTA Sample ID 902964-001

Sample Type Water

Date Sampled 11/26/90

Date Received 11/26/90

Date Analyzed 11/28/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(1 7) *	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	(2 3) *	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

OC Limits

Toluene-d ₈	99	%	92-109
4-Bromofluorobenzene	98	%	88-112
1,2-Dichloroethane-d ₄	100	%	83-113

* Detected below reporting limit quantitation may be unreliable
< = Compound not detected at or above the listed reporting limit

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID 20GA05002
 VISTA Sample ID 902964-002 Sample Type Water
 Date Sampled 11/26/90 Date Received 11/26/90
 Date Analyzed 11/27/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(2 6) *	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	97	%	92-109
4-Bromofluorobenzene	95	%	88-112
1,2-Dichloroethane-d ₄	103	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID 20GA06003
 VISTA Sample ID 902964-003
 Date Sampled 11/26/90
 Date Analyzed 11/27/90

Sample Type Water
 Date Received 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	94	%	92-109
4-Bromofluorobenzene	92	%	88-112
1,2-Dichloroethane-d ₄	105	%	83-113

< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

1

Client Woodward-Clyde Consultants
 Client Sample ID 20GA01004
 VISTA Sample ID 902964-004 Sample Type Water
 Date Sampled 11/26/90 Date Received 11/26/90
 Date Analyzed 11/27/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(2 4)*	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	(4 2)*	5	ug/L
1,1-Dichloroethane	(3 7)*	5	ug/L
1,2-Dichloroethenes, total	97	5	ug/L
Chloroform	33	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	13	5	ug/L
Carbon Tetrachloride	140	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	97	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	52	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

OC Limits

Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	96	%	88-112
1,2-Dichloroethane-d ₄	104	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
Client Sample ID 21GA01006
VISTA Sample ID 902964-005
Date Sampled 11/26/90
Date Analyzed 11/27/90

Sample Type Water
Date Received 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>OC Limits</u>
Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	97	%	88-112
1,2-Dichloroethane-d ₄	107	%	83-113

< = Compound not detected at or above the listed reporting limit

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
Client Sample ID 21GA02007
VISTA Sample ID 902964-006
Date Sampled 11/26/90
Date Analyzed 11/27/90

Sample Type Water
Date Received 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(4 5) *	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	100	%	92-109
4-Bromofluorobenzene	100	%	88-112
1,2-Dichloroethane-d ₄	111	%	83-113

* Detected below reporting limit quantitation may be unreliable
< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants

Client Sample ID 21GA08008

VISTA Sample ID 902964-007

Sample Type Water

Date Sampled 11/26/90

Date Received 11/26/90

Date Analyzed 11/28/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	99	%	92-109
4-Bromofluorobenzene	97	%	88-112
1,2-Dichloroethane-d ₄	93	%	83-113

< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID 22GA01009
 VISTA Sample ID 902964-008
 Date Sampled 11/26/90
 Date Analyzed 11/28/90

Sample Type Water
 Date Received 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>OC Limits</u>
Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	95	%	88-112
1,2-Dichloroethane-d ₄	97	%	83-113

< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants

Client Sample ID 23GA01010

VISTA Sample ID 902964-009

Sample Type Water

Date Sampled 11/26/90

Date Received 11/26/90

Date Analyzed 11/28/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>QC Limits</u>
Toluene-d ₈	99	%	92-109
4-Bromofluorobenzene	98	%	88-112
1,2-Dichloroethane-d ₄	97	%	83-113

< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants

Client Sample ID 24GA01011

VISTA Sample ID 902964-010

Sample Type Water

Date Sampled 11/26/90

Date Received 11/26/90

Date Analyzed 11/28/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	100	%	88-112
1,2-Dichloroethane-d ₄	102	%	83-113

< = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID 25GA01012
 VISTA Sample ID 902964-011
 Date Sampled 11/26/90
 Date Analyzed 11/28/90

Sample Type Water
 Date Received 11/26/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	<	5	ug/L
Acetone	(2 9) *	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	(3 5) *	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>QC Limits</u>
Toluene-d ₈	101	%	92-109
4-Bromofluorobenzene	100	%	88-112
1,2-Dichloroethane-d ₄	105	%	83-113

* Detected below reporting limit quantitation may be unreliable
 < = Compound not detected at or above the listed reporting limit

EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240

Client Woodward-Clyde Consultants
 Client Sample ID NA
 VISTA Sample ID 902964-Blank Sample Type Water
 Date Sampled NA Date Received NA
 Date Analyzed 11/27/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	(1 3)*	5	ug/L
Acetone	<	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	<	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L
<u>Surrogate Recoveries</u>			<u>OC Limits</u>
Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	99	%	88-112
1,2-Dichloroethane-d ₄	97	%	83-113

* Detected below reporting limit quantitation may be unreliable
 NA = Not Applicable
 < = Compound not detected at or above the listed reporting limit

**EPA-CLP Target Compound List
Volatile Organic Compounds - EPA Method 8240**

Client Woodward-Clyde Consultants
 Client Sample ID NA
 VISTA Sample ID 902964-Blank Sample Type Water
 Date Sampled NA Date Received NA
 Date Analyzed 11/28/90

<u>Analyte</u>	<u>Result</u>	<u>Reporting Limit</u>	<u>Units</u>
Chloromethane	<	10	ug/L
Bromomethane	<	10	ug/L
Vinyl Chloride	<	10	ug/L
Chloroethane	<	10	ug/L
Methylene Chloride	(2 6)*	5	ug/L
Acetone	(1 5)*	100	ug/L
Carbon Disulfide	<	5	ug/L
1,1-Dichloroethene	<	5	ug/L
1,1-Dichloroethane	<	5	ug/L
1,2-Dichloroethenes, total	<	5	ug/L
Chloroform	<	5	ug/L
1,2-Dichloroethane	<	5	ug/L
2-Butanone	<	100	ug/L
1,1,1-Trichloroethane	<	5	ug/L
Carbon Tetrachloride	<	5	ug/L
Vinyl Acetate	<	50	ug/L
Bromodichloromethane	<	5	ug/L
1,2-Dichloropropane	<	5	ug/L
Trans-1,3-Dichloropropene	<	5	ug/L
Trichloroethene	<	5	ug/L
Dibromochloromethane	<	5	ug/L
1,1,2-Trichloroethane	<	5	ug/L
Benzene	<	5	ug/L
Cis-1,3-Dichloropropene	<	5	ug/L
2-Chloroethyl Vinyl Ether	<	10	ug/L
Bromoform	<	5	ug/L
4-Methyl-2-Pentanone	(2 9)*	50	ug/L
2-Hexanone	<	50	ug/L
Tetrachloroethene	<	5	ug/L
1,1,2,2-Tetrachloroethane	<	5	ug/L
Toluene	<	5	ug/L
Chlorobenzene	<	5	ug/L
Ethylbenzene	<	5	ug/L
Styrene	<	5	ug/L
Xylenes, total	<	5	ug/L

Surrogate Recoveries

QC Limits

Toluene-d ₈	98	%	92-109
4-Bromofluorobenzene	96	%	88-112
1,2-Dichloroethane-d ₄	98	%	83-113

* Detected below reporting limit quantitation may be unreliable
 NA = Not Applicable
 < = Compound not detected at or above the listed reporting limit

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants

Client Sample ID NA

VISTA Sample ID NA

Date Sampled NA

Date Analyzed 11/27/90

Sample Type Water

Date Received NA

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	41 1	82	63-115
Trichloroethene	50	ND	48 8	98	84-121
Benzene	50	ND	53 4	107	83-119
Toluene	50	ND	52 7	105	84-121
Chlorobenzene	50	ND	49 0	98	88-114

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits</u>	
					<u>RPD</u>	<u>% Rec</u>
1,1-Dichloroethene	50	40 6	81	1	14	63-115
Trichloroethene	50	48 5	97	1	14	84-121
Benzene	50	52 9	106	1	11	83-119
Toluene	50	52 5	105	0	13	84-121
Chlorobenzene	50	48 6	97	1	13	88-114

NA = Not Applicable
 ND = Not Detected
 MS = Matrix Spike
 MSD = Matrix Spike Duplicate
 RPD = Relative Percent Difference

**Quality Assurance
Volatile Organics - EPA Method 8240
Matrix Spike Recovery and Precision**

Client Woodward-Clyde Consultants
Client Sample ID 21GA08008
VISTA Sample ID 902964-007
Date Sampled 11/26/90
Date Analyzed 11/28/90

Sample Type Water
Date Received 11/26/90

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>Sample Conc (ug/L)</u>	<u>MS Conc (ug/L)</u>	<u>MS % Rec</u>	<u>QC Limits % Rec</u>
1,1-Dichloroethene	50	ND	41 7	83	63-115
Trichloroethene	50	ND	48 9	98	84-121
Benzene	50	ND	49 4	99	83-119
Toluene	50	ND	48 9	98	84-121
Chlorobenzene	50	ND	48 0	96	88-114

<u>Compound</u>	<u>Spike Added (ug/L)</u>	<u>MSD Conc (ug/L)</u>	<u>MSD % Rec</u>	<u>RPD</u>	<u>QC Limits</u>	
					<u>RPD</u>	<u>% Rec</u>
1,1-Dichloroethene	50	39 6	79	5	14	63-115
Trichloroethene	50	47 8	96	2	14	84-121
Benzene	50	49 3	99	0	11	83-119
Toluene	50	48 6	97	1	13	84-121
Chlorobenzene	50	47 7	95	1	13	88-114

ND = Not Detected
MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

Woodward-Clyde Consultants

Stanford Place 3 Suite 1000 4582 South Ulster Street Parkway
 Denver Colorado 80237 (303) 694 2770

Chain of Custody Record

COC # 011

PROJECT NO

22558 TASK 500

ANALYSES

VOLATILES SURVEY*

902964

SAMPLERS: (Signature)

BE Clow

REMARKS
 (Sample preservation handling procedure)

For VISTA

DATE	TIME	SAMPLE NUMBER	ANALYSES	NUMBER OF CONTAINERS
11/26/90		20 GAO 7001		2
		20 GAO 5002		2
		20 GAO 6003		1
		21 GAO 1004		2
		21 GAO 2005		2
		21 GAO 1006		2
		21 GAO 2007		2
		21 GAO 8008		4
		22 GAO 1009		2
		23 GAO 1010		2
		24 GAO 1011		2
		25 GAO 1012		2

BEC 11/26/90

001
 002 Water
 003
 004 TIP Blank
 All samples stored on ice
 005
 006 Volatiles Survey
 007 See Bob Keck
 008 for QUESTIONS
 009
 010
 011 Samples Preserved
 with HCl to
 pH 2

Sample # 21GA08008
 is a Matrix Spike/
 Matrix Spike Duplicate

Contact personnel
 Brian Clow
 279-4501 x205

TOTAL NUMBER OF CONTAINERS

3
 25
 etc

RELINQUISHED BY (Signature) BE Clow	DATE/TIME 11/26/90 1700	RECEIVED BY (Signature)	RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)
METHOD OF SHIPMENT		SHIPPED BY (Signature)	COURIER (Signature)	RECEIVED FOR LAB BY (Signature)	DATE/TIME 11/26/90 1700



9830 High Court
Wheat Ridge CO 80033
(303) 467-0630

INVOICE

DATE 11/30/90
INVOICE # 1397

TO

CLIENT

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN DEBRA L LARSEN

WOODWARD-CLYDE CONSULTANTS
STANFORD PLACE 3 SUITE 1000
4582 SOUTH ULSTER PARKWAY
DENVER COLORADO 80237
ATTN MR STEVE BACA

AGENT P O / PROJ # SUBCONTRACT # 1C32

VISTA # 902964

MANAGER RJK _____ INV# 1997

QUANTITY	DESCRIPTION	CODE	UNIT PRICE	TOTAL
	WA - 8240 - Water	10	200 00	2 200 00

I hereby certify that the above bill is correct and just and that the amounts claimed represent fair and just compensation for the work performed and that no reimbursement has not and will not be received under any other contract or other source of Government funds.

Robert Keck

Robert Keck - Director Organic Chemistry - VISTA Laboratories Inc

TERMS Net 30 Days

TOTAL AMOUNT DUE \$ 2 200 00

Due on or Before December 30 1990



3830 High Court
Wheat Ridge CO 80033
(303) 467-0630

December 14 1990

Mr Steve Baca
Woodward Clyde Consultants
Stanford Place 3, Suite 612
4582 South Ulster Street Parkway
Denver, Colorado 80237

Dear Mr Baca

Enclosed are VISTA Laboratories control limits and control charts for November 1, 1990. October data points are plotted for your perusal. The data points include sample and blank data. Please feel free to call if you have any questions.

Sincerely,

A handwritten signature in cursive script, appearing to read "Corinne L. Bogert".

Corinne L. Bogert
Technical Director

CLB/lk
Enclosures

cc R Keck VISTA



Control Limits
VOA Surrogates

Method 624/8240
Matrix Water

November 1990

105 Data Points

	AVG	UCL	UWL	LWL	LCL
d8-Toluene	101	109	107	95	92
Bromofluorobenzene	100	112	108	92	88
d4-Dichloroethane	98	113	108	88	83



Control Limits

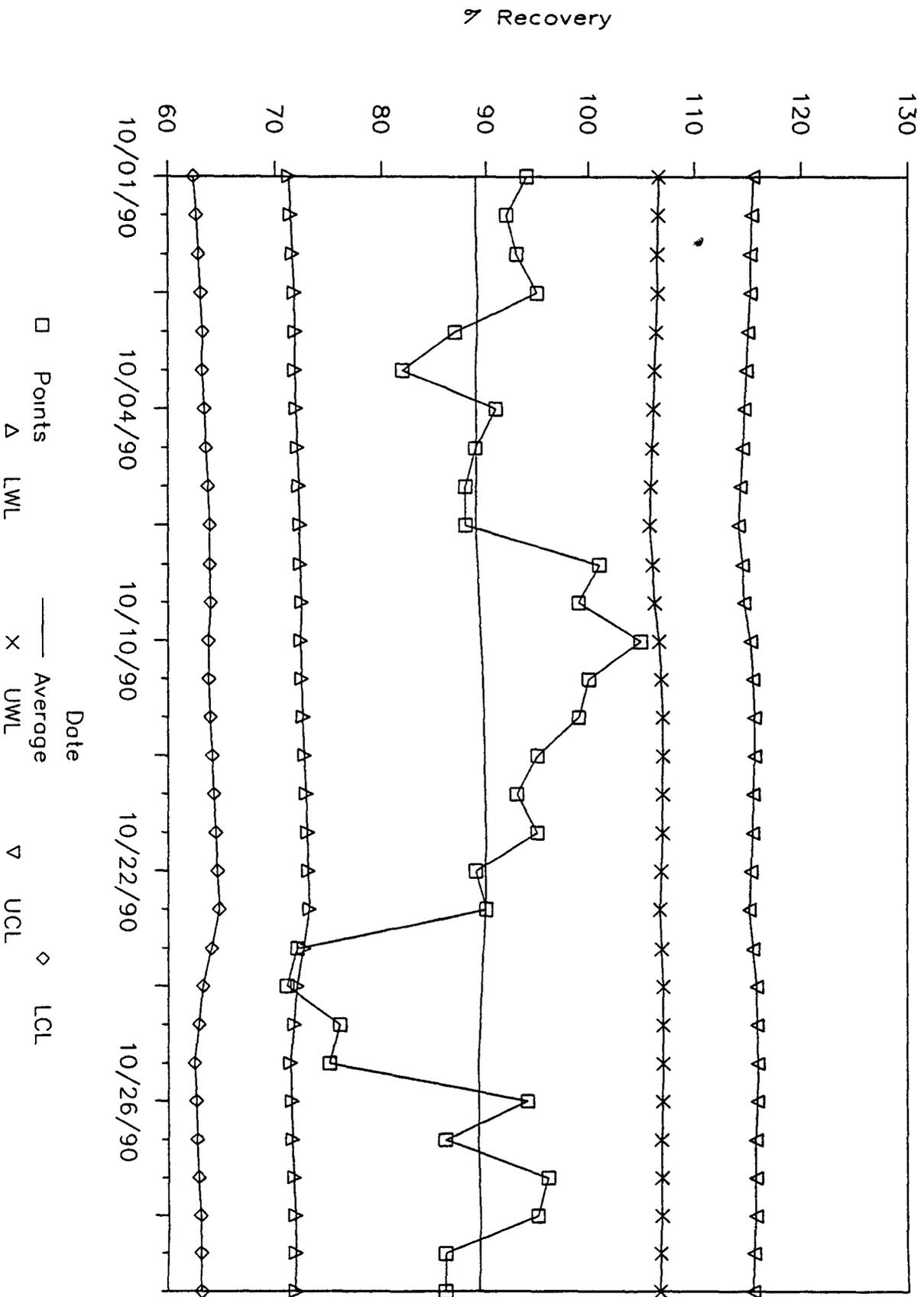
Methods 624/8240
Matrix Water

November 1990

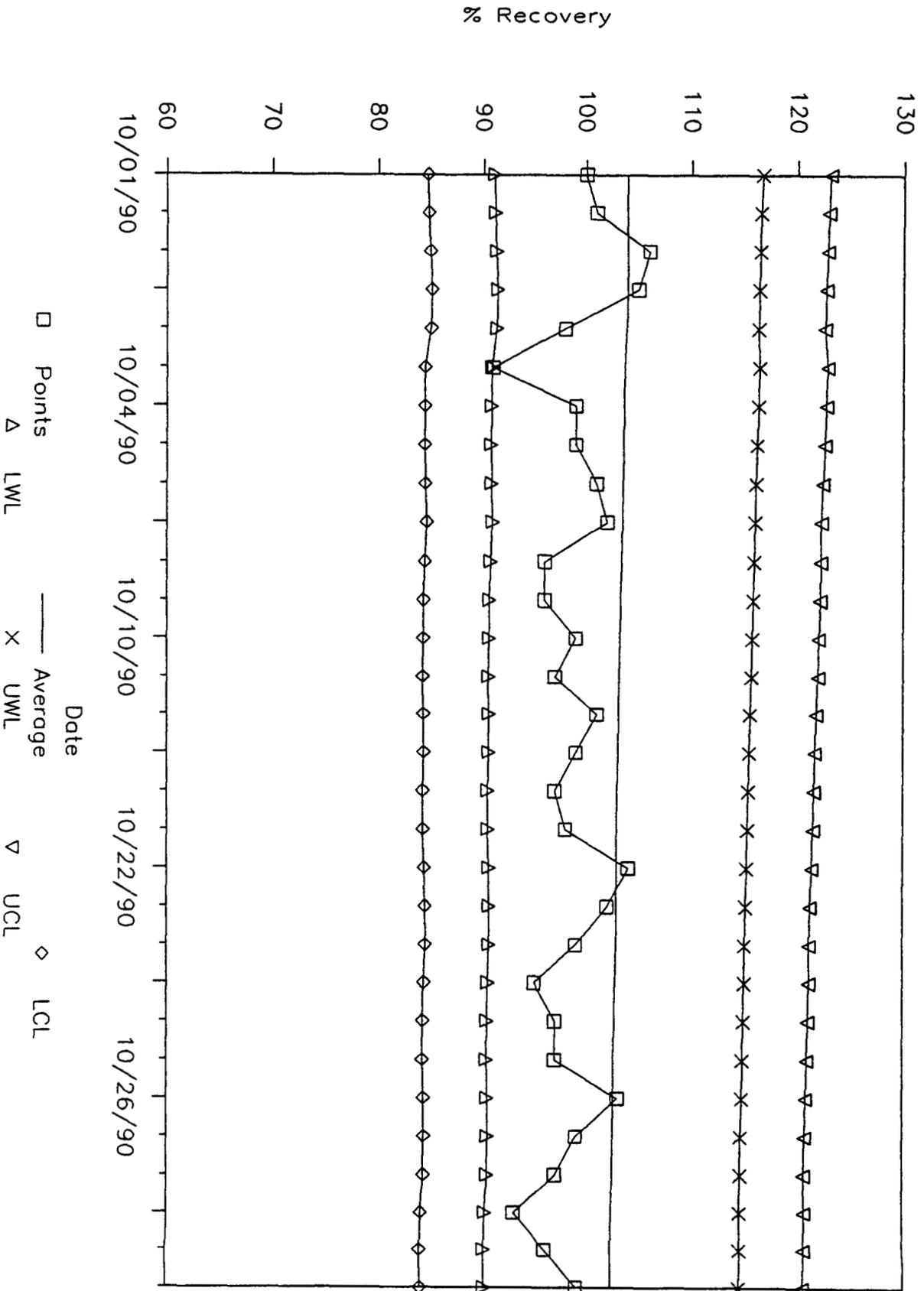
92 data points

4	Avg	LCL	LWL	UWL	UCL
1,1-Dichloroethene	89	63	72	107	115
Trichloroethene	102	84	90	115	121
Benzene	101	83	89	113	119
Toluene	102	84	90	114	121
Chlorobenzene	101	88	92	110	114

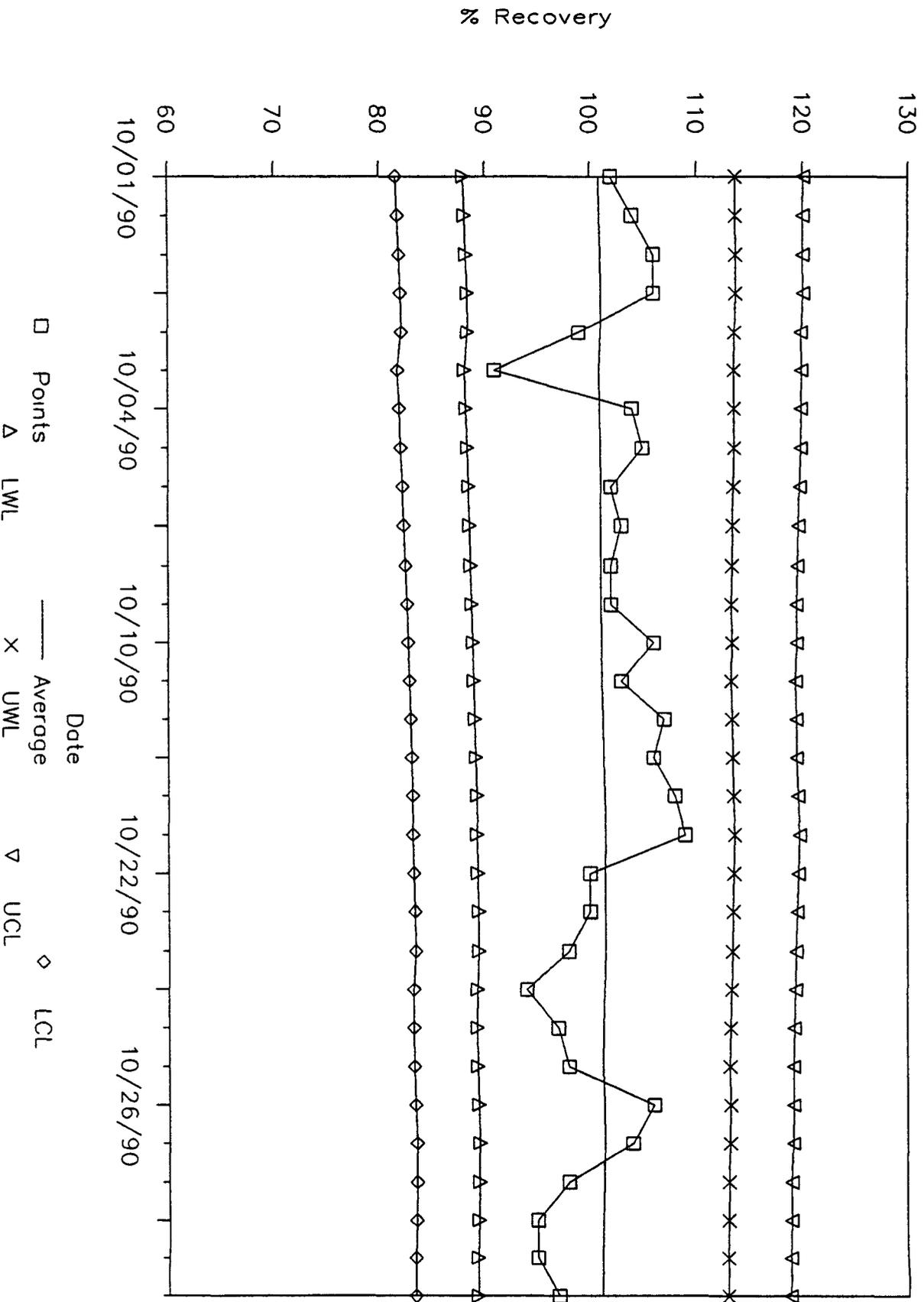
Spike Recovery -- 1,1-Dichloroethene



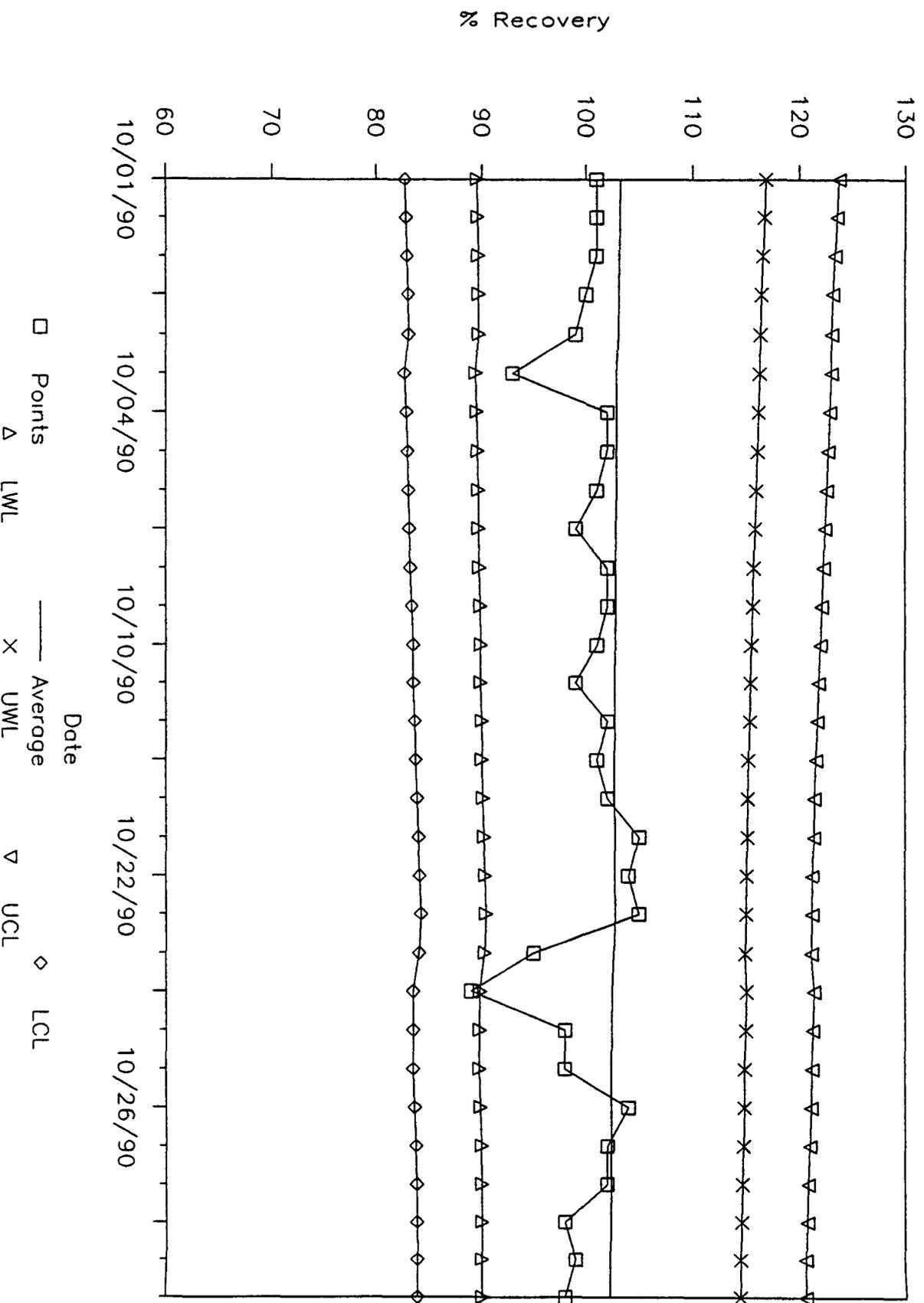
Spike Recovery -- Trichloroethene



Spike Recovery – Benzene



Spike Recovery – Toluene



% Recovery

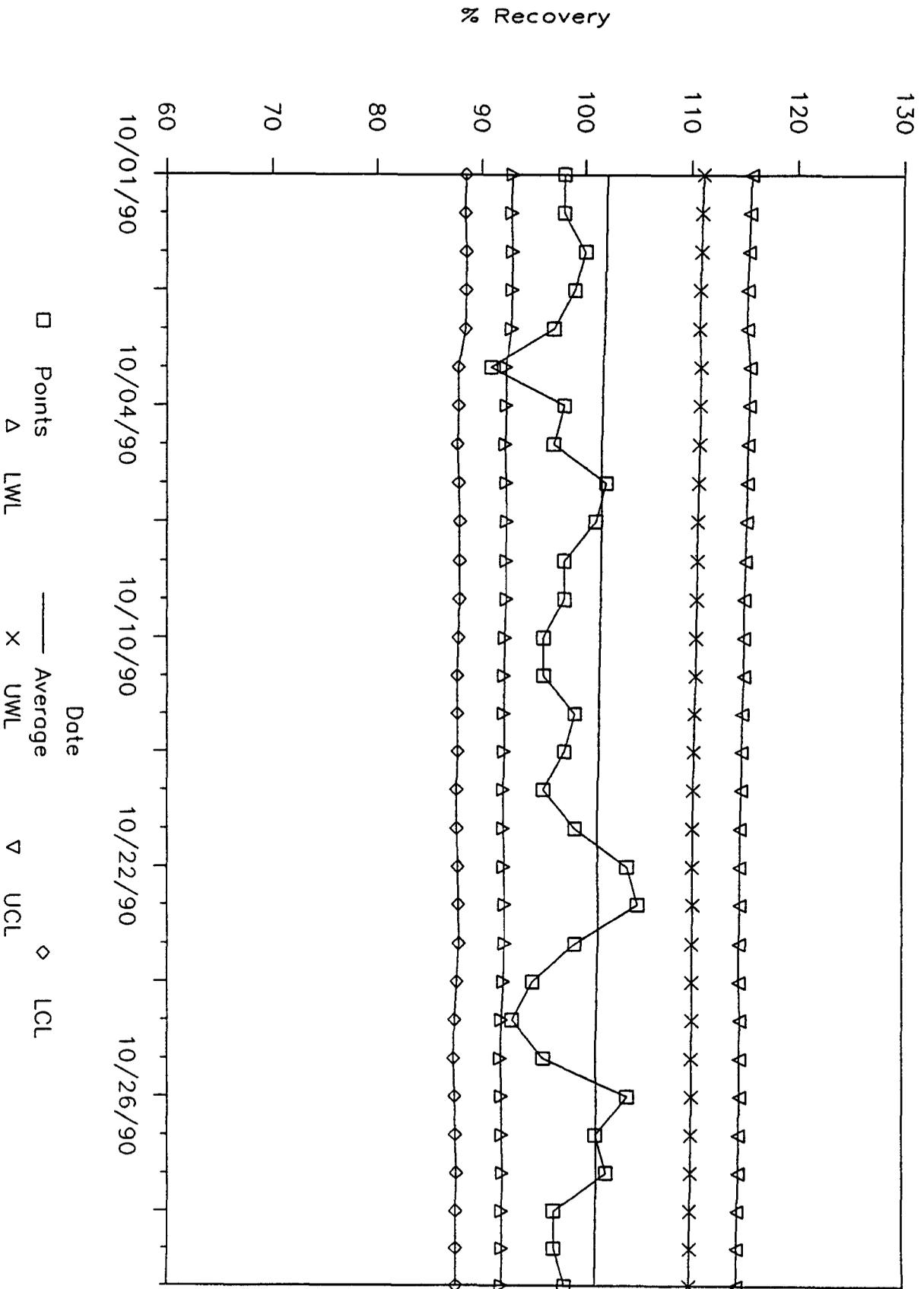
130
120
110
100
90
80
70
60

10/01/90 10/04/90 10/10/90 10/22/90 10/26/90

□ Points
 Δ LWL
 — Average
 × UWL
 ▽ UCL
 ◇ LCL

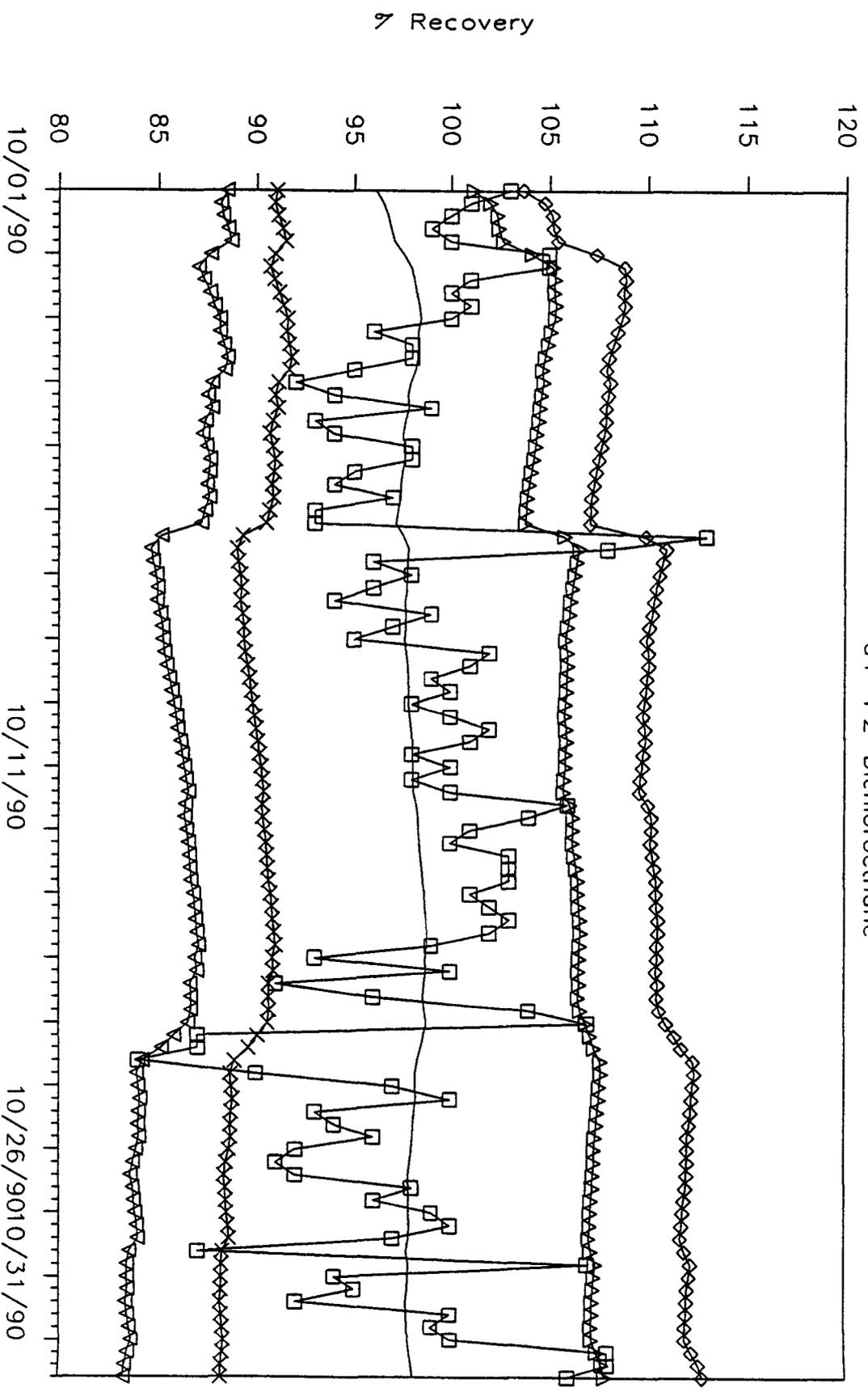


Spike Recovery – Chlorobenzene



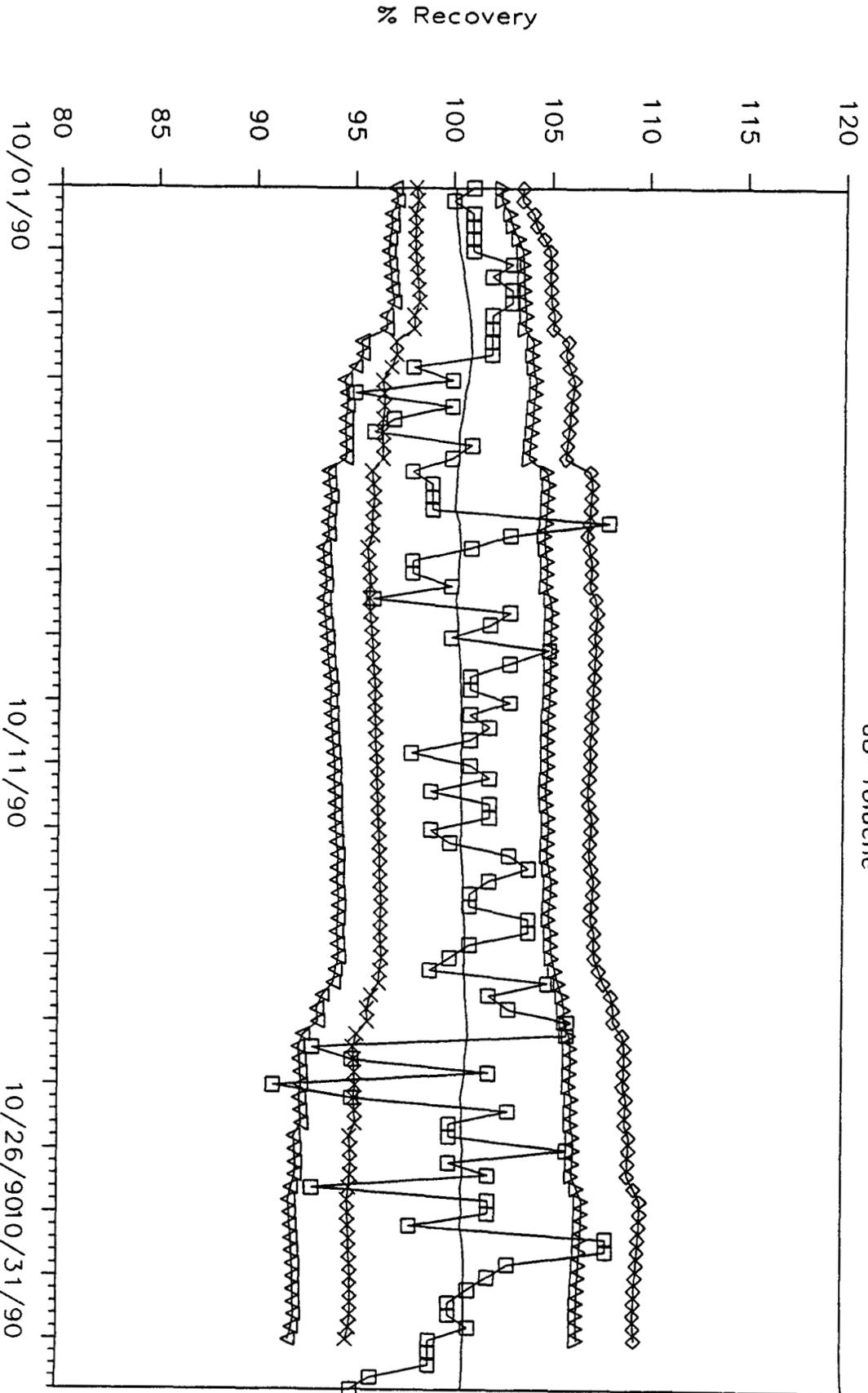
Surrogate Recoveries

d4-1 2-Dichloroethane



Surrogate Recoveries

d8-Toluene



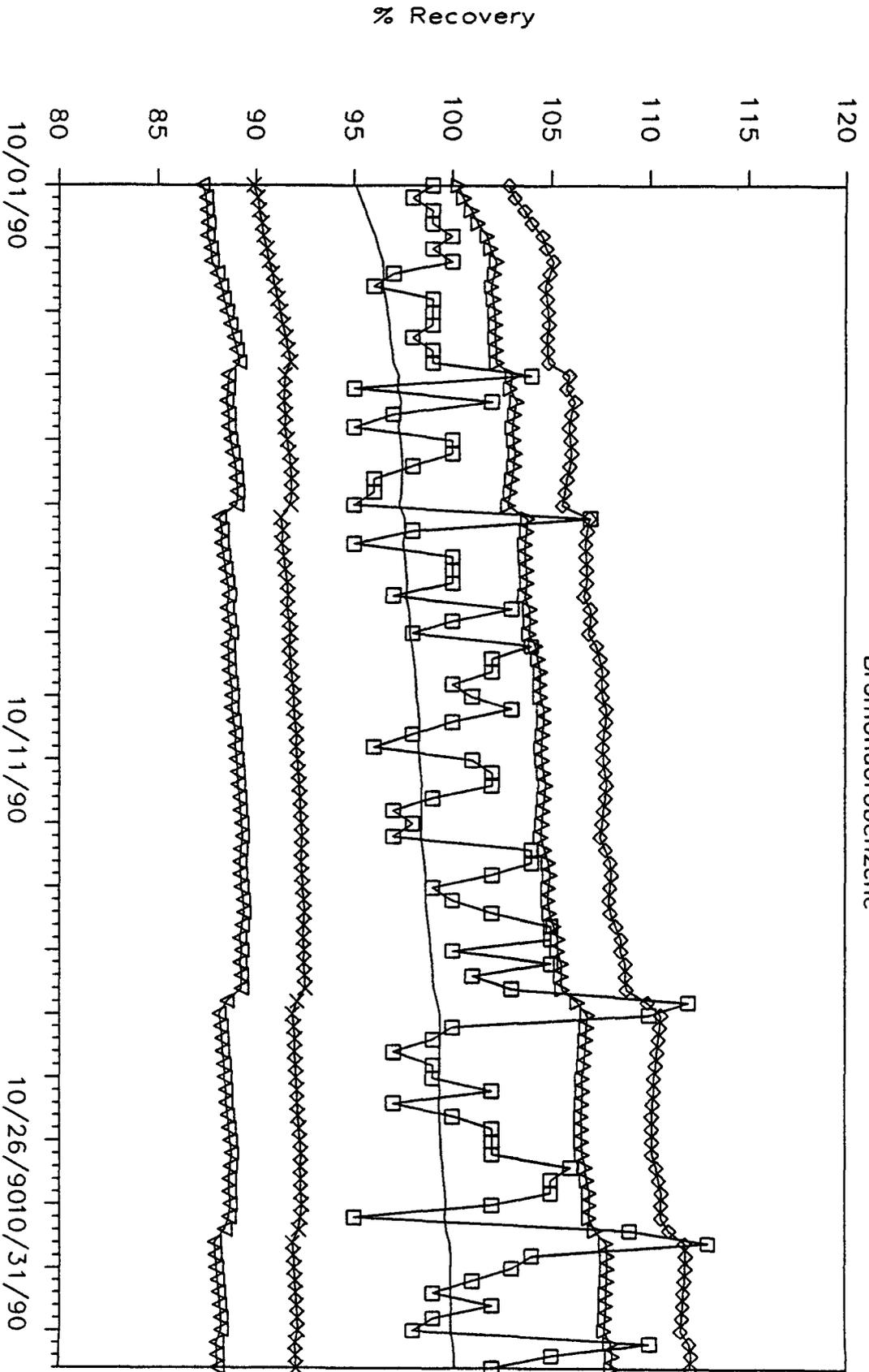
□ Points
△ UWL
— average
× LWL
▽ LCL
◇ UCL

Date



Surrogate Recoveries

Bromofluorobenzene



□ Points
△ LWL
— average
× LWL
▽ LCL
◇ UCL

