Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section 12.20
Reference
Report Sect. 4
Reference 86

Report date: 8/15/91

MEASUREMENT OF CHROMIUM EMISSIONS FROM CHROMIC ACID ANODIZING OPERATIONS IN BUILDING 472 AT NAVAL AVIATION DEPOT, SAN DIEGO, CA.

Prepared For
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PES Job Number 4321.001

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8/15/91

S. Hugh Brown

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TABLE OF CONTENTS

SECTION		PAGE
1.	INTRODUCTION	1
2.	PROCESS DESCRIPTION	2
3.	TESTING METHODOLOGY	3
4.	RESULTS	5
5.	PROJECT QUALITY ASSURANCE	8

FIGURES

1. DIAGRAM OF SAMPLING LOCATIONS - C2 SCRUBBER
2. DIAGRAM OF SAMPLING LOCATIONS - HELO SCRUBBER
3. CHROMIUM SAMPLING TRAIN - CARB METHOD 425

APPENDIXES

A: FIELD DATA, CALCULATIONS AND PROCESS DATA

B: LABORATORY ANALYSES REPORT

C: EQUIPMENT CALIBRATIONS

INTRODUCTION

The North Island Naval Base operates chromic acid anodizing tanks (C3-12) in Building 472 at the Naval Aviation Depot and the tanks are served by the C2 scrubber. In addition, the Base also operates a Helo Blade anodizing unit in Building 2 which is served by the Helo Blade scrubber. Both of theses scrubbers were selected for source testing to develope emission factors for total and hexavalent chromium to assist the Benmol Corporation in preparing the AB2588 report for the Base.

Benmol Corporation, one of the Navy's environmental consultants, selected Pacific Environmental Services (PES), a participant in the CARB independent contractor program, to perform the source testing. PES and its analytical laboratory, West Coast Analytical Services, qualify as independent testing laboratories (no conflict of interest).

Section 2 of the report describes the tested emission control system for each anodizing opertion. Section 3 describes the testing procedures and analytical methods used. Section 4 provides a summary and discussion of the test results and Section 5 addresses the project quality assurance. Appendix A contains the process data records, field data sheets, and all subsequent calculations; Appendix B contains the lab report showing the resulting sample analyses and QA/QC; and Appendix C contains equipment calibration records.

EQUIPMENT AND PROCESS DESCRIPTION

The C2 wet scrubber is used to collect fumes from the chromic acid anodizing operations in the cleaning shop of Building 472. The anodizing tanks are manifolded together and routed underground to the wet scrubber which is equipped with an integral squirrel cage blower and a stub stack (see Figure 1). The Helo Blade scrubber is used to collect fumes from the chromic acid anodizing operations in Building 2. The anodizing tanks are manifolded together and routed a short distance to the scrubber which is exhausted through a 12-inch diameter duct to a large stack with a rooftop blower (see Figures 2A and 2B). The large stack vents other process areas of Building 2.

During the source tests, the tank parameters were recorded by Benmol engineers. The tanks were operated without polyballs or fume suppressant. For each test on the C2 scrubber, six 4' x 5' aluminum sheets were processed for a total of 240 sq. ft. per test.

Production data sheets are included in Appendix A.

CLEANING SHOP
C-2 SCRUBBER
BUILDING 472

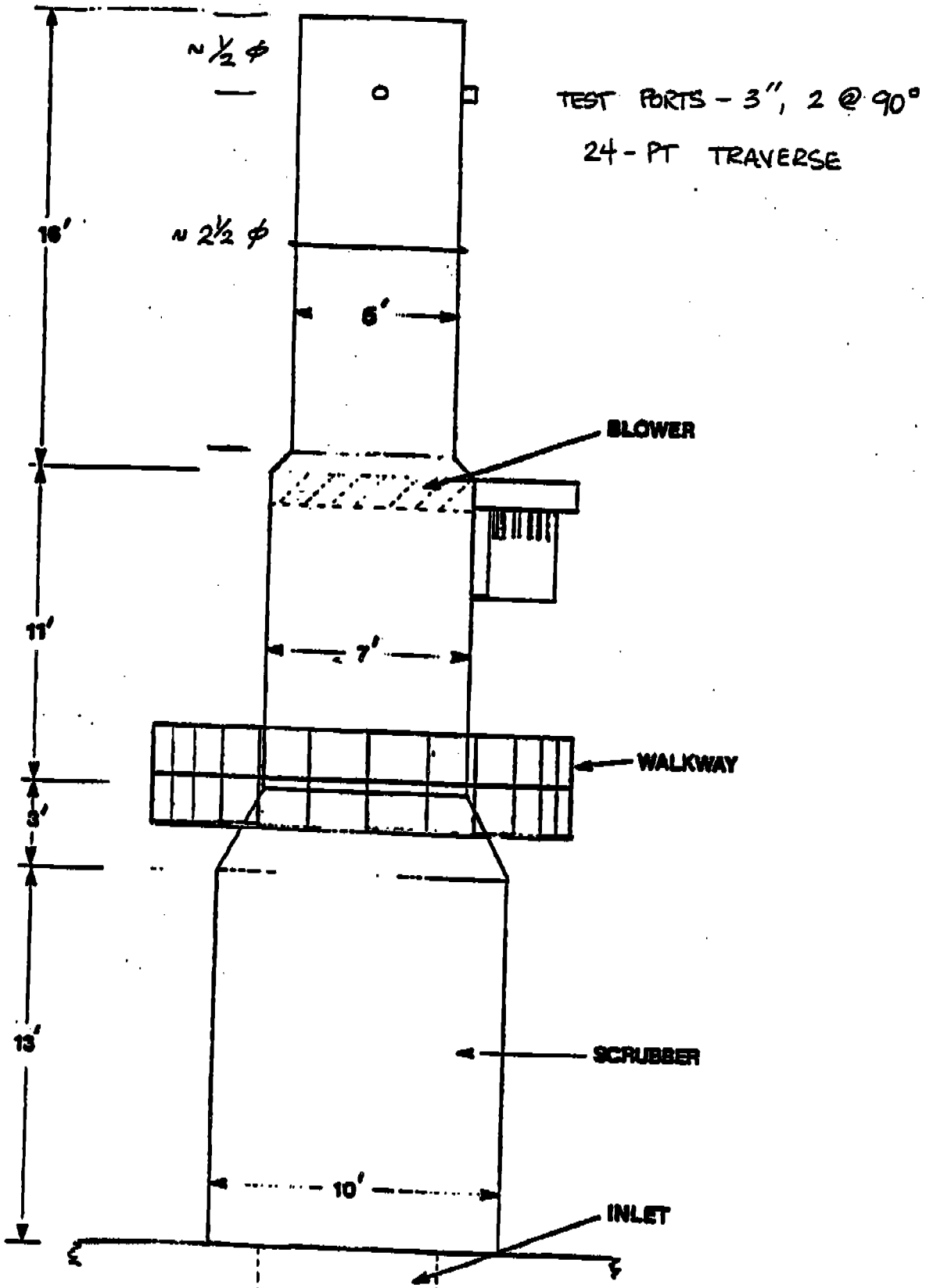


FIGURE 1

HELO BLADE ANODIZING UNIT
PROCESS OVERVIEW
BUILDING 2

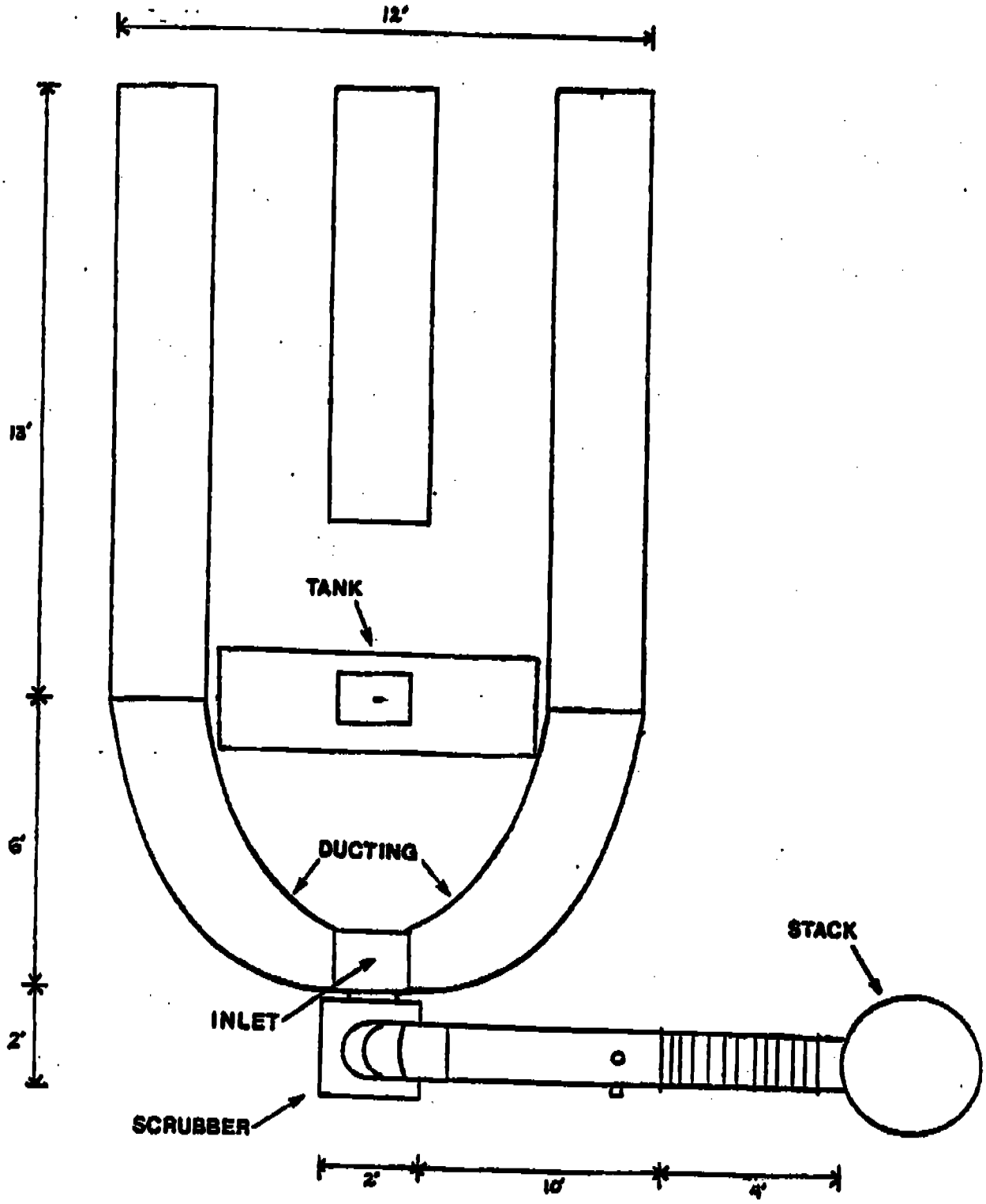


FIGURE 2A

HELO BLADE ANODIZING UNIT
EMISSIONS CONTROL SYSTEM

BUILDING 2

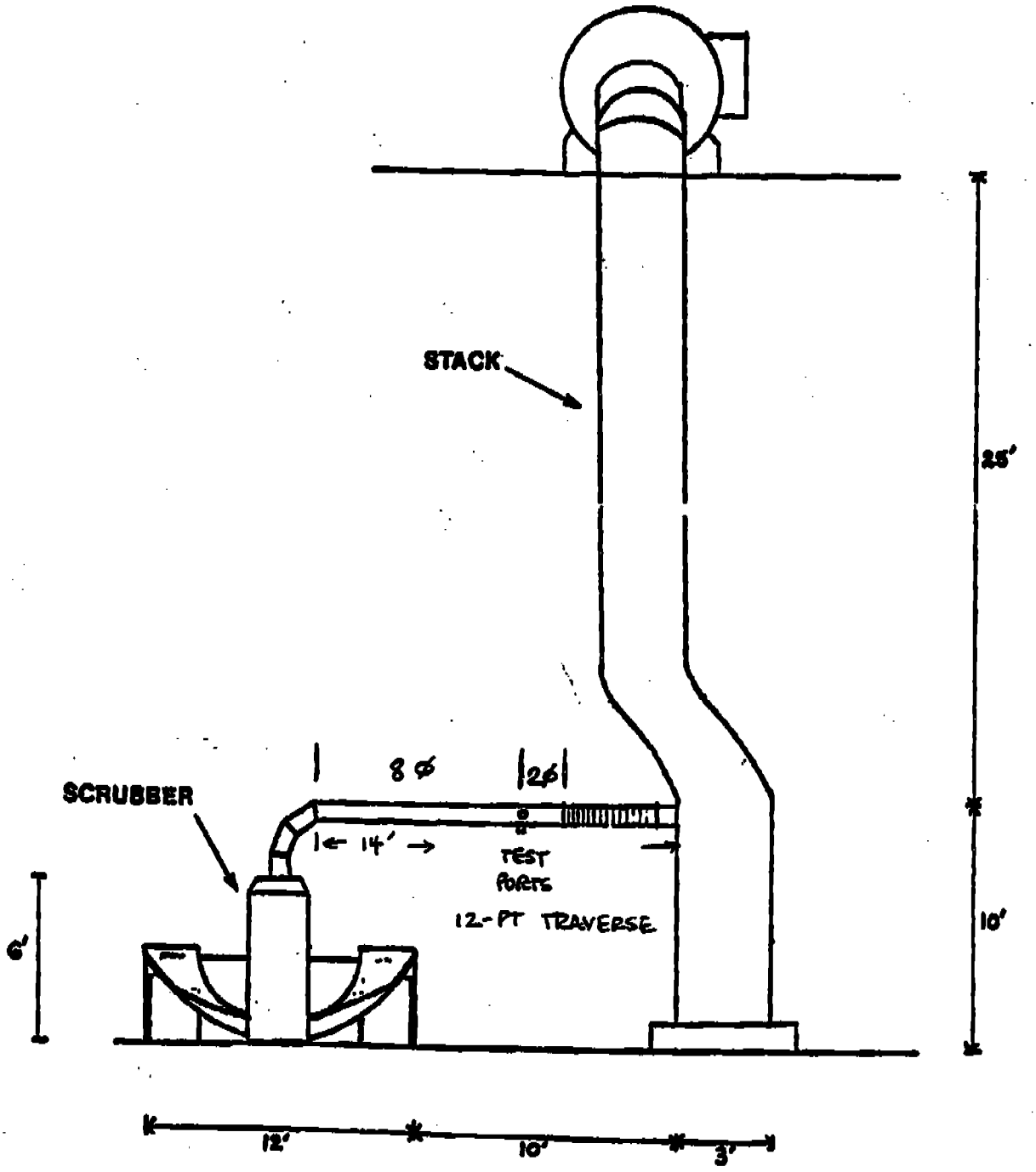


FIGURE 2B

TESTING METHODOLOGY

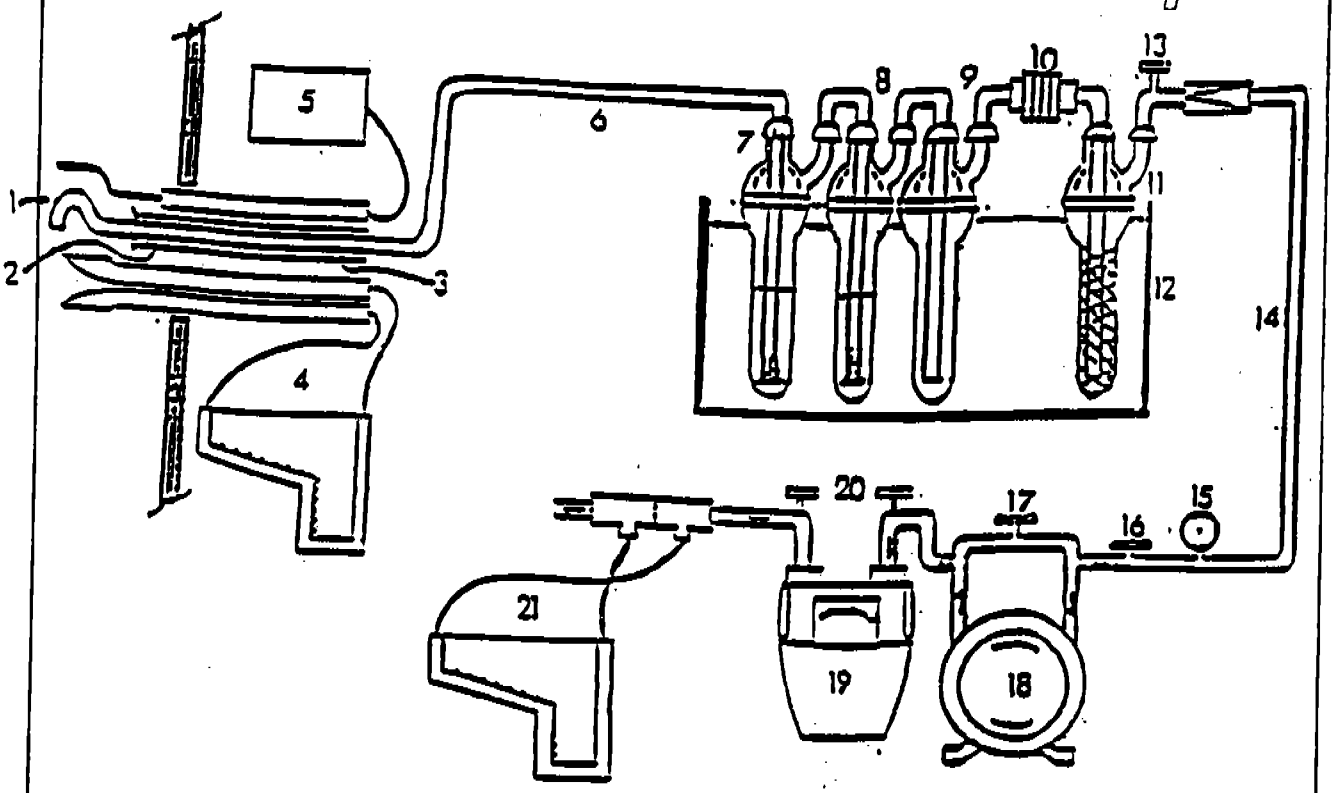
The sampling locations, number of traverse points, and location of traverse points were determined as described in CARB Method 1. The sampling was conducted for 2 hours at 24 traverse points on the C2 scrubber exhaust (5 minutes per point), and at 12 traverse points on the Rotoclone outlet (10 minutes per point). Three sub-tests were conducted on each scrubber exhaust. The sampling locations for the C2 scrubber are shown and the sampling locations for the Helo scrubber gure 2.

what Rotoclone?

Prior to sampling, the duct velocity, static pressure and temperature were measured to define an estimated average duct velocity for nozzle size selection in order to sample isokinetically. A cyclonic flow check was made during this preliminary measurement.

The samples for chromium were collected by CARB Method 425 modified to utilize 0.02N sodium bicarbonate in the impingers and allow analysis of the hexavalent chromium by ion chromatography. The sampling train was manufactured by Nutech and configured as shown in Figure 3. The sample train consisted of a glass nozzle, a teflon union, a glass-lined stainless steel probe (72-inch for the C2 scrubber, and 18-inch for Helo scrubber), a short length of 1/2-inch Teflon tubing, two Greenburg-Smith impingers each charged with 100 mls of 0.02N sodium bicarbonate solution, an empty impinger used as a water trap, a glass filter holder, an impinger filled with silica gel, a 30-foot umbilical line, a vacuum pump, a dry gas meter, and a calibrated orifice connected to an inclined manometer. Teflon-coated glass fiber filters with 0.3, 0.1, and 0.035 micron pore layers were used in the filter holders.

Pitot and sampling train leak checks were performed before and after each test. Prior to beginning the source test program, a 10-minute dry gas meter check was conducted on each sampling train at an orifice delta P of 2.0 inches of water, and the metered volume was checked against that of the calibration run at the same delta P. The sampling trains met the performance criteria of +/-3%.



1. Glass sampling nozzle with teflon union
2. Stainless steel probe sheath
3. Glass-lined probe
4. Type S pitot tube and manometer for velocity determinations
5. Stack temperature sensor
6. 15 ft. teflon probe line with ball and socket connectors
7. Greenburg-Smith impinger with 100 ml. of 0.02 $NaHCO_3$ sol.
8. Greenburg-Smith impinger with 100 ml. of " " " "
9. Modified Greenburg-Smith impinger (dry)
10. Filter holder with teflon-coated glass fiber filter
11. Modified Greenburg-Smith impinger filled with 200 grams of silica gel
12. Impinger case filled with ice
13. Impinger exit gas temperature sensor
14. Umbilical line to meter box
15. Vacuum gauge
16. Coarse adjustment valve
17. Bypass valve to adjust sample volume
18. Leak free vacuum pump
19. Dry gas meter
20. Dry gas meter inlet and outlet temperature sensors
21. Orifice with manometer sample volume metering

Figure 9: Diagram of sampling train.

The source test data was recorded during the tests by PES personnel on the field data sheets which are included in Appendix A. The weights of the impingers were recorded on sample retrieval sheets before and after the tests in order to obtain the moisture content of the stack gas stream. Process data was recorded simultaneously by Benmol engineers.

After the tests, the contents of the first three impingers were placed in a 1000 ml. polyethylene container. The filters were removed from the filter holder with plastic forceps and placed in the same sample bottle. The sampling train from the nozzle to the filter holder was then rinsed 3 times with the charging solution (0.02N sodium bicarbonate solution) and these rinses were added to the same container. Some 0.1 normal nitric acid solution was then used as a final rinse and these rinses were collected in a separate sample bottle and analyzed for total chromium. The sampling train was kept at 68 degrees Fahrenheit or less during the tests in order to induce condensation in the impingers. The samples remained chilled until analysis.

Laboratory analyses were conducted by West Coast Analytical Service in Sante Fe Springs, California. The total chromium concentration in each sample was measured by inductively coupled plasma (ICP) with detection by mass spectrometry (MS). The hexavalent chromium concentrations were measured by ion chromatography. The detection levels of the analytical procedures for total chromium, Cr T, and hexavalent chromium, Cr^{+6} were 0.5 and 0.01 ug/l respectively. The hexavalent chromium analyses were performed within 48 hours of the end of sampling for each individual sample.

RESULTS

Calculations were made from the field data sheets to determine sample volume, molecular weight, velocities, flow rate, and isokinetic variation for the test. These calculations are shown on the emission test calculation sheets in Appendix A.

Table 1 summarizes the results of the source tests on the C2 scrubber. There is a significant difference between the total chromium and the hexavalent chromium on the first two source tests. No explanation for this can be found. The hexavalent chromium results are relatively consistant for all three tests and are assumed to be the most representative of the two measurements.

Table 2 summarizes the results of the source tests on the Helo Blade scrubber. During test #1, production problems arose just after the start of the test. The test was aborted and not reported. During test #4, the scrubber went down in the middle of the test and the sampling was interrupted for almost 30 minutes while corrections were made. The sampling was resumed when the scrubber came back on line. The results for this test were about 10 times higher than those of the other two tests. The scrubber malfunction apparently had a significant effect on the emissions being measured and while the results are reported here, the test run should be considered invalid.

The blank sample from each scrubber test set exhibited essentially no hexavalent chromium (<0.1 ug) and very little total chromium (4.2 ug or less).

Isokinetic sampling rates all fell within the 95 to 103% range.

TABLE 1

NADEP BUILDING 472
C2 SCRUBBER EMISSIONS

Date:	6/18/91	6/18/91	6/19/91
Test Conditions:	324 AH	345 AH	333 AH
Test Number:	1	2	3
Flue Gas			
Temperature, oF	72	71	71
Velocity, ft/sec	28.3	28.1	28.3
Static Pressure, in. H_2O	+0.12	+0.12	+0.12
Duct Dimension, in.	72	72	72
Duct Area, sq. ft.	28.3	28.3	28.3
Flow Rate, ACFM	48,000	47,660	48,000
, DSCFM	46,860	46,570	46,940
Moisture, % v/v	2.0	2.1	2.1
Chromium			
Sample Start	10:37	14:10	08:08
Sample Stop	12:46	16:15	10:10
Sampling Time, min.	120	120	120
Sample Volume, DSCF	100.	98.4	92.9
Isokinetic Rate, %	103.0	102.0	95.6
Concentration, ppb			
Total Cr	4.2	2.2	0.97
Cr+6	0.38	0.45	0.69
Emission Rate, g/hr			
Total Cr	0.717	0.383	0.167
Cr+6	0.065	0.077	0.118
Emission Rate, mg/amp-hr			
Total Cr	2.2	1.1	0.50
Cr+6	0.20	0.22	0.35
Scrubber Water			
Concentration, ppm			
Total Cr		332	
Cr+6		300	

TABLE 2

NADEP BUILDING 2
HELO SCRUBBER EMISSIONS

Date:	6/20/91	6/20/91	6/20/91
Test Conditions:	9 AH	6 AH	8 AH
Test Number:	2	3	4
Flue Gas			
Temperature, oF	68	67	72
Velocity, ft/sec	18.3	20.5	19.0
Static Pressure, in. H_2O	-0.62	-0.65	-0.76
Duct Dimension, in.	12	12	12
Duct Area, sq. ft.	0.785	0.785	0.785
Flow Rate, ACFM	862	966	895
, DSCFM	856	955	873
Moisture, % v/v	1.3	1.6	1.7
Chromium			
Sample Start	08:32	11:53	15:16
Sample Stop	10:51	14:39*	17:42**
Sampling Time, min.	120	120	120
Sample Volume, DSCF	107.3	105.5	96.0
Isokinetic Rate, %	101.5	98.9	98.4
Concentration, ppb			
Total Cr	0.40	0.61	6.1
Cr+6	0.13	0.34	4.6
Emission Rate, mg/hr			
Total Cr	1.2	2.2	19.5
Cr+6	0.41	1.2	14.8
Emission Rate, mg/amp-hr			
Total Cr	0.14	0.36	2.4
Cr+6	0.046	0.20	1.9
Scrubber Water			
Concentration, ppm			
Total Cr		137	
Cr+6		138	

* Production problems interrupted sampling.
** Scrubber shutdown interrupted sampling.

QUALITY ASSURANCE/QUALITY CONTROL

Source tests are performed to determine the types and amounts of pollutants emitted by a source. Information form this source test program may be used for obtaining permits, evaluating control equipment performance, updating emission inventories, and determining compliance with present and future emission regulations. For these purposes, reliable data are required. PES provides this reliability by using the following work practices:

Use Of Standard Test Procedures

CARB Method 425 was utilized to determine the chromium emission rates. A procedure must be thoroughly studied under various conditions in order to be designated as a CARB Method. Results of many executions of the procedure are compared to demonstrate accuracy and repeatability before adoption of the procedure as a source testing method. Method 425 normally specifies hexavalent chromium analysis by the diphenylcarbazide colorimetric method but can be adapted to achieve maximum sensitivity for hexavalent chromium through the utilization of ion chromatography for analysis.

Use Of Trained Test Personnel

Because of the complexity of typical source testing methods, testers should be trained and experienced with the test procedures in order to assure reliable results. PES personnel have had professional training and routinely conduct hexavalent chromium source tests.

Knowledge Of Source's Operation

The source testing team should have sufficient knowledge of the process to be tested in order to properly document the process parameters during the tests. Without documentation of the process parameters used, results are much less meaningful. PES has previously tested many chrome platers and is familiar with the plating process.

Equipment Maintenance and Calibration

Use of properly maintained and calibrated test equipment is essential for minimizing systematic errors in results. All sampling devices were constructed, maintained, and calibrated as suggested in EPA documents APTD-0576, and APTD-0581 (These are commonly accepted construction and maintenance manuals for source testing equipment.). The dry gas meters were calibrated before and after the tests using a transfer gas meter with NBS traceability. These calibrations are included in Appendix C of this report.

Systematic Data Reduction

Data reduction was accomplished by the use of step by step calculation sheets. All calculations are shown in Appendix A.

Thorough Record Keeping

All data relating to the operation of the sampling train must be immediately recorded to ensure that it is not lost or misinterpreted. PES accomplishes thorough record keeping by use of field data sheets. The PES test team is familiar with these sheets and the information required to complete them. Any unusual occurrences in the process operation, unusual test instrument readings, or any other items that could have affected the test results were noted.

Proper Sample Handling Procedures

Inaccurate source test results can be caused by delays in retrieving samples, contamination of the samples, insufficient sample identification, tampering, and mishandling of samples. The chances of these errors are greatly increased when too many people are permitted to handle the samples. The samples were retrieved immediately after each test and returned to the PES lab within a few hours after each test. A sample submittal/chain of custody form (See Appendix B) was completed and submitted with all samples to document that the sample analyzed was taken under the conditions reported.

Use Of Thoroughly Cleaned Glassware

All glassware was cleaned prior to the tests with 0.1 normal nitric acid solution. The trains were then cleaned with 0.02N sodium carbonate solution and laboratory grade distilled water, air dried, and sealed until the next tests.

Submission Of Blank Samples

During each test set, a sample from an unused charged sampling train was carried to the field (train blank), submitted to the laboratory and analyzed with the other samples to detect any possible contamination of sampling media or equipment or problems with lab analyses. Corrections were not made to the measured concentrations of the collected samples. In addition, an audit sample (#1 DNS 0070) submitted to PES by the SDAPCD, and a sample of each scrubber water were analyzed along with the source test samples. The audit sample analysis yielded 110 ug/L hexavalent chromium, and 101 ug/L total chromium.

Analytical Checks

The analyses of each batch of samples included calibration curves, duplicate analyses, spike recoveries, and standard additions. A complete QA/QC package from the analytical lab is included in Appendix B.

The field testing described in this report was conducted by Bruce Gerber and Steve Hernandez of PES. Study direction and report preparation were under the supervision of S. Hugh Brown, Director of Air Quality of Pacific Environmental Services, Incorporated.

Approved: _____
S. Hugh Brown

APPENDIX A

Field Data, Calculations, and Process Data

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

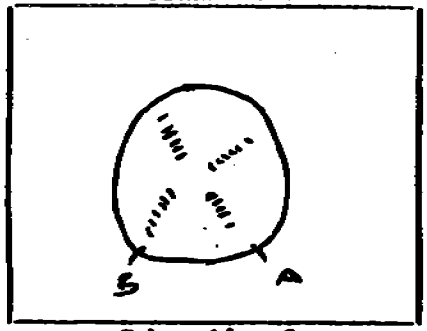
PLANT U.S. Navy Bldg 472
DATE 6-17-91
SAMPLING LOCATION C2 Scrubber outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 72.125
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) .125
STACK I.D., (DISTANCE A - DISTANCE B) 72"
NEAREST UPSTREAM DISTURBANCE 61"
NEAREST DOWNSTREAM DISTURBANCE 110"
CALCULATOR Gerber, Hernandez

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	2.1	72"	1.5		
2	6.7		4.8		
3	11.8		8.5		
4	17.7		12.74		
5	25.0		18.0		
6	35.6		25.6		
7	64.4		46.4		
8	75.0		54.0		
9	82.3		59.25		
10	88.2		63.5		
11	93.3		67.2		
12	97.9	72"	70.5		

Plant: US NAVY
Date: 6-18-99
Sampling Location: C2
Sample Type: Chromium Total & Cr+6
Run Number: C2-1
Operator: Gerber / HERNANDEZ
Ambient Temperature: 66
Barometric Pressure: 30.03
Static Pressure (P_s): +.12
Filter Number(s): N/A
Pretest Leak Rate = 0.015 cfm @ 15.5 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 5 Minutes

FIELD DATA



Schematic of Traverse Point Layout

Probe Length and Type: 7' Glass
Pitot Tube I.D. No.: 5-8
Nozzle I.D. No. & Diameter: 02P .299
Assumed Moisture, %: 2
Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.7
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: .20
Post Test Leak Rate = 0.019 cfm @ 12 in. Hg
Post Test Pitot Leak Check:
Post Test Orsat Leak Check: N/A

Impinger Box No. 3B ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	110:37	262.601	0.36	3.3	3.3	70	67	67	11	N/A	54
2	5	110:42	267.315	0.37	3.4	3.4	71	69	66	12		59
3	10	110:47	272.133	0.34	3.1	3.1	71	73	67	11		67
4	15	110:52	276.798	0.34	3.1	3.1	72	76	68	11		69
5	20	110:57	281.465	0.30	2.7	2.7	72	78	70	10.0		66
6	25	111:02	286.000	0.25	2.25	2.25	72	80	70	7.0		64
7	30	111:07	290.160	0.19	2.70	2.70	72	80	72	8.5		62
8	35	111:12	294.320	0.18	1.60	1.60	72	81	73	5.0		62
9	40	111:17	298.036	0.17	@2.5	2.5	72	82	74	8.0		61
10	45	111:22	301.965	0.17	@2.5	2.5	73	83	74	8.0		61
11	50	111:27	306.140	0.16	1.45	1.45	73	84	75	8.0		60
12	55	111:32	309.800	0.13	1.2	1.2	72	83	75	4		59
13	60	111:46	312.785	0.33	3.05	3.05	71	76	75	10		61
14	65	111:51	317.375	0.32	2.95	2.95	72	79	75	10		54
15	70	111:56	322.169	0.30	2.75	2.75	72	82	76	9		57
16	75	112:01	326.492	0.26	2.35	2.35	72	84	76	8		58
17	80	112:06	330.538	0.23	2.05	2.05	72	84	77	6		58
18	85	112:11	334.300	0.22	2.00	2.00	72	84	77	6		57
19	90	112:16	338.042	0.29	2.65	2.65	72	85	77	9		57
20	95	112:21	342.367	0.30	2.75	2.75	72	85	78	9		58
21	100	112:26	346.763	0.29	2.65	2.65	72	85	78	9		59
22	105	112:31	351.138	0.27	2.45	2.45	72	86	78	8		59
23	110	112:36	355.367	0.22	2.00	2.00	72	86	79	6		59
24	115	112:41	359.113	0.17	1.55	1.55	73	86	79	5	N/A	58
OFF	120	12:46	362.454	$\sqrt{\Delta P}$ = 0.502	ΔH = 2.46		T_s = 532		T_m = 537			

V_m = 99.853 ~~99.855~~ ~~0.257~~ ~~2.43~~ ~~71.419~~ ~~74.0~~ ~~79.375~~

≤68

PACIFIC ENVIRONMENTAL SERVICES, INC.

PES

SAMPLE RECOVERY DATA

Plant: US Navy Bldg 472

Date: 6-18-91

Sampling Location: C2 Scrubber Outlet

Sample Type: Chromium Total + Cr+6

Run Number: C2-1

Sample Box Number: 3B

Clean-up Man: Gerber

Job Number: 4321.001

Comments: Sample Volumes 1,098 − 125.6 = 972.4 $NaHCO_3$
295.3 − 58.6 = 236.7 HNO_3

FRONT HALF

Filter Number: N/A

Description of Filter: White

MOISTURE

Impingers			
Final Volume:	594.4 ml	584.9 ml	465.6 ml
Initial Volume:	580.8 ml	581.7 ml	462.5 ml
Net Volume:	ml	ml	ml
Total H_2O:	+ 13.6	3.2	3.10
Silica Gel			
Final Volume:	645.9 g	g	g
Initial Volume	621.5 g	g	g
Net Volume	24.4 g	g	g

Total Moisture: 24.4 + 13.6 + 3.2 + 3.1 = 44.3

Description of Impinger Catch: Clear 44.300

EMISSION TEST CALCULATION

Definiton of Symbols

A : cross-sectional area of stack, ft^2

A_n : cross-sectional area of nozzle, ft^2

B_{ws} : water vapor in gas stream, proportional by volume

C_p : pitot tube coeficient

I : percent of isokinetic sampling

M_d : dry molecular weight, lb/lb-mole

M_s : molecular weight of stack gas, lb/lb-mole

P_{bar} : barometric pressure at the sampling site, in. of Hg

P_s : stack gas pressure, in. of Hg

Q_s : stack volumetric flow rate , actual condition acfm

Q_{std} : stack volumetric flow rate, standard conditions dscfm

T_m : average dry gas meter temperature , $^oR = 460 + {}^oF$

T_s : average stack gas temperature, $^oR = 460 + {}^oF$

V_{lc} : total volume of liquid collected in impingers & silica gel, in ml

V_m : Volume of gas sample as measured by dry gas meter, dscf

$V_{m_{std}}$: Vm corrected to standard conditions, dscf

$V_{w_{std}}$: volume of water vapor in gas sample corrected to standard conditions, scf

V_s : stack gas velocity, ft/sec

Y : dry gas meter calibration factor

ΔH : average pressure differential across the orifice meter, in. of H_2O

Θ : total sampling time, in minutes

13.6 : specific gravity of mercury

Plant: U.S. NAVY

Date: 6-18-91

Source/Sample Number: C2-1

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(99.853)(1.009)\left[\frac{(30.03) + (2.46/13.6)}{(537)}\right]$

Vm(std) = 100 dscf.

2. Volume water vapor collected (standard conditions).

V(lo) = 44.3 condensate from impingers and selica gel.

Vw(std) = (0.04707) V(lo) = (0.04707)(44.3)

Vw(std) = 2.09 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(2.09)}{(2.09) + (100)} = ____$

Bw_s = 0.020 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (___) + 0.320(___) + 0.280(___)$

Md = 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.020)(18 - 29)$

Ms = 28.78 lb/lb-mole.

Plant: U.S. NAVY

Date: 6-18-91

Source/Sample Number: C2-1

5. Stack gas velocity average.

$$Vs(avg) = (85.49)(Cp)(\sqrt{\Delta P})\left[avg\sqrt{\frac{(Ts)}{(Ps)(Ms)}}\right]$$

$$Vs(avg) = (85.49)(0.84)(0.502)\left[\sqrt{\frac{(532)}{(30.04)(28.78)}}\right]$$

Vs(avg) = 28.3 ft/sec.

6. Stack volumetric flow rate, actual conditions (stack temperature and pressure).

$$Qs = (60)(Vs)(A) = (60)(28.3)(28.27)$$

Qs = 48002 acfm.

7. Stack volumetric flow rate, standard conditions (68 degrees F, 29.92 Hg).

$$Q(std) = (17.64)(Qs)(1-Bw_s)\left[\frac{(Ps)}{(Ts)}\right]$$

$$Q(std) = (17.64)(48002)(1-0.020)\left[\frac{(30.04)}{(532)}\right]$$

Q(std) = 46857 dscfm.

8. Isokinetic variation.

$$\%I = (K)\left[\frac{(Ts)(Vm(std))}{(Ps)(Vs)(An)(\theta)(1-Bw_s)}\right]$$

$$\%I = (0.0945)\left[\frac{(532)(100)}{(30.04)(28.3)(0.000488)(120)(1-0.020)}\right]$$

%I = 103.0 %

CLIENT: U.S. NAVY

Project No. 4321.001

Sampling Location: C2 SCRUBBER OUTLET #1

Sample Volume: 100.0 DSCF Flow Rate 46857 DSCFM

Blank: _____ mls Sample No. C2-BLANK

Cr: 0.00394 ug/ml x 779.5 mls = 3.1 ug Cr
wash: 0.005575 ug/ml x 197.5 mls = 1.1 ug Cr
Total 4.2 ug Cr

Cr+6: 0.0 ug/ml x 779.5 mls = 0.0 ug Cr+6

Sample No. C2-1 _____ .02345 .01125 ok

Total Chromium

Cr: 0.02345 ug/ml x 972.4 mls ✓
wash: 0.01125 ug/ml x 236.7 mls
Total ✓ 23.09 µg

(25.5) ug Cr x 24.05 ul/
52 ug/um x 28.3 L/DSCF (100.0) DS L Cr (ppmv)

(25.5) ug Cr x 60 min/hr x (46857
(100.0) DSCF x 1000 ug/mg 2.2 slap ok 2 mg/hr Cr

(716.9) mg/hr
(324) amp-hr/hr = 2.2 mg/

Hexavalent Chromium _____

Cr+6: 0.0024 ug/ml x 972.4 mls .0024 2.3 µg Cr+6

(23) ug Cr+6 x 24.05 ul/u ok
52 ug/um x 28.3 L/DSCF (100.0) DSCF Cr+6 (ppmv)

(2.3) ug Cr+6 x 60 min/hr x (46857
(100.0) DSCF x 1000 ug/mg 6 mg/hr Cr+6

(64.6) mg/hr
(324) amp-hr/hr = 0.20 mg/amp-hr

6-22-91-Sam for JJ

Hex Chrome System 2

Column = AS7, NG1
Flow = 1.2 ml/min
Loop = 1 ml
Backpressure = 590 psi.

File #	Job #	Chart	Sample ID	Dilution
C22CR0071.D07			Autrol 5R (5 ppb)	621-220-1
D02			Autrol 4R (1 ppb)	621-220-2
D03			Autrol 3R (0.5 ppb)	621-220-3
D04			Autrol 2R (0.05 ppb)	621-220-4
D05			Autrol 1R (0.02 ppb)	621-220-5
D06			Method Blank	
D07			1.0 ppb ICV	621-221-1
D08	18839	PES	HELO-4A	10
D09			1DNS 0070	10
D10			1DNS0070	100
D11			0.5 ppb Std	621-220-3

Plant: US NAVY Bldg 472
Date: 6-18-91
Sampling Location: C2 Scrubber Outlet
Sample Type: Chromium Total + Cr+6
Run Number: C2-2
Operator: Gerber / Hernandez
Ambient Temperature: 69
Barometric Pressure: 30.03
Static Pressure (P_s): +.12
Filter Number(s): N/A
Pretest Leak Rate = 0.006 cfm @ 16 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 5 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 7' Glass
Pitot Tube I.D. No.: 5-6
Nozzle I.D. No. & Diameter: 02P .289
Assumed Moisture, %: 2

Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.1
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.20
Post Test Leak Rate = 0.002 cfm @ 7 in. Hg
Post Test Pitot Leak Check: OK
Post Test Orsat Leak Check: N/A

Impinger Box No. 2B ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	114:10	365.004	0.31	2.85	2.85	70	72	72	5	N/A	64
2	5	114:15	367.591	0.32	2.95	2.95	70	75	73	5		63
3	10	114:20	372.118	0.30	2.75	2.75	70	78	73	5		65
4	15	114:25	376.513	0.25	2.25	2.25	71	80	73	4		63
5	20	114:30	380.536	0.25	2.25	2.25	72	82	75	4		62
6	25	114:35	384.532	0.24	2.2	2.2	72	84	76	4		61
7	30	114:40	388.511	0.27	2.5	2.5	71	85	77	4		59
8	35	114:45	392.144	0.30	2.75	2.75	71	85	77	5		57
9	40	114:50	397.011	0.31	2.9	2.9	71	85	78	5		57
10	45	114:55	401.641	0.28	2.6	2.6	70	86	78	4		57
11	50	115:00	406.103	0.24	2.2	2.2	71	86	79	4		57
12	55	115:05	409.987	0.16	1.45	1.45	71	86	79	3		57
13	60	115:15	413.264	0.38	3.5	3.5	70	81	79	5		59
14	65	115:20	418.142	0.36	3.35	3.35	71	84	79	5		54
15	70	115:25	423.014	0.34	3.2	3.2	71	86	80	5		55
16	75	115:30	428.003	0.33	3.1	3.1	71	87	80	5		55
17	80	115:35	432.510	0.30	2.8	2.8	72	89	81	4.5		55
18	85	115:40	437.035	0.25	2.3	2.3	72	91	82	4.0		56
19	90	115:45	441.320	0.18	1.7	1.7	72	91	83	4.0		54
20	95	115:50	445.110	0.18	1.7	1.7	71	90	83	4.0		53
21	100	115:55	449.250	0.17	1.6	1.6	71	89	83	3.0		53
22	105	116:00	452.850	0.16	1.45	1.45	71	88	83	3.0		56
23	110	116:05	456.150	0.15	1.40	1.40	72	88	83	3.0		54
24	115	116:10	459.763	0.11	1.0	1.0	71	89	83	2.0	N/A	55
Off	120	116:15	462.250	$\overline{\sqrt{\Delta p}}$=0.500	ΔH=2.37		T_s=531		T_m=542			66
				0.250	2.36		71.0	84.9	78.1			
			99.246					81.8				

0.517
0.482
0.500
0.250

PACIFIC ENVIRONMENTAL SERVICES, INC.

PES

SAMPLE RECOVERY DATA

Plant: US Navy Bldg 472

Date: 6-18-91

Sampling Location: C2 Scrubber Outlet

Sample Type: Chromium Total + Cr+6

Run Number: C2-2

Sample Box Number: 2B

Clean-up Man: Gerber

Job Number: 4321.001

Comments: Sample Volumes 1,173.5 − 124.7 = 1,048.8 Na_2HCO_3
300.0 − 58.8 = 241.2 HNO_3

FRONT HALF

Filter Number: N/A

Description of Filter: White

MOISTURE

Impingers			
Final Volume:	563.0 ml	560.0 ml	488.6 ml
Initial Volume:	545.6 ml	555.0 ml	485.1 ml
Net Volume:	17.4 ml	5.0 ml	3.5 ml
Total H_2O:			
Silica Gel			
Final Volume:	654.8 g	g	g
Initial Volume	636.4 g	g	g
Net Volume	18.4 g	g	g
Total Moisture:	44.3		44.3

Description of Impinger Catch: Clear

Plant: U.S. NAVY

Date: 6-18-91

Source/Sample Number: C2-2

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(99.246)(1.009)\left[\frac{(30.03) + (2.34/13.6)}{(542)}\right]$

$Vm(std) =$ 98.4 dscf.

2. Volume water vapor collected (standard conditions).

$V(lo) =$ 44.3 condensate from impingers and selica gel.

$Vw(std) = (0.04707)\ V(lo) = (0.04707)(44.3)$

$Vw(std) =$ 2.09 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(2.09)}{(2.09) + (98.4)} =$ _____

$Bw_s =$ 0.021 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (\ \ ) + 0.320(\ \ ) + 0.280(\ \ )$

$Md =$ 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.021)(18 - 29)$

$Ms =$ 28.77 lb/lb-mole.

Plant: U.S. NAVY

Date: 6-18-91

Source/Sample Number: C2-2

5. Stack gas velocity average.

$$Vs(avg) = (85.49)(Cp)(\sqrt{\Delta P})\left[avg\sqrt{\frac{(Ts)}{(Ps)(Ms)}}\right]$$

$$Vs(avg) = (85.49)(0.84)(0.500)\left[\sqrt{\frac{(531)}{(30.04)(28.77)}}\right]$$

Vs(avg) = 28.1 ft/sec.

6. Stack volumetric flow rate, actual conditions (stack temperature and pressure).

$$Qs = (60)(Vs)(A) = (60)(28.1)(28.27)$$

Qs = 47663 acfm.

7. Stack volumetric flow rate, standard conditions (68 degrees F, 29.92 Hg).

$$Q(std) = (17.64)(Qs)(1-Bw_s)\left[\frac{(Ps)}{(Ts)}\right]$$

$$Q(std) = (17.64)(47663)(1-0.021)\left[\frac{(30.04)}{(531)}\right]$$

Q(std) = 46566 dscfm.

8. Isokinetic variation.

$$\%I = (K)\left[\frac{(Ts)(Vm(std))}{(Ps)(Vs)(An)(\theta)(1-Bw_s)}\right]$$

$$\%I = (0.0945)\left[\frac{(531)(98.4)}{(30.04)(28.1)(0.000488)(120)(1-0.021)}\right]$$

%I = 102.0 %

CLIENT: U.S. NAVY

Project No. 4321.001

#2
Sa

Sampling Location: C2 SCRUBBER OUTLET #2

Sample Volume: 98.4 DSCF Flow Rate 465660 DSCFM

Blank: _____ mls Sample No. C2-BLANK

Cr: 0.00394 ug/ml x 779.5 mls = 3.1 ug Cr
wash: 0.005575 ug/ml x 192.5 mls = 1.1 ug Cr
Total 4.2 ug Cr

Cr+6: 0.0 ug/ml x 779.5 mls = 0.0 ug Cr+6

Sample No. C2-2 _____ mls

Total Chromium

Cr: 0.0112 ug/ml x 1048.8 mls = 11.7 ug C
wash: 0.00744 ug/ml x 241.2 mls = 1.8 ug C
Total 13.5 ug C

OK
Lab

$$\frac{(13.5)\ \text{ug Cr} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (98.4)\ \text{DSCF}} = 0.00204\ \text{ul/}$$

$$\frac{(13.5)\ \text{ug Cr} \times 60\ \text{min/hr} \times (465660)\ \text{DSCFM}}{(98.4)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 383.3\ \text{mg/hr Cr}$$

$$\frac{(383.3)\ \text{mg/hr}}{(345)\ \text{amp-hr/hr}} = 1.1\ \text{mg/amp-hr}$$

Hexavalent Chromium

Cr+6: 0.0026 ug/ml x 1048.8 mls = 2.7 ug Cr+6

$$\frac{(2.7)\ \text{ug Cr+6} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (98.4)\ \text{DSCF}} = 0.00045\ \text{ul/L Cr+6 (ppmv)}$$

$$\frac{(2.7)\ \text{ug Cr+6} \times 60\ \text{min/hr} \times (465660)\ \text{DSCFM}}{(98.4)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 76.7\ \text{mg/hr Cr+6}$$

$$\frac{(76.7)\ \text{mg/hr}}{(345)\ \text{amp-hr/hr}} = 0.22\ \text{mg/amp-hr}$$

Plant: US NAVY Bldg 472
Date: 6-19-91
Sampling Location: C2 Scrubber Outlet
Sample Type: Chromium Total + Cr^{+6}
Run Number: C2-3
Operator: Gerber, Hernandez
Ambient Temperature: 64
Barometric Pressure: 30.06
Static Pressure (P_s): +.12
Filter Number(s): N/A
Pretest Leak Rate = 0.015 cfm @ 15 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 5 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 7' Glass
Pitot Tube I.D. No.: 5-6
Nozzle I.D. No. & Diameter: 02P .299
Assumed Moisture, %: 2

Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.1
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.20
Post Test Leak Rate = 0.012 cfm @ 13 in. Hg
Post Test Pitot Leak Check: OK
Post Test Orsat Leak Check: N/A

Impinger Box No. 3B ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	108:02	476.505	0.34	3.2	3.2	70	69	67	11	N/A	52
2	5	108:07	476.160	0.36	3.4	3.4	70	74	68	12		48
3	10	108:12	481.000	0.35	3.25	3.25	70	77	69	12		56
4	15	108:17	485.840	0.34	3.20	3.20	71	80	71	12.0		57
5	20	108:22	490.645	0.32	3.0	3.0	71	82	72	10.5		61
6	25	108:27	495.300	0.25	2.35	2.35	71	83	73	8.0		61
7	30	108:32	499.550	0.22	2.0	2.0	71	84	74	6.5		56
8	35	108:37	503.410	0.19	1.8	1.8	72	84	75	5.5		55
9	40	108:42	507.045	0.17	1.6	1.6	72	85	76	5.0		54
10	45	108:47	510.000	0.17	1.6	1.6	72	85	77	5.0		53
11	50	108:52	513.845	0.15	1.45	1.45	71	86	77	5.0		53
12	55	108:57	517.140	0.12	1.1	1.1	70	84	78	4		53
13	60	109:10	519.805	0.30	2.75	2.75	70	79	76	9		52
14	65	109:15	524.227	0.32	3.0	3.0	71	82	76	10		50
15	70	109:20	528.873	0.30	2.75	2.75	71	85	76	9		53
16	75	109:25	533.319	0.29	2.65	2.65	71	86	79	9		55
17	80	109:30	537.751	0.24	2.2	2.2	71	87	79	7		55
18	85	109:35	541.847	0.22	2.0	2.0	71	88	80	6		55
19	90	109:40	545.615	0.27	2.5	2.5	71	89	80	8		56
20	95	109:45	549.868	0.34	3.65	3.65	72	89	81	9		56
21	100	109:50	554.222	0.30	2.75	2.75	71	89	81	9		56
22	105	109:55	558.670	0.28	2.6	2.6	71	90	81	9		57
23	110	110:00	563.049	0.24	2.2	2.2	72	90	82	7		58
24	115	110:05	567.066	0.18	1.65	1.65	72	90	82	5	N/A	57
OFF	120	10:10	570.547									
			94.042	0.254		2.40	71.04		80.17			568

θ=120 V=94.042 $\sqrt{\Delta P}$=0.504 ΔH=2.40 T_s=531 T_m=540

PACIFIC ENVIRONMENTAL SERVICES, INC.

(509)

PES

SAMPLE RECOVERY DATA

Plant: US NAVY Bldg 472

Date: 6-19-91

Sampling Location: C2 Scrubber Outlet

Sample Type: Chromium Total & Cr^{+6}

Run Number: C2-3

Sample Box Number: 3B

Clean-up Man: Gerber

Job Number: 4321.001

Comments: Sample Volumes 1,240.0 − 127.1 = 1,112.9 $NaHCO_3$
367.0 − 59.5 = 307.5 HNO_3

FRONT HALF

Filter Number: N/A

Description of Filter: White

MOISTURE

Impingers			
Final Volume:	600.8 ml	586.9 ml	463.6 ml
Initial Volume:	581.9 ml	586.3 ml	463.0 ml
Net Volume:	18.9 ml	0.6 ml	0.6 ml
Total H_2O:			
Silica Gel			
Final Volume:	674.9 g	g	g
Initial Volume	653.4 g	g	g
Net Volume	21.5 g	g	g
Total Moisture:	41.6		41.6

Description of Impinger Catch: Clear

Plant: U.S. NAVY

Date: 6-19-91

Source/Sample Number: C2-3

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(94.042)(1.009)\left[\frac{(30.06) + (2.40/13.6)}{(540)}\right]$

$Vm(std) =$ 92.9 dscf.

2. Volume water vapor collected (standard conditions).

$V(lo) =$ 41.6 condensate from impingers and selica gel.

$Vw(std) = (0.04707)\ V(lo) = (0.04707)(41.6)$

$Vw(std) =$ 1.96 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(1.96)}{(1.96) + (92.9)} =$ _____

$Bw_s =$ 0.021 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (\ \ ) + 0.320(\ \ ) + 0.280(\ \ )$

$Md =$ 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.021)(18 - 29)$

$Ms =$ 28.8 lb/lb-mole.

Plant: U.S. NAVY

Date: 6-19-91

Source/Sample Number: C2-3

5. Stack gas velocity average.

$$Vs(avg) = (85.49)(Cp)(\sqrt{\Delta P})\left[avg\sqrt{\frac{(Ts)}{(Ps)(Ms)}}\right]$$

$$Vs(avg) = (85.49)(0.84)(0.504)\left[\sqrt{\frac{(531)}{(30.07)(28.8)}}\right]$$

Vs(avg) = 28.3 ft/sec.

6. Stack volumetric flow rate, actual conditions (stack temperature and pressure).

$$Qs = (60)(Vs)(A) = (60)(28.3)(28.27)$$

Qs = 48002 acfm.

7. Stack volumetric flow rate, standard conditions (68 degrees F, 29.92 Hg).

$$Q(std) = (17.64)(Qs)(1-Bw_s)\left[\frac{(Ps)}{(Ts)}\right]$$

$$Q(std) = (17.64)(48002)(1-0.021)\left[\frac{(30.07)}{(531)}\right]$$

Q(std) = 46944 dscfm.

8. Isokinetic variation.

$$\%I = (K)\left[\frac{(Ts)(Vm(std))}{(Ps)(Vs)(An)(\theta)(1-Bw_s)}\right]$$

$$\%I = (0.0945)\left[\frac{(531)(92.9)}{(30.07)(28.3)(0.000488)(120)(1-0.021)}\right]$$

%I = 95.6 %

CLIENT: U.S. NAVY

Project No. 4321.001

Sampling Location: C2 SCRUBBER OUTLET #3

Sample Volume: 92.9 DSCF Flow Rate 46944 DSCFM

Blank: _____ mls Sample No. C2-BLANK

Cr: 0.00394 ug/ml x 779.5 mls = 3.1 ug Cr
wash: 0.005575 ug/ml x 197.5 mls = 1.1 ug Cr
Total 4.2 ug Cr

Cr+6: 0.0 ug/ml x 779.5 mls = 0.0 ug Cr+6

Sample No. C2-3 _____ mls

Total Chromium

Cr: 0.004485 ug/ml x 1112.9 mls = 5.0 u
wash: 0.00159 ug/ml x 307.5 mls = 0.49 u
Total 5.49 u

OK from lab rpt.

$$\frac{(5.49)\ \text{ug Cr} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (92.9)\ \text{DSCF}} = 0.00097$$

$$\frac{(5.49)\ \text{ug Cr} \times 60\ \text{min/hr} \times (46944)\ \text{DSCFM}}{(92.9)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 16$$

$$\frac{(166.5)\ \text{mg/hr}}{(333)\ \text{amp-hr/hr}} = 0.50\ \text{mg/amp-hr}$$

Hexavalent Chromium

Cr+6: 0.0035 ug/ml x 1112.9 mls = 3.9 ug Cr+6

$$\frac{(3.9)\ \text{ug Cr+6} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (92.9)\ \text{DSCF}} = 0.00069\ \text{ul/L Cr+6 (ppmv)}$$

$$\frac{(3.9)\ \text{ug Cr+6} \times 60\ \text{min/hr} \times (46944)\ \text{DSCFM}}{(92.9)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 118.2\ \text{mg/hr Cr+6}$$

$$\frac{(118.2)\ \text{mg/hr}}{(333)\ \text{amp-hr/hr}} = 0.35\ \text{mg/amp-hr}$$

Plant US NAVY
Date 6-19-91
Sampling Location C2 Scrubber outlet
Sample Type Meter (4) Check
Run Number Calibration Check
Operator Gerber
Ambient Temperature 64
Barometric Pressure 30.06
Static Pressure (P_s)
Filter Number(s)
Pretest Leak Rate = ____ cfm @ ____ in. Hg
Pretest Pitot Leak Check
Pretest Orsat Leak Check
Read and Record all Data Every ____ Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type
Pitot Tube I.D. No.
Nozzle I.D. No. & DIAMETER
Assumed Moisture, %
Meter Box Number 1A
Meter $\Delta H_@$ 1.932
C Factor
Meter Gamma 1.009
Heater Box Setting
Reference Δp
Post Test Leak Rate = ____ cfm @ ____ in. Hg
Post Test Pitot Leak Check
Post Test Orsat Leak Check

(0.992) = 0.8% OFF

Impinger Box No. ____ ; Blank Box No. ____

Traverse Point Number	Sampling Time, (min)	/ Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
	0	7:40	464.002					65	64			
	10	7:50	471.353					73	66			
			7.351					69				

PACIFIC ENVIRONMENTAL SERVICES, INC.

PES

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

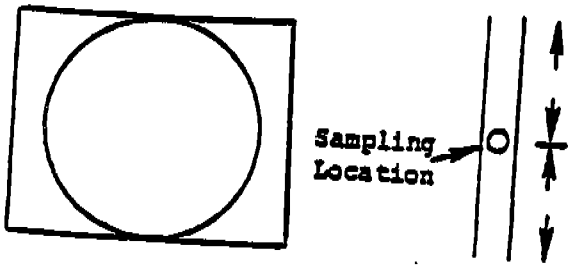
PLANT U.S. Navy Bldg 2
DATE 6-19-91
SAMPLING LOCATION Halo Scrubber Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 12.125
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) .125
STACK I.D., (DISTANCE A - DISTANCE B) 12.0
NEAREST UPSTREAM DISTURBANCE 85"
NEAREST DOWNSTREAM DISTURBANCE 84"
CALCULATOR Gerber

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	4.4	12.0	0.5 (1.0)		
2	14.6	12.0	1.75		
3	29.6	12.0	3.55		
4	70.4	12.0	8.45		
5	85.4	12.0	10.25		
6	95.6	12.0	11.5 (11.0)		

PRELIMINARY VELOCITY TRAVERSE

Plant: U.S NAVY Bldg 2
Date: 6-19-91
Location: Halo Scrubber
Stack I.D.: 12"
Barometric Pressure, in. Hg: 30.05
Stack Gauge Pressure, in. H_2O: -.37
Operators: Gerber, Hernandez
Pitot Tube I.D. Number: 5-38
Temperature Readout I.D.: 1A
Pitot Tube Leak Check: OK



Schematic of Traverse Point Layout

Traverse Point Number	Velocity Head (Δp_s) in. H_2O	Stack Temp. (T_s), °F	Cyclonic Flow Check ° from Null
1	0.06	73	+3
2	0.06	71	0
3	0.06	71	0
4	0.07	71	+4
5	0.05	71	0
6	0.07	71	0
Average			

Traverse Point Number	Velocity Head (Δp_s) in. H_2O	Stack Temp. (T_s), °F	Cyclonic Flow Check ° from Null
1	0.08	72	-1
2	0.09	72	0
3	0.08	72	0
4	0.06	72	0
5	0.06	72	0
6	0.08	72	0
Average			

Plant: US NAVY Bldg 2
Date: 6-17-91
Sampling Location: Halo Scrubber
Sample Type: Chromium Total + Cr6
Run Number: Halo-1
Operator: Gerber, Hernandez
Ambient Temperature: 75
Barometric Pressure: 30.05
Static Pressure (P_s): -.37
Filter Number(s): N/A
Pretest Leak Rate = 0.003 cfm @ 16 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 10 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 2' Glass
Pitot Tube I.D. No.: S-38
Nozzle I.D. No. & Diameter: 259, .385
Assumed Moisture, %: 2

Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.13
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.07
Post Test Leak Rate = ___ cfm @ ___ in. Hg
Post Test Pitot Leak Check:
Post Test Orsat Leak Check: N/A

Impinger Box No. 28 ; Blank Box No. 45

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	13:40	571.608	0.09	2.4	2.4	70	76	75	4	N/A	61
2	10											
3	20											
4	30											
5	40											
6	50											
7	60											
8	70											
9	80											
10	90											
11	100											
12	110											
OFF	120											

* Test Stopped & Restarted at 13:52, Ran 0.6 min. before stop

PACIFIC ENVIRONMENTAL SERVICES, INC.

VOID

SAMPLE RECOVERY DATA

Plant: U.S. Navy Bldg 2

Date: 6-19-91

Sampling Location: Helo Scrubber Outlet

Sample Type: Chromium Total & Cr+6

Run Number: Helo-1

Sample Box Number: 2B

Clean-up Man: Gerber

Job Number: 4321.001

Comments: Test VOIDED Due to Process Problems!

FRONT HALF

Filter Number: N/A

Description of Filter:

MOISTURE

Impingers

Final Volume:	ml	ml	ml
Initial Volume:	565.6 ml	545.5 ml	488.5 ml
Net Volume:	ml	ml	ml
Total H_2O:			

Silica Gel

Final Volume:	g	g	g
Initial Volume	625.0 g	g	g
Net Volume	g	g	g
Total Moisture:			

Description of Impinger Catch:

Plant: US NAVY Bldg 2
Date: 6-20-91
Sampling Location: Halo Scrubber
Sample Type: Chromium Total & Cr6
Run Number: Halo -2
Operator: Gerber, Hernandez
Ambient Temperature: 68
Barometric Pressure: 30.12
Static Pressure (P_s): ~~-37~~ -.62
Filter Number(s): N/A
Pretest Leak Rate = 0.02 cfm @ 16 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: NA
Read and Record all Data Every 10 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 2' Glass
Pitot Tube I.D. No.: 5-3B
Nozzle I.D. No. & Diameter: 250 @ .385
Assumed Moisture, %: 2

Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.15
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.07
Post Test Leak Rate = 0.02 cfm @ 19 in. Hg
Post Test Pitot Leak Check: OK
Post Test Orsat Leak Check: NA

Impinger Box No. 3B ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	108:32	579.981	0.06	1.6	1.6	64	70	70	5	NA	55
2	10	108:42	586.651	0.07	1.85	1.85	60	75	71	6		53
3	20	108:52	593.920	0.06	1.6	1.6	69	80	73	5		55
4	30	109:02	600.767	0.10	2.65	2.65	69	82	74	8		57
5	40	109:12	609.314	0.14	3.7	3.7	69	84	76	14		60
6	50	109:22	619.474	0.14	3.7	3.7	68	86	77	14		64
7	60	109:51	629.751	0.12	3.2	3.2	68	77	76	11		55
8	70	110:01	639.248	0.08	2.1	2.1	67	80	76	7		57
9	80	110:11	645.876	0.09	2.4	2.4	68	83	77	8		56
10	90	110:21	655.348	0.12	3.2	3.2	68	84	77	10		58
11	100	110:31	664.192	0.17	4.5	4.5	68	85	78	16		57
12	110	110:41	675.844	0.17	4.5	4.5	68	84	78	18		60
OFF	120	110:51	686.898									
		/										
		/										
		/										
		/	V_m=106.917		ΔH=2.982							
		/						T_m=538				
	θ=120	/		$\sqrt{\Delta P}$=0.327			T_s=527					
		/										<68
		/										
		/										
		/										
		/										

PACIFIC ENVIRONMENTAL SERVICES, INC.

PES

SAMPLE RECOVERY DATA

Plant: US NAVY Bldg #2

Date: 6-20-91

Sampling Location: Helo Scrubber Outlet

Sample Type: Chromium Total + Cr^{+6}

Run Number: Helo-2

Sample Box Number: 3B

Clean-up Man: Gerber

Job Number: 4321.001

Comments: Sample Volumes 906.4 - 124.8 = 781.6 $NaHCO_3$
299.3 - 59.4 = 239.9 HNO_3

FRONT HALF

Filter Number: N/A

Description of Filter: White

MOISTURE

Impingers			
Final Volume:	589.4 ml	582.3 ml	463.6 ml
Initial Volume:	587.6 ml	582.0 ml	462.6 ml
Net Volume:	1.8 ml	0.3 ml	1.0 ml
Total H_2O:			
Silica Gel			
Final Volume:	668.7 g	g	g
Initial Volume	641.3 g	g	g
Net Volume	27.4 g	g	g
Total Moisture:	30.5		30.5

Description of Impinger Catch: Clear

Plant: U.S. NAVY

Date: 6-20-91

Source/Sample Number: HELO-2

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(106.917)(1.009)\left[\frac{(30.12) + (2.92/13.6)}{(538)}\right]$

$Vm(std) =$ 107.3 dscf.

2. Volume water vapor collected (standard conditions).

$V(lo) =$ 30.5 condensate from impingers and selica gel.

$Vw(std) = (0.04707)\ V(lo) = (0.04707)(30.5)$

$Vw(std) =$ 1.44 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(1.44)}{(1.44) + (107.3)} =$ ____

$Bw_s =$ 0.013 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (\ __\ ) + 0.320(\ __\ ) + 0.280(\ ___\ )$

$Md =$ 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.013)(18 - 29)$

$Ms =$ 28.86 lb/lb-mole.

Plant: U.S. NAVY

Date: 6-20-91

Source/Sample Number: HELO-2

5. Stack gas velocity average.

$$Vs(avg) = (85.49)(Cp)(\sqrt{\Delta P})\left[avg\sqrt{\frac{(Ts)}{(Ps)(Ms)}}\right]$$

$$Vs(avg) = (85.49)(0.84)(0.327)\left[\sqrt{\frac{(527)}{(30.07)(28.86)}}\right]$$

Vs(avg) = 18.3 ft/sec.

6. Stack volumetric flow rate, actual conditions (stack temperature and pressure).

$$Qs = (60)(Vs)(A) = (60)(18.3)(0.785)$$

Qs = 862 acfm.

7. Stack volumetric flow rate, standard conditions (68 degrees F, 29.92 Hg).

$$Q(std) = (17.64)(Qs)(1-Bw_s)\left[\frac{(Ps)}{(Ts)}\right]$$

$$Q(std) = (17.64)(862)(1-0.013)\left[\frac{(30.07)}{(527)}\right]$$

Q(std) = 856 dscfm.

8. Isokinetic variation.

$$\%I = (K)\left[\frac{(Ts)(Vm(std))}{(Ps)(Vs)(An)(\theta)(1-Bw_s)}\right]$$

$$\%I = (0.0945)\left[\frac{(527)(107.3)}{(30.07)(18.3)(0.000808)(120)(1-0.013)}\right]$$

%I = 161.5 %

PES

CLIENT: U.S. NAVY

Project No. 4321.001

Sampling Location: HELO SCRUBBER OUTLET #2

Sample Volume: 107.3 DSCF Flow Rate 856 DSCFM

Blank: _____ mls Sample No. _____

Cr: 0.000915 ug/ml x 738.3 mls = 0.68 ug Cr
wash: 0.00464 ug/ml x 152.0 mls = 0.71 ug Cr
Total 1.39 ug Cr

Cr+6: 0.00012 ug/ml x 738.3 mls = 0.09 ug Cr+6

Sample No. HELO-2 _____ mls

Total Chromium

Cr: 0.002835 ug/ml x 781.6 mls = 2.2 ug Cr
wash: 0.00171 ug/ml x 239.9 mls = 0.4 ug Cr
Total 2.6 ug Cr

$$\frac{(2.6)\text{ ug Cr} \times 24.05\text{ ul/um}}{52\text{ ug/um} \times 28.3\text{ L/DSCF } (107.3)\text{ DSCF}} = 0.00040 \text{ ul/L Cr (ppmv)}$$

$$\frac{(2.6)\text{ ug Cr} \times 60\text{ min/hr} \times (856)\text{ DSCFM}}{(107.3)\text{ DSCF} \times 1000\text{ ug/mg}} = 1.24 \text{ mg/hr Cr}$$

$$\frac{(1.24)\text{ mg/hr}}{(\cancel{12}\ 9)\text{ amp-hr/hr}} = 0.14 \text{ mg/amp-hr}$$

Hexavalent Chromium

Cr+6: 0.0011 ug/ml x 781.6 mls = 0.86 ug Cr+6

$$\frac{(0.86)\text{ ug Cr+6} \times 24.05\text{ ul/um}}{52\text{ ug/um} \times 28.3\text{ L/DSCF } (107.3)\text{ DSCF}} = 0.00013 \text{ ul/L Cr+6 (ppmv)}$$

$$\frac{(0.86)\text{ ug Cr+6} \times 60\text{ min/hr} \times (856)\text{ DSCFM}}{(107.3)\text{ DSCF} \times 1000\text{ ug/mg}} = 0.41 \text{ mg/hr Cr+6}$$

$$\frac{(0.41)\text{ mg/hr}}{(\cancel{12}\ 9)\text{ amp-hr/hr}} = \cancel{0.034}\ 0.046 \text{ mg/amp-hr}$$

Plant: U.S. Navy Bldg 2
Date: 6-20-99
Sampling Location: Helo Scrubber
Sample Type: Chromium
Run Number: Helo-3
Operator: Gerber Hernandez
Ambient Temperature: 69
Barometric Pressure: 30.07
Static Pressure (P_s): -.65
Filter Number(s): N/A
Pretest Leak Rate = 0.002 cfm @ 15 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 10 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 2' Glass
Pitot Tube I.D. No.: S-38
Nozzle I.D. No. & Diameter: 09P 0.366
Assumed Moisture, %: 2

Meter Box Number: 1A
Meter $\Delta H_@$: 1.932
C Factor: 1.15
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.09
Post Test Leak Rate = 0.001 cfm @ 7 in. Hg
Post Test Pitot Leak Check: OK
Post Test Orsat Leak Check: N/A

Impinger Box No. 2B ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0 / 11:53	687.404	0.11	2.2	2.2	66	73	73	4.0	N/A	~~60~~ 58
2	10 / 12:03	695.000	0.10	2.1	2.1	69	79	74	3.5	–	61
3	20 / 12:13	703.140	0.09	1.85	1.85	69	82	75	3.0	–	53
4	30 / 12:23	710.563	0.15	3.5	3.5	68	80	75	5.0	–	50
5	40 / 12:33	720.42	0.18	3.7	3.7	68	82	75	5.5	–	51
6	50 / 12:43	730.245	0.17	3.9	3.9	68	83	76	6.0	–	52
7	60 / 12:53	740.362	0.18	3.7	3.7	69	71	71	5.5	–	52
8	70 / 13:39	~~740.362~~	0.09	1.85	1.85					–	50
8 4	~~80~~ 70 / 13:49	750.770	~~0.09~~			63	78	72	3.0	–	50
9 ~~70~~	~~90~~ 80 / 13:59	758.190	0.09	1.85	1.85	68	79	73	3.0	–	49
10 ~~H~~	~~100~~ 90 / 14:09	764.610	0.12	2.5	2.5	69	80	74	4.0	–	49
11 ~~12~~	~~110~~ 100 / 14:19	772.871	0.16	3.25	3.25	69	81	75	5.0	–	50
12 ~~OFF~~	~~120~~ 110 / 14:29	782.116	0.17	3.5	3.5	69	83	75	5.5	N/A	50
OFF	120 / 14:39	792.519									
	/										
	/										
	/										
	/	V_m=105.115		ΔH=2.83			T_m=537				
	/										<68
	θ=120 /		$\sqrt{\Delta P}$=0.365			T_s=527					
	/										
	/										
	/										
	/										

0.75

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: U.S. NAVY

Date: 6-20-91

Source/Sample Number: HELO-3

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(105.115)(1.009)\left[\frac{(30.07) + (2.83/13.6)}{(537)}\right]$

Vm(std) = 105.5 dscf.

2. Volume water vapor collected (standard conditions).

V(lo) = 35.6 condensate from impingers and selica gel.

Vw(std) = (0.04707) V(lo) = (0.04707)(35.6)

Vw(std) = 1.68 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(1.68)}{(1.68) + (105.5)} =$ _____

Bw_s = 0.016 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (\ \ ) + 0.320(\ \ ) + 0.280(\ \ )$

Md = 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.016)(18 - 29)$

Ms = 28.82 lb/lb-mole.

Plant: U.S. NAVY

Date: 6-20-91

Source/Sample Number: HELO-3

5. Stack gas velocity average.

$$Vs(avg) = (85.49)(Cp)(\sqrt{\Delta P})\left[avg\sqrt{\frac{(Ts)}{(Ps)(Ms)}}\right]$$

$$Vs(avg) = (85.49)(0.84)(0.365)\left[\sqrt{\frac{(527)}{(30.02)(28.82)}}\right]$$

Vs(avg) = 20.5 ft/sec.

6. Stack volumetric flow rate, actual conditions (stack temperature and pressure).

$$Qs = (60)(Vs)(A) = (60)(20.5)(0.785)$$

Qs = 966 acfm.

7. Stack volumetric flow rate, standard conditions (68 degrees F, 29.92 Hg).

$$Q(std) = (17.64)(Qs)(1-Bw_s)\left[\frac{(Ps)}{(Ts)}\right]$$

$$Q(std) = (17.64)(966)(1-0.016)\left[\frac{(30.02)}{(527)}\right]$$

Q(std) = 955 dscfm.

8. Isokinetic variation.

$$\%I = (K)\left[\frac{(Ts)(Vm(std))}{(Ps)(Vs)(An)(\theta)(1-Bw_s)}\right]$$

$$\%I = (0.0945)\left[\frac{(527)(105.5)}{(30.02)(20.5)(0.000731)(120)(1-0.016)}\right]$$

%I = 98.9 %

CLIENT: U.S. NAVY

Project No. 4321.001

Sampling Location: HELO SCRUBBER OUTLET #3

Sample Volume: 105.5 DSCF Flow Rate 955 DSCFM

Blank: _____ mls Sample No. _____

Cr: 0.000915 ug/ml x 738.3 mls = 0.68 ug Cr
wash: 0.004464 ug/ml x 152.0 mls = 0.71 ug Cr
Total 1.39 ug Cr

Cr+6: 0.00012 ug/ml x 738.3 mls = 0.09 ug Cr+6

Sample No. HELO-3 _____ mls

Total Chromium

Cr: 0.004805 ug/ml x 747.5 mls = 3.6 ug Cr
wash: 0.001865 ug/ml x 192.3 mls = 0.36 ug Cr
Total 3.96 ug Cr

$$\frac{(3.96)\text{ ug Cr} \times 24.05\text{ ul/um}}{52\text{ ug/um} \times 28.3\text{ L/DSCF } (105.5)\text{ DSCF}} = 0.0006\text{ ul/L Cr (ppmv)}$$

$$\frac{(3.96)\text{ ug Cr} \times 60\text{ min/hr} \times (955)\text{ DSCFM}}{(105.5)\text{ DSCF} \times 1000\text{ ug/mg}} = 2.15\text{ mg/hr Cr}$$

$$\frac{(2.15)\text{ mg/hr}}{(6)\text{ amp-hr/hr}} = 0.36\text{ mg/amp-hr}$$

Hexavalent Chromium

Cr+6: 0.003 ug/ml x 747.5 mls = 2.2 ug Cr+6

$$\frac{(2.2)\text{ ug Cr+6} \times 24.05\text{ ul/um}}{52\text{ ug/um} \times 28.3\text{ L/DSCF } (105.5)\text{ DSCF}} = 0.00034\text{ ul/L Cr+6 (ppmv)}$$

$$\frac{(2.2)\text{ ug Cr+6} \times 60\text{ min/hr} \times (955)\text{ DSCFM}}{(105.5)\text{ DSCF} \times 1000\text{ ug/mg}} = 1.2\text{ mg/hr Cr+6}$$

$$\frac{(1.2)\text{ mg/hr}}{(6)\text{ amp-hr/hr}} = 0.20\text{ mg/amp-hr}$$

Plant: US NAVY Bldg 2
Date: 6-20-91
Sampling Location: Helo Scrubber
Sample Type: Chromium Total Cr
Run Number: Helo-7
Operator: Gerber, Hernandez
Ambient Temperature: 63
Barometric Pressure: 30.00
Static Pressure (P_s): -.76
Filter Number(s): N/A
Pretest Leak Rate = 0.017 cfm @ 16 in. Hg
Pretest Pitot Leak Check: OK
Pretest Orsat Leak Check: N/A
Read and Record all Data Every 10 Minutes

FIELD DATA

Schematic of Traverse Point Layout

Probe Length and Type: 2' Glass
Pitot Tube I.D. No.: 5-3B
Nozzle I.D. No. & Diameter: 09 0.366
Assumed Moisture, %: 2
Meter Box Number: 1A
Meter $\Delta H_@$: 1.732
C Factor: .115
Meter Gamma: 1.009
Heater Box Setting: N/A
Reference Δp: 0.09
Post Test Leak Rate = 0.026 cfm @ 19 in. Hg
Post Test Pitot Leak Check: OK
Post Test Orsat Leak Check: N/A

Impinger Box No. 36 ; Blank Box No. 4B

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0	115:16	792.903	0.07	1.4	1.4	70	73	73	5	N/A	57
2	10	115:26	799.385	0.08	1.65	1.65	72	79	75	5.0		54
3	20	115:36	806.150	0.07	1.40	1.40	72	82	76	5.0		56
4	30	115:46	812.635	0.07	1.40	1.40	72	82	76	5.0		57
5	40	115:56	818.900	0.18	3.20	3.20	71	83	77	12.0		56
6	50	116:06	827.485	0.13	2.8	2.8	71	85	78	10.0		60
7	60	116:48	836.643	0.09	1.85	1.85	72	76	76	6.0		60
8	70	116:52	843.744	0.10	2.05	2.05	73	81	77	6.0		59
9	80	112:02	851.275	0.10	2.05	2.05	73	83	77	6.5		56
10	90	117:12	858.900	0.15	3.1	3.1	73	85	78	11.0		55
11	100	117:22	867.885	0.19	4.0	4.0	73	82	79	18.0		56
12	110	117:32	878.395	0.205	4.4	4.4	72	85	79	19.0		58
End	120	117:42	889.187								N/A	
			V_m=96.284		ΔH=2.47			T_m=539				
	θ=120			$\sqrt{\Delta P}$=0.337			T_s=532					<68

Leak 0.014 cfm at 12 in. Hg

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: U.S. NAVY

Date: 6-20-91

Source/Sample Number: HELO-4

1. $Vm(std) = (17.64)(Vm)(Y)\left[\frac{P_{bar} + (\Delta H/13.6)}{Tm}\right]$

$Vm(std) = (17.64)(96.284)(1.009)\left[\frac{(30.0) + (2.44/13.6)}{(539)}\right]$

$Vm(std) =$ 96.0 dscf.

2. Volume water vapor collected (standard conditions).

$V(lo) =$ 35.9 condensate from impingers and selica gel.

$Vw(std) = (0.04707)\ V(lo) = (0.04707)(35.9)$

$Vw(std) =$ 1.69 scf.

3. Percent moisture, by volume.

$Bw_s = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{(1.69)}{(1.69) + (96.0)} =$ _____

$Bw_s =$ 0.017 .

4. Molecular weight, stack gas.

Dry molecular weight.

$Md = 0.440(\%\ CO_2) + 0.320(\%\ O_2) + 0.280(\%\ N_2 + \%\ CO)$

$Md = 0.440\ (\ \ ) + 0.320(\ \ ) + 0.280(\ \ )$

$Md =$ 29.0 lb/lb-mole.

$Ms = Md + Bw_s\ (18 - Md) = (29) + (0.017)(18 - 29)$

$Ms =$ 28.81 lb/lb-mole.

CLIENT: U.S. NAVY

Project No. Y324.021

Sampling Location: HELO SCRUBBER OUTLET

Sample Volume: 96.0 DSCF Flow Rate 873 DSCFM

Blank: _____ mls Sample No. _____

Cr: 0.000915 ug/ml x 738.3 mls = 0.68 ug Cr
wash: 0.00464 ug/ml x 152.0 mls = 0.71 ug Cr
Total 1.39 ug Cr

Cr+6: 0.00012 ug/ml x 738.3 mls = 0.09 ug Cr+6

Sample No. HELO-4 _____ mls

Total Chromium

Cr: 0.04175 ug/ml x 778.1 mls = 32.5 ug Cr
wash: 0.01545 ug/ml x 206.3 mls = 3.2 ug Cr
Total 35.7 ug Cr

$$\frac{(35.7)\ \text{ug Cr} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (96.0)\ \text{DSCF}} = 0.0061\ \text{ul/L Cr (ppmv)}$$

$$\frac{(35.7)\ \text{ug Cr} \times 60\ \text{min/hr} \times (873)\ \text{DSCFM}}{(96.0)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 19.5\ \text{mg/hr Cr}$$

$$\frac{(19.5)\ \text{mg/hr}}{(8)\ \text{amp-hr/hr}} = 2.4\ \text{mg/amp-hr}$$

Hexavalent Chromium

Cr+6: 0.035 ug/ml x 778.1 mls = 27.2 ug Cr+6

$$\frac{(27.2)\ \text{ug Cr+6} \times 24.05\ \text{ul/um}}{52\ \text{ug/um} \times 28.3\ \text{L/DSCF}\ (96.0)\ \text{DSCF}} = 0.0046\ \text{ul/L Cr+6 (ppmv)}$$

$$\frac{(27.2)\ \text{ug Cr+6} \times 60\ \text{min/hr} \times (873)\ \text{DSCFM}}{(96.0)\ \text{DSCF} \times 1000\ \text{ug/mg}} = 14.8\ \text{mg/hr Cr+6}$$

$$\frac{(14.8)\ \text{mg/hr}}{(8)\ \text{amp-hr/hr}} = 1.9\ \text{mg/amp-hr}$$

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS	VOLTS
	8:30	6	50
	8:31	10	52
Test Start	8:32	14	52
	8:33	16	52
	8:35	15	51
	8:40	13	51
	8:50	12	51
	9:00	12	50
	9:10	12	50
	9:20	13	50
	9:30	13	50
Test Stop	9:32	13	50
	9:33	13	50

12 AVG

COMMENTS First Traverse First Test

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS	VOLTS
	9:50	12	50
Test Start	9:51	Ø8	51
	9:53	Ø7	51
	9:55	Ø7	51
	10:00	Ø6	51
	10:10	Ø6	51
	10:20	Ø6	51
	10:30	Ø6	51
	10:40	Ø6	51
	10:50	Ø6	51
Test End	10:51	Ø6	51
	10:53	Ø6	51

COMMENTS Second Inverse First Test

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS		VOLTS
	11:50	42		50
Test Start	11:53	30		50
	11:55	18		50
	11:58	10		50
	12:00	Ø6		50
	12:05	Ø4		51
	12:10	Ø4		51
	12:20	Ø4	6	51
	12:30	Ø4	AVG	51
	12:40	Ø6		51
	12:50	Ø6		51
Test Stop	12:53	Ø6		51

COMMENTS First Traverse, Second Test

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS	VOLTS
Test start	13:39	10	50
	13:43	Ø8	51
	13:45	Ø7	51
	13:50	Ø6	51
	14:00	Ø6	51
	14:10	Ø6	51
	14:20	Ø6	51
	14:30	Ø6	51
Test End	14:39	Ø6	51
	14:40	Ø6	51

6 AVG

COMMENTS Second Traverse, Second Test

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS		VOLTS
	15:15	30		50
Test Start	15:16	20		51
	15:17	16		51
	15:20	10		51
	15:25	10		51
	15:30	Ø8		51
	15:40	Ø8	19 AVG	51
	15:50	Ø8		51
	16:00	Ø8		51
	16:10	Ø8		61
	16:15	Ø8		51
	16:16	Ø8		51

COMMENTS First Traverse, Third Test

N.A.S. NORTH ISLAND
HELO BLADE ANODIZE SCRUBBER

DATE 6-20-91

	TIME	AMPS		VOLTS
	16:42	20		50
	16:41	10		51
Test start	16:42	Ø9		51
	16:43	Ø8		51
	16:45	Ø8		51
	16:50	Ø7	7	51
	17:00	Ø6	AVG	51
	17:10	Ø6		51
	17:20	Ø7		51
	17:30	Ø8		51
	17:40	Ø8		51
Test End	17:42	Ø8		51

COMMENTS Second Traverse, Third Test

166

117-166-1 1000ppm CrO4

4 0.2733g. K2CrO4 → 100mL w/17MΩ H2O

117-166-2 1ppm CrO4

4 1mL of 117-166-1 → 100mL w/17MΩ H2O

117-166-3 Stm 5ppm ICV I⁻ ICV

1000ppm I⁻ 1115-27-1 0.50g

Balance 18MΩ H2O to 100.00g

117-166-4 Stm 100ppm I⁻ Spike Soln.

1115-27-1 10.00g

Balance 18MΩ H2O to 100.00g

117-166-5 1 ppm NH4 ICV

U.P. 116-164-2 5ppm NH_4^+ 10.00g

Bal to 100 18MΩ H2O

612-218-1 1MB Cr+6 STD

10mL of 612-217-7 (1MB) → 50mL w/ 18MΩ H_2O

612-218-2 0.5MB Cr+6 STD

5mL of 612-217-7 1MB → 50mL w/ 18MΩ H_2O

612-218-3 0.05MB STD Cr+6

10mL of 612-218-2 (0.5MB) → 100mL w/ 18MΩ H_2O

612-218-4 0.02MB Cr+6 STD

20mL of 612-218-3 (0.05MB) → 50mL w/ 18MΩ H_2O

612-218-5/KB

NaH_2PO_4 BUFFER SOLUTION

SODIUM DIHYDROGEN PHOSPHATE
BAKER LOT D37189 69g

BALANCE 18MΩ H_2O TO 500mL

610-217-1 [illegible]

1.0M SDS NaCl 0.5mM CaCl, MgCl, [illegible]

20mL of 610-216-4 → 40mL w/ 18mM H_2O

610-217-2 [illegible]

0.5M SDS NaCl, 0.25mM CaCl, MgCl, [illegible]

20mL of 610-217-1 → 40mL w/ 18mM H_2O

610-217-3 [illegible]

0.1M SDS NaCl, 0.2M CaCl, MgCl, [illegible]

0.5mL of 221-195-2 → 10mL w/ 18mM H_2O

612-217-4 [illegible]

[redacted] CrCl6

1mL of [redacted] CrCl6 (17-166-1) → 10mL w/ [illegible]

612-217-5 [illegible]

100ppb CrCl6

1mL of 10ppm 612-217-4 → 100mL w/ [illegible]

612-217-6 [illegible]

50ppb CrCl6

10mL of 100ppb CrCl6 612-217-5 → 20mL w/ [illegible]

612-217-7 [illegible]

5ppb CrCl6

5mL of 612-217-6 → 50mL w/ 18M H_2O

1126-144-1 100ppm PERCHORATE STD.

4 1ml of 100ppm (111-119-3) → 100ml w/ 18mmol H_2O

1126-144-2 5ppm PERCHORATE STD.

4 .5ml of 100ppm (111-119-3) → 100ml w/ 18mmol H_2O

1126-144-3 1ppm PERCHORATE STD.

4 1ml of 10ppm STD 1126-144-1 → 100ml w/ 18mmol H_2O

1126-144-4 .5ppm STD PERCHORATE STD.

4 10ml of 1126-144-2 → 10ml w/ 18mmol H_2O

1126-144-5 .1ppm STD PERCHORATE

4 10ml of 1126-144-3 → 100ml w/ 18mmol H_2O

1205-144-6 1000ppm CrO4 STD

4 0.2832 g K_2CrO_4 → 100ml 18mmol water

1205-145-1 — 100% CRTG

ml of 1205-144-6 → 100ml w/ [illegible]

1205-145-2 — 100% CRTG

ml of 1205-145-1 → 100ml w/ [illegible]

1205-145-3 — 5% CRTG

5ml of 1205-145-2 → 100ml w/ [illegible]

1205-145-4 — 1% CRTG

ml of 1205-145-2 → 100ml w/ [illegible]

1205-145-5 — 0.5% CRTG

ml of 1205-145-3 → 100ml w/ [illegible]

1205-145-6 — 0.05% CRTG

ml of 1205-145-5 → 100ml w/ [illegible]

1205-145-7 — 0.02% CRTG

ml of 1205-145-6 → 50ml w/ [illegible]

1-7-90 SLM
107-156-6
1000 ppb Cr +6

1205-145-1 10 gm Cr +6 10.00 g
Bake 18 hr Ω H_2O to 100.00 g

107-156-2
500 ppb Cr +6 Sn

1205-145-1 5.00 g
Bake 18 hr Ω H_2O to 100.00 g

107-156-3
50 ppb Cr +6 Sn

1205-145-1 0.50 g
Bake 18 hr Ω H_2O to 100.50 g

107-156-4 Sn
250 ppb Cr 6+ ICV

1205-145-1 2.50 g
Bake 18 hr Ω H_2O to 100.60 g

PAH STD. MIX

~~320-185-1~~ 4

322-185-2 Reissner Solution

V.P. $FeCl_3 \cdot 6H_2O$ Baker lot 601332 - 33.8 g
HNO_3 - Baker Lot D32539 250 ml
Dilute to 500 ml with 18MΩ H_2O

322-185-3 Absorbing Solution for Mercaptan
Mercuric acetate PFALTZ & BAUER INC CT06708 - 22.5 g
V.P. Glacial Acetic Acid Baker lot # D30823 - 125 ml
18MΩ H_2O Balance to 500 ml

322-185-4 Stock Lead Mercaptide Solution
V.P. Methanethiol, Lead PFALTZ & Bauer M06115 - 56.6 mg
Bal to 100 ml with Absorbing Solution 322-185-3

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4 322-185-5 5 PPB CH4C

10 ml of 5 ppb STD 107-156-2 → 100 ml with water

4 322-185-6 1 PPB CH4C

20 ml of 322-185-5 → 100 ml with water

322-185-7 .5 PPB CH4C

10 ml of 5 PPB 322-185-5 → 100 ml with water

4 322-185-8 0.05 PPB CH4C

10 ml of 322-185-5 → 100 ml with water

00

301-66-1 20 mM $NaHCO_3$ 3c

6.72 g $NaHCO_3$ → 4 L H_2O (X 5)

305-66-2 0.05 M Anions, .1 M Hay 3c

2 ml of .(PMSTD 2[18-63-2]) → 100 ml w/ 1 µm H_2O

307-66-3 10 M Cations 3c

100 M 1 g of Magnesium Lot A36617 Baker
Calcium Lot A48628
Lithium F04619
Sodium A4563-4
Ammonium 0518-02-2
Potassium A52602
→ 100 ml w/ 1 µm H_2O 3c

307-66-4 10 M Ca, Mg STD 3c

1 g of 100 M Magnesium Lot A36617 → 100 ml w/ 1 µm H_2O
Calcium Lot A48628

307-66-5 1 M Cations 3

1 ml of 307-66-3 → 100 ml w/ 1 µm H_2O

307-66-6 .1 M Cations, .2 M Mg, Ca 3

10 ml of 307-66-5 (1 M) → 100 ml w/ 1 µm H_2O
1 ml of 307-66-4 (10 M) → 1 L 3

307-66-7 .01 M Cations, .1 M Mg, Ca

307-66-8 2 ml of 307-66-6 → 40 ml w/ 1 µm H_2O
100 M Cr+6 STD .2832 g K_2CrO_4, nanopure → 100 ml 1 µm H_2O Alfa Aesar

0523-87-1 Std
0.05 Major Cations 0.1 ppm Mg, Ca

10g 322-70-5 10.00g

Baker 18MΩ H2O qs ~~100.00g~~

1.00g

0523-87-2 Std

2ppm Cations 0523-86-8 20.00g

Baker 18MΩ H2O qs 100.00g

10g

10g

0525-87-3 Std 40 NTU ICV for Turbidity

1.00g 4000 NTU Std Lot # 2080 (HACH) ~~0.100g~~

1.00g Baker 18MΩ H2O qs 100.00

1.00g

1.00g

1.00g

1.00g

0525-87-4 Buffer Soln NaHCO3 0.119M

1.00 gm NaHCO3 Lot 3506-05 Baker
100g 18 MΩ H2O

525-87-5 10mM CrO4 STD

1mL of 10mM STD 2-8-66-8 → 100mL W/ 11mM H2O

0.00g 525-87-6 10mM CrO4
1mL of 525-87-5 → 100mL W/ 18MΩ H2O

00.00g

[redacted]

0.006423 g/ml 1016-133-1

1g of 0.6423g/ml 1016-132-6 dilute to 1000ml with 18 Ω H2O

Exp. 1017-133-2

L(+) Glutamic Acid	J.T. Baker	B40707	1.5g
Dextrose	J.T. Baker	B05716	1.5g

dilute to 100g w

1022-133-3 100 PPB CR+6 STD

1 mL of 1000 SLI-17-1 → 10mL w/18MΩ H2O

1022-133-4 50 PPB CR+6 STD.

10mL of 100 PPB CR+6 → 20mL w/18MΩ H2O

1022-133-5 5 PPB CR+6 STD

5 mL of 1022-133-2 → 50mL w/18 MΩ H2O

1024-135-1 SIMM FORMATE

20ml of solution (1024-134-1) → 40ml w/ 18MΩ H_2O

1024-135-2 1ppb Cr^{+6} Std

100-133-3 100ppb Cr^{+6} 1.00g

Balance 18MΩ H_2O to 100.00g

1024-135-3 Std 0.5ppb Cr^{+6}

100-133-3 0.50g

Balance 18MΩ H_2O to 100.00g

1024-135-4 Std 0.05ppb Cr^{+6}

1024-135-3 10.00g

Balance 18MΩ H_2O to 100.00g

1020-135-5 Std 0.02ppb Cr^{+6}

1024-135-3 4.00g

Balance 18MΩ H_2O to 100.00g

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-18-91

	TIME	AMPS		VOLTS
	10:30	350		36
Test Start	10:37	300		37
	10:40	300		37
	10:50	320		37
	11:00	325		37
	11:10	325	318	37
	11:20	325	AVG	37
	11:30	325		37
Test End	11:37	325		37
	11:40	325		37

COMMENTS First traverse first test

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-18-91

	TIME	AMPS		VOLTS
	11:43	400		35
Test Start	11:46	380		35
	11:53	335		35
	12:00	325		35
	12:10	320		35
	12:20	320	330 AVG	35
	12:30	320		35
	12:40	320		35
Test End	12:46	320		35
	12:50	320		35

COMMENTS Second traverse First test

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-18-91

	TIME	AMPS	VOLTS
Test Start	14:10	500	35
	14:12	400	35
	14:13	375	35
	14:14	350	35
	14:15	350	35
	14:20	330	35
	14:30	325	35
	14:40	325	35
	14:50	325	35
	15:00	325	35
Test stop	15:10	325	35

333 WTD AVG

COMMENTS First Traverse Second Test

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-18-91

	TIME	AMPS		VOLTS
Test Start	15:15	400		35
	15:20	375		35
	15:25	350		35
	15:30	350		35
	15:40	350		35
	15:50	350	350 AVG	35
	16:00	350	WTD	35
	16:10	350		35
Test Stop	16:15	350		35
	16:20	350		35

COMMENTS Second Traverse Second test

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-19-91

	TIME	AMPS	VOLTS
	8:01	375	35
Test Start	8:02	370	35
	8:04	355	35
	8:07	350	35
	8:08	330	35
	8:11	325	35
	8:21	320	35
	8:31	320	35
	8:41	320	35
	8:51	320	35
	9:01	320	35
Test End	9:02	320	35

326 WTD AVG

COMMENTS First Traverse Third Test

N.A.S. NORTH ISLAND
C-2 SCRUBBER

DATE 6-19-91

TIME	AMPS	VOLTS
9:09	400	35
9:10	391	35
9:11	385	35
9:13	350	35
9:17	345	35
9:19	340	35
9:29	330	35
9:39	330	35
9:49	330	35
9:59	330	35
10:09	330	35
Test End 10:10	330	35

339 W/D AW6

COMMENTS Second Traverse Third Test

APPENDIX B

Laboratory Analyses
QA/QC Package

WCAS
WEST COAST ANALYTICAL SERVICE, INC.
ANALYTICAL CHEMISTS

June 30, 1991

PACIFIC ENVIRONMENTAL SERVICES, INC.
13100 Brooks Dr.
Baldwin Park, CA 91706

Attn: S. Hugh Brown

JOB NO. 18839 A

LABORATORY REPORT

Samples Received: Ten (10) Liquid Samples
Date Received: 6-21-91
Purchase Order No: Proj#: 4321.001

The samples were analyzed as follows:

Samples Analyzed	Analysis	Results
Ten (10) liquids	Total Chromium by ICPMS	Table 1
Six (6) liquids	Hexavalent Chromium by EPA 7196/IC	Table 2

Michael Shelton
Technical Director

D. J. Northington, Ph.D.
President

9840 Alburtis Avenue • Santa Fe Springs, California 90670 • 213/948-2225 • FAX 213/948-5850

WEST COAST ANALYTICAL SERVICE, INC.

PACIFIC ENVIRONMENTAL SERVICES, INC.
Mr. S. Hugh Brown

Job # 18839
June 30, 1991

LABORATORY REPORT

TABLE 1

Job Number: 18839
Date Received: 6-21-91
Date Prepared: 6-24,25-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

Detection Limit: 0.0005

TOTAL CHROMIUM, mg/L

File	Sample ID	Run 1	Run 2	Average
9	Method Blank	ND	ND	ND
11	HELO BLANK A	0.00089	0.00094	0.000915
12	HELO-3A	0.00463	0.00498	0.004805
13	HELO-2A	0.00317	0.0025	0.002835
14	HELO-2A DUP	0.00299	0.00266	0.002825
15	HELO-2A MS	0.106	0.106	0.106
16	HELO-2A MSD	0.0995	0.0985	0.099
19	HELO-4A	0.0418	0.0417	0.04175
20	HELO-4A + 100PPB	0.14	0.142	0.141
21	HELO-4A + 250PPB	0.28	0.268	0.274
22	HELO-4A + 500PPB	0.523	0.493	0.508
23	HELO-4A + 750PPB	0.732	0.73	0.731
25	HELO BLANK B	0.00531	0.00397	0.00464
26	HELO-2B	0.00175	0.00167	0.00171
27	HELO-3B	0.00207	0.00166	0.001865
28	HELO-4B	0.0159	0.015	0.01545
31	1 DNS 0700	0.104	0.0985	0.10125
33	HELO-SCRUBBER	136	138	137

WEST COAST ANALYTICAL SERVICE, INC.

PACIFIC ENVIRONMENTAL SERVICES, INC.
Mr. S. Hugh Brown

Job # 18839
June 30, 1991

LABORATORY REPORT

TABLE 2

Parts Per Billion (ug/L)

Sample ID	Hexavalent Chromium by EPA 7196/IC
HELO-2A	1.1
HELO-3A	3.0
HELO-4A	35
HELO-SCRUBBER	140000
HELO BLANK A	0.12
1DNS 0070	110
Detection Limit	0.01

Dates Analyzed: 6-21-91, 6-22-91

WCAS
WEST COAST ANALYTICAL SERVICE, INC.
ANALYTICAL CHEMISTS

June 30, 1991

PACIFIC ENVIRONMENTAL SERVICES, INC.
13100 Brooks Dr.
Baldwin Park, CA 91706

Attn: S. Hugh Brown

JOB NO. 18817

A

LABORATORY REPORT

Samples Received: Six (6) Liquid Samples
Date Received: 6-19-91
Purchase Order No: Proj#: 4321-001

The samples were analyzed as follows:

Samples Analyzed	Analysis	Results
Six (6) liquids	Total Chromium by ICPMS	Table 1
Three (3) liquids	Hexavalent Chromium by EPA 7196/IC	Table 2

Michael Shelton
Technical Director

D. J. Northington, Ph.D.
President

9840 Alburtis Avenue • Santa Fe Springs, California 90670 • 213/948-2225 • FAX 213/948-5850

WEST COAST ANALYTICAL SERVICE, INC.

PACIFIC ENVIRONMENTAL SERVICES, INC.
Mr. S. Hugh Brown

Job # 18829
June 30, 1991

LABORATORY REPORT

TABLE 1

Job Number: 18829
Date Received: 6-20-91
Date Prepared: 6-24-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

Detection Limit: 0.0005

TOTAL CHROMIUM, mg/L

File	Sample ID	Run 1	Run 2	Average
9	Method Blank	ND	ND	ND
11	C2-3B	0.00164	0.00154	0.00159
12	C2-SCRUBBER	0.332	0.332	0.332
13	C2-3A	0.00449	0.00448	0.004485
14	C2-3A + 100PPB	0.101	0.101	0.101
15	C2-3A + 250PPB	0.259	0.256	0.2575
16	C2-3A + 500PPB	0.494	0.483	0.4885
17	C2-3A + 750PPB	0.719	0.704	0.7115

TABLE 2

Parts Per Billion (ug/L)

Sample ID	Hexavalent Chromium by EPA 7196/IC
C2-3A	3.5
C2-SCRUBBER	300
Detection Limit	0.01

Date Analyzed: 6-20-91

QC Data for these samples are included in WCAS report 18817.

WCAS
WEST COAST ANALYTICAL SERVICE, INC.
ANALYTICAL CHEMISTS

June 30, 1991

PACIFIC ENVIRONMENTAL SERVICES, INC.
13100 Brooks Dr.
Baldwin Park, CA 91706

Attn: S. Hugh Brown

JOB NO. 18829

A

LABORATORY REPORT

Samples Received: Three (3) Liquid Samples
Date Received: 6-20-91
Purchase Order No: Proj#: 4321-001

The samples were analyzed as follows:

Samples Analyzed	Analysis	Results
Three (3) liquids	Total Chromium by ICPMS	Table 1
Two (2) liquids	Hexavalent Chromium by EPA 7196/IC	Table 2

Michael Shelton
Technical Director

D. J. Northington, Ph.D.
President

9840 Alburtis Avenue • Santa Fe Springs, California 90670 • 213/948-2225 • FAX 213/948-5850

WEST COAST ANALYTICAL SERVICE, INC.

PACIFIC ENVIRONMENTAL SERVICES, INC.
Mr. S. Hugh Brown

Job # 18817
June 30, 1991

LABORATORY REPORT

TABLE 1

#2
lab-a

Job Number: 18817
Date Received: 6-19-91
Date Prepared: 6-19-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

Detection Limit: 0.0005

TOTAL CHROMIUM, mg/L

File	Sample ID	Run 1	Run 2	Average
20	Method Blank	0.00275	0.00262	0.002685
21	C2-BLANK-B	0.00558	0.00557	0.005575
22	C2-1B	0.0111	0.0114	0.01125
23	C2-2B	0.00708	0.0078	0.00744
25	C2-BLANK-A	0.00389	0.00399	0.00394
26	C2-2A	0.0112	0.0112	0.0112
27	C2-1A	0.0233	0.0236	0.02345
28	C2-1A DUP	0.0228	[illegible]	0.0223
29	C2-1A MS	0.0727	[illegible] OK w/ [illegible] before	0.072

TABLE 2

Parts Per Billion (ug/L)

Sample ID	Hexavalent Chromium by EPA 7196/IC
C2-1A	2.4
C2-2A	2.6
C2-BLANK-A	ND
Detection Limit	0.01

ND-Not Detected

Date Analyzed: 6-19-91

WCAS

PACIFIC ENVIRONMENTAL SERVICES, INC.

RESEARCH TRIANGLE PARK
WASHINGTON
PHILADELPHIA
LOS ANGELES
CINCINNATI

OUTSIDE LABORATORY ANALYSIS REQUEST

TO: WEST COAST ANALYTICAL

(213) 948-2225

SUBMITTAL DATE: 6-19-91

VERBAL RESULTS DATE: ASAP

CONTACT: S. HUGH BROWN

TELEPHONE: (818) 856-1400

SEND ANALYSIS INVOICE TO:

PACIFIC ENVIRONMENTAL SERVICES, INC.
13100 BROOKS DR
BALDWIN PARK CA 91706

RE: PROJECT NO. 4321-001

SEND ANALYSIS REPORT TO:

SAME

SAMPLE NUMBER	VOLUME	ANALYSIS REQUEST
C2-1A	—	Cr^6 & TCr USING I.C. & I.C.P./MS
C2-2A	—	Cr^6 & TCr " " " " "
C2-BLANK-A	—	Cr^6 & TCr " " " " "
C2-1B	—	TCr ONLY USING ICP/MS
C2-2B	—	TCr ONLY " "
C2-BLANK-B	—	TCr ONLY " "

COMMENT: ANALYZE Cr^6 BEFORE JUNE-21-91.

CHAIN OF CUSTODY

From: [illegible] 9:40 To: [illegible] NCAS 6/19

From: To: 18817 9:45am

PACIFIC ENVIRONMENTAL SERVICES, INC.

RESEARCH TRIANGLE PARK
WASHINGTON, D.C.
PHILADELPHIA
LOS ANGELES
CINCINNATI

OUTSIDE LABORATORY ANALYSIS REQUEST

TO: WEST COAST ANALYTICAL

(213) 948-2225

SUBMITTAL DATE: 6-20-91

VERBAL RESULTS DATE: ASAP

CONTACT: S. HUGH BROWN

TELEPHONE: (818) 856-1400

SEND ANALYSIS INVOICE TO:

PACIFIC ENVIRONMENTAL SERVICES, INC.
13100 BROOKS DR.
BALDWIN PARK CA 91706

RE: PROJECT NO. 4321-001

SEND ANALYSIS REPORT TO:

SAME

SAMPLE NUMBER	VOLUME	ANALYSIS REQUEST
✓ C2-3A	—	Cr^6 & TCr USING I.C. & I.C.P/M.S.
✓ C2-3B	—	[redacted] TCr ONLY USING I.C.P/M.S.
✓ C2-SCRUBBER	—	Cr^6 & TCr USING I.C. & I.C.P./M.S.

COMMENT: ANALYZE Cr^6 BEFORE JUNE-22-91 ~~#18829~~

CHAIN OF CUSTODY

From: [signature] 9:05 AM To: Mary Mulcahy ~~WEAS~~ 6-20-91

From: _____ To: _____

Job Number: 18917
Date Recieved: 6-19-91
Date Prepared: 6-19-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

Detection Limit: 0.0005

TOTAL CHROMIUM, mg/L

File	Sample ID	Run 1	Run 2	Average
20	Method Blank	0.00275	0.00262	0.002685
21	C2-BLANK-B	0.00558	0.00557	0.005575
22	C2-1B	0.0111	0.0114	0.01125
23	C2-2B	0.00708	0.0078	0.00744
25	C2-BLANK-A	0.00389	0.00399	0.00394
26	C2-2A	0.0112	0.0112	0.0112
27	C2-1A	0.0233	0.0236	0.02345
28	C2-1A DUP	0.0228	0.0218	0.0223
29	C2-1A MS	0.0727	0.0713	0.072

TOTAL CHROMIUM METHOD BLANK SUMMARY

Laboratory: West Coast Analytical Service

Matrix_____ liquid
Date Prepared_____ 6-19-91
Date Analyzed_____ 6-27-91
Instrument ID_____ ICPMS
Units_____ mg/L

File: 201	Result	Detection limit
Total chromium	0.00275	0.0005

This blank applies to the following samples:

Method Blank
C2-BLANK-B
C2-1B
C2-2B
C2-BLANK-A
C2-2A
C2-1A DUP
C2-1A MS

Sample: C2-1A

TOTAL CHROMIUM DUPLICATE/MS/MSD RESULTS

Laboratory Name: West Coast Analytical Service

Matrix_____ liquid
Date Received_____ 6-19-91
Date Prepared_____ 6-19-91
Date Analyzed_____ 6-27-91
Instrument_____ ICPMS
Units_____ mg/L

Sample Result: 0.0235

Duplicate: 0.0223

Matrix Spike: 0.072

Matrix Spike Dup: NA

Spike Level: 0.05

Detection Limit: 0.0005

Sample/Duplicate RPD: 5.2%

Matrix Spike Recovery: 98.2%

Matrix Spike Dup Recovery: NA

Matrix Spike/Matrix Spike Dup RPD 200.0%

CHROMIUM

STANDARD ADDITIONS

Job Number: 18829
Date Recieved: 6-20-91
Date Prepared: 6-24-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

File	Sample	mg/L added	IS Corr Response Run 1	Run 2	Avg Response
13	C2-3A	0.00	9906	9887	9897
14	C2-3A + 100PPB	0.10	133302	133459	133381
15	C2-3A + 250PPB	0.25	337620	333593	335607
16	C2-3A + 500PPB	0.50	640868	626560	633714
17	C2-3A + 750PPB	0.75	930730	911734	921232

Regression Output:

Constant	17107.98
Std Err of Y Est	11891.09
R Squared	0.999233
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	1217681.
Std Err of Coef.	19470.07

Amt Added	Predicted Response
0.00	17108
0.10	138876
0.25	321528
0.50	625949
0.75	930369
-0.01404	0

Response=1217681. * Amt Added + 17107.98

When Response = 0

Amt Added = -0.01404

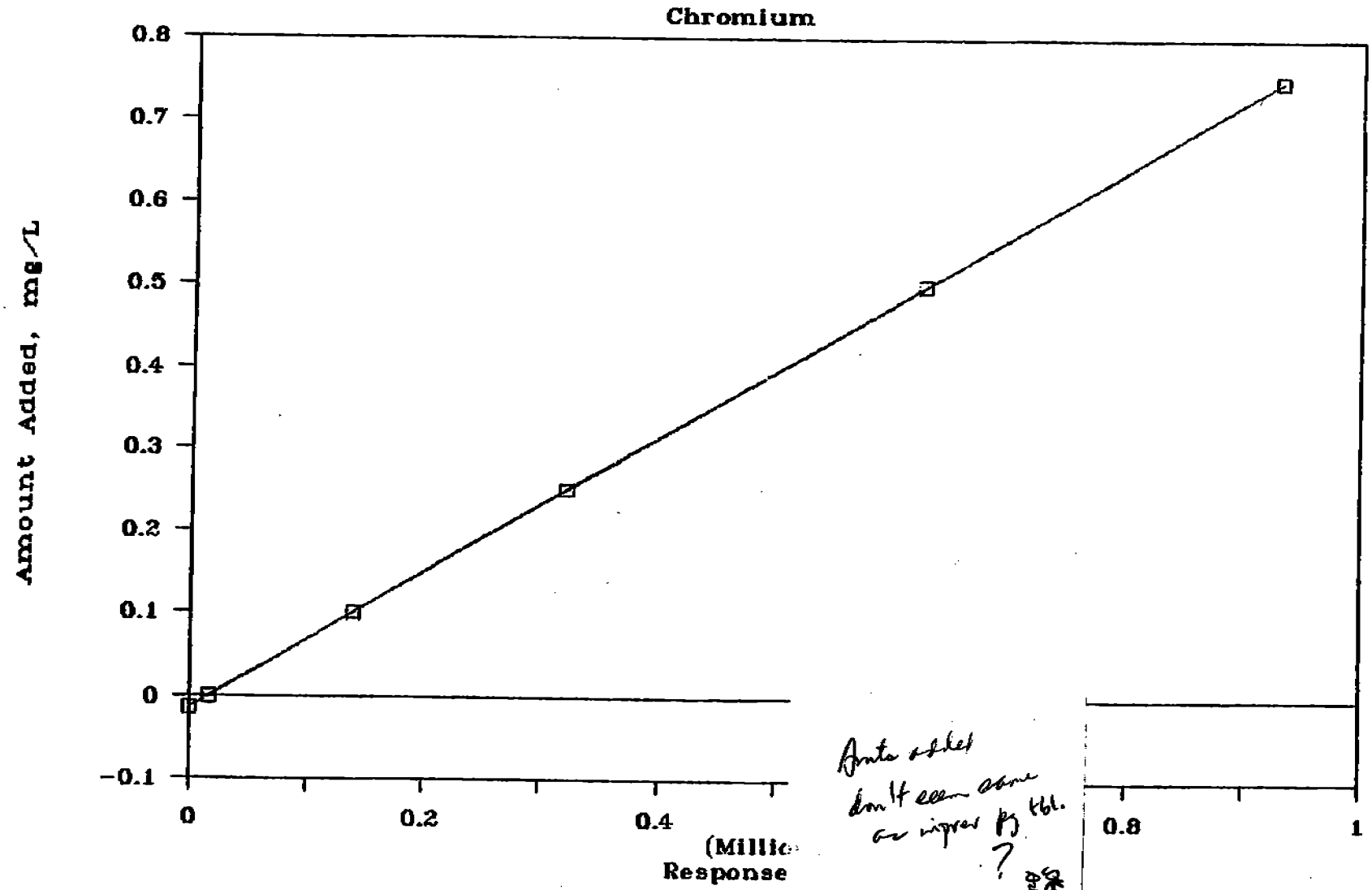
Concentration:

Predicted from MSA 0.014049 mg/L

From Calib Curve 0.004485 mg/L

Ratio (MSA/Calib) 3.13

Method of Standard Additions



Auto added
don't seem same
as input by tbl.
?

2 integrations per

EM = ~~Cr 2mm~~ Cr
Up = 60
Wash = 120

6/27/91 MM

8817a
~~8839a~~

1)	Cali blank	0626-228-3		
2)	Cali blank	0626-228-3		
3)	Cam D 5.0 ppm	0515-208-2		
4)	Cam B 1.0 ppm	0618-224-2		
* 5)	Cam A+B 0.1 ppm	0618-224-3		
6)	A+B 0.01 ppm	0607-221-2		
7)	USGS T-111	0619-225-2		
8)	Cali blank	0626-228-3		
9)	18829 PESI	blank	Nitrate	Cr
10)		blank		
11)		C2-3B	~~Solf~~ (straight)	
12)		C2-scrubber		
13)		C2-3A		
14)		C2-3A (100ppb)		
15)		C2-3A (250ppb)		
16)		C2-3A (500ppb)		
17)		C2-3A (750ppb)		
* 18)	A+B 0.1 ppm CCV	0618-224-3		
19)	Cali blank	0626-228-3		
20)	18817 PESI	blank	straight	Cr
21)		C2-Blank-B		
22)		C2-1B		
23)		C2-2B		
24)	Cali blank	0626-228-3		
25)	18817 PESI	C2-Blank-A	straight	Cr
26)		C2-2A		
27)		C2-1A		
28)		C2-1A dup		
29)		C2-1A MS		
30)	Cali blank	0626-228-3		
* 31)	A+B 0.1 ppm CCV	0618-224-3		
32)	USGS T-111	0619-225-2		

222	495195	12249	18867	17596
231	475041	8252	13250	11978
232	486082	9041	14187	12915
241	512312	554	825	0
242	510137	555	830	0
251	428155	5122	9125	7853
252	416544	5056	9258	7987
261	435143	10585	18554	17283
262	432312	10550	18614	17342
271	425444	19077	34202	32930
272	417263	18869	34492	33221
281	393777	17308	33526	32254
282	390787	16535	32274	31002
291	371539	47703	97932	96660
292	357620	45051	96087	94816
301	358366	439	934	0
302	369945	442	911	0
311	382464	67562	134739	133468
312	392222	69257	134684	133412
321	416533	19677	36032	34761
322	420214	20152	36579	35307

Calibration Summary:

File	Cr(ppm)	Area
21	0	0
41	1	1291687
51	0.1	134896
61	0.01	13955

Regression Output:

Constant	-0.00170
Std Err of Y Est	0.002454
R Squared	0.999982
No. of Observations	4
Degrees of Freedom	2
X Coefficient(s)	7.75E-07
Std Err of Coef.	0.000000

Cr(ppm)= 7.75E-07 *CrArea+(-0.0017)
Meth Blk= 0.0005

[For Prep Samples/Not STDS or LCS]

File:	Cr ppm (eq above)	Cr ppm MB Sub	Dil Fact	Total Cr (Tot ug)
11	0	ND	1	ND
12	0	ND	1	ND
21	0	ND	1	ND
22	0	ND	1	ND
31	4.16	4.16	1	4.16
32	4.21	4.21	1	4.21
41	1	1	1	1
42	1.01	1.01	1	1.01
51	0.103	0.103	1	0.103
52	0.103	0.103	1	0.103
61	0.0091	0.0086	1	0.0086
62	0.0091	0.0086	1	0.0086
71	0.0255	0.025	1	0.025
72	0.0256	0.0251	1	0.0251
81	0	ND	1	ND
82	0	ND	1	ND
91	-0.00125	ND	1	ND
92	-0.00117	ND	1	ND
101	-0.00106	ND	1	ND
102	-0.00105	ND	1	ND
111	0.00214	0.00164	1	0.00164
112	0.00204	0.00154	1	0.00154
121	0.332	0.332	1	0.332
122	0.332	0.332	1	0.332
131	0.00499	0.00449	1	0.00449
132	0.00498	0.00448	1	0.00448
141	0.101	0.101	1	0.101
142	0.101	0.101	1	0.101
151	0.259	0.259	1	0.259
152	0.256	0.256	1	0.256
161	0.494	0.494	1	0.494
162	0.483	0.483	1	0.483
171	0.719	0.719	1	0.719
172	0.704	0.704	1	0.704
181	0.105	0.105	1	0.105
182	0.105	0.105	1	0.105
191	0	ND	1	ND
192	0	ND	1	ND
201	0.00325	0.00275	1	0.00275
202	0.00312	0.00262	1	0.00262
211	0.00608	0.00558	1	0.00558
212	0.00607	0.00557	1	0.00557
221	0.0116	[illegible]	[illegible]	[illegible]

222	0.0119	0.0114	1	0.0114
231	0.00758	0.00708	1	0.00708
232	0.0083	0.0078	1	0.0078
241	0	ND	1	ND
242	0	ND	1	ND
251	0.00439	0.00389	1	0.00389
252	0.00449	0.00399	1	0.00399
261	0.0117	0.0112	1	0.0112
262	0.0117	0.0112	1	0.0112
271	0.0238	0.0233	1	0.0233
272	0.0241	0.0236	1	0.0236
281	0.0233	0.0228	1	0.0228
282	0.0223	0.0218	1	0.0218
291	0.0732	0.0727	1	0.0727
292	0.0718	0.0713	1	0.0713
301	0	ND	1	ND
302	0	ND	1	ND
311	0.102	0.102	1	0.102
312	0.102	0.102	1	0.102
321	0.0252	0.0247	1	0.0247
322	0.0257	0.0252	1	0.0252

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 1 OF 1

DATE : 24-Jun-91 JOB # : 18829 CLIENT :PESI

ANALYSIS : Cr PREPED BY F.H.

SAMPLE MATRIX : WATER WITH SEDIMENT NITRIC - ACID DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
C2-3B	LIQUID	
C2-SCRUBBER	LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 50 g

50 grams of the sample is digested by adding 3 ml nitric acid for 2 hours on a hot plate (120 C). Internal standard is added (0.5 g) and the digestate is filtered and diluted to a final mass of 50 g.

NOTES -

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 2 OF 2

DATE : 24-Jun-91 JOB # : 18829 CLIENT :PES1

ANALYSIS : Cr PREPED BY F.H.

SAMPLE MATRIX : WATER WITH SEDIMENT NITRIC - ACID DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
C2-3A	LIQUID	
C2-3A	LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 100 g

100 grams of the sample is digested by adding 4 ml nitric acid for 2 hours on a hot plate (120 C). Internal standard is added (~~1.0 g~~) and the digestate is filtered and diluted to a final mass of 100 g.

NOTES -

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 1 OF 1

DATE : 19-Jun-91 JOB # : 18817 CLIENT :PESI

ANALYSIS : Cr PREPED BY FH

SAMPLE MATRIX : WATER HNO3 PREP - NO DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
C2-1A	LIQUID	
C2-1A DUP	LIQUID	
C2-1A MS	LIQUID	
C2-2A	LIQUID	
C2-BLANK-A	LIQUID	
C2-1B	LIQUID	
C2-2B	LIQUID	
C2-BLANK-B	LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 20 ml

To 20 grams add 4 ml conc. nitric acid in phillips beaker.Digest for 2 hours on hot plate(120 c).Add 0.2 grams internal standard and dilute to final mass of 20 grams.

NOTES - MS has 100 µl of 10 PPM Cr 0115-168-1 = .05 µg/mL

DIONEX SCHEDULE - C:\DX\SCHEDULE\MCLAREN.SCH

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int.St
1	AUTOCAL5R	.\MCLAREN	.\620CR	1	1	1
2	AUTOCAL4R	.\MCLAREN	.\620CR	1	1	1
3	AUTOCAL3R	.\MCLAREN	.\620CR	1	1	1
4	AUTOCAL2R	.\MCLAREN	.\620CR	1	1	1
5	AUTOCAL1R	.\MCLAREN	.\620CR	1	1	1
6	METHOD BLANK	.\MCLAREN	.\620CR	1	1	1
7	1.0_PPB_ICV	.\MCLAREN	.\620CR	1	1	1
8	18817/C2-1A	.\MCLAREN	.\620CR	1	1	1
9	18817/C2-2A	.\MCLAREN	.\620CR	1	1	1
10	C2-BLANK-A	.\MCLAREN	.\620CR	1	1	1
11	18817/C2-2A DUP	.\MCLAREN	.\620CR	1	1	1
12	16817/C2-2A 10 PPB MS	.\MCLAREN	.\620CR	1	1	1
13	18817/C2-2A 10 PPB MSD	.\MCLAREN	.\620CR	1	5	1
14	0.5_PPB_STD	.\MCLAREN	.\620CR	1	5	1
15	18817/C2-2A	.\MCLAREN	.\620CR	1	1	1
16	18817/C2-2A + 2.5 PPB	.\MCLAREN	.\620CR	1	5	1
17	18817/C2-2A + 5.0 PPB	.\MCLAREN	.\620CR	1	5	1
18	18817/C2-2A + 10 PPB	.\MCLAREN	.\620CR	1	5	1
19	18817/C2-2A + 20 PPB	.\MCLAREN	.\620CR	1	5	1
20	0.5_PPB_STD	.\MCLAREN	.\620CR	1	5	1
21	18829/C2-3A	.\MCLAREN	.\620CR	1	1	1
22	16829/C2-SCRUBBER	.\MCLAREN	.\620CR	1	1	1
23	16829/C2-SCRUBBER	.\MCLAREN	.\620CR	1	1	1
24	0.5_PPB_STD	.\MCLAREN	.\620CR	1	100	1
25	STOP	.\MCLAREN	.\620CR	1	1	1
		.\CRSTALL	.\619CR	1	1	1

Client: Pacific Environmental Services
Job no: 18817, 18829

Sample: CZ-2A

ppb added	area
0	686760
2.5	1345711
5	2061965
10	3329795
20	5822988

Regression Output:

Constant	-2.83215
Std Err of Y Est	0.194349
R Squared	0.999546
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	0.000003
Std Err of Coef.	0.000000

Sample result: 2.83

Result from curve: 2.49

RPD: 12.8%

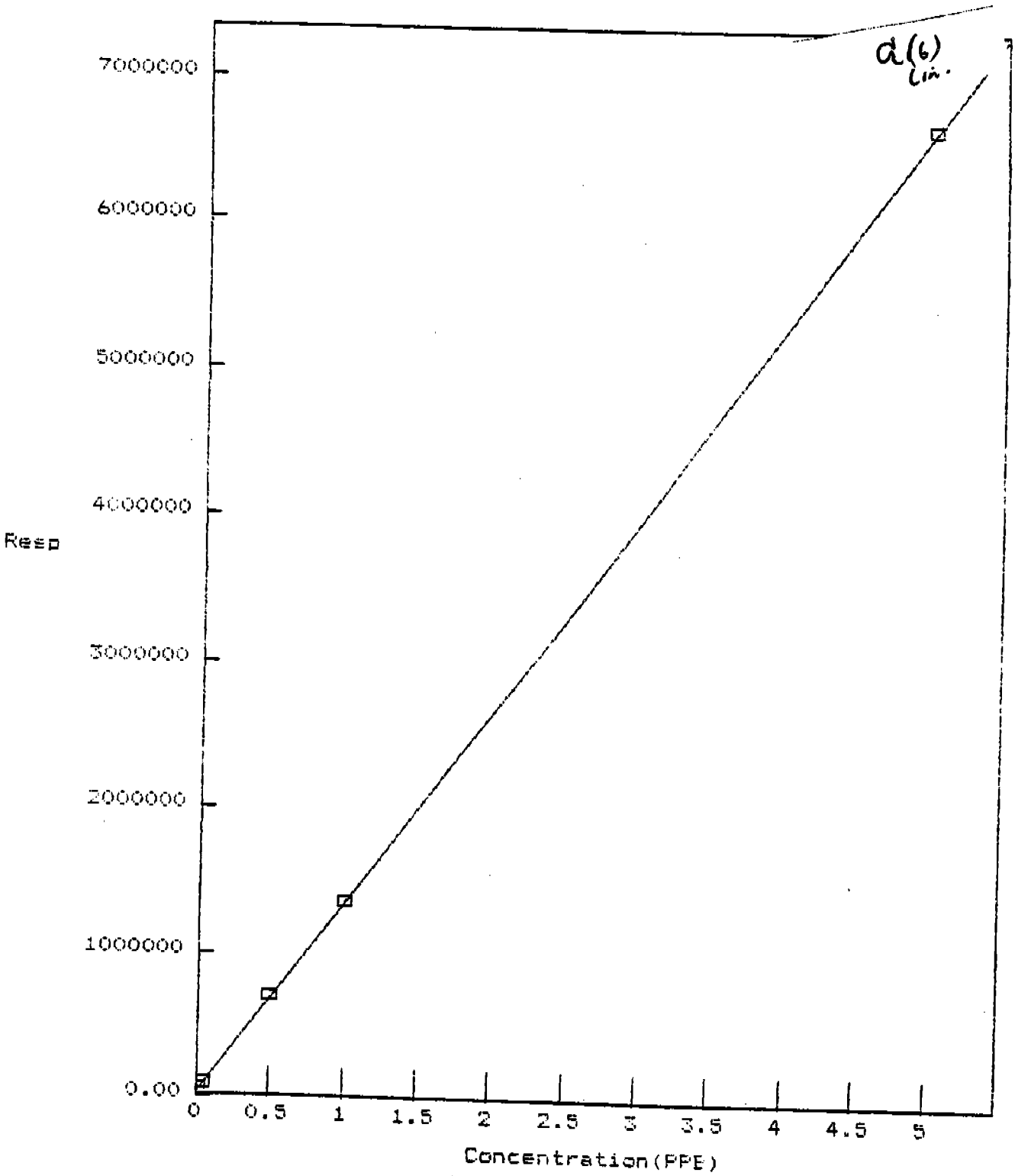
6-20-91 SWM

Hexavalent Chromium

Column = AS7, NG-1
Flow = 1.2 ml/min
Loop = 1 ml
Backpressure = 670 psi

File #	Job #	Client	Sample ID	Dilution
620CR001.D01				
D02			Autocal 5K (5 ppb)	612-217-7
D03			Autocal 4K (1 ppb)	612-217-1
D04			Autocal 3K (0.5 ppb)	612-218-3
D05			Autocal 2K (0.05 ppb)	322-1858
D06			Autocal 1K (0.02 ppb)	612-217-4
D07			Method Blank	
D08	18817	PES	1.0 ppb ILV	1024-135-2
D09	18817	PES	C2-1A	
D10	18817	PES	C2-2A	
D11			C2-Blank-A	
D12			C2-2A DUP	
D13			C2-2A 10 ppb MS	5
D14			C2-2A 10 ppb MSD	5
D15	18817	PES	0.5 ppb Std	612-218-3
D16			C2-2A	5
D17			+ 2.5 ppb	
D18			+ 5.0 ppb	
D19			+ 10 ppb	
D20			+ 20 ppb	
D21	18829	PES	0.5 ppb Std	612-218-3
D22			C2-3A	
D23			C2-Scrubber	
D24			C2-Scrubber	100
			0.5 ppm Std	612-218-3

Method: MCLAREN.MET
Component: HEX. CHROME
Fit Type: Linear
r^2: 0.999994
Conc = Resp * 7.539e-007 + -0.02071
Resp = Conc * 1.326e+006 + 27470
Standardization: External
Calibration: Area



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL4R
Result File: C:\DX\DATA\metals\620CR001.R02
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 2

Date: Thu Jun 20 09:51:58 1989
Calibration Level: 4
Detector: VDM-1

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
1	MATRIX	0.25	0.25	0.25	7.340e+004	1.526e+004	1.526e+004
2	HEX. CHROME	4.43	4.43	4.43	1.353e+006	1.359e+006	1.359e+006

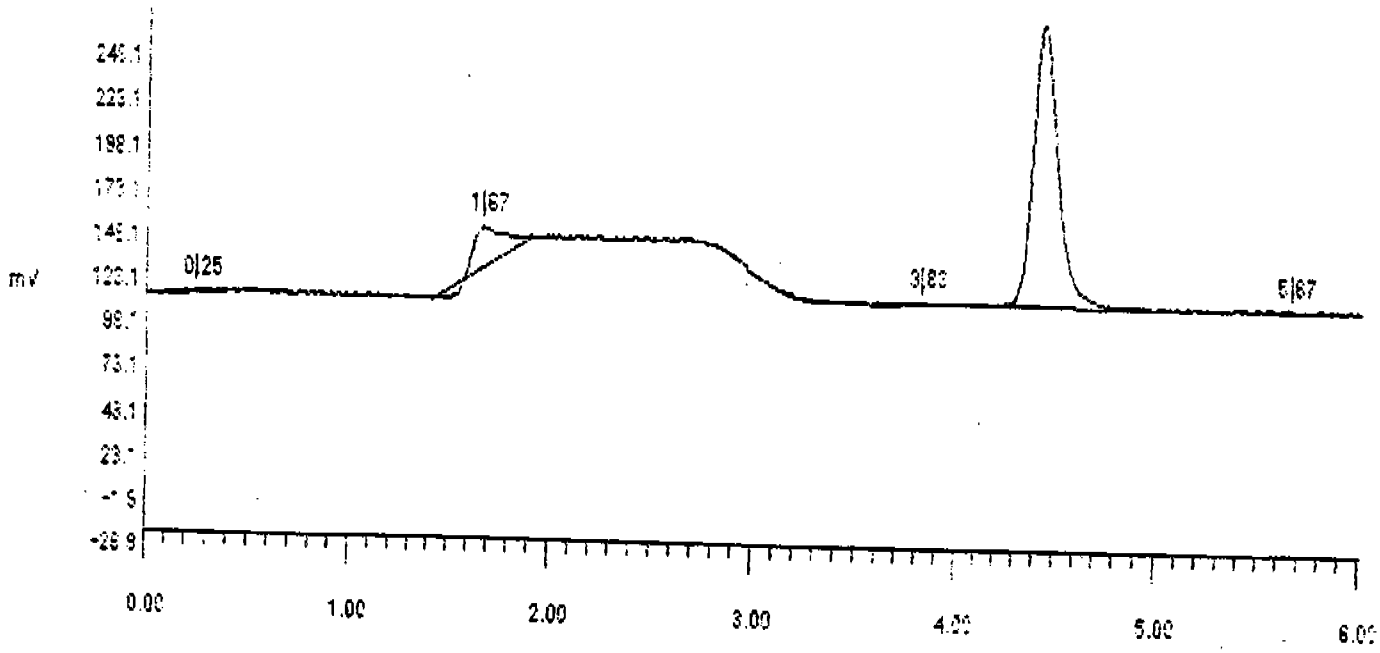
Custom Report Title of your choice

Sample Name: AUTOCAL4R	Date: Thu Jun 20 09:51:58 1995
Data File : C:\DX\DATA\metals\620CR001.D02	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 2 Detector: VDM-1	

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.25	MATRIX	0.000	1305	15256	1	0.0
2	1.67		0.000	22871	196324	1	
3	3.83		0.000	701	14188	1	
4	4.43	HEX. CHROME	1.000	157185	1359330	1	0.0

File: C:\DX\DATA\metals\620CR001.D02 Sample: AUTOCAL4R



********** AUTOMATIC CALIBRATION UPDATE **********

| Sample Name: AUTOCAL3R
| Result File: C:\DX\DATA\metals\620CR001.R03
| Method : C:\DX\METHOD\MCLAREN.MET
| ACI Address: 1 System : 2 Inject#: 3

Date: Thu Jun 20 10:01:25 1991

Calibration Level: 3
Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.25	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.43	4.40	4.40	7.137e+005	6.993e+005	6.993e+005

Custom Report title of your choice

Sample Name: AUTOCAL3R
Data File : C:\DX\DATA\metals\620CR001.D03 Date: Thu Jun 20 10:01:25 1995
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 3 Detector: VDM-1

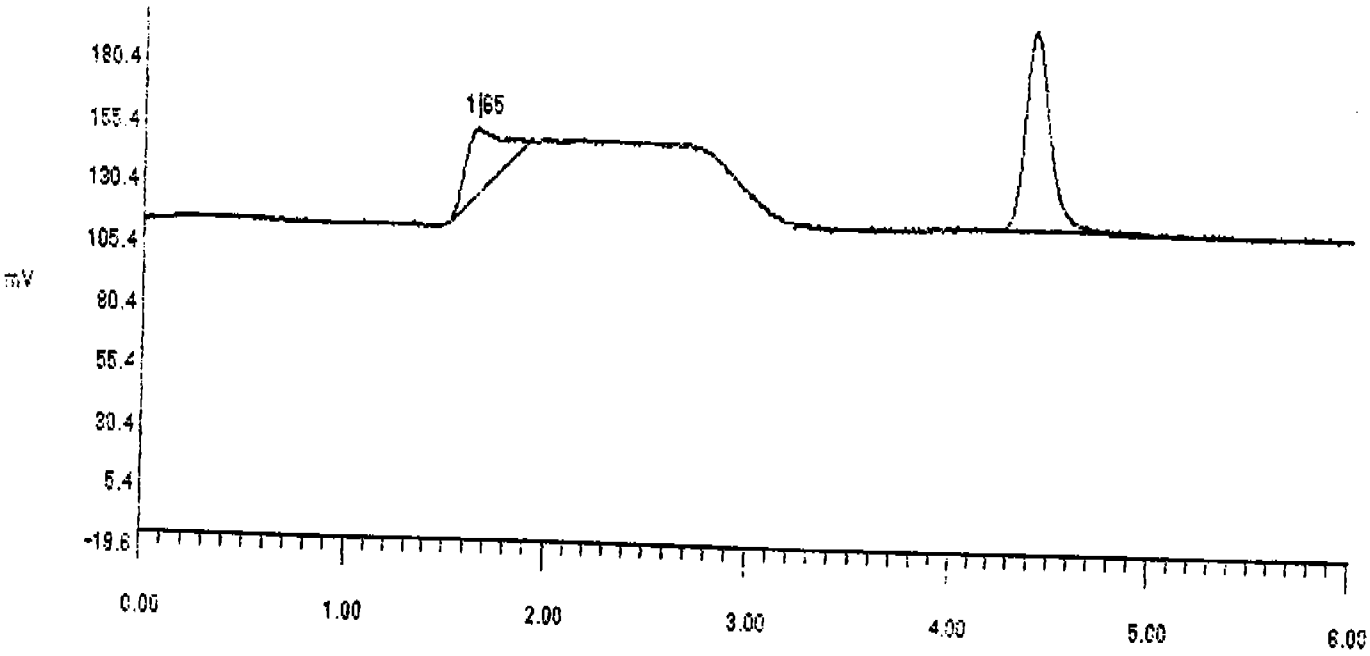
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.25	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	27010	324405	1	
2	4.40	HEX. CHROME	0.500	78566	699329	1	0.00

File: C:\DX\DATA\metals\620CR001.D03 Sample: AUTOCAL3R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL2R
Result File: C:\DX\DATA\metals\620CR001.R04 Date: Thu Jun 20 10:10:32 199
Method : C:\DX\METHOD\MCLAREN.MET
ADI Address: 1 System : 2 Inject#: 4 Calibration Level: 2
Detector: VDP-1

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
1	MATRIX	0.25	0.32	0.32	1.755e+004	4.370e+004	4.370e+004
2	HEX. CHROME	4.40	4.40	4.40	1.108e+005	8.895e+004	8.895e+004

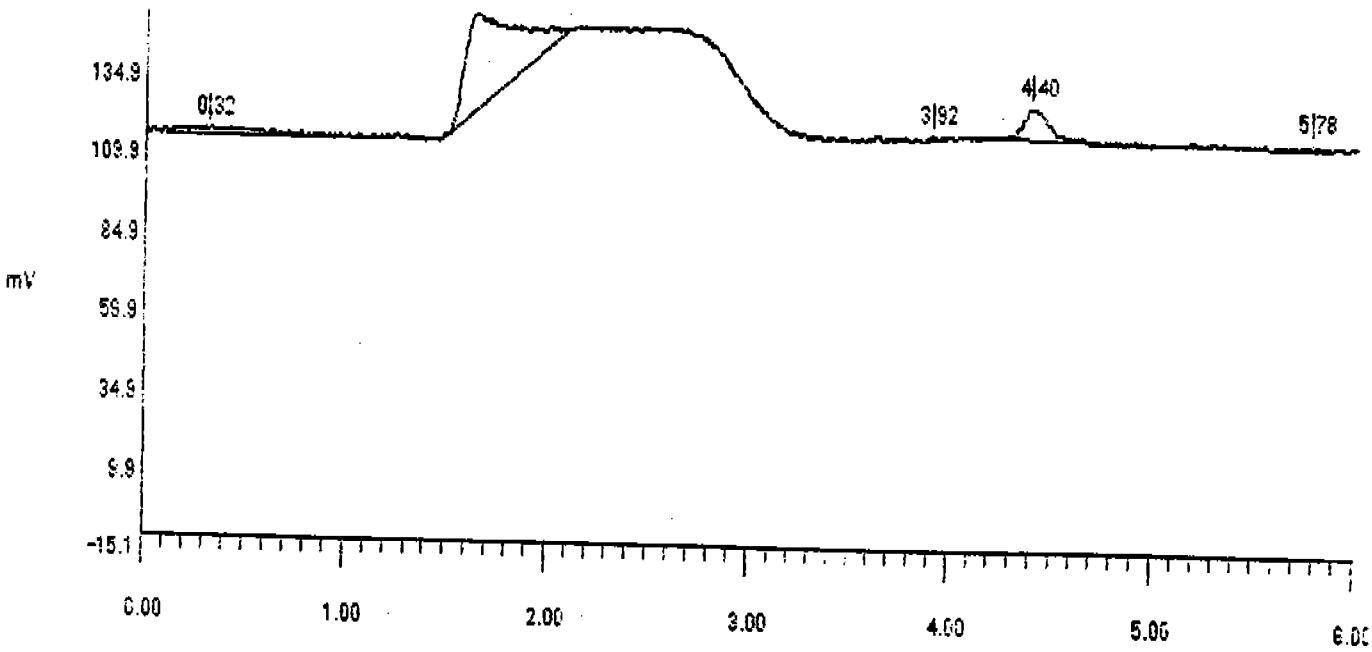
Enter Report Title of your choice

Sample Name: AUTOCAL2R	Date: Thu Jun 20 10:10:53 1[illegible]
Data File : C:\DX\DATA\metals\620CR001.D04	
Method : C:\DX\METHOD\MCLAREN.MET	
ADI Address: 1 System : 2 Inject#: 4	Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.32	MATRIX	0.000	1505	43698	1	26.[illegible]
2	1.63		0.000	30102	501769	1	
4	4.40	HEX. CHROME	0.050	9817	88949	1	0.[illegible]

File: C:\DX\DATA\metals\620CR001.D04 Sample: AUTOCAL2R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL1R
Result File: C:\DX\DATA\metals\620CR001.R05
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 5

Date: Thu Jun 20 10:20:21 19

Calibration Level: 1
Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.40	4.43	4.43	1.032e+005	4.670e+004	4.670e+004

Custom Report Title of your choice

Sample Name: AUTOCAL1R	Date: Thu Jun 20 10:20:21 1[illegible]
Data File : C:\DX\DATA\metals\620CR001.D05	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 5	Detector: VDM-1

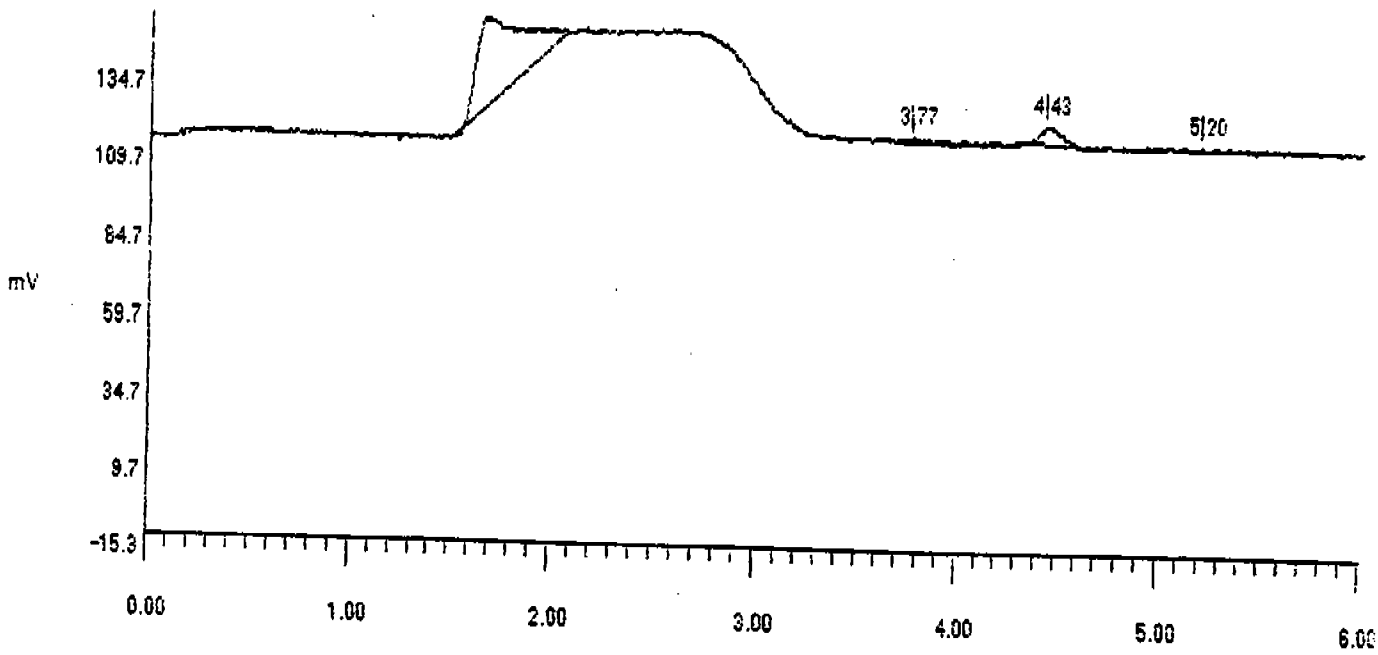
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delt
1	1.67		0.000	27831	421556	1	
3	4.43	HEX. CHROME	0.020	5393	46702	1	0.0
4	5.20		0.000	1006	13508	1	

File: C:\DX\DATA\metals\620CR001.D05 Sample: AUTOCAL1R



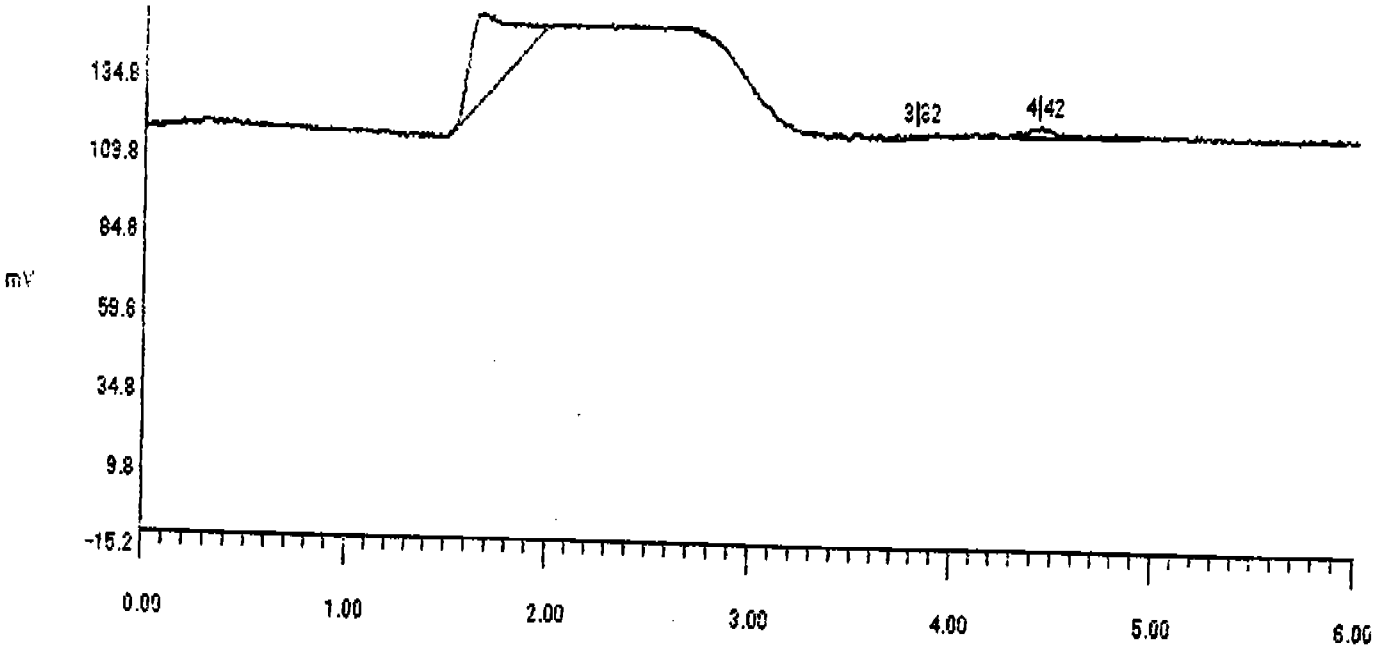
Custom Report Title of your choice

```
==================================================================================
| Sample Name: METHOD BLANK                          Date: Thu Jun 20 10:29:48 1991|
| Data File   : C:\DX\DATA\metals\620CR001.D06                                     |
| Method      : C:\DX\METHOD\MCLAREN.MET                                           |
| ACI Address: 1        System : 2        Inject#:   6  Detector: VDM-1          |
==================================================================================
**********************  PEAKS NOT FOUND IN THIS RUN  **********************
Name                Adjusted Ret Time   Reference Peak
-------------------------------------------------------
MATRIX                   0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	27379	369501	1	
3	4.42	HEX. CHROME	0.003	2011	31628	1	0.0

File: C:\DX\DATA\metals\620CR001.D06 Sample: METHOD BLANK



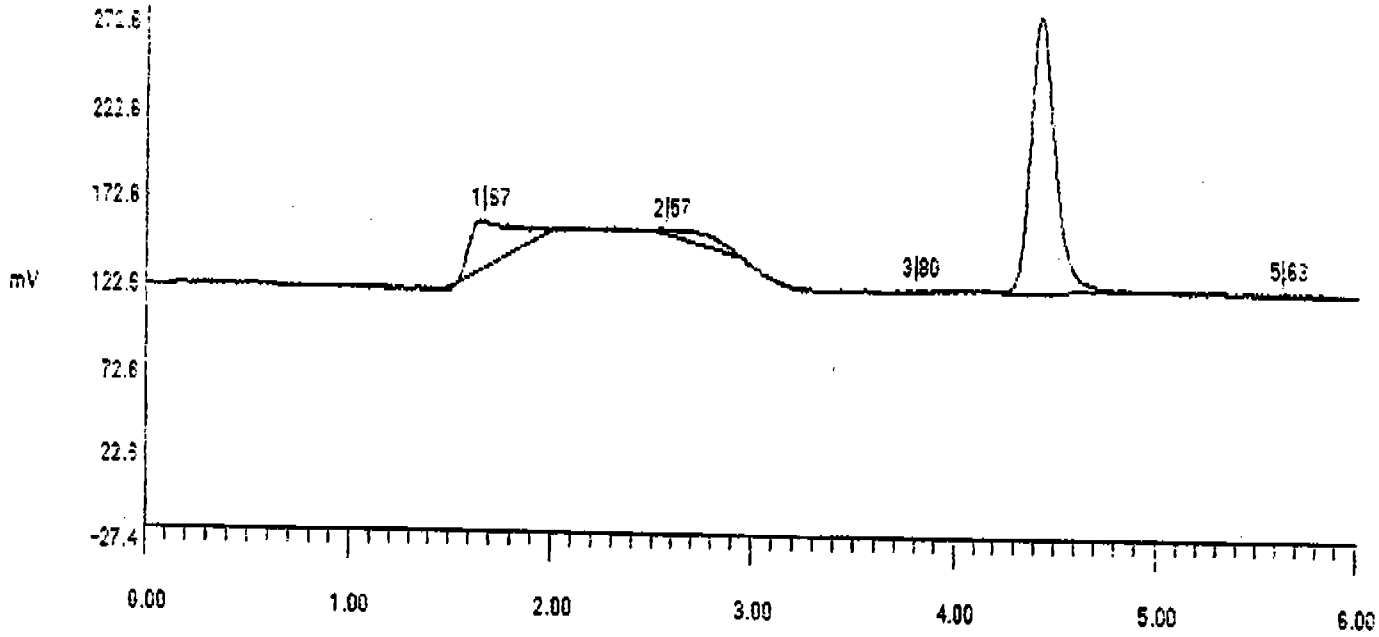
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 1.0_PPB_ICV                          Date: Thu Jun 20 10:49:40 1991 |
| Data File  : C:\DX\DATA\metals\620CR001.D07                                      |
| Method     : C:\DX\METHOD\MCLAREN.MET                                            |
| ACI Address: 1        System : 2        Inject#:   7  Detector: VDM-1          |
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  ***********************
Name                Adjusted Ret Time   Reference Peak
-------------------------------------------------------
MATRIX                  0.32                2


REPORT        VOLUME   DILUTION POINTS RATE  START   STOP AREA REJ
-------------------------------------------------------------------
External        1          1    1805  5Hz   0.00    6.02    10000

 Pk.    Ret Component          Concentration     Height       Area BL %Delta
 Num   Time Name
-------------------------------------------------------------------------------
   1   1.67                          0.000        26481     377882  1
   2   2.57                          0.000         2299     102021  1
   4   4.42 HEX. CHROME              0.996       155523    1348202  1    0.0
```

File: C:\DX\DATA\metals\620CR001.D07 Sample: 1.0_PPB_ICV



Custom Report Title of your choice

Sample Name: AUTOCAL2R	Date: Fri Jun 21 13:33:35 1991
Data File : C:\IX\DATA\metals\621CR001.D04	
Method : C:\DX\METHOD\MCLAREN.MET	
ADC Address: 1 System : 2 Inject#: 4	Detector: VDM-1

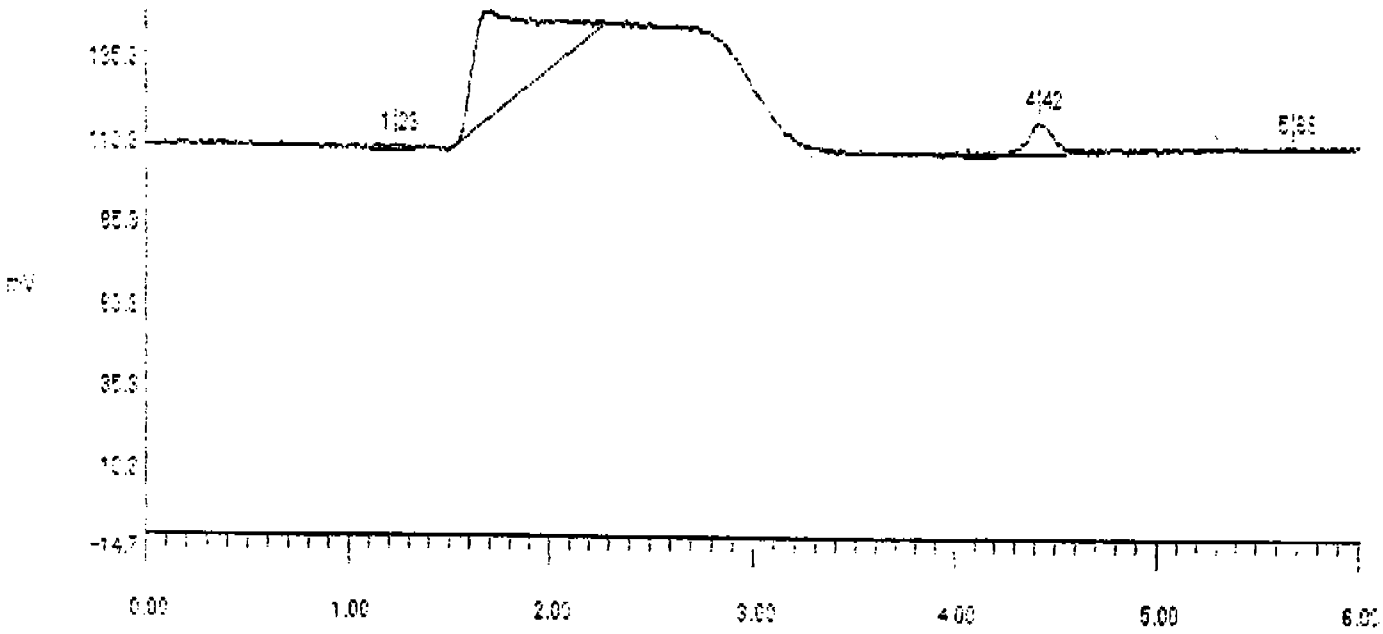
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
2	1.70		0.000	32302	708968	1	
3	4.42	HEX. CHROME	0.050	7201	93316	1	0.0

File: C:\DX\DATA\metals\621CR001.D04 Sample: AUTOCAL2R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCALIR
Result File: C:\DX\DATA\metals\621CR001.R05
Method : C:\DX\METHOD\MCLAREN.MET
ASI Address: 1 System : 2 Inject#: 5

Date: Fri Jun 21 13:43:[illegible]
Calibration Level: 1
Detector: VIM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.42	4.38	4.38	4.670e+004	3.324e+004	[illegible]

Custom Report Title of your choice

Sample Name: AUTOCAL1R		Date: Fri Jun 21 13:43:08 1991
Data File : C:\DX\DATA\metals\621CR001.D05		
Method : C:\DX\METHOD\MCLAREN.MET		
ADI Address: 1	System : 2	Inject#: 5 Detector: VDM-1

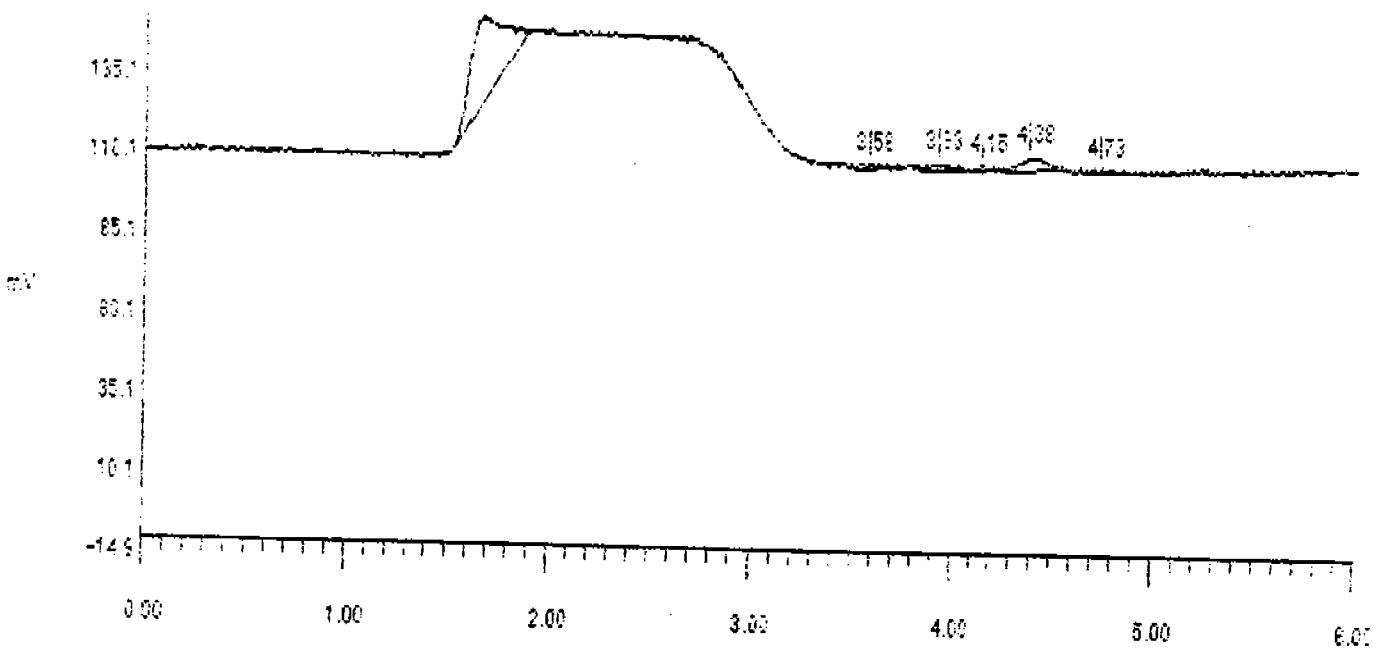
****** ********** PEAKS NOT FOUND IN THIS RUN ********** **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

EXPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	26420	290556	1	
5	4.38	HEX. CHROME	0.020	3530	33242	1	0.11

File: C:\DX\DATA\metals\621CR001.D05 Sample: AUTOCAL1R



Custom Report Title of your choice

Sample Name: METHOD BLANK	Date: Fri Jun 21 13:52:44 1991
Data File : C:\DX\DATA\metals\621CR001.D06	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 6 Detector: VDM-1

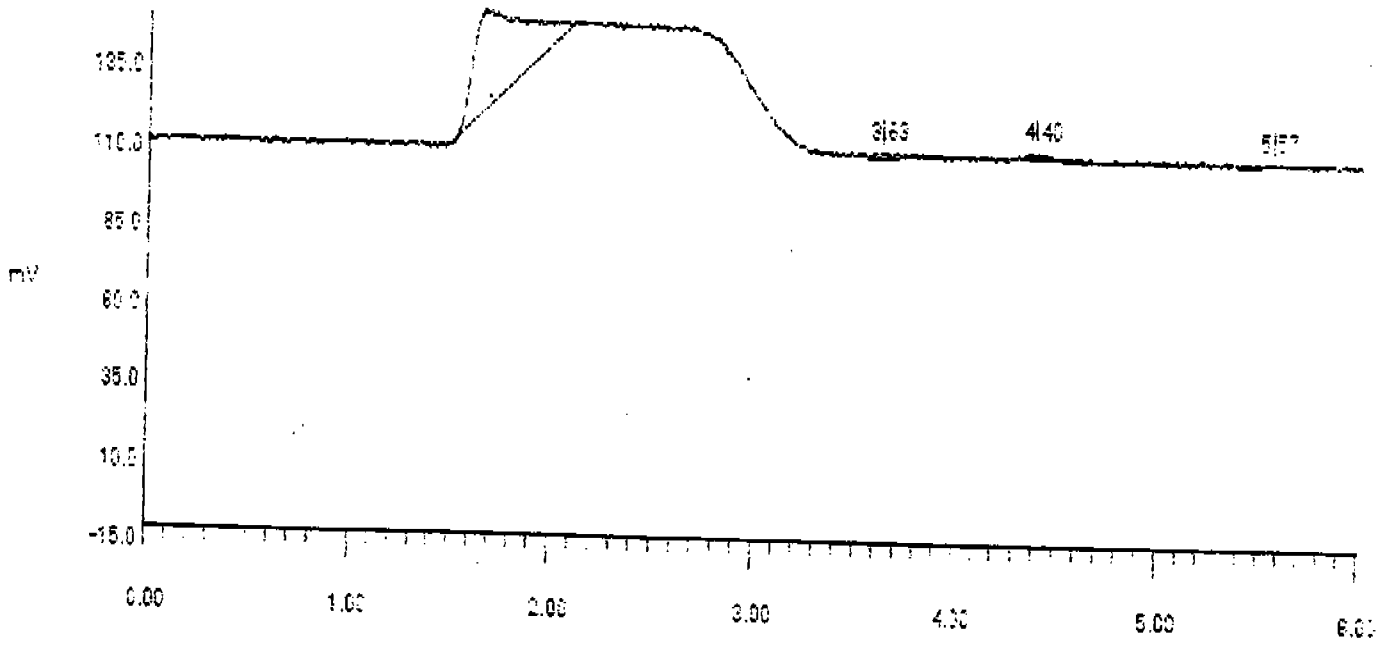
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REQ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.68		0.000	28719	503719	1	
2	3.63		0.000	1360	17311	1	
3	4.40	HEX. CHROME	-0.017	1209	10831	1	0.[illegible]

File: C:\DX\DATA\metals\621CR001.D06 Sample: METHOD BLANK



Custom Report Title of your choice

Sample Name: 18839/HELO-3A	Date: Fri Jun 21 15:54:26 19[illegible]
Data File : C:\DX\DATA\metals\621CR001.D09	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 9	Detector: VDM-1

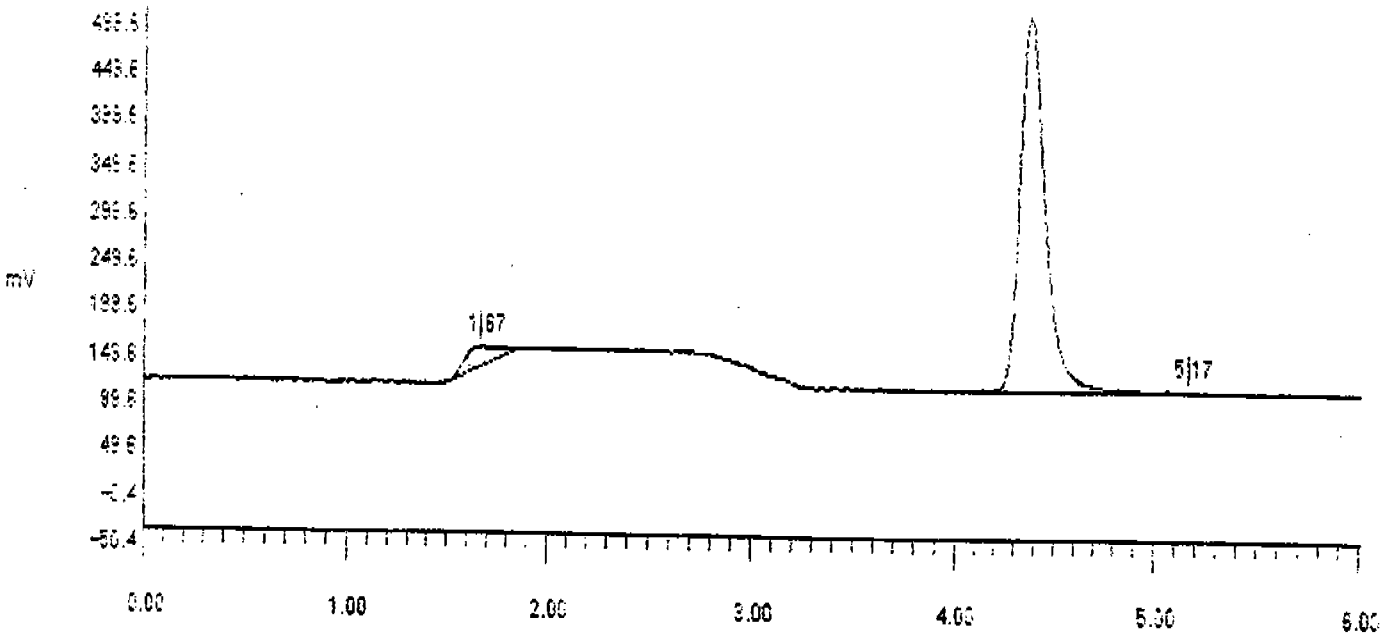
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	19576	233923	1	
2	4.37	HEX. CHROME	2.953	386468	3481160	3	0.0[illegible]
3	5.17		0.000	918	17186	4	

File: C:\DX\DATA\metals\621CR001.D09 Sample: 18839/HELO-3A



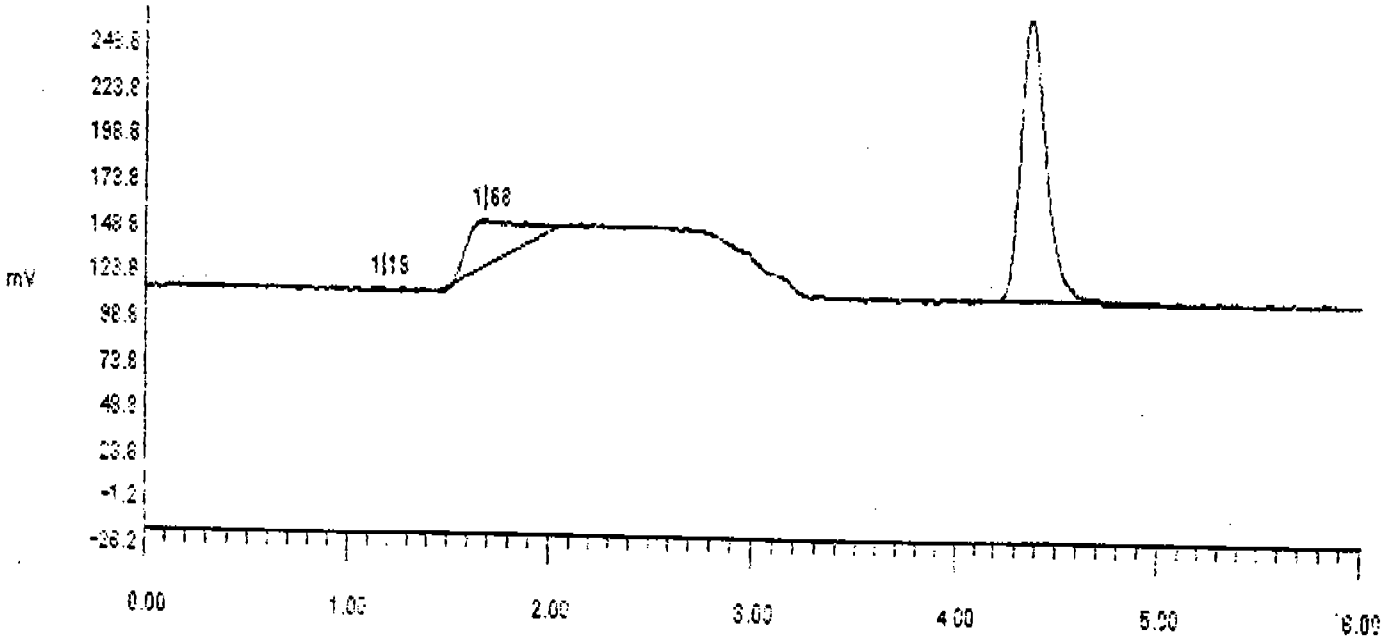
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 18839/HELO-2A                          Date: Fri Jun 21 15:44:57 199
| Data File  : C:\DX\DATA\metals\621CR001.DOS
| Method     : C:\DX\METHOD\MCLAREN.MET
| ACI Address: 1        System : 2        Inject#:   8  Detector: VDM-1
==================================================================================
**********************  PEAKS NOT FOUND IN THIS RUN  **********************
Name                Adjusted Ret Time   Reference Peak
----------------------------------------------------------
MATRIX                  0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REQ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
2	1.68		0.000	25500	435275	1	
3	4.37	HEX. CHROME	1.132	154140	1352539	1	0.00

File: C:\DX\DATA\metals\621CR001.D08 Sample: 18839/HELO-2A



Enter Report Title of your choice

Sample Name: 18839/HELO-3A DUP
Data File : C:\DX\DATA\metals\621CR001.D14
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 14 Detector: VDM-1

Date: Fri Jun 21 16:41:38 19[illegible]

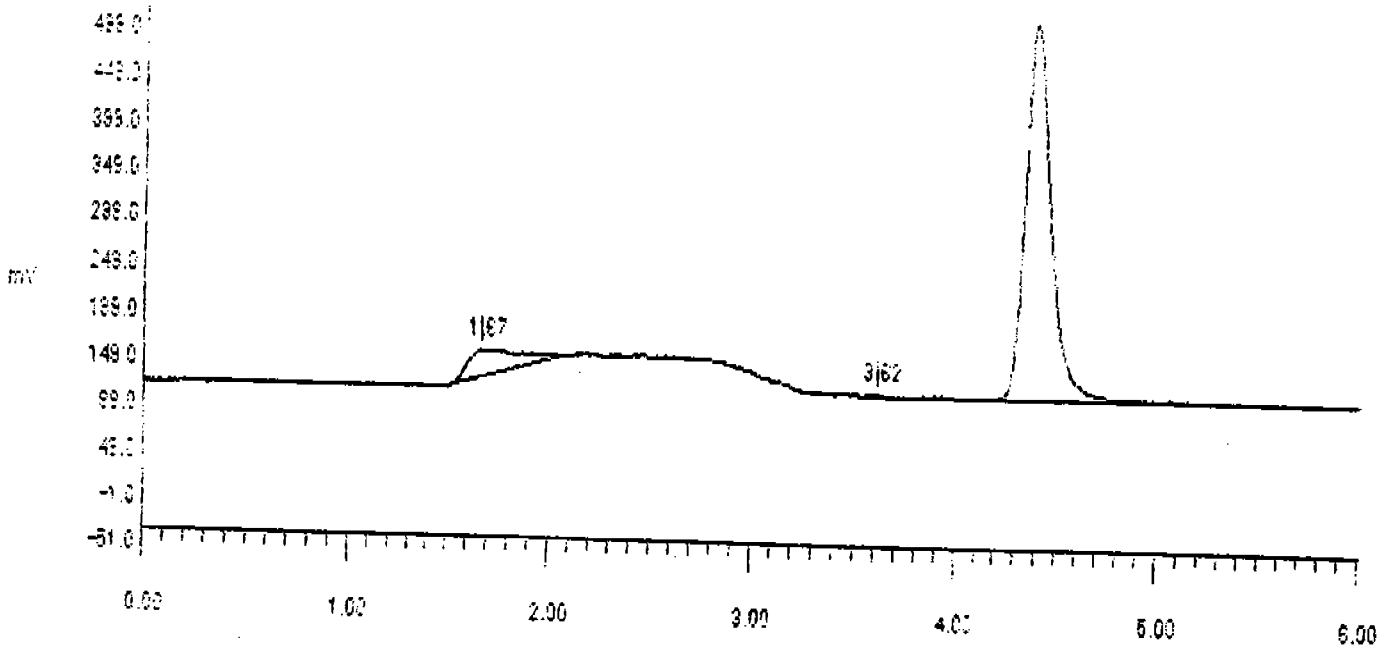
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	27312	471872	1	
3	4.38	HEX. CHROME	2.950	391345	3477534	1	0.0

File: C:\DX\DATA\metals\621CR001.D14 Sample: 18839/HELO-3A DUP



Custom Report Title of your choice

Sample Name:	18839/HELO-3A 10 PPB MS
Date:	Fri Jun 21 16:51:04 1993
Data File :	C:\DX\DATA\metals\621CR001.D15
Method :	C:\DX\METHOD\MCLAREN.MET
ACI Address: 1	System : 2 Inject#: 15 Detector: VDM-1

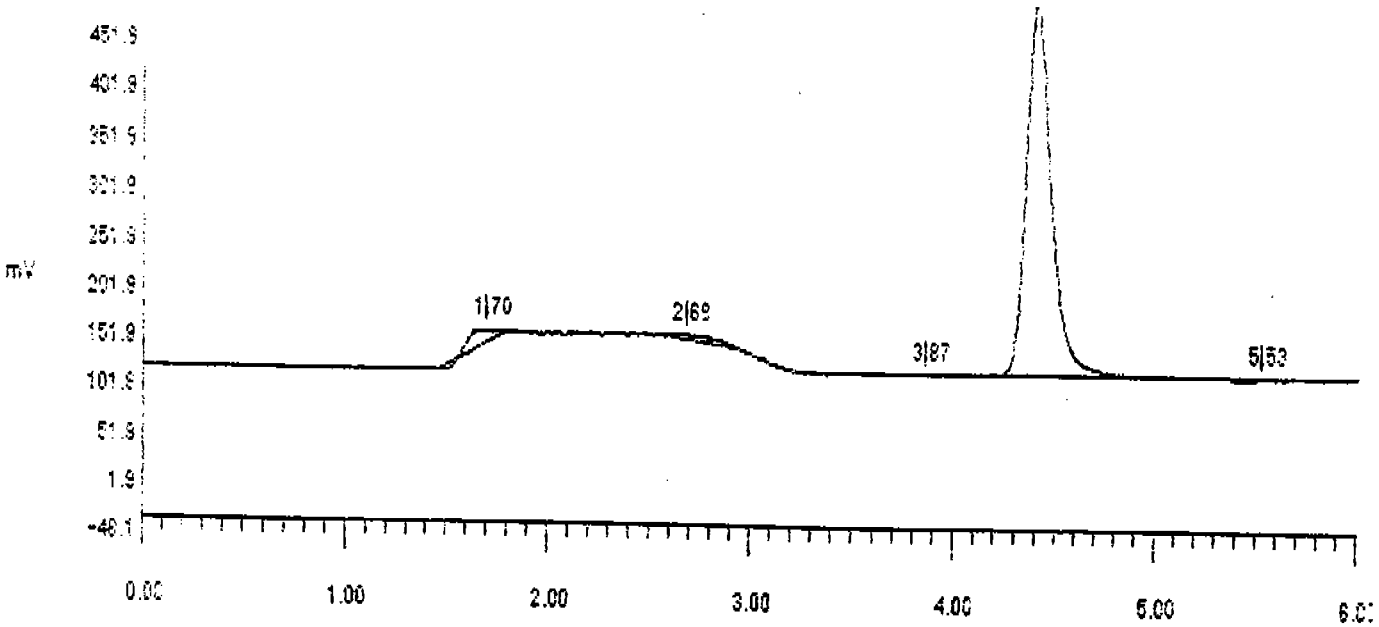
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.70		0.000	13491	135606	1	
2	2.69		0.000	3741	66138	1	
3	3.87		0.000	1066	30415	2	
4	4.40	HEX. CHROME	13.872	370339	3272426	2	[illegible]

File: C:\DX\DATA\metals\621CR001.D15 Sample: 18839/HELO-3A 10 PPB MS



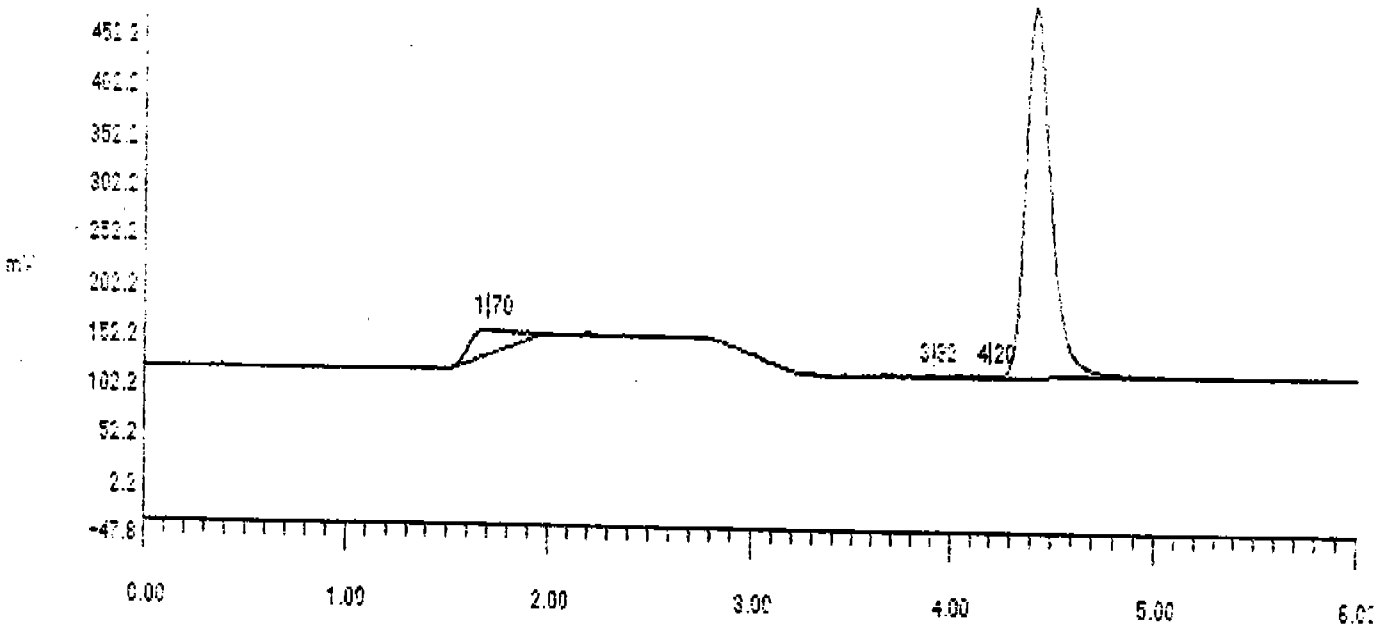
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 18839/HELO-3A 10 PPB MSD        Date: Fri Jun 21 17:00:30 19
| Data File  : C:\DX\DATA\metals\621CR001.D16
| Method     : C:\DX\METHOD\MCLAREN.MET
| ACI Address: 1        System : 2        Inject#:  16  Detector: VDM-1
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  *********************
Name                Adjusted Ret Time   Reference Peak
----------------------------------------------------------
MATRIX                  0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA	REJ
External	1	5	1805	5Hz	0.00	6.02	10000	

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.70		0.000	25021	366221	1	
4	4.42	HEX. CHROME	13.554	367769	3207391	2	0.

File: C:\DX\DATA\metals\621CR001.D16 Sample: 18839/HELO-3A 10 PPB MSD



Custom Report Title of your choice

Sample Name: 0.5_PPB_STD	Date: Fri Jun 21 17:09:57 19[illegible]
Data File : C:\DX\DATA\metals\621CR001.D17	
Method : C:\DX\METHOD\MCLAREN.MET	
ADI Address: 1 System : 2	Inject#: 17 Detector: VDM-1

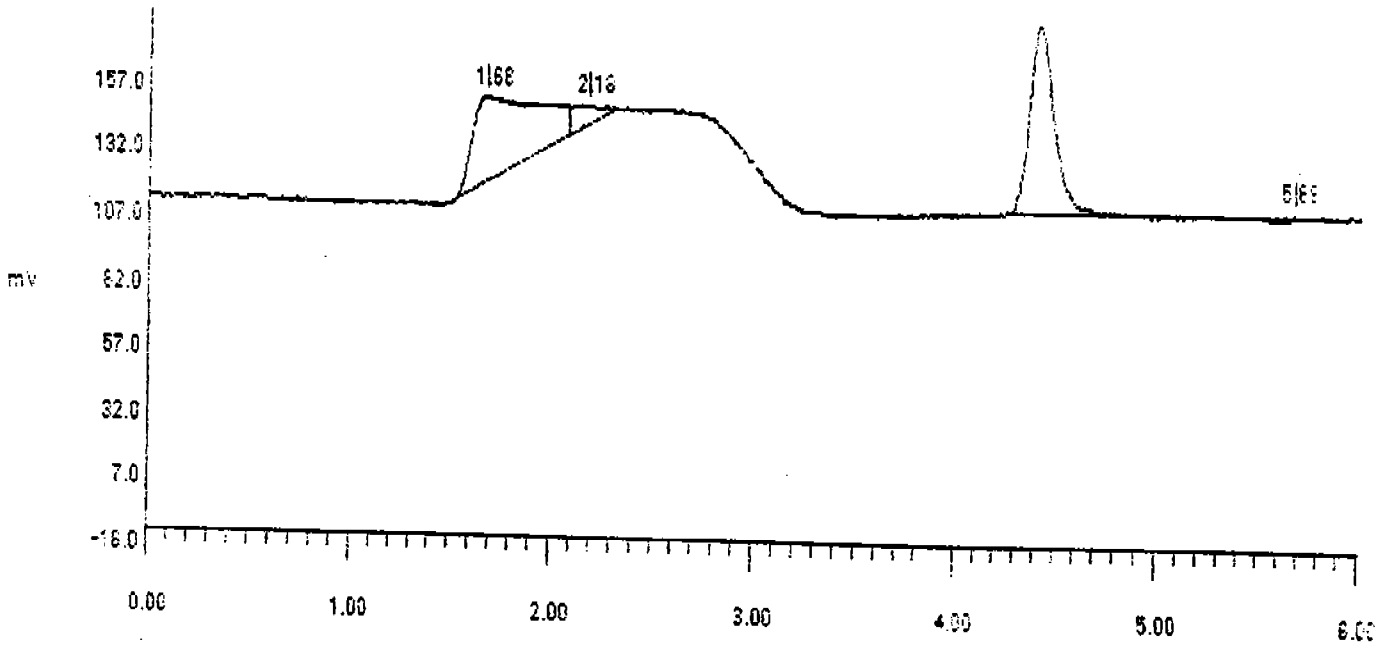
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Pea[illegible]
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.68		0.000	31760	683957	2	
2	2.18		0.000	7057	70936	2	
3	4.42	HEX. CHROME	0.495	70691	608836	1	0.00

File: C:\DX\DATA\metals\621CR001.D17 Sample: 0.5_PPB_STD



Custom Report Title of your choice

Sample Name: 18839/HELO-3A	Date: Fri Jun 21 17:19:23 1[illegible]
Data File : C:\DX\DATA\metals\621CR001.D18	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 18 Detector: VDM-1

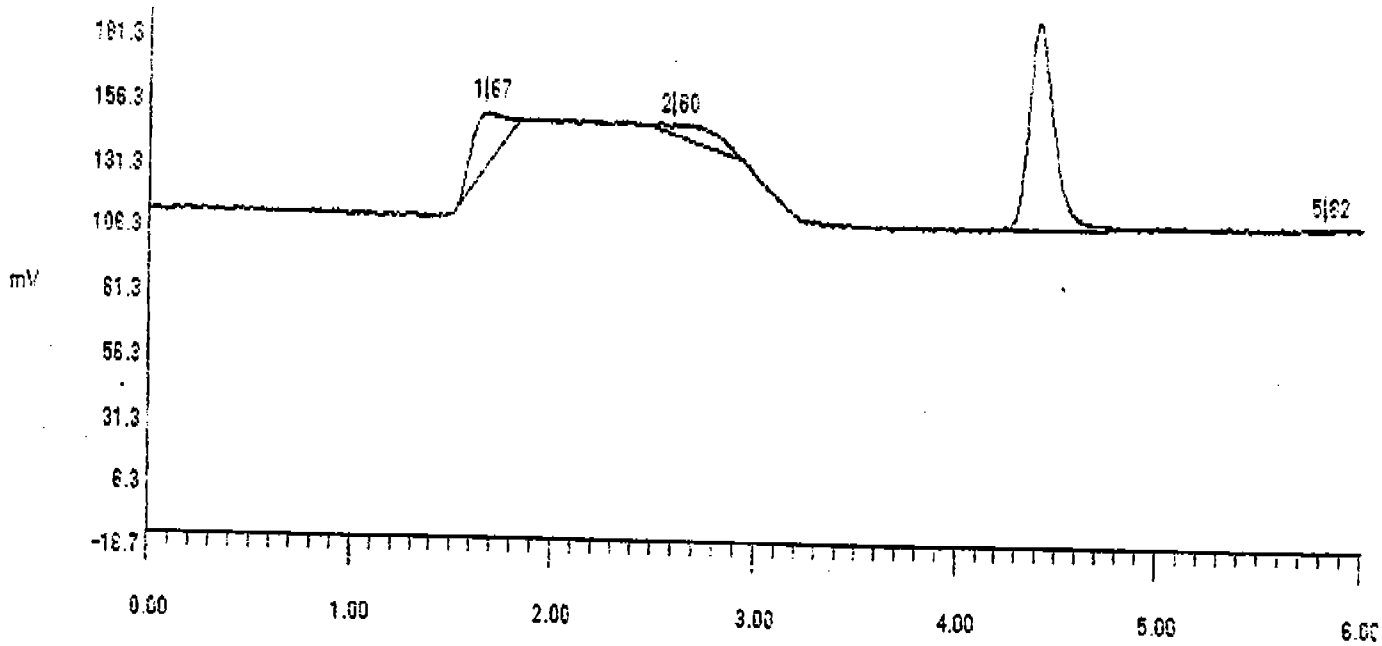
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	21792	232169	1	
2	2.60		0.000	3789	110561	1	
3	4.40	HEX. CHROME	2.900	79407	708013	1	0.0[illegible]

File: C:\DX\DATA\metals\621CR001.D18 Sample: 18839/HELO-3A



Custom Report Title of your choice

```
Sample Name: 18839/HELO-3A + 2.5 PPB          Date: Fri Jun 21 17:28:49 1991
Data File   : C:\DX\DATA\metals\621CR001.D19
Method      : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1        System : 2        Inject#:  19  Detector: VDM-1
```

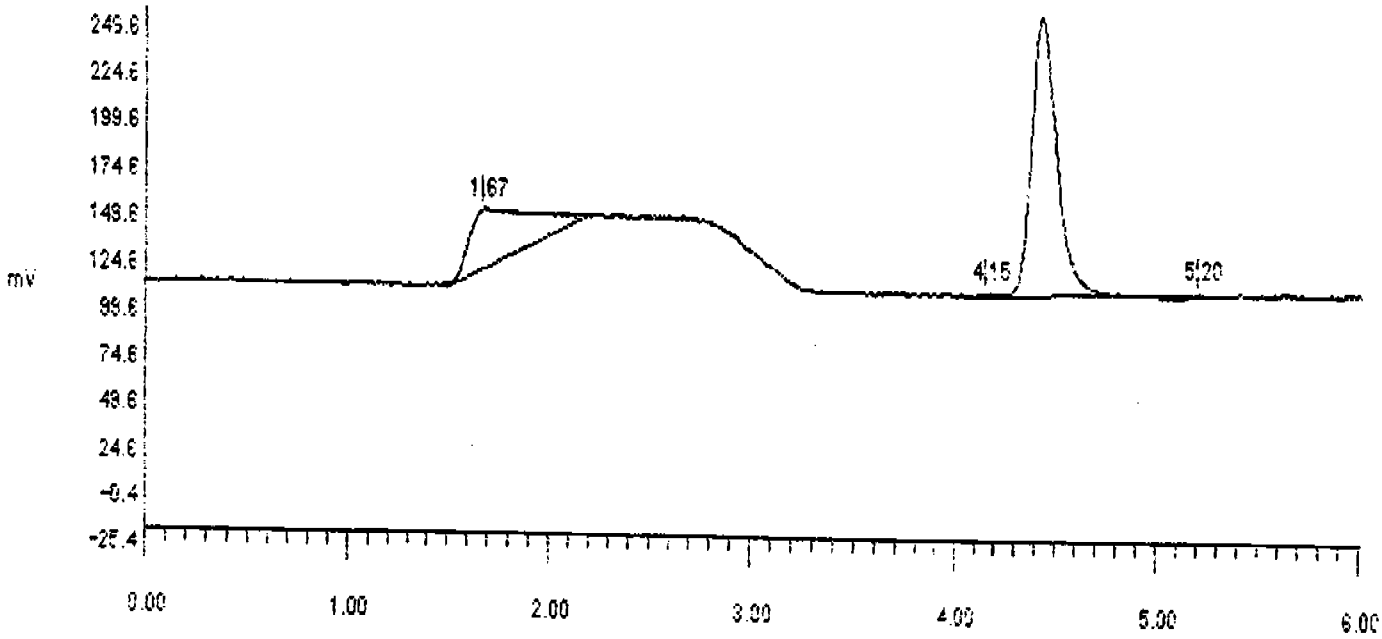
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Pe:
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	30776	623989	1	
3	4.42	HEX. CHROME	5.410	142978	1294719	2	0.00

File: C:\DX\DATA\metals\621CR001.D19 Sample: 18839/HELO-3A + 2.5 PPB



Custom Report Title of your choice

Sample Name: 18839/HELO-3A + 5 PPB	Date: Fri Jun 21 17:38:15 1[illegible]
Data File : C:\DX\DATA\metals\621CR001.D20	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 20 Detector: VDM-1

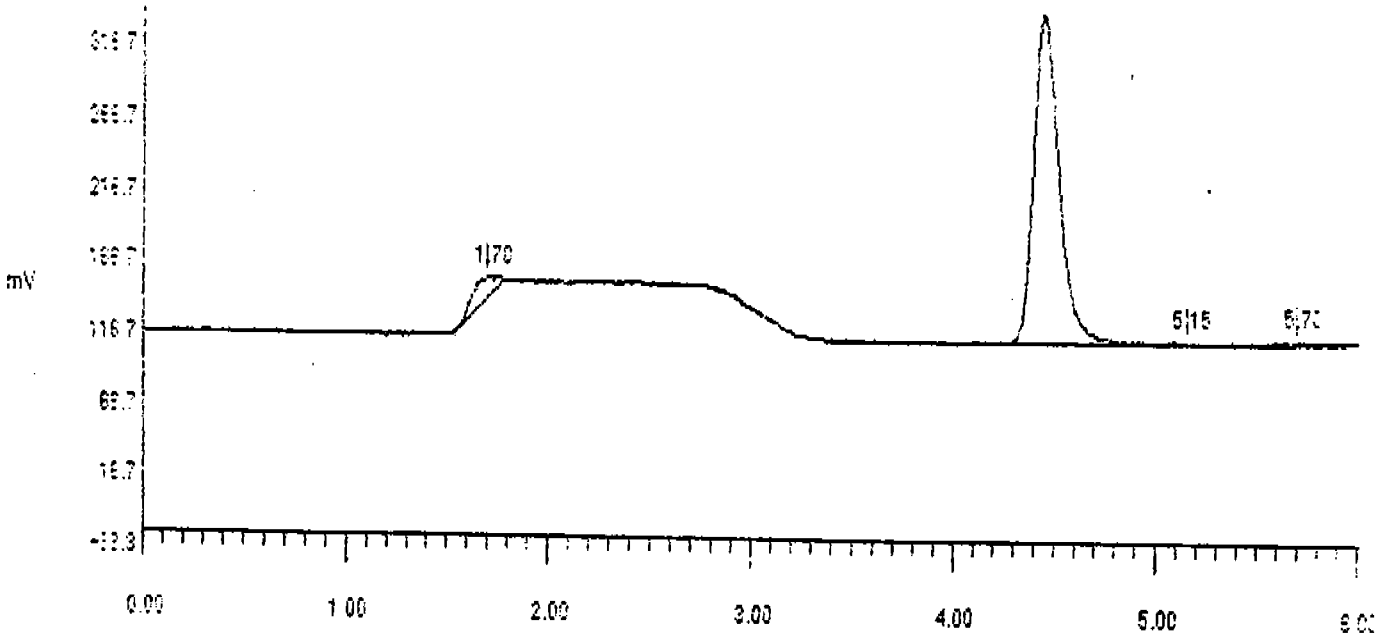
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.70		0.000	13546	128386	1	
2	4.45	HEX. CHROME	8.412	228124	1996260	1	[illegible]

File: C:\DX\DATA\metals\621CR001.D20 Sample: 18839/HELO-3A + 5 PPB



Custom Report Title of your choice

Sample Name: 18839/HELO-3A + 10 PPB	Date: Fri Jun 21 17:47:42 19[illegible]
Data File : C:\DX\DATA\metals\621CR001.D21	
Method : C:\DX\METHOD\MCLAREN.MET	
ADI Address: 1 System : 2	Inject#: 21 Detector: VDM-1

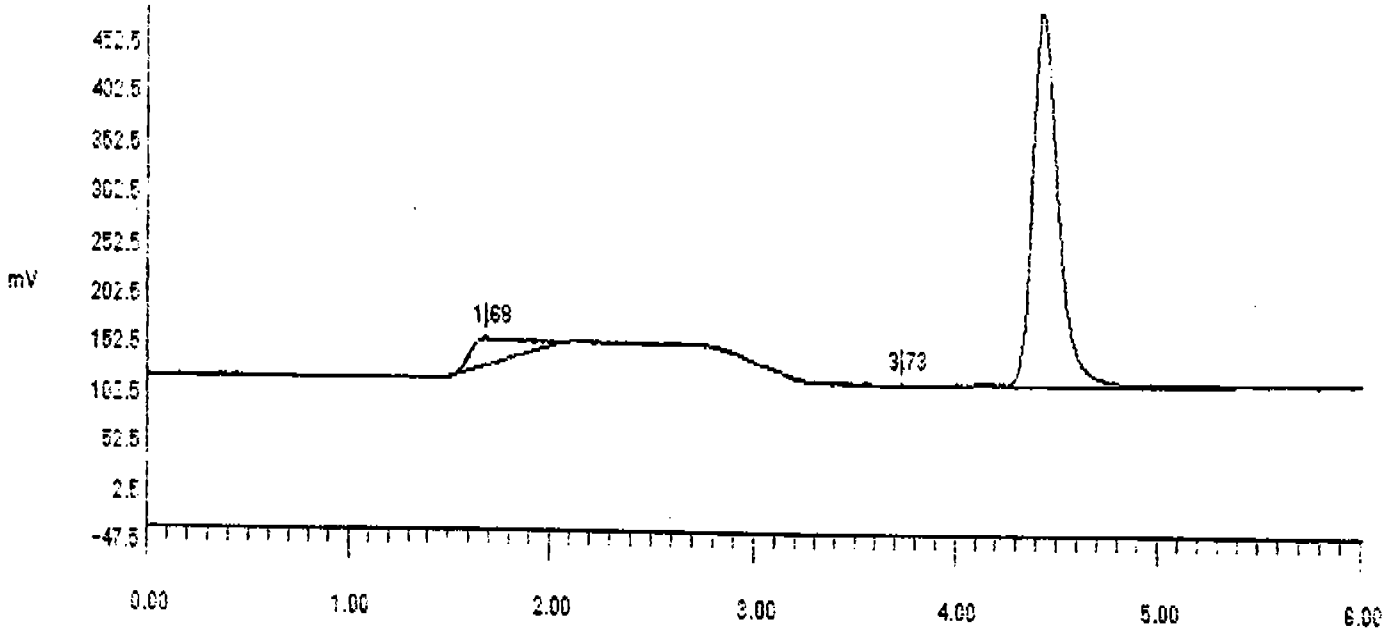
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.68		0.000	27007	425905	1	
2	3.73		0.000	896	11290	1	
3	4.42	HEX. CHROME	13.834	355800	3263631	1	0.00

File: C:\DX\DATA\metals\621CR001.D21 Sample: 18839/HELO-3A + 10 PPB



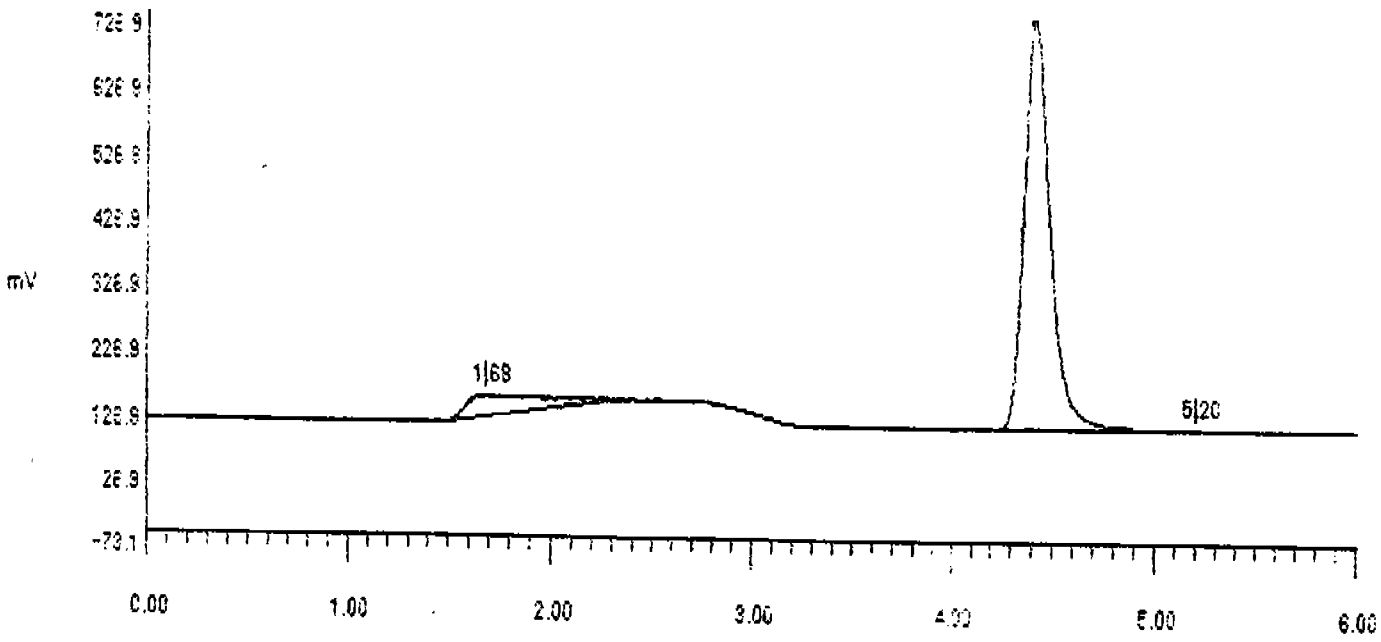
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 18839/HELO-3A + 20 PPB          Date: Fri Jun 21 17:57:08 1991 |
| Data File  : C:\DX\DATA\metals\621CR001.D22                                 |
| Method     : C:\DX\METHOD\MCLAREN.MET                                       |
| ACI Address: 1        System : 2        Inject#:  22  Detector: VDM-1      |
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  *********************
Name                Adjusted Ret Time   Reference Peak
----------------------------------------------------------
MATRIX                  0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.68		0.000	31253	746625	1	
2	4.40	HEX. CHROME	23.281	606149	5471553	1	0.00

File: C:\DX\DATA\metals\621CR001.D22 Sample: 18839/HELO-3A + 20 PPB



Custom Report Title of your choice

Sample Name: 0.5_PPB_STD	Date: Fri Jun 21 19:06:35 1991
Data File : C:\DX\DATA\metals\621CR001.D23	
Method : C:\DX\METHOD\MCLARE~1.MET	
ACI Address: 1 System : 2	Inject#: 23 Detector: VDM-1

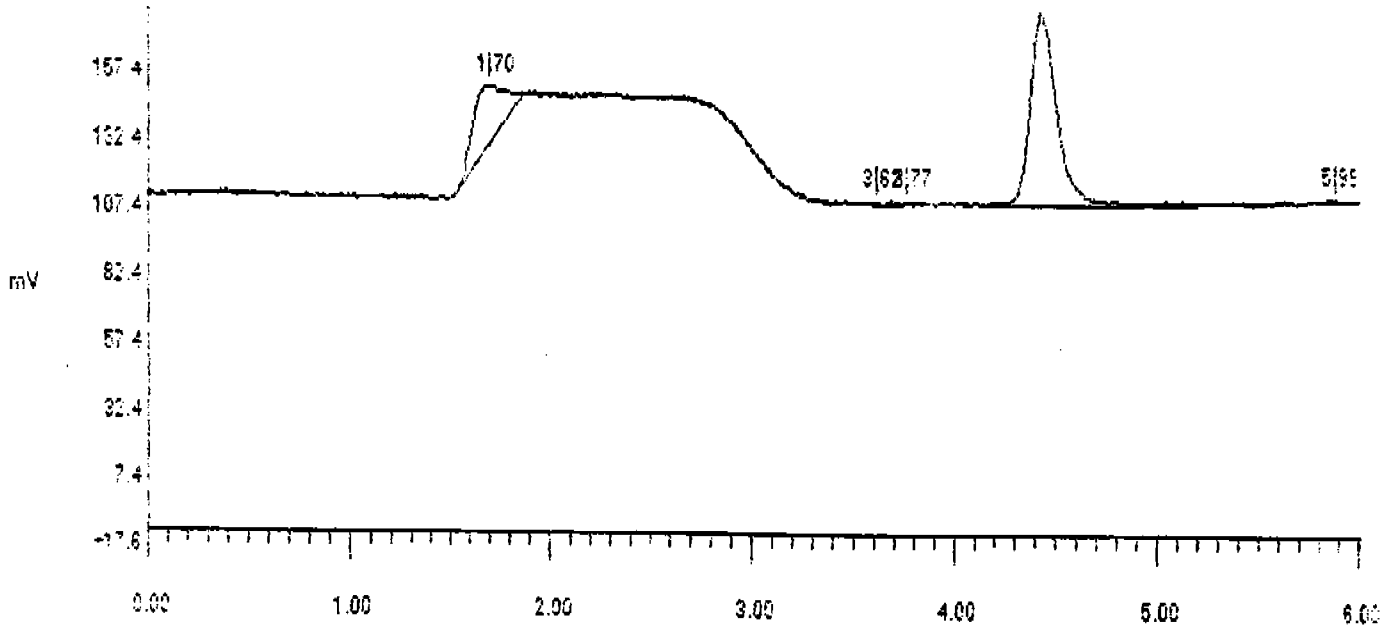
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1905	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.70		0.000	21002	245927	1	
4	4.42	HEX. CHROME	0.550	68016	673513	1	0.00

File: C:\DX\DATA\metals\621CR001.D23 Sample: 0.5_PPB_STD



DIONEX SCHEDULE - C:\DX\SCHEDULE\MCLAREN.SCH

Inj#	Sample Name	Method	Data File	Vol.	Dil.	I.S.
1	AUTOCAL5R	.\MCLAREN	.\622CR	1	1	1
2	AUTOCAL4R	.\MCLAREN	.\622CR	1	1	1
3	AUTOCAL3R	.\MCLAREN	.\622CR	1	1	1
4	AUTOCAL2R	.\MCLAREN	.\622CR	1	1	1
5	AUTOCAL1R	.\MCLAREN	.\622CR	1	1	1
6	METHOD BLANK	.\MCLAREN	.\622CR	1	1	1
7	1.0_PPB_ICV	.\MCLAREN	.\622CR	1	1	1
8	18839/HELD-4A	.\MCLAREN	.\622CR	1	10	1
9	18839/1 DNS 0070	.\MCLAREN	.\622CR	1	10	1
10	18839/1 DNS 0070	.\MCLAREN	.\622CR	1	100	1
11	0.5_PPB_STD	.\MCLAREN	.\622CR	1	1	1
12	STOP	.\CRSTALL	.\621CR	1	1	1

PACIFIC ENVIRONMENTAL SERVICES, INC.

RESEARCH TRIANGLE PARK, NC
WASHINGTON, D.C.
PHILADELPHIA, PA
LOS ANGELES, CA
CINCINNATI, OH

OUTSIDE LABORATORY ANALYSIS REQUEST

TO: WEST COAST ANALYTICAL

(213) 948-2225

SUBMITTAL DATE: 6-21-91

VERBAL RESULTS DATE:

CONTACT: S. HUGH BROWN

TELEPHONE: (818) 856-1400

SEND ANALYSIS INVOICE TO:

PACIFIC ENVIRONMENTAL SERVICES, INC.

SEND ANALYSIS REPORT TO:

PES
13100 BROOKS DR.
BALDWIN PARK, CA. 91706

RE: PROJECT NO. 4321.001

SAMPLE NUMBER	VOLUME	ANALYSIS REQUEST	
✓ HELO-2A QC	—	Cr^{+6} BY IC,	TCr BY ICP/MS
✓ HELO-3A	—	"	"
✓ HELO-4A	—	"	"
✓ HELO-SCRUBBER	—	"	"
✓ HELO BLANK A	—	"	"
✓ 1 DNS 0070	—	"	"
✓ HELO-2B	—	—	TCr BY ICP/MS
✓ HELO-3B	—	—	"
✓ HELO-4B	—	—	"
✓ HELO BLANK B	—	—	"

COMMENT: NO VOLUMES NEEDED, CONCENTRATIONS ONLY. WITH FULL QA/QC
ANALYZE Cr^{+6} BEFORE 6-23-91.

CHAIN OF CUSTODY

From: [signature] 10:00 To: [signature] WCAS 6/21/91

From: To: 18839

NOTE: Write signature and date on appropriate line. Include this form within analysis report.

Job Number: 18839
Date Recieved: 6-21-91
Date Prepared: 6-24,25-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

Detection Limit: 0.0005

TOTAL CHROMIUM, mg/L

File	Sample ID	Run 1	Run 2	Average
9	Method Blank	ND	ND	ND
11	HELO-BLANK A	0.00089	0.00094	0.000915
12	HELO-3A	0.00463	0.00498	0.004805
13	HELO-2A	0.00317	0.0025	0.002835
14	HELO-2A DUP	0.00299	0.00266	0.002825
15	HELO-2A MS	0.106	0.106	0.106
16	HELO-2A MSD	0.0995	0.0985	0.099
19	HELO-4A	0.0418	0.0417	0.04175
20	HELO-4A + 100PPB	0.14	0.142	0.141
21	HELO-4A + 250PPB	0.28	0.268	0.274
22	HELO-4A + 500PPB	0.523	0.493	0.508
23	HELO-4A + 750PPB	0.732	0.73	0.731
25	HELO-BLANK B	0.00531	0.00397	0.00464
26	HELO-2B	0.00175	0.00167	0.00171
27	HELO-3B	0.00207	0.00166	0.001865
28	HELO-4B	0.0159	0.015	0.01545
31	1 DNS 0700	0.104	0.0985	0.10125
33	HELO SCRUBBER	13.6	13.8	13.7

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 1 OF 2

DATE : 24-Jun-91 JOB # : 18839 CLIENT :PESI

ANALYSIS : Cr PREPED BY F.H.

SAMPLE MATRIX : WATER WITH SEDIMENT NITRIC - ACID DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
HELLO-SCRUBBER	YELLOW LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 10 g

10 grams of the sample is digested by adding 3 ml nitric acid for 2 hours on a hot plate (120 C). Internal standard is added (1.0 g) and the digestate is filtered and diluted to a final mass of 100 g.

NOTES - 1:100 Dilution will be required.

TOTAL CHROMIUM METHOD BLANK SUMMARY

Laboratory: West Coast Analytical Service

Matrix_____ 0
Date Prepared_____ 6-24,25-91
Date Analyzed_____ 6-27-91
Instrument ID_____ ICPMS
Units_____ Micrograms in Digest

File:	91	Result	Detection limit
Total chromium		ND	0.0005

This blank applies to the following samples:

Method Blank
HELO-BLANK A
HELO-3A
HELO-2A
HELO-2A DUP
HELO-2A MS
HELO-4A
HELO-4A + 100PPB
HELO-4A + 250PPB
HELO-4A + 500PPB
HELO-4A + 750PPB
HELO-BLANK B
HELO-2B
HELO-3B
HELO-4B
1 DNS 0700
HELO SCRUBBER

TOTAL CHROMIUM CALIBRATION SUMMARY

Laboratory: West Coast Analytical Service

Date Analyzed_____6-27-91

Instrument ID_____ICPMS

INITIAL CALIBRATION SUMMARY

File:	Total Cr ug/mL	Area Cnts m/z 52
21	0	0
41	1	305725
51	0.1	31324
61	0.01	3401

Cal Summ

Correlation coefficient, r^2: 0.999995
Total Cr (ppm)= 3.27E-06 * Area +(-0.0012)

The Area in this equation is that calculated after correction for IS recovery, then subtracting the Cali Blk. The raw peak integrals are proportional to the areas saved in the ASCII files from which this data is taken.

CONTINUING CALIBRATION SUMMARY

File no.	Concentration	% Error
171	0.109	9.0%
172	0.101	1.0%
291	0.107	7.0%
292	0.101	1.0%
381	0.1	0.0%
382	0.102	2.0%

DRY GAS METER AND ORIFICE CALIBRATION

Dry Gas Meter No. 1042485 Meter Box No. 1A Reference Dry Gas Meter No. 25507 Rockwell

Barometric Pressure 29.5 Calibration Date 06-24-91 Calibration Performed By:

Orifice Manometer Setting H="H2O	Initial Reference DGM Reading V=ft3	Final Reference DGM Reading V=ft3	Reference Gas Volume Vr=ft3	Initial DGM Reading V=ft3	Final DGM Reading V=ft3	Test DGM Volume Vd=ft3	Temperature: Reference DGM tr=F	Temperature: Box DGM Inlet t=F	Temperature: Box DGM Outlet t=F	Temperature: Box DGM Average td	Run Time Min.	Flow Rate Q=cfm	Meter Gamma	H@
0.5	40.552	50.622	10.07	891.655	901.692	10.037	76	83	78	80.5	25.7	0.38	1.010	1.860
1.0	51.232	61.359	10.127	902.399	912.422	10.023	76	88	82	85	18.2	0.54	1.025	1.830
2.0	62.578	72.630	10.052	913.644	923.722	10.078	77	91	84	87.5	13.1	0.74	1.012	1.923
4.0	74.167	84.240	10.073	925.259	935.329	10.070	77	94	86	90	9.3	1.05	1.014	1.921
												AVERAGE	1.015	1.883

TOTAL CHROMIUM LABORATORY CONTROL STANDARD SUMMARY

Laboratory: West Coast Analytical Service

Date Analyzed_____ 6-27-91
Instrument ID_____ ICPMS
LCS Sample ID_____ USGS T111
True Value_____ 0.0258 +/- 0.003
Units_____ Parts per million (mg/L)

File no.	Result	% Error
71	0.0248	-3.9%
72	0.026	0.8%
371	0.026	0.8%
372	0.025	-3.1%

Sample: HELO-2A

TOTAL CHROMIUM DUPLICATE/MS/MSD RESULTS

Laboratory Name: West Coast Analytical Service

Matrix_____ liquid
Date Received_____ 6-21-91
Date Prepared_____ 6-24,25-91
Date Analyzed_____ 6-27-91
Instrument_____ ICPMS
Units_____ mg/L

Sample Result:	0.00284
Duplicate:	0.00283
Matrix Spike:	0.106
Matrix Spike Dup:	0.099
Spike Level:	0.1
Detection Limit:	0.0005
Sample/Duplicate RPD:	0.4%
Matrix Spike Recovery:	103.2%
Matrix Spike Dup Recovery:	96.2%
Matrix Spike/Matrix Spike Dup RPD	7.0%

Dup

CHROMIUM

STANDARD ADDITIONS

Job Number: 18839
Date Recieved: 6-21-91
Date Prepared: 6-24,25-91
Date Analyzed: 6-27-91
Instrument ID: ICPMS
Matrix: liquid

File	Sample	mg/L added	IS Corr Response Run 1	Run 2	Avg Response
19	HELO-4A	0.00	13459	13451	13455
20	HELO-4A + 100PPB	0.10	43243	44001	43622
21	HELO-4A + 250PPB	0.25	85960	82506	84233
22	HELO-4A + 500PPB	0.50	160153	151231	155692
23	HELO-4A + 750PPB	0.75	223995	223466	223731

Regression Output:

Constant	14555.05
Std Err of Y Est	1214.549
R Squared	0.999848
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	279973.6
Std Err of Coef.	1988.660

Amt Added	Predicted Response
0.10	42552
0.25	84548
0.50	154542
0.75	224535
0	14555
-0.05198	-0

Response=279973.6 * Amt Added + 14555.05

When Response = 0

Amt Added = -0.05198

Concentration:

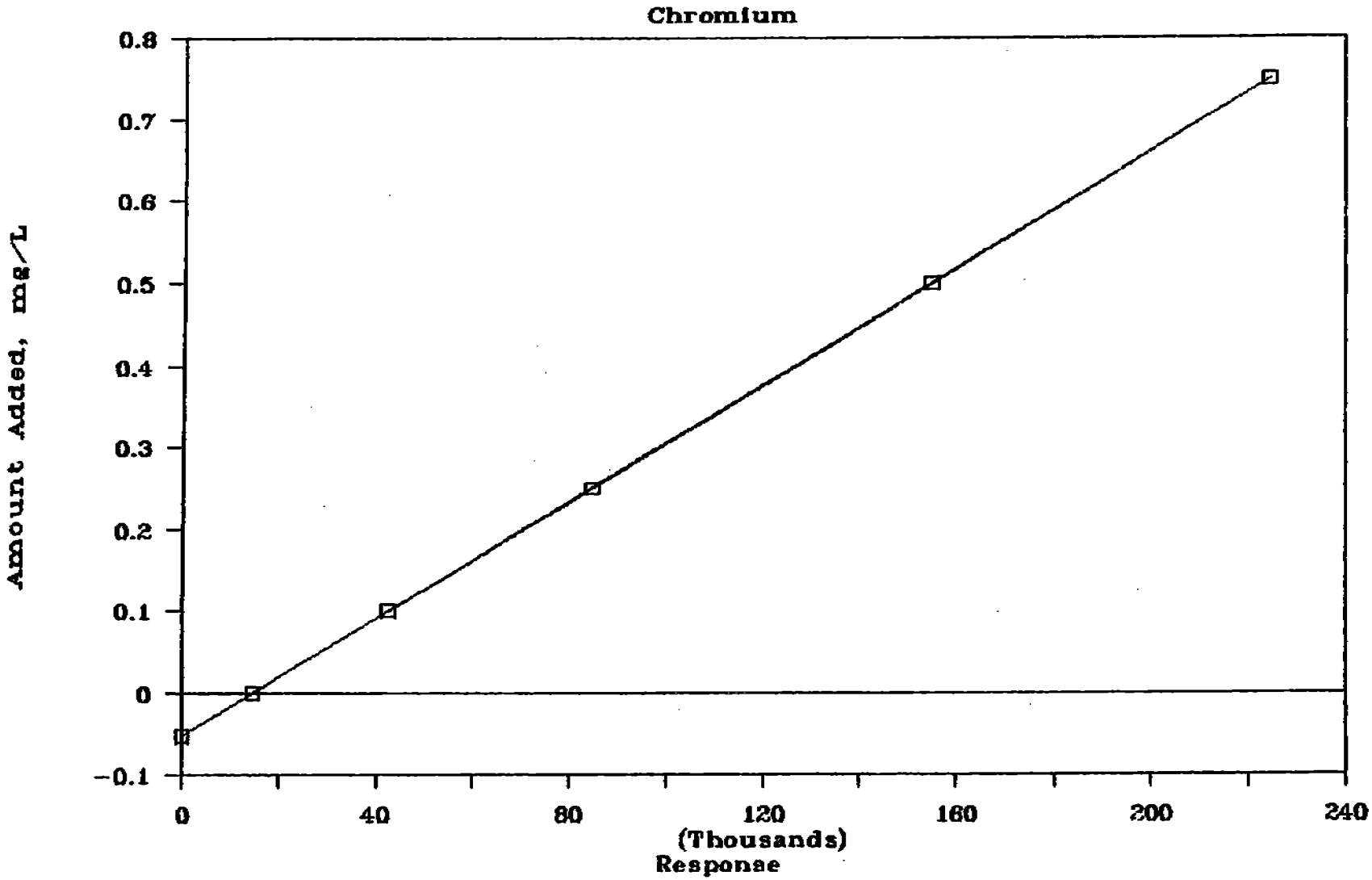
Predicted from MSA 0.051987 mg/L

From Calib Curve 0.04175 mg/L

Ratio (MSA/Calib) 1.25

alow mg/L. St Add Helo

Method of Standard Additions



In 2 book

2 integrators

6/27/91 AA

EM2 Cr2
Up = 60
Wash 2 120

8839a

1) Cali blank 0626-228-3
2) Cali blank 0626-228-3
3) Cam D 5.0 ppm 0515-208-2
4) Cam B 1.0 ppm 0618-224-2
* 5) A+B 0.1 ppm 0618-224-3
6) A+B 0.01 ppm 0607-221-2
7) USGS T-111 0619-225-2
8) Cali blank 0626-228-3
9) 18839 PESI blank
10) blank
11) HELO Blank A
12) HELO -3A
13) HELO -2A
14) HELO -2A dup
15) HELO -2A MS
16) HELO-2A MSD
* 17) A+B 0.1 CCV 0618-224-3
18) Cali blank 0626-228-3
19) 18839 PESI
20) HELO-4A
21) HELO -4A (100ppb)
22) HELO -4A (250ppb)
23) HELO -4A (500ppb)
24) HELO -4A (750ppb)
24) Cali blank 0626-228-3
25) 18839 PESI
26) HELO BLANK B
27) HELO-2B
28) HELO-3B
* 29) A+B 0.1 CCV HELO-4B 0618-224-3
30) Cali blank 0626-228-3
31) 18839 PESI
32) 1 DAS 0700
33) Blank 1/100
HELO-Scrubber 10g

Nitric Cr Straight
Nitric Cr Straight
Nitric Cr Straight
Nitric Cr Straight

34) 18839 PESI HELO-Scrubber 10g Cr
35) Cali blank
36) Cali blank
37) USGS T-111
* 38) A+B 0.1 CCV

CRMSA
4-6-91

Run Name: 8839A
1st Samp: 1
Last Samp: 38
IS Corr File: 51

Repeats: 2
Diln Fact 1
Det Lim: 0.0005
FWT File:817H
MB File: 91
MB Res: 0.0005
PQ(Tor2):T

File:	Raw Areas Sc 45	Raw Areas Cr 52	IS Corr Cr 52 (181034)	CB SUB Cr 52 (193)
11	176872	214	219	26
12	175368	196	202	10
21	182239	194	193	0
22	181761	202	201	8
31	176357	1234737	1267482	1267290
32	175721	1218995	1255852	1255659
41	175976	297371	305918	305725
42	174904	301695	312269	312076
51	181034	31517	31517	31324
52	178682	32553	32981	32789
61	180555	3594	3594	3401
62	178762	3627	3673	3480
71	178573	8023	8134	7941
72	175023	8201	8483	8290
81	175871	198	204	11
82	175754	256	264	71
91	181481	291	290	98
92	181524	333	332	139
101	158567	430	491	298
102	165565	438	479	286
111	139615	755	979	786
112	138218	760	995	803
121	131404	1541	2123	1930
122	128552	1563	2229	2037
131	125077	1159	1678	1485
132	125485	1020	1472	1279
141	120227	1077	1622	1429
142	118519	996	1521	1329
151	98220	17802	32812	32619
152	96214	17556	33033	32840
161	110797	19003	31049	30857
162	109657	18665	30814	30622
171	115688	21713	33978	33785
172	120784	20886	31304	31112
181	126826	159	227	34
182	127091	152	217	24
191	109423	8135	13459	13266
192	105142	7812	13451	13258
201	93152	22251	43243	43050
202	89877	21845	44001	43808
211	87476	41536	85960	85767
212	84810	38652	82506	82313

222	0.493	0.493	1	0.493
231	0.732	0.732	1	0.732
232	0.73	0.73	1	0.73
241	-0.00057	ND	1	ND
242	-0.00036	ND	1	ND
251	0.00581	0.00531	1	0.00531
252	0.00447	0.00397	1	0.00397
261	0.00225	0.00175	1	0.00175
262	0.00217	0.00167	1	0.00167
271	0.00257	0.00207	1	0.00207
272	0.00216	0.00166	1	0.00166
281	0.0164	0.0159	1	0.0159
282	0.0155	0.015	1	0.015
291	0.107	0.107	1	0.107
292	0.101	0.101	1	0.101
301	-0.00111	ND	1	ND
302	0	ND	1	ND
311	0.104	0.104	1	0.104
312	0.099	0.0985	1	0.0985
321	-0.00112	ND	1	ND
322	-0.00113	ND	1	ND
331	0.136	0.136	100	13.6
332	0.138	0.138	100	13.8
341	9.12	9.12	1	9.12
342	9.01	9.01	1	9.01
351	0.0012	0.0007	1	0.0007
352	0.00167	0.00117	1	0.00117
361	-0.00035	ND	1	ND
362	-0.00030	ND	1	ND
371	0.026	0.0255	1	0.0255
372	0.025	0.0245	1	0.0245
381	0.1	0.0995	1	0.0995
382	0.102	0.102	1	0.102

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 2 OF 2

DATE : 24-Jun-91 JOB # : 18839 CLIENT :PESI

ANALYSIS : Cr PREPED BY F.H.

SAMPLE MATRIX : WATER WITH SEDIMENT NITRIC - ACID DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
HELO-2A	LIQUID	
HELO-2A DUP	LIQUID	
HELO-2A MS	LIQUID	
HELO-2A MSD	LIQUID	
HELO-3A	LIQUID	
HELO-4A	LIQUID	
HELO BLANK A	LIQUID	
1 DNS 0070	LIQUID	
HELO-2B	LIQUID	
HELO-3B	LIQUID	
HELO-4B	LIQUID	
HELO BLANK B	LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 50 g

50 grams of the sample is digested by adding 3 ml nitric acid for 2 hours on a hot plate (120 C). Internal standard is added (0.5 g) and the digestate is filtered and diluted to a final mass of 50 g.

NOTES - MS/MSD 0.5 ml 10 PPM Cr 0115-168-1

ICPMS
RECORD OF SAMPLE PREPARATION

PAGE : 1 OF 1

DATE : 25-Jun-91 JOB # : 18839 CLIENT : PESI

ANALYSIS : Cr PREPED BY F.H.

SAMPLE MATRIX : WATER WITH SEDIMENT NITRIC - ACID DIGEST

SAMPLE ID NUMBER	SAMPLE DESCRIPTION	QC
HELO-4A	LIQUID	
HELO-4A	LIQUID	

SAMPLE PREP PROCEDURE :

SAMPLE QUANTITY : 100 g

100 grams of the sample is digested by adding 4 ml nitric acid for 2 hours on a hot plate (120 C). Internal standard is added (1.0 g) and the digestate is filtered and diluted to a final mass of 100 g.

NOTES -The sample is digested for method of standard addition. Internal standard will be adjusted accordingly after subsampling.

DIONEX SCHEDULE - C:\DX\SCHEDULE\MCLAREN.SCH

Inj#	Sample Name	Method	Data File	Vol.	Dil.	Int.S
1	AUTOCAL5R	.\MCLAREN	.\621CR	1	1	1
2	AUTOCAL4R	.\MCLAREN	.\621CR	1	1	1
3	AUTOCAL3R	.\MCLAREN	.\621CR	1	1	1
4	AUTOCAL2R	.\MCLAREN	.\621CR	1	1	1
5	AUTOCAL1R	.\MCLAREN	.\621CR	1	1	1
6	METHOD BLANK	.\MCLAREN	.\621CR	1	1	1
7	1.0_PPB_ICV	.\MCLAREN	.\621CR	1	1	1
8	18839/HELO-2A	.\MCLAREN	.\621CR	1	1	1
9	18839/HELO-3A	.\MCLAREN	.\621CR	1	1	1
10	18839/HELO-4A	.\MCLAREN	.\621CR	1	1	1
11	18839/HELO-SCRUBBER	.\MCLAREN	.\621CR	1	1e+5	1
12	18839/HELO-BLANK A	.\MCLAREN	.\621CR	1	1	1
13	18839/1 DNS 0070	.\MCLAREN	.\621CR	1	1	1
14	18839/HELO-3A DUP	.\MCLAREN	.\621CR	1	1	1
15	18839/HELO-3A 10 PPB MS	.\MCLAREN	.\621CR	1	5	1
16	18839/HELO-3A 10 PPB MS	.\MCLAREN	.\621CR	1	5	1
17	0.5_PPB_STD	.\MCLAREN	.\621CR	1	1	1
18	18839/HELO-3A	.\MCLAREN	.\621CR	1	5	1
19	18839/HELO-3A + 2.5 PPB	.\MCLAREN	.\621CR	1	5	1
20	18839/HELO-3A + 5 PPB	.\MCLAREN	.\621CR	1	5	1
21	18839/HELO-3A + 10 PPB	.\MCLAREN	.\621CR	1	5	1
22	18839/HELO-3A + 20 PPB	.\MCLAREN	.\621CR	1	5	1
23	0.5_PPB_STD	.\MCLAREN	.\621CR	1	1	1
24	18835/MJ-15-5	.\MCLAREN	.\621CR	1	10	1
25	0.5_PPB_STD	.\MCLAREN	.\621CR	1	1	1
26	STOP	.\CRSTALL	.\621CR	1	1	1

27-Jun-91

Wet Chemistry Data Forms

Analysis:Cr+6 {PHENOL,SULFIDE,FORMAL or CN ONLY}
Method:Std Addition

Abscissa (X-axis) Units: ppb
Ordinate (Y-axis) Units: ppb

Calibration Standards

Obs.	ppb	ppb
Blank	0	2.9
1	2.5	5.41
2	5	8.41
3	10	13.8
4	20	23.3
5		
6		

Sig Figs:	3
Y-intercept:	3.08625
Slope:	1.0237
Correlation Coefficient:	0.998371
Error of Y-Estimate:	0.377402
Error in X:	0.023869

Regression Output:

Constant	3.08625
Std Err of Y Est	0.377402
R Squared	0.998371
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	1.0237
Std Err of Coef.	0.023869
Observation Count	5

Linear Regression Points

SA

Obs.	X	Y=m.
Blank	0	3.08625
1	2.5	5.6455
2	5	8.20475
3	10	13.32325
4	20	23.56025
5	0	3.08625
6	0	3.08625

Client : Pacific Environmental Services Date: 21-Jun-91
Job no.: 18839

QC SUMMARY TABLE

SAMPLE ID : HELO-3A ANALYSIS : Hexavalent Chromium

SAMPLE =	2.95	DUP =	2.95	MS =	13.9	MSD =	13.6
% RPD=	0.00	%REC1 =	109.5	%REC2 =	105.5	% RPD=	2.18

SPIKE = 10 ppb (200 ul 100 ppb # 111-161-1 to 10 ml sample DF=5)

********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCALSP	Date: Fri Jun 20 [illegible]
Result File: C:\DX\DATA\metals\621CR001.R01	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: [illegible]
ACI Address: 1 System : 2 Inject#: 1	Detector: VDM-[illegible]

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NO.	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
1	-3X. CHROME	4.43	4.38	4.38	6.658e+006	5.870e+006	5.870e+[illegible]

Enter report title of your choice

```
: Sample Name: AUTOCAL5R                          Date: Fri Jun 21 13:04:55 1991
: Data File  : C:\DX\DATA\metals\621CR001.D01
: Method     : C:\DX\METHOD\MCLAREN.MET
: ACI Address: 1        System : 2        Inject#:   1  Detector: VDM-1
```

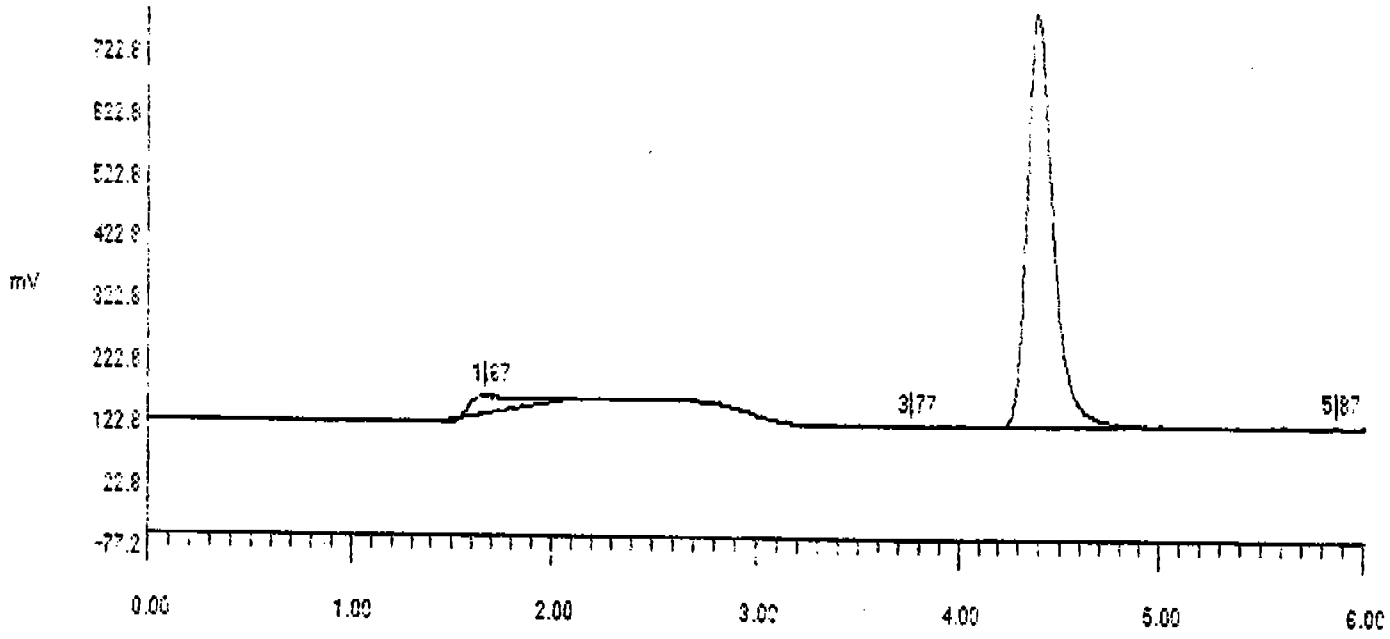
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	30245	527945	1	
3	4.38	HEX. CHROME	5.000	661383	5970419	1	0.0

File: C:\DX\DATA\metals\621CR001.D01 Sample: AUTOCAL5R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL4F	Date: Fri Jun 21 17:14:30 199
Result File: C:\DX\DATA\metals\621CROC1.R02	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: 4
ACI Address: 1 System : 2 Inject#: 2	Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.38	4.40	4.40	1.359e+006	1.208e+006	1.209e+006

Custom Report Title of your choice

Sample Name: AUTOCAL4R	Date: Fri Jun 21 13:14:30 1[illegible]
Data File : C:\DX\DATA\metals\621CR001.D02	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 2	Detector: VDM-1

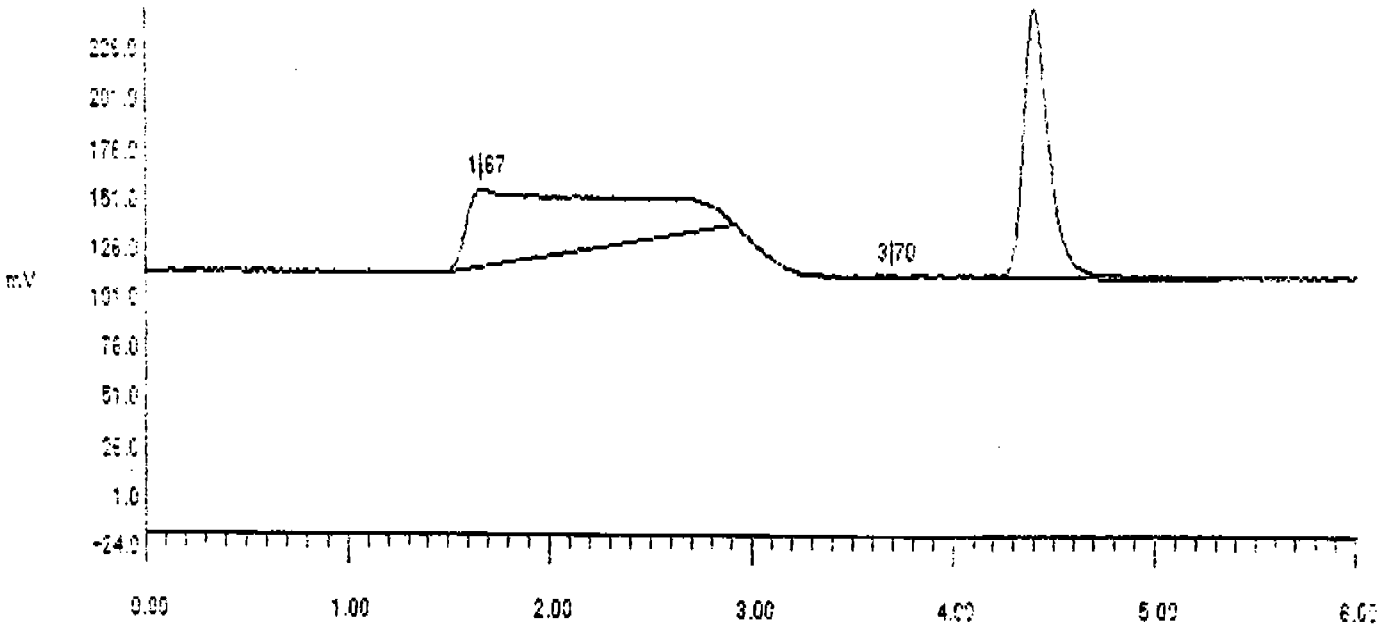
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret. Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	39403	2003360	1	
3	4.40	HEX. CHROME	1.000	132271	1207872	1	0.[illegible]

File: C:\DX\DATA\metals\621CR001.D02 Sample: AUTOCAL4R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL3R Date: Fri Jun 21 17:24:05 1[illegible]
Result File: C:\DX\DATA\metals\621CR001.R03
Method : C:\DX\METHOD\MCLAREN.MET Calibration Level: [illegible]
ACI Address: 1 System : 2 Inject#: 3 Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.40	4.42	4.42	6.993e+005	6.242e+005	6.242e+[illegible]

Custom Report Title of your choice

Sample Name: AUTOCAL3R		Date: Fri Jun 21 13:24:03 1991
Data File : C:\DX\DATA\metals\621CR001.D03		
Method : C:\DX\METHOD\MCLAREN.MET		
ADC Address: 1	System : 2	Inject#: 3 Detector: VDM-1

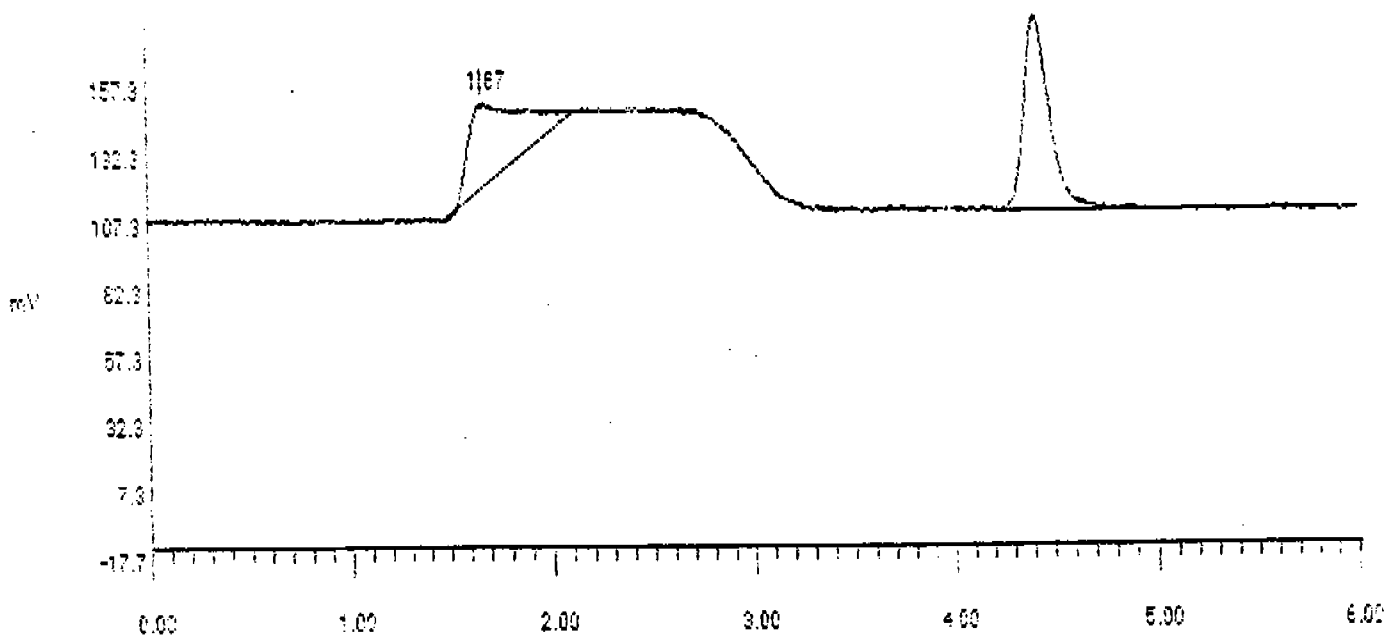
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	Bl	%Delta
1	1.67		0.000	3[illegible]905	530631	1	
2	4.42	HEX. CHROME	0.500	7[illegible]216	624181	1	0.0[illegible]

File: C:\DX\DATA\metals\621CR001.D03 Sample: AUTOCAL3R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL2R	Date: Fri Jun 21 10:37:25 1991
Result File: C:\DX\DATA\metals\621CR001.R04	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: 2
ACI Address: 1 System : 2 Inject#: 4	Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.42	4.42	4.42	8.895e+004	9.332e+004	9.332e+004

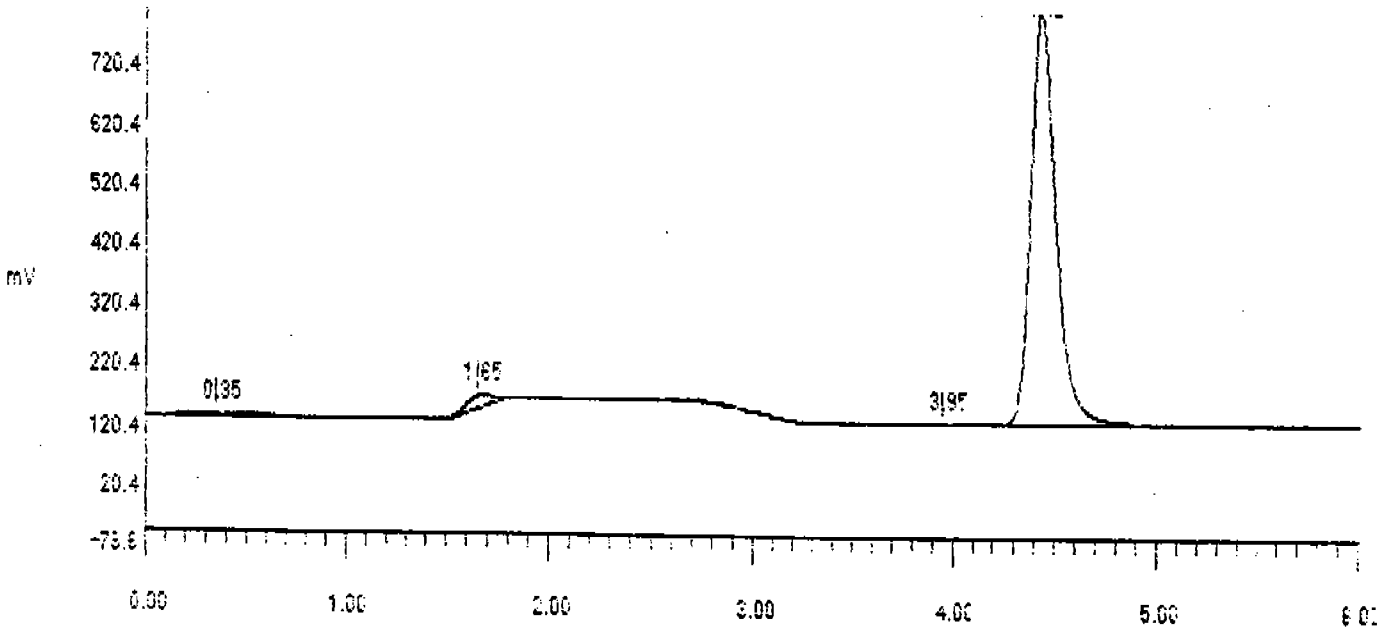
Custom Report Title of your choice

Sample Name: 18817/C2-2A + 20 PPB Date: Thu Jun 20 12:43:03 19-1
Data File : C:\DX\DATA\metals\620CR001.D19
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 19 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.35	MATRIX	0.000	2042	45776	1	10.[illegible]
2	1.65		0.000	19776	172913	1	
4	4.42	HEX. CHROME	21.840	655068	5822988	1	0.[illegible]

File: C:\DX\DATA\metals\620CR001.D19 Sample: 18817/C2-2A + 4.0 PPM



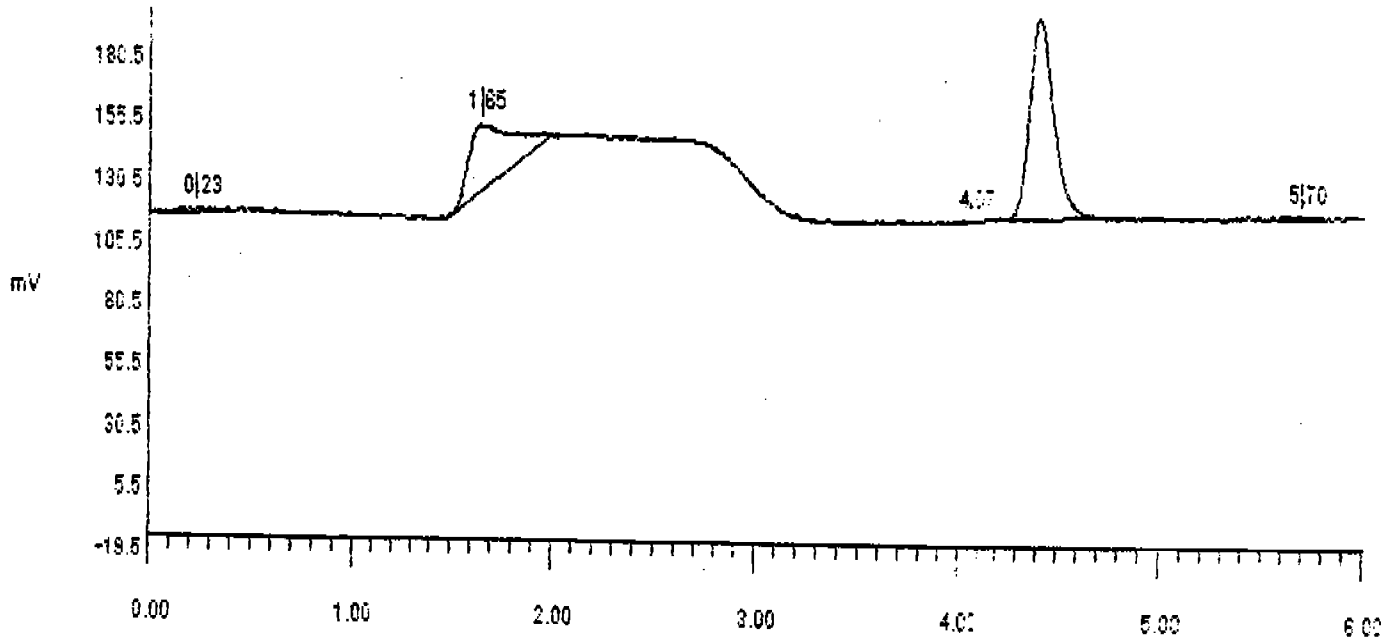
Custom Report Title of your choice

Sample Name: 0.5_PPB_STD	Date: Thu Jun 20 12:52:21 1991
Data File : C:\DX\DATA\metals\620CR001.D20	
Method : C:\DX\METHOD\MCLAREN.MET	
ADC Address: 1 System : 2	Inject#: 20 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	5.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.23	MATRIX	0.000	1039	15054	1	-25.7
2	1.65		0.000	26265	394781	1	
4	4.40	HEX. CHROME	0.496	75139	685024	1	0.00
5	5.70		0.000	1252	13722	1	

File: C:\DX\DATA\metals\620CR001.D20 Sample: 0.5_PPB_STD



Custom Report Title of your choice

Sample Name: 18829/C2-3A	Date: Thu Jun 20 13:01:58 1991
Data File : C:\DX\DATA\metals\620CR001.D21	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 21 Detector: VDM-1	

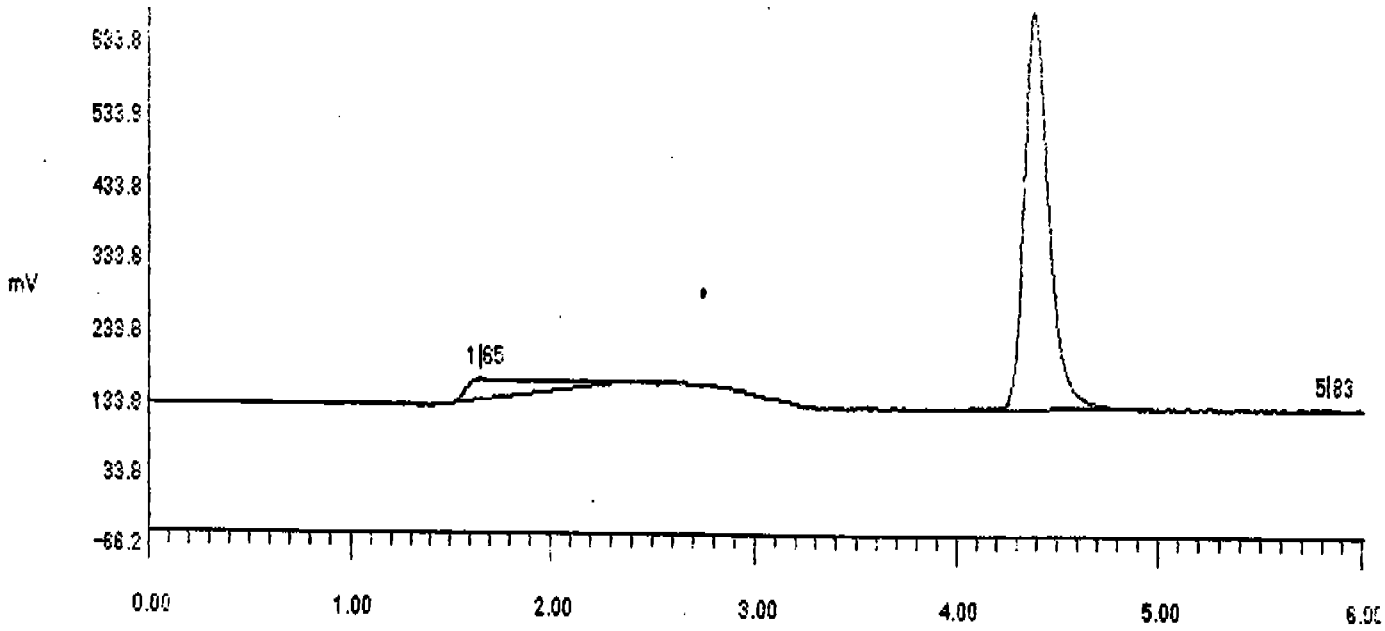
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA	REJ
External	1	1	1805	5Hz	0.00	6.02	10000	

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	29208	706312	1	
2	4.36	HEX. CHROME	3.494	544917	4662186	1	0.[illegible]

File: C:\DX\DATA\metals\620CR001.D21 Sample: 18829/C2-3A



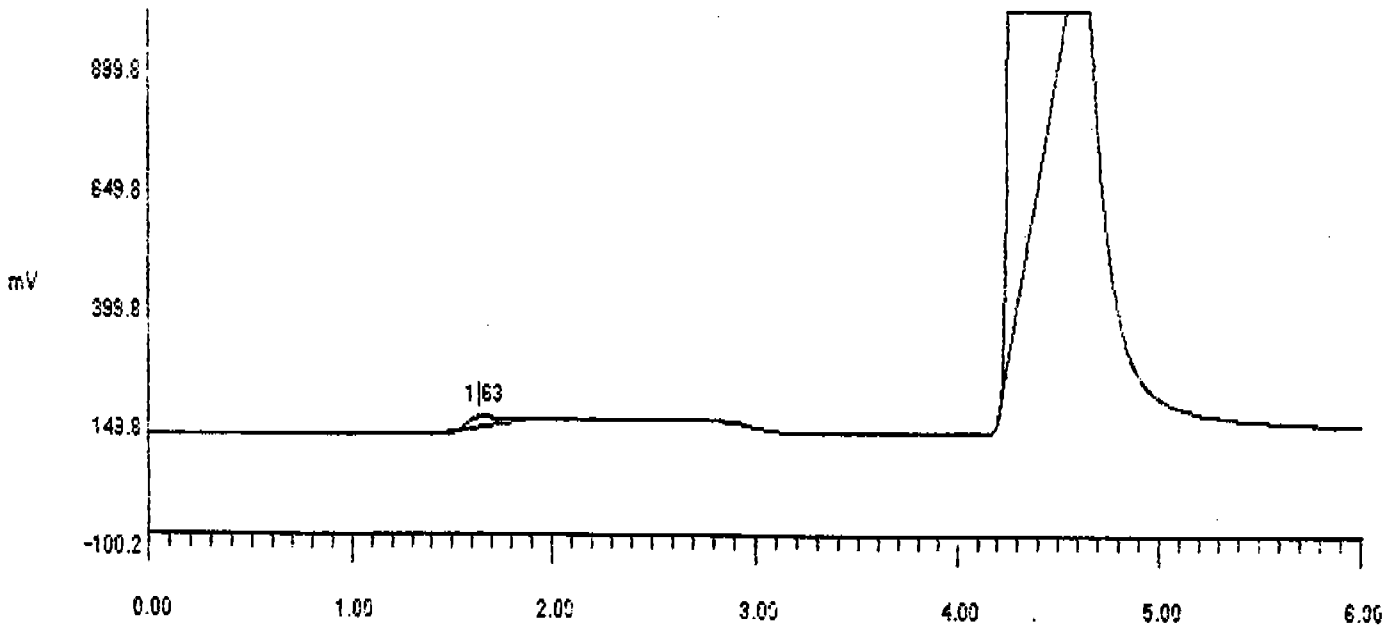
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 18829/C2-SCRUBBER                    Date: Thu Jun 20 13:11:23 1991 |
| Data File   : C:\DX\DATA\metals\620CR001.D22                                     |
| Method      : C:\DX\METHOD\MCLAREN.MET                                           |
| ACI Address: 1        System : 2        Inject#:  22  Detector: VDM-1          |
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  *********************
Name                Adjusted Ret Time   Reference Peak
-------------------------------------------------------
MATRIX                  0.30                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA	REJ
External	1	1	1805	5Hz	0.00	6.02	10000	

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.63		0.000	21930	241299	1	
2	4.27	HEX. CHROME	5.213	705610	6942570	1	0.00

File: C:\DX\DATA\metals\620CR001.D22 Sample: 18829/C2-SCRUBBER



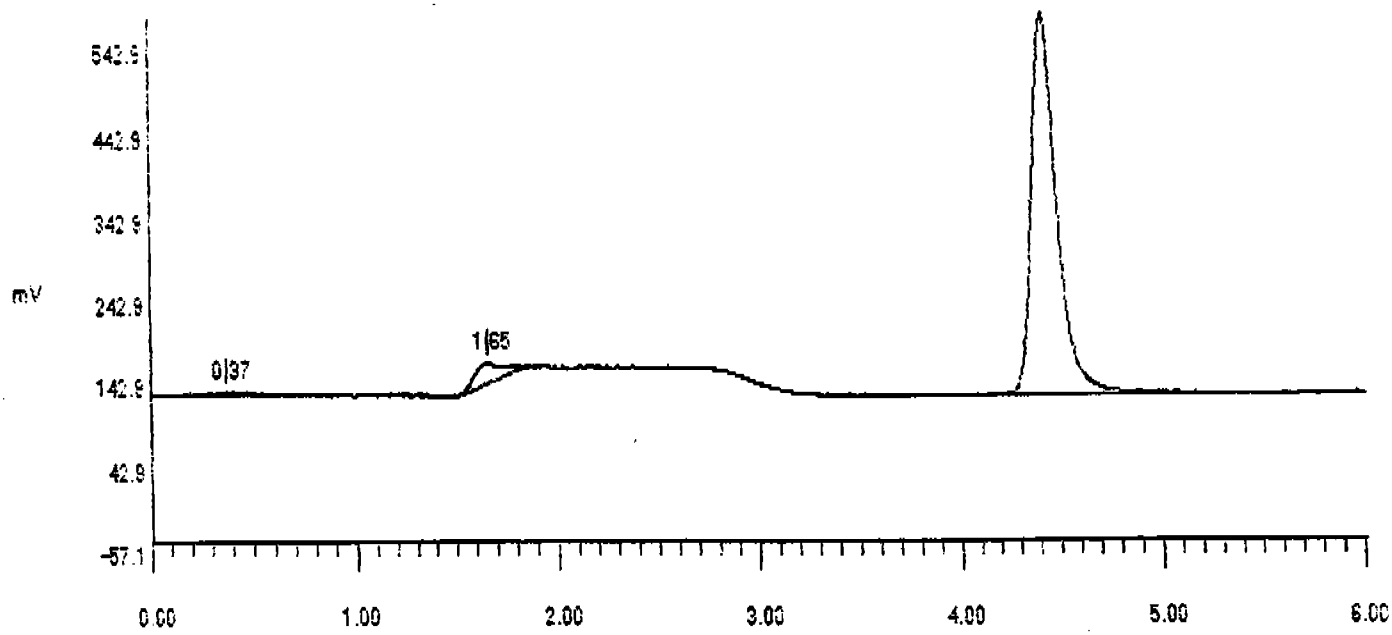
Custom Report Title of your choice

Sample Name: 18829/C2-SCRUBBER	Date: Thu Jun 20 13:23:13 1991
Data File : C:\DX\DATA\metals\620CR001.D23	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 23	Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	100	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.37	MATRIX	0.000	2635	79879	1	16.23
2	1.65		0.000	24210	244028	1	
3	4.42	HEX. CHROME	297.992	454354	3980230	1	0.00

File: C:\DX\DATA\metals\620CR001.D23 Sample: 18829/C2-SCRUBBER



Custom Report Title of your choice

Sample Name: 0.5_PPB_STD	Date: Thu Jun 20 13:32:41 1991
Data File : C:\DX\DATA\metals\620CR001.D24	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 24 Detector: VDM-1

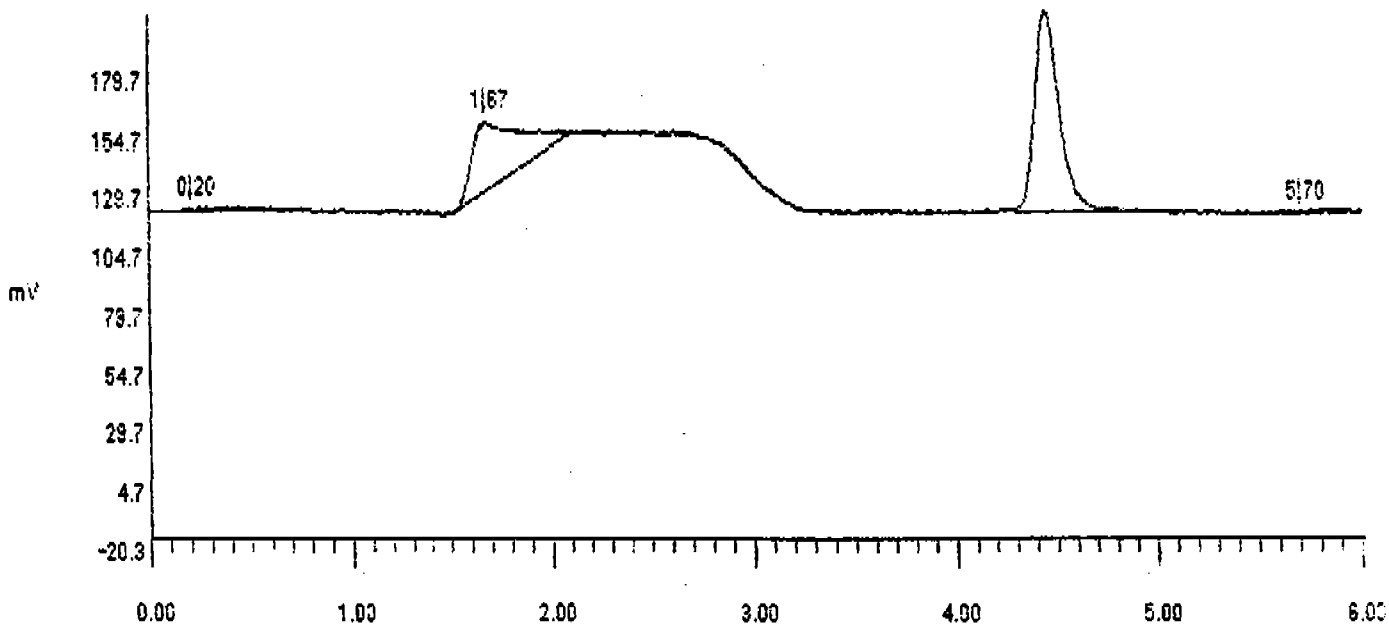
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.20		0.000	1233	17337	1	
2	1.67		0.000	29220	467933	1	
3	4.43	HEX. CHROME	0.524	80766	722801	1	0.00

File: C:\DX\DATA\metals\620CR001.D24 Sample: 0.5_PPB_STD



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL5R Date: Sat Jun 22 07:37:37 1991
Result File: C:\DX\DATA\metals\622CR001.R01
Method : C:\DX\METHOD\MCLAREN.MET Calibration Level: 5
ACI Address: 1 System : 2 Inject#: 2 Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.38	4.40	4.40	5.870e+006	5.693e+006	5.693e+006

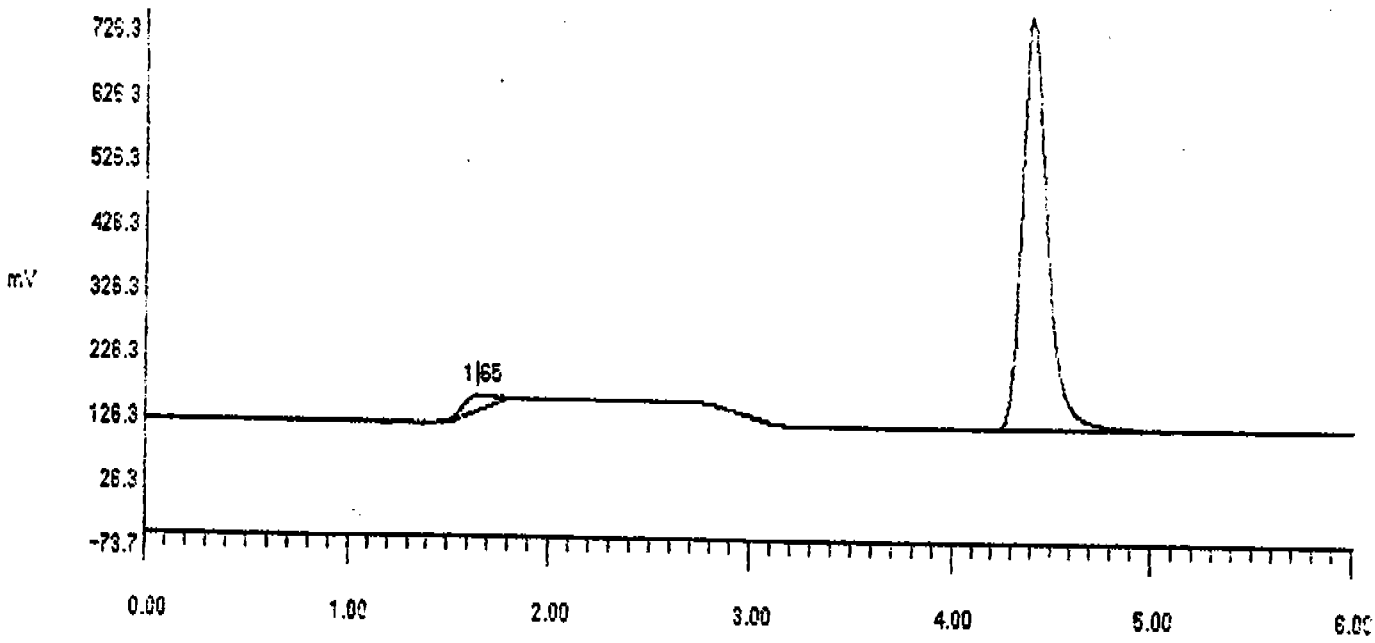
Custom Report Title of your choice

```
==================================================================================
| Sample Name: AUTOCAL5R                          Date: Sat Jun 22 07:37:37 1991 |
| Data File  : C:\DX\DATA\metals\622CR001.D01                                    |
| Method     : C:\DX\METHOD\MCLAREN.MET                                          |
| ACI Address: 1        System : 2        Inject#:   1  Detector: VDM-1         |
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  ********************
Name                Adjusted Ret Time   Reference Peak
-------------------------------------------------------
MATRIX                   0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA	REJ
External	1	1	1805	5Hz	0.00	6.02	10000	

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	22274	213843	1	
2	4.40	HEX. CHROME	5.000	634528	5692797	1	0.0

File: C:\DX\DATA\metals\622CR001.D01 Sample: AUTOCAL5R



********** AUTOMATIC CALIBRATION UPDATE **********

| Sample Name: AUTOCAL4R | Date: Sat Jun 22 07:47:10 [illegible]
| Result File: C:\DX\DATA\metals\622CR001.RC2
| Method : C:\DX\METHOD\MCLAREN.MET
| ADI Address: 1 System : 2 Inject#: 2 Calibration Level: [illegible]
| Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.40	4.40	4.40	1.208e+006	1.135e+006	1.135e+0[illegible]

Custom Report Title of your choice

Sample Name: AUTOCAL4R	Date: Sat Jun 22 07:47:10 19[illegible]
Data File : C:\DX\DATA\metals\622CR001.D02	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 2 Detector: VDM-1	

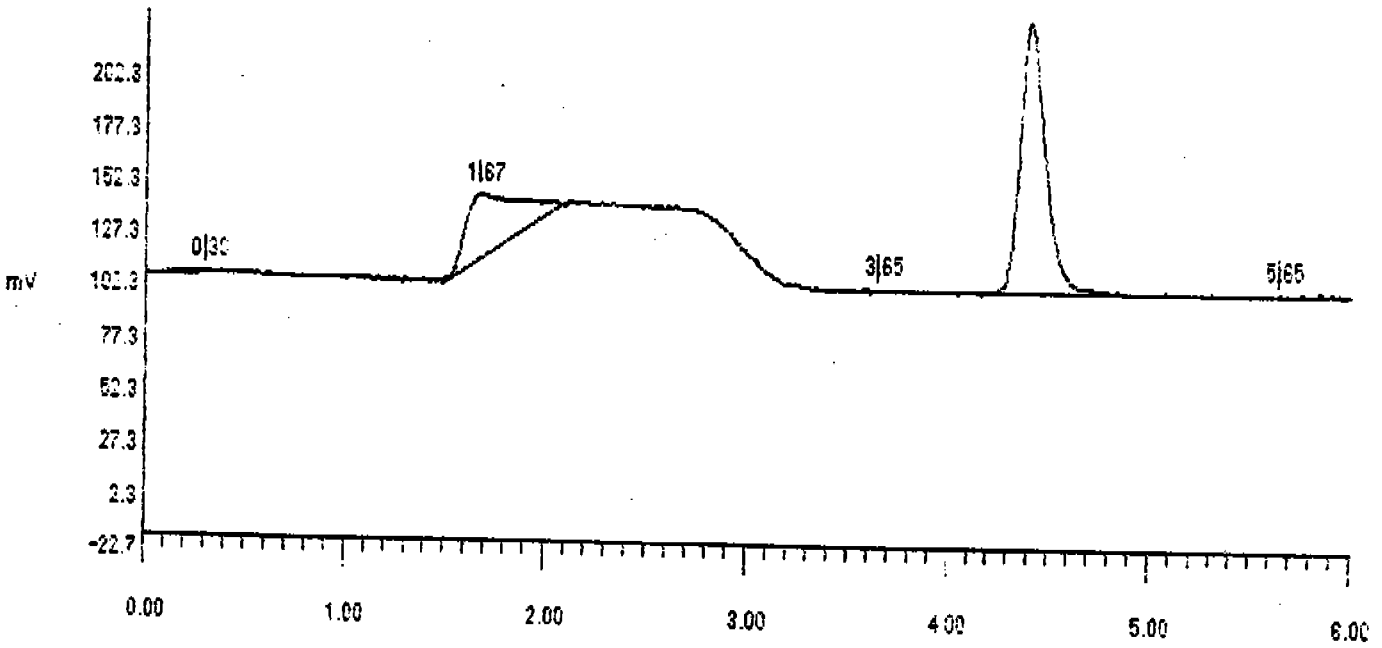
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delt[illegible]
2	1.67		0.000	29693	514685	1	
4	4.40	HEX. CHROME	1.000	126990	1134515	1	0.0[illegible]

File: C:\DX\DATA\metals\622CR001.D02 Sample: AUTOCAL4R



********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL3R	Date: Sat Jun 22 07:56:4[illegible] 1991
Result File: C:\DX\DATA\metals\622UR001.RO3	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: 3
ACI Address: 1 System : 2 Inject#: 3	Detector: VDM-[illegible]

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.40	4.40	4.40	6.242e+005	6.152e+005	6.152e+[illegible]

********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCAL2R	Date: Sat Jun 22 [illegible]:06:14 1991
Result File: D:\DX\DATA\metals\S22DR001.R04	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: 2
ACI -Stress: 1 System : 2 Inject#: 4	Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	ACI CHROME	4.40	4.38	4.38	9.332e+004	8.524e+004	8.524e+004

********** AUTOMATIC CALIBRATION UPDATE **********

Sample Name: AUTOCALIR	Date: Sat Jun 22 08:15:47 1991
Result File: C:\DX\DATA\metals\622CR001.R05	
Method : C:\DX\METHOD\MCLAREN.MET	Calibration Level: 1
ADI Address: 1 System : 2 Inject#: 5	Detector: VDM-1

********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

********** COMPONENTS FOUND IN THIS RUN **********

COMP NUM	COMPONENT NAME	OLD RET.TIME	MEASURED RET.TIME	NEW RET.TIME	OLD AREA	MEASURED AREA	NEW AREA
2	HEX. CHROME	4.38	4.40	4.40	3.324e+004	2.364e+004	2.364e+[illegible]

Quantar Report Title of your choice

| Sample Name: AUTOCAL1R | Date: Sat Jun 22 08:15:47 1991
| Data File : C:\DX\DATA\metals\622CR001.D05
| Method : C:\DX\METHOD\MCLAREN.MET
| ASI Address: 1 System : 2 Inject#: 5 Detector: VDM-1

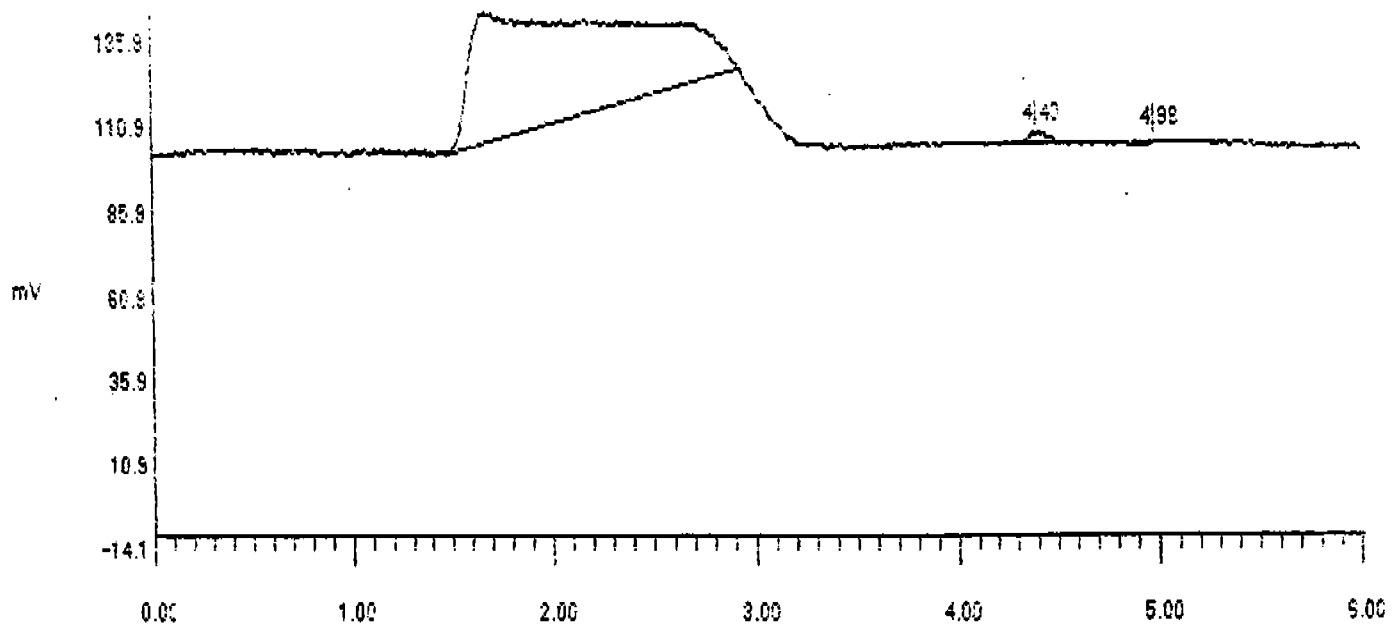
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

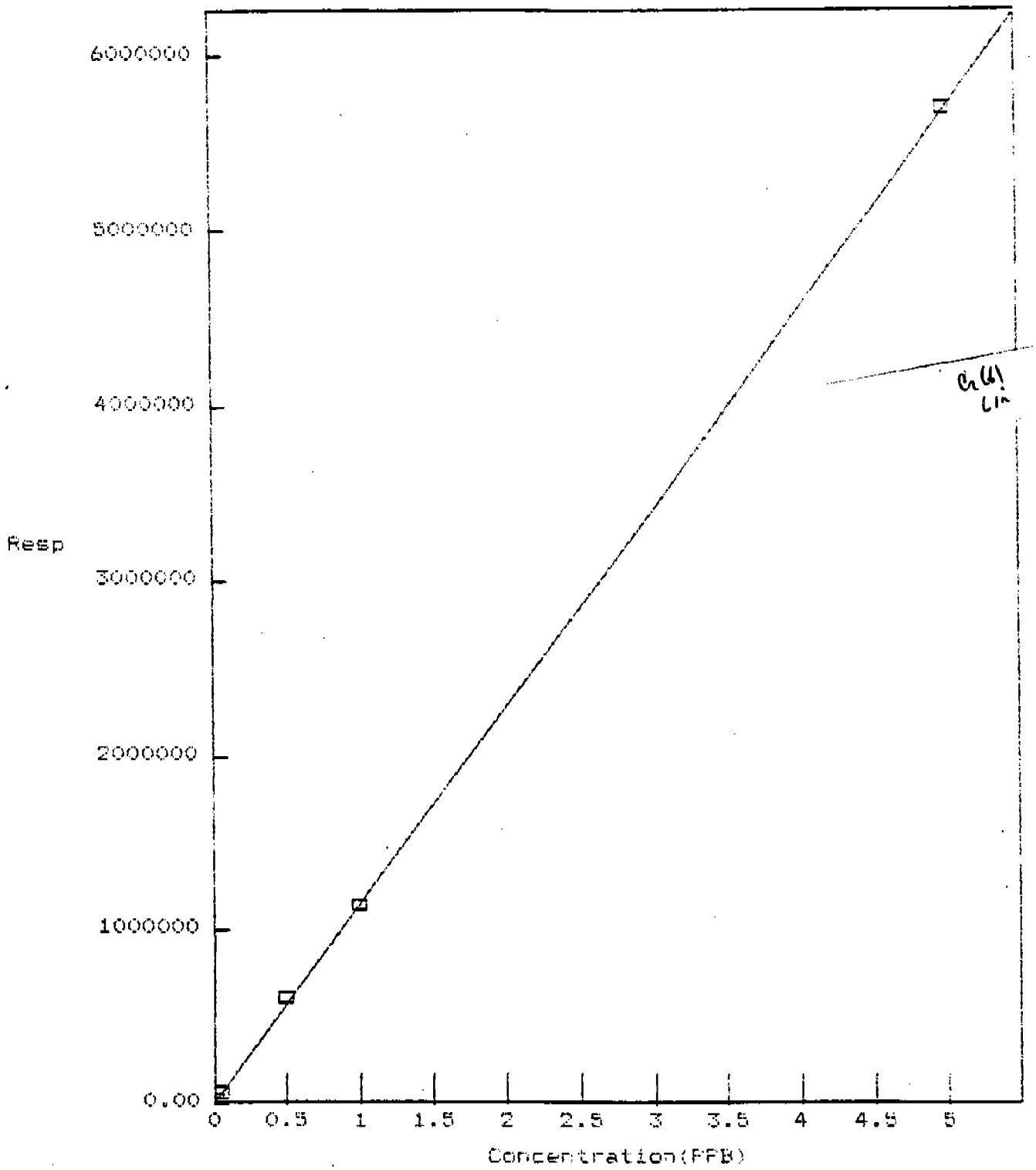
REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	37895	1983575	1	
2	4.40	HEX. CHROME	0.020	2491	23644	1	0.0

File: C:\DX\DATA\metals\622CR001.D05 Sample: AUTOCAL1R



Method: MCLAREN.MET
Component: HEX. CHROME
Fit Type: Linear
r^2: 0.999938
Conc = Resp * 8.803e-007 + -0.01155
Resp = Conc * 1.136e+006 + 13170
Standardization: External
Calibration: Area



Quick Report Title of your choice

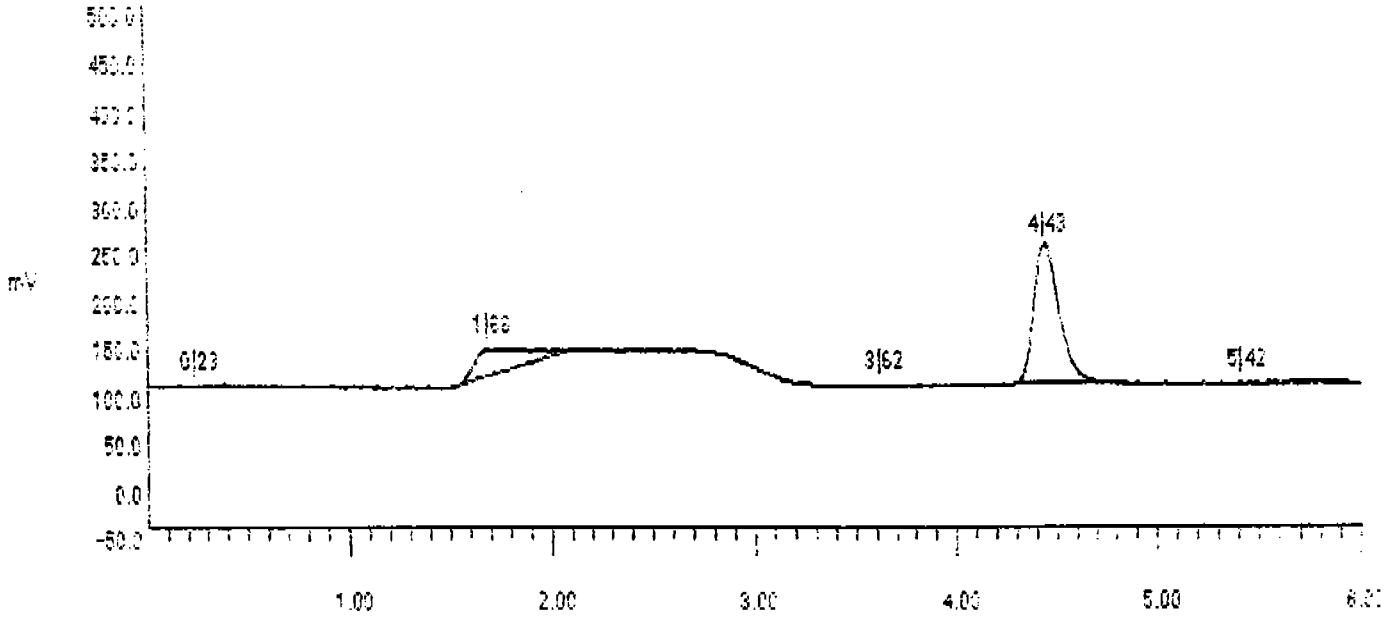
DATA REPROCESSED ON Thu Jun 27 11:09:07 1996

Sample Name: 1.0_PPB_ICV Date: Sat Jun 22 08:34:47 1996
Data File : C:\DX\DATA\METALS\622CR001.D07
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 7 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

No. Num.	Ret Time	Component Name	Concentration	Height	Area	BL	Method
2	1.68		0.000	28759	431353	1	
3	3.60		0.000	1422	10071	1	
4	4.43	HEX. CHROME	1.089	143489	1249745	1	C.[illegible]

File: C:\DX\DATA\METALS\622CR001.D07 Sample: 1.0_PPB_ICV



Custom Report Title of your choice

Sample Name: 18239/HELO-4A	Date: Sat Jun 22 08:44:15 19[illegible]
Data File : C:\DX\DATA\metals\622CR001.D08	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 8 Detector: VDM-1	

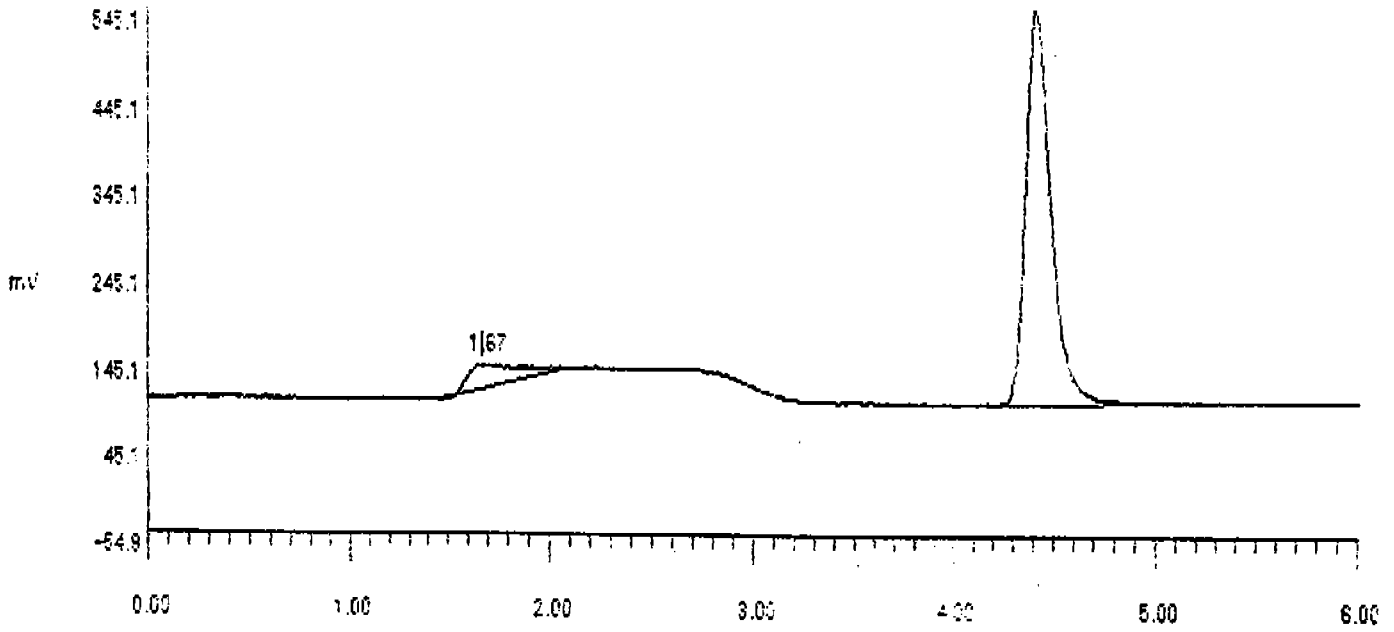
********** PEAKS NOT FOUND IN THIS F[illegible] **********

Name	Adjusted Ret Time	Reference Pea[illegible]
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA RED
External	1	10	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	37259	442165	1	
2	4.42	HEX. CHROME	35.310	4[illegible]1263	4024423	1	0.0[illegible]

File: C:\DX\DATA\metals\622CR001.D08 Sample: 18839/HELO-4A



Custom Report Title of your choice

```
| Sample Name: 18839/1 DNS 0070                    Date: Sat Jun 22 08:55:43 1991 |
| Data File  : C:\DX\DATA\metals\622CR001.D09                                     |
| Method     : C:\DX\METHOD\MCLAREN.MET                                           |
| ADC Address: 1        System : 2        Inject#:   9  Detector: VDM-1          |
```

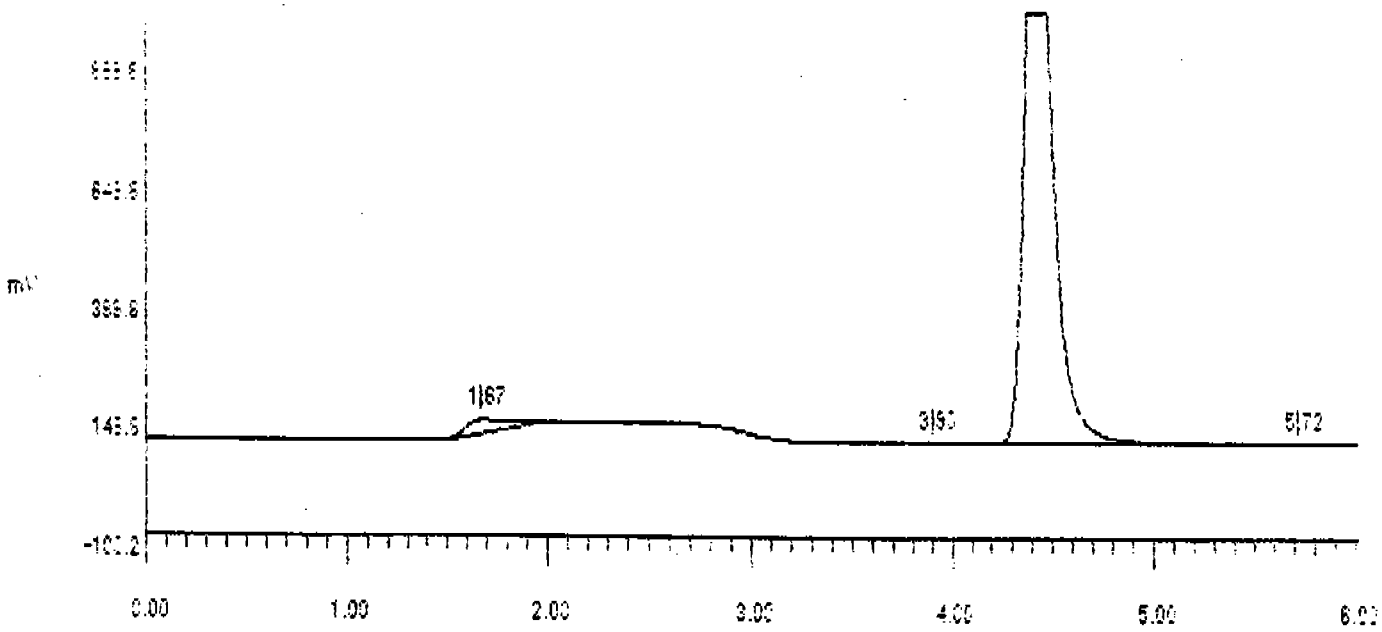
```
*****>>>>>>>>>>>>>>>>>>  PEAKS NOT FOUND IN THIS RUN  <<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	10	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	27668	383135	1	
3	4.38	HEX. CHROME	92.782	902639	10553251	1	0.00

File: C:\DX\DATA\metals\622CR001.D09 Sample: 18839/1 DNS 0070



Custom Report Title of your choice

```
| Sample Name: 18839/1 DNS 0070                    Date: Sat Jun 22 09:03:11 19-1:
| Data File   : C:\DX\DATA\metals\622CR001.D10                                    |
| Method      : C:\DX\METHOD\MCLAREN.MET                                          |
| ACI Address: 1        System : 2        Inject#:  10  Detector: VDM-1          |
```

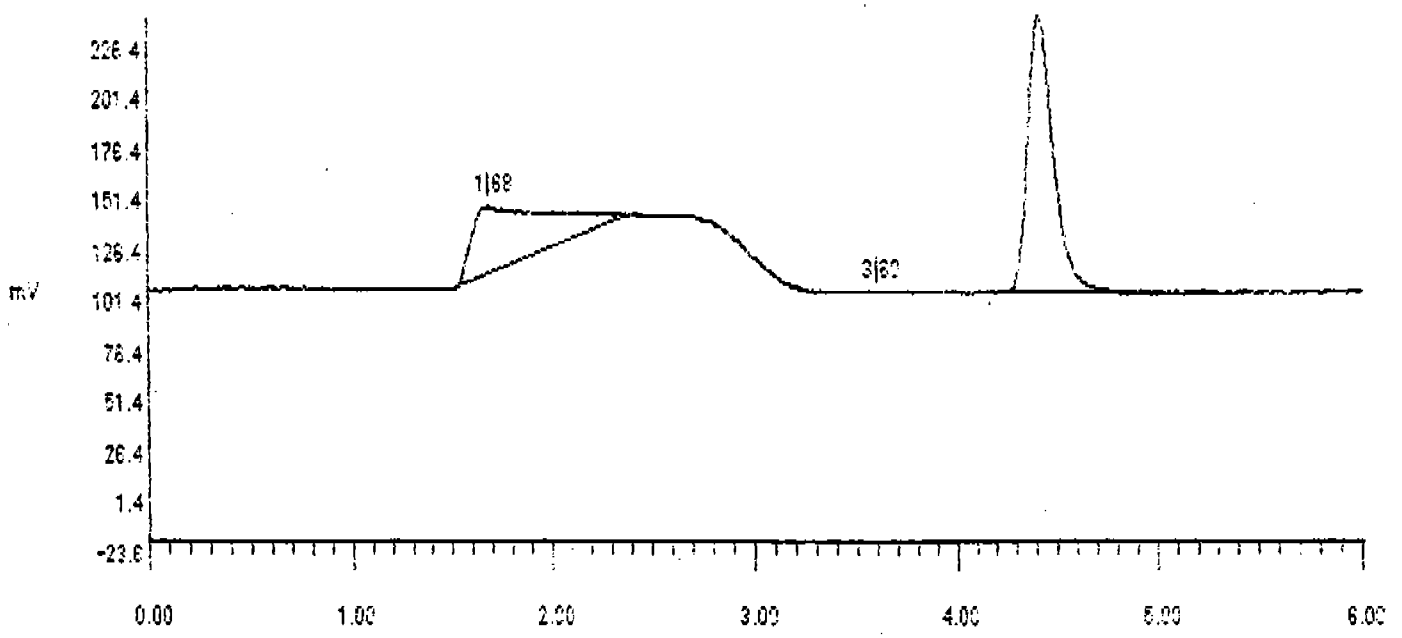
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	100	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.48		0.000	33245	829945	1	
3	4.42	HEX. CHROME	105.766	136392	1214680	1	0.0

File: C:\DX\DATA\metals\622CR001.D10 Sample: 18839/1 DNS 0070



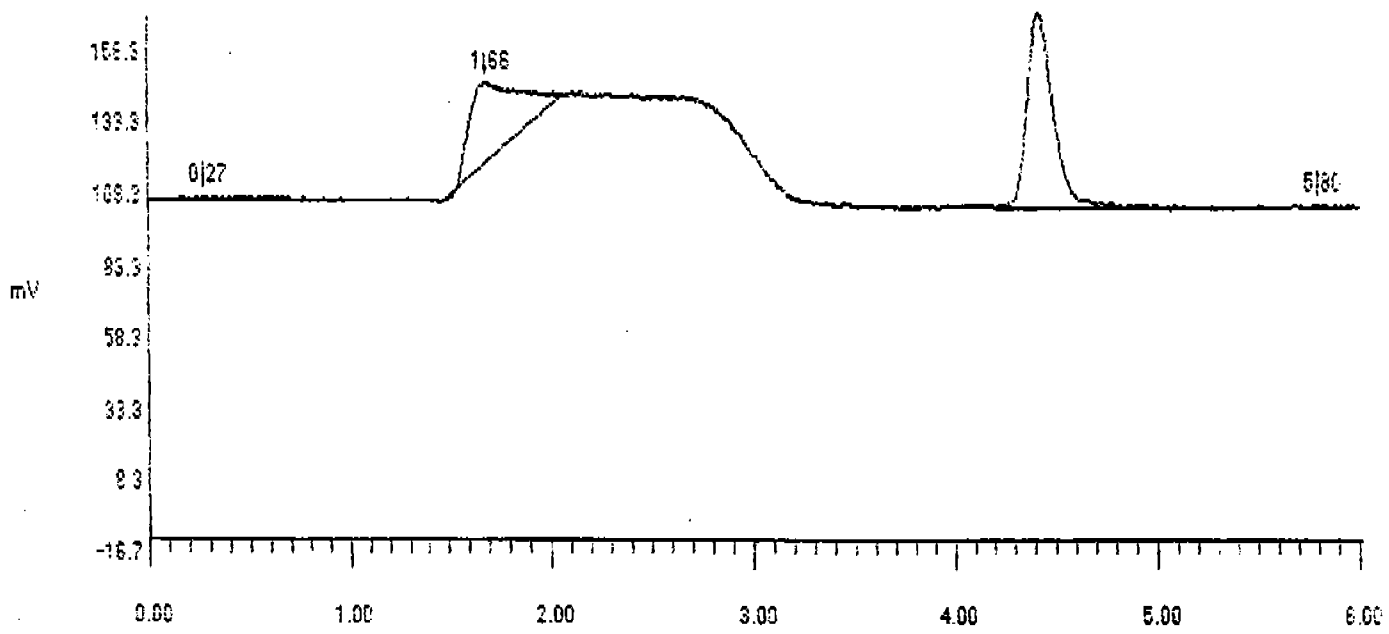
Custom Report Title of your choice

Sample Name: 0.5_PPB_STD	Date: Sat Jun 22 09:12:38 19[illegible]
Data File : C:\DX\DATA\metals\622CR001.D11	
Method : C:\DX\METHOD\MCLAREN.MET	
ADC Address: 1 System : 2 Inject#: 11 Detector: VDM-1	

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Peak Num	Ret Time	Component Name	Concentration	Height	Area	DL	%Delta
1	0.27	MATRIX	0.000	890	20378	1	-16.11
2	1.69		0.000	27856	449319	1	
3	4.42	HEX. CHROME	0.531	67314	616320	1	0.00

File: C:\DX\DATA\metals\622CR001.D11 Sample: 0.5_PPB_STD



Custom Report Title of your choice

Sample Name: 18817/C2-1A	Date: Thu Jun 20 10:59:06 19[illegible]
Data File : C:\DX\DATA\metals\620CR001.D08	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 8	Detector: VDM-1

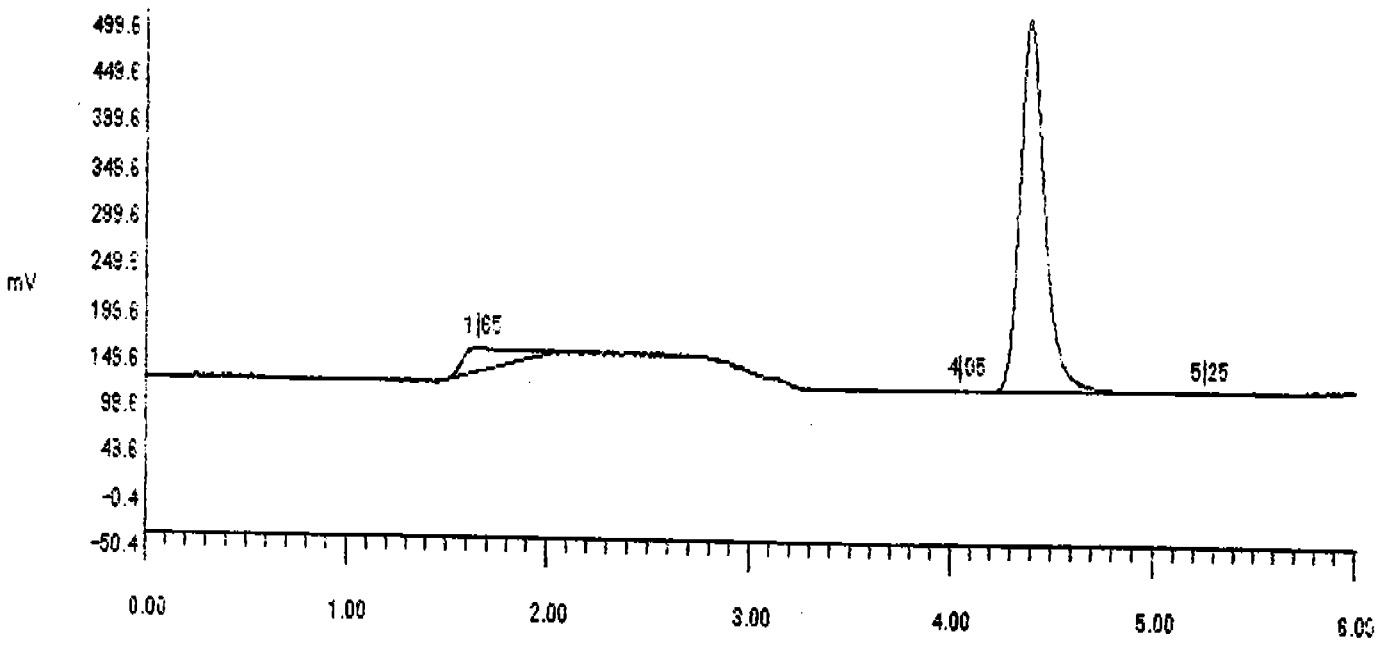
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	25558	391507	1	
3	4.38	HEX. CHROME	2.477	386938	3313301	1	0.0[illegible]

File: C:\DX\DATA\metals\620CR001.D08 Sample: 18817/C2-1A



Custom Report Title of your choice

6-20-91

Sample Name: 11817/C2-2A	Date: Thu Jun 20 11:08:32 1991
Data File : C:\DX\DATA\metals\620CR001.D09	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 9 Detector: VDM-1

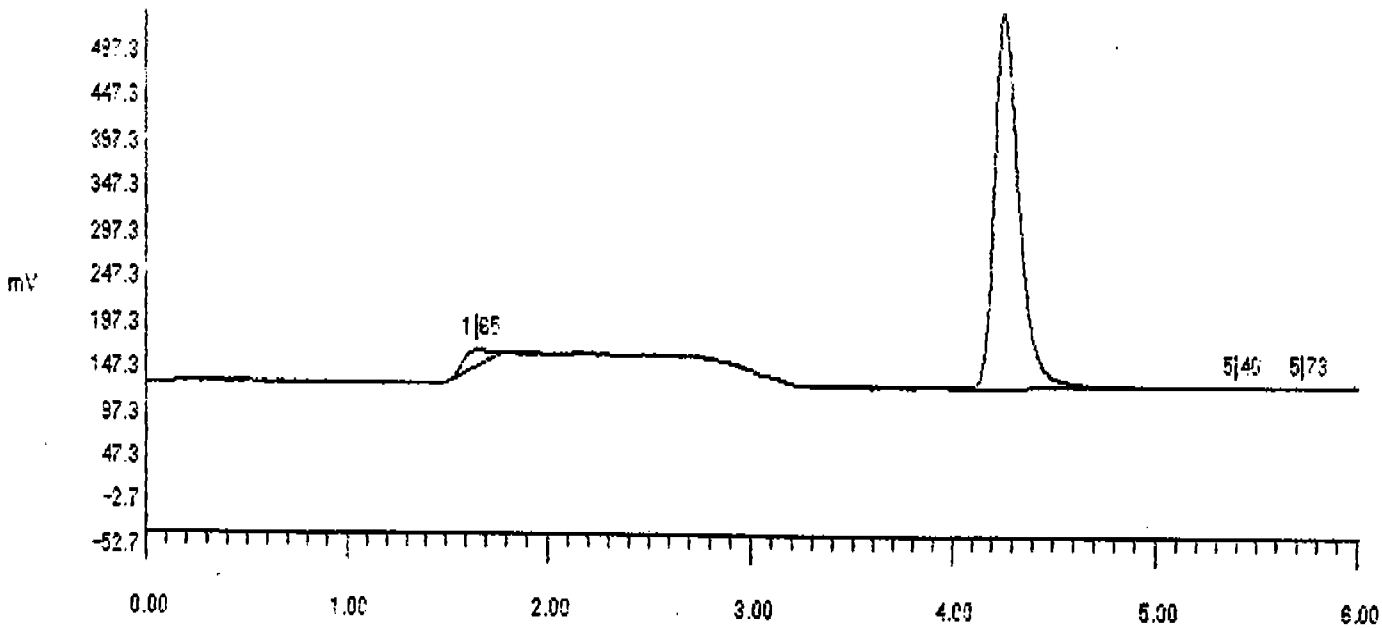
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.30	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	18553	164333	1	
2	4.27	HEX. CHROME	2.574	412549	3441361	1	0.0

File: C:\DX\DATA\metals\620CR001.D09 Sample: 11817/C2-2A



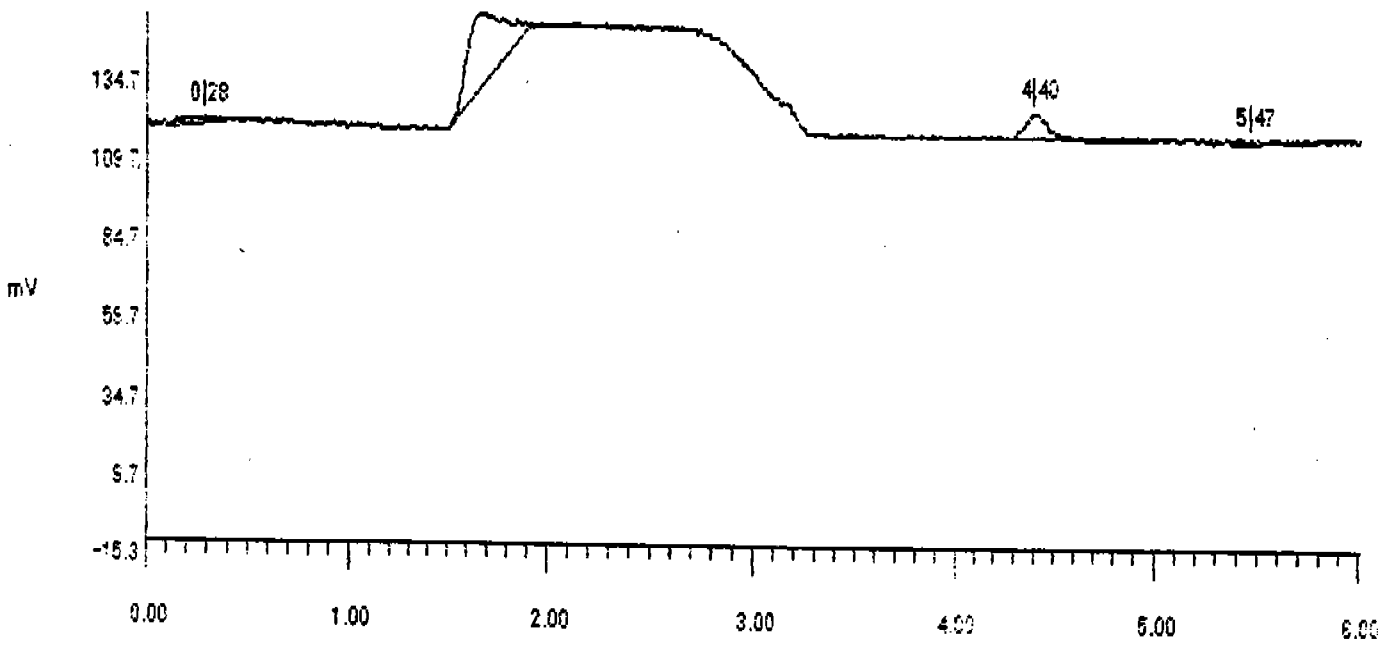
Custom Report Title of your choice

Sample Name: C2-BLANK-A	Date: Thu Jun 20 11:17:58 1991
Data File : C:\DX\DATA\metals\620CR001.D10	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 10 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.28	MATRIX	0.000	1231	14328	1	-9.85
2	1.68		0.000	21658	285730	1	
3	4.40	HEX. CHROME	0.043	8100	83981	1	0.00
4	5.47		0.000	858	10455	1	

File: C:\DX\DATA\metals\620CR001.D10 Sample: C2-BLANK-A



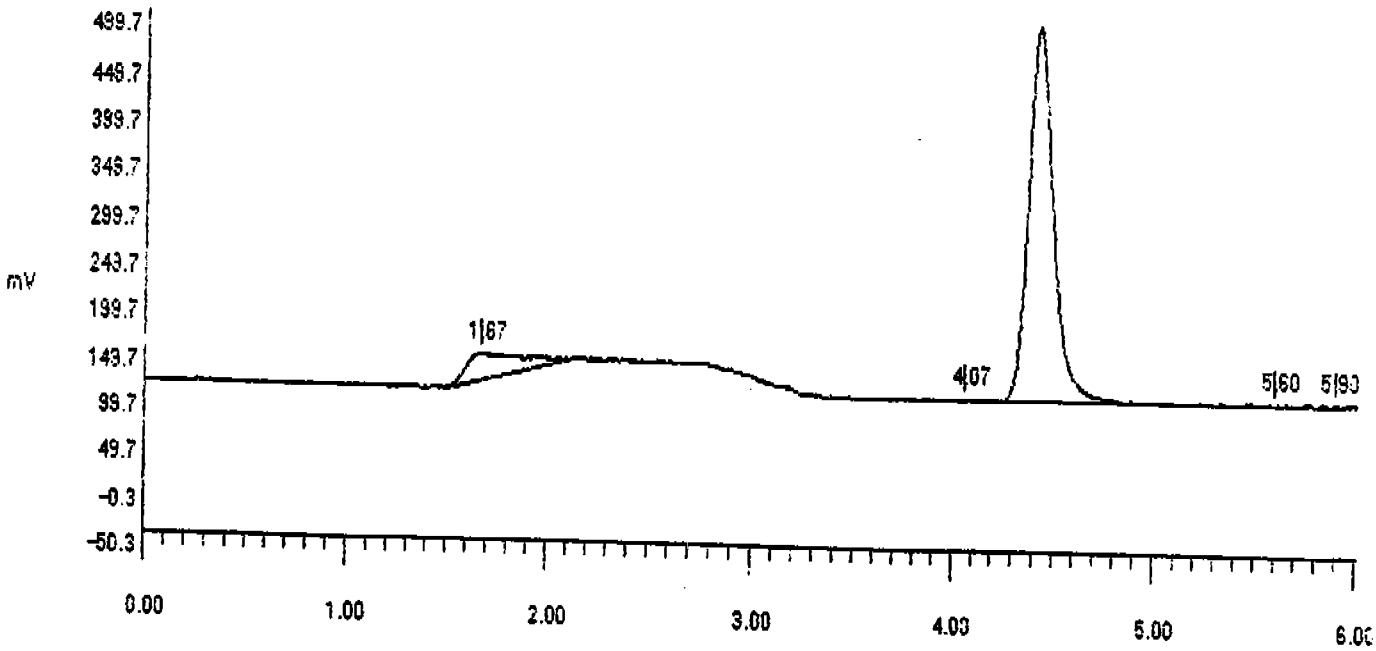
Custom Report Title of your choice

```
==================================================================================
| Sample Name: 18817/C2-2A DUP                          Date: Thu Jun 20 11:27:29 19-1|
| Data File  : C:\DX\DATA\metals\620CR001.D11                                     |
| Method     : C:\DX\METHOD\MCLAREN.MET                                           |
| ACI Address: 1        System : 2        Inject#:  11  Detector: VDM-1          |
==================================================================================
*********************  PEAKS NOT FOUND IN THIS RUN  *********************
Name                Adjusted Ret Time   Reference Peak
-------------------------------------------------------
MATRIX                   0.32                2
```

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	26874	467160	1	
2	4.07		0.000	1471	11948	2	
3	4.42	HEX. CHROME	2.520	393110	3370046	2	0.0

File: C:\DX\DATA\metals\620CR001.D11 Sample: 18817/C2-2A DUP



Custom Report Title of your choice

Sw 6-20-97

Sample Name:	18817/C2-2A 10 PPB MS
Data File :	C:\DX\DATA\metals\620CR001.D12
Method :	C:\DX\METHOD\MCLAREN.MET
ACI Address: 1	System : 2

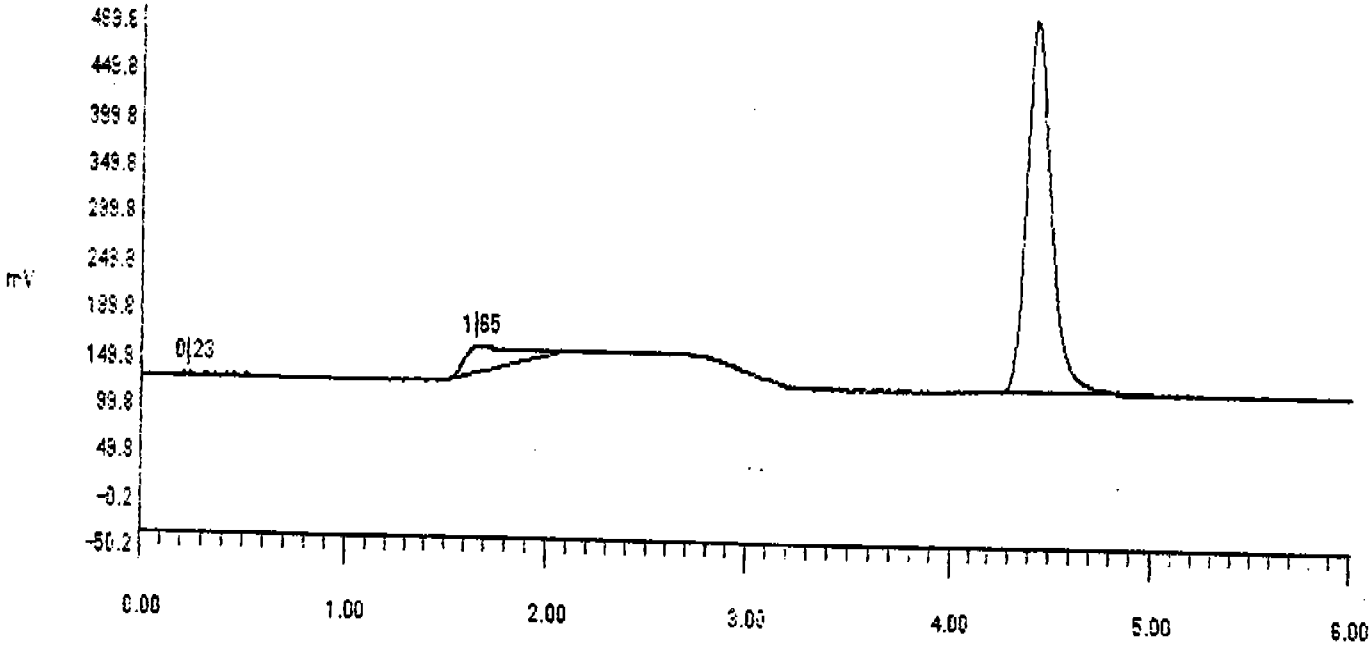
Date: Thu Jun 20 11:36:56 1997

Inject#: 12 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.23	MATRIX	0.000	1290	30201	1	-26.04
2	1.65		0.000	28228	471574	1	
3	4.42	HEX. CHROME	12.312	379893	3293814	1	0.00

File: C:\DX\DATA\metals\620CR001.D12 Sample: 18817/C2-2A 5 PPM MS



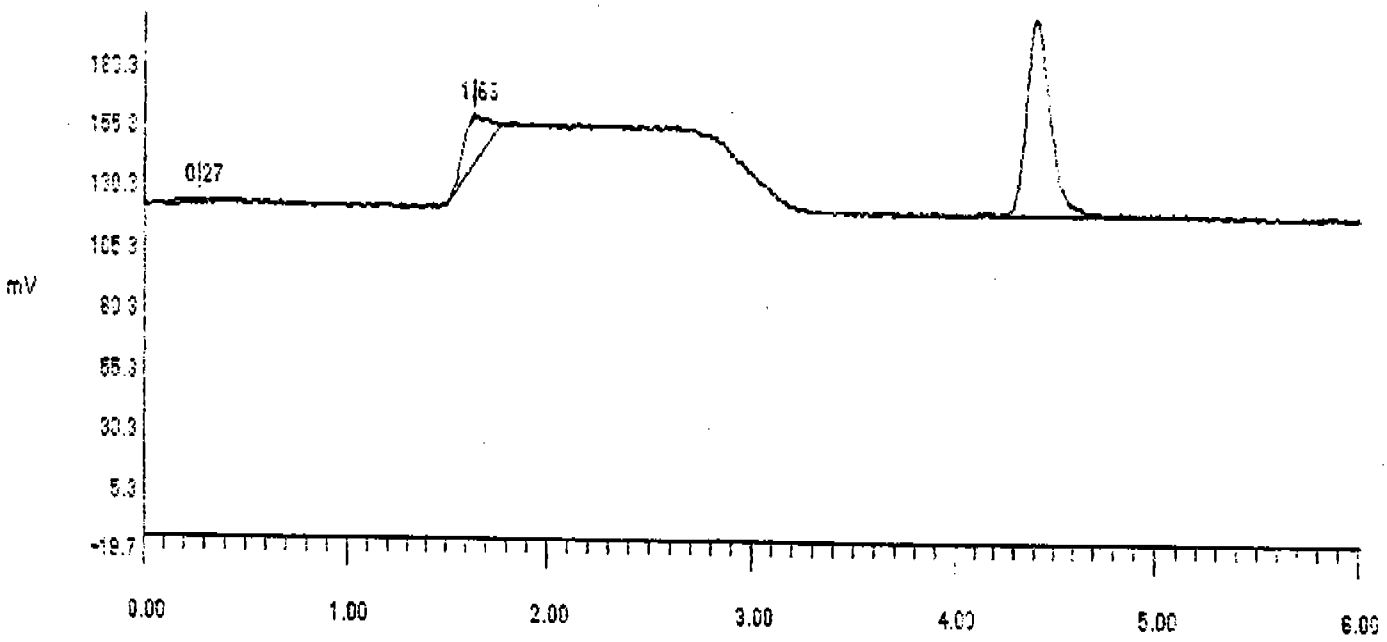
Custom Report Title of your choice

Sample Name: 18817/C2-2A	Date: Thu Jun 20 12:05:14 1991
Data File : C:\DX\DATA\metals\620CR001.D15	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 15 Detector: VDM-1	

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.27	MATRIX	0.000	1825	14479	1	-15.15
2	1.63		0.000	20034	163161	1	
3	4.40	HEX. CHROME	2.485	80161	686760	1	0.00

File: C:\DX\DATA\metals\620CR001.D15 Sample: 18817/C2-2A



Custom Report Title of your choice

Sample Name: 18817/C2-2A + 2.5 PPB Date: Thu Jun 20 12:14:40 1991
Data File : C:\DX\DATA\metals\620CR001.D16
Method : C:\DX\METHOD\MCLAREN.MET
ACI Address: 1 System : 2 Inject#: 16 Detector: VDM-1

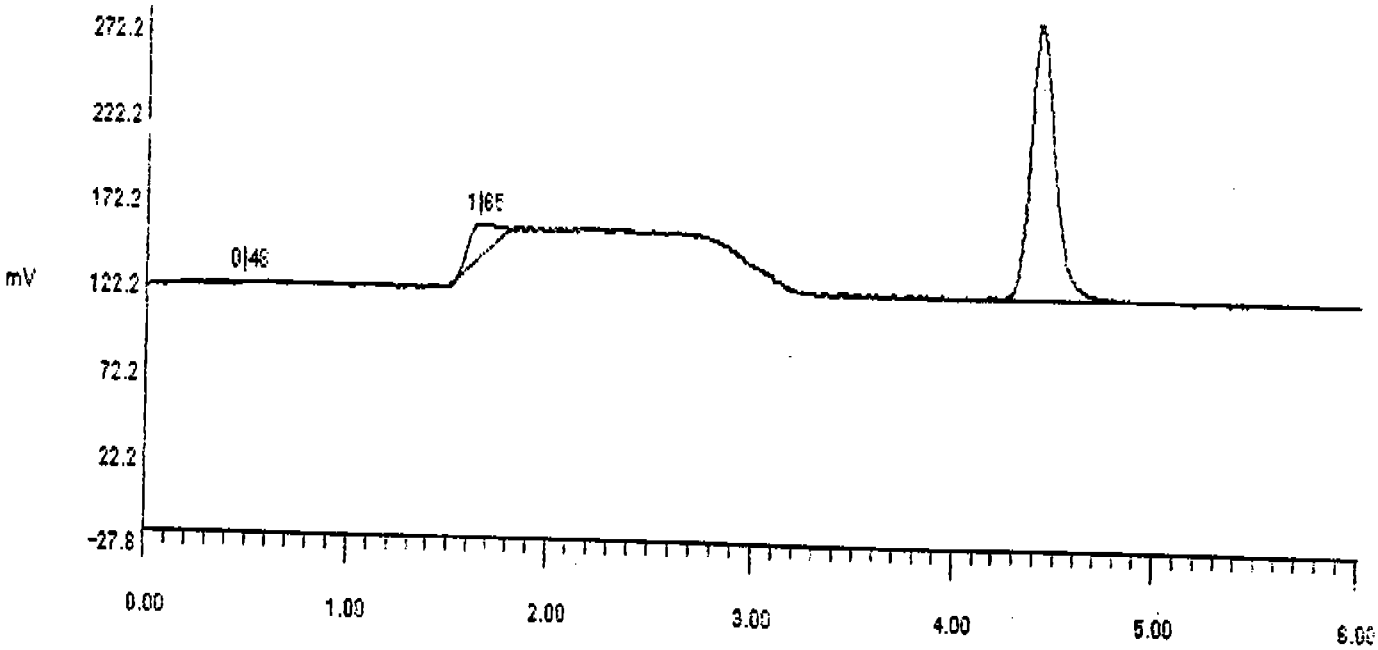
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.48		0.000	966	31461	1	
2	1.65		0.000	18811	175227	1	
3	4.40	HEX. CHROME	4.969	153134	1345711	1	0.0

File: C:\DX\DATA\metals\620CR001.D16 Sample: 18817/C2-2A + 0.5 PPM



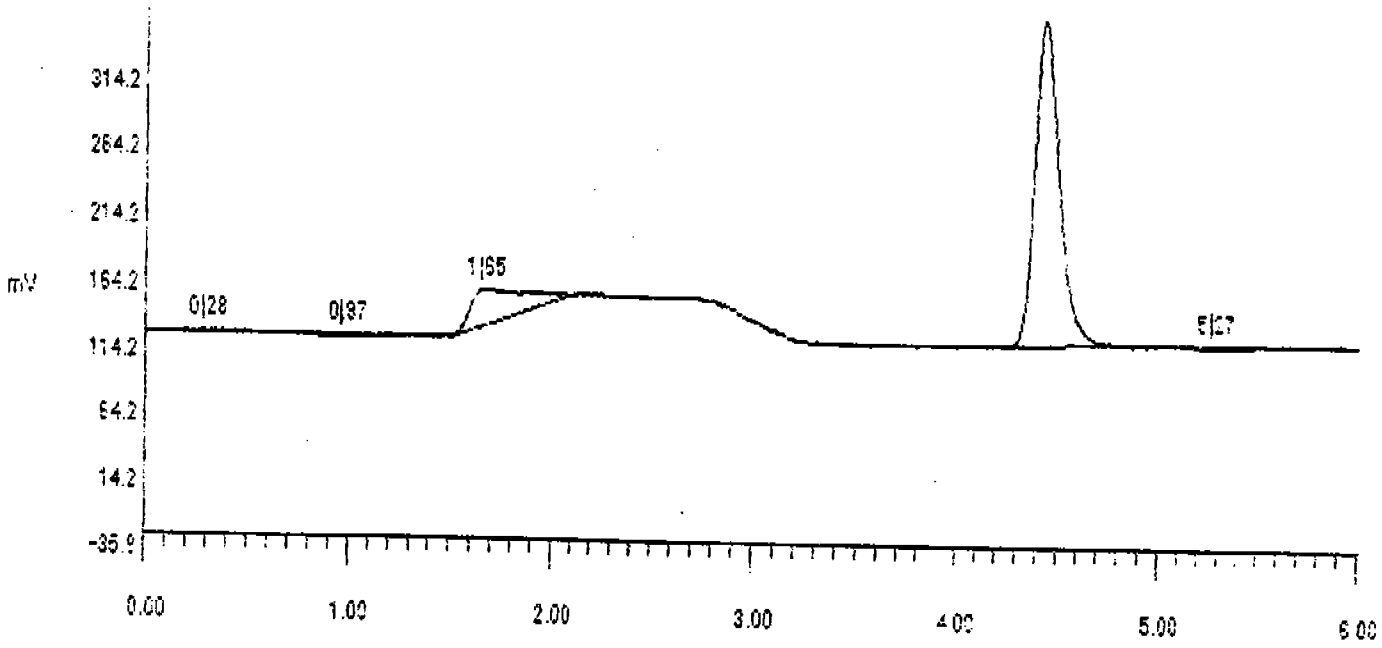
Custom Report Title of your choice

Sample Name: 18817/C2-2A + 5.0 PPB Date: Thu Jun 20 12:24:08 1991
Data File : C:\DX\DATA\metals\620CR001.D17
Method : C:\DX\METHOD\MCLAREN.MET
ADI Address: 1 System : 2 Inject#: 17 Detector: VDM-1

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	5	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	0.28	MATRIX	0.000	1139	18434	1	-10.57
3	1.65		0.000	28058	453165	1	
4	4.43	HEX. CHROME	7.669	241340	2061965	1	0.01
5	5.27		0.000	1289	18100	1	

File: C:\DX\DATA\metals\620CR001.D17 Sample: 18817/C2-2A + 1.0 PPM



Enter Report Title of your choice

Sample Name: 18817/C2-2A + 10.0 PPB
Data File : C:\DX\DATA\metals\620CR001.D18 Date: Thu Jun 20 12:33:3[illegible]
Method : C:\DX\METHOD\MCLAREN.MET
ACC Address: 1 System : 2 Inject#: 18 Detector: VDM-1

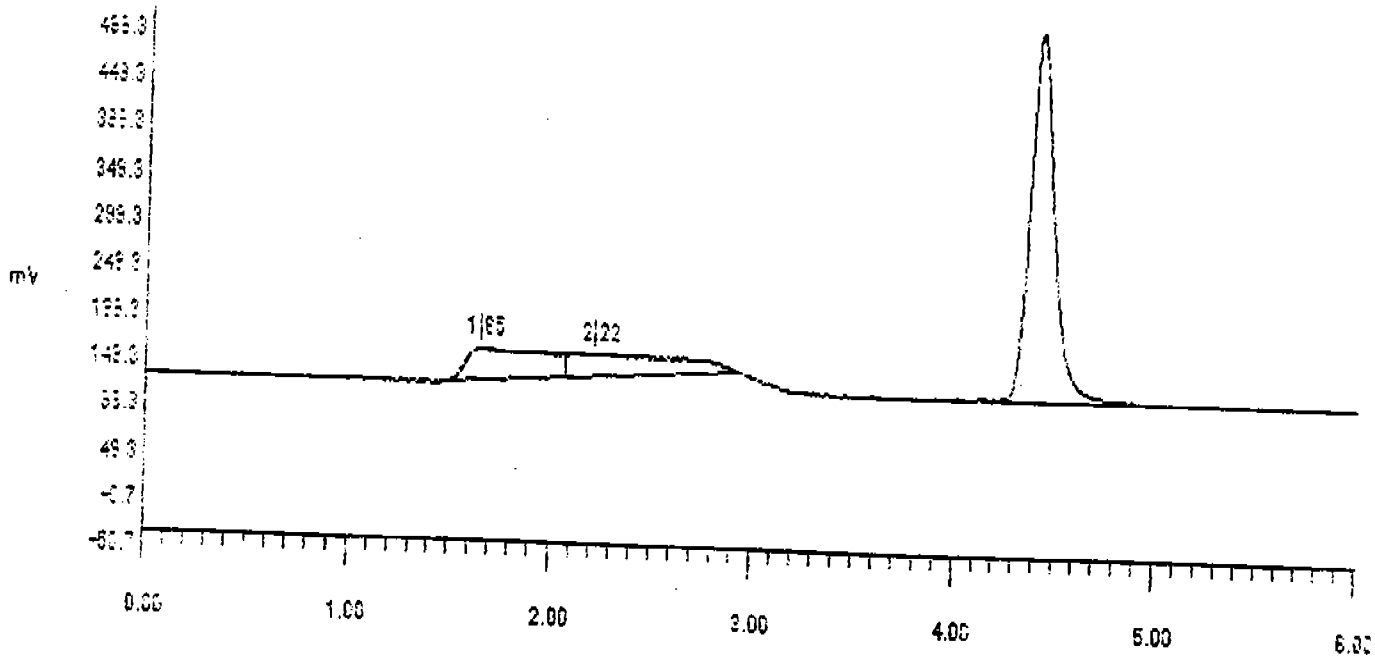
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

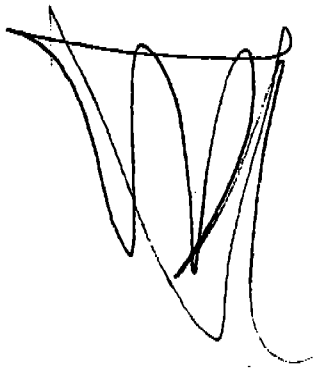
REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REQ
External	1	5	1808	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.65		0.000	35065	897035	2	
2	2.22		0.000	23845	899253	2	
3	4.40	HEX. CHROME	12.448	379988	3329795	1	0.0[illegible]

File: C:\DX\DATA\metals\620CR001.D18 Sample: 18817/C2-2A + 2.0 PPM



D



E

C

APPENDIX C

Equipment Calibration Records

PES

METER BOX TEMPRATURE READOUT CALIBRATION

CALIBRATED BY: [illegible]

DATE: 4-17-91

	Inlet (°F)	Outlet (°F)	Thermometer (°F)
BOX 1A	85	85	86 (30° C)
	205	205	205 (96° C)
	31	32	32 (0° C)
BOX 2A	85	84	86 (30° C)
	202	204	203 (95° C)
	31	32	32 (0° C)

EVER READY THERMOMETER CO., INC.
401 PARK AVENUE SOUTH
NEW YORK, NY 10016

REPORT OF CALIBRATION

LIQUID-IN-GLASS-THERMOMETER

CALIBRATED BY EVER READY THERMOMETER CO.

MARKED: ERTCO 611-3FC S/N-2269
RANGE: -20 TO +110 DEGREES C IN 1 DEGREE GRADUATIONS.

THERMOMETER READING	CORRECTION (ITS-90)**
0.0 C	0.0 C
37.0	-0.1
56.0	0.0

** ALL TEMPERATURES IN THIS REPORT ARE BASED ON THE INTERNATIONAL TEMPERATURE SCALE OF 1990 (ITS-90) PUBLISHED IN THE METROLGIA 27, NO. 1, 3/10/90.

THIS THERMOMETER WAS CALIBRATED AGAINST A STANDARD CALIBRATED AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) FORMERLY THE NATIONAL BUREAU OF STANDARDS (NBS).

FOR A DISCUSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS MONOGRAPH 150.

IF NO SIGN IS GIVEN ON THE CORRECTION, THE TRUE TEMPERATURE IS HIGHER THAN THE INDICATED TEMPERATURE; IF THE SIGN GIVEN IS NEGATIVE, THE TRUE TEMPERATURE IS LOWER THAN THE INDICATED TEMPERATURE. TO USE THE CORRECTIONS PROPERLY, REFERENCE SHOULD BE MADE TO THE NOTES GIVEN BELOW.

THE THERMOMETER WAS TESTED IN A LARGE, CLOSED-TOP, ELECTRICALLY HEATED, LIQUID BATH, BEING "IMMERSED" 76MM. THE TEMPERATURE OF THE ROOM WAS ABOUT 25 DEGREES C (77 DEGREES F). IF THE THERMOMETER IS USED UNDER CONDITIONS WHICH WOULD CAUSE THE AVERAGE TEMPERATURE OF THE EMERGENT LIQUID COLUMN TO DIFFER MARKEDLY FROM THAT PREVAILING IN THE TEST, APPRECIABLE DIFFERENCES IN THE INDICATIONS OF THE THERMOMETER WOULD RESULT.

THE TABULATED CORRECTIONS APPLY PROVIDED THE ICE POINT READING IS 0.0 DEGREES C. IF THE ICE-POINT READING IS FOUND TO BE HIGHER (OR LOWER) THAN STATED, ALL OTHER READINGS WILL BE HIGHER (OR LOWER) TO THE SAME EXTENT.

TEST NUMBER: 140381
DATE: 06/21/90
STANDARD SERIAL NO. 128239
NIST IDENTIFICATION NO. 88024

EVER READY THERMOMETER CO.

NONISOLATED TYPE S

PITOT TUBE CALIBRATION DATA SHEET

Calibrated By: SIYA MOKH

Date: 8-29-90

Pitot I.D. No.: S-3B

Effective Length: 29"

Pitot Tube Assembly Level? Yes ✓ No ____

Pitot Tube Openings Damaged? Yes (explain below) ____ No ✓

α_1 = 0 ° (<10°) α_2 = 0 ° (<10°)

β_1 = 1.0 ° (<5°) β_2 = 1.50 ° (<5°)

γ = 1.0 ° θ = 0 ° A = 1.111 °

Z = A sin γ = 0.02 cm (in.) 0.32 cm (<1/8 in.)

W = A sin θ = 0 cm (in.) 0.08 cm (<1/32 in.)

P_A = 0.557 cm (in.)

P_B = 0.553 cm (in.)

D_t = 0.373 cm (in.)

ASSEMBLY: X = in. (≥ 0.75 in. for D_n = 0.5 in.)

W = in. (≥ 3 in.) & Z = in. (≥ 0.75 in) -OR- Z = in. (≥ 2 in.)

Y = in. (≥ 3 in.)

Calibration Required? Yes ____ No ✓

SOURCE SAMPLING NOZZLE CALIBRATION

CALIBRATED/UPDATED BY: [illegible]

DATE: 6-4-91

NOZZLE ID #	READING (INCHES) 1	2	3	AVERAGE DIAMETER	SHAPE	COMMENTS
02P	0.300	0.298	0.299	0.299	CURVED	
03P	0.304	0.298	0.299		CURVED	CHIPPED
04P	0.399	0.397	0.399	0.398	CURVED	
06P	0.503	0.505	0.504	0.504	B.H.	
07Q	0.264	0.264	0.260	0.263	90	
08P	0.367	0.369	0.368	0.368	CURVED	
09P	0.366	0.366	0.366	0.366	CURVED	
10Q	0.380	0.382	0.379	0.380	90	
11P	0.497	0.497	0.498	0.497	CURVED	
12Q	0.382	0.382	0.384	0.383	90	
14P	0.299	0.303	0.299	0.300	CURVED	
16	0.496	0.497	0.495	0.496	CURVED	
17P	0.494	0.494	0.496	0.495	CURVED	
18P	0.496	0.495	0.497	0.496	CURVED	
19Q	0.261	0.262	0.259	0.261	90	
21S	0.367	0.363	0.367	0.366	B.H.	
22S	0.498	0.498	0.499	0.498	B.H.	
23S	0.248	0.246	0.247	0.247	B.H.	
24Q	0.516	0.515	0.516	0.515	90	
25Q	0.385	0.384	0.385	0.385	90	
26S	0.490	0.489	0.487	0.489	B.H.	
28PB	0.429	0.430	0.433	0.431	B.H.	
30PB	0.808	0.797	0.806		B.H.	
38PB	0.801	0.807	0.804		B.H.	
40P	0.224	0.224	0.222	0.223	90	
41P	0.222	0.223	0.222	0.222	90	
45PB	0.375	0.379	0.375	0.376	B.H.	
46PB	0.383	0.382	0.386	0.384	B.H.	
47PB	0.246	0.248	0.245	0.246	B.H.	
112	0.374	0.374	0.375	0.374	B.H.	
O	0.142	0.141	0.140	0.141	B.H.	
O1	0.141	0.142	0.141	0.141	B.H.	
O2	0.141	0.141	0.142	0.141	B.H.	

Dick Munns Company

LIQUID AND GAS - FLOWMETER CALIBRATION SERVICE

Phone (213) 596-1559 • FAX (714) 827-0823 • 10571 Calle Lee—133 • Los Alamitos, CA 90720

Certificate

CUSTOMER PACIFIC ENVIRONMENTAL SERVICES, INC.		TYPE OF INSTRUMENT: P.D. Meter	
		FLUID: Air @ 14.7 PSIA & 70°F.	
DATE 6-4-91	CALIBRATION INTERVAL 12 months	BAROMETER	HUMIDITY
SERIAL NO. 25507	ASSET NO.	MODEL 190 CFH	MANUFACTURER Rockwell
RATED ACCURACY ± .5%	TEST UNITS A-3 & A-54	N.I.S.T. M-0122	TEST RESULTS ☒ AS RECEIVED ☐ ADJUSTED

INDICATED	ACTUAL		
S.C.F.M.	S.C.F.M.		
.102	.101		
.200	.200		
.276	.275		
.713	.714		
1.225	1.226		
1.740	1.720		
2.672	2.684		
3.350	3.362		

ALL TEST UNITS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS & TECHNOLOGY AS PER MIL-STD-45662 A.

TECHNICIAN RM	APPROVED BY S Munns

DRY GAS METER AND ORIFICE CALIBRATION

Dry Gas Meter No. 1042485 Meter Box No. 1A Reference Dry Gas Meter No. 25507 Rockwell

Barometric Pressure 29.5 Calibration Date 06-24-91 Calibration Performed By:

Orifice Manometer Setting H="H2O	Initial Reference DGM Reading V=ft3	Final Reference DGM Reading V=ft3	Reference Gas Volume Vr=ft3	Initial DGM Reading V=ft3	Final DGM Reading V=ft3	Test DGM Volume Vd=ft3	Temperature: Reference DGM tr=F	Temperature: Box DGM Inlet t=F	Temperature: Box DGM Outlet t=F	Temperature: Box DGM Average td	Run Time Min.	Flow Rate Q=cfm	Meter Gamma	HH
0.5	0.000	0.000	0	0.000	0.000	0.000	0	0	0	0	0	ERR	ERR	ERR
1.0	84.529	90.009	5.48	935.621	941.146	5.525	77	97	87	92	10	0.53	1.017	1.869

Sample Name Title of your choice

Sample Name: 18039/HELO-4A	Date: Fri Jun 21 16:03:53 199[illegible]
Data File : C:\DX\DATA\metals\621CR001.D10	
Method : C:\DX\METHOD\MCLAREN.MET	
Acq. Schedule: 1 System : 2 Inject#: 10 Detector: VDM-1	

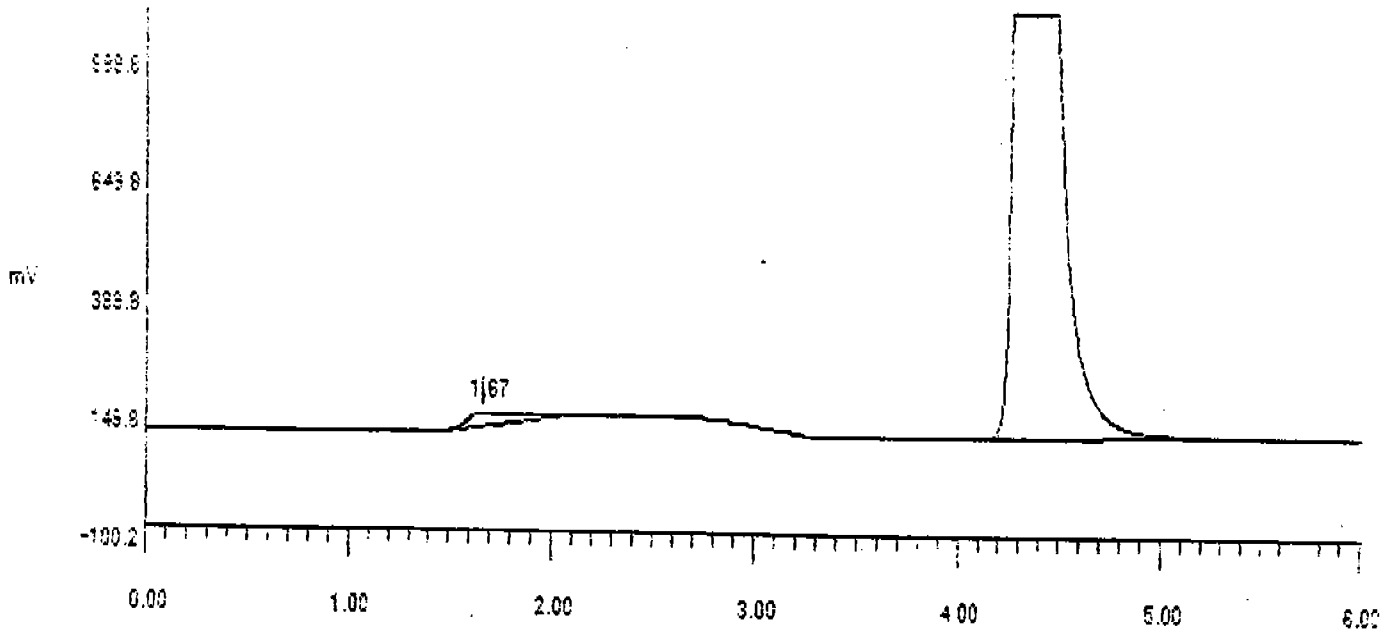
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1005	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	37502	474726	i	
2	4.30	HEX. CHROME	14.522	895895	17000220	i	0.0[illegible]

File: C:\DX\DATA\metals\621CR001.D10 Sample: 18039/HELO-4A



Custom Report Title of your choice

DATA REPROCESSED ON Fri Jun 21 16:10:50 1991

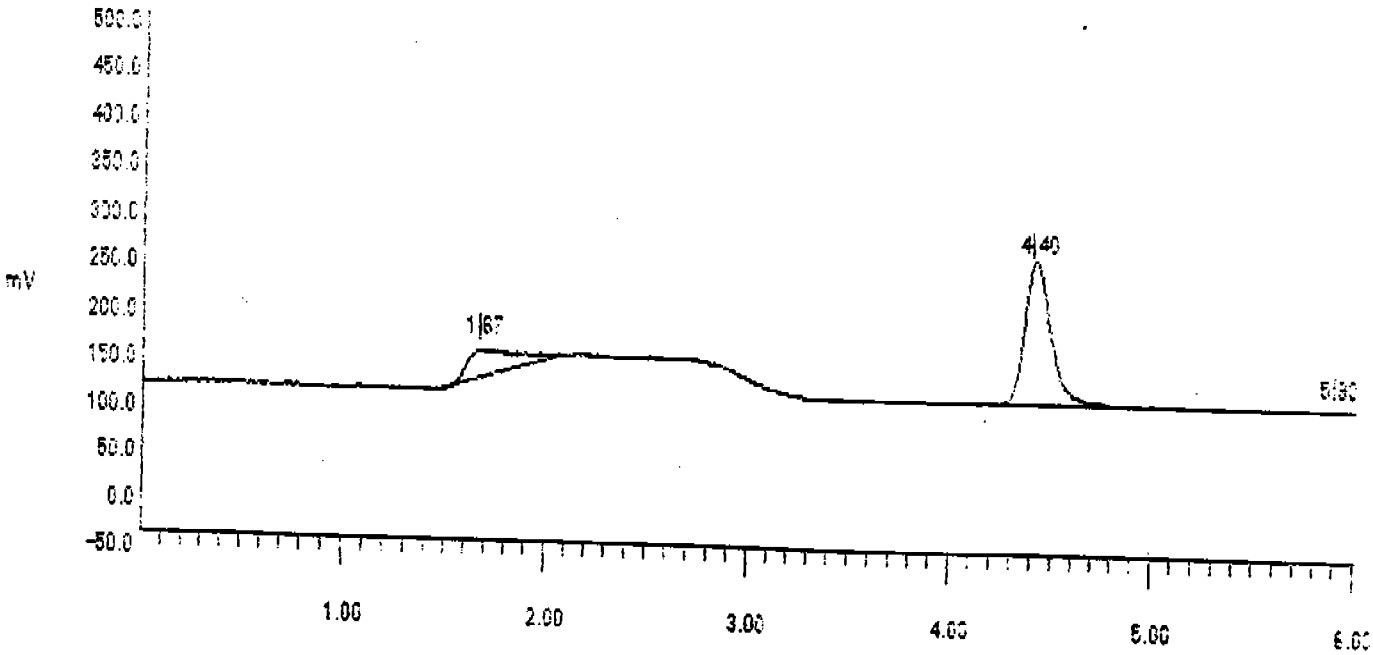
```
==================================================================================
| Sample Name: 1.0_PPB_ICV                                                       |
| Data File  : C:\DX\DATA\METALS\621CR001.D07          Date: Fri Jun 21 15:35:31 1991 |
| Method     : C:\DX\METHOD\MCLAREN.MET                                          |
| ACI Address: 1        System : 2        Inject#:   7   Detector: VDM-1        |
==================================================================================
*********************** PEAKS NOT FOUND IN THIS RUN ***********************
```

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Dev
1	1.67		0.000	28282	420522	1	
2	4.40	HEX. CHRUME	1.093	143249	1308084	1	0.[illegible]

File: C:\DX\DATA\METALS\621CR001.D07 Sample: 1.0_PPB_ICV



Custom Report Title of your choice

Sample Name: 18839/HELO-SCRUBBER	Date: Fri Jun 21 16:13:23 19[illegible]
Data File : C:\DX\DATA\metals\621CR001.D11	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2 Inject#: 11 Detector: VDM-1	

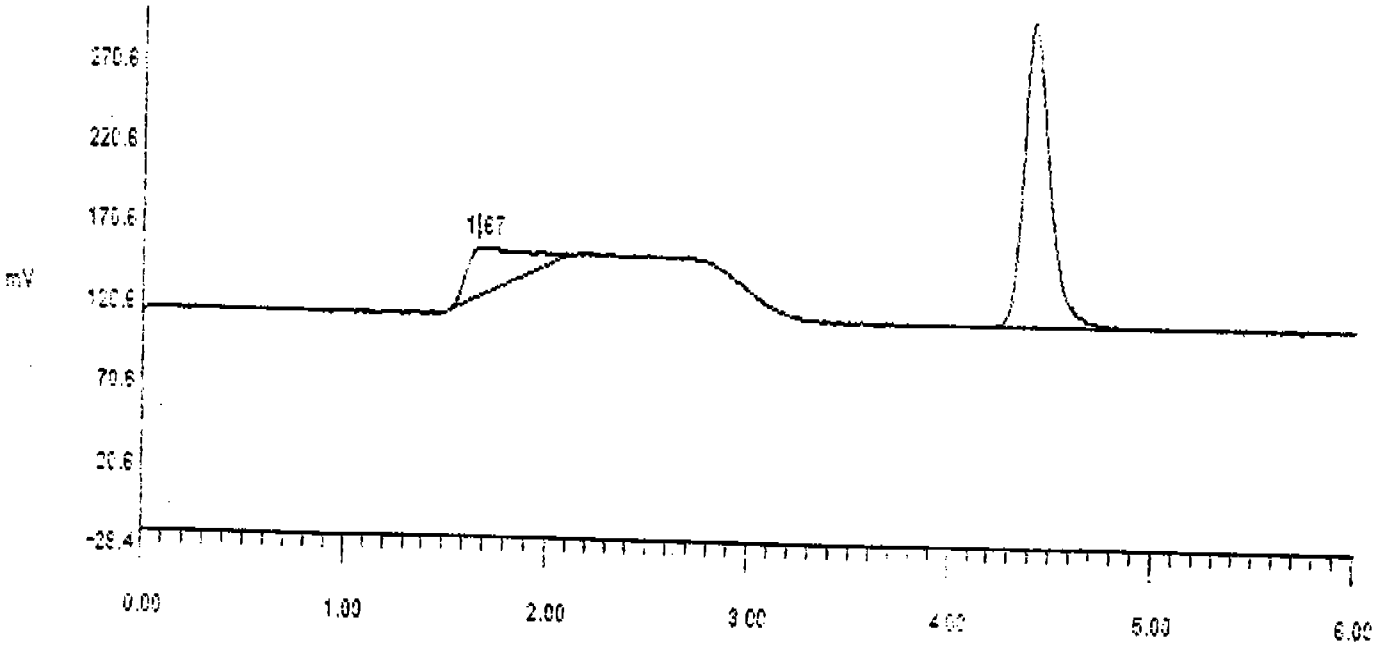
********** PEAKS NOT FOUND IN THIS R[illegible] **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.32	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	100000	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	25348	490210	1	
2	4.42	HEX. CHROME	137946.930	181219	1642313	1	0.0[illegible]

File: C:\DX\DATA\metals\621CR001.D11 Sample: 18839/HELO-SCRUBBER



Custom Report Title of your choice

Sample Name: 18839/HELO-BLANK A	Date: Fri Jun 21 16:22:45 1[illegible]
Data File : C:\DX\DATA\metals\621CR001.D12	
Method : C:\DX\METHOD\MCLAREN.MET	
ADI Address: 1 System : 2	Inject#: 12 Detector: VDM-1

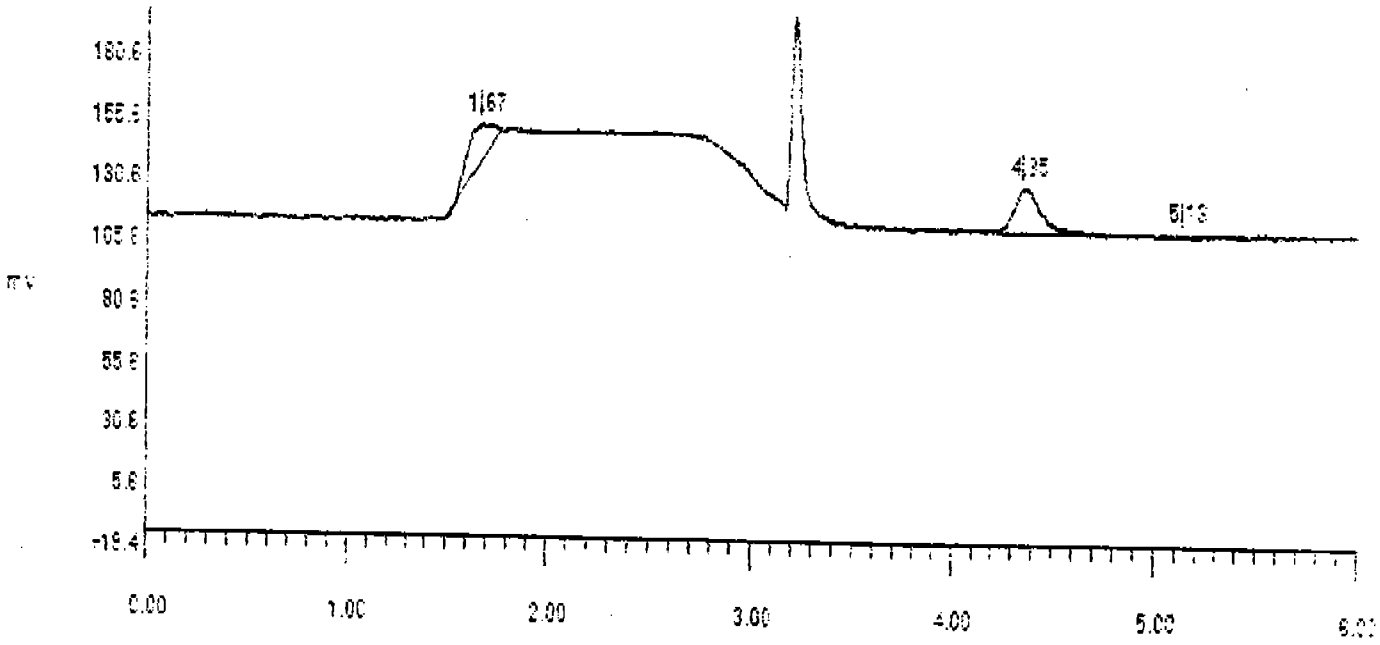
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA	REJ
External	1	1	1805	5Hz	0.00	6.02	10000	

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	14409	134359	1	
2	4.35	HEX. CHROME	0.115	17253	164456	1	0.0[illegible]

File: C:\DX\DATA\metals\621CR001.D12 Sample: 18839/HELO-BLANK A



Custom Report Title of your choice

Sample Name: 18839/1 DNS 0070	Date: Fri Jun 21 16:32:14 1994
Data File : C:\DX\DATA\metals\621CR001.D13	
Method : C:\DX\METHOD\MCLAREN.MET	
ACI Address: 1 System : 2	Inject#: 13 Detector: VDM-1

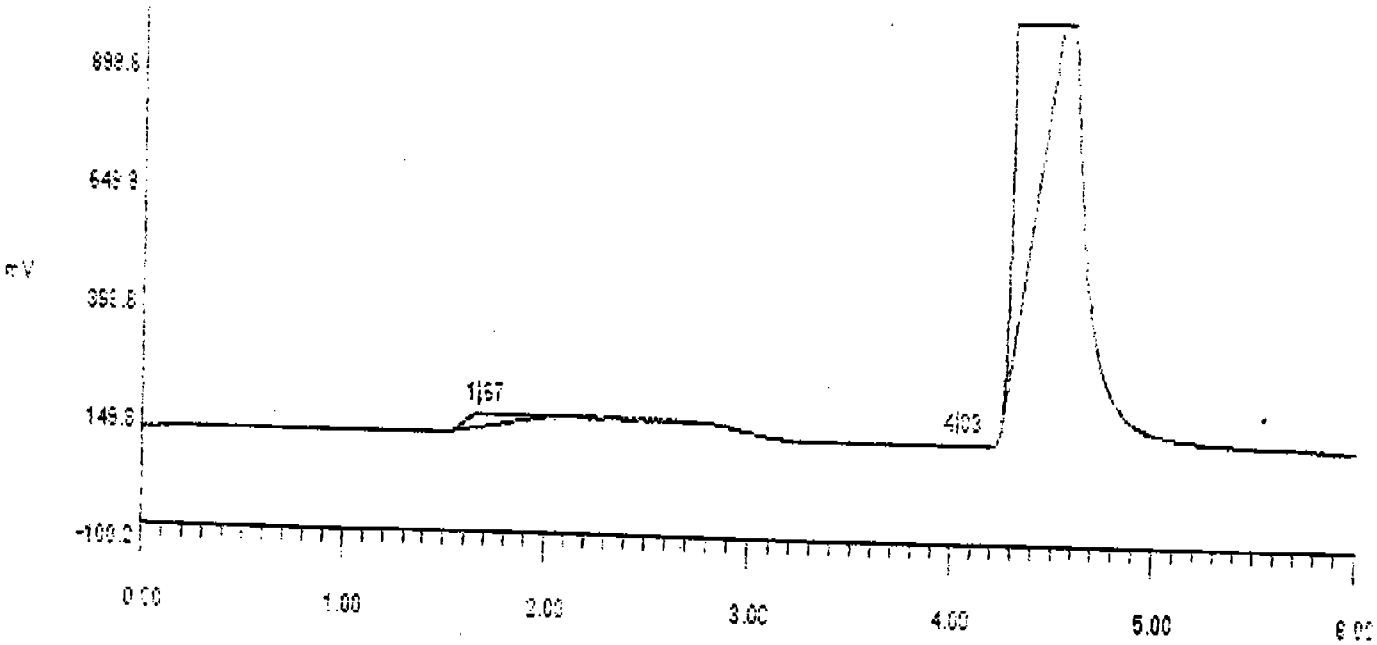
********** PEAKS NOT FOUND IN THIS RUN **********

Name	Adjusted Ret Time	Reference Peak
MATRIX	0.31	2

REPORT	VOLUME	DILUTION	POINTS	RATE	START	STOP	AREA REJ
External	1	1	1805	5Hz	0.00	6.02	10000

Pk. Num	Ret Time	Component Name	Concentration	Height	Area	BL	%Delta
1	1.67		0.000	29483	454701	1	
3	4.32	HEX. CHROME	4.639	650882	5451965	1	0.0

File: C:\DX\DATA\metals\621CR001.D13 Sample: 18839/1 DNS 0070



Source category: Electroplating
Plant name : NAS North Island NADEP
Process : Chromic acid anodizing

Filename: REF_4-86.WQ1
Location: San Diego, CA
Test date: 6/18-20/91

Date: 04/17/96
Ref. No.: 4-86
Process rate basis: Tank surface area

Tank type	Type of control	Pollutant	Run No.	Test Meth.	Samp. time, min	Isokin. %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, ug	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ft2	Emission factor g/hr-m2	Emission factor gr/hr-ft2	Rat.
Chromic acid anodizing tank	PBS	total Cr	1	CARB 425	120	103.0	100.00	46,860	23.09	3.56E-06	0.0014	73	0.096	0.14	
		total Cr	2		120	102.0	98.40	46,570	13.50	2.12E-06	0.00085	73	0.057	0.082	
		total Cr	3		120	95.6	92.90	46,940	5.49	9.12E-07	0.00037	73	0.025	0.035	
		Average								2.20E-06			0.059	0.085	B
		Cr+6	1	CARB 425	120	103.0	100.00	46,860	2.30	3.55E-07	0.00014	73	0.0096	0.014	
		Cr+6	2		120	102.0	98.40	46,570	2.70	4.23E-07	0.00017	73	0.011	0.016	
		Cr+6	3		120	95.6	92.90	46,940	3.90	6.48E-07	0.00026	73	0.018	0.025	
		Average								4.75E-07			0.013	0.018	B
Chromic Acid anodizing	PBS	total Cr	2	CARB 425	120	101.5	107.30	856	2.60	3.74E-07	2.7E-06	31	0.00043	0.00061	
		total Cr	3		120	98.9	105.50	955	3.96	5.79E-07	4.7E-06	31	0.00074	0.0011	
		total Cr	4		120	98.4	96.00	873	35.70	5.74E-06	4.3E-05	31	0.0067	0.0096	
		Average								2.23E-06			0.0026	0.0038	C
		Cr+6	2	CARB 425	120	101.5	107.30	856	0.86	1.24E-07	9.1E-07	31	0.00014	0.00020	
		Cr+6	3		120	98.9	105.50	955	2.20	3.22E-07	2.6E-06	31	0.00041	0.00059	
		Cr+6	4		120	98.4	96.00	873	27.20	4.37E-06	3.3E-05	31	0.0051	0.0073	
		Average								1.61E-06			0.0019	0.0027	C

Notes: Run No. 1 on Helo Blade line not reported due to process upset.Scrubber malfunction on run 4 on helo tank; results not valid.
Scrubber malfunction on Run No. 4 on Helo Blade line; results not valid.
Tank surface area taken from reports (Ref. 83, 84) of other tests at facility.
Same sources as Ref. 83, 84.