FLD981932494

Universal Waste & Transit, Inc.

Operation Permit Application

Located at:
2002 North Orient Road
Tampa, Florida 33619
(813) 623-5302

Volume 3

- Waste Analysis Plan
- Quality Assurance Plan

UNIVERSAL WASTE & TRANSIT

WASTE ANALYSIS PLAN

FOR

STORAGE & TREATMENT FACILITY

AT

Orient Road

TAMPA, FLORIDA

RECEIVED
OCT 30 1989
HAZARDOUS WASTE
PERMITTING

VOLUME 3

WASTE ANALYSIS PLAN & QUALITY ASSURANCE PLAN

INDEX

Waste Analysis Rationale	Tab A
Frequency of Analysis	Tab B
Generator Requirements	Tab C
On-Site Waste Inspection	Tab D
Ignitable & Reactive Wastes	Tab E
Waste Sampling and Parameters	Tab F
Internal Quality Control	Tab G
Table 1: Recommended Samplers	Tab H
Table 2: Recommended Sampling Points	Tab I
Table 3: Recommended Number of Samples	Tab J
Table 4: Sample Methods	Tab K
Shipment Screening Procedures	Tab L
Request For Disposal Form	Tab M
Table 5: Material Safety Data Sheet	Tab N
Pace Laboratories QA/QC Program	Tab O
ENCON QA/QC Program	Tab P
Wadsworth Laboratories QA/QC Program	Tab Q

General Waste Analysis

Waste Analysis Rationale

Before any waste material is accepted at the Universal Waste & Transit facility a detailed chemical and physical analysis on a representative sample of the waste must be available for review by facility personnel. At a minimum this information must be in sufficient detail so as to allow the generator to complete the attached Universal Waste & Transit Request For Disposal form. **The responsibility for obtaining this analytical information rests with the generator of the waste.**

The information requested on the Universal Waste & Transit Request For Disposal form is sufficient for facility personnel to determine the following:

- whether the facility is permitted to handle the waste
- if the waste is potentially amenable to treatment
- where the waste must be stored to insure compatibility
- if the wastes require special handling
- whether sufficient storage space is available

If the generator does not supply the information required on the Universal Waste & Transit Request For Disposal form and the waste is inadvertently accepted into the facility the following steps will be taken:

- immediately contact the generator
- determine if the analytical data is available
- if it is not the waste will be rejected

Any required sampling will be performed as specified within the "Sampling Techniques" section of this document.

All required analyses will be performed in accordance with the Quality Assurance Plan as appended to this document.

Frequency Of Analyses

The generator of the waste will be required to update the Universal Waste & Transit Request For Disposal form on the following basis:

- when the process generating the waste has changed
- when plant operations have sufficiently changed to warrant concern over changing waste characteristics
- when on-site quality control (QC) samples indicate a substantial variation between the data obtained and waste identified on the manifest
- if none of the above occur the waste shall be re-analyzed at least on an annual basis

Obviously Universal Waste & Transit must rely upon the generator for information relating to changes in either processes or plant operations. If the generator fails to notify Universal Waste & Transit of any such changes or if through due diligence on the part of Universal Waste & Transit such changes are not uncovered they will be detected during routine quality control inspections. If discrepancies are discovered they will be handled as a manifest discrepancy.

Generator Requirements

Universal Waste & Transit will require all generators who intend to use this facility to submit at least the following:

- a completed Universal Waste & Transit Request For Disposal form
- a one quart (minimum) sample of any bulk waste (samples are not required for lab packs)
- all required Certification Statements as specified by the RCRA Reauthorization Act (land ban restrictions)

In lieu of the analytical data required on the Universal Waste & Transit Request For Disposal form the generator may submit a Material Safety Data Sheet(s) or analytical data obtained on a representative sample of the waste. The analytical data must be obtained from a DER or HRS certified laboratory. The laboratory must employ approved sampling and analytical techniques (as specified in 40 CFR Part 261, Appendix I. II & III).

On an annual basis all waste stream analytical data must be updated by the generator. This will include re-submission of a representative sample of the waste in question (minimum one quart sample volume).

On-Site Waste Inspection

When a waste shipment arrives at the Universal Waste & Transit facility the following steps are taken to insure its acceptability at the site:

1. the manifest is reviewed for completeness (Recordkeeping & Reporting Section ----Volume 1)

2. the shipment is then visually inspected for the following:
   - number & type of containers
   - properly labeled and marked
   - irregularities (leaks; damaged drums etc.)
   - any restricted wastes present

3. After the shipment passes the initial visual inspection it is identified as being ready for quality control (QC) check samples. The subsequent steps and procedures are identified in the section entitled "Waste Sampling & Analysis".

As indicated in Volume 5, Attachment 20; all pertinent data is computerized. To insure that the aforementioned steps are performed the Universal Waste & Transit Facility Manager or his/her designated representative must complete the items on this computerized checklist. Items E-21 thru E-33 of Attachment 20 insure that steps one and two are performed. Items E-40 thru E-46 insure that step three is performed.

Analytical Requirements For Ignitable & Reactive Wastes

As recommended by the USEPA, Universal Waste & Transit has adopted the CERCLA requirements for reactive and ignitable wastes into the Request For Disposal Form.

All reactivity and flammability data such as flash point; pH; cyanide; sulfide and ORP are required to be analyzed on all waste materials prior to their receipt at the Universal Waste & Transit facility. Flash point; pH and ORP are reanalyzed on all quality control samples.

All containers will be DOT certified and meet the criteria specified in 49CFR Part 178. Each chemical will be placed into appropriate containers (DOT 17C, 17E, 17H etc), as directed in 49CFR Part 172, Subpart B, Paragraph 172.101.

Waste Sampling & Analysis

All shipments of waste into the Universal Waste & Transit facility will have some portion of the shipment sampled and analyzed to ensure its consistency with the accompanying manifest or shipping document.

The intent of the quality control program is not to completely reanalyze the waste but to determine, through indicator parameters, its conformance with the manifest and the Universal Waste & Transit Request For Disposal form.

The parameters employed on the QC samples will be:

- Flash Point (closed cup)
- pH
- Oxidation/Reduction Potential
- Color
- Total Solids
- Density

These parameters allow us the ability to ascertain a great deal of information in a short time period. Each parameter is discussed below.

Flash Point:
This determination will identify flammable & combustible materials so that appropriate storage and handling can be accommodated.

pH:
The pH value of the waste will allow us to identify the appropriate storage area for that material so that no comingling of incompatible wastes will result. It is also a good indicator parameter for assessing container compatibility.

Oxidation/Reduction Potential:
The ORP test will determine the oxidizing or reducing capacity of the waste. This will help identify any reactive wastes which may arrive at the site.

Color:
The color of the waste is the easiest parameter to assess. This parameter allows us to quickly determine if the waste is consistent with the original sample and waste data submission.

Total Solids:
The solids content of the waste is a simple method to initially screen those incoming containers to determine their potential for solidification.

Density:
As with the color test, the density of a liquid waste should not change dramatically between the time of initial data submission and receipt of the waste at the facility. This parameter allows us the ability to rapidly screen incoming wastes.

All analyses will be performed in accordance with the methods specified in "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods" (SW-846). All specific methodology is included within the Quality Assurance Program which is appended to this plan.

The sampling procedure employed for the QC samples is dependent upon two criteria. Those criteria are:
- containment vessel (drum, tanker, lagoon etc.)
- type of waste (liquid, viscous, fly ash etc.)

A list of recommended samplers is included as Table 1; recommended sampling points as Table 2 and recommended number of samples to be collected as Table 3.

A list of representative sampling methods as specified in 40 CFR is attached as Table 4. This table will be used when determining what sampling method and equipment to employ.

Universal Waste & Transit anticipates that most, if not all, of the waste entering the facility will be in 55 gallon drums or smaller containers. Universal Waste & Transit will employ the method of random numbers for the selection of containers to be sampled. The number of drums to be sampled is based upon the American Society for Testing and Materials (ASTM) cube root equation for barrels. A random number generator will be available at the facility.

All personnel involved in the sampling of hazardous waste will be outfitted in the proper protective clothing as specified in the "General" and "Training Program" portions of this application.

Internal Quality Control

Universal Waste & Transit will purchase commercially prepared analytical standards for the pH , ORP, and specific gravity procedures. An ASTM certified thermometer will be employed for the flash point determination. No standards are available for the solids and color determination.

USEPA quality control standards will be used for internal accuracy and precision assessments.

Any detailed chemical analyses will be performed on a contract basis with certified analytical laboratories such as Wadsworth Laboratory; Pace Laboratories or ENCON, Inc.

Universal Waste & Transit will employ the contractor laboratories sample labels, sample seals and chain-of-custody forms.

TABLE 1 SAMPLERS RECOMMENDED FOR VARIOUS TYPES OF WASTE

Waste type	Recommended sampler	Limitations
Liquids, sludges, and slurries in drums, vacuum trucks, barrels, and similar containers	Coliwasa	Not for containers 1.5 m(5 ft) deep.
	a) Plastic	Not for wastes containing ketones, nitrobenzene, dimethylformamide, mesityl oxide, or tetrahydrofuran[3,4].
	b) Glass	Not for wastes containing hydrofluoric acid and concentrated alkali solutions.
Liquids and sludges in ponds, pits, or lagoons	Pond	Cannot be used to collect samples beyond 3.5 m(11.5 ft). Dip and retrieve sampler slowly to avoid bending the tubular aluminum handle.
Powdered or granular solids in bags, drums, barrels, and similar containers	a) Grain sampler	Limited application for sampling moist and sticky solids with a diameter 0.6 cm(¼ in.).
	b) Sampling trier	May incur difficulty in retaining core sample of very dry granular materials during sampling.
Dry wastes in shallow containers and surface soil	Trowel or scoop	Not applicable to sampling deeper than 8 cm(3 in.). Difficult to obtain reproducible mass of samples.
Waste piles	Waste pile sampler	Not applicable to sampling solid wastes with dimensions greater than half the diameter of the sampling tube.
Soil deeper than 8 cm(3 in.)	a) Soil auger	Does not collect undisturbed core sample.
	b) Veihmeyer sampler	Difficult to use on stony, rocky, or very wet soil.
Wastes in storage tanks	Weighted bottle sampler	May be difficult to use on very viscous liquids.

TABLE 2 SAMPLING POINTS RECOMMENDED FOR MOST WASTE CONTAINERS

Container type	Sampling point
Drum, bung on one end	Withdraw sample through the bung opening.
Drum, bung on side	Lay drum on side with bung up. Withdraw sample through the bung opening.
Barrel, fiberdrum, buckets, sacks, bags	Withdraw samples through the top of barrels, fiberdrums, buckets, and similar containers. Withdraw samples through fill openings of bags and sacks. Withdraw samples through the center of the containers and to different points diagonally opposite the point of entry.
Vacuum truck and similar containers	Withdraw sample through open hatch. Sample all other hatches.
Pond, pit, lagoons	Divide surface area into an imaginary grid.[a] Take three samples, if possible: one sample near the surface, one sample at mid-depth or at center, and one sample at the bottom. Repeat the sampling at each grid over the entire pond or site.
Waste pile	Withdraw samples through at least three different points near the top of pile to points diagonally opposite the point of entry.
Storage tank	Sample from the top through the sampling hole.
Soil	Divide the surface area into an imaginary grid.[a] Sample each grid.

[a]The number of grid is determined by the desired number of samples to be collected, which when combined should give a representative sample of the wastes.

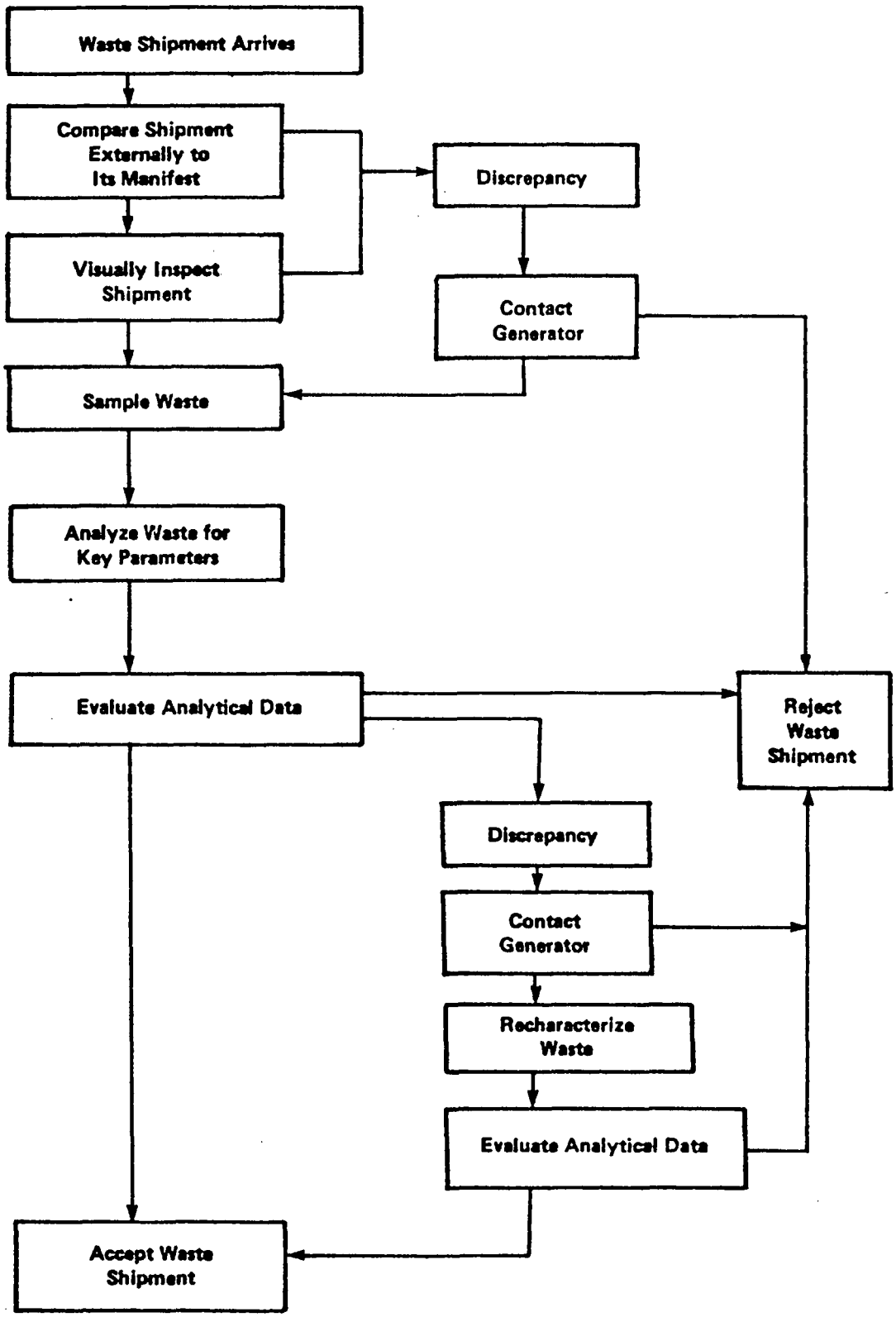
TABLE 3 NUMBER OF SAMPLES TO BE COLLECTED

Case No.	Information desired	Waste type	Container type	Number of samples to be collected
1	Average concentration	Liquid	Drum, vacuum truck, and similar containers	1 Collected with Coliwasa
2	Average concentration	Liquid	Pond, pit, lagoon	1 Composite sample of several samples collected at different sampling points or levels
3	Average concentration	Solid (powder or granular)	Bag, drum, bin sack	Same as Case #2
4	Average concentration	Waste pile	--	Same as Case #2
5	Average concentration	Soil	--	1 Composite sample of several samples collected at different sampling areas
6	Concentration range	Liquid	Drum, vacuum truck, storage tank	3 to 10 separate samples, each from a different depth of the liquid
7	Concentration range	Liquid	Ponds, pit, lagoon	3 to 20 separate samples from different sampling points and depths
8	Concentration range	Solid (powder or granular)	Bag, drum, bin	3 to 5 samples from different sampling points
9	Concentration range	Waste pile	--	Same as Case #8
10	Concentration range	Soil	--	3 to 20 separate samples from different sampling areas
11	Average concentration for legal evidence	All types	All containers	3 Identical samples or 1 composite sample divided into 3 identical samples if homogeneous
12	Average concentration	Liquid	Storage tank	Same as Case #2
13	Average concentration	Liquid	Storage tank	Same as Case #6

Table 4

PROPOSED SAMPLING METHODS

Extremely Viscous Liquids	ASTM D140-70
Crushed or Powdered Material	ASTM D346-75
Soil or Rock-Like Material	ASTM D420-69
Soil-Like Material	ASTM D1452-65
Fly Ash-Like Material	ASTM D2234-76
Containerized Liquid Waste	SW-846 Section 1.4.1
Liquids in Tanks	SW-846 Section 1.4.2



Shipment screening procedures.

UNIVERSAL WASTE & TRANSIT, INC.

GENERATOR'S WASTE MATERIAL PROFILE SHEET

A. GENERAL INFORMATION

GENERATOR NAME _____
GENERATOR ADDRESS _____
_____
GENERATOR U. S. EPA I.D. NO. _____
TECHNICAL CONTACT _____
PHONE NO. _____
TRANSPORTER NAME _____
TRANSPORTER ADDRESS _____
_____
TRANSPORTER U. S. EPA I.D. NO. _____
CONTACT PERSON _____
PHONE NO. _____
CLIENT _____
BILLING ADDRESS _____
_____
CONTACT PERSON _____
PHONE NO. _____
P.O. NO. _____

B. GENERAL DESCRIPTION OF WASTE AND GENERATING PROCESS

_____
_____
_____
_____

ANTICIPATED VOLUME:
_____ GALLONS _____ CUBIC YARDS

METHOD OF SHIPMENT:
☐ BULK LIQUID ☐ BULK SOLID ☐ DRUM

FREQUENCY OF SHIPMENT:
☐ ONE TIME ☐ WEEK ☐ MONTH
☐ QUARTER ☐ YEAR ☐ OTHER _____

C. PHYSICAL CHARACTERISTICS OF WASTE (Include Analytical Test Report)

FREE LIQUIDS
☐ YES ☐ NO
VOLUME [ ] %

SOLIDS
VOLUME [ ] %
WEIGHT [ ] %

pH ☐ < 2 ☐ 7.1-10 ☐ N/A
☐ 2-4 ☐ 10.1-12.5
☐ 4.1-6.9 ☐ > 12.5
☐ 7 ☐ EXACT [ ]

FLASH POINT
☐ < 70°F ☐ > 200°F ☐ CLOSED CUP
☐ 70°F-100°F ☐ NO FLASH ☐ OPEN CUP
☐ 101°F-139°F ☐ EXACT
☐ 140°F-200°F

LAYERS
☐ MULTILAYERED
☐ BI-LAYERED
☐ SINGLE PHASED

COLOR

ODOR
☐ NONE ☐ MILD
☐ STRONG
☐ DESCRIBE [ ]

PHYSICAL STATE @ 70°F
☐ SOLID ☐ SEMI-SOLID
☐ LIQUID ☐ POWDER

SPECIFIC GRAVITY
☐ < .8 ☐ 1.3-1.4
☐ .8-1.0 ☐ 1.5-1.7
☐ 1.1-1.2 ☐ > 1.7
☐ EXACT [ ]

D. CHEMICAL COMPOSITION (NO TRADE NAMES)

[ ] [ ] %
[ ] [ ] %
[ ] [ ] %
[ ] [ ] %
[ ] [ ] %
[ ] [ ] %
[ ] [ ] %

E. METALS

☐ TOTAL (PPM) ☐ EPA EXTRACTION PROCEDURE (mg/L)

ARSENIC (As)	[ ]	SELENIUM (Se)	[ ]
BARIUM (Ba)	[ ]	SILVER (Ag)	[ ]
CADMIUM (Cd)	[ ]	COPPER (Cu)	[ ]
CHROMIUM (Cr)	[ ]	NICKEL (Ni)	[ ]
MERCURY (Hg)	[ ]	ZINC (Zn)	[ ]
LEAD (Pb)	[ ]	THALLIUM (Ti)	[ ]
CHROMIUM-HEX (Cr + 6)	[ ]		[ ]
CYANIDES	[ ]	PCBs	[ ]
SULFIDES	[ ]	PHENOLICS	[ ]

F. ORGANIC INFORMATION

BOD-5 [ ] TOC [ ]
TSS [ ]

NAME ALL KNOWN ORGANIC CONSTITUENTS LISTED BY THE U.S.E.P.A. AS PRIORITY POLLUTANTS WHICH ARE CONTAINED IN THE WASTE.

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

COMMENTS

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

CERTIFICATION

I hereby certify that all information submitted in this and all attached documents is complete and accurate, that all known or suspected hazards have been disclosed, and that this material is considered non-hazardous according to U.S. EPA and MDNR regulations.

GENERATOR'S SIGNATURE _____ TITLE _____ DATE _____

ALPHABETICAL CROSS INDEX OF MATERIALS

A

	MSDS#
Accelerator for Urethane Enamel	1115
Acetaldehyde	535
Acetene	457
Acetic Acid, Ammonium Salt	139
Anhydrous	327
Glacial	327
Isopropyl Ester	496
Methyl Ester	503
Propyl Ester	515
Vinyl Ester	509
Zinc Salt, Dihydrate	550
28%	327A
Acetic Aldehyde	535
Acetic Anhydride	434
Acetic Ether	437
Acetic Oxide	434
Acetidin	437
Acetoacetic Acid, Ethyl Ester	553
Acetoacetic Ester	553
Acetoacetone	556
Acetone	300
Acetone Solvent Blend	420
Acetonic Acid	546
Acetonitrile	499
Acetophenon	567
Acetophenone	567
Acetylacetate, Active	553
Acetylacetone	556
Acetylbenzene	567
Acetyl Chloride	452
Acetyldimethylamide	458
Acetylene	403
Acetylenogen	78
Acetylene Tetrabromide	562
Acetyl Oxide	434
Acid Ammonium Fluoride	49
Acid Anhydride, Liquid, Epoxy Curing Agent	1091B, 1101
Acid K	475
ACINTOL FA 2, 3	495
ACONEW EXTRA, 450, 500	495
Acraldehyde	573
Acroleic Acid	449
Acrolein	573
Acrylaldehyde	573
Acrylamide	577
Acrylate Spray Coating	1059
Acrylic Acid	449
Butyl Ester	547
n-Butyl Ester	547
Methyl Ester	551
ACRYLIC ADHESIVE Q, Parts A & B	1001A, B
Acrylic Aldehyde	573
Acrylic Amide	577
Acrylic Resin Monomer	441
ACRYLIC TOUCH-UP LACQUER, AEROSOL	1265
Acrylonitrile (Monomer)	381
ACTIRON NX-3	378
Adhesive, Epoxy, Parts A & B	1172
Adhesive, Sealant, RTV-102	1142
Adhesive (Polyacrylate and Monomer, Part 1 of 2)	1150
Adipic Acid	400
Adipic Acid Dinitrile	549
Adipic Acid Nitrile	549
Adipic Ketone	570
Adiponitrile	549
AGE	576
AGITENE	1210
AgNO3	81
AIRBRASIVE POWDER #1	1000
#3	1197
AIRCOSIL 45, Brazing Alloy	41
AISI 286, 304, 305, 308, 309, 310, 314, 316, 317, 329, 347, 348, 405, 409, 410, 414, 440's, 450's	164
Al	100
Alboline	525
Alcohol-Resin Flux	1032
Aldehyde	535
ALFONIC 1412A	490
Al(H2PO4)3	11
ALIPAL CD-128	490
Aliphatic Naphtha	530
Alkaline Cleaner, Liquid	1158, 1159, 1160
Alkaline Cleaning Agent, Liquid	1090
Alkaline Cleaning Agent, Solid	1195
Alkaline Electrocleaner	1185
Alkaline Etch (HAVILAND ND 68G)	1041
Alkaline Hot Tank Cleaner	1109,1113
Alkaline Paint Booth Water Wash	1112
Alkaline Paint Booth Purging Solution, Concentrate	1114
Alkaline Spray Cleaner, Granular	1186
Alkaline Steam Clean Compound, Liquid	1111
ALKALUME 1744	1206
ALKANEX Insulating Varnish	1163
ALK-TRI	312
Alkyd Paint, Air-Drying, Gloss Black	1193
Alkyd Primer, Corrosion Resisting	1194
Alkyd Primer, Red Oxide	1192
Allomaleic Acid	545
Allyl Alcohol	505
Allyl Aldehyde	573
Allyl Chloride	374
Allyl 2,3-Epoxypropyl Ether	576
Allyl Glycidyl Ether	576
1-(Allyloxy)-2,3-Epoxypropane	576
Alpha-Aminopyridine	568
ALPHA-FLOC	507
ALPHA 413-F THINNER	1077
611 FLUX	1080
810 THINNER	1078
811 FLUX	1250

MSDS#

812 THINNER ---------- 1252
815 FLUX ---------- 1079
MELROSE 611 FLUX -------- 1080
Alpha-pyridinamine ---------- 568
Alum ---------- 92
Alumina, Fused, Powdered ------ 1197
Alumina Powder ---------- 1000
Aluminum Metal/Powder --------- 100
Aluminum Phosphate C5 --------- 11
Aluminum Sulfate, Liquid ------ 92
Aluminum Trioxide, Powdered --- 1197
Amchlor ---------- 21
Amido-Amine Epoxy Curing Agent 1074
Amidosulfonic Acid ---------- 72
Aminobenzene ---------- 407
1-Aminobutane ---------- 569
Aminocaproic Lactam---------- 580
Aminocyclohexane ---------- 537
2,2'-Aminodiethanol ---------- 426
Aminoethane ---------- 540
2-Aminoethanol ---------- 418
2-((2-Aminoethyl) amino)
Ethanol ---------- 555
Aminoethylethanolamine -------- 555
n-Aminoethylethanolamine ------ 555
N-Aminoethyl Piperazine ------- 408
6-Amino Hexanoic Acid Lactam--- 580
6-Aminohexanoic Acid Cyclic
Lactam---------- 580
2-Aminopropane ---------- 483
2-Aminopyridine ---------- 568
O-Aminopyridine ---------- 568
Ammoneric ---------- 21
Ammonia, Anhydrous, Gas or
Liquid ---------- 1
Ammonia Water (Strong) -------- 1A
Ammonium Acetate ---------- 139
Ammonium Bichromate ---------- 129
Ammonium Bifluoride ---------- 49
Ammonium Chloride ---------- 21
Ammonium Dichromate ---------- 129
Ammonium Dodecyltrioxyethylene
Sulfate ---------- 490
Ammonium Fluoride ---------- 111
Ammonium Hydrate ---------- 1A
Ammonium Hydrofluoride--------- 49
Ammonium Hydrogen Fluoride ---- 49
Ammonium Hydroxide (28-30%) --- 1A
Ammonium Laureth-3 Sulfate ---- 490
Ammonium Lauryl Ether Sulfate - 490
Ammonium Metavanadate --------- 130
Ammonium Muriate ---------- 21
Ammonium Nitrate ---------- 79
Ammonium Peroxydisulfate ------ 33
Ammonium Persulfate ---------- 33
Ammonium Salt ---------- 130
Ammonium Vanadate ---------- 130
AMOCO TMA ---------- 330
AMOLITE Oil ---------- 1264
Amorphous Silica ---------- 69
AMSCO Rubber Solvent ---------- 371
AMSCO SOLV 5425 ---------- 486
AMSCO SOLV 5470 ---------- 353
AMSCO Special Naphtholite ----- 391
di-n-Amylamine---------- 582
Amyl Acetate Primary
(Mixed Isomers) ---------- 486

MSDS#

Amyl Hydride ---------- 523
n-Amyl Alcohol ---------- 506
Amyl Ethyl Ketone ---------- 480
n-Amyl Methyl Ketone ---------- 302
Amyl Nitrite ---------- 575
AN (Acrylonitrile) ---------- 381
ANCAMINE T-1 ---------- 1072B
Anhydrotrimellitic Acid ------- 330
Anhydrous Acetic Acid --------- 327
Anhydrous Boric Acid ---------- 143
Anhydrous Ammonia ---------- 1
Aniline ---------- 407
Aniline Oil ---------- 407
Anilinobenzene ---------- 461
ANSI/AWS A5.8, Brazing Alloys:
BAg-1 ---------- 41
Antimony ---------- 70
Antimony (III) Oxide ---------- 28
Antimony Sesquioxide ---------- 28
Antimony Trioxide ---------- 28
Antimony White ---------- 28
Aqua Ammonia ---------- 1A
Aqua Fortis ---------- 7
Ar ---------- 64
ARALDITE 6005 ---------- 335B
6010 ---------- 335B
6084 ---------- 335
ARALDITE CY179 ---------- 386
ARCOSOLVE PM ---------- 522
Argon ---------- 64
ARKLONE P or ARKLONE P-113 ---- 314
ARMAFLEX PIPE INSULATION ------ 1133B
ARMSTRONG 520 ADHESIVE -------- 1133A
ARMSTRONG D-253 ---------- 1287
AROCLOR 1254 ---------- 1200
AROMATIC A-150 ---------- 1286
Aromatic Naphtha:
Aromatic 100 ---------- 1061
Aromatic 150 ---------- 1061A
Aromatic Naphtha, High Flash -- 1286
Arsenic Hydride---------- 178
Arsenic Trihydride---------- 178
Arsine---------- 178
Arsenous Hydride---------- 178
Arseniuretted Hydrogen--------- 178
Asbestos (Chrysotile) --------- 15A
Asbestos (Rubber sheet &
gaskets, compressed)--------- 15B
Asbestos Tape (Crysotile) ----- 15
AsH3---------- 178
ASHLAND 190/P-3224 ---------- 1073
Rubber Solvent -------- 371
ASTM = American Society for Testing
and Materials
ASTM A481 ---------- 83
B6 ---------- 73
B69---------- 176
B237 ---------- 70
B299 ---------- 75
B350 ---------- 17
B385 ---------- 84
B386 ---------- 84
B387 ---------- 84
B440 ---------- 23
B493, B494, B495 --------- 17
C5, C45, C46, C49, C53,
C258, C415 and C828 ------ 22

	MSDS#
C53, C295	39
C911	22
D13	375
D124	477
D234	476
D235	334,334A 1257, 1258
D303	338
D304	337
D315	15
D329	300
D330	320
D331	319
D343	321
D362	317
D363	332
D364	318
D369	468, 469, 473, 474
D388	491
D439	467
D456	3
D458	48
D476	118
D484, Type I	1257, 1258
D537	85
D538	43
D561	51
D578-D581	46
D600, Class B, 6% Cobalt	363,1268
24% Lead	384
D605	42
D607	24
D700 Type 2,3,11	1254A
D700 Type 13,22	1254
D740	303
D770	324
D835, D836	316
D841	317
D843, D845, D846	318
D975	470
D1007	442
D1152	354
D1153	304
D1249, Type 1	414
D1719	398
D1763, Type I, Grade I:	
Class I	335B
Class V	335
D1786	331
D1835	380, 481
D1836	397
D1933	61
D1984	495
D2116	1010
D2190	509
D2270	1264
D2323	405
D2359	316
D2378	360
D2403	417
D2422	1264
D2439	355
D2472	27
D2627	353
D2693	323
D2826, D2827	351
D2916	356
D3055	389
D3126	338
D3127	437
D3128	352
D3130	515
D3172	491
D3264	407
D3400, Type III	99
D3487	393
D3504	438
D3506	310
D3540	486
D3541	345
D3547	547
D3699	488
D3734	1286
D3735	391
F65	486
F104 Type I, Class 1	15B
ASTRO 3069, Parts A & B	1072A, B
3104	1075

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

SPECIAL 3044	1029
4017 (Parts A&B)	1190
Automotive Gasoline, Lead-free	467
AZ-111 PHOTO RESIST	1014
AZ-1112A REMOVER	1015
AZ 119S	1205A
AZ 119 THINNER	1205
2-Azacycloheptanone	580
Azacyclopentane	498

B

B & B 3100	1092
BaCl2	132
BaCO3	119
BAKELITE ERL 4221	386
Baking Varnish, Clear in Xylene	1184
Ba(NO3)2	173
Ba(OH)2·8H2O	40
B2H6	103
Ba(OH)2 8H2O	40
BARCO BOND MB-100X and MB-12	1177
Barium Carbonate	119
Barium Chloride	132
Barium Dichloride	132
Barium Dinitrate	173
Barium Fluoride	131
Barium Hydrate	40
Barium Hydroxide (Octahydrate)	40
Barium Nitrate	173
Barium Octahydrate	40
Be	59
Benzene (Benzol)	316
Benzene Carbinol	536
Benzene Methanol	536

MSDS#

Benzenamine ---------- 407
Benzenecarbonyl Chloride ------ 459
Benzenecarboxylic Acid -------- 402
1,4-Benzenedicarboxylic Acid -- 443
1,2-Benzenedicarboxylic Acid
Anhydride ---------- 417
1,2-Benzenedicarboxylic Acid,
Dimethyl Ester ---------- 430
1,4-Benzenedicarboxylic Acid,
Dimethyl Ester ---------- 404
1,2-Benzenedicarboxylic Acid,
Monopotassium Salt ---------- 475
1,2-Benzenedicarboxylic Di-2-
propenyl Ester ---------- 527
Benzene Tetrahydride ---------- 516
Benzoic Acid ---------- 402
Benzoyl Chloride ---------- 459
Benzoyl Methide ---------- 567
Benzoyl Peroxide, Dry ----------500
Benzoyl Superoxide ---------- 500
Benzyl Alcohol ---------- 536
Benzyldimethylamine ---------- 326
BERYLCO #10 ---------- 32
Beryllium-Copper Alloy -------- 165
Beryllium Copper (Be-Cu) Alloy 165
Beryllium, Metal/Powder ------- 59
BF3 ---------- 91
B2H6 ---------- 103
B10H14 ---------- 104
BHT ---------- 456
Bi ---------- 60
Bibenzene ---------- 451
Bichromate of Potash---------- 168
Bichromate of Soda ---------- 153
Bicyclo (4.4.0) Decane -------- 563
Biethylene ---------- 463
Biphenyl ---------- 451
Biphenyl-Biphenyloxide,
Eutectic Mixture ---------- 1076
Bis(2-Aminoethyl)Amine -------- 1034
N,N'-Bis (2-Aminoethyl)-
ethylenediamine ---------- 1035
Bis(p-Aminophenyl)Methane ----- 346
Bis(2-Chloroethyl) Ether ------ 571
2,6-Bis (1,1,-Dimethylethyl)-
4-Methylphenol ---------- 456
Bis(2-Ethoxyethyl) Ether ------ 565
Bis(2-Ethylhexyl)Phthalate ---- 414
Bis(Hydroxyethyl)Amine -------- 426
Bismuth, Metal/Powder --------- 60
2,2-Bis(4 Hydroxyphenol)Propane 369
Bisphenol A ---------- 369
Bisphenol A Diglycidyl Ether -- 335B
Bisphenol-A/epichlorohydrin --- 559
Bituminous Coal Dust ---------- 491
Bivinyl ---------- 463
BIWAX 142-C (Part B) ---------- 1091B
142-R (Part A) ---------- 1091A
BLACO-PER ---------- 313
BLACO-THANE ---------- 311
BLACO-TRI ---------- 312
BLACO-TRON TF ---------- 314
BLANKROLA SOLVENT ---------- 1063
Bleach Solution ---------- 115
BLUE GOLD ---------- 1160
Bluestone ---------- 29
Blue Vitriol ---------- 29

MSDS#

BN (Boron Nitride) ---------- 113
B203 (Boron Nitride) ---------- 143
Boletic Acid ---------- 545
BORAX Pentahydrate ---------- 112
BORDEN FM 203W ---------- 1168
Boric Acid ---------- 4
Boric Acid, Anhydrous --------- 143
Boric Anhydride ---------- 143
Boric Oxide ---------- 143
2-Bornanone ---------- 531
Boroethane ---------- 103
Boron Hydride ---------- 103
Boron Nitride Powder ---------- 113
Boron Oxide ---------- 143
Boron Sesquioxide ---------- 143
BORON Solvent VM&P Naphtha 2429 391
Boron Trifluoride ---------- 91
Bottom Ash ---------- 155
BR-123 PRIMER ---------- 1126A
Brazing Alloy (Ag/Cd/Zn/Cu) --- 41
Brazing Flux, Acid Fluoride --- 1144
BrF5---------- 172
Brimstone ---------- 56
Bromine ---------- 77
Bromine Pentafluoride---------- 172
Bromine Pentafluoride (DOT)---- 172
Bromobenzene ---------- 564
BRULIN 815 MX ---------- 1158
BRULIN 815 QR ---------- 1159
Bunker "C" ---------- 474
Bunker Fuel ---------- 473
1-Buranamine ---------- 569
1,3-Butadiene ---------- 463
Butane-1 ---------- 485
1,4-Butanediol ---------- 485
Butane, Liquefied Gas --------- 481
1,4-Butanedicarboxylic Acid --- 400
1,3-Butanediol ---------- 362
1,4-Butanediol ----------485
n-Butanethiol ---------- 504
Butanoic Acid ---------- 553
2-Butanol---------- 578
Butanol, 1-Butanol or
n-Butanol ---------- 337
2-Butanol or sec-Butanol ------ 442
t-Butanol ---------- 497
Butanone or 2-Butanone -------- 303
2-Butanone Peroxide ---------- 329A
Butenedioic Acid, (E) --------- 545
trans-Butenedioic Acid -------- 545
cis-Butenedioic Anhydride ----- 438
2-Butoxy Ester ---------- 519
2-Butoxyethanol ---------- 320
2-(2'-Butoxyethoxy) Ethanol --- 322
2(2'-Butoxyethoxy) Ethanol ---- 322
Acetate ---------- 368
n-Butyl Acetate or
Butyl Acetate ---------- 338
Butyl Acrylate ---------- 547
i-Butyl Alcohol ---------- 398
n-Butyl Alcohol, Butyl Alcohol or
1-Butyl Alcohol ---------- 337
sec-Butyl Alcohol ---------- 442
n-Butyl Aldehyde ---------- 542
n-Butylamine ---------- 569
Butylated Hydroxy Toluene ----- 456
n-Butyl carbinol ---------- 506

MSDS#

Butyl CARBITOL ---------- 322
Butyl CARBITOL Acetate -------- 368
4-tert-Butylcatechol or
p-t-Butylcatechol ---------- 421
Butyl CELLOSOLVE ---------- 320
4-t-Butyl-1,2-Dihydroxybenzene 421

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

Butyl DIOXITOL ---------- 322
1,3-Butylene Glycol
(or b-Butylene Glycol) ------ 362
1,4 Butylene Glycol ---------- 485
1,3-Butylene Glycol Dimethy-
acrylate ---------- 1106
S.B.A.,Butylene Hydrate ------- 442
1-Butyl Ethanoate ---------- 338
o-Butyl Ethylene Glycol ------- 320
Butyl Ethyl Ketone ---------- 306
Butyl Glycol ---------- 320
4-t-Butyl-1-Hydroxybenzene ---- 422
Butyl Mercaptan ---------- 504
n-Butyl Methacrylate ---------- 554
Butyl 2-Methacrylate ---------- 554
n-Butyl Methyl Ketone --------- 425
Butyl 2-Methyl-2-Propenoate --- 554
Butyl OXITOL ---------- 320
t-Butyl Perbenzoate
(or Peroxybenzoate) --------- 406
4-t-Butylphenol or
p-tertiary-Butylphenol ------ 422
Butyl 2-Propenoate ---------- 547
t-Butylpyrocatechol ---------- 421
Butyl Sulfhydrate ---------- 504
Butyral ---------- 542
Butyric Alcohol ---------- 337
Butyric Aldehyde ---------- 542

C

C5 Mono-Aluminum Phosphate ---- 11
CAB-O-SIL H-5, M-5, M-7 ------- 1064
CaC2 ---------- 78
Cadmium Anodes, Cadmium Metal - 23
Cadmium Chloride, Anhydrous --- 144
Cadmium Dichloride ---------- 144
Cadmium Metal Powder ---------- 154
Cadmium Nitrate Tetrahydrate--- 171
Cadmium Oxide ---------- 133
Calcined Brucite ---------- 94
Calcium Carbide ---------- 78
Calcium Carbonate (Calcite) --- 1082
Calcium Chloride, Anhydrous --- 141
Calcium Hydrate (Hydroxide) --- 39
Calcium Hydroxy Apatite ------- 137
Calcium Hypochlorite (Dry) ---- 68
Calcium Orthophosphate -------- 137
Calcium Oxide (Calx) ---------- 22
Calcium Oxychlorite ---------- 68
Calcium Phosphate Tribasic ---- 137

MSDS#

Calcium Silicate or
meta-Silicate ---------- 55
Calcium Stearate ---------- 445
2-Camphanone ---------- 531
Camphogen ---------- 557
Camphor ---------- 531
CaO ---------- 22
Ca(OCl)2 ---------- 39
Ca(OH)2 ---------- 68
Ca10(OH)2(PO4)6 ---------- 137
Caprolactam---------- 580
Carbamide ---------- 528
Carbinol ---------- 354
CARBITOL ---------- 460
Carbohydrate (Starch) --------- 472
Carbolic Acid ---------- 355
Carbon Black ---------- 51
Carbon, Charcoal
(Coconut Shell) ---------- 471
Carbon Dioxide ---------- 54
Carbon Disulfide ---------- 350
Carbonic Acid, Cyclic
Propylene Ester ---------- 447
Carbonic Anhydride ---------- 54
Carbon Monoxide ---------- 35
Carbinol ---------- 354
Carbon Oxychloride ---------- 66
Carbon Steel (Scrap) ---------- 161
Carbon Tetrachloride ---------- 410
Carbonyl Chloride ---------- 66
Carbonyldiamine ---------- 528
CARBOWAX 3350, 4600, 8000 ----- 364
CARBOWAX Hand Solution -------- 1087
4-Carboxyphthalic Anhydride --- 330
Carbazotic Acid ---------- 534

CAS = Chemical Abstract Services
CAS # XXXXXX-XX-X (ACS format)

Note: Some older Genium Sheets have CAS numbers in an XXX XXX XXX format. The ACS format is preferred and is the current practice.

000050 00 0 ---------- 360
000050 21 5 ---------- 546
000056 23 5 ---------- 410
000057 11 4 ---------- 415
000057 13 6 ---------- 528
000060 29 7 ---------- 343
000060 34 4 ---------- 552
000062 53 3 ---------- 407
000064 17 5 ---------- 361
000064 18 6 ---------- 416
000064 19 7 ---------- 327
000065 85 0 ---------- 402
000067 56 1 ---------- 354
000067 63 0 ---------- 324
000067 64 1 ---------- 300
000067 66 3 ---------- 315
000067 68 5 ---------- 428
000068 11 1 ---------- 574
000068 12 2 ---------- 424

	MSDS#
000069 72 7	543
000070 55 3	1068
000071 23 8	494
000071 36 3	337
000071 41 0	506
000071 43 2	316
000071 55 6	311
000074 82 8	440
000074 85 1	457
000074 86 2	403
000074 87 3	373
000074 93 1	465
000074 98 6	380
000075 00 3	538
000075 01 4	382
000075 04 7	540
000075 05 8	499
000075 07 0	535
000075 08 1	510
000075 09 2	310
000075 12 7	390
000075 15 0	350
000075 19 4	529
000075 20 7	78
000075 21 8	433
000075 31 0	483
000075 36 5	452
000075 44 5	66
000075 45 6	307
000075 52 5	508
000075 65 0	497
000075 69 4	309
000075 83 2	397A
000075 71 8	308
000076 03 9	524
000076 13 1	314
000076 14 2	572
000076 22 2	531
000077 73 6	340
000077 78 1	344
000078 10 4	446
000078 59 1	357
000078 79 5	341
000078 83 1	398
000078 92 2	442
000078 93 3	303
000079 01 6	312, 1156
000079 06 1	577
000079 10 7	449
000079 20 9	503
000079 24 3	436
000079 27 6	562
000079 29 8	397A
000079 46 9	448
000080 05 7	369
000080 62 6	441
000084 74 2	429
000085 42 7	482
000085 44 9	417
000087 61 6	365
000087 86 5	517
000088 89 1	534
000088 19 7	1068
000090 72 2	378
000091 17 8	563
000091 66 7	348

	MSDS#
000092 52 4	451
000095 47 6	318A
000095 48 7	560
000095 50 1	358
000096 14 0	397A
000096 22 0	478
000096 33 3	551
000096 33 3	551
000096 45 7	423
000097 88 1	554
000097 99 4	520
000098 00 0	479
000098 01 1	413
000098 29 3	421
000098 54 4	422
000098 82 8	395
000098 86 2	567
000098 88 4	459
000098 95 3	439
000099 87 6	557
000100 21 0	443
000100 41 4	385
000100 42 5	351
000100 51 6	536
000101 02 0	411
000101 14 4	372
000101 68 8	1105
000101 77 9	346
000102 71 6	427
000103 11 7	345
000103 83 3	326
000104 76 7	367
000105 46 4	519
000105 60 2	580
000106 35 4	306
000106 46 7	514
000106 68 3	480
000106 92 3	576
000106 93 4	492
000106 98 8	481
000107 02 8	573
000107 05 1	374
000107 06 2	359
000107 13 1	381
000107 15 3	325
000107 18 6	505
000107 21 1	323
000107 31 3	432
000107 83 5	397A
000107 87 9	305
000107 88 0	362
000107 98 2	522
000108 01 0	566
000108 05 4	509
000108 10 1	304
000108 20 3	541
000108 21 4	496
000108 24 7	434
000108 31 6	438
000108 32 7	447
000108 83 8	501
000108 86 1	564
000108 88 3	317
000108 90 7	366
000108 91 8	537
000108 93 0	489
000108 94 1	301

	MSDS#
000108 95 2	355
000109 60 4	515
000109 66 0	523
000109 73 9	569
000109 79 5	504
000109 86 4	352
000109 89 7	453
000109 94 4	502
000109 99 9	379
000110 17 8	545
000110 19 0	396
000110 43 0	302
000110 46 3	575
000110 49 6	526
000110 54 3	397
000110 63 4	485
000110 80 5	319
000110 82 7	389
000110 83 8	516
000110 86 1	405
000110 91 8	356
000111 15 9	321
000111 30 8	548
000111 40 0	1034
000111 41 1	555
000111 41 1	555
000111 42 2	426
000111 44 4	571
000111 69 3	549
000111 76 2	320
000111 90 0	460
000112 24 3	1035
000112 34 5	322
000112 36 7	565
000115 10 6	342
000115 27 5	339
000115 28 6	511
000115 86 6	333
000117 81 7	414
000120 61 6	404
000120 92 3	570
000121 44 8	392
000121 69 7	347
000122 39 4	461
000123 42 2	353
000123 54 6	556
000123 72 8	542
000123 75 1	498
000123 73 9	578
000123 86 4	338
000123 91 1	412
000124 04 9	400
000124 17 4	368
000124 38 9	54
000126 73 8	521
000127 18 4	313
000127 19 5	458
000128 37 0	456
000128 39 2	1208
000131 11 3	430
000131 17 9	527
000138 87 4	493
000140 31 8	408
000141 32 2	547
000141 43 5	418
000141 78 6	437
000141 79 7	454

	MSDS#
000141 97 9	553
000142 82 5	464, 1275
000143 39 9	58
000144 62 7	328
000150 76 5	455
000151 50 8	13
000302 01 2	126
000464 49 3	531
000504 29 0	568
000513 77 9	119
000497 19 8	48
000527 60 6	581
000540 84 1	383
000544 92 3	12
000546 93 0	97
000552 30 7	330
000557 05 1	444
000563 80 4	466
000576 26 1	561
000584 84 9	331
000586 81 2	493
000591 78 6	425
000598 62 9	135
000614 45 9	406
000628 63 7	487
000630 08 0	35
000631 61 8	139
000864 66 2	435
000872 50 4	431
000877 24 7	475
000999 97 3	513
001010 97 0	37
001189 08 8	1106
001300 71 6	409A
001303 86 2	143
001305 62 0	39
001305 78 8	22
001306 06 5	137
001306 19 0	133
001309 37 1	175
001309 48 4	94
001309 64 4	28
001310 02 7	31
001310 58 3	2
001310 73 2	3, 3A
001312 81 8	145
001313 13 9	122
001314 13 2	45
001314 36 9	134
001314 62 1	88
001317 36 8	38
001317 38 0	158
001317 39 1	157

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

001317 65 3	1082
001318 33 8	112
001319 73 9	336

	MSDS#
001319 77 3	409, 409A
001330 20 7	318
001330 78 5	332
001332 21 4	15A
001333 74 0	65
001333 82 0	5
001333 86 4	51
001333 86 4	51
001336 21 6	1A
001338 23 4	329
001341 49 7	49
001344 09 8	99
001344 28 1	1000, 1197
001344 67 8	121
001592 23 0	445
001633 05 2	120
002050 92 2	582
002551 62 4	27
004094 36 0	500
005329 14 6	72
005970 45 6	550
006484 52 2	79
006834 92 0	85
006846 50 0	1039
007429 90 5	100
007439 96 5	148
007439 97 6	26
007439 98 7	84
007440 02 0	164, 1118
007440 16 6	147
007440 25 7	167
007440 28 0	80
007440 29 1	76
007440 31 5	74
007440 32 6	166
007440 36 0	70
007440 37 1	64
007440 41 7	59
007440 43 9	23, 154
007440 44 0	51
007440 47 3	83
007440 48 4	82, 163
007440 50 8	162
007440 59 7	98
007440 66 2	124
007440 66 6	73, 176
007440 67 7	17
007440 69 9	60
007446 08 4	152
007446 09 5	50
007446 20 0	96
007447 39 4	121
007488 55 3	14
007546 30 7	146
007550 35 8	149
007553 56 2	114
007580 67 8	160
007601 54 9	43
007601 90 3	102
007631 86 9	1064
007631 99 4	101
007632 00 0	116

	MSDS#
007637 07 2	91
007646 85 7	18
007647 01 0	30, 30A
007664 38 2	8
007664 39 3	6
007664 41 7	1
007664 93 9	9
007681 49 4	138
007697 37 2	7
007704 34 9	56
007705 08 0	19
007719 09 7	86
007719 12 2	110
007720 78 7	57
007722 64 7	95
007722 84 1	44A, B
007723 14 0	25
007726 95 6	77
007727 37 9	61
007727 54 0	33
007733 02 0	96
007758 95 4	150
007758 98 7	29
007758 99 8	29
007761 88 8	81
007772 99 8	67
007778 50 9	168
007778 54 3	68
007782 44 7	62
007782 49 2	136
007782 50 5	53
007783 05 3	9A
007783 06 4	52
007784 42 1	178
007785 87 7	151
007789 09 5	129
007789 12 0	153
007789 24 4	105
007789 30 2	172
007790 91 2	125
007790 94 5	544
007791 20 0	36
007791 25 5	90
007803 51 2	63
007803 55 6	130
007803 57 8	127
007803 62 5	107
MX8006 64 2	375
008000 41 7	493
008001 22 7	477
008001 26 1	476
008002 09 2	484
008004 13 5	1076
008006 39 1	493
008006 61 4	467
008006 61 9	1280
008006 64 2	375
008008 20 6	387
008014 95 1	9A
008030 30 6	518,530,1280
008030 31 7	530
008032 32 4	530
008050 09 7	377
008052 41 3	334, 334A
008152 10 6	377

MSDS#

009002 89 5 ---------- 539
009002 93 1 ---------- 1291
009004 34 6 ---------- 507
009004 35 7 ---------- 532
009005 25 8 ---------- 472
009005 90 7 ---------- 375
009014 63 5 ---------- 377
010022 31 8 ---------- 173
010022 68 1 ---------- 171
010024 92 2 ---------- 109
010025 87 3 ---------- 117
010026 04 7 ---------- 106
010028 15 6 ---------- 34
010031 43 3 ---------- 174
010042 76 9 ---------- 159
010043 01 3 ---------- 92
010043 11 5 ---------- 113
010043 35 3 ---------- 4
010043 52 4 ---------- 141
010045 94 0 ---------- 169
010101 39 0 ---------- 55
010101 97 0 ---------- 37
010102 44 0 ---------- 47
010108 64 2 ---------- 144
010421 48 4 ---------- 142
011130 12 4 ---------- 112
011135 81 2 ---------- 16
012070 12 1 ---------- 123
012125 11 8 ---------- 111
012125 02 9 ---------- 21
012230 71 6 ---------- 40
013093 70 1 ---------- 161
013933 17 0 ---------- 118
013478 00 7 ---------- 20
013494 80 9 ---------- 108
013746 66 2 ---------- 140
013775 80 9 ---------- 10
013933 17 0 ---------- 121
014708 14 6 ---------- 128
014808 60 7 ---------- 71
016721 80 5 ---------- 87
016893 85 9 ---------- 31
016940 66 2 ---------- 93
016961 83 4 ---------- 89
017194 00 2 ---------- 40
017702 41 9 ---------- 104
019287 45 7 ---------- 103

021368 68 3 ---------- 531
021908 53 2 ---------- 170
025013 15 4 ---------- 336
025068 38 6 ---------- 335, 335B
025134 21 8 ---------- 1062
025322 68 3 ---------- 364
026027 38 3 ---------- 1094
026444 49 5 ---------- 450, 1081
026444 72 4 ---------- 378
026590 20 5 ---------- 1091B
027323 18 8 ---------- 1200
030525 89 4 ---------- 462
032612 48 9 ---------- 490
032718 56 2 ---------- 526
050922 29 7 ---------- 1130
061790 12 3 ---------- 495
061790 53 2 ---------- 69

MSDS#

063231 67 4 ---------- 1253
064741 88 4 ---------- 1264
064741 89 5 ---------- 1264
064742 46 7 ---------- 525
064742 73 0 ---------- 1274
064748 89 8 ---------- 530
068476 30 2 ---------- 469
068476 33 5 ---------- 473
068476 34 6 ---------- 470
068553 00 4 ---------- 474
068647 86 9 ---------- 471
Casting or Powder Scrap ------- 162
Catalyst Powder for Urethane Foam ---------- 1168
Caulking Cmpd, Polyurethane-based, Moisture Cure ---------- 1100
Caustic Baryta ---------- 40
Lime ---------- 39
Potash ---------- 2
Soda ---------- 3
Soda, Liquid (50%) ---- 3A
Cd ---------- 23, 154
CDA No. 820 ---------- 32
CdCl2 ---------- 144
Cd(NO3)2·4H2O ---------- 171
CdO ---------- 133
CELITE 266 ---------- 69
FC (or Filter-Cel) ----- 69
Snowfloss ---------- 69
CELLOSIZE, Type WP and QP ----- 401
CELLOSOLVE Acetate ---------- 321

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

CELLOSOLVE Solvent ---------- 319
CELLUFLOC ---------- 507
Cellulose Acetate, Lacquer Grade ---------- 532
Cellulose Flock from Wood ----- 507
Chalk ---------- 1082
Chameleon Mineral ---------- 95
Channel Black ---------- 51
Charcoal, Coconut Shell ------- 471
CHEMGLAZE Z004 ---------- 1187
CHEMLOK 250 ---------- 1241
Chile Saltpeter ---------- 101
Chinese Bean Oil ---------- 477
Chinese White ---------- 45
Chlorendic Acid ---------- 511
Chlorendic Anhydride ---------- 339
Chlorinated Hydrocarbon, Proprietary Mixture --------- 1131
Chlorinated Paraffin ---------- 1149A
Chlorinated Paraffin, Liquid -- 1149
Chlorine ---------- 53
1-Chloro-2-(-Chloroethoxy) Ethane ---------- 571
Chlorobenzene (Chlorobenzol) -- 366
Chlorodifluoromethane --------- 307
Chloroethyl Ether ---------- 571
Chlorine Trifluoride ---------- 125

MSDS#

CHLOROCLEAN ---------- 1245
Chloroethane ---------- 538
Chloroethene (Chloroethylene) - 382
Chloroform ---------- 315
Chloroformyl Chloride --------- 66
Chloromethane ---------- 373
3-Chloropropylene or
3-Chloro-1-propene ---------- 374
Chlorosulfonic Acid ---------- 544
Chlorosulfuric Acid ---------- 90, 544
CHLOROTHENE NU and VG --------- 311
CHLOROWAX-40 and 100 (liquid) - 1149
CHLOROWAX-70 and 70-S --------- 1149A
CHLOROWAX Resin ---------- 1149A
Chromate, Zinc, Basic --------- 1130
Chrome ---------- 83
Chromic Acid, Dipotassium Salt- 168
Chromic Acid, Solid ---------- 5
Chromic Anhydride ---------- 5
Chromium Compounds (ELECTRO-
BRITE Z-200) ---------- 1155
Chromium Metal/Powder --------- 83
Chromium (VI) Oxide ---------- 5
Chromium Trioxide ---------- 5
Chrysotile Asbestos ---------- 15,
15A
CIM CLEAN 30 ---------- 1090
CIMCOOL FIVE STAR 30 ---------- 1246
CITGO Sentry Oil ---------- 1264
Citric Acid ---------- 533
C12 ---------- 53
Cleaner, Alkaline Soak
(CM-154-XTX) ---------- 1135
Cleaning Agent, Alkaline ------ 1090
Cleaning Agent, Alkaline, solid 1195
Cleaning Agent, Aqueous,
Alkaline ---------- 1096
Cleaning Compound, Mineral
Spirits ---------- 1095
Cleaning Powder, Alkaline ----- 1167
Cleaning Solution for Metals,
Acidic ---------- 1017
CLEARTEX 120 Cutting Oil ------ 1162
CLEAR VARNISH 2609 ---------- 1164
ClF3 ---------- 125
CLOROX ---------- 115
CM-154-XTX, Alkaline Soak
Cleaner ---------- 1135
CO ---------- 35, 82
CO2 ---------- 54
Coal Dust (Bituminous) -------- 491
Coal Gas ---------- 35
Coal Oil ---------- 488
Coating (See also Primer,
Paint, Varnish)
Coating Powder, Epoxy --------- 1179
Cobalt ---------- 82
Cobalt Naphthenate Solution --- 363,1268
COBEHN SPRAY-CLEAN Solvent ---- 315
COCl2 ---------- 66
Coconut Shell Charcoal -------- 471
Colamine ---------- 418
Cold Stripper, SK-4 ---------- 1199
Colophony ---------- 377
COMPOUNDERS WAX IE-367 -------- 1138
CONAP S-8 Solvent (Toluene) --- 317
CONAP, 1155, Parts A & B ------ 1004A, B

MSDS#

CONATHANE CE-1155, Parts A & B 1004A, B
Condy's Crystals ---------- 95
Conformal Coating, 1066
Urethane Solution ---------- 1178
Copolymer (Hexafluoropropylene-
Vinylidiene Fluoride) ------- 1107
Copperas ---------- 57
Copper (II) Chloride ---------- 121
Copper Dinitrate, Trihydrate -- 174
Copper (Cu) Metal ---------- 162
Copper (I) Cyanide ---------- 12
Copper Hemioxide ---------- 157
Copper Monoxide ---------- 158
Copper (II) Nitrate,
Trihydrate ---------- 174
Copper (I) Oxide ---------- 157
Copper (II) Oxide ---------- 158
Copper Protoxide ---------- 157
Copper (Scrap - Generic) ------ 162
Copper Suboxide ---------- 157
Copper (II) Sulfate ---------- 29
CORAL NO-TARN ---------- 1043
3005 CORN PRODUCTS STARCH ----- 472
Corn Starch ---------- 472
Corrosive Sublimate ---------- 146
Cr ---------- 83
CrO3 ---------- 5
Cresol ---------- 409, 409A
o-Cresol ---------- 560
Cresyl Diphenyl Phosphate ----- 450,
1081
Cresylic Acid ---------- 409A,
560
Crotonal ---------- 578
Crotonaldehyde ---------- 578
Crotonic Aldehyde ---------- 578
o-Crysylic Acid ---------- 560
Cryofluoran ---------- 572
Crysotile Asbestos ---------- 15, 15A
CuCl2 ---------- 121
CuCN ---------- 12
Cu/Co/Be Alloy(0.4-0.75 Be) --- 32
Cu (NO3) 2·3H2O ---------- 174
CuO ---------- 158
Cu2O ---------- 157
Cumene (Cumol) ---------- 395
CUPOSIT 802A ---------- 1233A
802B and B-2 ---------- 1233B
802M ---------- 1233
802R Replenisher ------ 1233C
Catalyst 9F ---------- 1227
CP-74A ---------- 1234
CP-74B ---------- 1236
CP-74H ---------- 1237
CP-74M ---------- 1238
CP-74Q ---------- 1239
CP-74R ---------- 1240
Y ---------- 1232
Z ---------- 1235
Cupric Chloride ---------- 121
Cupricin ---------- 12
Cupric Nitrate, Trihydrate ---- 174
Cupric Oxide ---------- 158
Cupric Sulfate Pentahydrate --- 29
Cuprous Cyanide ---------- 12
Cutting Oil ---------- 1161, 1162

MSDS#

Cutting Oil, Thread ---------- 1099
CW-340-1 ---------- 1147
CY 179 Epoxide ---------- 386
Cyanide of Potassium ---------- 13
Cyanoacrylic Adhesive ---------- 1065
Cyanoethylene ---------- 381
Cyanomethane ---------- 499
Cycloaliphatic Epoxy Resin ---- 386
Cyclohexanamine ---------- 537
Cyclohexane ---------- 389
1,2-Cyclohexanedicarboxylic
Anhydride ---------- 482
Cyclohexanol ---------- 489
Cyclohexanone ---------- 301
Cyclohexene ---------- 516
Cyclohexanone Iso-Oxime ------- 580
Cyclohexyl Alcohol ---------- 489
Cyclohexylamine ---------- 537
Cyclopentadiene Dimer --------- 340
Cyclopentanone ---------- 570
Cyclopropane ---------- 529
Cyclotetramethylene ---------- 379
Cyclotetramethylene Oxide ----- 379
Cymene ---------- 557
p-Cymene ---------- 557
Cymol ---------- 557

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

D

DADPS ---------- 1036
DAG 154 ---------- 1243
DAP Alkyd ---------- 1279
DAP Monomer ---------- 527
Dapsone ---------- 1036
Darammon ---------- 21
DBMP ---------- 456
DBP ---------- 429
DBPC ---------- 456
DCB ---------- 358
DCPD ---------- 340
DCPD-97 ---------- 340
DDS ---------- 1036
DEA ---------- 426
DEC ---------- 563
Decaborane ---------- 104
Decaboron Tetradecahydride ---- 104
Decahydronapthalene ---------- 563
Decalin ---------- 563
DEHP ---------- 414
Denatured Spirits (Ethanol) --- 1073, 1242
DEP ---------- 435
DER 330 ---------- 335B
DER 331 ---------- 335B
DER 664 ---------- 335
DETA (Diethylenetriamine) ----- 1034
Detergent Solution, Alcoholic,
with Lanolin Derivative ----- 1088

MSDS#

Detergent Solution, Aqueous --- 1093
Detergent Solution, Hydrocarbon
Solvent ---------- 1092
Developer System, Aqueous ----- 1049
(6 Part) (A to F)
Diacetone Alcohol ---------- 353
Diacetylmethane ---------- 556
DIALA A and AX Oils ---------- 393
Diallyl Phthalate Monomer ----- 527
Diamine ---------- 126
1,8-Diamino-3,6-Diazooctane --- 1035
b,b'-Diaminodiethylamine ------ 1034
4,4'-Diaminodiphenylsulfone --- 1036
Di(p-Aminophenyl) Sulfone ----- 1036
1,2-Diaminoethane ---------- 325
Diammonium Peroxydisulfate ---- 33
Diammonium Salt ---------- 129
Diamyl Amine ---------- 582
Dianilinomethane ---------- 346
Diatomaceous Earth (Natural) -- 69
Diatomite ---------- 69
Dibenzoyl Peroxide ---------- 500
DIBK ---------- 501
Diborane ---------- 103
Diboron Hexahydride ---------- 103
Diboran Trioxide ---------- 143
1,2-Dibromoethane ---------- 492
Dibutyl Phthalate ---------- 429
DICALITE 103 ---------- 69
SA3 ---------- 69
SA23 ---------- 69
SA33 ---------- 69
o-Dichlorobenzene ---------- 358
p-Dichlorobenzene ---------- 514
1,4-Dichlorobenzene ---------- 514
p-Dichlorobenzol ---------- 514
3,3'-Dichloro-4,4'-
diaminodiphenylmethane ------ 372
, -Dichlorodiethyl Ether ----- 571
Dichlorodifluoromethane ------- 308
1,2-Dichloroethane ---------- 359
Dichloroether ---------- 571
Dichloroethyl Ether ---------- 571
2,2'-Dichloroethyl Ether ------ 571
Dichloroethyl Oxide ---------- 571
Dichloromethane ---------- 310
Dichlorotetrafluoroethane ----- 572
Dichromic Acid ---------- 129,
153
Dicyclopentadiene ---------- 340
DIELEKTROL I ---------- 1051
DIELEKTROL II ---------- 1052
DIELEKTROL III ---------- 1216
Diesel Fuel Oil No. 2-D ------- 470
Diethanolamine ---------- 426
Diethylamine ---------- 453
Diethylaminobenzene ---------- 348
N,N-Diethylaniline ---------- 348
Diethyl Carbitol ---------- 565
Diethylenedioxide ---------- 412
Diethylene Glycol n-Butyl
Ether ---------- 322
Diethylene Glycol Ether ------- 565
Diethylene Glycol Monobutyl
Ether ---------- 322
Diethylene Glycol Monobutyl
Ether Acetate ---------- 368

	MSDS#
Diethylene Glycol Monoethyl Ether	460
Diethylene Oxide	379
Diethylenetriamine	1034
N,N-Diethyl Ethanamine	392
Diethyl Ether	343
Di(2-Ethylhexyl) Phthalate	414
Diethyl Ketone	478
Diethylolamine	426
Diethyl Oxide	343
Diethyl Phthalate	435
DIFFERENTIATED KLARIFIANT	1020
Difluorochloromethane	307
Diglycidyl Bisphenol-A Ether	335B
1,4-Dihydroxybutane	485
b,b´-Dihydroxydiethylamine	426
Diisobutyl Ketone	501
Diisopropyl	397A
Diisopropyl Ether	541
Diisopropyl Oxide	541
sym-Diisopropylacetone	501
N,N-Dimethyl Acetamide	458
Dimethacrylate Ester of 1, 3-Butanediol	1106
Dimethylacetone	478
Dimethylamide Acetate	458
(Dimethylamino) Benzene	347
Dimethylamino Ethanol	566
N-Dimethylamino Ethanol	566
N,N-Dimethylamino Ethanol	566
2-Dimethylamino Ethanol	566
-Dimethylaminoethyl Alcohol	566
c-Dimethylaminotoluene	326
N,N-Dimethylaniline	347
Dimethylbenzene	318
1,2-Dimethylbenzene	318A
1,3-Dimethylbenzene	318B
1,4-Dimethylbenzene	318C
N,N-Dimethylbenzylamine	326
2,2- and 2,3-Dimethylbutane	397A
Dimethyl Carbinol	324
Dimethylenediamine	325
1,1-Dimethylethanol	497
Dimethylethanolamine	566
N,N-Dimethylethanolamine	566
Dimethyl Ether	342
Dimethylformaldehyde	300
N,N-Dimethylformamide	424
2,6-Dimethyl-4-Heptanone	501
N,N-Dimethyl-2-Hydroxyethylamine	566
Dimethylketal	300
Dimethyl Ketone	300
Dimethylnitromethane	448
2,6-Dimethylphenol	561
Dimethyl Phthalate	430
Dimethyl p-Phthalate	404
Dimethyl Silicone Fluid	349
Dimethyl Sulfate (DMS)	344
Dimethyl Sulfoxide	428
Dimethyl Terephthalate	404
Di-n-butyl Phthalate	429
Dinitrogen Tetroxide	47
Dioctyl Phthalate	414
4-Diol	485
Diolamine	426
1,4-Dioxane	412

	MSDS#
DIOXITOL	460
1,3-Dioxolan-2-one, 4 Methyl	447
Dioxonium Perchlorate	102
DIPE	541
Diphenyl	451
Dipentylamine	582
Diphenylamine	461
Diphenyl-Diphenyloxide, Eutectic Mixture	1076
Diphenyl Methane Diisocyonate	1202A
4,4´-Diphenylmethane Diisocyanate	1105
Disodium Hexafluorosilicate	31
Disodium Dichromate	153
Disodium Salt	153
Disulfuric Acid	9A
2,6-Di-t-Butyl-4-Hydroxyltoluene	456
2,6-Di-t-Butyl-p-Cresol	456
2,6-Di-t-Butyl-p-Methylphenol	456
2,6-Di-t-butylphenol	1208
Dithiocarbonic Anhydride	350
Divinyl	463
DL-Lactic Acid	546
DMA	458
DMAC	458
DMF or DMFA	424
DMP	430
DMP-30	378
DMSO	428
DMT	404
DOLPH CW-340-1	1147
DOLPH T-200X (xylene)	1148
"DOP"	414
DOT I.D. No. (see UN No.)	
DOWANOL DB	322
DE	460
EB	320
EE	319
EM	352
PM	522
DOW CORNING GP-77 VARNISH	1171
DOW CORNING 200	349
561	349
DOW CORNING 994 VARNISH	1289
DOW CORNING 997 VARNISH	1290
DOW CORNING 1090 VARNISH	1169
DOWFLAKE	141
DOWTHERM A	1076
DOWTHERM G	1215
DOWTHERM J	1262
DOW Vinyltoluene, Grades T12 and T50	336
DPA	461
DRAKE Special VM&P 2429	391
Dry Ice	54
Dumasin	570
Duplicating Toners (Xerox)	1028
DUPONT Y-469-D PIGMENT	1124
DURITE LD 5102	1103
Dust, Wood	376
1,4-Dyeyarobutane	549
DYKEM LAYOUT FLUIDS	1154
DYKEM REMOVER AND THINNER	1153

E

MSDS#

EA934 A&B ---------- 1011A, B
EAA ---------- 553
EAGLE #20 (PbO) ---------- 38
EAK ---------- 480
Eastman 910 Adhesive ---------- 1219
EASY-FLO 45, Brazing Alloy ---- 41
ECCOSTRIP 93 ---------- 1033
EDE ---------- 492
Electrical Insulating Oil ----- 393
ELECTRO-BRITE NAZ-32 ---------- 1166
ELECTRO-BRITE Z-200 ---------- 1155
Electrocleaner, Alkaline ------ 1185
Electroless copper solutions
(see CUPOSIT) ----------
Elvanol ---------- 539
EMERSOL 132 and 153 ---------- 415
EMTAL 42 and 500 ---------- 42
Emulsifier (MAKON NF-5)
Alkoxylated Alkanolamide-type 1122
Enamel, Alkyd Resin, Green
(Exempt Solvent) (Deere & Co.
JDM F2A2) ---------- 1174
ENDOX 114 ---------- 1230
ENSTRIP A ---------- 1145
Epichlorohydrin/Bisphenol A-type
Diepoxide Resin, Unmodified:
Liquid, Epoxy Equiv. Wt.
175-195 ---------- 335B
Solid, Epoxy Equiv. Wt.
900-1000 ---------- 335
Liquid Solution ---------- 1128
EPI-CURE 855 ---------- 1269
EPI-CURE 856 ---------- 1074
EPI-REZ 509 ---------- 335B
EPI-REZ 510 ---------- 335B
EPI-REZ 530C ---------- 335
EPOCAST 2226B ---------- 1101
EPOLON 22 BLACK MASTIC (A & B) 1221
EPON Curing Agent D ---------- 1027B
Curing Agents V-15, V-25,
V-40 ------- 394
826 and 828 Resin -------- 335B
829 Resin ---------- 1128
1004 Resin ---------- 335
EPOTUF 37-139 ---------- 335B
37-140 ---------- 335B
37-304 ---------- 335
EPORAL ---------- 1036
Epoxy Adhesive, 2-part
Solventless ---------- 1177
Epoxy Bond Coat, #946 --------- 1129
1,4-Epoxybutane ---------- 379
Epoxy Curing Agent, Liquid:
Acid Anhydride Type --------- 1101
Amido-Amine Type ---------- 1074
Polyamide Type ---------- 394
3,4-Epoxycyclohexylmethyl-3,4-
epoxycyclohexylcarboxylate -- 386
1,2-Epoxyethane ---------- 433
Epoxy Putty (ASTRO 3069) ------ 1072A, B

MSDS#

Epoxy Resin:
Asbestos-Filled Paste ------- 1027
Coating Powder
with curing agent --------- 1179
Curing Agent ---------- 558
Cycloaliphatic, Liquid ------ 386
Filled ---------- 1027A
Hydrated Alumina-Filled
Liquid ---------- 1091A
Liquid and Curing Agent
(2 part) ---------- 1181,
1189,
1190
Liquid, Dyed Green(GE 2PV-32) 1089
Liquid, w/Hardner ---------- 1025,
1026
Liquid, w/Hardner,
thixotropic ---------- 1191
Liquid, Uncured ---------- 559
Modified, Film Form with
Curing Agent ---------- 1126B
Modified, Solution of ------- 1126A
Solution ---------- 1128,
1129
Epoxy Resin, Unmodified (Epi-
chlorohydrin/Bisphenol A-Type):
Liquid, Epoxy Equivalent Wt.
175-195 ---------- 335B
Solid, Epoxy Equivalent Wt.
900-1000 ---------- 335
EPOXY VARNISH 74023 ---------- 1026
Epoxy Varnish, Amido-Amine
Hardner, Solventless -------- 1075

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

ERL 4221 ---------- 386
Erythrene ---------- 463
1,2-Ethanediamine ---------- 325
Ethanedioic Acid ---------- 328
1,2-Ethanediol ---------- 323
Ethanenitride ---------- 499
Ethanethiol ---------- 510
Ethanoic Acid ---------- 327
Ethanoic Anhydride ---------- 434
Ethanol ---------- 361, 535
Ethanolamine ---------- 418
Ethanol, Denatured ---------- 1073, 1242
Ethanol, Specially Denatured -- 579
Ethanoyl Chloride ---------- 452
Ethene ---------- 457
1,2-Ethenedicarboxylic Acid,
trans. ---------- 545
Ethenylbenzene ---------- 351
Ethenyl Ethanoate ---------- 509
Ethenyl Trichloride ---------- 312
Ether ---------- 343
Ethoxyethane ---------- 343
2-Ethoxyethanol ---------- 319
1-Ethoxy-2-(-Ethoxyethoxy)
Ethane ---------- 565
2-Ethoxyethyl Acetate --------- 321

MSDS#

2-(2-Ethoxyethoxy)Ethanol ----- 460
ETHYL 701 ---------- 1208
Ethyl Acetate ---------- 437
Ethyl Acetic Ester ---------- 437
Ethyl Acetoacetate ---------- 553
Ethyl Acetone ---------- 305
Ethyl Acetyl Acetate ---------- 553
Ethyl Acetylacetonate --------- 553
Ethyl Alcohol ---------- 361
Ethyl Alcohol, Denatured ------ 1073, 1242
Ethyladehyde ---------- 535
Ethylamine ---------- 540
Ethyl Amyl Ketone ---------- 480
ETHYL ANTIOXIDANT 701 --------- 1208
Ethyl Benzene (Ethyl Benzol) -- 385
Ethyl Butyl Ketone or
Ethyl n-Butyl Ketone ---------- 306
Ethyl Carbinol ---------- 494
Ethyl Chloride ---------- 538
Ethylene ---------- 457
ETHYLENE/ACRYLIC COPOLYMER,
ELASTOMERIC ---------- 1104
Ethylene Aldehyde ---------- 573
Ethylenecarboxamide ---------- 577
Ethylene Carboxylic Acid ------ 449
Ethylenediamine ---------- 325
Ethylene Dibromide ---------- 492
trans-1,2-Ethylenedicarboxylic
Acid ---------- 545
Ethylene Dichloride ---------- 359
Ethylene Dipropionate --------- 578
Ethylene Glycol ---------- 323
Ethylene Glycol Ethers:
n-Butyl (or Monobutyl) Ether - 320
Ethyl (or Monoethyl) Ether --- 319
Ethyl Ether Acetate ---------- 321
Methyl (or Monomethyl) Ether - 352
Methyl Ether Acetate --------- 526
Ethylene Oxide ---------- 433
Ethylene Propionate ---------- 578
Ethylene Tetrachloride -------- 313
ETHYLENE THIOUREA (ETU) ------- 1187
Ethylene Trichloride ---------- 312
N-Ethyl-Ethanamine ---------- 453
Ethyl Ethanoate ---------- 437
Ethyl Ether ---------- 343
Ethyl Formate ---------- 502
2-Ethylhexanol (2-Ethyl-1-
hexanol) ---------- 367
2-Ethylhexyl Acrylate --------- 345
Ethylhexyl Alcohol ---------- 367
2-Ethylhexyl-2-Propenoate ----- 345
Ethyl Hydrosulfide ---------- 510
Ethylidenlactic Acid ---------- 546
Ethyl Mercaptan ---------- 510
Ethyl Methanoate ---------- 502
Ethyl Methyl Ketone ---------- 303
Ethyl Orthosilicate ---------- 446
Ethyl Oxide ---------- 343
Ethyl-3-Oxobutanoate ---------- 553
Ethyl-3-Oxobutyrate ---------- 553
Ethyl Silicate ---------- 446
Ethyl Sulfhydrate ---------- 510
Ethyne ---------- 403
EVANS 7050 HOT MELT ---------- 1097
(No longer commercially available)
EXPRAY-541 ---------- 1186

MSDS#

EXXON AROMATIC #100 ---------- 1061
#150 ---------- 1061A
VM&P Naphtha ---------- 391

F

FACTOQUENCH 74 ---------- 1067
FC 11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314
FC12CCC1F2 ---------- 314
FEL PRO C-102 ---------- 1225
FEL309 ---------- 142
FeN309 ---------- 142
FEP ---------- 1010
Ferric Chloride 42oBe --------- 19
FeC13 ---------- 19
Ferric Nitrate ---------- 142
Ferric Oxide ---------- 175
Fe2O3 ---------- 175
Ferric Perchloride ---------- 19
FeSO4 7H2O ---------- 57
Ferric Trichloride ---------- 19
FERRO Naphthenate 6% Cobalt --- 363
24% Lead ----- 384
Ferrous Sulfate Heptahydrate -- 57
Fibrous Glass (Fiberglass) ---- 46
Film, Adhesive, Modified Epoxy
Resin with Curing Agent ----- 1126B
FIREX RX-2373 ---------- 1189
Flaxseed Oil ---------- 476
FLEXISEAL, 2-Part Polysulfide
Sealant ---------- 1102A,
1102B
Flint ---------- 71
Flour, Wood ---------- 376
Flowers of Sulfur ---------- 56
Flowers of Zinc ---------- 45
Fluorinated Ethylene Propylene
Copolymer (FEP) ---------- 1010
Fluorocarbon 11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314
Fluoroelastomer Gum, Unfilled - 1107
FLUOROLUBE OIL ---------- 388
FLUOROLUBE S-30 ---------- 388
Fluorosilicic Acid ---------- 89
Fluorotrichloromethane -------- 309
Fluosilicic Acid ---------- 89
Flux, Activated-Rosin
(KESTER 197) ---------- 1022
Flux, ALPHA 811 ---------- 1050
Flux, ALPHA 815 ---------- 1079
Flux, ALPHA MELROSE 611 ------- 1080
FM-123-5 ADHESIVE FILM -------- 1126B
FM 203W Catalyst Powder ------- 1168
Formagene ---------- 462
Formaldehyde, Aqueous --------- 360
Formalin (37-50%) ---------- 360
Formamide ---------- 390
Formic Acid ---------- 416
Ethyl Ester ---------- 502
FORMVAR 12/85 and 85T, 5/95E,
6/95E, 15/95E and 95SS ------ 399

MSDS#

FORMVAR/Phenolic Wire Enamel -- 1040
FREON ---------- 572
11 ---------- 309
12 ---------- 308
22 ---------- 307
30 ---------- 310
113 ---------- 314
MF ---------- 309
TE & FREON TES ---------- 1213
TF ---------- 314
TMC ---------- 1212
TMS ---------- 1211
FREUND 6060 GLUE ---------- 1134
FRIGEN 113 TR-T ---------- 314
Fuel Oil Additive, Mn-Based --- 1196
Fuel Oil No. 1 ---------- 468
Fuel Oil No. 2 ---------- 469
Fuel Oil (Diesel) No. 2-D ----- 470
Fuel Oil No. 5 ---------- 473
Fuel Oil No. 6 ---------- 474
Fumaric Acid ---------- 545
Fumed Silica ---------- 1064
Fuming Sulfuric Acid ---------- 9A
2-Furaldehyde ---------- 413
2-Furancarbonal ---------- 413
2,5-Furandione ---------- 438
Furanidine ---------- 379
2-Furan Methanol ---------- 479
Furfural ---------- 413
Furfural Alcohol ---------- 479
Furfuraldehyde ---------- 413
Furfuryl Alcohol ---------- 479
Furnace Black ---------- 51
2-Furylcarbinol ---------- 479
FYRQUEL 150 R+O ---------- 1282
FYRQUEL 550 ---------- 1175

G

GALAXY THREAD CUTTING OILS ---- 1099
Gasoline, Lead-free ---------- 467
GE A50A262, Epoxy Varnish ----- 1075
GE MU-124 ---------- 1025
GE RTV-577, Polymer ---------- 1006
GE RTV-9811, Curing Agent ----- 1007
GE RTV Grades (One Component, Acetoxy-Cure) ---------- 1142
GE SF-96, SF-97 ---------- 349
GE SS-4004, Primer ---------- 1008
GE SS-4155 Primer ---------- 1151

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

GE 2PV-4, Hand Cleaner -------- 1088
GE 2PV-32, Epoxy Resin -------- 1089
GE 10 and 10C Oils (Discontinued Designation) ---------- 393
GE 1500 Thinner ---------- 1173
GE 9522 and 9637 (ALKANEX Varnish) ---------- 1163
GE 73039 Wire Enamel ---------- 1040

MSDS#

GE 73156 Wire Enamel ---------- 1005
GE 73517, PERMAFIL Polyester -- 1024
GE 74023 Epoxy Varnish -------- 1026
GE 113011 (Parts A & B) ------- 1072A, B
GELVATOL ---------- 539
GENAL (see PLENCO) ---------- 1254, 1254A
GENEPOXY 925 ---------- 335
GENESOLV D ---------- 314
GENETRON 11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314
114 ---------- 572
141 ---------- 307
GETTY A-150 ---------- 1286
GETTYSOLVE B ---------- 1274
GETTYSOLVE C ---------- 1275
GLASKYD 1901 ---------- 1279
Glass Fiber ---------- 46
GLUCINIUM ---------- 59
GLUCINUM ---------- 59
Glue, 6060, Emulsion-Type ----- 1134
Glutaral, 1,5-Pentanedial ----- 548
Glutaraldehyde ---------- 548
Glycidal Ethers ---------- 559
Glycol ---------- 323
Glycol Butyl Ether ---------- 320
Glycol Monoethyl Ether -------- 319
GLYPTAL C-1103 ---------- 1194
GLYPTAL C.E. 514 ---------- 1192
GLYPTAL 1500 Alkyd Thinner ---- 1173
GLYPTAL 7815 ---------- 1193
GOHSENOL ---------- 539
Grain Alcohol ---------- 361
Green Vitriol ---------- 57
Gum Rosin ---------- 377

H

H2 ---------- 65
H2-3404, HYSOL TETA ---------- 1035
H2-3416, HYSOL DETA ---------- 1034
Halocarbon Solvent Blend ------ 1170
HAND CLEANER, GE 2PV-4 -------- 1088
HANDY FLUX ---------- 1144
HASTALLOY "X" ---------- 164
HATCOL-101 ---------- 414
HAVILAND ND 68G ETCH ---------- 1041
H3BO3 ---------- 4
He ---------- 98
HEC (Hydroxyethyl Cellulose) -- 401
Helium ---------- 98
Heptane ---------- 464
n-Heptane ---------- 464
2-Heptanone ---------- 302
3-Heptanone ---------- 306
1,4,5,6,7,7-Hexachlorobicyclo (2.2.1) 5-heptene-2,3-dicarboxylic Anhydride ---------- 339
HERCO Pine Oil ---------- 484
HET Acid ---------- 511
Hexachloroendomethylenetetrahydrophthalic Acid ---------- 511
Hexachloroendomethylenetetrahydrophthalic Anhydride ----- 339

MSDS#

Hexafluoropropylene-Vinylidene Fluoride Copolymer ---------- 1107
Hexafluorosilicic Acid -------- 89
Hexahydroaniline ---------- 537
Hexahydro-2H-Azepin-2-One ----- 580
Hexahydro-2-Azepinone --------- 580
Hexahydrobenzene ---------- 389
Hexahydrophenol ---------- 489
Hexahydrophthalic Anhydride --- 482
Hexamethyldisilazane ---------- 513
Hexamethylene ---------- 389
Hexanaphthene ---------- 389
Hexanedinitrile ---------- 549
Hexanedioic Acid ---------- 400
Hexanedioic Acid, Dinitrile --- 549
Hexane (n-Hexane) ---------- 397
Hexane Isomers (Other than n-Hexane) ---------- 397A
6-Hexane Lactam ---------- 580
2-Hexanone ---------- 425
Hexanone Isoxime ---------- 580
1,6 Hexolactam ---------- 580
Hexone ---------- 304
HF (Hydrogen Fluoride) -------- 6
Hg ---------- 26
HgC12 ---------- 146
Hg(NO3)2 ---------- 169
HgO ---------- 170
HHPA ---------- 482
HI-POINT 90 ---------- 329A
HI-THERM BC-350 ---------- 1184
HI-SIL ---------- 1253
HI-TRI ---------- 312
HLi ---------- 160
HMDS ---------- 513
HNO3 ---------- 7
H2O2 ---------- 44A, B
Household Bleach ---------- 115
HOT MELT ADHESIVE, EVANS 7050 - 1097
H.S. 188 ---------- 163
H2S ---------- 52
H2S1F6 ---------- 89
H2SO4 ---------- 9
HTH ---------- 68
Humiseal 1A20 ---------- 1222
HYCAR 4031-50 ---------- 1086
Hydrargyrum ---------- 26
Hydrated Lime ---------- 39
Hydraulic Fluid (Triaryl Phosphate) --------- 1175
Hydrazine, Anhydrous ---------- 126
Hydrazine, Aqueous ---------- 127
Hydrazine, Methyl ---------- 552
Hydrazine Monobromide or Hydrazine Monohydrobromide -- 10
Hydrazomethane ---------- 552
Hydrobenzene ---------- 355
Hydrocarbon Solvent, Light Aliphatic ---------- 1280
Hydrochloric Acid ---------- 30A
Hydrochloric Acid, Anhydrous -- 30
Hydrochloric Ether ---------- 538
Hydroexytoluene (Benzyl Alcohol) ---------- 536
Hydrofluoric Acid, Anhydrous -- 6
Hydrofluoric Acid (47-70%) ---- 6A
Hydrofluosilicic Acid --------- 89

MSDS#

Hydrogen Arsenide ---------- 178
Hydrogen Borate ---------- 4
Hydrogen Carboxylic Acid ------ 416
Hydrogen Chloride, Anhydrous -- 30
Hydrogen Fluoride ---------- 6
Hydrogen Fluoride, Anhydrous -- 6
Hydrogen Gas ---------- 65
Hydrogen Hexafluorosilicate --- 89
Hydrogen Nitrate ---------- 7
Hydrogen Peroxide (60%) ------ 44A
Hydrogen Peroxide (27-52%) ---- 44B
Hydrogen Phosphate (75-85%) --- 8
Hydrogen Phosphide ---------- 63
Hydrogen Sulfate ---------- 9
Hydrogen Sulfide ---------- 52
Hydronium Perchlorate --------- 102
Hydroquinone Monomethyl Ether - 455
p-Hydroxyanisole ---------- 455
Hydroxybenzene ---------- 355
2-Hydroxy Benzoic Acid -------- 543
1-Hydroxybutane ---------- 337
2-Hydroxybutane ---------- 442
Hydroxycyclohexane ---------- 489
1-Hydroxyethanecarboxylic Acid 546
Hydroxyethyl Cellulose -------- 401
-Hydroxyethyldimethylamine --- 566
n-Hydroxyethyl-1,2-Ethanediamine ---------- 555
n-(2-Hydroxyethyl) Ethylenediamine ---------- 555
n-(-Hydroxyethyl) Ethylenediamine ---------- 555
2-Hydroxymethylfuran ---------- 479
4-Hydroxy-4-Methylpentanone-2 - 353
1-Hydroxymethyl propane ------- 398
2-Hydroxypropanoic Acid ------- 546
alpha-Hydroxypropionic Acid --- 546
2-Hydroxypropionic Acid ------- 546
2-Hydroxy-1,2,3-propanetri-carboxylic acid ---------- 533
Hydroxytoluene (Cresol)-------- 409
o-Hydroxytoluene ---------- 560
-Hydroxytricarballylic Acid -- 533
Hypnon ---------- 567
Hypnone ---------- 567
Hypochlorite Solution --------- 115
HYSOL DK 0295 ---------- 1179
HYSOL EA 934 (Parts A & B) ---- 1011A, B
H2-3404 TETA ---------- 1035
H2-3416 DETA ---------- 1034
PC 17 (Parts A & B) ----- 1255A, B
PC 18 ---------- 1066

I

IBA ---------- 398
2-Imidazolidinethione --------- 423
IMIDEX E, 73156 ---------- 1005
IMMUNOL S-6 ---------- 1093
IMRON M,M, ENAMEL, White (817U) 1117
INCO ---------- 164
INCONEL ---------- 164
INDUSTRIAL CLEANER 68-A ------- 1096
INHIBISOL ---------- 311

MSDS#

Ink Cleaning Solvent ---------- 1152
Insulating Oil, Electrical ---- 393
Insulating Varnish Phenolic
resin-modified polyester) --- 1002
Intumescent Coating
(2-part epoxy) ---------- 1189
Iodine ---------- 114
I2 ---------- 114
IONOL ---------- 456
IPA ---------- 324
IPE ---------- 541
IPN ---------- 575
IPS TR 250 (Component A) ------ 1202A
IPS TR 250 (Component B) ------ 1202B
IR-75 Developer System -------- 1049
(6 part) (A to F)
Iron (III) Chloride ---------- 19
Iron Nitrate ---------- 142
Iron (III) Nitrate, Anhydrous - 142
Iron (III) Oxide ---------- 175
Iron Sesquioxide ---------- 175
Iron (II) Sulfate ---------- 57
Iron Trinitrate ---------- 142
Iron Vitriol ---------- 57

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

Isobutenyl Methyl Ketone ------ 454
Isobutyl Acetate ---------- 396
Isobutyl Alcohol (Isobutanol) - 398
Isobutyl Methyl Ketone -------- 304
Isocyanate Solution, Pigmented 1127
Isohexane ---------- 397A
Isohol ---------- 324
ISOMID "B" ---------- 1085
ISONEL 31-66 (XV-503) --------- 1002
"Isooctane" ---------- 383
ISOPAR L ---------- 1259
ISOPAR M ---------- 1260
Isopentyl Alcohol Nitrite ----- 575
Isopentyl Nitrite ---------- 575
Isophorone ---------- 357
Isoprene ---------- 341
Isopropanol ---------- 324
2-Isopropoxy Propane ---------- 541
Isopropyl Acetate ---------- 496
Isopropyl Alcohol ---------- 324
Isopropyl Amine ---------- 483
Isopropyl Carbinol ---------- 398
Isopropyl Ether ---------- 541
Isopropylbenzene ---------- 395
4,4-Isopropylidene-bis phenol - 369
4,4-Isopropylidenediphenol ---- 369
p,p-Isopropylidenediphenol ---- 369
1-Isopropyl-4-Methylbenzene --- 557
4-Isopropyl-1-Methylbenzene --- 557
p-Isopropyltoluene ---------- 557
ISOTRON 11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314
Isovalerone ---------- 501

J

MSDS#

J-1345 Basic Zinc Chromate ---- 1130
JDM F2A2 GREEN ALKYD RESIN
ENAMEL (Exempt Solvent) ----- 1174

K

KA12Si3O10(OH)2 ---------- 24
KANO KROIL ---------- 1050
KAYNIDE ---------- 312
KCN ---------- 13
K2Cr2O7 ---------- 168
Kerosene (Kerosine) Burner Fuel 488
Kerosene (Kerosine) Solvent --- 387
Kerosine No. 1-K ---------- 488
2-K ---------- 488
KESTER 108 THINNER ---------- 1023
197 RESIN FLUX --------- 1022
Ketocyclopentane ---------- 570
2-Ketohexamethylenimine ------- 580
Ketone Propane ---------- 300
Ketopentamethylene ---------- 570
Kieselguhr ---------- 69
Klinger 61 ---------- 15B
KMnO4 ---------- 95
KODAFLEX DOP ---------- 414
KODAFLEX TXIB ---------- 1039
KODAK Metal Etch Resist (KMER)
Developer ---------- 1204
KODAK Metal Etch Resist Thinner 1201
KODAK Photo Resist Developer -- 1203
KODAK Photo Resist, KPR ------- 1277
KODAK Photo Resist Thinner,
Type 4 ---------- 1217
KOH ---------- 2
KPR 4 ---------- 1217
KROIL ---------- 1050
KRYLON CRYSTAL CLEAR SPRAY
COATING (1300-1305) (Aerosol) 1059
KURIFLOCK PN-147 (Cancelled) -- 1119
KURIFLOCK PN-161 ---------- 1119A
KWICK KASE ---------- 1045

L

L605 ---------- 163
LACO M-A Flux (La-Co-M-A Flux) 1018
Lacquer, Wood (MOBIL 2609) ---- 1165
Lactic Acid ---------- 546
DL-Lactic Acid ---------- 546
LAMINAC 4146 ---------- 1009
Lanthana ---------- 145
Lanthanium Sesquioxide -------- 145
Lanthanum Oxide ---------- 145
Lanthanum Trioxide ---------- 145
La2O2 ---------- 145
Lanthana ---------- 145
Lanthanum Oxide ---------- 145

MSDS#

Lanthanum Sesquioxide --------- 145
Lanthanum Trioxide ---------- 145
Lard Oil ---------- 512
Laughing Gas ---------- 109
Lauryl tri(oxyethyl Sulfate
Ammonium Salt ---------- 490
Layout Fluid (DYKEM) ---------- 1154
Lead Chloride ---------- 150
Lead (II) Chloride ---------- 150
Lead Dichloride ---------- 150
Lead Chloride ---------- 150
Lead (II) Chloride ---------- 150
Lead Dichloride ---------- 150
Lead Monoxide ---------- 38
Lead Naphthenate Solution ----- 384
Lead (II) Oxide ---------- 38
LECTON ACRYLIC RK6323 &
RK6327 ---------- 1060
LiBr ---------- 149
LiF ---------- 105
Light Aliphatic Solvent Naphtha 530
Lignite Oil ---------- 525
Ligroin(e), Light ---------- 518
Lime ---------- 22
Lime, Hydrated, High Calcium -- 39
Lime, Slaked ---------- 39
Liquefied Petroleum Gas:
Butane Based ---------- 481
Propane Based ---------- 380
Liquid Caustic Soda ---------- 3A
Liquid Metal (NaK Alloy) ------ 16
Linseed Oil, Raw ---------- 476
Litharge ---------- 38
Lithium Bromide ---------- 149
Lithium Bromide ---------- 149
Lithium Fluoride ---------- 105
Lithium Hydride ---------- 160
LORD ACCELERATOR #4 ---------- 1001B
LPG & LP-Gas ---------- 380,481
LUCIDOL-98 ---------- 500
LUNAR CAUSTIC ---------- 81
LUPERSOL DDM and DELTA-X ------ 329
LUPERSOL DDM-9 and DELTA-X9 --- 329A
Lye ---------- 2, 3
Lye Solution (50%) ---------- 3A

M

M-A Soldering Flux ---------- 1018
MAGNAFLUX SKC-NF SPOTCHECK
CLEANER ---------- 1031
MAGNAFLUX ZC-7 ---------- 1031
MAGNAFLUX ZYGLO DEVELOPER
ZP-9 ---------- 1071
Magnesia ---------- 94
Magnesium Carbonate ---------- 97
Magnesium Oxide ---------- 94
Magnesium Silicate, Hydrous
(asbestiform) ---------- 15A
MAGNUS 26-N ---------- 1108
92-S ---------- 1109
215D ---------- 1111
614 ---------- 1113
617 ---------- 1114
763-NF ---------- 1176

MSDS#

SC-100 ---------- 1110
Water Wash 402 --------- 1112
MAGNU-SPRAY 105 ---------- 1069
MAKON NF-5 ---------- 1122
Maleic Anhydride ---------- 438
MALLORY 100 (obsolete) -------- 32
Manganese Binoxide ---------- 122
Manganese Black ---------- 122
Manganese Carbonate ---------- 135
Manganese Dioxide ---------- 122
Manganese Metal/Powder -------- 148
Manganese Oxide ---------- 122
Manganese Sulfate ---------- 151
Manganese (II) Sulfate -------- 151
Manganous Carbonate ---------- 135
Manganous (II) Sulfate -------- 151
MARKEM 320 CLEANER ---------- 1152
Marsh Gas ---------- 440
Massicot ---------- 38
MBK ---------- 425
MC ---------- 311
MDA (Methylenedianiline) ------ 346
MDI ---------- 1105
MEA ---------- 418
MEK (Methyl Ethyl Ketone) ----- 303
MEK Peroxide Solution --------- 329
MEK Peroxide Solution
(9wt% max "active oxygen") -- 329A
Mequinol ---------- 455
Mercaptoacetic Acid ---------- 574
2-Mercaptoacetic Acid --------- 574
Mercaptoethane ---------- 510
Mercaptolutane ---------- 504
Mercaptoimidazoline ---------- 423
Mercuric Bichloride ---------- 146
Mercuric Chloride ---------- 146
Mercuric Nitrate ---------- 169
Mercuric Oxide ---------- 170
Mercuric Oxide, Red ---------- 170
Mercuric Oxide, Yellow -------- 170
Mercury (II) Nitrate ---------- 169
Mercury (II) Oxide ---------- 170
Mercury p-Nitrate ---------- 169
Mercury (II) Salt ---------- 169
Mercury ---------- 26
Mercury (II) Chloride --------- 146
Mesitol ---------- 581
Mesityl Oxide ---------- 454
Metaformaldehyde ---------- 462
Methacetone ---------- 478
Methacrylic Acid, Butyl Ester - 554
Methacrylic Acid, Methyl Ester 441
Methanal, Aqueous ---------- 360
Methanamide ---------- 390
Methane ---------- 440
Methane Carboxylic Acid ------- 321
Methane Dichloride ---------- 310
Methane Tetrachloride --------- 410
Methanethiol ---------- 465
Methanoic Acid ---------- 416
Methanol ---------- 354
p-Menthenols (tertiary) ------- 493
Methoxycarbonylethylene ------- 551
2-Methoxyethanol ---------- 352
Methoxymethane ---------- 342
2-Methoxyethyl Acetate -------- 526
4-Methoxyphenol ---------- 455

MSDS#

p-Methoxyphenol ---------- 455
1-Methoxy-2-Propanol ---------- 522
Methyl Acetate ---------- 503
beta-Methyl Acrolein ---------- 578
Methyl Acrylate ---------- 551
Methyl Alcohol ---------- 354
Methyl Aldehyde Solution ------ 360
Methyl n-Amyl Ketone ---------- 302
Methylbenzene ---------- 317
Methyl-bicyclo 2.2.1 heptene-
2,3-dicarboxylic anhydride -- 1062
2-Methyl-1,3-Butadiene -------- 341
3-Methylbutanol Nitrite ------- 575
3-Methyl-2-Butanone ---------- 466
2-Methyl-Butylacrylate -------- 554
3-Methyl Butyl Ester Nitrous
Acid ---------- 575
4-Methyl-2,6-di-t-butyl Phenol 456
Methyl i-Butyl Ketone --------- 304
Methyl n-Butyl Ketone --------- 425
3-Methylbutyl Nitrite --------- 575
Methyl CELLOSOLVE ---------- 352
Methyl CELLOSOLVE Acetate ----- 526
Methyl Chloride ---------- 373
Methyl Chloroform ---------- 311
p-Methyl Cumone ---------- 557
Methyl Cyanide ---------- 499
4,4'-Methylene
bis(2-Chloroaniline) -------- 372
Methylene bis(Phenylisocyanate) 1105
Methylene Chloride ---------- 310
Methylenedianiline ---------- 346
Methylene Diphenylisocyanate -- 1105
Methylene Oxide Solution ------ 360
Methyl Ethanoate ---------- 503
Methyl Ether ---------- 342
Methyl Ethyl Carbinol --------- 442
Methyl Ethyl Ketone ---------- 303
Methyl Ethyl Ketone Peroxide
(9%) ---------- 329A
Methyl Ethyl Ketone Peroxide
Solution ---------- 329
Methyl Formate ---------- 432
5-Methyl-3-Heptanone ---------- 480
Methyl Hydrazine ---------- 552
1-Methylhydrazine ---------- 552
Methyl Hydride ---------- 440
Methyl Hydroxide ---------- 354
Methyl Isobutyl Ketone -------- 304
p-Methyl Isopropyl Benzene ---- 557
1-Methyl-4-Isopropyl Benzene -- 557
Methyl Isopropyl Ketone ------- 466
Methyl Mercaptan ---------- 465
Methyl Methacrylate (Monomer) - 441
Methyl Methanoate ---------- 432
Methyl Oxide ---------- 342
Methyl OXITOL ---------- 352
2- and 3-Methylpentane -------- 397A
4-Methyl-2-Pentanone ---------- 304
4-Methyl-3-Pentene-2-One ------ 454
Methylphenol ---------- 409
2-Methylphenol ---------- 560
o-Methylphenol ---------- 560
Methyl Phenyl Ketone ---------- 567
2-Methyl Propanol ---------- 398
2-Methyl-1-Propanol ---------- 398
2-Methylpropan-1-ol ---------- 398

MSDS#

2-Methyl-2-Propanol ---------- 497
Methyl Propenate ---------- 551
Methyl 2-propanoate ---------- 551
2-Methyl Propenoic Acid Methyl
Ester ---------- 441
Methyl Propensate ---------- 551
1-Methylpropyl Acetate -------- 519
b-Methylpropyl Acetate -------- 396
2-Methylpropyl Alcohol -------- 398
2-Methyl-1-propyl Ethanoate --- 396
Methyl n-Propyl Ketone or
Methyl Propyl Ketone -------- 305
1-Methyl-5-Pyrrolidinone ------ 431
N-Methylpyrrolidinone --------- 431
N-Methyl-2-Pyrrolidone -------- 431
Methylpyrrolidone ---------- 431
Methylstyrene ---------- 336
Methyl Sulfhydrate ---------- 465
Methyl Sulfoxide ---------- 428
Methyl Tetrahydrophthalic 1091B
Anhydride, Epoxy Curing Agent 1101
Methylvinylbenzene ---------- 336
MgCO3 ---------- 97
MgO ---------- 94
MIBK ---------- 304
Mica Powder (Muscovite) ------- 24

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

Mineral Oil ---------- 525
Mineral Oil, White ---------- 525,
1137
Mineral Oil with Detergents,
"Soluble" in Water ---------- 1132,
1183
Mineral Oil with Lube Additives 1140,
1141
Mineral Powder Slurry (PROTECT-
O-METAL No. 2) ---------- 1044
Mineral Seal Oil ---------- 525
Mineral Spirits ---------- 334,
1257,
1258
Mineral Spirits Cleaning
Compound ---------- 1095
MME ---------- 441, 455
Mn ---------- 148
MnCO3 ---------- 135
Mn-Based Fuel Oil Additive ---- 1196
MnSO4 ---------- 151
MnO2 ---------- 122
MO (Mesityl Oxide) ---------- 454
Mo ---------- 84
MOBIL Clear Varnish 2609 ------ 1164
Mist Lube #27 ---------- 1141
VACTRA #2 ---------- 1140
VACTRA #4 ---------- 1140A
VAPROTEC Conc ---------- 1267
VAPROTEC Light ---------- 1266
MOD-EPOX ---------- 411
MOLD RELEASE #210-SS (Paraffin) 1136

MSDS#

Mold Release, Silicone (aerosol) ---------- 1198
Molybdenum Metal/Powder ------- 84
MONDUR M ---------- 1105
Mono-aluminum Phosphate ------- 11
Monobromobenzene ---------- 564
Monobutylamine ---------- 569
Monochlorobenzene ---------- 366
Monochlorodifluoromethane ----- 307
Monochlorosulfuric Acid ------- 544
Monoethanolamine ---------- 418
Monoethanolethylenediamine ---- 555
Monoethylamine ---------- 540
Monofluorotrichloromethane ---- 309
Monohydroxy Methane ---------- 354
Monomethylhydrazine ---------- 552
Mono-n-Butylamine ---------- 569
Morpholine ---------- 356
MOWIOL ---------- 539
MPK (Methyl Propyl Ketone) ---- 305
M-PYROL ---------- 431
MULTILITH DEGLAZING SOLVENT --- 310
MULTRATHANE M - MDI ---------- 1105
Muriatic Acid ---------- 30A
Muriatic Ether ---------- 538
Muscovite Mica, Powdered ------ 24
Muthmann's Liquid ---------- 562

N

N155 ---------- 163
N2 ---------- 61
NaBH4 ---------- 93
NaCN ---------- 58
Na2CO3 ---------- 48
Na2 Cr7 2H20 ---------- 153
NADIC METHYL ANHYDRIDE -------- 1062
NaHS ---------- 87
NaNO2 ---------- 111, 116
NaNO3 ---------- 101
NaOCl ---------- 115
NaK-78 ---------- 16
NaK Alloy ---------- 16
Naphtha, Aromatic High Solvency 1061,
High Flash ---------- 1061A
Naphtha, VM&P (Rule 66 Exempt) 391
Naphthenate Soap Solution:
6% Cobalt Catalyst ---------- 363
24% Lead Catalyst ---------- 381
Na2SiF6 ---------- 31
Na2SiO3 ---------- 85
Natural Camphor ---------- 531
Natural Gas ---------- 440
NAVEE 42 ---------- 1057
Navy Special Fuel Oil --------- 473
NE ---------- 436
Neohexane ---------- 397A
NEOSOL ---------- 1073
NEU-TRI Solvent ---------- 1156
NH3 ---------- 1
NH4Cl ---------- 21
NH42Cr2O7 ---------- 129
NH4F ---------- 111
NH4HF2 ----------49
NH2NH2 ---------- 126

MSDS#

NH2NH2 H2O ---------- 127
NH2NH3Br ---------- 10
NH4NO3 ---------- 79
(NH4)2S2O8 ---------- 33
NH2SO3H ---------- 72
Nickel Borofluoride ---------- 128
Nickel Dichloride ---------- 36
Nickelous Chloride Hexahydrate- 36
Nickel Fluoborate ---------- 128
Nickel (II) Chloride ---------- 36
Nickel (II) Nitrate ---------- 20
Nickel Salt, Hexahydrate ------ 37
Nickel (II) Sulfate ---------- 37
Nickel (II) Terrafluoroborate - 128
Nickelous Chloride Hexahydrate 36
Nickelous Nitrate Hexahydrate - 20
Nickelous Sulfate Hexahydrate - 37
Nickel, Spongy or Porous,
Powder ---------- 1118
NiCl2 6H2O ---------- 36
Ni(NO3)2 ---------- 20
NIPAR S-20 ---------- 448
NiSO4 6H2O ---------- 37
Nitramyl ---------- 575
Nitratine ---------- 101
Nitric Acid (55-70%) ---------- 7, 159
Nitric Acid, Ammonium Salt ---- 79
Iron (3+) Salt --- 142
Nitric Acid-Based Cleaning
Solution ---------- 1017
Nitric Acid Barium Salt ------- 173
Nitric Acid, Cadmium Salt ----- 171
Nitric Acid, Copper II Salt,
Trihydrate ---------- 174
Nitrobarite ---------- 173
2,2',2" Nitrilotriethanol ----- 427
Nitrobenzene ---------- 439
Nitrobenzol ---------- 439
Nitrocarbol ---------- 508
Nitrocellulose Lacquer (DYKEM) 1154
Nitroethane ---------- 436
Nitrogen ---------- 61
Nitrogen Dioxide ---------- 47
Nitrogen Monoxide ---------- 109
Nitrogen Peroxide ---------- 47
Nitrogen Tetroxide ---------- 47
Nitroisopropane ---------- 448
Nitromethane ---------- 508
2-Nitropropane ---------- 448
Nitroxanthic Acid ---------- 534
Nitrous Acid, Sodium Salt ----- 116
Nitrous Oxide ---------- 109
NMH ---------- 552
NMP ---------- 431
N2O ---------- 109
Non-ionic Surfactant, Liquid -- 1094
Nonmetal Hydride ---------- 178
Nonylphenoxy(polyethanoxy)
ethanol ---------- 1094
Norvalamine ---------- 569
NO-TARN ---------- 1043
NOVACITE 325, 1250, L-207A ---- 1021
NOZZLE KLEEN (Aerosol) -------- 1164
2-NP ---------- 448
Nujol ---------- 525

MSDS#

NUODEX Naphthenate Catalyst
6% Cobalt ---------- 1268
24% Lead ---------- 384
NYAD G, 325, or 400 ---------- 55
NYLATRON GS-63 ---------- 1209

O

O2 ---------- 62
O3 ---------- 34
OAKITE 32 ---------- 1214
56 ---------- 1224
67 ---------- 1167
90 ---------- 1226
94 ---------- 1228
98 ---------- 1183
160 ---------- 1032
Cryscoat 247 ---------- 1244
Deoxidizer 34 ---------- 1247
Stripper ANP ---------- 1042
Stripper 156 ---------- 1182
Octadecanoic Acid ---------- 415
Octadecanoic Acid Calcium Salt 445
Octyl Acrylate ---------- 345
"Octyl" Alcohol ---------- 367
Octylphenoxypolyethoxyethanol - 1291
Odorless Mineral Spirits ------ 334B
Odorless Petroleum Spirits ---- 334B
Odorless Solvent ---------- 334B
Oil of Mirbane ---------- 439
Oil of Pine ---------- 484
Oil of Vitriol ---------- 9
Oil, Transformer (or Electrical Insulating) ---------- 393
Olefiant Gas ---------- 457
Oleum ---------- 9A
Oleum Abietis ---------- 484
Oracetic Ether ---------- 553
Orthoboric Acid ---------- 4
Orthodichlorobenzene ---------- 358
Orthophosphoric Acid (75%) --- 8
Orthohydroxybenzoic ---------- 543
Oxacyclopentane ---------- 379
Oxalic Acid ---------- 328
OXIRANE ---------- 433
OXITOL ---------- 319
3-Oxo-, Ethyl Ester ---------- 553
3-Oxo-1-Heptanol ---------- 320
2-Oxo-Hexomethyleneimine ------ 580
2-Oxohexamethylenime ---------- 580
Oxolane ---------- 379
Oxybenzene ---------- 355
1,1'-Oxybis (2-Chloro) Ethane - 571
2,2'-Oxybis (Propane) --------- 541
Oxygen ---------- 62
o-Oxytoluene ---------- 560
Ozone ---------- 34

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

P

MSDS#

PACO Solvent T.R. 590 --------- 1073
Paint, Alkyd, Air-Drying, Gloss Black ---------- 1193
Paint Flocculant ---------- 1021
Paint Remover, Alkaline, Solvent-Type ---------- 1182
Paracymene ---------- 557
Paracymol ---------- 557
Paradichlorobenzene ---------- 514
Paraffinic Min. Oil Lubricant - 1264
Paraffin Oil ---------- 525
Paraffin Wax in Min. Sp. ------ 1136
Paraform ---------- 462
Paraformaldehyde ---------- 462
PARAPLEX P-49 ---------- 1038
(No longer commercially available)
PARK KASE 5C ---------- 1045
PAS ---------- 1253
PbC12 ---------- 150
PbO ---------- 38
PC 18, Printed Circuit Coating 1066
PCB ---------- 1200
PCP ---------- 517
PC13 ---------- 110
PD680 Cleaning Compound ------- 1095
PDCB ---------- 514
P.D.GEORGE #946,Epoxy Bond Coat 1129
PEACOCK BRAND (Lard Oil)
No. 1 ---------- 512
EWS ---------- 512
Prime ---------- 512
PEDIGREE Wire Enamel #357 ----- 1125
#946 ----- 1129
PEG 4000 ---------- 364
PEG Hand Solution ---------- 1087
PENESOLVE 5 ---------- 1053
PENETONE 2389 ---------- 1054
PENETONE Type S ---------- 1055
Penetrant, Non-destructive Testing ---------- 1048
PENNWALT CLEANER K-2 ---------- 1261
Penta ---------- 517
Pentachlorophenol ---------- 517
n-Pentane ---------- 523
Pentanedione ---------- 556
1,5-Pentanedione ---------- 548
2,4-Pentanedione ---------- 556
Pentanol ---------- 506
2-Pentanone ---------- 305
3-Pentanone ---------- 478
Pentyl Alcohol ---------- 506
1-Pentyl Acetate ---------- 487
Pentyl Acetate, Primary ------- 486
N-Pentyl-1-Pentanamine -------- 582
Pentyl Pentylamine ---------- 582
PERCHLOR ---------- 313
Perchloric Acid 70-72% -------- 102
Perchloroethylene ---------- 313
Perchloromethane ---------- 410

MSDS#

PERCLENE ---------- 313
PERCLENE D ---------- 313
2-Perhydroazepinone ---------- 580
Perhydronapthalene ---------- 563
Periclase ---------- 94
PERK ---------- 313
PERMABOND QUICK FILLER/SETTER - 1188
PERM-A-CLOR ---------- 312
PERM-A-CLOR NA ---------- 312
PERMAFIL 73517 ---------- 1024
Peroxide, Benzoyl ---------- 500
Peroxide (MEK Peroxide) ------- 329
Peroxybenzoic Acid,
t-Butyl Ester ---------- 406
Petrohol ---------- 324
Petrol ---------- 467
Petroleum Distillate ---------- 530
Petroleum "Ether" ---------- 518,1280
Petroleum Naphtha, C --------- 1274
Petroleum Naphtha, C --------- 1275
Petroleum Spirit ---------- 518
Petroleum Spirits ---------- 334,
334A
PEX SPRAY 66 ---------- 1019
PGME ---------- 522
PH3 ---------- 63
Phenchlorol ---------- 517
Phene ---------- 316
Phenic Acid ---------- 355
Phenol ---------- 355
Phenol-formaldehyde Resin, Two-
stage, Unfilled ---------- 1103
Phenolic Modified Polyester
Resin in Xylene ---------- 1184
Phenolic Molding Compound -
Cellulose Filled ---------- 1254A
Phenolic Molding Compound -
Mineral Filled ---------- 1254
Phenolics (mainly C7 to C9) --- 409A
Phenyl Alcohol ---------- 355
Phenylamine ---------- 407
N-Phenylaniline ---------- 461
Phenylbenzene ---------- 451
Phenyl Bromide ---------- 564
Phenyl Carbinol ---------- 536
Phenyl Carboxylic Acid -------- 402
Phenyl Chloride ---------- 366
N-Phenyldiethylamine ---------- 348
Phenylethane ---------- 385
Phenylethylene ---------- 351
1-Phenylethanone ---------- 567
1-Phenyl Ethanone ---------- 567
Phenylformic Acid ---------- 402
Phenyl Hydrate ---------- 355
Phenylhydride ---------- 316
Phenyl Hydroxide ---------- 355
Phenylic Acid ---------- 355
Phenylmethane ---------- 317
Phenol Methyl Ketone ---------- 567
2-Phenylpropane ---------- 395
1-Phenyl-1(3,4-Xylyl)Ethane --- 1216
PHOSFLEX 4 ---------- 521
PHOSFLEX 112, Plasticizer ----- 1081
(Discontinued by Manufacturer)
See MSDS #450
Phosgene ---------- 66
Phosphine ---------- 63

MSDS#

Phosphoric Acid (>75%) -------- 8
Phosphorous Acid,
Triphenyl Ester ---------- 411
Phosphorous Chloride ---------- 110
Phosphorus ---------- 25
Phosphorus Oxychloride -------- 117
Phosphorus Trichloride -------- 110
Phosphorus Trihydride --------- 63
Phosphoryl Chloride ---------- 117
Photo Resist (see KODAK)
Phthalandione ---------- 417
o-Phthalic Acid, Diallyl Ether 527
Phthalic Anhydride ---------- 417
Picric Acid ---------- 534
Picronitro Acid ---------- 534
Pigment, Basic Zinc Chromate -- 1130
Chrome Yellow Med. --- 1124
Muscovite Mica ------- 24
Pimelic Ketone ---------- 301
Pinenes (dicyclic) ---------- 375
Pine Oil ---------- 484
Plasticizer, KODAFLEX TX1B ---- 1039
PHOSFLEX 112 ----- 1081
PLENCO 04300 Phenolic Cmpds --- 1254
PLENCO 02000 BLACK (Inj Mold) - 1254A
PLENCO 0720C BLACK (Inj Mold) - 1254A
PLENCO 07203 BLACK (Comp. Mold) 1254A
PLENCO 12983, 4300 ---------- 1254
PLENCO 4000, 4200, 14015 ------ 1254A
Plumbous Chloride ---------- 150
Plumbous Oxide ---------- 38
POCl3 ---------- 117
Polyacrylamide Powder --------- 1119
Polyacrylate Adhesive (2-part) 1150
Polyacrylic Elastomer --------- 1086
Poly(amide-imide) Wire Enamel - 1037
Polyamide Resin, Liquid,
Reactive ---------- 394
Polychlorinated Biphenyl ------ 1200
Poly(Dimethylsiloxane) Fluid -- 349
Polyester Resin in Xylene
Solution (ALKANEX) ---------- 1163
Polyester Resin, Phenolic
Modified, Solution ---------- 1184
Polyester Resin, Unsaturated:
Styrene-Type ---------- 1024, 1038
Styrene-Type, Catalyzed ----- 1070, 1123
Polyester-imide:
Resin Solution ---------- 1125
Wire Enamel ---------- 1005, 1085
Polyethylene Glycol, Alcohol
Solution ---------- 1087
Polyethylene Glycol, Solid
mole. wt. ca (6000-7500) ---- 364
Polyglycol E-6000 ---------- 364
Polyimide Resin Solution, PTFE
Filled ---------- 1143
POLYISOCYANATE ACTIVATOR 192-S 1116
Polyoxymethylene ---------- 462
POLY-SOLV DB ---------- 322
DE ---------- 460
EB ---------- 320
EE ---------- 319
Polystyrene Beads, Expandable - 1276
Polysulfide Sealant, 2 Part --- 1120A, B
POLY-TERGENT B-300 ---------- 1094

MSDS#

Poly(Tetrafluoroethylene-Hexa-
fluoropropylene) Copolymer -- 1010
Polytrifluorochloroethylene,
Liquid ---------- 388
Polyurethane-Based Caulk,
Airborne Moisture Cure ------ 1100
Polyurethane Black Insulator
Varnish ---------- 1146
Polyurethane Coating, One-
Component, Moisture Cure ---- 1187
Polyurethane Enamel, White ---- 1117
Polyurethane Rubber
(One Component) ---------- 1139
(SEE ALSO URETHANE)
Polyvinyl Alcohol ---------- 539
Polyvinyl Formal Resins
(FORMVAR) ---------- 399
Pond Sludge ---------- 156
Potash Lye ---------- 2
Potash, Red Prussiate of ------ 140
Potassium Acid Phthalate ------ 475
Potassium Bichromate ---------- 168
Potassium Biphthalate --------- 475
Potassium Cyanide ---------- 13
Potassium Dichromate ---------- 168
Potassium Ferricyanide -------- 140
Potassium Hexacyanoferrate
(III) ---------- 140
Potassium Hydrogen Phthalate -- 475
Potassium Hydroxide ---------- 2
Potassium Permanganate--------- 95
POVAL ---------- 539
Powdered Aluminum Oxide ------- 1000
Powdered Wood ---------- 376
PR-420 ---------- 1127
PR-1527 ---------- 1139
Precipitated Amorphous Silica - 1253
Precipitated Calcium Phosphate 137
Primer, Alkyd, Corrosion
Resisting ---------- 1194
Primer, Alkyd, Red Oxide ------ 1192
Primer for RTV Silicone Rubber:
SS-4004 ---------- 1008
SS-4155 ---------- 1151
Printed Circuit Coating ------- 1066
Prolamine ---------- 498
Propane, Liquified Gas -------- 380
n-Propanol ---------- 494
2-Propanol ---------- 324
Propanone ---------- 300
Propellant 11 ---------- 309
12 ---------- 308
22 ---------- 307
2-Propenal ---------- 573
Propenamide ---------- 577
2-Propenamide ---------- 577
Propenenitrile ---------- 381
Propenoic Acid ---------- 449
Propenoic Acid, Methyl Ester -- 551
2-Propenoic Acid, Butyl Ester - 547
2-Propenoic Acid, Methyl Ester 551
2-Propenoic-2-Methyl Butyl
Ester ---------- 554
2-Propen-1-ol ---------- 505
2-Propenol-one ---------- 573
2-Propenol ---------- 505
Propenyl Alcohol ---------- 505

MSDS#

2-Propenyloxy Methyl Oxirane -- 576
Proprietary Solvent #1 -------- 1242
Proprietary Solvent #3 -------- 1073
2-Propyl Acetate ---------- 496
n-Propyl Acetate ---------- 515
1-Propyl Alcohol ---------- 494
n-Propyl Alcohol ---------- 494
sec-Propyl Alcohol ---------- 324
2-Propylamine ---------- 483
Propylcarbinol ---------- 337
Propylene Aldehyde ---------- 578
Propylene Carbonate ---------- 447
Propylene Glycol Monomethyl
Ether ---------- 522
PROTECT-O-METAL No. 2 --------- 1044
PROTEXULATE ---------- 1082
PtX (PbO) ---------- 38
PVA ---------- 539
PVAL ---------- 539
PVOH ---------- 539
PXE ---------- 1216
PYNOL ---------- 484
PYRANOL ---------- 1200
PYRE-ML WIRE ENAMEL
RC 5863 ---------- 1120
Type I (RC 5877) ---------- 1121
Pyridine ---------- 405
2-Pyridylamine ---------- 568
Pyroacetic Acid ---------- 300
Pyroacetic Ether ---------- 300
Pyrogenic Silica
(discontinued term) --------- 1064
Pyrolusite ---------- 122
Pyromucic Aldehyde ---------- 413
Pyro Powder ---------- 100
Pyrosulfuric Acid ---------- 9A
Pyrrolidine ---------- 498
Pyrrolyene ---------- 463

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

Q

Q-CLEAN SE-67 ---------- 1195
QUANTOR IR-75 Developer System 1049
(6 Part) ---------- (A to F)
Quartz ---------- 71
Quartz, Natural, Micro-
crystalline (NOVACITE) ------ 1021
Quench Oil (Hydrocarbon) ------ 1067
Quicklime ---------- 22
QUICKSET 90 ---------- 329A

R

MSDS#

RACK STRIP C ---------- 1017A
RACK STRIP C Cleaning Solution 1017
RAM MOLD RELEASE 225 ---------- 1046A
RAM MOLD RELEASE 225 (Aerosol) 1046
RANEY NICKEL CATALYST #28 ----- 1118
Range Oil ---------- 488
RC 577 PYRE-ML Wire Enamel ---- 1121
RC 5863 PYRE-ML Wire Enamel --- 1120
Red Iron Oxide ---------- 175
REFRIGERANT 11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314
114 ---------- 572
RELIASOLV NO. 564 ---------- 1249
1001 ---------- 1207
Remover, Thinner (DYKEM) ------ 1153
REMOVER 1112A ---------- 1015
Rene 41, 77, 95 ---------- 163
Resin Flux 197 ---------- 1022
RESIN-NT ---------- 1047
REZ-N-BOND #1 ---------- 1131
Rh ---------- 147
Rhodium Metal/Powder ---------- 147
Rhodochrosite ---------- 135
RISTON II DEVELOPER 2000
(Concentrate) ---------- 1013
RISTON II DEVELOPER 2000
(Use Concentration) --------- 1013A
RISTON II STRIPPER 1000X ------ 1012
RODINE 85 ---------- 1248
RODINE 92A ---------- 1083
ROLFITE 404 ---------- 1196
Rosin (Gum or Wood) ---------- 377
RTV-102,103,106,108,109,
112,116,118,157,158,159 ----- 1142
RTV-577 (Silicone Polymer) ---- 1006
RTV Silicone Rubber,
Acetoxy-Cure ---------- 1142
RTV-9811 (Catalyst) ---------- 1007
Rubber Solvent ---------- 371
Rubber, Uncured, Polyacrylic -- 1086
RUBILENE Oil ---------- 1264
Rust Inhibitor for Steel ------ 1098
Rust Inhibitor, Alkaline ------ 1108

S

Sal Ammonia ---------- 21
Salammonite ---------- 21
Salicylic Acid ---------- 543
Salmiac Sal Ammoniac ---------- 21
Sal Soda ---------- 48
Sand ---------- 71
SANTICIZER 9 ---------- 1068
SARTOMER SR-297 ---------- 1106
Sawdust, Wood ---------- 376
Saxol ---------- 525

MSDS#

Sb ---------- 70
Sb203 ---------- 28
S.B.A. ---------- 442
Sb2 03 ---------- 28
SC 3700 ---------- 513
SCOTCHCAST #8 (Parts A & B) --- 1181
SCOTCHKOTE RESIN K2006 & K2008 1003
(No longer commercially available)
SCOTCHWELD STRUCTURAL ADHESIVE
2216, Parts A & B ---------- 1157A, B
SDA-3A ---------- 579
SD No. 3A Alcohol ---------- 579
Se (Selenium) ---------- 136
SE-75 Degreasing Solvent ------ 1251
SECURITY Oil ---------- 1264
Selenium (Metal Powder) ------- 136
Selenium Dioxide ---------- 152
Selenium Oxide ---------- 152
Selenious Anhydride ---------- 152
SeO2 ---------- 152
Serpentine Asbestos ---------- 15A
SF6 ---------- 27
SF-96, SF-97 ---------- 349
Shellac, White, Alcohol-Based
Solution ---------- 370
SHELL BPA 154 or 157 ---------- 369
EPON (See EPON)
OMALA OILS ---------- 1270
PD680 Cleaning Compound - 1095
Rubber Solvent ---------- 371
TELLUS OILS ---------- 1272
TURBO OILS ---------- 1271
VM&P Naphtha EC --------- 391
SHIPLEY CATALYST 9F ---------- 1227
SiC14 ---------- 106
SiH4 ---------- 107
SIKAFLEX 1A ---------- 1100
Signal Oil ---------- 525
Silane ---------- 107
SILASTIC RTV (Acetoxy-Cure) --- 1288
Silica (see Silicon Dioxide)
Silicane ---------- 107
Silicic Acid Disodium Salt ---- 85
Silicic Anhydride ---------- 71
Silicofluoric Acid ---------- 89
Silicon Dioxide:
Amorphous ---------- 69
Amorphous, fumed ---------- 1064
Crystalline ---------- 71
Flour ---------- 71
Natural, microcrystalline --- 1021
Silicone Fluid (Dimethyl) ----- 349
Silicone Polymer (Fluid) for
2-Part RTV Rubber ---------- 1006
Silicone Resin Solution:
DOW CORNING GP-77 ---------- 1171
DOW CORNING 1090 Varnish ---- 1169
Silicone Rubber ---------- 1142
Silicon Tetrachloride --------- 106
Silicon Tetrahydride ---------- 107
SILVALOY 45, Brazing Alloy ---- 41
Silver Brazing Alloy ---------- 41
"Silver Brazing Flux" --------- 1144
Silver Nitrate ---------- 81
SiO2 ---------- 69
SKELLYSOLVE F ---------- 1280
SK-4 Cold Stripper ---------- 1199

MSDS#

SKC-NF SPOTCHECK CLEANER (Formula B) ---------- 1031
SKD-NF SPOTCHECK DEVELOPER ---- 1071
Sn ---------- 74
SnC12 ---------- 67
SnSO4 ---------- 14
SO2 ---------- 50
SOC12 ---------- 86, 90
Soda Ash ---------- 48
Soda Bleach Liquor ---------- 115
Soda Lye ---------- 3
Soda Niter ---------- 101
Sodium Bichromate ---------- 153
Sodium Bisulfide (Commercial)-- 87
Sodium Borohydride ---------- 93
Sodium Carbonate, Anhydrous --- 48
Sodium Cyanide ---------- 58
Sodium Dichromate (Dihydrate) - 153
Sodium Fluoride ---------- 138
Sodium Fluosilicate ---------- 31
Sodium Hydrogen Sulfide ------- 87
Sodium Hydrosulfide ---------- 87
Sodium Hydroxide ---------- 3
Sodium Hydroxide, 50% --------- 3A
Sodium Hypochlorite (5-12%) --- 115
Sodium Metasilicate, Anhydrous 85
Sodium Nitrate ---------- 101
Sodium Nitrite ---------- 116
Sodium Phosphate Tribasic ----- 43
Sodium-Potassium Alloy -------- 16
Sodium Silicate (40-43 deg Be)- 99
Sodium Silicofluoride --------- 31
Sodium Tetraborete Pentahydrate 112
Sodium Tetrahydroborate ------- 93
Solder Flux, Acid ---------- 19
Solder Flux, Alcohol-Rosin Type, Activated ---------- 1022, 1080
Solder Flux Thinner ---------- 1023
SOLKA-FLOC ---------- 507
Soluble Glass ---------- 85, 99
SOLUBLE OIL "C" ---------- 1132
SOLVATONE A (discontinued name) 420
Solvent, Light Aliphatic Hydrocarbon ---------- 1280
Solvent, saturated hydrocarbon, synthetic ---------- 1259, 1260
SOLVESSO 100 and 150 (Obsolete Tradenames; see EXXON Aromatic 100 and 150) ------- 1061, 1061A
Soya Oil ---------- 477
Soybean Oil ---------- 477
Specially Denatured Alcohol No. 3A ---------- 579
SPRAY 66 ---------- 1019
Spirit of Hartshorn ---------- 1A
SPIRITS Mold Release ---------- 1198
Sr(NO3)2 ---------- 159
SrCO3 ---------- 120
SS-4004 Primer ---------- 1008
SS-4044 Primer ---------- 1281
SS-4155 Primer ---------- 1151
STAFLEX DOP ---------- 414
Stainless Steel/Cobalt Base --- 163
Stainless Steel/Nickel Base --- 164
Stannous Chloride ---------- 67
Stannous Sulfate ---------- 14
Stannum ---------- 74

MSDS#

Starch (Corn) ---------- 472
Stator Compound, Putty-Like Polyester ---------- 1147
STAYSILV-45 ---------- 41
STEAM KLEEN ---------- 1056
Stearic Acid ---------- 415
STEELGARD 1505E ---------- 1098
STERLING U-300-20 ---------- 1191
Stibium ---------- 70
Stoddard Solvent, Type I ------ 334
Stoddard Solvent, Type II (140 deg F min FP) ---------- 334A
Stoddard Solvent, Type III ---- 334B
Stokes V-Lube F ---------- 1285
Strippable Coating for Metal -- 1110
Stripper, Alkaline, Solvent-Type ---------- 1182
Stripper Compound for Metal (Alkaline Cyanide-Based) ---- 1145
Stripper for Photoresists, Acidic Methylene Chloride --- 1199
Strontium Carbonate ---------- 120
Strontium Nitrate ---------- 159
Strontium Salt ---------- 159
STRYPP NF ---------- 1016
STYROPOR (BR Grades) ---------- 1276
Styrene Monomer (Styrol) ------ 351
Sulfamic Acid ---------- 72
Sulfonic Acid, Monochloride --- 544
Sulfonyl Chloride ---------- 90
Sulfur (Sulphur) ---------- 56
Sulfur Dioxide, Anhydrous ----- 50
Sulfur Fluoride ---------- 27
Sulfur Hexafluoride ---------- 27
Sulfur Trioxide in Sulfuric Acid ---------- 9A
Sulfuretted Hydrogen ---------- 52
Sulfuric Acid ---------- 37
Sulfuric Acid, Aluminum Salt -- 92
Sulfuric Acid, Concentrated --- 9
Sulfuric Acid, Fuming --------- 9A
Sulfuric Chloride ---------- 90
Sulfuric Chlorohydrin --------- 544
"Sulfuric Ether" ---------- 343
Sulfuric Oxychloride ---------- 90
Sulfurous Acid Anhydride ------ 50
Sulfurous Oxychloride --------- 86
Sulfuryl Chloride ---------- 90
p,p´-Sulfuryl Dianiline ------- 1036
SUMINE 2015 ---------- 326
SUNNY Sol Bleach ---------- 115
SUNVIS 916 (32) ---------- 1284
SUN WAY OIL 90 ---------- 1256
SUPERFLAKE ---------- 141
SUPER GLUE-3 ---------- 1065
Surfactant, Non-ionic, Liquid - 1094
SYNASOL PM509 & PM 3224 ------- 1073
SYNASOL SOLVENT 190 PM41 ------ 1242
Synthetic Camphor ---------- 531
SYNTHITE EB-41 ---------- 1146

Can´t find the material you need? Genium recommends that you contact the manufacturer of the material.

T

MSDS#

T-200X (Xylene) ---------- 1148
Ta ---------- 167
TA ---------- 443
Talc (Talcum) ---------- 42
Tall Oil, Fatty Acids --------- 495
Tantalum Powder ---------- 167
Tape, Woven, Asbestos, unsized 15
Tarnish Remover (NO-TARN) ----- 1043
TBE ---------- 562
TBP ---------- 521
TCA ---------- 524
TCE (Trichloroethylene) ------- 312, 1156
TCP (Tricresyl Phosphate) ----- 332
TDI ---------- 331
Te ---------- 108
TEA (Triethanolamine) --------- 427
TECSOL-3 ---------- 1073
TECTYL Rust Preventatives
511M ---------- 1283
511HF ---------- 1283
848D ---------- 1283
848D-HF ---------- 1283
890 ---------- 1229
TEFLON FEP ---------- 1010
Tellurium Metal/Powder -------- 108
TERASOD #357 ---------- 1125
Terephthalic Acid ---------- 443
Terpene Achols/Mixtures ------- 484
Terpenes ---------- 375
Terpineol ---------- 493
Tertiary Calcium Phosphate ---- 137
Tertiary Sodium Phosphate ----- 43
TETA (Triethylenetetramine) --- 1035
Tetrabromoacetylene ---------- 562
1,1,2,2-Tetrabromoethane ------ 562
Tetrachloroethylene ---------- 313
Tetrachloromethane ---------- 410
Tetrachlorosilane ---------- 106
Tetraethyl Orthosilicate ------ 446
1,2,3,4-Tetrahydrobenzene ----- 516
Tetrahydrofuran ---------- 379
Tetrahydro-2-furanmethanol ---- 520
Tetrahydrofurfuryl Alcohol ---- 520
Tetrahydrofuryl Carbinol ------ 520
Tetrahydropyrrole ---------- 498
Tetramethylene Cyanide -------- 549
Tetramethylene Glycol --------- 485
Tetramethylene Oxide ---------- 379
Tetramethylenimine ---------- 498
Tetramethylguanidine ---------- 419
TEXACO 2228 CLEARTEX B -------- 1162
1157 TRANSULTEX F ------ 1161
2234 CLEARTEX 140X ----- 1137
CLEARTEX 120 Cutting Oil 1162
SOLUBLE OIL "C" -------- 1132
TEXSOLVE B ---------- 1274
TEXSOLVE C ---------- 1275
TEXSOLVE F ---------- 1280
Th ---------- 76
THALLIUM Metal/Powder --------- 80

MSDS#

THEIC (Obsolete Tradename; see
RESIN-NT) ---------- 1047
Thermal Black ---------- 51
THERMOPOXY COMPOUND U-300-20 -- 1191
THF (Tetrahydrofuran) --------- 379
THFA ---------- 520
Thinner, ALPHA 413-F ---------- 1077
Thinner, ALPHA 810 ---------- 1078
Thinner, ALPHA 812 ---------- 1252
Thinner, GLYPTAL 1500 --------- 1173
Thinner 108 ---------- 1023
Thinner and Remover (DYKEM) --- 1153
Thiobutyl ---------- 504
Thioethanol ---------- 510
Thioglycolic Acid ---------- 574
2-Thioglycolic Acid ---------- 574
Thiomethyl Alcohol ---------- 465
Thionyl Chloride ---------- 86
Thiovanic Acid ---------- 574
THORIUM Metal/Powder and cmpds 76
THOXENE TA-12B ---------- 1027A
(No longer commercially available)
THREE M, TYPE R DEVELOPER ----- 1180
Ti ---------- 75,80
Tin (II) Chloride ---------- 67
Tin Metal/Powder ---------- 74
Tin Protochloride ---------- 67
Tin (II) Sulfate ---------- 14
TiO2 ---------- 118
Titania ---------- 118
Titanic Anhydride ---------- 118
Titanium-Based Alloy ---------- 166
Titanium Dioxide ---------- 118
TITANIUM Metal/Powder --------- 75
Titanium Oxide ---------- 118
Tl ---------- 80
TMG ---------- 419
Toluene (Toluol) ---------- 317
Toluene-2,4-diisocyanate ------ 331
Toluenesulfonamide (o- and p-
isomers) ---------- 1068
Tolylene-2,4-diisocyanate ----- 331
Toxilic Anhydride ---------- 438
TPP (Triphenyl Phosphate) ----- 333
Transformer Oil ---------- 393
TRANSULTEX F (1557) ---------- 1161
TRIAD E ---------- 312
Triaryl Phosphate Hydraulic
Fluid ---------- 1175
Tricalcium Orthophosphate ----- 137
Triatomic Oxygen ---------- 34
Tributyl Phosphate ---------- 521
Tricalcium Phosphate ---------- 137
TRICHLOR ---------- 312
Trichloroacetic Acid ---------- 524
Trichlorobenzene, Dielectric
Grade ---------- 365
-Trichloroethane ---------- 311
1,1,1-Trichloroethane --------- 311
Trichloroethylene ---------- 312, 1156
Trichlorofluoromethane -------- 309
Trichloromethane ---------- 315
Trichlorotrifluoroethane ------ 314
1,1,2-Trichloro-1,2,2-trifluoro-
ethane ---------- 314
TRICLENE D ---------- 312
MD ---------- 312

MSDS#

Tricresyl Phosphate ---------- 332
TRI-ETHANE ---------- 311
Triethanolamine ---------- 427
Triethylamine ---------- 392
Triethylenetetramine ---------- 1035
Trifluoroborane ---------- 91
Trimellitic Acid-1,2-Anhydride 330
Trimellitic Anhydride --------- 330
Trimethylcarbinol ---------- 497
3,5,5-Trimethyl-2-cyclohexen-1-one ---------- 357
Trimethylene ---------- 529
2,2,4-Trimethylpentane -------- 383
2,2,4-Trimethyl-1,3-pentanediol Diisobutyrate Ester --------- 1039
2,4,6-Trimethyl Phenol -------- 581
TRIM TAP HEAVY ---------- 1058
2,4,6-Trinitrophenol ---------- 534
Triphenyl Phosphate ---------- 333
Triphenyl Phosphite ---------- 411
Triple Carbonate Coating Media 1273
Tripoli (SiO2) ---------- 1021
Tripotassium Hexakiscyanoferrate (3-) --- 140
2,4,6-tris(Dimethylaminomethyl) Phenol ---------- 378
tris(2-Hydroxyethyl)amine ----- 427
tris(2-Hydroxyethyl) Isocyanurate ---------- 1047

Can't find the material you need? Genium recommends that you cantact the manufacturer of the material.

tris-(2-Hydroxyethyl)-s-Triazine-2,4,6-Trione ------- 1047
Trisodium Phosphate Dodecahydrate (TSP) ---------- 43
Trisodium Orthophosphate ------ 43
TRITHENE ---------- 311
TRITHERM 981 WIRE ENAMEL ------ 1037
Tritolyl Phosphate ---------- 332
TRITON X-100 SURFACTANT ------- 1291
Trodaloy #1 ---------- 32
Tungsten Carbide (Cemented w/ Cobalt Binder) ---------- 177
Tungsten Carbide Powder ------- 123
TUN-O-WASH CLEANER ---------- 1170
Turpentine, Spirit or Oil of -- 375
Type 6 Nylon ---------- 1209
TYPE R DEVELOPER (3M) --------- 1180

U

UCON ---------- 572
11 ---------- 309
12 ---------- 308
22 ---------- 307
113 ---------- 314

MSDS#

Department of Transportation "proper shipping names" of materials (49CFR 172.101, 172.102) are included as a cross reference where an appropriate Material Safety Data Sheet is available.

"UN" numbers are appropriate for both international and domestic shipments. Those preceded by "NA" are designated for North American shipments only, including between U.S. and Canada.

UN# (DOT I.D. No.)
1001 Acetylene ---------- 403
1005 Ammonia, Anhydrous (see 2672, Ammonia solution Solution) ---------- 1
1006 Argon, compressed (see UN1951 Argon, liquid) --- 64
1008 Boron Trifluoride ---- 91
1010 Butadiene, Inhibited - 463
1011 Butane or Butane Mixtures (see UN1075) --- 481
1013 Carbon Dioxide (see UN1845, 2187) ------ 54
1016 Carbon Monoxide ------ 35
1017 Chlorine ---------- 53
1018 Chlorodifluoromethane 307
1027 Cyclopropane -------- 529
1028 Dichlorodifluoromethane ---------- 308
1033 Dimethyl Ether ------- 342
1036 Ethylamine ---------- 540
1037 Ethyl Chloride ------- 538
1038 Ethylene, Liquid (see UN1962) ---------- 457
1040 Ethylene Oxide (0.2% max N) ---------- 433
1046 Helium, Compressed (see UN1963 Helium, Liquid) ---------- 98
1049 Hydrogen, Compressed - 65
1050 Hydrogen Chloride Anhydrous (see UN1789 Hydrochloric Acid) ------ 30
1052 Hydrofluoric Acid Anhydrous ---------- 6
1053 Hydrogen Sulfide ----- 52
1063 Methyl Chloride ------ 373
1064 Methyl Mercaptan --- 465
1066 Nitrogen, Compressed (see UN1977 Nitrogen, Liquid) ---------- 61
1067 Nitrogen Dioxide ----- 47
1070 Nitrous Oxide -------- 109
1072 Oxygen, Compressed --- 62
1073 Oxygen, Refrigerated Liquid ---------- 62
1075 Liquefied Petroleum Gas (Propane Based) --------- 380
(Butane Based) ---------- 481
1076 Phosgene ---------- 66
1079 Sulfur Dioxide ------- 50
1080 Sulfur Hexafluoride -- 27
1086 Vinyl Chloride ------- 382
1090 Acetone ---------- 300
1092 Acrolein ---------- 573
1093 Acrylonitrile -------- 381

MSDS#

1095 Alcohol (see specific alcohol) ---------- --
1096 Alcohol (see specific alcohol) ---------- --
1098 Allyl Alcohol -------- 505
1100 Allyl Chloride ------- 374
1104 Amyl Acetate --------- 486,487
1105 n-Amyl Alcohol ------- 506
1110 Methyl Amyl Ketone --- 302
1114 Benzene ---------- 316
1115 Benzine ---------- 530
1120 Butyl Alcohol -------- 337
Isobutyl Alcohol ----- 398
1121 sec-Butanol ---------- 442
1120 t-Butanol ---------- 497
1123 Butyl Acetate -------- 338
1124 sec-Butyl Acetate ---- 519
1125 n-Butylamine --------- 569
1129 N-Butyraldehyde ------ 542
1131 Carbon Disulfide or Bisulfide ---------- 350
1134 Chlorobenzene -------- 366
1145 Cyclohexane ---------- 389
1147 Decahydronaphthalene - 563
1148 Diacetone Alcohol ---- 353
1154 Diethylamine --------- 453
1155 Diethyl Ether -------- 343
1156 Diethyl Ketone ------- 478
1157 Diisobutyl Ketone ---- 501
1159 Isopropyl Ether ------ 541
1165 Dioxane (1,4-Dioxane) 412
1170 Ethyl Alcohol -------- 361
1171 2-Ethoxyethanol ------ 319
1172 2-Ethoxyethyl Acetate 321
1173 Ethyl Acetate -------- 437
1175 Ethyl Benzene -------- 385
1184 Ethylene Dichloride -- 359
1188 Ethylene Glycol Monomethyl Ether -------- 352
1189 Acetaldehyde --------- 535
1190 Ethyl Formate -------- 502
1193 Methyl Ethyl Ketone (MEK) ---------- 303
1198 Formaldehyde Soln. (see UN2209) ---------- 360
1199 Furfural ---------- 413
1203 Gasoline ---------- 467
1206 Heptane ---------- 464
1208 n-Hexane ---------- 397
1208 Neohexane (2,2-Dimethylbutane) and hexane isomers (see UN2457,2462) 397A
1212 Isobutyl Alcohol ----- 398
1213 Isobutyl Acetate ----- 396
1218 Isoprene ---------- 341
1219 Isopropyl Alcohol ---- 324
1220 Isopropyl Acetate ---- 496
1221 Isopropyl Amine ------ 483
1223 Kerosine (Kerosene) -- 387,488
1229 Mesityl Oxide -------- 454
1230 Methyl Alcohol ------- 354
1231 Methyl Acetate ------- 503
1243 Methyl Formate ------- 432
1244 Methyl Hydrazine ----- 552
1245 Methyl Isobutyl Ketone (MIBK) ---------- 304

MSDS#

1247 Methyl Methacrylate Monomer, Inhibited (Uninhibited NA 1247) --- 441
1249 Methyl Propyl Ketone - 305
1255 Petroleum Naphtha ---- 334,334A, 530,1274, 1275
1261 Nitromethane --------- 508
1262 Isooctane (2,2,4 Trimethylpentane) ------- 383
1265 n-Pentane ---------- 523
NA1268 Naphtha Distillate --- 530
1268 Mineral Seal Oil ----- 525
1268 Petroleum Distillate - 334,334A
1271 Petroleum Spirit ----- 518,1280
1271 Petroleum "Ether" ---- 518
1272 Pine Oil ---------- 484
1274 n-Propyl Alcohol ----- 494
1282 Pyridine ---------- 405
1292 Ethyl Silicate ------- 446
1294 Toluene ---------- 317
1296 Triethylamine -------- 392
1299 Turpentine ---------- 375
1301 Vinyl Acetate -------- 509
1307 Xylenes ---------- 318A,B,C
1309 Aluminum Powder Coated (see UN1383, 1396) ------ 100
1344 Picric Acid ---------- 534
1350 Sulfur, Lump or Powder 56
1352 Titanium Metal Powder, Wetted (see UN2546) ----- 75
1358 Zirconium Metal, Powder, Wet (see UN1308, 1932, 2008) ---------- 17
NA1361 Coal,Ground Bituminous 491
1381 Phorphorus, White or Yellow, Dry or Wet ------ 25
1383 Pyrophoric Metals, n.o.s. ---------- 17,73,76, 100
1396 Aluminum, Powder, Uncoated (see UN1309, 1383) ---------- 100
1402 Calcium Carbide ------ 78
1414 Lithium Hydride ------ 160
1422 Sodium-Potassium Alloy 16
1426 Sodium Borohydride --- 93
1436 Zinc, Metal, Powder or Dust (Non-Pyrophoric) (see UN1383) ---------- 73, 176
1446 Barium Nitrate ------- 173
1439 Ammonium Dichromate -- 129
1444 Ammonium Persulfate -- 33
NA1463 Chromic Acid, Solid (see UN1755) ---------- 5
1466 Ferric Nitrate ------- 142
NA1477 Nitrate Compounds ---- 174, 168
NA1479 Sodium Dichromate, (Dihydrate) ---------- 153
1490 Potassium Permanganate 95
1493 Silver Nitrate ------- 81
1498 Sodium Nitrate ------- 101
1500 Sodium Nitrate ------- 116
1507 Strontium Nitrate ---- 159
1547 Aniline ---------- 407
1564 Barium Carbonate ----- 119
1564 Barium Chloride ------ 132

MSDS#

1564 Barium Fluoride ------ 132
1564 Barium Hydroxide ----- 40
1567 Beryllium,Metal Powder 59
1587 Copper Cyanide ------- 12
1591 o-Dichlorobenzene ---- 358
1592 p-Dichlorobenzene ---- 514
1593 Dichloromethane (Methylene Chloride) ---- 310
1595 Dimethyl Sulfate ----- 344
1604 Ethylenediamine ------ 325
1605 Ethylene Dibromide --- 492
1624 Mercuric Chloride ---- 146
1625 Mercury (II) Nitrate - 169
1641 Mercury (II) Oxide --- 170
1648 Methyl Cyanide ------- 499
NA1648 Acetonitrile --------- 499
1662 Nitrobenzene --------- 439
1671 Phenol (see UN2312, NA2821) ---------- 355
1680 Potassium Cyanide ---- 13
1689 Sodium Cyanide ------- 58
1690 Sodium Fluoride ------ 138
1710 Trichloroethylene ---- 312,1156
1715 Acetic Anhydride ----- 434
1717 Acetyl Chloride ------ 452
1727 Ammonium Hydrogen Fluoride, Solid --------- 49
1736 Benzoyl Chloride ----- 459
1744 Bromine ---------- 77
1748 Calcium Hypochlorite, Dry, ---------- 68
1749 Chlorine Trifluoride - 125
2754 Chlorosulfonic Acid -- 544
1755 Chromic Acid, Solution (see UN1463) ---------- 5
NA1759 Stannous Chloride, Solid ---------- 67
1760 Aminoethylethanolamine 555
Dimethylamino Ethanol 566
NA1760 Aluminum Phosphate Solution ---------- 11
NA1760 Nitric Acid, 40% or Less (see UN2031) ---------- 7
NA1760 Morpholine Aqueous Mixture (see UN2054) ---- 356
NA1760 Lactic Acid ---------- 546
1773 Ferric Chloride, Anhydrous or Soda ------- 19
1778 Fluorosilicic Acid --- 89
NA1778 Hydrofluorosilicic Acid ---------- 89
1779 Formic Acid ---------- 416
1789 Hydrochloric Acid (see UN1050) ---------- 30A
NA1789 Hydrochloric Acid Mixtures ---------- 1043,1199 1214,1245
1790 Hydrofluoric Acid Solution ---------- 6A

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

MSDS#

1791 Hypochlorite Solution, 115
NA1791 Hypochlorite Solution, (Corrosive Material Class) ---------- 115
NA1791 Hypochlorite Solution, (ORM-B Class) ---------- 115
1802 Perchloric Acid (see UN1873) ---------- (see 102)
1805 Phosphoric Acid ------ 8
1809 Phosphorus Trichloride 110
1810 Phosphorus Oxychloride 117
1813 Potassium Hydroxide, Solid ---------- 2
1818 Silicon Tetrachloride 106
1823 Sodium Hydroxide,Solid 3
1824 Sodium Hydroxide, Solution ---------- 3A
1830 Sulfuric Acid -------- 9
NA1831 Oleum ---------- 9A
1834 Sulfuryl Chloride ---- 90
1836 Thionyl Chloride ----- 86
1839 Trichloroacetic Acid (Solid) ---------- 524
1840 Zinc Chloride, Solution ---------- 18
1842 Acetic Acid (see UN2789, 2790) ---------- 327
1845 Carbon Dioxide, Solid (see UN1013, 2187) ------ 54
1846 Carbon Tetrachloride - 410
1866 Resin Solution ------- 1133A
1868 Decaborane ---------- 104
1873 Perchloric Acid (50-72%) (see UN1802) ---------- 102
1888 Chloroform ---------- 315
1896 SD No. 3A Alcohol ---- 579
NA1896 SD No. 3A Alcohol ---- 579
1910 Calcium Oxide -------- 22
1911 Diborane ---------- 103
1915 Cyclohexanone -------- 301
1919 Methyl Acrylate ------ 551
1922 Pyrrolidine ---------- 498
1932 Zirconium Scrap (see 1308,1358,2008,2009,2858) 17
1940 Thioglycolic Acid ---- 574
1942 Ammonium Nitrate (0.2% Max Combustibles) ------- 79
1951 Argon, Refrigerated Liquid (see UN1006) ----- 64
1958 Dichlorotetra-fluoroethane ---------- 572
1962 Ethylene, Compressed (see UN1038) ---------- 457
1963 Helium, Liquid (see 1046) ---------- 98
1965 Hydrocarbon Gas, Liquified ---------- (see 380, 440,481)
1971 Methane or Natural Gas, with a High Methane Content, Compressed ---------- 440
1972 Methane or Natural Gas, with a High Methane Content, Refrigerated Liquid ----- 440
1977 Nitrogen, Refrigerated Liquid (see UN1066) ----- 61

MSDS#

1978 Propane or LPG (see UN1075) ---------- 380
1986 Alcohols, Toxic n.o.s. 1073,1242
NA1986 Denatured Alcohol ---- 1073,1242
1993 Flammable Liquid, n.o.s. ---------- 1151,1281
NA1993 Diethyl Carbitol ----- 565
NA1993 Fuel Oil 1 ---------- 468
NA1993 Fuel Oil 2 ---------- 469
NA1993 Fuel Oil 5 ---------- 473
NA1993 Fuel Oil 6 ---------- 474
2008 Zirconium, Metal, Powder, dry (see UN1358,1932) - 17
2009 Zirconium, Metal, Sheet, Wire (see UN1932, 2858) - 17
2014 Hydrogen Peroxide (8-40% Oxidizer Class) --------- 44B
2014 Hydrogen Peroxide(40-60% Oxidizer, Corrosive) ---- 44B
2015 Hydrogen Peroxide, Stabilized ---------- 44A
NA2020 Pentachlorophenol ---- 517
2022 Cresylic Acid -------- 409A
2029 Hydrazine, Anhydrous - 126
2030 Hydrazine, Aqueous --- 127
2031 Nitric Acid, Other Than Red Fuming (see UN1760) - 7
2048 Dicyclopentadiene ---- 340
2054 Morpholine(see NA1760) 356
NA2054 Morpholine, Aqueous Mixture ---------- 356
2055 Styrene Monomer, Inhibited ---------- 351
2056 Tetrahydrofuran ------ 379
2073 Ammonia Solution, ---- 1A
2076 Cresol ---------- 409, 560
2078 Toluene Diisocyanate (TDI) ---------- 331
2079 Diethylenetriamine --- 1034
2085 Benzoyl Peroxide, With Inert Solid (also for specific types, see UN2086-2090) ---------- 500
2187 Carbon Dioxide,Liquefied (see 1013, 1845) -------- 54
2188 Arsine ---------- 178
2193 Hexafluoroethane ----- 1231
2199 Phosphine ---------- 63
2203 Silane ---------- 107
2209 Formaldehyde Soln. (see 1198) ---------- 360
2213 Paraformaldehyde ----- 462
2214 Phthalic Anhydride --- 417
2215 Maleic Anhydride ----- 438
2218 Acrylic Acid,Inhibited 449
2219 Allyl Glycidyl Ether - 576
2256 Cyclohexene ---------- 516
2259 Triethylenetetramine - 1035
2261 2,6-Xylenol ---------- 561
2265 N,N-Dimethylformamide 424
2271 Ethyl Amyl Ketone ---- 480
NA2291 Lead Chloride -------- 150
2312 Phenol, Molten (see UN1671, 2821) ------ 355
2315 Polychlorinated Biphenyls (PCB) ---------- 1200
2347 Butyl Mercaptan ------ 504

MSDS#

2357 Cyclohexylamine ------ 537
2363 Ethyl Mercaptan ------ 510
2369 Ethylene Glycol Monobutyl Ether --------- 320
2432 N,N-Diethylaniline --- 348
2457 2,3-Dimethylbutane (see UN1208) ---------- 397A
2462 Methylpentanes (see UN1208) ---------- 397A
2489 Diphenylmethane Diisocyanate (MDI) ------ 1105
2491 Monoethanolamine or ethanolamine and solutions thereof ---------- 418
2504 Acetylene Tetrabromide 562
2505 Ammonium Fluoride ---- 111
2546 Titanium Metal Powder, Dry (see UN1352) -------- 75
2550 Methyl Ethyl Ketone Peroxide Solution ------- 329A
NA2556 Nitrocellulose, wet with Alcohol or Solvent ----- 1154
2564 Trichloroacetic Acid (Soln) ---------- 524
2570 Cadmium Compounds ---- 171
Cadmium Metal Powder - 154
Cadmium Oxide -------- 133
NA2570 Cadmium Chloride, Anhydrous ---------- 144
2582 Ferric Chloride Soln - 19
2608 Nitropropanes -------- 448
2619 Benzyldimethylamine -- 326
2658 Selenium Metal Powder 136
2671 2-Aminopyridine ------ 568
2672 Ammonia Solution (10-35 wt % NH) -------- 1A
NA2672 Ammonium Hydroxide 12-44% (Corrosive Material Label, see UN1005) ------ 1A
2717 Camphor ---------- 551
2725 Nickel Nitrate ------- 20
2789 Acetic Acid, Glacial see UN1842) ---------- 327
2790 Acetic Acid, Solution (25-80% by Weight) ------ 327A
NA2809 Mercury, Metallic ---- 27
NA2811 Selenium Dioxide ----- 152
2815 N-Aminoethylpiperazine 408
2821 Phenol, Solution ----- see 355
NA2821 Phenol, Liquid or Solution, Phenol, see UN1671, 2312) ---------- 355
2831 1,1,1-Trichloroethane 311
2842 Nitroethane ---------- 436
2858 Zirconium Metal, Sheet, Strip, Wire (18-254 m, see UN1932, 2009) ---------- 17
2859 Ammonium Metavanadate 130
2862 Vanadium Pentoxide --- 88
2880 Calcium Hypochlorite, Hydrated ---------- 68
NA2923 Sodium Hydrosulfide, Solid ---------- 87
NA9077 Adipic Acid ---------- 400
NA9079 Ammonium Acetate ----- 139
NA9085 Ammonium Chloride ---- 21
NA9094 Benzoic Acid --------- 402

MSDS#

NA9109 Cupric Sulfate ------- 29
NA9126 Fumaric Acid --------- 545
NA9139 Nickel Chloride ------ 36
NA9141 Nickel Sulfate ------- 37
NA9153 Zinc Acetate --------- 550
NA9161 Zinc Sulfate --------- 96
NA9170 Thorium Metal, Pyrophoric ---------- 76
NA9201 Antimony Trioxide ---- 28
UNIVOLT 60 and N61 ---------- 393
Urea ---------- 528
URETHANE ENAMEL ACCELERATOR (VHY-260) (189-S) ---------- 1115
Urethane (See also polyurethane)
Urethane, Conformal Coating --- 1178
Urethane Polymer, Oil Modified, Catalyzed, in Xylene Solution 1146
Urethane Printed Circuit Coating Solution ---------- 1066
Urethane Resin ---------- 1202B
UT-100 Adhesive, Parts A & B -- 1172

V

V ---------- 124
VACTRA #2 ---------- 1140
VACUOLINE Oil ---------- 1264
VAM ---------- 509
VAMAC B124 ---------- 1104
Vanadic Acid ---------- 130
Vanadic Anhydride ---------- 88
Vanadium Metal/Powder --------- 124
Vanadium Pentoxide ---------- 88
VARMOR 302 ---------- 484
Varnish (MOBIL 2609) ---------- 1165
Varnish, Baking, Clear -------- 1184
Varnish, Silicone:
DOW CORNING GP-77 ---------- 1171
DOW CORNING 1090 ---------- 1169
Varnish, White Shellac Cut #3 - 370
VARSOL 1 ---------- 1257
VARSOL 18 ---------- 1258
VCM (Vinyl Chloride Monomer) -- 382
Vegetable Oil ---------- 476,477
VELSICOL Chlorendic Anhydride - 339
VERSAMID 115, 125, 140 -------- 394
VERSILOK 505 ---------- 1150
528 ---------- 1001A
Vinegar Naphtha ---------- 437
VINOL ---------- 539
Vinyl Acetate Monomer, Inhibited ---------- 509
Vinyl Alcohol Polymer --------- 539
Vinyl Carbinol ---------- 505
Vinyl Chloride (Monomer) ------ 382
Vinylbenzene ---------- 351
Vinylcyanide ---------- 381
Vinylethylene ---------- 463
Vinyl Formic Acid ---------- 449
VINYLOID 160 Reducer ---------- 1218
Vinyltoluene ---------- 336
VITON E-60 ---------- 1107
VITREA Oil ---------- 1264
V-Lube Pump Oil F ---------- 1285

MSDS#

VM&P Naphtha ---------- 391
V205 ---------- 88

W

Water "Soluble" Oil ---------- 1132, 1183
Washing Soda ---------- 48
Water Glass ---------- 99
Wax, Petroleum-Type in Min. Sp. 1136
WAYCOAT SC Resist 100, 180, 900 1263
WC ---------- 123
WD-40 ---------- 1030
WELDWOOD CONTACT CEMENT ------- 1084
Wet-Ground Mica ---------- 24
Wetting Agent (MAKON NF-5) Alkoxylated Alkanolamide-Type 1122
White Mineral Oil ---------- 525, 1137
White Shellac Solution -------- 370
White Spirits ---------- 334
White Vitriol ---------- 96
Whiting ---------- 1082
WHITE STAR BODY FILLER, #104, #202, #204, #205 ---------- 1123
Wire Enamel (GE 73039) -------- 1040
Wire Enamel, Poly(amide-imide) 1037
Wire Enamel, Poly(ester-imide) 1005
Wire Enamel, Polyester-imide -- 1085
Wire Enamel (PYRE-ML, RC 5863) 1120
Wire Enamel (PYRE-ML, RC 5877) 1121
Wollastonite ---------- 55

Can't find the material you need? Genium recommends that you contact the manufacturer of the material.

Wood Alcohol ---------- 354
Wood Cellulose Flock --------- 1255
Wood Dust or Flour ---------- 376
Wood Ether ---------- 342
Wood Naphtha ---------- 354
Wood Rosin ---------- 377
WYANDOTTE B.N. ---------- 1185
WYANDOTTE EXPRAY-541 --------- 1186

X

Xenene ---------- 451
XEROX DUPLICATING TONER:
Part No. 6R5, 6R20, 6R21, 6R60, 6R61, 6R148, 6R152, 6R157, TRADE NAMES: 720/813/914/970/1000/1824/1860/LDX Toner ---- 1028
XEROX DUPLICATING TONER (Dry Imager)
Part No. 6R87, 6R40, 6R41, 6R64, 6R65, 6R62, 6R63, 6R207, 6R208, TRADE NAMES: 1200 Toner (Dry Imager/970; TC200/600 MEP Toner (Dry Imager) 2400/3600/7000/840 EPS Toner (Dry Imager) ------ 1028A

MSDS#

XYLAN 1010 ---------- 1143
Xylene (T-200X Tradename) ----- 1148
Xylene (Xylol) ---------- 318
m-Xylene (m-Xylol) ---------- 318B
o-Xylene (o-Xylol) ---------- 318A
p-Xylene (p-Xylol) ---------- 318C
2,6-Xylenol ---------- 561

Y

Y-469-D PIGMENT (Chrome Yellow
Med.) ---------- 1124
Yitria ---------- 134
Yitrium Oxide ---------- 134
Y2O3 ---------- 134

Z

ZC-ZYGLO CLEANER ---------- 1031
Zinc Acetate ---------- 550
Zinc Acetate, Dihydrate ------- 550
Zinc Chloride Soldering Flux -- 18
Zinc Chloride Solution -------- 18
Zinc Chromate, Basic (J-1345) - 1130
Zinc Diacetate, Dihydrate ----- 550
Zinc Metal/Powder ---------- 73, 176
Zinc Oxide (Zinc White) ------- 45
ZINC-PLATE 49 ORGANIC PRIMER -- 1223
Zn ---------- 73, 176
ZnO ---------- 45
ZnSO4 ---------- 96
ZnSO4 7H2O ---------- 96
Zinc White ---------- 45

SUPPLIER INDEX

Aakash Chemicals & Dyestuffs, Inc.
Mercuric Chloride 146
Mercury (II) Oxide 170

Aceto Chemical Co.
Acetophenone 566

Acheson Industries
DAG 154 1243

Agrico Chemical Co.
Urea 528

AIRCO Inc.
Industrial Gases Div.
Argon 64
Carbon Monoxide 35
Hydrogen Gas 65
Methane 440
Nitrogen 61
Oxygen 62

AIRCO Inc.
Welding Products Div.
AIRCOSIL 45
Brazing Alloy 41

Air Products and Chemicals, Inc.
Chemicals Group
Dimethylamino Ethanol 566
Silane 107
Silicon Tetrachloride 106
Triethylamine 392

Air Products and Chemicals, Inc.
Industrial Gas Div.
Acetylene 403
Argon 64
Ethylene Oxide 433
Helium 98
Hydrogen Sulfide 52
Methane 440
Nitrogen 62
Phosphine 63
VINOL 539

Alcolac, Inc.
Allyl Glycidyl Ether 576

Aldrich Chemical Co., Inc.
Ammonium Metavanadate 130
Biphenyl 451
o-Cresol 560
p-Cymene 557
Dimethyl Sulfoxide 428
Ethyl Acetoacetate 553
Mercury (II) Nitrate 169
Mesitol 581
Methyl Formate 432
Methyl Hydrazine 552
2,4 Pentanedione 556
Selenium Dioxide 152

ALFA Products
Camphor 531

Allied Corporation
Adipic Acid 400
Ammonium Acetate 139
Ammonium Chloride 21
Ammonium Dichromate 129
Ammonium Fluoride 111
Barium Hydroxide, Octahydrate 40
Butyl Acetate 338
Calcium Chloride, Anhydrous 141
Citric Acid 533
Dichlorotetrafluoroethane 572
Ferric Nitrate 142
GENESOLV D 314
GENETRON 11 309
GENETRON 12 308
GENETRON 22 307
GENETRON 113 314
Isopropyl Alcohol 324
Methyl Chloride 373
Nickel (II) Chloride 36
Nickel Fluoborate 128
Phosporic Acid 8
Phthalic Anhydride 417
Potassium Hydroxide 2
Sodium Carbonate 48
Sodium Fluoride N 138
Sodium Nitrate 101
Sulfur Hexafluoride 27
Sulfuric Acid 9
TUN-O-WASH Cleaner 1170
Zinc Acetate 550

Alloychem, Inc.
Cadmium Metal Powder 154
Nickel Sulfate 37
Selenium 136
Selenium Dioxide 152

Alpha Metals, Inc.
ALPHA 413-F THINNER 1077
ALPHA 810 THINNER 1078
ALPHA 811 FLUX 1250
ALPHA 812 THINNER 1252
ALPHA 815 FLUX 1079
ALPHA 611 FLUX (or
ALPHA MELROSE 611 FLUX) 1080
ARKLONE P-113 314
RELIASOLV 564 1249
RELIASOLV NO. 1001 1207

Amchem Products, Inc.
RODINE 85 1249
RODINE 92A 1083

Amerada Hess Corp.
Fuel Oil No. 6 474

American Chrome and Chemicals, Inc.
Chromic Acid, Solid 5
Sodium Dichromate (Dihydrate) 153

American Cyanamid Company
Acrylamide 577
Aniline 407
BR-123 PRIMER 1126A
Diphenylamine 461
FM-123-5 ADHESIVE FILM 1126B

GLASKYD 1901 1279
LAMINAC 4146 1009
Tetramethylguanidine 419

American Hoechst Corporation
AZO PLATE Div.
AZ-111 Photo Resist 1014
AZ 119 THINNER 1205
AZ 119S 1205A

American Research Products Co.
Acrylamide 577

AM International Inc.
Multigraphics Div.
BLANKROLA Solvent 1063

AMOCO Chemicals Corporation
AMOCO TMA 330

AMOCO Oil Co.
AMOLITE Oil 1264
Fuel Oil No. 2 469
Fuel Oil No. 5 473

Anachemia Chemical
Diisobutyl Ketone 501

ANGUS Chemical Co.
Nitroethane 436
Nitromethane 508
2-Nitropropane 448

The Ansul Company
4-Methoxyphenol 455
Sulfur Dioxide, Anhydrous 50

ARCO Chemical Co.
ARCOSOLVE PM 522

ARCO Petroleum Products Co.
RUBILENE Oil 1264

Arizona Chemical Company
ACINTOL FA2, 3 495

Armstrong Cork Company
520 ADHESIVE 1133A
ARMAFLEX PIPE INSULATION 1133B
Armstrong D-253 1287

ARSYNCO, Inc.
Benzyldimethylamine 326

ASARCO, Inc.
Antimony Trioxide 28
Bismuth 60
Cadmium Metal 23
Selenium 136
Thallium Metal/Powder 80
Zinc Sulfate 96

Ash Grove Cement Co.
Calcium Hydroxide 39
Calcium Oxide 22

Ashland Chemical Company
190/-P3224 1073
Acetic Anhydride 434
Acetone Solvent Blend 420
Barium Chloride 132
Boric Acid 4
n-Butylamine 569
Copper Sulfate 29
Cuprous Cyanide 12
Diethyl Phthalate 435
N,N-Dimethyl Acetamide 458
Dimethyl Phthalate 430
Helium 99
Isopropyl Ether 541
Rubber Solvent 371
Soda Ash 48
Talc Yellow Pulverized 42

Ashland Oil Inc.
Potassium Permanganate 95
TECTYL Rust Preventatives
511M, 511HF, 848D, 848D-HF 1283
890 1229

Astro Chemical Company, Inc.
ASTRO SPECIAL 3044
(No longer manufactured) 1029
ASTRO SPECIAL 4017 (Parts A&B) 1190
ASTRO 3069 Parts A & B 1072A&B
ASTRO 3104 1075
BARCO BOND MB-100X & MB-12 1177

Automergic Chemetals Corp.
Barium Nitrate 173

Avatar Corp.
Mineral Oil 525

B & B Chemical Company, Inc.
B & B 3100 1092

Badische Corp.
Caprolactam 580
2-Ethylhexyl Acrylate 345

J.T. Baker Chemical Co.
Ammonium Dichromate 129
n-Amyl Alcohol 506
Antimony Trioxide 28
Barium Chloride 132
Cadmium Chloride, Anhydrous 144
Cadmium Nitrate Tetrahydrate 171
Copper Oxide 157
Copper (II) Oxide 155
Formic Acid 416
Lead Chloride 150
Manganese Sulfate 151
Potassium Dichromate 168
Potassium Ferricyanide 140

Barium & Chemicals, Inc.
Barium Carbonate 119
Barium Fluoride 131
Strontium Nitrate 159

Barnebey-Cheney
Coconut Shell Charcoal 471

Baron-Blakeslee
BLACO-PER 313
BLACO-THANE 311
BLACO-TRI 312
BLACO-TRON TF 314

BASF Wyandotte Corporation
B.N. 1185
1,4-Butanediol 485
Diamyl Amine 582
EXPRAY-541 1186
Iron (III) Oxide 175
N-Methyl-2-Pyrrolidone 431
Pyrrolidine 498
Sodium Carbonate 48
STYROPOR (BR Grades) 1276

Belmont Metals, Inc.
Manganese Metal/Powder 148

Berylco
Beryllium-Copper Alloy 165

Bethlehem Steel
Carbon Steel (Scrap) 161

Big Three Industries, Inc.
Argon 64
Nitrogen 61
Oxygen 62

BiWax Corporation
BIWAX 142-R (Parts A & B) 1091A&B

Blue Grass Chemical Specialities, Inc.
Copper (II) Nitrate 174

Borden Chemical Div., Borden, Inc.
DURITE LD-5102 1103
FM 203W Catalyst Powder 1168
KRYLON Crystal Clear Spray
Coatings 1059

Brulin and Company, Inc.
815 MX 1158
815 QR 1159

Brush Wellman
Alloy Division
Beryllium 59
Beryllium-Copper Alloy 165

Buckman Laboratories, Inc.
Dichloroethyl Ether 571

Buffalo Color Corp.
Nadic Methyl Anhydride 1062
Hexahydrophthalic Anhydride 482

CPS Chemical Co., Inc.
Allyl Glycidyl Ether 576

Cabot Corporation
CAB-O-SIL M-5 (or MS-5) 1064
CAB-O-SIL M-7 (or MS-7) 1064
CAB-O-SIL H-5 (or HS-5) 1064
Carbon Black 51

Callery Chemical Company
Div. Mine Safety Appliance Company
Decaborane 104
Diborane 103
Sodium-Potassium Alloy 16

Canadian Industries Ltd.
Chemicals Div.
Ammonium Hydroxide 1A
Calcium Hypochlorite (Dry) 68
CHLOROCLEAN 1245
Ferrous Sulfate Heptahydrate 57
Hydrofluosilicic Acid 89
Sodium Bisulfide 87
Sodium Hypochlorite (5-12%) 115

Captree Chemical Co.
2-Butanol 442
t-Butanol 497

Carroll Company
BLUE GOLD 1160

Celanese Chemical Company
Acetaldehyde 535
1,3-Butanediol 362
Butyl Acetate 338
Diacetone Alcohol 353
Ethyl Acetate 437
2-Ethylhexyl Acrylate 345
Isobutyl Alcohol 398
Methyl Formate 432
Paraformaldehyde 462
Vinyl Acetate, Monomer, Inhibited 509

Celanese Specialty Resins
EPI-CURE 855 1269
EPI-CURE 856 1074
EPI-REZ 509, 510 335B
EPI-REZ 530C 335

Central Hudson Gas & Electric Corp.
Bottom Ash 155
Pond Sludge 156

CERAC, Inc.
Ammonium Metavanadate 130
Barium Fluoride 131
Beryllium 59
Cadmium Metal Powder 154

Chemetals, Inc.
Manganese Metal/Powder 148
Manganese Sulfate 151

Chemical Dynamics Corp.
Pyrrolidine 498

Chemical Methods, Inc.
CM-154-XTX 1135

Chemical Products Corp.
Barium Carbonate 119
Sodium Silicate (40-43 deg Be) 99
Strontium Carbonate 120

Ciba-Geigy Corporation
Plastics and Additives
ARALDITE 6005, 6010 335B
ARALDITE 6084 335
ARALDITE CY 179 Epoxide 386
EPORAL 1036

Cincinnati Milacron Company
CIM CLEAN 30 1090
CIMCOOL FIVE STAR 30 1246

Cities Service Co.
Aluminum Sulfate, Liquid 92
CITGO Sentry Oil 1264

The Clorox Co.
CLOROX Liquid Bleach 115

Cobehn, Inc.
COBEHN SPRAY-CLEAN Solvent 315

Colt Industries Inc.
KAOBESTOS 57088, 57090, 57105
15B

Columbia Chase Corporation
Humiseal Div.
HUMISEAL 1A20 1222

Columbian Chemicals Corp.
Carbon Black 51

Compounders, Inc.
WAX IE-367 1138

Conap Incorporated
CONAP 1155 (Parts A & B) 1004A,B

CON-LUX Coatings
EPOLON 22 BLACK MASTIC (A & B) 1221
VINYLOID 160 Reducer 1218
ZINC-PLATE 162 REDUCER 1220
ZINC-PLATE 49 ORGANIC PRIMER 1223

CONOCO Chemicals Div.
Ammonium Lauryl Ether Sulfate 490
Methyl Chloride 373

Conroy Chemicals, Inc
Potassium Ferricyanide 140

Contacts, Metals, & Welding, Inc.
Cu/Co/Be Alloy 32

Coral Chemical Company
NO-TARN 1043

Corn Products
Starch (corn) 472

Crown Zellerback Corp.
Dimethyl Sulfoxide 428

M.J. Daly Company, Inc.
(distributor)
SHELL PD 680 CLEANING COMPOUND 1095

Dap, Inc.
FLEXISEAL (Parts One & Two) 1102A&B

Dart Industries
Electrochemicals Div.
ELECTRO-BRITE NAZ-32
ELECTRO-BRITE Z-200 1155

Dart Industries
Chemical Div.
Benzoyl Peroxide, Dry 500

Deere & Company
JMD F2A2 GREEN ALKYD RESIN ENAMEL
(Exempt solvent) 1174

Degussa Corporation
Rhodium Metal/Powder 147

Detrex Chemical Industries, Inc.
PERM-A-CLOR 312
PERM-A-CLOR NA 312
TRIAD E 312

The Dexter Corporation
Hysol Division
HYSOL DK 0295 1179
HYSOL EA 934 1011
HYSOL H2-3416 DETA 1034
HYSOL H2-3404 TETA 1035
HYSOL PC 17, PART A 1255A
HYSOL PC 17, PART B 1255B
HYSOL PC 18 1066

Diamond Shamrock Chemicals Co.
Chlor-Alkali Division
Sodium Dichromate (Dihydrate) 153
Sodium Hydroxide 3
Sodium Hydroxide 3A (50% Liquid)

Diamond Shamrock Chemicals Co.
Electrochemicals Division
CHLOROWAX-40 1149
CHLOROWAX-70 1149A
CHLOROWAX-70-S 1149A
CHLOROWAX-100 1149
PERCLENE 313
PERCLENE D 313
TRICLENE D 312
TRICLENE MD 312

J.C. Dolph Company
CW-340-1 1147
HI-THERM BC-350 1184
SYNTHITE EB-41 1146
T-200X 1148

Dow Chemical USA
Acetone 300
Acetylene Tetrabromide 562
ALK-TRI 312
Allyl Chloride 374
Aminoethylethanolamine 555
Biphenyl 451
Bisphenol A 369
Bromine 77
2-Butoxyethanol 320
4-t-Butylphenol 422
Calcium Chloride, Anhydrous 141
CHLOROTHENE NU 311
CHLOROTHENE VG 311
DER 330, 331 335B
DER 664 335
o-Dichlorobenzene 358
p-Dichlorobenzene 514
1,2-Dichloroethane 359
Diethanolamine 426
Diethylene Glycol Monoethyl
Ether 460
DOWANOL DB 322

DOWANOL EB 320
DOWANOL EE 319
DOWANOL EM 352
DOWANOL PM 522
DOWTHERM A 1076
DOWTHERM G 1215
DOWTHERM J 1262
Ethylenediamine 325
Ethylene Dibromoethane 492
HI-TRI 312
Methylene Chloride 310
NEU-TRI 312
Phenol 555
Polyethylene Glycol E4500, E8000 364
Salicylic Acid 543
Styrene Monomer 351
Triethanolamine 427
Vinyltoluene 336

Dow Chemical USA
Inorganic Chemistry Department
Ammonia, Anhydrous 1
Sodium Hydroxide 3

Dow Corning Corporation
DOW CORNING 200 349
DOW CORNING 994 Varnish 1289
DOW CORNING 997 Varnish 1290
DOW CORNING 1090 Varnish 1169
DOW CORNING GP-77 1171
SILASTIC RTV (Acetoxy-cure) 1288

Drake Petroleum Co.
Special VM&P Naphtha (66) 391

DuBois Chemical
Division of Chemed Corp.
DIFFERENTIATED KLARIFIANT 1020
STRYPP NF 1016

Dupont - See E.I. duPont de Nemours & Co.

Dykem Company
Layout Fluids 1154
Remover and Thinner 1153

E.I. duPont de Nemours & Co., Inc.
Chemicals and Pigments Department
Aniline 407
1,4-Butanediol 485
Chlorosulfonic Acid 544
Cuprous Cyanide 12
Decahydronapthalene 563
N,N-Dimethyl Acetamide 458
Dimethyl Sulfate 344
Dimethylformamide 424
Ferric Chloride Solution 19
Formamide 390
Hydrofluoric Acid 6A
Methyl Alcohol 354
Methyl Formate 432
Sodium Silicate (40-43 deg Be) 99
Tetrahydrofuran 379
Titanium Dioxide 118
Y-469-D PIGMENT 1124

E.I. duPont de Nemours & Co., Inc.
Finishes and Fabricated Products Department
IMRON M, M, ENAMEL WHITE (817U) 1117
POLYISOCYANATE ACTIVATOR 192-S 1116
PYRE-ML WIRE ENAMEL RC 5863 1120
PYRE-ML WIRE ENAMEL (RC 5877) 1121
URETHANE ENAMEL ACCELERATOR VH-260 (189-S) 1115

E.I. duPont de Nemours & Co., Inc.
Petrochemicals Department
Freon Products Division
Dichlorotetrafluoroethane 572
FREON 11 309
FREON 12 308
FREON 22 307
FREON 113 314
FREON 116 1231
FREON TE & FREON TES 1213
FREON TF 314
FREON TMC 1212
FREON TMS 1211

E.I. duPont de Nemours & Co., Inc.
Petrochemicals Department
Intermediates Division
Adipic Acid 400
Dimethyl Terephthalate 404

E.I. duPont de Nemours & Co., Inc.
Photochemicals Dept.
Adiponitrile 549

E.I. duPont de Nemours & Co., Inc.
Photosystems & Electronic Products Department
RISTON II STRIPPER 1000X 1012
RISTON II DEVELOPER 2000 1013

E.I. duPont de Nemours & Co., Inc.
Polymer Products Department
ELVANOL 539
TEFLON FEP 1010
VITON E-60 1107

Eagle-Picher Ind., Inc.
EAGLE #20 38

Eastman Chemical Products, Inc.
Acetaldehyde 535
Butyl Alcohol 337
Cellulose Acetate, Lacquer Grade 532
Crotonaldehyde 578
Dibutyl Phthalate 429
Diethyl Phthalate 435
Dimethyl Phthalate 430
2-Ethylhexyl Alcohol 367
KODAFLEX DOP 414
KODAFLEX TXIB 1039
KODAK Metal Etch Resist (KMER) Developer 1204
KODAK Metal Etch Resist Thinner 1201
KODAK Photo Resist Developer 1203
KODAK Photo Resist Thinner, Type 4 1217
Methyl Acetate 503
TECSOL-3 1073
Terephthalic Acid 443

Eastman Kodak Company
Cyclopentanone 570
N-Butyraldehyde 542

Isopentyl Nitrite 575
2-Methoxyethyl Acetate 526
Nitromethane 508
Kodak Photo Resist Developer 1278
Kodak Photo Resist, KPR 1277
Thioglycolic Acid 574

Economics Laboratory, Inc.
Magnus Division
MAGNU-SPRAY 105 1069
MAGNUS SC-100 1110
MAGNUS 26-N 1108
MAGNUS 92S 1109
MAGNUS 215D 1111
MAGNUS 402 1112
MAGNUS 614 1113
MAGNUS 617 1114
MAGNUS 763-NF 1176

Emerson & Cuming, Inc.
ECCOSTRIP 93 1033

Emery Industries, Inc.
EMERSOL 132 & 153 415

Engelhard Minerals and Chem. Div.
Engelhard/Plainville
EMTAL 42 42
EMTAL 500 42
SILVALOY 45 Brazing Alloy 41

Enthone, Inc.
ENDOX 114 1230
ENSTRIP A 1145

Essex Chemical Corporation
Aluminum Sulfate, Liquid 92

Ethyl Corporation
Bromine 77
ETHYL Antioxidant 701 1208
Ethyl Chloride 538
Ethylene Dibromide 492

Evans Adhesive Corporation
7050 HOT MELT 1097

EXXON Chemical Americas
Dicyclopentadiene 340

EXXON Company, USA
Aromatic 100 1061
Aromatic 150 1061B
Hexane 397
ISOPAR L 1259
ISOPAR M 1260
Kerosene Solvent 387
UNIVOLT 60 and N61 393
VARSOL 1 1257
VARSOL 18 1258
VM&P Naphtha 391
Xylene 318

FMC Corporation
Allyl Alcohol 505
Diallyl Phthalate Monomer 527
HYDROGEN Peroxide 44A,B
Phosphorus Oxychloride 117
Phosphorus Trichloride 110
Strontium Carbonate 120
Trisodium Phosphate 43

Fel Pro Incorporated
FEL PRO C-102 1225

Ferro Corporation
FERRO Naphthenate 6% Cobalt 363
FERRO Naphthenate 24% 384

Ferro Corporation
Grant Chemical Division
Diethyl Carbitol 565

Fibre Glass-Evercoat Company
WHITE STAR BODY FILLER
#202, 204, 205 1123

Fike Chemicals, Inc.
Ethylene Thiourea 423

Fisher Scientific
Lead Chloride 150
Petroleum "Ether," High Boiling 530
Picric Acid 534
Sulfamic Acid 72
Tributyl Phosphate 521

Foote Mineral Co.
Lithium Bromide 149
Lithium Fluoride 105

Freund Can Company
6060 GLUE 1134

Fritzche Dodge and Olcott, Inc.
Ethyl Formate 502

Furane Products Company
EPOCAST 2226B 1101

GAF Corp.
Ammonium Lauryl Ether Sulfate 490
1,4-Butanediol 485
M-PYROL N-Methyl-2-Pyrrolidone 431
Tetrahydrofuran 379

GTE Products Corp.
Tantalum Powder 167

Galaxy Chemical Company, Inc.
THREAD CUTTING OIL 1099

General Electric Company
Capacitor Department
DIELEKTROL I 1051
DIELEKTROL II 1052
DIELEKTROL III 1216

General Electric Company
Carboloy System Department
Tungsten Carbide Powder 123

General Electric Company
L&IMBD
ALKANEX Insulating Varnish 1163
(GE 9522 and GE 9637)
GE 73039 WIRE ENAMEL 1040

GE 74023 EPOXY VARNISH 1026
GLYPTAL C-1103 1194
GLYPTAL C.E. 514 1192
GLYPTAL 1500 Thinner 1173
GLYPTAL 7815 1193
IMIDEX E, 73156 1005
PERMAFIL 73517 1024

General Electric Company
LSTG, Wood and Plastics
GE Material A50A206B 1070
GE Material A50A262 1075

General Electric Company
Silicone Products Department
RTV 102, 103, 106, 108, 109, 112, 116, 118, 157, 158, 159 1142
RTV 577 1006
RTV 9811 1007
SC-3700 513
SF-96, SF-97 349
SS-4004 1008
SS-4044 Primer 1281
SS-4155 Primer 1151

General Electric Company
Steam Turbine Generator Division
M&P Laboratory
GE Material A50A224A 1087
GE 2PV-4 1088
GE 2PV-32 1089
GE ZL-182 1075
GE PEG Hand Solution 1087

General Mills Chemical, Inc.
(Sold to Henkel Corp.; see below)

G. Frederick Smith Chem. Co.
Cupric Chloride 121
Perchloric Acid 70-72% 102

P.D. George Company
TERASOD #357 1125
#946 EPOXY BOND COAT 1129
TRITHERM 981 WIRE ENAMEL 1037

Geo. Pfau's Sons Co.
Lard Oil 512

Georgia-Pacific
CELLUFLOC 507

Getty Oil Company
(See Texaco Chemical Company)
GETTY A-150 1286
(now Aromatic A-150)
GETTYSOLVE B 1274
(Now Texsolve B)
GETTYSOLVE C 1275
(now Texsolve C)
GETTYSOLVE F 1280
(now Texsolve F)

W.R. Grace & Company
Davison Chemical Division
RANEY NICKEL CATALYST #28 1118

W.R. Grace & Company
Hatco Chemicals Div.
HATCOL-101 414

Gray Mills Corp.
AGITENE 1210

Great Lakes Chemical Corp.
Bromobenzene 564

Grefco, Inc.
Diatomaceous Earth (Natural) 69
DICALITE 103 69
DICALITE SA3 69
DICALITE SA23 69
DICALITE SA33 69

Gulf Oil Co. USA
Security Oil 1264

Haarman & Reimer Corp.
Terpineol 493

Hall Chemical Company
Nickel Nitrate 20

Handy & Harman
EASY-FLO 45 Brazing Alloy 41
HANDY FLUX 1144

J.W. Harris Co. Inc.
Brazing Alloy 41
STAYSILV 45

Harshaw/Filtrol Partnership
Ammonium Bifluoride 49
Calcium Hydroxide 396
Hydrofluoric Acid, Aqueous 6A
Nickel Nitrate 20

Haviland Products Company
HAVILAND ND 68-G ETCH 1041
RACK STRIP C 1017A

Henkel Corporation
Resins Division
GENEPOXY 925 335
VERSAMID 115, 125, and 140 394

Henley & Co.
Methyl Isopropyl Ketone 466

Hercules, Inc.
HERCO Pine oil 484
Termineol "318" 493
YARMOR 302 484

Hexagon Laboratories
Diethyl Ketone 478

Hexcel Specialty Chemicals
Benzyldimethylamine 326

Hoechst AG
FRIGEN 113TR-T 314

Hooker Chemical Corp.
Chlorendic Acid 510
FLUOROLUBE S-30 388

Hooker Chemicals and Plastics Corp.
Specialty Chemicals Division
Benzoyl Chloride 459
Phthalic Anhydride 417
Potassium Hydroxide 2
Sulfuryl Chloride 90
Thionyl Chloride 86

Hughson Chemical Company
(See Lord Corporation)

Imperial Chemical Industries, Ltd.
ARKLONE P-113 314

International Packaging Systems
IPS TR 250 Component A 1202A
IPS TR 250 Component A 1202B

James River Corp.
ALPHA-FLOC 507
SOLKA-FLOC 507

Johns-Manville
(See Manville Products Corp.)

Jones Chemicals, Inc.
Sunny Sol Bleach 115

Kano Laboratories, Inc.
KANO KROIL 1050

Kawecki Berylco Ind., Inc.
BERYLCO 10 32

Kerr-McGee Chemical Corp.
Boric Acid 4
V-BOR 112
THREE ELEPHANT 112
TRONOX 118

Kester Solder Company
KESTER 187 RESIN FLUX 1022
KESTER 108 THINNER 1023

Klatt Chemical Co.
Mercuric Chloride 146

Koppers Company, Inc.
Organic Materials Div.
Cresol 409
o-Cresol 560
2,6-Di-t-Butyl-p-Cresol 456
Cresylic Acid 409A
2,6-Xylenol 561

Kraft Chemical Company
Cyanoids 58
KAYNIDE 312

Krupp Widia
Tungsten Carbide 177

Kurita Water Ind., Ltd.
(Tokyo, Japan)
KURIFLOCK PN-161 1119

Lachat Chemicals
Ethyl Butyl Ketone 306
Methyl n-Propyl Ketone 305

Lake Chemical Company
LACO M-A FLUX 1018

Linden Chemicals and Plastics
Carbon Tetrachloride 410

Liquid Air Corp.
Arsine 178

Lithum Corp. of America
Lithium Bromide 149
Lithium Fluoride 105

London Chemical Co.
SK-4 Cold Stripper 1199

Lord Corporation
Chemical Products Group
ACCELERATOR #4 1001B
CHEMGLAZE Z004 1187
CHEMLOK 250 1241
VERSILOK 505 1150
VERSILOK 528 1001A

LTU Steel Company
Carbon Steel (Scrap) N 161

3M (See Three M)

Madison Industries, Inc.
Zinc Oxide 45

Magnaflux Corporation
SKC-NF SPOTCHECK CLEANER
(Formula B) 1031
SKD-NF SPOTCHECK DEVELOPER
(Formula B) 1071
ZC-7 ZYGLO CLEANER 1031
ZP-9 ZYGLO DEVELOPER
(Formula B) 1071
ZYGLO PENETRANT 1048

Magnus
(See Economics Laboratory, Inc.)

Mallinckrodt, Inc.
Acetonitrile 499
Barium Carbonate 119
Copper Sulfate 29
Cupric Chloride 121
Iodine 114
Magnesium Carbonate 97
Magnesium Oxide 94
Oxalic Acid 328

Mallory Metallurgical Company
MALLORY 100 (Obsolete) 32

Malvern Mineral Company, Inc.
NOVACITE 325 1021
NOVACITE 1250 102
NOVACITE L-207A 1021

Manville Products Corporation
Diatomaceous Earth (Natural) 69
CELITE 266 69
CELITE Snowfloss 69
CELITE FC (or Filter-Cel) 69

Markem Corporation
320 Cleaner 1152

Master Chemical Corporation
TRIM TAP HEAVY 1058

Matheson Gas Products
Arsine 178
Boron Trifluoride 91
1,3-Butadiene 463
Carbon Monoxide 35
Chlorine Trifluoride 125
Cyclopropane 529
Ethylene 457
Hydrogen Sulfide 52
Methyl Mercaptan 465
Nitrogen Dioxide 47
Nitrous Oxide 109
Phosphine 63
Silane 107
Sulfur Hexafluoride 27

McGean Rohco, Inc.
Diatomaceous Earth (Natural) 69
Nickel (II) Chloride 36

Meadowbrook Corp.
Zinc Metal/Powder 176

Michelman Chemicals, Inc.
MOLD RELEASE #210-SS 1136

Michlin Chemical Corporation
WHITE SHELLAC VARNISH,
#3 Cut 370

Harry Miller Corporation
Immunol S-6 1093
STEELGARD #1505B 1098

Mineral Pigments Corporation
J-1345, Basic Zinc Chromate 1130

Mobay Chemical Company
MONDUR M 1105
MULTRATHANE M - MPI 1105

Mobil Chemical Company
CLEAR VARNISH 2609 1165
Mono-Aluminum Phosphate C-5 11
Phosphorus Oxychloride 117

Mobil Oil Company
Kerosene Solvent 387
MIST LUBE 27 1141
VACTRA #2 1140
VACTRA #4 1140A
VACUOLINE OIL 128, 133, 137,
146 1264
VAPROTEC Conc 1267
VAPROTEC Light 1266

Monsanto Company
Adipic Acid 400
AROCLOR 1254 (Obsolete) 1200
Biphenyl 451
Chlorosulfonic Acid 544
Cyclohexylamine 537
FORMVAR Resins 399
Fumaric Acid 545
GELVATOL 539
Lactic Acid 546
Maleic Anhydride 438
MOD-EPOX (Triphenyl Phosphite) 441
Oleum 9A
Phosphorus Oxychloride 117
Phthalic Anhydride 417
Salicylic Acid 543
SANTICIZER 9 1068
Tricalcium Phosphate 137
Triphenyl Phosphate 333
Trisodium Phosphate 43

National Distillers and Chemical Corp.
U.S. Industrial Chemicals Company, Div.
Proprietary Solvent #3 1073

NF&M International
Titanium-Based Alloy (Scrap-Generic) 166

NL Baroid, Inc.
PtX 38 38

Nissan Chemical Industries, Inc.
(Tokyo, Japan)
RESIN-NT 1047
THEIC (Obsolete Tradename) 1047

NUODEX, Inc.
Calcium Stearate 445
Maleic Anhydride 438
NUODEX Naphthenate Cobalt 6% 1268
NUODEX Naphthenate Lead 24% 384
Zinc Stearate 444

Oakite Products, Inc.
OAKITE 32 1214
OAKITE 56 1224
OAKITE 67 1167
OAKITE 90 1226
OAKITE 156 1182
OAKITE 160 1032
OAKITE CRYSCOAT 247 1244
OAKITE DEOXIDIZER 34 1247
OAKITE STRIPPER ANP 1042

Olin Corporation
Calcium Hypochlorite (Dry) 68
Disodium Hexafluorosilicate 31
Hydrazine, Anhydrous 126
Hydrazine, Aqueous 127
POLY-SOLV DB 322
POLY-SOLV EE 319
POLY-TERGENT B-300 1094
Sodium Fluoride 138
Trisodium Phosphate 43

Oregon Metallurgical Corp.
Titanium-Based Alloy (Scrap-Generic) 166

Park Chemical Company
KWICK-KASE 1045
PARK KASE 5C 1045

Peck's Product Company
PEX SPRAY 66 1019

Penetone Corporation
INHIBISOL 311
NAVEE 42 1057
PENESOLVE 5 1053
PENETONE 2389 1054
PENETONE TYPE S 1055
STEAM KLEEN 1056

Pennwalt Corporation
Fluorochemicals Division
ISOTRON 11 309
ISOTRON 12 308
ISOTRON 22 307
ISOTRON 113 314
REFRIGERANT 113 314

Pennwalt Corporation
Lucidol Division
Benzoyl Peroxide, Dry 500
t-Butyl Perbenzoate 406
LUCIDOL 98 500
LUPERSOL DDM 329
LUPERSOL DELTA-X 329
MEK Peroxide Solution
(9 wt% max "active oxygen") 329A

Pennwalt Corporation
Ind-chem Div.
Butyl Mercaptan 504
Chlorine Trifluoride 125
Ferric Chloride Solution 19
Hydrogen Peroxide 44A,B
Isopropyl Amine 483
PENNWALT Cleaner K-2 1261

Pennwalt Corporation
Organic Chemicals Div.
Diamyl Amine 582

Pennwalt Corporation
Stokes Div.
V-Lube Pump Oil F 1285

Permabond International Corp.
Eastman 910 Adhesive 1219
PERMABOND QUICK FILLER/SETTER 1188

Petrarch Systems, Inc.
Hexamethyldisilazane 513

Pfaltz and Bauer, Inc.
Cresyl Diphenyl Phosphate 450

Pfizer, Inc.
Minerals, Pigments & Metals Div.
Citric Acid 533
FIREX RX-2373 1189

Phelps Dodge Refining Corp.
Selenium 136

Philip A. Hunt Chemical Co.
WAYCOAT SC RESIST 100, 180, 900 1263

Phillips Petroleum Co.
Butyl Mercaptan 504
Ethyl Mercaptan 510
Hexane (n-Hexane) 397
n-Pentane 523
2,2,4-Trimethylpentane 383

Pierce Chemical Co.
Hexamethyldisilazane 513

Plastics Engineering Company
PLENCO 12983 1254
4300 1254
4200 1254A
4000 1254A
14015 1254A

Pluess-Stanfer, Inc.
PROTEXULATE 1082

Polymer Corp.
NYLATRON GS-63 1209

Polysciences, Inc.
SD No. 3A Alcohol 579

PPG Industries, Inc.
Chemical Division
Ethyl Chloride 538
HI-SIL 233 1253
PERCHLOR 313
Sodium Bisulfide 87
TRI-ETHANE 311
TRICHLOR 312

PQ Corp.
Sodium Silicate (40-43 deg Be) 99

Processed Minerals, Inc.
NYCO Div.
NYAD G, 325, 400 55

Productive Chemicals, Inc.
SE-75 Degreasing Solvent 1251

Products Research & Chemical Corp.
PR-420 1127
PR-1527 1139

Publicker Industries, Inc.
PACO SOLVENT T.R. 590 1073

Purex Corp.
PUREX Liquid Bleach 115

Quaker Oats Co.
(See QO Chemicals)

QO Chemicals
(Formerly Quaker Oats Company)
Furfuryl Alcohol 479
Tetrahydrofuran 379
Tetrahydrofurfuryl Alcohol 520

Quantor Corporation
QUANTOR IR-75 1049

Reichhold Chemicals, Inc.
ACONEW EXTRA 450,500 495
Dibutyl Phthalate 429
Dimethyl Phthalate 430
EPOTUF 37-140, 37-139 335B
EPOTUF 37-304 335
Maleic Anhydride 438
Pine Oil 220 484

STAFLEX DOP 414
STERLING U-300-20 (or 83-003) 1191

Reilly Tar & Chemical Company
Aminopyridine 568

Rem Chemicals, Inc.
Q-CLEAN SE-67 1195

Rhone-Poulenc, Inc.
Lanthanium Oxide 145
Yitrium Oxide 134

Roberts Consolidated Ind.
WELDWOOD CONTACT CEMENT 1084

Rohm and Haas Company
Acrylic Acid 449
n-Butyl Methacrylate 554
DMP-30 378
Methyl Acrylate 551
PARAPLEX P-49 1038
(No longer commercially available)
TRITON X-100 SURFACTANT 1291

The Rolfite Company
ROLFITE 404 1196

SCM Corporation
SCM Metal Products/SCM Chemicals Div.
Copper (I) Oxide 157

SCM Specialty Chemicals Division
Bromine Pentafluoride 172
Trichlorotrifluoroethane 314

Sandvik, Inc.
Tungsten Carbide
(Cemented with Cobalt Binder) 177

Sartomer Company
SARTOMER SR-297 1106

Schenectady Chemicals, Inc.
ISOMID "B" 1085
ISONEL 31-66 (XV-503) 1002

Scientific Gas Products, Inc.
Nitrogen Dioxide 47

Schwartz Chemical Company
REZ-N-BOND #1 1131

Shawinigan Products Corp.
Calcium Carbide 78

Shell Chemical Company and
Shell Oil Company
Allyl Alcohol 505
Allyl Chloride 374
Butyl DIOXITOL 322
DIALA A and AX 393
Diethylene Glycol Monoethyl
Ether 460
2,6-Di-t-Butyl-p-Cresol 456
EPON 826 335B
EPON 828 335B
EPON 829 1128
EPON 1004 335
EPON Curing Agent D 1027B
Ethyl Amyl Ketone 480
Kerosene Solvent 387
Mesityl Oxide 454
Methyl OXITOL 352
NEOSOL 1073
OMALA OILS 1270
OXITOL 319
PD680 CLEANING COMPOUND 1095
Rubber Solvent 371
TELLUS OILS 1272
Toluene 317
TURBO OILS 1271
VITREA OIL 1264
VM&P Naphtha EC 391
Xylene 318

Shepard Chemical Company
Cobalt Naphthenate Solution 363

Sherwin Williams Co.
Benzyldimethylamine 326

Shipley Chemical Company
AZ-111 PHOTO RESIST 1014
AZ-1112A REMOVER 1015
CUPOSIT 802A 1233A
802B and B-2 1233B
802M 1233
802R Replenisher 1233C
Catalyst 9F 1227
CP-74A 1234
CP-74B 1236
CO-74H 1237
CP-74M 1238
CP-74Q 1239
CP-74R 1240
Y 1232
Z 1235

Sika Chemical Corporation
SIKAFLEX 1A 1100

G. Frederick Smith Chemical Company
Perchloric Acid 102

G.W. Smith and Sons, Inc.
PROTECT-O-METAL No. 2 1044

SPRITS
SPRITS Mold Release 1198

SRS, Inc.
TRITHENE 311

Standard Chlorine Chemical Co., Inc.
p-Dichlorobenzene 514
Trichlorobenzene,
Electrical Grade 365

Standard Oil Company (Ohio)
BORON Solvent VM&P 2429 391
FACTOQUENCH 74 1067

Standard Oil Company (California)
Fuel Oil No. 1 468

State Chemical Manufacturing Company
INDUSTRIAL CLEANER 68-A 1096

Stauffer Chemical Company
Benzyl Alcohol 536
Carbon Disulfide 350
FRYQUEL 550 1175
Hydrofluoric Acid, Aqueous 6A
LINDOL 332
PERK 313
PHOSFLEX 112 1081
Phosphoric Acid 8
Sodium Metasilicate 85
Sulfur 56
SYN-O-AD 8484 332
Tributyl Phosphate 521
Trisodium Phosphate 43

Stepan Company
MAKON NF-5 1122

Sterling Div., RCI
U-300-20 THERMOPOXY 1191

Sun Oil Co.
Toluene 317

Sun Petroleum Products
SUN Wax Oil 90 1256

SUN Refining and Marketing Co.
SUNVIS 916 (32) 1284

Synthron, Inc.
ACTIRON NX-3 378

Texaco Chemical Co.
Aromatic A-150 1286
2228 CLEARTEX B 1162
2234 CLEARTEX 140X 1137
Propylene Carbonate 447
SOLUBLE OIL "C" 1132
Texsolve B 1274
Texsolve C 1275
Texsolve F 1280
1557 TRANSULTEX F 1161

Textron Inc.
Spencer Kellogg Div.
Linseed Oil, Raw 476
Soya Oil 477

THIOKOL
Ventron Division
Decaborane 104
Sodium Borohydride 93

Three M Company (3M)
SCOTCHCAST RESIN #8 1181
SCOTCHKOTE RESIN K2006, K2008 1003
(no longer commercially available)
SCOTCHWELD STRUCTURAL ADHESIVE
2216, A&B 1157A&B
TYPE R DEVELOPER 1180

Timken Company
Carbon Steel (Scrap) 161

Titanium Metals Corp. of America
Titanium-Based Alloy (Scrap-Generic) 166

Toyomenko America, Inc.
(Agent for Nissan Chemical Industries, Inc., Tokyo, Japan)
RESIN-NT (formerly THEIC) 1047

Troy Scientific Corp.
Potassium Biphthalate 475

Union Carbide Corp.
Coatings Materials Div.
Butyl Acrylate 547

Union Carbide Corp.
Ethylene Oxide Derivatives Div.
Ethylamine 540

Union Carbide Corp.
Linde Div.
Acetylene 403
Argon 64
Carbon Monoxide 35
Dichlorotetrafluorethane 572
Helium 98
Hydrogen Gas 65
Hydrogen Sulfide 52
Methane 440
Nitrogen 61
Oxygen 62
Phosgene 66
Phosphine 63

Union Carbide Corporation
Solvents & Intermediates
Acetic Anhydride 434
N-Aminoethyl Piperazine 408
BAKELITE ERL-4221 386
Butanol 337
Butyl Acetate 338
Butyl CARBITOL 322
Butyl CARBITOL Acetate 368
4-t-Butylphenol 422
CARBOWAX 3350, 4600, 8000 364
CELLOSIZE HEC, Types WP and QP 401
CELLOSOLVE Acetate 321
CELLOSOLVE Solvent 319
Cumene 395
Dibutyl Phthalate 429
Diethanolamine 426
Diethylene Glycol Monoethyl
Ether 460
Diethyl Ketone 478
1,4-Dioxane 412
Ethyl Acetate 437
Ethyl Butyl Ketone 306
Ethylenediamine 325
2-Ethylhexyl Acrylate 345
Ethyl Silicate 446
Formic Acid 416
Isopropyl Acetate 496
Methyl CELLOSOLVE 352
Methyl Methacrylate (Monomer) 441
Monoethanolamine 418
Proprietary Solvent
(Federal Formula #1) 1242
n-Propyl Acetate 515
SYNASOL PM 3224 & PM 509 1073
SYNASOL Solvent 190, PM41 1242
Triethanolamine 427
Triethylamine 392

UCON 11 309
UCON 12 308
UCON 22 307
UCON 113 314

Union Carbide Corporation
Specialty Chemicals & Plastics Div.
Acrolein 573
N-Butyraldehyde 542
Glutaraldehyde 548

Union Oil Company of California
Union Chemical Div.
AMSCO Rubber Solvent 371
AMSCO Solv 5391 496
AMSCO Solv 5470 353
AMSCO Special Naptholite 391
Amyl Acetate, Primary
(Mixed Isomers) 486

US Borax & Chemical Co.
Boron Oxide 143
Boric Acid 4

US Steel Corp.
USS Chemicals Div.
Aniline 407
Di(2-Ethylhexyl)Phthalate 414

United Mineral & Chemical Corp.
Zinc Sulfate 96

Urethane Tooling and Eng'g Corp.
UT-100 Adhesive 1172

USI Chemical
Vinyl Acetate, Monomer,
Inhibited 509

Ventron Corp.
ALFA Div.
Silver Nitrate 81

Vesicol Chemical Corporation
Benzoic Acid 402
Chlorendic Anhydride 339

Virginia Chemicals, Inc.
Diethylamine 453
Isopropyl Amine 483
Sulfur Dioxide, Anhydrous 50

Vulcan Materials Company
Stannous Chloride 67
Stannous Sulfate 14

Warner Company
Industrial Minerals Div.
Calcium Hydroxide 39
(Bell Mine Chemical Hydrate)

WD-40 Company
WD-40 1030

Weld-Aid Products, Inc.
NOZZLE KLEEN 1164

S.S. White Industrial Products
AIRBRASIVE POWDER No. 1 1000
No. 3 1197

White Chemical Corporation
Acetyl Chloride 452

Whitford Corp.
XYLAN 1010 1143

Whittaker Corporation
Ram Chemicals Division
RAM MOLD RELEASE 225 (Aerosol) 1046
RAM MOLD RELEASE 225 1046A

Witco Chemical Corp.
U.S. Peroxygen Div.
MEK Peroxide Solution
(9 wt% max "active oxygen") 329A

Woodhill Chemical Sales Corporation
SUPERGLUE 3 1065

Woodmont Products, Inc.
THOXENE TA-12 A&B 1027A
(No longer commercially available)

Xerox Corporation
XEROX DUPLICATING TONERS 1028
Part Numbers: 6R5, 6R20, 6R60, 6R61, 6R148, 6R152, 6R157
TRADE NAMES: 720/813/914/970/1000/1824/1860/LDX Toner
XEROX DUPLICATING TONER (Dry Imager) 1028A
Part Numbers: 6R87, 6R40, 6R41, 6R64, 6R65, 6R62, 6R63, 6R207, 6R208
TRADE NAMES: 1200 Toner (Dry Imager)/970; TC 200/600 MEP Toner (Dry Imager); 2400/3600/7000/840 EPS Toner (Dry Imager)

LATEST ISSUE LIST

	DATED
Title Page	--
Update Record Page	10/84
Latest Issue List	5/86
Alphabetical Index of Materials	5/86
Supplier Index	5/86
Code for Sources Used	5/86
Glossaries Section and Misc.	
Glossary of Terms	3/86
Key to Abbreviations	7/85
EPA Regional Offices	8/83
State Solid Waste Program Offices	8/83
OSHA Regional Offices	8/83
Other Federal Agencies	8/83
Non-Governmental Agencies	8/83
Poison Control Center Directory	6/85
DOT Hazardous Materials Warning Labels and Placards (Chart #8)	1/85
Wilson's Risk Chart (See end of Glossary of Terms)	3/86

NUMBERS: GENIUM assigns Data Sheet numbers to materials arbitrarily. The numbers have no other significance than merely the organization of this Collection.

DATES: The Sheets are dated when originally written and revised. Sheets marked with "R" indicate the sheet was reviewed and found not to need revision. "R" dates remain the issue date in the Latest Issue List; the date of the review is noted only on the MSDS Sheet itself.

VOLUME I - INORGANIC MATERIALS (1 to 299)

MSDS#		DATED(a)
1	Anhydrous Ammonia	8/85
1A	Ammonium Hydroxide (28-30%)	5/80
2	Potassium Hydroxide	2/84
3	Sodium Hydroxide	8/85
3A	Sodium Hydroxide, 50% Liquid	8/85
4	Boric Acid	3/83
5	Chromic Acid, Solid	8/85
6	Hydrofluoric Acid (Anhydrous)	5/81
6A	Hydrofluoric Acid (47-70%)	5/81
7	Nitric Acid	10/80
8	Phosphoric Acid	3/83
9	Sulfuric Acid	2/86
9A	Oleum	2/86
10	Hydrazine Monohydrobromide	7/79
11	Mono-Aluminum Phosphate	10/77
12	Cuprous Cyanide	5/84
13	Potassium Cyanide	5/80
14	Stannous Sulfate	9/84
15	Asbestos Tape	11/79
15A	Chrysotile Asbestos	11/79
15B	Asbestos-Rubber Sheet & Gaskets	10/82
16	Sodium-Potassium Alloy	2/84
17	Zirconium Metal/Powder	9/80
18	Zinc Chloride Soldering Flux	5/84
19	Ferric Chloride Solution	2/84
20	Nickel Nitrate	5/84
21	Ammonium Chloride	8/85
22	Calcium Oxide	9/78
23	Cadmium Metal	12/80
24	Mica Powder (Muscovite)	9/77
25	Phosphorus (Yellow)	9/77

VOLUME I - INORGANIC MATERIALS 1 to 299

MSDS #		Dated (a)
26	Mercury	9/81
27	Sulfur Hexafluoride	6/81
28	Antimony Trioxide	10/85
29	Copper Sulfate	5/84
30	Hydrogen Chloride (Anhydrous)	6/84
30A	Hydrochloric Acid	6/84
31	Disodium Hexafluorosilicate	7/79
32	Cu/Co/Be Alloy	5/80
33	Ammonium Persulfate	1/78
34	Ozone	2/82
35	Carbon Monoxide	1/86
36	Nickel Chloride	2/86
37	Nickel Sulfate	2/86
38	Lead Monoxide	2/86
39	Calcium Hydroxide	10/84
40	Barium Octahydrate	2/86
41	Ag/Cd/Zn/Cu Brazing Alloy	7/84
42	Talc	11/78
43	Trisodium Phosphate Dodecahydrate	11/78
(44)	None issued	--
44A	Hydrogen Peroxide (60%)	12/78
44B	Hydrogen Peroxide (27-52%)	12/78
45	Zinc Oxide	2/86
46	Fibrous Glass	12/78
47	Nitrogen Dioxide	R-12/78
48	Sodium Carbonate, Anhydrous	11/84
49	Ammonium Bifluoride	2/86
51	Carbon Black	8/85
52	Hydrogen Sulfide	7/79
53	Chlorine	7/79
54	Carbon Dioxide	7/79
55	Wallastonite	7/79
56	Sulfur	10/79
57	Ferrous Sulfate Heptahydrate	4/80
58	Sodium Cyanide	4/80
59	Beryllium Metal/Powder	4/80
60	Bismuth Metal/Powder	4/80
61	Nitrogen	4/80
62	Oxygen	4/80
63	Phosphine	5/80
64	Argon	10/84
65	Hydrogen Gas	5/80
66	Phosgene	5/80
67	Stannous Chloride	7/80
68	Calcium Hypochlorite	7/80
69	Diatomaceous Earth (Natural)	R-9/80
70	Antimony Metal/Powder	9/80
71	Quartz	9/80
72	Sulfamic Acid	9/80
73	Zinc Metal/Powder	9/80
74	Tin Metal/Powder	9/80
75	Titanium Metal/Powder	10/80
76	Thorium Metal/Powder	11/80
77	Bromine	7/80
78	Calcium Carbide	4/81
79	Ammonium Nitrate	7/81
80	Thallium Metal/Powder	12/80
81	Silver Nitrate	12/80
82	Cobalt Metal/Powder	3/81
83	Chromium Metal/Powder	3/81
84	Molybdenum Metal/Powder	3/81
85	Sodium Meta Silicate	10/81
86	Thionyl Chloride	7/81
87	Sodium Bisulfide	5/81
88	Vanadium Pentoxide	6/81
89	Hydrofluosilicic Acid	6/81

VOLUME I - INORGANIC MATERIALS

MSDS #	1 to 299	Dated (a)
90	Sulfuryl Chloride	7/81
91	Boron Trifluoride	10/81
92	Aluminum Sulfate, Liquid	10/81
93	Sodium Borohydride	10/81
94	Magnesium Oxide	10/81
95	Potassium Permanganate	10/81
96	Zinc Sulfate	10/81
97	Magnesium Carbonate	11/81
98	Helium	3/82
99	Sodium Silicate Solution	5/82
100	Aluminum Metal/Powder	5/84
101	Sodium Nitrate	4/82
102	Perchloric Acid (70-72%)	10/85
103	Diborane	3/82
104	Decaborane	10/82
105	Lithium Fluoride	10/82
106	Silicon Tetrachloride	9/82
107	Silane	11/82
108	Tellurium Metal/Powder	10/82
109	Nitrous Oxide	10/82
110	Phosphorus Trichloride	10/82
111	Ammonium Fluoride	10/82
112	Borax Pentahydrate	11/82
113	Boron Nitride Powder	11/82
114	Iodine	12/82
115	Sodium Hypochorite Aqueous Solution (5-12%)	2/83
116	Sodium Nitrite	7/83
117	Phosphorus Oxychloride	7/83
118	Titanium Dioxide	10/83
119	Barium Carbonate	10/83
120	Strontium Carbonate	10/83
121	Cupric Chloride	10/83
122	Manganese Dioxide	10/83
123	Tungsten Carbide Powder	10/83
124	Vanadium Metal/Powder	10/83
125	Chlorine Trifluoride	12/83
126	Hydrazine, Anhydrous	6/84
127	Hydrazine, Aqueous	6/84
128	Nickel Fluoborate	4/85
129	Ammonium Dichromate	12/85
130	Ammonium Metavanadate	4/85
131	Barium Fluoride	4/85
132	Barium Chloride	4/85
133	Cadmium Oxide	5/85
134	Yitrium Oxide	6/85
135	Manganese Carbonate	6/85
136	Selenium	6/85
137	Tricalcium Phosphate	7/85
138	Sodium Fluoride	8/85
139	Ammonium Acetate	8/85
140	Potassium Ferricyanide	9/85
141	Calcium Chloride, Anhydrous	8/85
142	Ferric Nitrate	8/85
143	Boron Oxide	8/85
144	Cadmium Chloride, Anhydrous	8/85
145	Lanthanum Oxide	8/85
146	Mercuric Chloride	8/85
147	Rhodium Metal/Powder	8/85
148	Manganese Metal/Powder	9/85
149	Lithium Bromide	9/85
150	Lead Chloride	9/85
151	Manganese Sulfate	9/85
152	Selenium Dioxide	10/85
153	Sodium Dichromate	10/85
154	Cadmium Metal Powder	10/85
155	Bottom Ash	11/85

VOLUME I - INORGANIC MATERIALS

MSDS #	1 TO 299	Dated (a)
156	Pond Sludge	11/85
157	Copper I Oxide	12/85
158	Copper II Oxide	12/85
159	Strontium Nitrate	12/85
160	Lithium Hydride	12/85
161	Carbon Steel (Scrap)	12/85
162	Copper (Scrap)	12/85
163	Stainless Steel-Cobalt Base	12/85
164	Stainless Steel-Nickel Base	12/85
165	Beryllium-Copper Alloy (Scrap)	12/85
166	Titanium-Based Alloy	12/85
167	Tantalum Powder	1/86
168	Potassium Dichromate	1/86
169	Mercury (II) Nitrate	1/86
170	Mercury (II) Oxide	1/86
171	Cadmium Nitrate Tetrahydrate	1/86
172	Bromine Pentafluoride	2/86
173	Barium Nitrate	2/86
174	Copper (II) Nitrate, Trihydrate	2/86
175	Iron (III) Oxide	2/86
176	Zinc Metal Powder	3/86
177	Tungsten Carbide	3/86
178	Arsine	3/86

MSDS #'s 179 to 299 are reserved for future use.

VOLUME I - ORGANIC MATERIALS

MSDS#	(300 to 999)	DATED
300	Acetone	9/85
301	Cyclohexanone	8/79
302	Methyl n-Amyl Ketone	9/79
303	Methyl Ethyl Ketone	9/79
304	Methyl Isobutyl Ketone	9/79
305	Methyl n-Propyl Ketone	9/79
306	Ethyl n-Butyl Ketone	9/79
307	Chlorodifluoromethane	2/86
308	Dichlorodifluoromethane	2/86
309	Fluorotrichloromethane	2/86
310	Methylene Chloride	9/85
311	1,1,1-Trichloroethane	8/83
312	Trichloroethylene	7/79
313	Perchloroethylene	11/78
314	Trichlorotrifluoroethane	2/86
315	Chloroform	8/79
316	Benzene	11/78
317	Toluene	8/79
318	Xylene	10/80
318A	o-XYLENE	11/80
318B	m-XYLENE	11/80
318C	p-XYLENE	11/80
319	2-Ethoxyethanol	R-10/79
320	2-Butoxyethanol	9/85
321	2-Ethoxyethyl Acetate	R-11/79
322	Diethylene Glycol Monobutyl Ether	9/78
323	Ethylene Glycol	11/80
324	Isopropyl Alcohol	9/85
325	Ethylenediamine	5/84
326	Benzyldimethylamine	2/84
327	Acetic Acid, Glacial	12/80
327A	Acetic Acid, 28%	10/80
328	Oxalic Acid	2/81
329	MEK Peroxide Solution	R-4/80
329A	MEK Peroxide Solution, 9% Max	11/80

MSDS #	VOLUME I - ORGANIC MATERIALS 300 TO 999	Dated (a)
330	Trimellitic Anhydride	12/79
331	Toluene-2,4-Diisocyanate	R-11/78
332	Tricresyl Phosphate	11/77
333	Triphenyl Phosphate	11/82
334	Mineral Spirits, Type I	7/84
334A	Mineral Spirits, Type II	7/84
334B	Stoddard Solvent, Type III	11/77
335	Epoxy Resin, Solid (Unmodified)	1/82
(335A)	None issued	--
335B	Epoxy Resin, Liquid (Unmodified)	1/82
336	Vinyltoluene	7/79
337	n-Butyl Alcohol	6/84
338	n-Butyl Acetate	5/84
339	Chlorendic Anhydride	10/81
340	Dicyclopentadiene	2/84
341	Isoprene	11/77
342	Dimethyl Ether	4/83
343	Diethyl Ether	8/79
344	Dimethyl Sulfate	11/77
345	2-Ethylhexyl Acrylate	2/84
346	Methylenedianiline	10/78
347	N,N-Dimethylaniline	11/77
348	N,N-Diethylaniline	12/79
349	Dimethyl Silicone Fluid	R-12/76
350	Carbon Disulfide	9/82
351	Styrene Monomer	8/79
352	2-Methoxyethanol	R-7/81
353	Diacetone Alcohol	12/83
354	Methyl Alcohol	9/85
355	Phenol	9/85
356	Morpholine	3/81
357	Isophorone	7/79
358	o-Dichlorobenzene	2/84
359	1,2-Dichloroethane	11/78
360	Formalin	3/81
361	Ethyl Alcohol	10/81
362	1,3-Butanediol	10/77
363	Cobalt (6%) Naphthenate Solution	8/83
364	Polyethylene Glycol	3/82
365	Trichlorobenzene, Dielectric Grade	12/79
366	Chlorobenzene	11/82
367	2-Ethylhexanol	2/84
368	Diethylene Glycol Monobutyl Ether Acetate	11/77
369	Bisphenol A	9/85
370	White Shellac Solution	1/78
371	Rubber Solvent	1/78
372	4,4'-Methylene Bis(2-chloroaniline)	7/79
373	Methyl Chloride	8/78
374	Allyl Chloride	8/78
375	Turpentine	10/84
376	Wood Dust	7/79
377	Rosin (Gum, Wood or Tall Oil)	10/84
378	Tris(dimethylaminomethyl) Phenol	8/78
379	Tetrahydrofuran	9/85
380	Liquefied Propane	10/84
381	Acrylonitrile Monomer	8/78
382	Vinyl Chloride Monomer	R-8/78
383	"Isooctane"	8/78
384	Lead Naphthenate Solution (24% Lead)	8/78
385	Ethyl Benzene	8/78
386	Cycloaliphatic Epoxy Resin	8/83
387	Kerosene Solvent	12/82
388	Polytrifluorochloroethylene, Liquid	10/78
389	Cyclohexane	3/84
390	Formamide	9/78
391	VM&P Naphtha (Rule 66 Exempt)	9/78

MSDS #	VOLUME I - ORGANIC MATERIALS 300 TO 999	Dated (a)
392	Triethylamine	9/78
393	Electrical Insulating Oil	R-9/78
394	Reactive Polyamide Liquid Resins	R-9/78
395	Cumene	9/78
396	Isobutyl Acetate	10/78
397	n-Hexane	8/83
397A	Hexane Isomers	8/83
398	Isobutyl Alcohol	8/85
399	Polyvinyl Formal Resins	10/78
400	Adipic Acid	12/79
401	Hydroxyethyl Cellulose	10/78
402	Benzoic Acid	11/78
403	Acetylene	7/84
404	Dimethyl Terephthalate	12/78
405	Pyridine	12/78
406	t-Butyl Perbenzoate	12/78
407	Aniline	10/84
408	N-Aminoethyl Piperazine	12/78
409	Cresol	12/78
409A	Cresylic Acid	12/79
410	Carbon Tetrachloride	12/80
411	Triphenyl Phosphite	11/84
412	1,4-Dioxane	R-12/78
413	Furfural	9/81
414	Di(2-Ethylhexyl)Phthalate	11/84
415	Stearic Acid	6/79
416	Formic Acid	6/79
417	Phthalic Anhydride	R-6/79
418	Monoethanolamine	6/79
419	Tetramethylguanidine	6/79
420	Acetone Solvent Blend	7/79
421	4-t-Butylcatechol	8/79
422	4-t-Butylphenol	8/79
423	Ethylene Thiourea	10/79
424	Dimethylformamide	3/82
425	Methyl-n-Butyl Ketone	10/79
426	Diethanolamine	10/79
427	Triethanolamine	4/80
428	Dimethyl Sulfoxide	4/80
429	Dibutyl Phthalate	5/80
430	Dimethyl Phthalate	5/80
431	N-Methyl-2-pyrrolidone	7/80
432	Methyl Formate	5/80
433	Ethylene Oxide	5/80
434	Acetic Anhydride	5/80
435	Diethyl Phthalate	7/80
436	Nitroethane	5/85
437	Ethyl Acetate	R-7/80
438	Maleic Anhydride	R-7/80
439	Nitrobenzene	7/80
440	Methane	7/80
441	Methyl Methacrylate	7/80
442	2-Butanol	2/86
443	Terephthalic Acid	9/80
444	Zinc Stearate	9/80
445	Calcium Stearate	9/80
446	Ethyl Silicate	5/81
447	Propylene Carbonate	2/81
448	2-Nitropropane	5/85
449	Acrylic Acid	3/81
450	Cresyl Diphenyl Phosphate	3/81
451	Biphenyl	4/81
452	Acetyl Chloride	9/81
453	Diethylamine	5/81
454	Mesityl Oxide	5/81
455	4-Methoxyphenol	6/81
456	2,6-Di-t-Butyl-p-Cresol	8/81

VOLUME I - ORGANIC MATERIALS 300 TO 999

MSDS #		Dated (a)
457	Ethylene	11/81
458	N,N-Dimethyl Acetamide	7/81
459	Benzoyl Chloride	6/81
460	Diethylene Glycol Monoethyl Ether	6/81
461	Diphenylamine	9/81
462	Paraformaldehyde	9/81
463	1,3-Butadiene	9/81
464	n-Heptane	9/81
465	Methyl Mercaptan	10/81
466	Methyl Isopropyl Ketone	10/81
467	Automotive Gasoline, Lead-free	10/81
468	Fuel Oil #1	3/82
469	Fuel Oil #2	10/81
470	Diesel Fuel Oil #2-D	10/81
471	Coconut Shell Charcoal	12/81
472	Starch (Corn)	2/82
473	Fuel Oil #5	10/81
474	Fuel Oil #6	10/81
475	Potassium Biphathalate	10/81
476	Linseed Oil	11/81
477	Soya Oil	11/81
478	Diethyl Ketone	3/82
479	Furfuryl Alcohol	7/82
480	Ethyl Amyl Ketone	4/80
481	Liquefied Butane	3/82
482	Hexahydrophthalic Anhydride	6/82
483	Isopropyl Amine	8/82
484	Pine Oil	8/82
485	1,4-Butanediol	9/85
486	Amyl Acetate Primary (Mixed Isomers)	3/82
487	n-Amyl Acetate	3/82
488	Kerosine Burner Fuel	11/82
489	Cyclohexanol	9/82
490	Ammonium Lauryl Ether Sulfate	5/82
491	Bituminous Coal Dust	5/82
492	Ethylene Dibromide	9/82
493	Terpineol	9/82
494	n-Propyl Alcohol	9/82
495	Tall Fatty Acids	9/82
496	Isopropyl Acetate	10/82
497	t-Butanol	2/86
498	Pyrrolidine	10/82
499	Acetonitrile	10/82
500	Benzoyl Peroxide	10/82
501	Diisobutyl Ketone	10/82
502	Ethyl Formate	7/85
503	Methyl Acetate	12/82
504	Butyl Mercaptan	12/82
505	Allyl Alcohol	2/86
506	n-Amyl Alcohol	12/82
507	Cellulose Flock from Wood	4/82
508	Nitromethane	5/85
509	Vinyl Acetate, Monomer, Inhibited	2/83
510	Ethyl Mercaptan	2/83
511	Chlorendic Acid	2/83
512	Lard Oil	3/83
513	Hexamethyldisilazane	7/83
514	p-Dichlorobenzene	10/83
515	n-Propyl Acetate	10/83
516	Cyclohexene	10/83
517	Pentachlorophenol	10/83
518	Petroleum "Ether"	10/83
519	sec-Butyl Acetate	10/83
520	Tetrahydrofurfuryl Alcohol	10/83
521	Tributyl Phosphate	10/83
522	Propylene Glycol Monomethyl Ether	10/83

VOLUME I - ORGANIC MATERIALS 300 TO 999

MSDS #		Dated (a)
523	n-Pentane	10/83
524	Trichloroacetic Acid	12/83
525	Mineral Oil	11/85
526	2-Methoxyethyl Acetate	2/84
527	Diallyl Phthalate Monomer	2/84
528	Urea	2/84
529	Cyclopropane	5/84
530	Petroleum "Ether," High Boiling	5/84
531	Camphor	5/84
532	Cellulose Acetate, Lacquer Grade	10/84
533	Citric Acid	4/85
534	Picric Acid	4/85
535	Acetaldehyde	5/85
536	Benzyl Alcohol	5/85
537	Cyclohexylamine	5/85
538	Ethyl Chloride	5/85
539	Polyvinyl Alcohol	7/85
540	Ethylamine	5/85
541	Isopropyl Ether	5/85
542	N-Butyraldehyde	5/85
543	Salicylic Acid	7/85
544	Chlorosulfonic Acid	7/85
545	Fumaric Acid	7/85
546	Lactic Acid	7/85
547	Butyl Acrylate	7/85
548	Glutaraldehyde	7/85
549	Adiponitrile	7/85
550	Zinc Acetate	8/85
551	Methyl Acrylate	8/85
552	Methyl Hydrazine	8/85
553	Ethyl Acetoacetate	8/85
554	n-Butyl Methacrylate	8/85
555	Aminoethylethanolamine	8/85
556	2,4-Pentanedione	8/85
557	p-Cymene	8/85
558	Epoxy Resins (Liquid) Generic	11/85
559	Epoxy Resins (Curing Agents) Generic	11/85
560	o-Cresol	11/85
561	2,6-Xylenol	11/85
562	Acetylene Tetrabromide	12/85
563	Decahydronapthalene	12/85
564	Bromobenzene	12/85
565	Diethyl Carbitol	12/85
566	Dimethylamino Ethanol	12/85
567	Acetophenone	1/86
568	Aminopyridine	1/86
569	Butylamine	1/86
570	Cyclopentanone	1/86
571	Dichloroethyl Ether	1/86
572	Dichlorotetrafluoroethane	12/85
573	Acrolein	2/86
574	Thioglycolic Acid	2/86
575	Isopentyl Nitrite	2/86
576	Allyl Glycidyl Ether	2/86
577	Acrylamide	2/86
578	Crotonaldehyde	2/86
579	SD No. 3A Alcohol	2/86
580	Caprolactam	2/86
581	Mesitol	2/86
582	Diamyl Amine	2/86

MSDS #'s 583 to 999 are reserved for future use.

VOLUME II - TRADENAME LISTINGS

MSDS#	(1000-2000)	DATED
Tradename Index		7/85
1000	AIRBRASIVE POWDER #1	7/79
(1001)	None issued	--
1001A	VERSILOK 528	R-10/78
1001B	LORD ACCELERATOR #4	R-10/78
1002	ISONEL 31-66 (XV 503)	7/79
1003	SCOTCHKOTE RESINS (K2006, K2008)	9/78
(1003 No longer commercially available)		
(1004)	None issued	--
1004A	Conthane CE-1155, Part A	10/84
1004B	Conthane CE-1155, Part B	9/84
1005	IMIDEX E, GE 73156	7/79
1006	RTV-577	7/79
1007	RTV-9811	7/79
1008	SS-4004	8/83
1009	LAMINAC 4146	7/79
1010	TEFLON FEP	7/79
(1011)	None issued	--
1011A	HYSOL EA 934, Part A	7/79
1011B	HYSOL EA 934, Part B	7/79
1012	RISTON II STRIPPER 1000X (Concentrate)	8/79
1013	RISTON II DEVELOPER 2000 (Concentrate)	8/79
1013A	RISTON II DEVELOPER 2000 (Use Conc.)	7/79
1014	AZ-111 PHOTO RESIST	8/79

See Volume I for sheet #'s below 1000.

1015	AZ-1112A REMOVER	8/79
1016	STRYPP NF	R-10/75
1017	RACK#STRIP C SOLUTION	10/79
1017A	RACK STRIP C	10/79
1018	LACO M-A Flux	R-11/75
1019	PEX SPRAY 66	9/84
1020	DIFFERENTIATED KLARIFIANT	R-10/75
1021	NOVACITE	R-11/76
1022	KESTER 197 RESIN FLUX	R-10/76
1023	KESTER 108 THINNER	R-10/76
1024	PERMAFIL 73517	R-10/76
1025	GE MU-124	R-10/76
1026	GE 74023	10/78
(1027)	None issued	--
1027A	THOXENE TA-12B	R-1/77
(1027A No longer commercially available)		
1027B	EPON CURING AGENT D	R-1/77
1028	XEROX DUPLICATING TONER	11/82
1028A	XEROX DUPLICATING TONER (Dry Imager)	11/82
1029	ASTRO SPECIAL 3044	R-12/76
(1029 No longer manufactured)		
1030	WD-40	9/84
1031	SKC-NF SPOTCHECK CLEANER (Formula B)	11/78
1032	OAKITE 160	R-11/76
1033	ECCOSTRIP 93	12/78
1034	HYSOL H2-3416 DETA	12/79
1035	HYSOL H2-3404 TETA	12/79
1036	EPORAL	12/79
1037	TRITHERM 981 WIRE ENAMEL	1/81
1038	PARAPLEX P-49	12/76
(1038 No longer commercially available)		
1039	KODAFLEX TXIB	4/80
1040	GE 73039 WIRE ENAMEL	12/79
1041	HAVILAND ND 68G ETCH	2/82
1042	OAKITE STRIPPER ANP	11/78
1043	CORAL NO-TARN	12/79
1044	PROTECTO-O-METAL No. 2	9/84
1045	KWIK KASE, PARK KASE 5C	9/81

VOLUME II - TRADENAME MATERIALS

MSDS #	1000 AND UP	Dated (a)
1046	RAM MOLD RELEASE 225 (Aerosol)	6/80
1046A	RAM MOLD RELEASE 225	6/80
1047	RESIN-NT (Formerly THEIC)	11/78
1048	ZYGLO PENETRANT, ZL-22A and B	10/80
(1049)	None issued	--
1049A	Quantor IR-75, First Developer (Part 1)	12/76
1049B	Quantor IR-75, First Rinse (Part 2)	12/76
1049C	Quantor IR-75, Bleach (Part 3)	12/76
1049D	Quantor IR-75, Cleaning Bath (Part 4)	12/76
1049E	Quantor IR-75, Second Developer (Part 5)	12/76
1049F	Quantor IR-75, Second Rinse (Part 6)	12/76
1050	KANO KROIL	R-1/77
1051	DIELEKTROL I	12/80
1052	DIELEKTROL II	12/80
1053	PENESOLVE 5	3/84
1054	PENETONE 2389	2/84
1055	PENETONE TYPE S	2/84
1056	STEAM KLEEN	2/84
1057	NAVEE 42	3/84
1058	TRIM TAP HEAVY	R-1/77
1059	KRYLON CRYSTAL CLEAR SPRAY COATINGS	R-1/77
1060	LECTON ACRYLIC RK6323 & RK6327	10/78
(1060 No longer manufactured)		
1061	EXXON AROMATIC 100	5/80
1061A	EXXON AROMATIC 150	5/80
1062	NADIC METHYL ANHYDRIDE	10/80
1063	BLANKROLA SOLVENT	R-1/77
1064	CAB-O-SIL	R-1/81
1065	SUPERGLUE 3	8/80
1066	HYSOL PC 18	8/80
1067	FACTOQUENCH 74	8/80
1068	SANTICIZER 9	9/80
1069	MAGNU-SPRAY 105	8/80
1070	GE MATERIAL A50A206B	10/77
1071	SKD-NF SPOTCHECK DEVELOPER (Formula B)	12/78
(1072)	None issued	---
1072A	ASTRO 3069, Part A	10/77
1072B	ASTRO 3069, Part B	10/77
1073	PROPRIETARY SOLVENT (Fed. Formula #3)	9/80
1074	EPI-CURE 856	10/83
1075	GE A50A262, EPOXY VARNISH	10/83
1076	DOWTHERM A	10/80
1077	ALPHA 413-F THINNER	5/84
1078	ALPHA 810 THINNER	5/84
1079	ALPHA 815 FLUX	10/80
1080	ALPHA MELROSE 611 FLUX	11/78
1081	PHOSFLEX 112	10/77
(1081 No longer manufactured)		
1082	PROTEXULATE	10/77
1083	RODINE 92A	5/81
1084	WELDWOOD CONTACT CEMENT	2/81
1085	ISOMID "B"	2/81
1086	HYCAR 4031-50	10/77
(1086 No longer commercially available)		
1087	PEG Hand Solution	R-10/77
1088	GE 2PV-4, HAND CLEANER	10/77
1089	GE 2PV-32, EPOXY RESIN	10/77
1090	CIM CLEAN 30	3/82
(1091)	None issued	--
1091A	BIWAX 142-R (Part A)	3/82
1091B	BIWAX 142-C (Part B)	3/82
1092	B&B 3100	10/77
1093	IMMUNOL S-6	4/83
1094	POLY-TERGENT SURFACTANTS	2/84
1095	SHELL PD680 CLEANING COMPOUND	10/77

VOLUME II - TRADENAME MATERIALS

SDS #	1000 AND UP	Dated (a)
1096	INDUSTRIAL CLEANER 68-A	3/82
1097	EVANS 7050 HOT MELT	10/77
(1097 No longer commercially available)		
1098	STEELGARD #1505B	2/83
1099	GALAXY THREAD CUTTING OILS	10/77

See Volume I for sheet #'s below 1000.

1100	SIKAFLEX 1A	4/83
1101	EPOCAST 2226B	6/84
(1102)	None issued	--
1102A	FLEXISEAL (Part One)	10/77
(1102A No longer commercially available)		
1102B	FLEXISEAL (Part Two)	10/77
(1102B No longer commercially available)		
1103	DURITE LD-5102	10/80
1104	VAMAC B-124	4/83
1105	MONDUR-M	7/80
1106	SARTOMER SR-297	3/83
1107	VITON E-60, E60C	2/84
1108	MAGNUS 26-N	8/83
1109	MAGNUS 92-S	3/83
1110	MAGNUS SC-100	10/83
1111	MAGNUS 215D	10/83
1112	MAGNUS WATER WASH 402	4/83
1113	MAGNUS 614	4/83
1114	MAGNUS 617	R-11/77
1115	URETHANE ENAMEL ACCELERATOR 189-S	10/83
1116	POLYISOCYANATE ACTIVATOR 192-S	10/83
1117	IMRON M, M, ENAMEL WHITE (817 U)	2/84
1118	RANEY NICKEL CATALYST #28	11/77
1119	KURIFLOCK PN-147 (Cancelled)	11/77
1119A	KURIFLOCK PN-161	10/82
1120	PYRE-ML WIRE ENAMEL, RC 5863	10/83
1121	PYRE-ML WIRE ENAMEL, Type I (RC5877)	10/83
1122	MAKON NF-5	8/83
1123	WHITE STAR BODY FILLER	5/84
1124	Y-469-D PIGMENT, YELLOW MED.	11/77
1125	PEDIGREE #357, TERASOD Wire Enamel	9/84
(1126)	None issued	--
1126A	BR-123 PRIMER	4/80
1126B	FM-123-5 ADHESIVE FILM	1/78
1127	PR-420	1/78
1128	EPON RESIN 829	1/78
1129	PEDIGREE #946 Wire Enamel	9/84
1130	J-1345, Basic Zinc Chromate	1/78
1131	REZ-N-BOND #1	12/78
1132	TEXACO SOLUBLE OIL "C"	1/78
(1133)	None issued	--
1133A	ARMSTRONG 520 ADHESIVE	12/83
1133B	ARMAFLEX PIPE INSULATION	1/78
1134	FREUND 6060 GLUE	10/84
1135	CM-154-XTX, Alkaline Soak Cleaner	1/78
1136	MOLD RELEASE #210-SS	9/84
1137	TEXACO 2234 CLEARTEX 140X	1/78
1138	COMPOUNDERS WAX IE-367	1/78
(1138 No longer commercially available 5/85)		
1139	PR-1527	1/78
1140	MOBIL VACTRA #2	4/82
1140A	MOBIL VACTRA #4	4/82
1141	MOBIL MIST LUBE 27	4/83
1142	GE RTV Silicone Rubber, Acetoxy-cure	R-3/82
1143	XYLAN 1010	8/78
1144	HANDY FLUX	8/78

VOLUME II - TRADENAME MATERIALS

MSDS #	1000 AND UP	Dated (a)
1145	ENSTRIP A	5/84
1146	SYNTHITE EB-41	12/83
1147	DOLPH CW-340-1	8/78
1148	DOLPH T-200X	8/78
1149	CHLOROWAX, LIQUID	8/78
1149A	CHLOROWAX RESIN	6/79
1150	VERSILOK 505	R-9/78
1151	SS-4155 PRIMER	5/84
1152	MARKEM 320 CLEANER	9/84
1153	DYKEM REMOVER AND THINNER	9/78
1154	DYKEM LAYOUT FLUIDS	9/78
1155	ELECTRO-BRITE Z-200	10/84
1156	NEU-TRI SOLVENT	9/78
(1157)	None issued	--
1157A	SCOTCHWELD STRUCTURAL ADHESIVE 2216, A	2/84
1157B	SCOTCHWELD STRUCTURAL ADHESIVE 2216, B	12/83
1158	BRULIN 815 MX	9/84
1159	BRULIN 815 QR	9/84
1160	BLUE GOLD	1/82
1161	TEXACO 1557, TRANSULTEX F	9/84
1162	TEXACO 2228, CLEARTEX B	9/84
1163	ALKANEX INSULATING VARNISH (GE 9522 and GE 9637)	9/78
1164	NOZZLE KLEEN	9/78
1165	CLEAR VARNISH 2609	9/78
1166	ELECTRO-BRITE NAZ-32	9/78
1167	OAKITE 67	10/78
1168	BORDEN FM 203W CATALYST POWDER	10/78
1169	DOW CORNING 1090 VARNISH	11/78
1170	TUN-O-WASH CLEANER	10/78
1171	DOW CORNING GP-77 VARNISH	10/78
1072	UT-100 ADHESIVE (Parts A & B)	10/78
1173	GLYPTAL 1500 THINNER	11/84
1174	JDM F2A2 GREEN ALKYD RESIN ENAMEL (Exempt Solvent)	11/78
1175	FRYQUEL 550	6/84
1176	MAGNUS 763-NF	12/78
1177	BARCO BOND MB-100X & MV-12	12/78
(1178)	No sheet issued, See 1178A and 1178B	--
1178A	HYSOL PC 29 PART A	2/81
1178B	HYSOL PC 29 PART B	2/81
1179	HYSOL DK0295	12/78
1180	3M BRAND TYPE R DEVELOPER	12/78
1181	SCOTCHCAST RESIN #8 (Parts A & B)	12/83
1182	OAKITE STRIPPER 156	7/79
1183	OAKITE 98	8/79
1184	HI-THERM BC-350	8/79
1185	WYANDOTTE B.N.	9/79
1186	WYANDOTTE EXPRAY-541	9/79
1187	CHEMGLAZE Z004	R-10/79
1188	PERMABOND QUICK FILLER/SETTER	10/79
1189	FIREX RX-2373 (Parts A & B)	10/79
1190	ASTRO SPECIAL 4017 (A & B)	10/79
1191	STERLING U-300-20 THERMOPOXY COMPOUND	9/84
1192	GLYPTAL C.E. 514	10/79
1193	GLYPTAL 7815	10/79
1194	GLYPTAL C-1103	10/79
1195	Q-CLEAN SE-67	11/79
1196	ROLFITE 404	11/79
1197	AIRBRASIVE POWDER NO. 3	12/79
1198	SPRITS MOLD RELEASE	12/79
1199	SK-4 COLD STRIPPER	4/80
1200	AROCLOR 1254	5/80
1201	KODAK METAL ETCH RESIST THINNER	7/80
(1202)	None issued	--
1202A	IPS TR 250 (Component A)	7/80
1202B	IPS TR 250 (Component B)	7/80

DRAFT

CONFIDENTIAL

Generic Quality Assurance Plan

Prepared For:
State of Florida
The Department of Environmental Regulation

Prepared By:

PACE Laboratories, Inc.
Tampa, FL 55422

June 1987

Consultant Manager Laboratory Director	Date
Consultant QA Officer	Date
DER QA Officer	Date

II. TABLE OF CONTENTS

	Section	Page	Date	Revision
I.	Title and Signature Page	I-1	6/30/87	
II.	Table of Contents	II-1	6/30/87	
	II. A Introduction	II-2	6/30/87	
	II. B List of Tables	II-3	6/30/87	
	II. C List of Figures	II-4	6/30/87	
	II. D. Appendices	II-4	6/30/87	
III.	Statement of Policy	III-1	6/30/87	
IV.	Organizational Structure	IV-1	6/30/87	
V.	Quality Assurance/Objectives	V-1	6/30/87	
VI.	Sampling Procedure	VI-1	6/30/87	
VII.	Sample Custody	VII-1	6/30/87	
VIII.	Calibration Procedures and Frequency	VIII-1	6/30/87	
IX.	Analytical Procedures	IX-1	6/30/87	
X.	Data Reduction Validation and Reporting	X-1	6/30/87	
XI.	Internal Quality Assurance/ Quality Control Checks and Frequency	XI-1	6/30/87	
XII.	Performance and System Audits and Frequency	XII-1	6/30/87	
XIII.	Preventive Maintenance Procedures and Schedules	XIII-1	6/30/87	
XIV.	Routine Specific Procedures to be Used to Assess Data Precision, Accurancy, Completeness, Representativeness and Comparability of Specific Measurement Parameters Involved	XIV-1	6/30/87	
XV.	Corrective Actions	XV-1	6/30/87	
XVI.	Quality Assurance Reports to Management	XVI-1	6/30/87	
XVII.	Personnel Qualifications, Resumes	XVII-1	6/30/87	

A. INTRODUCTION

The Generic Quality Assurance (QA) Plan was written in compliance with the Florida Department of Environmental Regulation (FDER) with "Guidelines for Preparing Quality Assurance Plans" (DER-QA-001/85 January 30, 1986). This document contains the seventeen (17) required elements of a Quality Assurance Plan and is prepared in such a way that entire sections can be referenced in subsequent project plans.

B. LIST OF TABLES

Tables		Page
V-1	Quality Assurance Objectives	V-5
V-2	Precision Goals	V-19
VI-1	Sample Preservation and Recommended Holding Times	VI-4
IX-1	Analytical Methods	IX-1

C. LIST OF FIGURES

Figures		Page
IV-1	PACE Laboratories, Inc. Organizational Structure	IV-2
IV-2	Laboratory Organizational Structure	IV-3
VII-1	Chain of Custody	VII-5
VII-2	Samples and Analysis Data Entry Form	VII-6
XIV-1	Accuracy Data Chart	XIV-10
XIV-2	Precision Data Chart	XIV-11

D. APPENDICES

Appendix A Ground Water Monitoring Field Quality Assurance Manual

III. STATEMENT OF POLICY

PACE Laboratories, Inc. is committed to the policy of providing the highest quality product to its clients. The validity and reliability of the information generated is maximized by the adherence to documented quality control procedures and quality assurance protocols. PACE emphasizes the application of sound quality assurance/quality control principles beginning with the initial planning of the project, through all the field and laboratory activities and ultimately to the generation of the final report. The principles of data quality objectives, representativeness, completeness, comparability, precision and accuracy are applied.

PACE is committed to providing the resources, including facilities, equipment and personnel, to ensure the adherence to rigorous QA/QC protocols. Individual Quality Assurance Project Plans are developed for monitoring analytical projects to conform with the established QA/QC protocols.

IV. PROJECT ORGANIZATION AND RESPONSIBILITY

The organizational structures for PACE Laboratories, Inc. and the Laboratory Division of PACE (Tampa) are provided in Figures IV-1 and IV-2. Resumes which give qualifications, specific duties and experience summaries for each of the professionals in the organization are provided in Section XVII.

Figure IV-1

PACE Laboratories, Inc.

ORGANIZATIONAL STRUCTURE

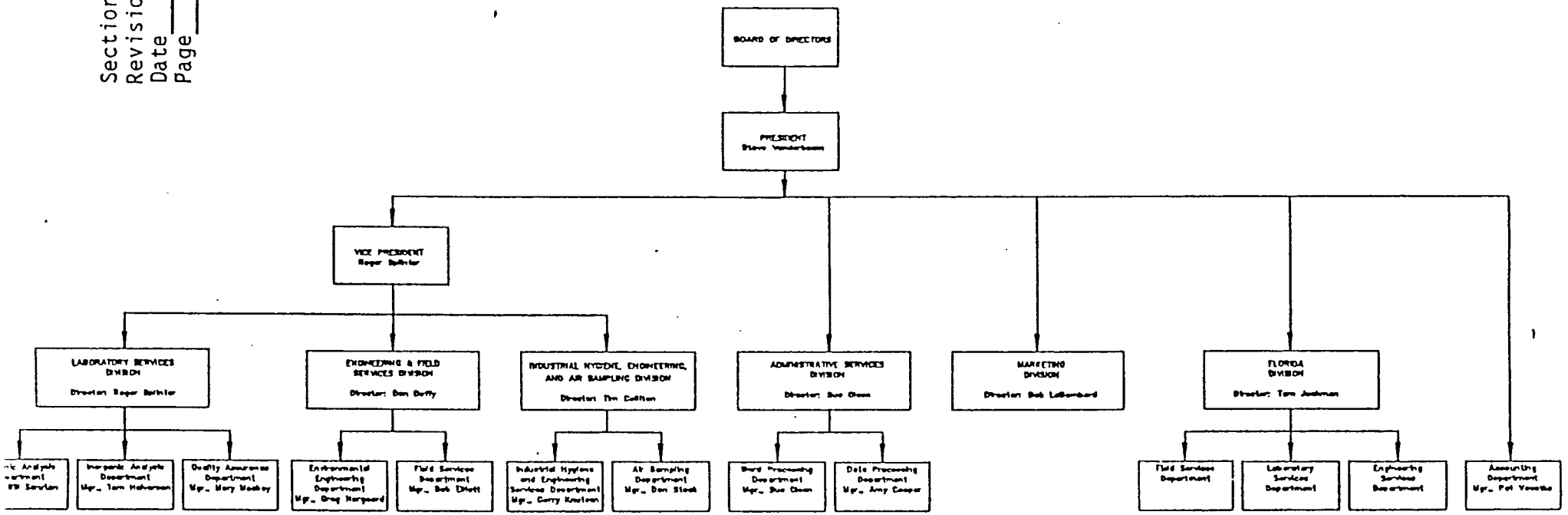


Figure IV-2

PACE LABORATORIES, INC.
FLORIDA DIVISION

Organizational Structure

Thomas A Jackman, Ph.D.
Director

Laboratory Services

Inorganic

Timothy M O'Dell	Supervisor
Kathy L. Harris	Chemist, Quality Assurance Officer
Michael F. Valder	Chemist
Michael C. Jackman	Technician
Ron Brock	Lab Aide

Organic

Michael W. Palmer	Chemist
R. Niles Bashaw	Chemist

Field Services

James E. Franklin	Environmental Technician
John T. Stimus	Environmental Technician

Engineering

Curt W. Lessl	Ch.E., E.I.T.

Administration

Sandra G. Bell	Secretary
Cheryl Kochansky	Receptionist/Typist

V. QUALITY ASSURANCE/OBJECTIVES

A. INTRODUCTION

The purpose of the Quality Assurance/Quality Control (QA/QC) program outlined here is to define procedures for the evaluation and documentation of sampling, analytical methodologies and the reduction validation and reporting of data. The objective is to provide a uniform basis for sampling, sample handling, instrument condition, methods control, performance evaluation and analytical data generation and reporting.

The Quality Assurance program is designed to monitor all phases of a project including: pre-survey planning, sample collection, preservation, transportation and storage, sample log-in and tracking, laboratory analysis, and data validation and reporting of results.

The scope of the program includes those audit procedures used to evaluate the application of the procedures defined within this QA/QC program.

B. SAMPLE COLLECTION

1. Duplicate Samples

One out of every 10 samples will be collected in duplicate and analyzed separately.

2. Travel Blanks

A travel blank will be prepared using organic free deionized

water each day of sample collection. The environmental technician will prepare the appropriate sample bottles which will travel to the job site and return without being opened. The travel blanks will be analyzed only if contaminants are found in the field blanks.

3. Field Blanks

Field blank samples will be collected at each monitoring well. Field blanks may be analyzed upon review of the raw data or at the request of the client.

4. Ground Water Sample Collection

Ground water sample collection will be performed as described in Section VI using standard operating procedures from the PACE "Groundwater Monitoring Field Quality Assurance Manual".

C. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

1. Objectives

The primary objective of the analytical QA/QC plan is to insure validity and reliability of analytical results. To this end, all samples collected during the project will be analyzed following EPA or other approved methods, and other QA/QC requirements detailed in this plan.

Specific objectives for the completeness of QA effort are accuracy, precision, representativeness, documentation, and comparability. These are summarized in Table V-1.

2. Completeness of QA Effort

Travel blanks, method blanks, and field blanks will be provided for each set of water samples collected. A method blank will also be run with each day's analysis. A minimum of 10 percent duplicate spiked samples will be analyzed or 1 per group of samples collected. Surrogates will be added to each sample for organic analysis to monitor adequate system performance. Prior to the monitoring program, PACE Laboratories, Inc. will validate their analytical methodology consistent with EPA Methods. Independently prepared external reference samples shall be analyzed quarterly at a minimum.

3. Accuracy Goals

For sample spikes, reagent water spikes, and performance check evaluations at concentrations of 10 ug/l or greater, recoveries should range from 80-120 percent at the 95 percent confidence level or +/- 2 standard deviations from the mean recovery. Reference sample results should be within +/- 20% of the true values.

4. Precision Goals

The relative percent difference (RPD) for all duplicate analysis will be calculated and reported. The RPD should range within the control limits specified for that analyses. These control limits are summarized in Table V-2.

5. Detection Limits Goals

Method detection limits are established in Section IX for

all analyses. The detection levels listed in Section IX will be utilized unless the sample matrix dictates otherwise. Laboratory method blanks should have concentrations below the method detection levels for the compounds of interest. Method detection limit for soil samples will be established appropriately based on the nature of the sample matrix.

6. Completeness Goals

The completeness goal will be greater than or equal to 90 percent.

7. Documentation

The documentation system includes the following elements: calibration procedures, analytical procedures, computational procedures, quality control procedure, bench data, operating procedures, lab notebook policy.

8. Comparability Goals

Comparability between data generated in the laboratory is matrix dependent. Every effort is made to compare sample results of similar matrices analyzed by equivalent methods.

9. Representativeness Goals

The samples collected will be representative of the environment that is being assessed.

TABLE V-1
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]		Accuracy (%R, Sd)[1]	
Acidity	Water	0	0	NA	
Alkalinity	Water	3	8	100	2
Bacteria					
Total Coliform	Water	NA		NA	
Fecal Coliform	Water	NA		NA	
Fecal Coliform	Water	NA		NA	
Total Plate	Water	NA		NA	
Biochemical Oxygen Demand	Water	NA		95	6
Boron	Water	9	6	96	12
Chemical Oxygen Demand, - High	Water	427	664	104	10
Chemical Oxygen Demand - Low	Water	0.8	0.6	101	12
Chloride	Water	0.6	0.6	100	5
Chlorine, Residual	Water	ID		ID	
Cyanide, Total	Water	0.1	0.2	88	11
Chromium, Hexavalent	Water	0.02	0.05	99	4
Cyanide, Chlorine Amenable	Water	ID		ID	
Fluoride, Total	Water	0.5	0.12	97	13
Fluoride, Dissolved	Water	ID		ID	
Hardness, Total	Water	7.8	8.8	NA	
Hardness, Calcium	Water	NA		NA	

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]		Accuracy (%R, Sd)[1]	
Nitrate Nitrogen	Water	3.6	4.4	96	8
Total Kjeldahl Nitrogen	Water	0.8	0.7	103	9
Nitrite Nitrogen	Water	ID		ID	
Organic Nitrogen	Water	ID		ID	
Oil & Grease Soxhlet	Water	NA		97	10
Oil & Grease Gravimetric	Water	NA		97	10
Dissolved Oxygen Electrode	Water	NA		NA	
pH	Water	0	0	100	0.4
Phenol	Water	0.004	0.004	91	10
Total Phosphorus	Water	0.7	1.1	101	8
Ortho Phosphorus	Water	ID		91	26
Silica, Reactive	Water	ID		NA	
Total Solids	Water	23	26	100	7
Total Volatile Solids	Water	ID		95	17
Total Suspended Solids	Water	66	77	100	8
Total Volatile Suspended Solids	Water	ID		ID	

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]		Accuracy (%R, Sd)[1]	
Total Dissolved Solids	Water	23	26	94	6
Specific Conductivity	Water	1.3	3.5	100	2
Sulfate	Water	28	34	102	8
Sulfide	Water	ID		ID	
Sulfite	Water	ID		ID	
Surfactants	Water	ID		ID	
Turbidity	Water	0.84	1.9	95	10
% Asn	HW or Oil	0.9	1.4	NA	
% Chlorine	HW or Oil	0.4	0.5	NA	
Density	HW or Oil	NA		NA	
Flash Point	HW or Oil	ID		ID	
Free Liquids	HW or Oil	NA		NA	
% Sulfur	HW or Oil	0.32	0.32	NA	
% Water	HW or Oil	ID		NA	
Cyanide, Total	HW or Oil	ID		75	0
Cyanide, Amenable	HW or Oil	ID		ID	
Cyanide, Reactive	HW or Oil	ID		ID	
Sulfide					
Total	HW or Oil	ID		ID	
Reactive	HW or Oil	ID		ID	
pH	HW or Oil	0	0	NA	

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]		Accuracy (%R, Sd)[1]	
Specific Conductivity	HW or Oil	1.3	3.5	100	2
Specific Gravity	HW or Oil	0.7	2.6	NA	
Formaldehyde	Water	NA		78	18

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$,	Sd)[1]	Accuracy (%R,	Sd)[1]
Aluminum-U	Water	ID		120	39
Aluminum-A	Water	ID		106	13
Aluminum-A	Soil	ID		103	10
Antimony-U	Water	ID		100	16
Antimony-A	Water	ID		101	16
Antimony-A	Soil	ID		96	0
Arsenic-U	Water	1	2	99	19
Arsenic-U	Soil	ID		NA	
Barium-U	Water	ID		106	16
Barium-A	Water	0.19	0.29	104	11
Barium-A	Soil	36	75	101	8
Beryllium-U	Water	ID		104	12
Beryllium-A	Water	ID		9	1
Beryllium-A	Soil	ID		92	1
Cadmium-U	Water	ID		99	8
Cadmium-A	Water	0.04	0.05	9	3
Cadmium-A	Soil	0.10	0.12	100	5
Calcium-A	Water	3.9	4.8	103	4
Chromium-U	Water	0.3	0.5	82	10
Chromium-A	Water	0.55	0.92	103	5
Chromium-A	Soil	0.7	0.7	94	8

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$,	Sd)[1]	Accuracy (%R,	Sd)[1]
Cobalt-U	Water	ID		108	9
Cobalt-A	Water	ID		96	9
Copper-U	Water	ID		90	8
Copper-A	Water	0.29	0.39	100	1
Copper-A	Soil	0.4	0.5	100	0
Iron-A	Water	0.29	0.76	99	3
Lead-U	Water	4.4	3.6	103	8
Lead-A	Water	2.8	2.0	102	7
Lead-A	Soil	9.8	12		
Magnesium-A	Water	2.3	2.5	100	2
Manganese-A	Water	0.03	0.04	99	3
Mercury	Water	0.3	0.9	95	12
Mercury	Soil	ID		ID	
Molybdenum-U	Water	ID		NA	
Molybdenum-A	Water	ID		98	14
Molybdenum-A	Soil	ID		ID	
Nickel-U	Water	1.6	2.6	99	5
Nickel-A	Water	0.2	0.7	99	5
Nickel-A	Soil	2.4	2.4	102	6
Potassium-A	Water	0.3	0.5	99	3
Potassium-A	Soil	ID		100	0

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$,	Sd)[1]	Accuracy (%R,	Sd)[1]
Selenium-U	Water	ID		86	16
Selenium-H	Water	0.8	0.8	102	22
Silver-U	Water	ID		90	21
Silver-A	Water	0.4	0.5	98	10
Silver-A	Soil	ID		ID	
Sodium	Water	6.5	8.5	101	3
Strontium	Water	0.03	0.04	91	10
Thallium-U	Water	ID		100	3
Thallium-A	Water	ID		100	0
Thallium-A	Soil	ID		92	0
Tin-U	Water	ID		130	0
Tin-A	Water	ID		107	8
Tin-A	Soil	ID		100	0
Titanium-A	Water	ID		108	13
Vanadium-U	Water	ID		78	0
Vanadium-A	Water	ID		105	17
Vanadium-A	Soil	ID		92	5
Zinc-U	Water	ID		100	18
Zinc-A	Water	0.7	1.1	100	1
Zinc-A	Soil	2.6	2.7	100	3

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$,	Sd)[1]	Accuracy (%R,	Sd)[1]
Chloromethane	Water	10	8.7	82	31
Bromomethane	Water	6.8	5.3	97	15
Vinyl Chloride	Water	6.9	5.4	93	20
Chloroethane	Water	7.6	7.7	94	17
Methylene Chloride	Water	5.1	5.6	96	13
1,1-Dichloroethylene	Water	7.6	1.1	94	15
1,1-Dichloroethane	Water	4.7	4.7	92	14
Chloroform	Water	6.7	5.5	96	15
Carbon Tetrachloride	Water	10	6.5	93	13
1,2-Dichloropropane	Water	7.2	6.0	93	10
1,1,2-Trichloro-ethylene	Water	11	7.5	91	11
Dibromochloromethane	Water	9.0	7.7	97	19
1,1,2-Trichloroethane	Water	9.0	7.7	97	19
Chloroethylvinyl Ether	Water	ID		94	20
1,1,2,2-Tetrachloro-ethylene	Water	12	8.6	88	12
Chlorobenzene	Water	8.3	4.5	86	14
1,3-Dichlorobenzene	Water	9.3	6.3	80	19
1,4-Dichlorobenzene	Water	11	6.9	83	21
Dichlorodifluoro methane	Water	11	11	106	26
Trichlorofluoromethane	Water	7.1	6.9	104	11

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$,	Sd)[1]	Accuracy (%R,	Sd)[1]
1,2-Dibromoethane	Water	ID		ID	
Methyl-t-butyl ether	Water	ID		ID	
Dichlorofluoromethane	Water	7.3	4.7	104	12
Trans-1,2-Dichloroethylene	Water	6.7	5.4	98	10
1,2-Dichloroethane	Water	4.1	4.1	100	12
1,1,1-Trichloroethane	Water	5.3	4.5	97	12
Bromodichloromethane	water	4.6	3.4	100	10
2,3-Dichloropropene	Water	3.9	3.3	99	12
Trans-1,3-Dichloropropene	Water	5.1	5.3	90	19
Cis-1,3-Dichloropropene	Water	5.6	4.5	100	13
1,2-Dibromomethane	Water	5.0	4.8	101	17
Bromoform	Water	6.9	6.3	96	14
1,1,2,2-Tetrachloroethane	Water	7.9	10	99	13
1,2-Dichlorobenzene	Water	9.0	8.3	92	13
Benzene	Water	8.0	10	99	15
Toluene	Water	11	9.6	95	9.9
Ethylbenzene	Water	8.2	8.3	98	11
m-Xylene	Water	7.7	9.0	9.0	13
o-Xylene	Water	7.8	9.4	9.1	15
Benzene	Water	ID		ID	
Bromodichloromethane	Water	ID		ID	
Bromoform	Water	ID		ID	

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]	Accuracy (%R, Sd)[1]
Bromomethane	Water	ID	ID
Carbon Tetrachloride	Water	ID	ID
Chlorobenzene	Water	ID	ID
Chloroethane	Water	ID	ID
2-Chloroethylvinyl Ether	Water	ID	ID
Chloroform	Water	ID	ID
Chloromethane	Water	ID	ID
Dibromochloromethane	Water	ID	ID
1,2-Dichlorobenzene	Water	ID	ID
1,3-Dichlorobenzene	Water	ID	ID
1,4-Dichlorobenzene	Water	ID	ID
1,1-Dichloroethane	Water	ID	ID
1,2-Dichloroethane	Water	ID	ID
1,1-Dichloroethene	Water	ID	ID
trans-1,2-Dichloroethene	Water	ID	ID
1,2-Dichloropropane	Water	ID	ID
cis-1,3-Dichloropropene	Water	ID	ID
trans-1,3-Dichloropropene	Water	ID	ID
Ethyl Benzene	Water	ID	ID
Methylene Chloride	Water	ID	ID
1,1,2,2-Tetrachloroethane	Water	ID	ID
Tetrachloroethene	Water	ID	ID

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]	Accuracy (%R, Sd)[1]
Toluene	Water	ID	ID
1,1,1-Trichloroethane	Water	ID	ID
1,1,2-Trichloroethane	Water	ID	ID
Trichloroethene	Water	ID	ID
Trichlorofluoromethane	Water	ID	ID
Vinyl Chloride	Water	ID	ID
Acenapthene	Water	ID	ID
Acenapthylene	Water	ID	ID
Aldrin	Water	ID	ID
Anthracene	Water	ID	ID
Benzo(a)anthracene	Water	ID	ID
Benzo(b)fluoranthene	Water	ID	ID
Benzo(k)fluoranthene	Water	ID	ID
Benzo(a)pyrene	Water	ID	ID
Benzo(g,h,i)perylene	Water	ID	ID
Benzyl butyl phthalate	Water	ID	ID
B-BHC	Water	ID	ID
B-BHC	Water	ID	ID
Bis(2-Chloroethyl)ether	Water	ID	ID
Bis(2-Chloroethoxy)methane	Water	ID	ID
Bis(2-Chloroisopropyl)ether	Water	ID	ID

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]	Accuracy (%R, Sd)[1]
Bis(2-ethylhexyl)phthalate	Water	ID	ID
4-Bromophenyl phenyl ether	Water	ID	ID
2-Chloronapthalene	Water	ID	ID
4-Chlorophenyl phenyl ether	Water	ID	ID
Chrysene	Water	ID	ID
4,4'-DDD	Water	ID	ID
4,4'-DDE	Water	ID	ID
4,4'-DDT	Water	ID	ID
Dibenzo(a,h)anthracene	Water	ID	ID
Di-n-butyl phthalate	Water	ID	ID
1,2-Dichlorobenzene	Water	ID	ID
1,3-Dichlorobenzene	Water	ID	ID
1,4-Dichlorobenzene	Water	ID	ID
3,3'-Dichlorobenzene	Water	ID	ID
Dieldrin	Water	ID	ID
Diethyl phthalate	Water	ID	ID
Dimethyl phthalate	Water	ID	ID
2,4-Dinitrotoluene	Water	ID	ID
2,6-Dinitrotoluene	Water	ID	ID
Di-n-octyl phthalate	Water	ID	ID
Endosulfan sulfate	Water	ID	ID
Endrin aldehyde	Water	ID	ID

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\bar{X}$, Sd)[1]	Accuracy (%R, Sd)[1]
Fluoranthene	Water	ID	ID
Fluorene	Water	ID	ID
Heptachlor	Water	ID	ID
Heptachlor epoxide	Water	ID	ID
Hexachlorobenzene	Water	ID	ID
Hexachloro butadiene	Water	ID	ID
Hexachloroethane	Water	ID	ID
Indeno(1,2,3-cd)pyrene	Water	ID	ID
Isophorone	Water	ID	ID
Naphthalene	Water	ID	ID
Nitrobenzene	Water	ID	ID
N-Nitrosodi-n-propylomine	Water	ID	ID
PCB-1260	Water	ID	ID
Phenanthrene	Water	ID	ID
Pyrene	Water	ID	ID
1,2,4-Trichlorobenzene	Water	ID	ID
4-Chloro-3-methylphenol	Water	ID	ID
2-Chlorophenol	Water	ID	ID
2,4-Dichlorophenol	Water	ID	ID
2,4-Dimethylphenol	Water	ID	ID
1-Methyl Napthalene	Water	ID	ID
2-Methyl Napthalene	Water	ID	ID

TABLE V-1 (Continued)
QUALITY ASSURANCE OBJECTIVES

Measurement Parameter	Experimental Matrix	Precision ($\overline{X}$, Sd)[1]	Accuracy (%R, Sd)[1]
2,4-Dinitrophenol	Water	ID	ID
2-methyl-4,6-dinitrophenol	Water	ID	ID
2-Nitrophenol	Water	ID	ID
4-Nitrophenol	Water	ID	ID
Pentachlorophenol	Water	ID	ID
Phenol	Water	ID	ID
2,4,6-Trichlorophenol	Water	ID	ID
PCB,			
Aracnlor-1016	Water	ID	ID
Arachlor-1221	Water	ID	ID
Arachlor-1232	Water	ID	ID
Arachlor-1242	Water	ID	ID
Arachlor-1248	Water	ID	ID
Arachlor-1254	Water	ID	ID
Arachlor-1260	Water	ID	ID

1) $\overline{X}$ = Average Range Between Duplicate Analysis
%R = Average Percent Recovery Of Spikes
Sd = Standard Deviation
NA = Not Applicable
ID = Insufficient Data
U = Furnace Atomic Absorption
A = Flame Direct Aspiration
H = Hydride

Accuracy and precision control limits have not been internally generated for all parameters and matrices. Control values (Table V-1) and EPA specified quality control objectives are used as guidelines when internally generated statistics are insufficient.

TABLE V-2
PRECISION GOALS*

Duplicate Analysis	Maximum Relative Percent Difference
Volatiles	30%
Semi-Volatiles	30%
Metals	20%

* These limits are for advisory purposes and are not meant to be used as a criteria for re-analysis of samples.

VI. SAMPLING PROCEDURES

A. SAMPLING PROCEDURES FOR GROUND WATER AND SURFACE WATER

Ground and surface water sampling techniques employed by PACE are in accordance with the EPA Region IV Standard Operating Procedures and Quality Assurance Manual, and FDER's Supplement "A" - Standard Operating Procedures and Quality Assurance Manual.

Trained field sampling crews will be sent to the site for sample collection and delivery of samples to the laboratory.

Samples from monitoring wells will be taken with a precleaned stainless steel bailer. Bailers are precleaned by washing first with detergent then rinsed with tap water and finally triple rinsed with deionized water.

Prior to sampling, the water level in the well is determined with an electronic water level meter and recorded on the field log data sheet, along with all the other pertinent information. (See Appendix A, page 74). The volume of water in the casing is calculated and three to five times that volume is purged from the well. In all cases the well is purged until the conductivity, temperature, and pH has stabilized.

All samples collected for metals analysis will be filtered with a disposable 0.45 micron filter immediately after collection and preserved with nitric acid.

The bailer to be used for sampling is used for purging two inch diameter wells and a gas driven centrifugal pump is used when larger volumes of water need to be removed, (static water level

less than 25 feet). Wells with static water levels greater than twenty-five feet and casing diameters greater than 3 inches are purged with a submersible pump.

See Appendix A for detailed sampling and prepumping standard operating procedures.

For surface water sampling, see Appendix A pg 48.

Table VI-1 lists the containers used for sampling, preservatives, holding times and conditions for ground and surface water samples. New bottles are used for sample collection. Detailed bottle preparation procedures are listed in Appendix A for the specific parameters of concern.

B. SAMPLING PROCEDURES FOR SOILS AND SEDIMENTS

Soil and sediments will be collected according to procedures in Test Methods for Evaluating Solid Waste EPA-SW-846.

There are numerous methods that can be used when taking soil samples, ranging from a power auger to a sample spade.

Soil sampling is used to determine the depth and range of contamination from spillage or the leaching effect of rain on material stored above ground. The depth and placement of the borings should be determined by the project manager and the client, using the suspected range of contamination as a guide. A background boring is usually collected to analyze the conditions of the soil.

Step 1. Meeting with project manager to discuss analysis to be

run and placement and depth of borings and also the various depths at which samples are to be collected.

Step 2. Prepare and clean auger and sample bottles. (For PCB samples all bottles must be hexane rinsed.)

Step 3. Contact client once on site to gain access to site area.

Step 4. Collect a surface sample in the first boring location, if desired. (Fill out a soil boring data sheet as you go along.)

Step 5. Begin boring. If a total composite is desired, place the soil in a large jar. If samples are desired at only certain depths the unwanted soil can be discarded in a pile next to the boring.

Step 6. Continue augering until the desired depth is reached. Then fill the sample bottles from the bottom of the auger.

Step 7. Usually the auger will have to be cleaned with D.I. water or hexane between samples.

Step 8. Repeat Step 6 until you have collected all the samples desired.

Step 9. Refill the hole with the soil augered out and place a stake in the hole to mark the location.

TABLE VI-1
SAMPLE PRESERVATION TECHNIQUES AND
RECOMMENDED HOLDING TIMES

Parameter	Vol. Req. (ml)	Container[a]	Preservative	Recommended Holding Time	EPA Proposed Holding Time
A. Non Metals					
Acidity	100	P, G	Cool, 4^oC	24 Hours	14 Days
Alkalinity	100	P, G	Cool, 4^oC	24 Hours	14 Days
Bacteria	250	Whirlpak,	Cool, 4^oC	6 Hours - polluted waters	6 Hours - polluted water
		Sterilized Glass	(2 ml 0.1 N Thiosulfate for chlorinated waters)	48 Hours - potable waters	48 Hours - potable waters
Biochemical Oxygen Demand	100	P, G	Cool, 4^oC	6 Hours	48 Hours
Boron	100	P	Cool, 4^oC	7 Days	-
Chemical Oxygen Demand	100	P, G	H_2SO_4 (pH <2)	7 Days	28 Days
Chloride	50	P, G	None Required	7 Days	28 Days
Chlorine Residual	500	P, G	Det. on Site	No Holding	2 Hours
Color	100	P, G	Cool, 4^oC	24 Hours	48 Hours
Cyanides	500	P, G	4^oC, NaOH (pH >11) 0.6 g. ascorbic acid	24 Hours	14 Days
Fluoride	300	P, G	Cool, 4^oC	7 Days	28 Days
Hardness	100	P, G	4^oC, HNO_3 (pH <2)	7 Days	6 Months

TABLE VI-1
SAMPLE PRESERVATION TECHNIQUES AND
RECOMMENDED HOLDING TIMES (Cont'd)

Parameter	Vol. Req. (ml)	Container[a]	Preservative	Recommended Holding Time	EPA Proposed Holding Time
Nitrogen,					
Ammonia	500	P, G	4^oC, H_2SO_4 (pH <2)	24 Hours	28 Days
Kjeldahl	500	P, G	4^oC, H_2SO_4 (ph <2)	7 Days	28 Days
Nitrate	50	P, G	Cool, 4^oC	24 Hours	48 Hours
Nitrite	50	P, G	Cool, 4^oC	48 Hours	48 Hours
Nitrate-nitrite	50	P, G	4^oC, H_2SO_4 (pH <2)		28 Days
Grease & Oil	1000	G	4^oC, H_2SO_4 (pH <2)	24 Hours	28 Days
Oxygen, Dissolved					
Probe	300	G	Det. on Site	No Holding	1 Hour
Winkler	300	G	Fix on Site	4-8 Hours	8 Hours
pH	25	P, G	Cool, 4^oC	6 Hours	2 Hours
Phenols	500	G only	Cool, 4^oC, H_2SO_4 (pH <2)	24 Hours	28 Days
Phosphorus,					
Total	100	P, G	4^oC, H_2SO_4 (pH <2)	7 Days	28 Days
Ortho	100	P, G	4^oC, H_2SO_4 (ph <2)	24 Hours	48 Hours
Silica	100	P only	Cool, 4^oC	7 Days	28 Days

TABLE VI-1
SAMPLE PRESERVATION TECHNIQUES AND
RECOMMENDED HOLDING TIMES (Cont'd)

Parameter	Vol. Req. (ml)	Container[a]	Preservative	Recommended Holding Time	EPA Proposed Holding Time
Solids,					
Total	100	P, G	Cool, 4°C	7 Days	7 Days
Suspended	100	P, G	Cool, 4°C	7 Days	7 Days
Volatile	100	P, G	Cool, 4°C	7 Days	7 Days
Dissolved	100	P, G	Cool, 4°C	7 Days	48 Hours
Settleable	100	P, G	None Required	24 Hours	48 Hours
Specific					
Conductance	100	P, G	Cool, 4°C	24 Hours	28 Days
Sulfate	100	P, G	Cool, 4°C	7 Days	28 Days
Sulfide	500	P, G	2 ml Zinc Acetate	24 Hours	7 Days
Sulfite	100	P, G	Det. on Site	No Holding	48 Hours
Surfactants	250	P, G	Cool, 4°C	24 Hours	48 Hours
Turbidity	100	P, G	Cool, 4°C	7 Days	48 Hours
B. Metals					
Total	100	P	HNO_3 (pH < 2)	6 Months	
Dissolved	200	P	Filter on Site HNO_3 (pH < 2)	6 Months	
C. Hazardous Waste & Oil Analysis					
% Ash	50 ml	P, G	None Required	-	-
% Chlorine (bomb)	1 g	P, G	None Required	-	-
Density	50 g	P, G	None Required	-	-

TABLE VI-1
SAMPLE PRESERVATION TECHNIQUES AND
RECOMMENDED HOLDING TIMES (Cont'd)

Parameter	Vol. Req. (ml)	Container[a]	Preservative	Recommended Holding Time	EPA Proposed Holding Time
Flash Point	25 ml	P, G	None Required	-	-
Heat of Combustion	1 g	P, G	None Required	-	-
% Sulfur (Bomb)	1 g	P, G	None Required	-	-
Viscosity	25	P, G	None Required	-	-
% Water					
D. Gas Chromatography					
Herbicide	500	G, Foil or Teflon Cap	Cool, 4°C	7 Days (Pre-extraction) 40 Days (Completion)	
Phenol	1000	G. Teflon Cap Teflon Cap	Cool, 4°C, H_2SO_4 pH < 2, Sodium Thiosulfate	7 Days (Pre-extraction) 40 Days (Completion)	
PCB, Water	1500	G, Foil or Teflon Cap	Cool, 4°C	7 Days (Pre-extraction) 40 Days (Completion)	
Soxhlet	50 g	G, Foil or Teflon Cap	Cool, 4°C	7 Days (Pre-extraction) 40 Days (Completion)	
Sludge	10 g	G, Foil or	Cool, 4°C	7 Days (Pre-extraction) 40 Days (Completion)	

TABLE VI-1
SAMPLE PRESERVATION TECHNIQUES AND
RECOMMENDED HOLDING TIMES (Cont'd)

Parameter	Vol. Req. (ml)	Container[a]	Preservative	Recommended Holding Time	EPA Proposed Holding Time
Oil	5 g	G, Foil or Teflon Cap	Cool, 4°C		
Purge & Trap					
Water	40	Vial, Teflon Septum	Cool, 4°C	14 Days	
Solid	5 g	Vial, Teflon Septum	Cool, 4°C	14 Days	
Solvent Characterization					
Liquid	1	G, M	None Required		-
Solid	2 g	G, M	None Required		-

a - P = Plastic
G = Glass

Reference - F.R., Vol. 49, No. 209, U.S. EPA, 1984.

VII. SAMPLE CUSTODY

A. CHAIN OF CUSTODY

Chain of Custody will be initiated in the field according to Appendix A pg 50.

B. CONTROL OF INCOMING SAMPLES

PACE has a designated sample custodian whose primary responsibility is to document receipt of samples, initiate the appropriate log-in procedures described below, assure proper documentation and prompt analyses of the samples. The sample custodian also maintains proper custody of samples and analytical data to verify the integrity of reports submitted to our clients.

When samples are received at the laboratory accompanied by a chain of custody form (Figure VII-1), the sample custodian will initiate the following steps:

1. Verify that each sample was in the packing container as recorded on the Chain of Custody record.
2. Document on the Chain of Custody form any breaking of seal of sample bottles which may have occurred during transport to the laboratory.
3. Sign and date the "received at laboratory by" box. The exact number of sample containers received by the laboratory is recorded for each sample.

4. Next, a sample and analysis data entry form is filled out (see Figure VII-2). This sheet contains all pertinent

information about the client, sample collection, sample matrix, analyses to be performed and number of bottles received.

All samples received by PACE are identified and labeled showing the name of the client, sample location or code, date received and the preservative added to the bottle. Samples are entered into the log book which contains the following:

1. A number assigned to each sample. Numbers begin with 1 on the first day of the year.
2. Identification of the client name.
3. Date the sample was received at the laboratory.
4. Number of bottles received for each sample.
5. Initials of person who checked in samples.

To complete the sample and analysis data entry procedure, all the information from the sample receiving form is entered into a computer noted as the Lab Data Management System (LDMS). A copy of what was checked into the LDMS is attached to the original check-in sheet and kept with any other information about the project. Before samples are stored, they are rechecked to make sure they are in the correct container and are properly preserved.

C. MAINTENANCE OF CUSTODY AND SAMPLE STORAGE

PACE has implemented standard operating procedures to assure the integrity of both samples and data so that they are not degraded or disclosed to unauthorized personnel. In order to insure that this policy is maintained, the laboratory facilities are under controlled access. Only employees of PACE Laboratories, Inc.

are allowed access to the laboratory facilities. Visitors must register at the front desk. Visitors are accompanied at all times when in the laboratory by an employee of PACE. The building is locked and secured at the end of each working day. Keys to the building are issued only to select personnel.

Samples are stored either in refridgerators at 4° C, at room temperature, or in a ventilated hazardous waste room. All sample storage areas have locks and are secured at the end of each working day by the sample custodian.

Samples are removed from their proper storage location by the analyst and are returned to the storage area immediately after the required sample volume has been taken. This minimizes unnecessary time spent searching for samples and helps prevent matrix degradation from prolonged exposure to room temperature.

Most samples are retained in storage in their original locations for approximately two months. Preserved metals samples and hazardous waste type samples are stored for up to six months. After the final report is sent and clients are allowed adequate time to review the results, the samples are properly discarded or returned to the client.

PACE normally will complete the sample analysis within ten working days after receipt, except for those parameters whose holding time requires otherwise. Those parameters with holding times less than 24 hours are given top priority for immediate analysis.

Additional and more rigorous chain of custody protocols for samples and data can be implemented by client request. For

samples involving a high degree of confidentiality or potential litigation, PACE Laboratories, Inc. has developed more extensive sample and data handling protocols to assure the scientific and legal defensibility of the report submitted.

ice
laboratories, inc.

Douglas ... polis, MN 55422 612 544 5543

CHAIN-OF-CUSTODY RECORD

NO. 6491

Section No. VII
Revision No. 0
Date 06/30/87
Page 5 OF 6

PROJ	NAME OF CLIENT	PROJECT TELEPHONE NO.	PROJECT NUMBER

SAMPLE NO	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK 1	2	3	4	5	6	7

FIGURE VII-1

PERSON RESPONSIBLE FOR SAMPLE COLLECTION	AFFILIATION

DATE	TIME

PURPOSE OF ANALYSIS (use back of front sheet if needed)

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1					
2					
3					
4					
5					
6					
7					

ORIGINAL

pace laboratories, inc.

Client Name: _____ Contact: _____ Phone #: _____

Address: _____ Project Name: _____

SAMI LYSIS
D/ ORM

Section No. VII
Revision No. 0
Date 06/30/87
Page 6 of 6

Client # : _____ Project # : _____ Collected By: _____ Date: _____

Lab Rec'd Date: _____ By: _____ Check-In By: _____ Due Date: _____ Priority: _____

Special Instructions: _____ PACE Contact: _____

SAMPLE #	SAMPLE DESCRIPTION (30 Characters)	MATRIX	BOTTLE TYPES (30 Characters)	COMMENTS
	ANALYSIS:			
	ANALYSIS:			
	ANALYSIS:			
	ANALYSIS:			
	ANALYSIS:			
	ANALYSIS:			
	ANALYSIS:			

FIGURE VII-2

BOTTLE TYPES:

Cyanide	CN	Oil & Grease	OG	Whirpak	WK	III Filter Cassette	IIF
General	GN	Phenol	PH	GC VOA	GV	III Impinger	II
Metals Not Filtered	MD	Radiological	RA	GC O-Amber	GL	III Sorbent Tube	IIT
Metals Filtered	MU	Sulfide	SU	GC Misc. Rehlg	GM	III Diffusion Mon	IIM
[illegible]	MF	[illegible]	[illegible]	GC Unrehlg	GG	III Bulk Sample	IIB

Proun Wash [illegible] Wel [illegible] WC [illegible]

VIII. CALIBRATION PROCEDURES AND FREQUENCY

A. LABORATORY OBJECTIVES

Standardized calibration of the equipment used is necessary to obtain valid data. Standard procedures for the preparation of standard solutions is also necessary to generate valid data. Detailed procedures for calibrations are provided as follows for each piece of lab equipment or can be found in the corresponding analytical methods manual.

1. Metals Analysis Calibration Procedures

a. Stock Solution Preparation

1. Reagents and standard solutions for EPA Atomic Absorption (AA) methods are purchased from American Scientific Products.

2. Stock reagents and working standards are prepared and stored according to EPA methods.

3. All standards prepared for use throughout the laboratory are entered in the Standard Notebook with all information regarding source of the standard, the preparation of that standard, i.e., date, analyst, name of each compound and amount used and final volume. All standard and stock reagent containers are labeled with the standard's or reagent name, date and analysts' initials.

for every analyte by the analysis of EPA Quality Control Solutions. When measurements for the certified components exceed the specified control limits, the analysis must be terminated, the problem corrected, the instrument recalibrated and the calibration reverified.

3. The values for the initial and subsequent continuing calibration verifications shall be recorded for AA and cyanide analyses, as indicated.

4. The instrument detection limits are documented within 30 days of the start of the analyses and at least quarterly (every 3 months), and must meet the levels specified. The instrument detection limits (IDL) are 3 times the standard deviation obtained for the analysis of a standard solution (each analyte in reagent water) at a concentration 3-5 times the IDL on three (3) nonconsecutive days with 7 consecutive measurements per day. These instrument detection limits will be lower than or equal to the required detection limit.

5. A calibration blank is analyzed each time the instrument is calibrated, at the end of the run, and at a frequency of 10% during the run. The results for the calibration blank solution shall be recorded for AA analysis, as indicated. Blanks are to be reported as "less than (numeric value)" when the concentration is less than the required detection limit, not as "N.D." or " D.L.". If this blank result is greater than the (RDL), terminate analysis, correct the

4. For Atomic Absorption and cyanide systems, calibration standards are prepared by diluting the stock solution at the time of analysis. Low calibation standards are prepared fresh each time an analysis is to be made and discarded after use. A blank and at least three calibration standards in graduated amounts in the appropriate range is prepared. The calibration standards are prepared using the same type of acid or combination of acids and at the same concentration as will result in the samples following sample preparation.

b. Calibration of Atomic Absorption

1. The Atomic Absorption system is set up according to EPA and manufacturer's instruction. Beginnning with the blank and working towards the highest concentration each standard is aspirated and the absorbance readings are recorded. Readings for the highest standard are compared with previous data and the suggested manufacturers guidelines for optimum instrument performance. The system is calibrated daily or each time an analysis is performed. The instrument response obtained for each compound in a newly prepared standard is compared to the response obtained from the previous standard which was verified by EPA QA Standard. The two standards must agree within 15% or the new standard may not be used until the discrepancy has been resolved.

2. After the AA system has been calibrated, the accuracy of the initial calibration is verfied and documented

problem and recalibrate.

6. Continuing Calibration Verification

To assure calibration accuracy during each analysis run, one of the standards is analyzed for each analyte at a frequency of 10% during an analysis run, and after the last analytical sample. The analyte concentrations in the continuing calibration standard must be at or near the mid-range levels of the calibraton curve.

The same continuing calibration standard is used throughout the analysis runs for a case of samples received.

If the deviation of the continuing calibration verification is greater than the Control Limit specified, the instrument is recalibrated and the preceding 10 samples reanalyzed for the analytes affected. Information regarding the continuing verification of calibration for AA is recorded.

B. FIELD INSTRUMENTATION

Calibration procedures and frequency of calibration for field equipment is an integral component of each instrument's Standard Operating Procedure (SOP) detailed in PACE Laboratories, Inc. Field Manual (See Appendix A). The instruments used will be routinely calibrated in conformance with manufacturer's specification, at a minimum. The Log Sheet for each piece of equipment will contain the following items where appropriate:

1. Date of calibration,

2. All data pertaining to the calibration and/or maintenance procedure (not contained in specific equipment worksheets),

3. Next due date of calibration and/or maintenance,

4. Initials of person performing the calibration and/or maintenance,

5. Adjustments made and the accuracy of the equipment prior to and following calibration (where applicable),

6. A record of equipment failure or inability to meet specifications (where applicable).

Tables VIII-1 and VIII-2 provide calibration procedures for the field pH meter and conductivity meter.

TABLE VIII-1
STANDARD PROCEDURE FOR CALIBRATION OF pH METERS

STEP 1: Choose appropriate pH buffers depending upon expected pH of the sample (Acidic use four and seven, Basic use seven and ten).

STEP 2: Turn selector dial to zero and the meter to warm up for the ten minutes.

STEP 3: Adjust temperature dial to the temperature of the buffers.

STEP 4: Rinse the probe with D.I. water and place it in the seven buffer. Turn the selector dial to the pH position.

STEP 5: While gently stirring the buffer with the probe turn the calibration knob until the meter is reading seven.

STEP 6: Turn the selector dial back to zero. Rinse the probe with D.I. water and place it in either the four or ten buffer.

STEP 7: Turn the selector dial to pH. The meter should read four or ten depending upon the buffer being used. If it does not, split the difference by turning the calibration knob.

STEP 8: Turn the selector dial to zero, rinse the probe with D.I water and place it in the seven buffer.

STEP 9: Turn the selector dial to pH. If the meter reads seven it is now ready to be used. The probe should be rinsed and the temperature dial adjusted between samples.

STEP 10: Turn the selector dial to zero and record what the meter reads. As long as the zero remains the same it is not necessary to recalibrate until the next day.

IX. ANALYTICAL PROCEDURES

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	ASTM
A. Non-Metals					
Acidity	Potentiometric Titration	1 mg/l	402		D1067-70
Alkalinity	Potentiometric Titration	1 mg/l	403	310.1	D1067
	Automated Methyl Orange	10 mg/l		310.2	
Bacteria,					
Total Coliform	Membrane Filter	-	909C		
Fecal Coliform	Membrane Filter	-	980C		
Fecal Strept.	Membrane Filter	-	910A		
Total Plate	Agar Medium	-	907		
Biochemical Oxygen Demand, 5-day	Winkler	1 mg/l	507	405.1	
	Electrode	6 mg/l	507		
Boron	Curcumin 405-A	0.2 mg/l	404A	212.3	
Chemical Oxygen Demand	Dichromate Reflux High	50 mg/l	508A	410.1	D1252-78
	Dichromate Reflux Low	5 mg/l	508A		
Chloride	Mercuric Nitrate	1 mg/l	407B	325.3	D512-67
	Automated Ferricyanide	1 mg/l		325.2	
Chlorine, Residual	Amperometric Titration	0.01 mg/l	408C	330.1	D1253-76
Color	Visual Comparison	1 Unit	204A		
Cyanide, Total	Pyridine-Barbitutic Acid, Colorimetric	0.01 mg/l	412D	335.2	D2036-75
Amendable	Chlorination-colorimetric	0.02 mg/l	412F	335.1	D2036-75
Flouride, Total	Distillation-Electrode	0.1 mg/l	413A		D1179-72
Fluoride, Diss.	Electrode	0.1 mg/l	413B	340.2	

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	ASTM
Hardness, Total	EDTA Titration	1 mg/l as $CaCO_3$	314B	130.2	D1126-67
Hardness, Calcium	EDTA Titration	1 mg/l as $CaCO_3$		242.1	
Nitrogen,					
Ammonia	Distillation-Titration	0.1 mg/l as N	417D	350.2	
Kjeldahl	Digestion-Distillation-	0.1 mg/l as N	420B	351.3	D3590-77
Nitrate	Automated Cadmium	0.1 mg/l as N	418F	353.2	D3967-79
Nitrite	Automated Cadmium	0.1 mg/l as N	418F	353.2	D3867-79
Organic	Kjeldahl-NH_3	0.1 mg/l as N	420A	-	
Oil & Grease	Soxhlet	1 mg/l	503C		
	Partition-Gravimetric	1 mg/l	503A	413.1	
Oxygen, Dissolved	Winkler	0.1 mg/l	421B	360.2	D1589-60
	Electrode	0.1 mg/l	421F	360.1	
pH	Electrode	0.1 Unit	423	150.1	D1293-78
Phenol	Distillation-Extraction Colorimetric	0.005 mg/l	420.1		D1783-70
Phosphorus, Total	Persulfate Digestion- Ascorbic Acid Reduction	0.02 mg/l as P	424F	365.2	D515-78
Ortho	Ascorbic Acid Reduction	0.02 mg/l as P	424F		
Silica, Reactive	Molybdosilicate	0.02 mg/l	425C	370.1	D859-65
Solids,					
Total	Gravimetric	1 mg/l	209A	160.3	
Total Volatile	Gravimetric	1 mg/l	209E	160.4	
Suspended	Gravimetric	1 mg/l	209D	160.2	
Suspended Volatile	Gravimetric	1 mg/l	209A		
Total Dissolved	Gravimetric	1 mg/l	209B	160.1	
Settleable	Gravimetric	1 mg/l	209F	160.5	
Specific Conductance	Meter	1 umho	205	120.1	D1125-77

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	ASTM
Sulfate	Turbimetric	1 mg/l	426C	375.4	D516-68
	Automated Methyl Thymol Blue	3mg/l	-	375.2	
Sulfide	Colorimetric	0.1 mg/l as S	427C	376.2	
	Titration	0.2 mg/l as S	427D	376.1	
Sulfite	Titration	0.2 mg/l as S	428F	377.1	D1339-78
Surfactants (MBAS)	Methylene Blue	0.05 mg/l	512A	425.1	D2330-68
Turbidity	Meter	0.1 NTU	214A	180.1	D1889-71

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	SW 846
B. Metals					
Aluminum	AA-Direct Aspiration	0.4 mg/l	303C	202.1	
	AA-Furnace	7 ug/l	304	202.2	
Antimony	AA-Direct Aspiration	0.8 mg/l	303A	204.1	7040
	AA-Furnace	3 ug/l	304	204.2	7041
Arsenic	AA-Gaseous Hydride	1 ug/l	303E	206.3	7061
	AA-Furnace	4 ug/l	304	206.2	7060
Barium	AA-Direct Aspiration	0.2 mg/l	303C	208.1	7080
	AA-Furnace	3 ug/l	304	208.2	7081
Beryllium	AA-Direct Aspiration	0.02 mg/l	303C	210.1	7090
	AA-Furnace	0.2 ug/l	304	210.2	7091
Cadmium	AA-Direct Aspiration	0.01 mg/l	303A	213.1	7130
	AA-Furnace	0.1 ug/l	304	213.2	7131
Calcium	AA-Direct Aspiration	0.4 mg/l	303A	215.1	
	EDTA Titration	1 mg/l	311C	215.2	

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	SW 846
Chromium, Total	AA-Direct Aspiration	0.05 mg/l	303A	218.1	7190
	AA-Furnace	1 ug/l	304	218.2	7191
Hexavalent	Colorimetric	0.02 mg/l	312B		7196
Cobalt	AA-Direct Aspiration	0.05 mg/l	303A	219.1	
	AA-Furnace	1 ug/l	304	219.2	
Copper	AA-Direct Aspiration	0.05 mg/l	303A	220.1	721.0
	AA-Furnace	4 ug/l	304	220.2	721.1
Iron	AA-Direct Aspiration	0.05 mg/l	303B	236.1	
	AA-Furnace	1 ug/l	304	236.2	
Lead	AA-Direct Aspiration	0.1 mg/l	303A	239.1	7420
	AA-Furnace	1 ug/l	304	239.2	7421
Lithium	AA-Direct Aspiration	0.02 mg/l	317B		
Magnesium	AA-Direct Aspiration	0.4 mg/l	303A	242.1	
Manganese	AA-Direct Aspiration	0.03 mg/l	303A	243.1	
	AA-Furnace	1 ug/l	304	243.2	
Mercury	AA-Cold Vapor	0.2 ug/l	303F	245.1	7470 or
				7471	
Molybdenum	AA-Direct Aspiration	0.3 mg/l	303C	246.1	
	AA-Furnace	5 ug/l	304	246.2	
Nickel	AA-Direct Aspiration	0.05 mg/l	303A	249.1	7520
	AA-Furnace	2 ug/l	304	249.2	7521
Potassium	AA-Direct Aspiration	0.01 mg/l	303A	258.1	
Selenium	AA-Gaseous Hydride	1 ug/l	303E	270.3	7740
	AA-Furnace	5 ug/l	304	270.2	7741
Silver	AA-Direct Aspiration	0.04 mg/l	303A	272.1	7760
	AA-Furnace	0.2 ug/l	304	272.2	7761

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	SW 846
Chromium, Total	AA-Direct Aspiration	0.05 mg/l	303A	218.1	7190
	AA-Furnace	1 ug/l	304	218.2	7191
Hexavalent	Colorimetric	0.02 mg/l	312B		7196
Cobalt	AA-Direct Aspiration	0.05 mg/l	303A	219.1	
	AA-Furnace	1 ug/l	304	219.2	
Copper	AA-Direct Aspiration	0.05 mg/l	303A	220.1	721.0
	AA-Furnace	4 ug/l	304	220.2	721.1
Iron	AA-Direct Aspiration	0.05 mg/l	303B	236.1	
	AA-Furnace	1 ug/l	304	236.2	
Lead	AA-Direct Aspiration	0.1 mg/l	303A	239.1	7420
	AA-Furnace	1 ug/l	304	239.2	7421
Lithium	AA-Direct Aspiration	0.02 mg/l	317B		
Magnesium	AA-Direct Aspiration	0.4 mg/l	303A	242.1	
Manganese	AA-Direct Aspiration	0.03 mg/l	303A	243.1	
	AA-Furnace	1 ug/l	304	243.2	
Mercury	AA-Cold Vapor	0.2 ug/l	303F	245.1 7471	7470 or
Molybdenum	AA-Direct Aspiration	0.3 mg/l	303C	246.1	
	AA-Furnace	5 ug/l	304	246.2	
Nickel	AA-Direct Aspiration	0.05 mg/l	303A	249.1	7520
	AA-Furnace	2 ug/l	304	249.2	7521
Potassium	AA-Direct Aspiration	0.01 mg/l	303A	258.1	
Selenium	AA-Gaseous Hydride	1 ug/l	303E	270.3	7740
	AA-Furnace	5 ug/l	304	270.2	7741
Silver	AA-Direct Aspiration	0.04 mg/l	303A	272.1	7760
	AA-Furnace	0.2 ug/l	304	272.2	7761

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	SW 846
Sodium	AA-Direct Aspiration	0.1 mg/l	303A	273.1	
Strontium	AA-Direct Aspiration	0.05 mg/l	303A		
Thallium	AA-Direct Aspiration	0.4 mg/l	303A	279.1	7840
	AA-Furnace	3 ug/l	304	279.2	7841
Tin	AA-Direct Aspiration	2 mg/l	303A	282.1	
	AA-Furnace	5 ug/l	304	282	
Titanium	AA-Direct Aspiration	1.0 mg/l	303C	283.1	
	AA-Furnace	1 ug/l	304	283.2	
Vanadium	AA-Direct Aspiration	1 mg/l	303C	286.1	7910
	AA-Furnace	5 ug/l	304	286.2	7911
Zinc	AA-Direct Aspiration	0.1 mg/l	303A	289.1	7950
	AA-Furnace	1 ug/l	304	289.2	7951
C. Hazardous Wastes & Oil Analyses					
% Ash	Gravimetric	0.01%	209E		
% Chlorine	Bomb Calorimeter	0.01%		8808-63	
Density	Gravimetric	0.01	213E		
Flash Point Closed Cup	Pensky-Martin	1°F		D93-73	1010
Free Liquids	Paint Filter	1 ml			9095
Heat of Combustion	Bomb Calorimeter	100 BTU		D240-64	
Leach Test, EP Toxicity	Extraction	-			1310
ASTM Water	Extraction			D3987	

TABLE IX-1
ANALYTICAL METHODS

Parameter	Method	Minimum Detection Limit	Standard Methods 15th Ed.	EPA Methods 1979	SW 846
% Sulfur	Bomb Calorimeter	0.01%		D129-64	
Viscosity	Saybolt	0.1 S	-	D88-56	
% Water	Distillation	0.1%		D95-74	
Cyanide, Total	Pyridine-Barbitutic Acid Colorimetric				9010
Amenable	Chlorination-Colorimetric				9010
Reactive	Pyridine-Barbitutic Acid Colorimetric				261.23
Sulfide, Total	Titration				9030
Reactive	Titration				261.23
pH	Electrode				9040
Specific Conductance	Meter				9050
Specific Gravity	Mass Displacement		213E		

Parameter	Method	EPA 600-4-82-067 July 1982	MDH*	SW 846
D. Organic Analytical Method				
Purgeable Halocarbons (includes trihalomethanes)	Gas Chromatography	601		8010 8020
Purgeable Aromatics	Gas Chromatography	602		8020
Acrolein & Acrylonitrile	Gas Chromatography	603		8030
Phenols	Gas Chromatography	604		8040
Phthalate Esters	Gas Chromatography	606		8060

TABLE III
ANALYTICAL METHODS

Parameter	Method	EPA 600-4-82-067 July 1982	MDH*	SW 846
Pesticides & PCB's	Gas Chromatography	608		8080
Nitroaromatics & Isophorone	Gas Chromatography	609		8090
Polynuclear Aromatic Hydrocarbons	Gas Chromatography	610		8100
Haloethers	Gas Chromatography	611		
Purgeables	Gas Chromatography Mass Spectrophotometer	624		8240
Base/Neutral Acids	Gas Chromatography Mass Spectrophotometer	625		8250 8270
Purgeables (includes 601, 602)	Gas Chromatography		465B	8015
1,2-Dibromoethane	Gas Chromatography	601**		

* Minnesota Health Department Method 504.1
** ECD detector used in place of Hall detector

==========

The following parameters are analyzed at PACE Laboratories, Inc in Minneapolis, Minnesota and are not currently analyzed in the Tampa:

Parameter	Method	
Purgeables	EPA 624	Gas Chromatograph-Mass Spectrometer
Base/Neutral	EPA 625	Gas Chromatograph-Mass Spectrometer

X. DATA REDUCTION VALIDATION AND REPORTING

Upon receiving samples for a project, all background information pertaining to that project is entered via the LDMS as described in Control of Incoming Samples (Section VII).

All information is then gathered and organized by the LDMS and is displayed in a series of reports. These reports show the progress of the analytical workload which is reviewed and assessed by the appropriate laboratory manager. These reports are reviewed before the beginning of each week and a work schedule are made for performing the analytical tasks needed to complete each project. Each technician then uses this schedule and a daily updated report to perform analyses in guiding them in completing each analytical task. The data are then appropriately recorded on parameter specific raw data sheets, which are signed and dated by the technician. These raw data sheets are reviewed and approved by signature of the laboratory manager. The data are then entered into the computer by the LDMS operator and when the last piece of data is entered for a particular project a draft report is formulated for that project. The raw data sheets go to the Quality Assurance Department (QAD) to be reviewed for calculation errors, precision and accuracy. QC data are recorded and plotted on QC charts, any data point, which exceeds the calculated control limit is investigated and corrective action taken when necessary. If there are any changes in the data, the QAD will notify the laboratory manager and the LDMS operator before the final report is generated. All changes in original data are crossed out with a straight line and the corrected number is written in, initialed by the technician, and dated. These raw data are then filed and stored in the QAD where the access is restricted to authorized personnel only. When the laboratory manager is satisfied that the draft report results are valid and correct, a final report

is produced, which is reviewed and signed by the Laboratory Manager and the Director of Laboratory Services. The project is invoiced and mailed to the client. A copy of the report is retained for PACE's files.

When needed, additional footnotes are attached describing problems, interferences, analytical procedures, quality control or other information necessary for accurate data interpretation by the client.

XI. INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

A. INTERNAL QUALITY ASSURANCE CHECKS

Internal quality assurance procedures are designed to assure the consistency and continuity of data. If required, external quality assurance procedures (interlaboratory checks) are carried out to assess the accuracy of the data generated. Internal quality assurance procedures include:

1. Instrument performance checks;

2. Instrument calibration;

3. Documentation on the traceability of instrument standards, samples, and data;

4. Documentation on analytical methodology and QC methodology (QC methodology includes spiked samples, duplicate samples, and split sample use of reference blanks and check standards for method accuracy and precision); and

5. Documentation on sample preservation and transport.

B. TYPES OF QUALITY CONTROL CHECKS INCLUDE BUT ARE NOT LIMITED TO:

1. <u>Method Blank Analysis</u>

   A method blank is a volume of deionized-distilled laboratory water carried through the entire analytical scheme. The method blank volume must be approximately equal to the sample volumes being processed.

2. Surrogate Spike Analysis

Surrogate spikes are routinely added to samples, standards, and blanks to monitor the performance of analytical methods and equipment. The surrogate spiking compounds should behave in a similar fashion to analytical compounds, but should not be found naturally occurring in samples.

3. Duplicate Analysis

At selected stations on a random time frame, duplicate samples are collected from two sets of field equipment installed at the site, or duplicate grab samples are collected, or samples are randomly split in the laboratory and analyzed separately. This provides a check of sampling, techniques, and analytical methods for precision.

4. Matrix Spike/Matrix Spike Duplicate Analysis

Known amounts of a particular constituent are added to an actual sample at concentrations at which the accuracy of the test method is satisfactory. The amount added is coordinated with the laboratory. This method provides a proficiency check for the accuracy of the analytical procedures.

The spiked samples can also be run in duplicate as indicated in an analytical procedure (ie., Volatile Organic Analysis U.S. EPA Method 601). This provides a check of analytical procedures for precision.

5. Control Charts

Control Charts are used to monitor variations in the precision and accuracy of routine analysis and detect trends in these variations. QC control charts are

constructed from data representing performance of the complete analytical method. The construction of a control chart requires initial data to establish the mean and range of measurements. Control charts are used to monitor both accuracy and precision.

C. FREQUENCY OF QUALITY CONTROL CHECKS

With each lot of samples analyzed at a particular time, at least one matrix spike, and one matrix spike duplicate sample are run. The total number of laboratory matrix spike duplicates and matrix spikes analyzed over the course of a project are at least 10% of the total number of samples. Surrogate spike compounds are added to each analysis run where called for in the respective method.

At least one method blank is analyzed with each batch of analyses. Internal standards, as recommended in the pertinent methods, are added to several samples as a check on accuracy of the external standard.

XIII. PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

A. INSTRUMENTATION MAINTENANCE

PACE is dependent on sophisticated instrumentation. The end result of any test performed on an instrument depends on the inherent accuracy and proper operation, use and function of the instrument itself.

It is essential that the instruments in the laboratory operate under optimum conditions at all times. Local service personnel are available on an on-call basis. Formalized preventive maintenance contracts have been executed with outside vendors. Much of the preventive maintenance is done on a day-to-day basis, in-house. The laboratory staff at PACE is familiar with the manufacturer's operating manual on each instrument and routinely performs various service checks.

Each instrument, prior to use, is calibrated according to the manufacturer's instructions. Next to the instrument, for the analyst's use, is a set of operating instructions. Daily checks of the instrument performance are made by the analyst assigned responsibility for that instrument.

B. EQUIPMENT LOG RECORD

An inventory control system including all equipment and instrumentation is maintained by the equipment manager as the basis for maintenance and calibration control. The inventory control documentation includes for each item:

1. Description of item.

2. Manufacturer, model number, and serial number.

3. Name, address, and telephone number of company which services item.

4. Type of service policy.

5. Timing and frequency of routine maintenance, servicing, and calibration.

C. ROUTINE MAINTENANCE AND TROUBLESHOOTING

Preventive maintenance that is routinely performed does not correct for all problems associated with the VOA analyses. Samples with very high concentrations and equipment malfuctions can cause a variety of problems that are difficult to diagnose. It may be necessary to disconnect portions of the analytical system to identify the problem. (For example the purge and trap system can be eliminated by directly injecting onto the column.) A troubleshooting guide for an individual method is only a guideline; each problem may require a combination of corrective actions before acceptable data may be generated.

XIV. SPECIFIC ROUTINE PROCEDURES TO BE USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS OF SPECIFIC MEASUREMENT PARAMETERS INVOLVED

A. OVERVIEW

The Quality Assurance Program provides a measure of the credibility of the data produced in the laboratory on a day to day basis. The program is designed to ensure that the laboratory continues to generate valid results through current quality control assessment procedures as well as preventive and corrective measures.

The following sections describe in detail the Quality Control measures used at PACE Laboratories, Inc. These practices are critical in assuring the consistent production of reliable data. However, the experience, knowledge, professional pride and motivation of the analyst are human qualities which are difficult to measure. Yet these subjective factors are crucial in assuring optimum performance. Therefore, the Quality Assurance Program at PACE is intended to help each analyst evaluate his performance in a valuable manner. The program is not a critic of poor results, but a constructive tool for the assurance of the high level of performance maintained by PACE Laboratories, Inc.

This section documents the system used at PACE to verify - on a daily basis - that procedures pertaining to laboratory methods, glassware, solvents, reagents and gases are in control.

The reliability and credibility of analytical laboratory results can be established by the inclusion of a program of randomly-

scheduled replicate analyses, analysis of standard or spiked samples, and the cooperative analysis of split samples by several laboratories. These external quality control checks should be an integral part of any sampling and analytical plan.

Regularly scheduled analysis of known duplicates, standards, and spiked samples are a routine aspect of data reduction validation and reporting procedures (see Section X). The specific procedures used to calculate these values follow.

B. QUALITY CONTROL PROCEDURES FOR ANALYTICAL PERFORMANCE

The system used at PACE involves the use of precision and accuracy data to determine the acceptability of analytical results. Precision refers to the reproductibility of the results and accuracy measures the degree of difference between observed and true values. Approximately, one of every ten analyses performed at PACE is run in duplicate (precision). Also, every tenth to fifteenth sample is spiked with a synthetic standard to check the accuracy of the method. Once 15 to 18 sets of precision or accuracy data have been obtained, a quality control chart is prepared. The Shewart technique[4] is the statistical method used to construct the charts. These quality control charts provide a quick, visual means for monitoring the daily performance of the laboratory. Figures XIV-1 and XIV-2 contain examples of accuracy and precision charts along with their corresponding data sheets.

1. Precision

The precision, or ability to reproduce results, of each method is monitored by the construction of statistically

meaningful charts. Samples representing the entire range of concentrations and interferences are analyzed in duplicate. Since the range between duplicates varies with concentration, all precision data is separated into concentration ranges. Two factors are considered when assigning ranges to a particular parameter. First, each concentration range must contain a "significant" number of data pairs to allow calculation of statistically sound precision values. Therefore, considering the relatively small number of samples analyzed, the fewest number of concentration ranges is desired. Yet, as the second consideration, the ranges must be small enough so that variation in true concentration values does not negatively affect the average range and standard deviation. In most cases, concentrations separated by a factor of ten provide the simplest consideration of the data. However, these are arbitrary designations and are subject to change depending upon the test, number of data sets, and the distribution of the data sets within a range.

After 15 to 18 duplicate results have been obtained for a concentration range, a Shewart Quality Control Chart is calculated. The ranges between each set of duplicates are entered into the computer program for precision. The program calculates the average range (R) and multiplies it by the factor 3.27 to produce the upper control limit (UCL). The chart for the concentration range will graphically display the average range (R) and the upper control limit (UCL). The range values for successive duplicate analyses are plotted on the chart and any value that exceeds the upper control limit is considered out of

control. If such an out of control situation exists, the test is shut down until the problem is identified, corrected and documented. The charts are periodically updated with the accumulation of 15 to 18 additional data pairs.

Precision data can also be reviewed through the calculation of the Relative Percent Difference (RPD) for a matrix spike duplicate analysis using the following equation

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

where:

RPD = Relative percent Difference
D_1 = First Sample Value
D_2 = Second Sample Value

This method of calculating precision is used for volatile organic analysis or other analysis as specified in a particular project plan.

2. Accuracy

In addition to the guarantee of precise results, one must also be assured of the accuracy of those results. This is accomplished by spiking one of every ten to fifteen samples analyzed with a synthetic standard for the parameter. The sample is analyzed and the recovery(P_i) of the spike is

determined. When 15 to 18 spike results have been obtained, the computer program for accuracy will calculate the mean percent recovery (P), the standard deviation (Sp), and the upper and lower control limits, (UCL, LCL). A test is considered in control if the percent recovery (P_i) is between the upper and lower control limits. These limits are determined to be plus or minus two standard deviations from the mean percent recovery (P + 2Sp), or plus or minus ten percent from the mean percent recovery (P + 10%). Successive data points are plotted on the accuracy chart which graphically displays the UCL, LCL and P. With the accumulation of 15 to 18 additional data sets, a new chart is prepared.

The Quality Control Charts for accuracy and precision are kept in separate three ring notebooks where they can be easily reviewed for QC interpretation. The analysts themselves are encouraged to use them as a constructive measure of the test's integrity and their own professional performance.

3. Other Quality Control Procedures

a. Method Blank Analysis

A method blank is a volume of deionized, distilled laboratory water carried through the entire analytical scheme. The method blank volume must be approximately equal to the sample volumes being processed.

1. Method blank analysis must be performed at the

following frequency:

A method blank analysis must be performed every twelve hours, once per lot or with every twenty (20) samples of similar concentration and/or sample matrix, whichever is more frequent.

It is the laboratory's responsibility to ensure that method interferences caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in gas chromatograms be minimized.

2. For the purpose of this protocol, an acceptable laboratory method blank should meet the following criteria:

   A method blank for volatile analysis should contain no greater than two times (2X) the Detection Limit of common laboratory solvents (common laboratory solvents are: methylene chloride, acetone, benzene, methyl ethyl ketone and toluene). The method blank <u>must not</u> contain greater than five times (5X) the Detection Limit of those compounds previously listed.

b. Analytical Standards

All analyses require that standard samples, samples that the analyst has prepared from pure materials and distilled water or purchased from certified materials

(traceable to the National Bureau of Standards) be analyzed concurrently with the samples. In general, the range covered by the standards should comprise the useful parameters concentration range and sensitivity of the analytical method.

The data generated from analysis of these standards are documented and reviewed in the same manner as the matrix spike analysis for accuracy.

c. Sample Analysis

Samples can be analyzed upon successful completion of the initial QC activities. Any major system maintenance may necessitate a recalibration. Minor maintenance should necessitate only the calibration verification.

C. DOCUMENTATION

As discussed earlier, if a test result for quality control exceeds the control limits, the test is stopped until the source of error is identified and corrected. Great care is taken to promptly document the situation in the Laboratory Out-of-Control Situation (LOCS) Notebook. This documentation provides a valuable review of the laboratory's performance. It also helps to resolve current problems that may have occured previously under similar circumstances. Any situation that requires documentation is assigned an identifying "LOCS" number which describes the page in the LOCS notebook and the situation. For example, "LOCS #12.7" indicates an out-of-control situation is documented on page 12 of the notebook and is the seventh entry

of the page. This identification number is entered in the comment section on the raw data sheet so that either the analyst or supervisory personnel can quickly review the situation.

D. WEEKLY QC REVIEW

The Quality Control staff meets with the laboratory personnel, supervisor, manager, and director at least once a week at a predetermined time. Out-of-control situations from the previous week are reviewed to determine the progress made in resolving the problem.

New situations of concern are discussed and corrective measures are instituted. This meeting also serves to cultivate new ideas on how the laboratory may perform more efficiently. The open, informal discussion reduces the occurrence of problems due to lack of communication. The results of these weekly reviews and the subsequent actions taken are recorded in the Weekly QC Review Notebook.

E. COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

For most remedial activities these 3 terms are quality characteristics which should be considered during study planning. Data completeness can be quantified during data assessment. It is expected that laboratories should provide data, meeting QC acceptance criteria, for 90% or more of the requested determinations. It is incumbent for planners to identify any sample types, such as control or background locations, which require 100% completeness. Representativeness is most often thought of in terms of collection of

representative samples that can accurately assess the environment being evaluated (compositing sub-aliquots if appropriate) or selection of representative sample aliquots during laboratory analysis. Comparability is a consideration during planning to avoid noncomparability between different organizations' data or between different analytical methods or sample matrices.

REFERENCES

1. U.S. EPA, Handbook for Analytical Quality Control in Water and Wastewater Laboratories, NERC 1972.

Parameter:
Upper & Lower Control Limit (UCL-LCL):
# of Samples Considered:

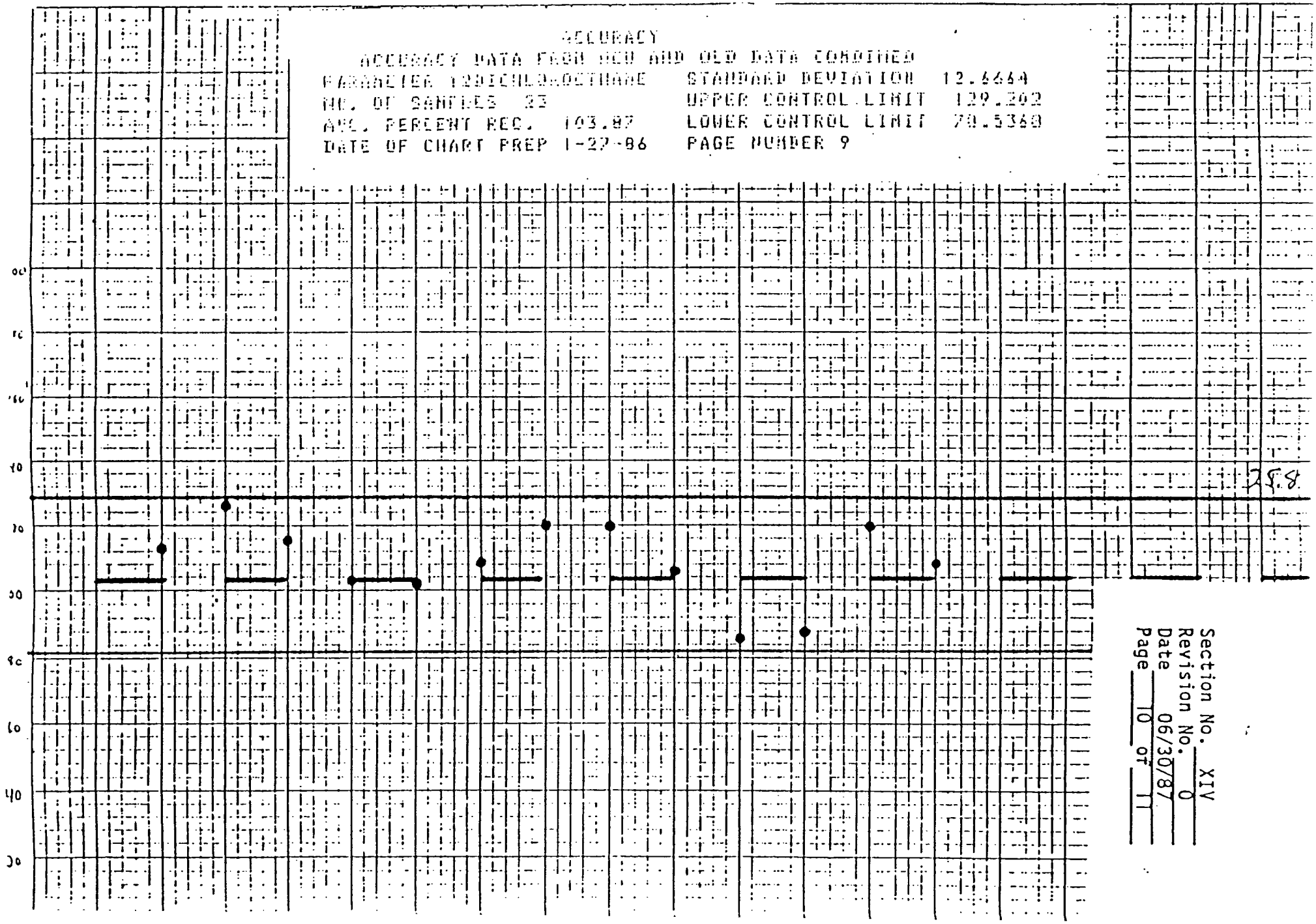
Average % Recovery:
Standard Deviation:
Date of Chart Preparation:

QUALITY CONTROL
SHEWHART CONTROL CHART FOR PRECISION

Page #:

ACCURACY
ACCURACY DATA FROM NEW AND OLD DATA COMBINED

PARAMETER 1,2DICHLOROETHANE	STANDARD DEVIATION 12.6664
NO. OF SAMPLES 23	UPPER CONTROL LIMIT 129.202
AVG. PERCENT REC. 103.87	LOWER CONTROL LIMIT 78.5368
DATE OF CHART PREP 1-27-86	PAGE NUMBER 9



Section No. XIV
Revision No. 0
Date 06/30/87
Page 10 of 11

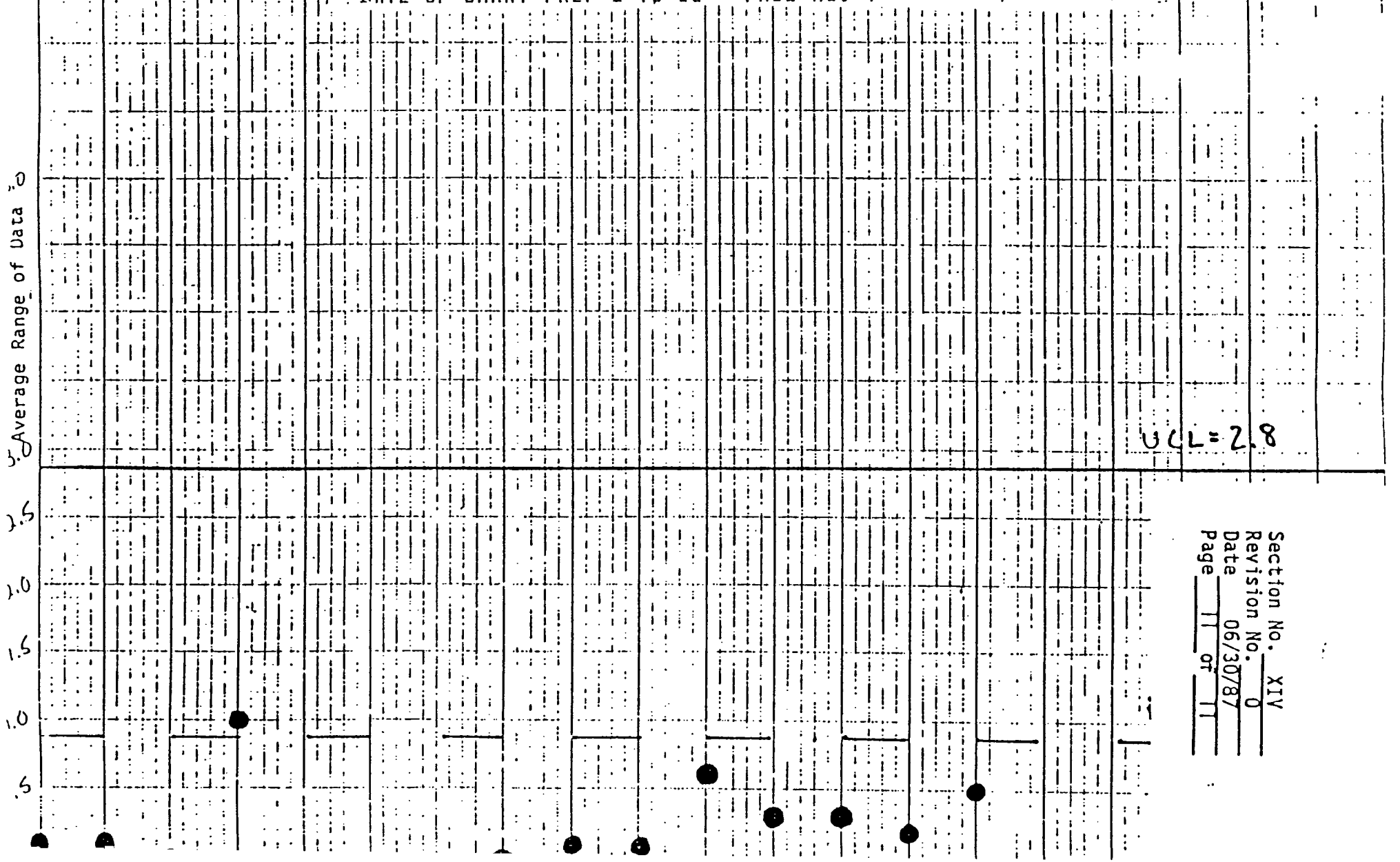
Parameter:
Concentration Range:
Upper Control Limit (UCL):
# of Samples Considered:

Average Range of Data:
Standard Deviation:
Date of Chart Preparation:

Page #:

QUALITY CONTROL
SHEWHART CONTROL CHART FOR PRECISION

PRECISION
PARAMETER 12DICHLOROETHANE AVERAGE RANGE .877778
CONCENTRATION RANGE 0-20 UG/L STANDARD DEVIATION 1.03896
NUMBER OF SAMPLES 9 UPPER CONTROL LIMIT 2.87033
DATE OF CHART PREP 2-15-85 PAGE NO. 1



Section No. XIV
Revision No. 0
Date 06/30/87
Page 11 of 11

CV. CORRECTIVE ACTIONS

When, as a result of audits or QC sample analysis, sampling or analysis systems are shown to be unsatisfactory, a corrective action shall be implemented. The Project Manager, Laboratory Director, Quality Assurance Manager, and analyst may be involved in the corrective action. If previously reported data is affected by the situation requiring correction or if the corrective action will impact the project budget or schedule, the action should directly involve the Project Manager and the Quality Assurance Manager. Corrective actions are of two kinds:

A. Immediate, to correct or repair nonconforming equipment and systems. The need for such an action will most frequently be identified by the analyst as a result of calibration checks and QC sample analyses.

B. Long term, to eliminate causes of nonconformance. The need for such actions will probably be identified by audits. Examples of this type of action include:

1. Staff training in technical skills or in implementing the QA Program;

2. Rescheduling of laboratory routine to ensure analysis within allowed holding times;

3. Identifying vendors to supply reagents of sufficient purity; and

4. Revision of QA system or replacement of personnel.

submittal as verification that the problem has been eliminated.

XVI. QUALITY ASSURANCE REPORTS TO MANAGEMENT

A. OBJECTIVE

This section describes the methods used by PACE to store and retrieve quality assurance records and issue the appropriate reports.

B. REQUIREMENTS

Comprehensive records shall be maintained to provide evidence of the quality assurance activities. All points which indicate an out-of-control situation must be evaluated and explained. Any corrective actions and re-analysis of samples must be fully explained and documented.

C. IMPLEMENTATION

Procedures for recording all aspects of the quality assurance program will be written and placed on file. Appropriate personnel will be trained in the use of these procedures.

D. DISCUSSION

The proper maintenance of quality assurance records is essential to document validity and reliability and to provide support in evidentiary proceedings as needed.

The original quality assurance records will be kept in the Program Quality Assurance Department.

All information received from outside sources will be retained

by the group using the data.

Access to working files will be restricted to only project personnel.

Access to all files containing quality assurance records will be restricted to listed personnel.

Upon termination of an individual task or work assignment, working files will be processed for storage as quality assurance records.

E. RESPONSIBILITIES

The Project Manager shall be responsible for ensuring that quality assurance records are being properly stored and that they can be retrieved.

The Quality Assurance Department shall be responsible for maintaining the records, which will include quality assurance record files and a quality assurance records index.

The Quality Assurance Department shall be responsible for identifying the documents to be designated as quality assurance records. These shall be responsble for identifying the documents to be designated as quality assurance records.

F. REPORTS TO MANAGEMENT

Quarterly reports are provided by the Quality Assurance Department to the President, Vice President and Director of Laboratory Services of PACE. This report addresses the

quarterly Quality Assurance Activities including details of corrective actions implemented, audit results, and Q.C. summary information.

THOMAS A. JACKMAN, Ph.D.
Director, Florida Division
PACE Laboratories, Inc.

EDUCATION

Ph.D. Chemistry	University of South Florida, Tampa, Florida, 1976.
B. A. Chemistry	University of South Florida, Tampa, Florida, 1971.

PROFESSIONAL AFFILIATIONS

American Chemical Society
Sigma XI
American Association for the Advancement of Science
Association of Official Analytical Chemists

PROFESSIONAL EXPERIENCE

Experienced in the acquisition and interpretation of data from various types of analytical instrumentation. Representative instrumentation includes:

Gas Chromatography (FID, ECD, NPFID, FPD, HALL, DID)
Gas Chromatography/Mass Spectrometry
Atomic Absorption Spectrophotometry
Ion Chromatography
Infrared, Visible, Ultraviolet Spectroscopy
Nuclear Magnetic Resonance
Electron Paramagnetic Resonance

Specialized expertise in the use of chemical analytical instrumentation for the detection of trace quantities of chemical compounds in various matrices. This includes:

Analysis of industrial atmospheres to determine worker exposure to hazardous materials. Working knowledge of NIOSH sampling and analytical procedures.

Analysis of fire debris to determine the presence of absence of potential accelerants. Qualified as an expert witness in state and federal courts in Florida and Louisiana.

Analysis of water, wastewater, and hazardous waste in accordance with USEPA Protocol. Working knowledge of the 500 and 600 series protocol, SW-846, ASTM, AOAC, and Standard Methods.

Experienced in the generation and detection of trace organic chemicals in the air. Actively participating in a research project which involves the generation and validation of low concentrations of organosulfur and organophosphorus compounds. The analytical protocol requires the use of gas chromatographic separation with flame photometric detection.

Provide technical support and consulting to clients regarding the determination of regulatory compliance in the following areas:

Hazardous Waste: Permitting, agency liaison, and interpretation of RCRA and HSWA regulatory requirements.

Superfund: Project Manager for Remedial Investigation at a site included ont he National Priorities List. Provide technical expertise in all aspects of the investigation and remedy selection and participate in negotiations with the Environmental Protection AGency. Working knowledge of the provisions of the CERCLA and SARA regulations.

Air Emissions: Air Emissions testing (EPA Methods 1-5, 6,7,8,9,12,13), permitting, and regulatory liaison.

WORK EXPERIENCE

1987 - Present PACE Laboratories, Inc.
Director, Florida Division

Responsible for operations and management of organization specializing in environmental consulting and laboratory analysis.

1977 - 1987	Interscience, Inc. Vice President, Senior Chemist Responsible for all aspects pertaining to the operation of an analytical chemical laboratory. Also responsible for environmental monitoring programs and consulting services.
1976 - 1977	Department of Chemistry Wright State University Dayton, Ohio Postdoctoral Fellow
1976	Hillsborough Community College Tampa, Florida Instructor
1972 - 1976	Department of Chemistry University of South Florida Tampa, Florida

KATHY L. HARRIS
Chemist
Quality Assurance Officer
PACE Laboratories, Inc.

EDUCATION

B. S. Chemistry	University of Florida, Gainesville, Florida, 1981.
Computer Courses	Eastern Mennonite College
Waters HPLC Short Course	
IL - AA Course, Flame and Furnace	

EXPERIENCE

June 1987 - Present

PACE Laboratories, Inc.
Chemist
Quality Assurance Officer

Analytical and quantitative testing using AA, flame and furnace, GC, IC, UV-Vis, TLC, titrametric and gravimetric assays, Kjeldahl nitrogen, COD, BOD, and IR.

Responsible for quality control, data interpretation, equipment maintenance and repair, and technical consulting.

July 1985 - June 1987

Interscience, Inc.
Chemist

Analytical and quantitative testing, quality control, data interpretation, equipment maintenance and repair, and technical consulting.

Proficient in analytical techniques: AA, flame and furnace, LC, GC, IC, UV-Vis, TLC, titrametric and gravimetric assays, sterile preparticulate matter, Kjeldahl nitrogen, COD, BOD, and IR, with exposure to NMR.

Dec. 1984 - Mar. 1985 — Merck & Company, Inc.
Chemist

Developed HPLC method which was 50% faster than the assay currently in use in Q.C. Participated in strain improvement program by establishing analytical support for the program with HPLC and Technicon auto analyzer.

June 1982 - Dec. 1987 — Merck & Company, Inc.
Quality Control Technician

Responsible for maintaining quality throughout the processes of pharmaceutical manufacturing.

Sept. 1981 - Apr. 1982 — University of Florida
Department of Biochemistry
Chemist I

Pioneered only lab in the Southeast for sequencing and analysis of synthesized amino acids. Developed an HPLC method for quantitation of amino acids.

June 1979 - Apr. 1982 — Shands Teaching Hospital, Inc.
Medical Laboratory Technician

Analyzed blood serum using automated instrumentation and flame AA.

MEMBERSHIPS

Florida Society of Environmental Analysts

CURT W. LESSL
Chemical Engineer
PACE Laboratories, Inc.

EDUCATION

1979 St. Louis Community College, St. Louis, Missouri, Associate Degree in General Education.

1985 University of South Florida, Tampa, Florida, B. S. Chemical Engineering

EXPERIENCE

1987 - Present PACE Laboratories, Inc.
Chemical Engineer

RCRA compliance; air emissions testing and permitting; POTW discharge permitting; hazardous waste manifest preparation, documentation, shipment, and disposal; waste treatment process development and design; bench scale and pilot plant studies; classification of chemical waste for lab pack disposal; economic analysis; personnel training; SARA/Community Right to Know; Environmental Auditing.

1986 - 1987 Interscience, Inc.
Chemical Engineer

MEMBERSHIPS

American Institute of Chemical Engineers

Engineer in Training

MICHAEL F. VALDER
Chemist
PACE Laboratories, Inc.

EDUCATION

B. S. Chemistry — University of South Florida, Tampa, Florida, 1986.

EXPERIENCE

1987 - Present — PACE Laboratories, Inc.
Chemist

Responsibilities include general wet chemistry, ion chromatography, and low level chloride in concrete analysis. Certified Visible Emissions observer with client contact in areas concerning visible emissions.

1986 - 1987 — Interscience, Inc.
Chemist

Major responsibilities include general wet chemistry, ion chromatography, and low level chloride in concrete analysis.

MEMBERSHIPS

Florida Society of Environmental Analysts

R. NILES BASHAW
Chemist
PACE Laboratories, Inc.

EDUCATION

B. S. Chemistry — Florida State University, Tallahassee, Florida, 1957.

PROFESSIONAL AFFILIATIONS

American Chemical Society
Florida Advisory Committee on Arson Prevention (FACAP)
International Association of Arson Investigators (IAAI)
International Association for Fire Safety Science
Florida Chapter of IAAI
Pinellas Arson Co-Op of Florida (PARCO)

EXPERIENCE

1987 - Present — PACE Laboratories, Inc.
Chemist

Fire and explosion cause and origin determinations for residential, commercial and industrial losses. Fire and materials chemistry analyses. Participation in laboratory and full scale burn testing. Gas chromatography, Infrared and Mass Specoscopy analyses, Forensic chemistry analysis.

1985 - 1987 — Interscience, Inc.
Chemist

Fire and explosion cause and origin determinations for residential, commercial and industrial losses. Fire and materials chemistry analyses. Participation in laboratory and full scale burn testing. Gas chromatography, Infrared and Mass Specoscopy analyses, Forensic chemistry analysis.

1982 - 1985 Selin Company
President

A marketing firm representing several manufacturers selling to the gift and stationery market in Florida.

1973 - 1982 Iminac, Inc.
Subsidiary of The Dow Chemical Company
Sales Manager and Technology Manager

Responsible for marketing and the research and development. Iminac was purchased by the major managers.

1957 - 1973 Dow Chemical Company
Advanced from Chemist to Research Specialist

Conducted individual and group research in fire chemistry, polymer chemistry, radiation chemistry, free radical chemistry and chemical synthesis.

1954 - 1957 Florida State University

Individual research in radiation chemistry and teaching assistant.

MICHAEL WAYNE PALMER
Chemist
PACE Laboratories, Inc.

EDUCATION

1984 University of Tampa, Tampa, Florida, Bachelor of Science, Majors: Chemistry, Biology, Marine Science, December 1984.

EXPERIENCE

1987 - Present
PACE Laboratories, Inc.
Chemist

Analysis of pesticides, herbicides, poly aromatic hydrocarbons, volatile organics and PCB's, in drinking water, waste water, soil and oil by gas chromatography. Experienced with FID, Hall, ECD, PID, TCD gas chromatographs equipped with FID, Hall, PID, ECD and TCD detection. Experienced with EPA Methods including 601, 602, 608, 610, 504.2

1986 - 1987
ENVIROPACT, Inc.
Analytical Chemist

Analysis of pesticides, herbicides, poly aromatic hydrocarbons, volatile organics and PCB's, in drinking water, waste water, soil and oil by gas chromatography using Shimadzu Mini G.C. and a Varian 3700 with a Tracor Hall Detector.

1985 - 1986
State Department of HRS
Chemist II

Analysis of pesticides, herbicides, EDB and hydrocarbons in water and food by gas chromatography and method development using Hewlett Packard, Perkin Elmer, and Tracor gas chromatographs on line with a Hewlett Packard Data System.

JOHN T. STIMUS
Environmental Technician
PACE Laboratories, Inc.

EDUCATION

1985 University of Tampa, Tampa, Florida, Bachelor of Science, April, 1985.

EXPERIENCE

1987 - Present
PACE Laboratories, Inc.
Environmental Technician

Experienced in the collection of air, groundwater, wastewater and hazardous waste samples. Completed 40 hours training for work on hazardous waste sites.

1986 - 1987
ENVIROPACT, Inc.
Remedial Technician/Field Supervisor

Chemist, Wet Lab Supervisor

1985 - 1986
University of Tampa
Admissions Representative

1985 - 1985
Hillsborough County Schools
Substitute Teacher

JAMES E. FRANKLIN
Environmental Technician
PACE Laboratories, Inc.

EDUCATION

University of Minnesota, Bachelor of Arts, Biology

Vermilion Community College, Ely, Minnesota, EAT Program

EXPERIENCE

1986 - Present

PACE Laboratories, Inc.
Environmental Technician

Transferred to Florida in June, 1987. Responsible for supervising the Field Services Department.

Ground water sample collection for analysis of trace level contaminants at sanitary landfills, Super Fund sites, hazardous waste sites, accidental spills and leaking underground storage tanks.

Waste water sample collection at a wide variety of manufacturing and industrial facilities for NPDES permitting, process control, and compliance testing.

Flow monitoring involving the construction and installation of weirs, other primary devices, and the set up and maintenance of ISCO 2500 systems.

Soil sampling for PCB's, organics, and conventional parameters. One project involved sampling a grid covering over 3 square kilometers.

Hazardous waste sampling, labelling, and recontainerization involving a wide range of wastes and materials. Experienced in SCBA (self-contained breathing apparatus) and air-line work.

Completed a 16 hour course on hazardous waste safety for EPA Level B.

Co-author of PACE's Hazardous Waste QC Manual.

Air stack sampling of industrial emissions to test for compliance and process efficiency.

Sample custody involving sample check-in, chain of custody, and Contract Lab Protocol.

Prior to joining PACE, Mr. Franklin's experience included:

Field Services for the MN Department of Health.

Portage Crew with the U. S. Forest Service in Ely, Minnesota.

Laboratory technician with the University of MN, Minneapolis.

MEMBERSHIPS

National Water Well Association

RONALD ERWIN BROCK
Lab Aide
PACE Laboratories, Inc.

EDUCATION

James Sprunt Institute, Kennansville, N.C., Radio & Television Repair, 1977-1979.

Wallace-Rosehill High School, Wallace, N.C., 1977.

EXPERIENCE

1987 - Present	PACE Laboratories, Inc. Lab Aide Responsibilities include preparation of equipment for use in field sampling and in laboratory analyses.
1982 - 1987	Rhone-Poulenc Inc. Research Triangle Park, N.C. Research Assistant Analyzed crop samples and environmental samples for Aldicarb. Data entry and quarterly reports.

SYO 5176
Reel 1
6240
6240
TLH
CSB/RICHARDS

ENVIRONMENTAL CONSERVATION LABORATORIES, INC.

10207 GENERAL DRIVE
ORLANDO, FL. 32824
(407) 826-5314

GENERIC QUALITY ASSURANCE PLAN

FOR

THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

APPROVAL NUMBER 880817 - G
OCTOBER 14, 1988

		APPROVAL/DATE
ENVIRONMENTAL CONSERVATION LABORATORIES, INC		
LABORATORY MANAGER	JEFFREY K. RICHARDS	Jeffrey K. Richards 10/14/88
DEPARTMENT OF ENVIRONMENTAL REGULATION		
Q.A. OFFICER	CAROLYN LEWIS	Carolyn A. Lewis 11/21/88

RECEIVED
DEPT. ENVIRONMENTAL REG.

APPROVED

2.1 TABLE OF CONTENTS

Section		Revision Date	Page
1.0	Title and Signatures	10/14/88	1-1
2.0	Table of Contents	10/14/88	2-1
3.0	Statement of Policy	10/14/88	3-1
4.0	Organization and Responsibilities	10/14/88	4-1
5.0	Q.A. Objectives for Measurement of Data in Terms of Precision, Accuracy, Completeness, Representativeness, and Comparability	10/14/88	5-1
6.0	Sampling Procedures	10/14/88	6-1
7.0	Sample Custody	10/14/88	7-1
7.1	Sample Identification	10/14/88	7-3
8.0	Calibration Procedures and Frequency	10/14/88	8-1
8.1	Volatile Organics	10/14/88	8-2
8.1.1	Initial Method Verification	10/14/88	8-2
8.1.2	Routine Calibration	10/14/88	8-3
8.1.3	Routine Quality Control	10/14/88	8-4
8.2	Extractable Organics	10/14/88	8-5
8.2.1	Initial Method Verification	10/14/88	8-5
8.2.2	Calibration	10/14/88	8-5
8.3	Atomic Spectroscopy Department	10/14/88	8-6
8.3.1	Calibration	10/14/88	8-6
8.4	Wet Chemistry	10/14/88	8-7
8.4.1	pH Meter	10/14/88	8-7
8.4.2	Analytical Balance	10/14/88	8-7
8.5	Traceability of Standards	10/14/88	8-8

2.1 TABLE OF CONTENTS (cont.)

Section		Revision Date	Revision Number
9.0	Analytical Procedures	10/14/88	9-1
9.1	Inorganic Analysis	10/14/88	9-1
9.2.1	Volatile Organics	10/14/88	9-1
9.2.2	Extractable Organics	10/14/88	9-3
9.2.3	Miscellaneous Parameters	10/14/88	9-5
10.0	Data Reduction, Validation and Reporting	10/14/88	10-1
10.1	Inorganic Analysis	10/14/88	10-1
10.1.1	Dilution	10/14/88	10-1
10.1.2	Particulates	10/14/88	10-1
10.1.3	Solids	10/14/88	10-2
10.1.3.1	Solids - Dry	10/14/88	10-2
10.1.3.2	Solids - Wet	10/14/88	10-2
10.1.4	Different Injection Volumes	10/14/88	10-3
10.1.5	Method of Standard Additions	10/14/88	10-3
10.2	Organic Analysis	10/14/88	10-4
10.3	Data Flow and Reporting	10/14/88	10-4
10.3.1	Schematic of Sample/Data Flow	10/14/88	10-5
11.0	Laboratory Quality Control Checks	10/14/88	11-1
11.1	Duplicates	10/14/88	11-2
11.2	Spikes	10/14/88	11-2
11.3	Performance Samples	10/14/88	11-2
12.0	Performance and System Audits	10/14/88	12-1
12.1	System Audits	10/14/88	12-2
13.0	Preventative Maintenance	10/14/88	13-1
13.1	Organic Routine Maintenance	10/14/88	13-1
13.2	Inorganic Routine Maintenance	10/14/88	13-1
14.0	Specific Routine Procedures Used to Assess Data Reduction, Accuracy and Completeness	10/14/88	14-1
14.1	Measures of Variability	10/14/88	14-1
14.1.1	Precision	10/14/88	14-1
14.1.2	Accuracy	10/14/88	14-1
14.1.3	% Relative Standard Deviation	10/14/88	14-1

2.1 TABLE OF CONTENTS (cont)

Section		Revision Date	Page
14.2	Central Tendency and Dispersion	10/14/88	14-2
14.2.1	Arithmetic Mean	10/14/88	14-2
14.2.2	Range	10/14/88	14-2
14.2.3	Standard Deviation	10/14/88	14-2
14.2.4	Confidence Levels	10/14/88	14-3
14.3	Q.C. Charts for Accuracy	10/14/88	14-3
14.4	Q.C. Charts for Precision	10/14/88	14-4
15.0	Corrective Action	10/14/88	15-1
15.1	Corrective Action for Blank Contamination	10/14/88	15-2
15.2	Failure of Instrument or Method to Calibrate	10/14/88	15-3
16.0	Quality Assurance Reports Reports to Management	10/14/88	16-1
17.0	Resumes	10/14/88	17-1
18.0	References	10/14/88	18-1

2.2 LIST OF FIGURES AND TABLES

Figure	4.1	Laboratory Organization Chart	10/14/88	4-1
Table	5.1	Q.A. Objectives for Data	10/14/88	5-2
Table	6.1	Required Containers, Preservative Techniques and Holding Times	10/14/88	6-2
Figure	7.1	Chain of Custody	10/14/88	7-2
Figure	7.2	Sample Log In	10/14/88	7-3
Figure	7.3	Sample Analysis Request Form	10/14/88	7-4
Figure	10.1	Plot of Standard Additions	10/14/88	10-3
Figure	10.3	Schematic of Sample/Data Flow	10/14/88	10-5
Figure	14.1	Q.C. Chart for Accuracy	10/14/88	14-3
Figure	14.3	Q.C. Chart for Precision	10/14/88	14-4

3.0 STATEMENT OF POLICY

Environmental Conservation Laboratories, Inc. (ENCO), has generated this quality assurance plan in order to satisfy the policy requirements set forth by the Florida Department of Environmental Regulation pertaining to the environmental monitoring and measurement efforts mandated or regulated by the E.P.A. or D.E.R.

ENCO Laboratories assumes the responsibility to implement procedures which assure that precision, accuracy, completeness and representativeness of its data are known and documented.

ENCO Laboratories will utilize only the most sophisticated equipment, highly trained professionals, and current advanced methodology in order to assure the data produced within this lab is of the utmost quality.

The quality control/quality assurance measures incorporated to insure the caliber of data are detailed within this document.

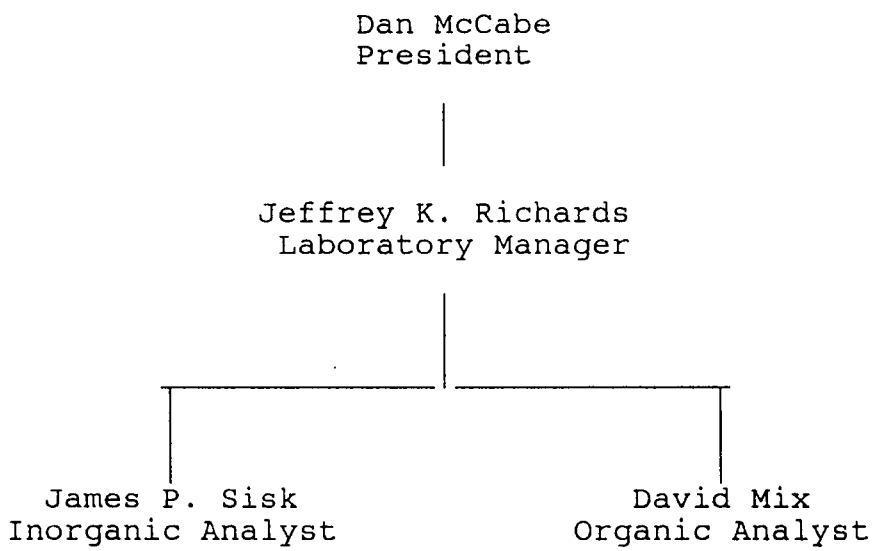
4.0 ORGANIZATION AND RESPONSIBILITIES

ENCO Laboratories, Inc. will be responsible for the analysis of all samples provided and all quality control measures associated therein.

- ORGANIZATION -

Dan McCabe	President
Jeffrey K. Richards	Manager
David Mix	Organic Analyst
James P. Sisk	Inorganic Analyst

Figure 4.1 Laboratory Organization



5.0 Q.A Objectives for Measurement of Data in Terms of Precision, Accuracy, Completeness, Representativeness, and Comparability

The following table includes data for precision, accuracy and completeness. The data presented is taken from the EPA methods and are provisionary goals. This data table will be updated when sufficient data has been accumulated.

TABLE 5.1 Q.A. Objectives for Data Measurement

PARAMETER	METHOD	MATRIX	(1) PRECISION %	(2) ACCURACY %	COMPLETENESS
Bromodichloromethane	EPA601	Water	11,5	110, 5	≥ 90 %
Bromoform	EPA601	Water	12,6	92, 6	≥ 90 %
Bromomethane	EPA601	Water	21,11	74,11	≥ 90 %
Carbon Tetrachloride	EPA601	Water	15,8	96, 8	≥ 90 %
Chlorobenzene	EPA601	Water	7,15	98, 7	≥ 90 %
Chloroethane	EPA601	Water	13,72	96, 7	≥ 90 %
2-Chloroethyl vinyl ether	EPA601	Water	20,10	100,10	≥ 90 %
Chloroform	EPA601	Water	12,6	92, 6	≥ 90 %
Chloromethane	EPA601	Water	21,11	77,11	≥ 90 %
Dibromochloromethane	EPA601	Water	11, 5	99, 5	≥ 90 %
1,2 Dichlorobenzene	EPA601	Water	21,10	96,10	≥ 90 %
1,3 Dichlorobenzene	EPA601	Water	18, 9	96, 9	≥ 90 %
1,4 Dichlorobenzene	EPA601	Water	15, 7	93, 7	≥ 90 %
1,1 Dichloroethane	EPA601	Water	8, 4	93, 4	≥ 90 %
1,2 Dichloroethane	EPA601	Water	13, 6	102, 6	≥ 90 %
1,1 Dichloroethene	EPA601	Water	20,10	96,10	≥ 90 %
Trans 1,2 Dichloro ethene	EPA601	Water	14, 7	97, 7	≥ 90 %
1,2 Dichloropropane	EPA601	Water	13, 7	100, 7	≥ 90 %
cis 1,3 Dichloro propene	EPA601	Water	18, 9	100, 9	≥ 90 %
trans 1,3 Dichloro propene	EPA601	Water	18, 9	100, 9	≥ 90 %

(1) - Precision is listed as %RSD, sd; where %RSD = percent relative standard deviation and sd = standard deviation.

(2) - Accuracy is listed as %R, sd; where %R = percent recovery and sd = standard deviation.

Data presented as provisionary goals and are calculated from formulas given in Federal Reigister Friday, October 26, 1984 and substituting the spike values (50ppb) used in this laboratory.

TABLE 5.1 Q.A. Objectives for Data Measurement (cont.)

PARAMETER	METHOD	MATRIX	PRECISION %	ACCURACY %	COMPLETENESS
1,2 Dibromoethane	EPA504	Water	9,9	40,9	≥ 90 %
Total Xylenes	EPA602	Water	25,10	95,10	≥ 90 %
Methyl-tertbutylether	EPA602	Water	25,10	95,10	≥ 90 %
Napthalene	EPA610	Water	22,11	56,11	≥ 90 %
Acenaphthylene	EPA610	Water	24,12	65,12	≥ 90 %
Acenaphthene	EPA610	Water	22,11	53,11	≥ 90 %
Fluorene	EPA610	Water	22,11	55,11	≥ 90 %
Phenanthrene	EPA610	Water	20,10	70,10	≥ 90 %
Anthracene	EPA610	Water	16, 8	60, 8	≥ 90 %
Fluoranthene	EPA610	Water	16, 8	68, 8	≥ 90 %
Pyrene	EPA610	Water	18,19	69,19	≥ 90 %
Benzo(a)anthracene	EPA610	Water	21,10	73,10	≥ 90 %
Chrysene	EPA610	Water	24,12	77,12	≥ 90 %
Benzo(b)fluoranthene	EPA610	Water	16, 8	78, 8	≥ 90 %
Benzo(k)fluoranthene	EPA610	Water	26,13	59,13	≥ 90 %
Benzo(a)pyrene	EPA610	Water	21,11	56,11	≥ 90 %
Dibenzo(a,h)anthracene	EPA610	Water	10, 5	41, 5	≥ 90 %
Indeno(1,2,3-cd)pyrene	EPA610	Water	16, 8	54, 8	≥ 90 %
Benzo(g,h,i)perylene	EPA610	Water	11, 6	45, 6	≥ 90 %
2-Methylnaphthalene	EPA610	Water	*, *	*, *	≥ 90 %
1-Methylnaphthalene	EPA610	Water	*, *	*, *	≥ 90 %

(1) - Precision is listed as %RSD, sd; where %RSD = percent relative standard deviation and sd = standard deviation.

(2) - Accuracy is listed as %R, sd; where %R = percent recovery and sd = standard deviation.

** No data available at this time

Data presented as provisionary goals and are calculated from formulas given in Federal Reigister Friday, October 26, 1984 and substituting the spike values (50ppb) used in this laboratory.

TABLE 5.1 Q.A. Objectives for Data Measurement (cont.)

PARAMETER	METHOD	MATRIX	PRECISION %	ACCURACY %	COMPLETENESS
Aldrin	EPA608	Water	13, 3	81, 3	≥ 90 %
α - BHC	EPA608	Water	11, 3	84, 3	≥ 90 %
β - BHC	EPA608	Water	18, 4	81, 4	≥ 90 %
δ - BHC	EPA608	Water	15, 3	81, 3	≥ 90 %
γ - BHC	EPA608	Water	10, 2	82, 2	≥ 90 %
Chlordane	EPA608	Water	11, 3	82, 3	≥ 90 %
4,4' - DDD	EPA608	Water	16, 3	86, 3	≥ 90 %
4,4' - DDE	EPA608	Water	11, 3	86, 3	≥ 90 %
4,4' - DDT	EPA608	Water	18, 4	92, 4	≥ 90 %
Dieldrin	EPA608	Water	12, 3	90, 3	≥ 90 %
Endosulfan I	EPA608	Water	10, 2	97, 2	≥ 90 %
Endosulfan II	EPA608	Water	36, 7	95, 7	≥ 90 %
Endosulfan Sulfate	EPA608	Water	13, 3	87, 3	≥ 90 %
Endrin	EPA608	Water	19, 4	89, 4	≥ 90 %
Endrin Aldehyde	EPA608	Water	19, 4	89, 4	≥ 90 %
Heptachlor	EPA608	Water	5, 1	69, 1	≥ 90 %
Heptachlor Epoxide	EPA608	Water	16, 3	90, 3	≥ 90 %
Toxaphene	EPA608	Water	24, 5	89, 5	≥ 90 %
PCB - 1016	EPA608	Water	12, 2	84, 2	≥ 90 %
PCB - 1221	EPA608	Water	25, 5	99, 5	≥ 90 %
PCB - 1232	EPA608	Water	21, 4	145, 4	≥ 90 %
PCB - 1242	EPA608	Water	18, 4	97, 4	≥ 90 %
PCB - 1248	EPA608	Water	18, 4	97, 4	≥ 90 %
PCB - 1254	EPA608	Water	21, 4	86, 4	≥ 90 %
PCB - 1260	EPA608	Water	7, 2	85, 2	≥ 90 %
2,4 - D	EPA615	Water	13, 4	78, 4	≥ 90 %
2,4,5 - TP (Silvex)	EPA615	Water	13, 5	81, 5	≥ 90 %

(1) - Precision is listed as %RSD, sd; where %RSD = percent relative standard deviation and sd = standard deviation.

(2) - Accuracy is listed as %R, sd; where %R = percent recovery and sd = standard deviation.

Data presented as provisionary goals and are calculated from formulas given in Federal Reigister Friday, October 26, 1984 and substituting the spike values (50ppb) used in this laboratory.

TABLE 5.1 Q.A. Objectives for Data Measurement (cont.)

PARAMETER	METHOD	MATRIX	PRECISION %	ACCURACY %	COMPLETENESS
Arsenic (Furnace)	EPA206.2	Water	44,22	101,22	≥ 90 %
Barium (Furnace)	EPA208.2	Water	27,14	200,14	≥ 90 %
Cadmium (Furnace)	EPA213.2	Water	11, 2	99, 2	≥ 90 %
Chromium(Furnace)	EPA218.2	Water	15, 5	92, 5	≥ 90 %
Lead (Furnace)	EPA239.2	Water	17, 9	93, 9	≥ 90 %
Mercury (Cold Vapor)	EPA245.1	Water	27, 2	92, 2	≥ 90 %
Selenium(Furnace)	EPA270.2	Water	10, 2	98, 2	≥ 90 %
Silver (Furnace)	EPA272.2	Water	44,22	101,22	≥ 90 %
Acidity	EPA305.1	Water	0.5,10	*,10	≥ 90 %
Chloride	EPA325.3	Water	3, 3	90, 3	≥ 90 %
Cyanide, Total	EPA9010	Water	10, 5	85, 5	≥ 90 %
Reactivity	SW 846	Water	*, *	*, *	≥ 90 %
Sulfide	EPA376.1	Water	*,10	10,10	≥ 90 %
Residue, Filterable	EPA160.1	Water	*, *	*, *	≥ 90 %
Residue, Nonfilterable	EPA160.2	Water	*, *	*, *	≥ 90 %
Residue, Total	EPA160.3	Water	*, *	*, *	≥ 90 %
Residue, Volatile	EPA160.4	Water	*,11	7,11	≥ 90 %
Ignitability	EPA1010	Water	*, *	*, *	≥ 90 %

(1) - Precision is listed as %RSD, sd; where %RSD = percent relative standard deviation and sd = standard deviation.

(2) - Accuracy is listed as %R, sd; where %R = percent recovery and sd = standard deviation.

Metals data presented as provisionary goals and are calculated from formulas given in Federal Reigister Thursday September 3, 1987 and substituting the spike values used in this laboratory. Miscellaneous paramter data from "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983.

6.0 SAMPLING PROCEDURES

ENCO Laboratories has no plans at this time to provide field sampling.

Sample containers will be provided at the clients' request. The types of containers and methods of preservation are detailed in table 6.1. See section 15.1 regarding blank containers required for sampling.

TABLE 6.1 REQUIRED CONTAINERS, PRESERVATIVE * TECHNIQUES AND HOLDING TIMES

PARAMETER	CONTAINER	PRESERVATIVE	MAXIMUM HOLDING TIME
Acidity	P,G	Cool, 4 degrees C	14 days
Bromide	P,G	None Required	28 days
Chloride	P,G	None Required	28 days
Cyanide, Total and Amendable to Chlorination	P,G	Cool, 4 degrees C NaOH to pH>12 0.6gms Ascorbic Acid	14 days 14 days
Chromium VI	P,G	Cool, 4 degrees C	24 hours
Mercury	P,G	HNO3 to pH<2	28 days
Metals, except above	P,G	HNO3 to pH<2	6 months
Residue, Total	P,G	Cool, 4 degrees C	7 days
Residue, Filterable	P,G	Cool, 4 degrees C	7 days
Residue, Non-filterable	P,G	Cool, 4 degrees C	7 days
	P,G	Cool, 4 degrees C	7 days
Residue-settleable	P,G	Cool, 4 degrees C	48 hours
Sulfate	P,G	Cool, 4 degrees C	28 days

* According to 40CFR Part 136 Table II

TABLE 6.1 Required Containers and Preservatives (cont.)

PARAMETER	CONTAINER	PRESERVATIVE	MAXIMUM HOLDING TIME
Purgeable Halocarbons	G, Teflon lined septum	Cool 4 degrees C 0.008% Na2S2O3*	14 days
Purgeable Aromatics	G, Teflon lined septum	Cool, 4 degrees C 0.008% Na2S2O3*	14 days**
Acrolein and Acrylonitrile	G, Teflon lined septum	Cool, 4 degrees C 0.008% Na2S2O3*	14 days
Phthalate Esters	G, Teflon lined cap	Cool, 4 degrees C 0.008% Na2S2O3*	7 days until extraction, 40 days after extraction
Polynuclear Aromatics	G, Teflon lined cap	Cool, 4 degrees C 0.008% Na2S2O3*	7 days until extraction, 40 days after extraction
PCB's	G, Teflon lined cap	Cool, 4 degrees C pH 5 - 9	7 days until extraction, 40 days after extraction
Pesticides	G, Teflon lined cap	Cool, 4 degrees C pH 5 - 9	7 days until extraction, 40 days after extraction

* Use only if residual chlorine is present.

** Cool to 4 degrees C - 7 days
Cool to 4 degrees C, pH=2 with HCL - 14 days

7.0 SAMPLE CUSTODY

A sample is physical evidence collected from a facility or from the environment. To maintain sample integrity the following guidelines will be followed:

1. The number of people handling the sample will be held to a minimum.

2. Chain of custodies will accompany all samples. See page 7-2, Figure 7.1.

3. Samples will be stored in a manner which insures that the parameters under investigation are not altered and the proper preservatives and holding times will be adhered to at all times.

4. To insure that the container material does not interfere with the analysis, only proper containers as listed in table 6.1 will be used.

ENCO Laboratories

ENVIRONMENTAL CONSERVATION LABORATORIES
10207 GENERAL DRIVE, ORLANDO, FLORIDA 32824
(407) 826-5314

CHAIN OF CUSTODY RECORD

Page _____ of _____

PROJECT NO. | PROJECT NAME

SAMPLER'S (SIGNATURE)

STATION NO.	DATE	TIME	COMPOSITE	GRAB	STATION LOCATION	NO. OF CONTAINERS									REMARKS

RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME:	REMARKS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	RECEIVED FOR LABORATORY BY:		

FIGURE 7.1 Chain of Custody Record

7.1 SAMPLE IDENTIFICATION

Prior to shipment of empty sample containers, the bottles will be numbered. A chain of custody form (figure7.1) will be included in the kit shipment. It will then be the clients' responsibility to correlate the sample number listed on the bottles with the "station number." This information will be detailed on the chain of custody along with the sampling information i.e. date, time, remarks. The chain of custody form will remain with the samples and when custody is passed, the form will be signed over to the responsible parties involved.

Included in the kit shipment will be a 'Sample Analysis Request Form' which details the analysis required by the client. See Figure 7.3, Page 7-4.

Upon arrival at the laboratory, the information contained on the chain of custody will be compared to the samples recieved. Any discrepancies that are noted will be recorded and discussed with either the carrier, client or sampling team.

At this point the project will be assigned a unique four digit "laboratory project number" which will be logged into a bound log book along with the project name, client name, date recieved, number of samples recieved and a space to be filled in at the completion of the work.

FIGURE 7.2 Sample Log In

Project Number	Date	Client	Project Name	# of Samples	Date Completed
1234	3/9/88	Smith Corp.	Exxon Stn. Orlando,FL	6	3/27/88

FIGURE 7.3 Sample Analysis Request Form

Environmental Conservation Laboratories
10207 General Drive, Orlando, Florida 32824
(407) 826-5314

ENCO Laboratories

SAMPLING ANALYSIS REQUEST

PART I: FIELD SECTION

COLLECTOR	DATE SAMPLED	TIME	HOURS

AFFILATION OF SAMPLER

ADDRESS (NUMBER) (STREET) (CITY) (STATE) (ZIP CODE)

TELEPHONE ( ) COMPANY CONTACT

LABORATORY SAMPLE NO.	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE *	FIELD INFORMATION**

ANALYSIS REQUESTED:

SPECIAL HANDLING AND/OR STORAGE:

PART II: LABORATORY/SECTION **

RECEIVED BY TITLE DATE

ANALYSIS REQUIRED:

* Indicate whether sample is soil, sludge, ect.
** Use back of page for additional information relative to sample location.

7.1 SAMPLE IDENTIFICATION (cont.)

Upon completion of the analysis, the data will be entered by the analyst and submitted to typing. Attached to the data sheets will be quality control sheets which will report the precision and accuracy obtained during the analysis of the samples. This information will be published in the final report.

The final typed report and raw data will then be sent to the laboratory manager to be approved and signed.

The report will then be copied and the original and a copy sent to the client, a third copy is filed along with the bench sheet. The original chain of custody is also returned to the client.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

All analytical instruments are calibrated with each use. A series of standard solutions are prepared from stock standards. These stock standards are purchased from various vendors. The reference methods for preparation of the standards are found in the U.S. EPA "Methods for Chemical Analysis of Water and Wastewater"' 16th Edition and 40CFR Part 136, Friday, October 26, 1984, 40CFR Part 136, Thursday September 3, 1987, 40CFR Part 136, Friday, January 4, 1985, and 40CFR Part 136, Monday, June 30, 1986. Adherence to the published procedure is mandatory. All stock standards are dated and initialed, both when received and when prepared.

8.1 VOLATILE ORGANICS

VOLATILE ORGANICS INSTRUMENTATION

- Varian Model 3300 Gas Chromatograph
- Tekmar LSC-2000
- Tekmar ALS
- Photo Ionization Detector (PID)
- Electrolytic Conductivity Detector
- Megabore Column (J&W Brand DB-624 30 m.X0.53 mm. I.D.)

This instrument is calibrated to run EPA 601 and EPA 602 volatile compounds as stated in the Federal Register 40 CFR Part 136, Friday, October 26, 1984 by using PID and electrolytic conductivity detectors in series.

8.1.1 INITIAL METHOD VERIFICATION

A stock Q.C. check sample containing 10 ug/ml of all parameters to be analyzed will be made. Stock material for this standard will be obtained from either Supelco or Chem-Serve.

A check sample of 20 ug/L of all parameters under investigation will be made by taking 200 ul of the above standard (10ug/ml) and adding to 100 ml of reagent water. Analysis of 4, 5 ml well mixed aliquots will be performed.

The average recovery ($\bar{x}$) in ug/L and the standard deviation of the recovery (s) will be calculated. These results will be compared with the limits set forth in table 2 of 40CFR Part 136, Friday October 26, 1984, page 34.

If any individual s exceeds the precision limit, or any individual x falls outside the range for accuracy, the system performance for that paramter will be considered unacceptable.

8.1.1 INITIAL METHOD VERIFICATION (cont.)

If any parameter should fall outside the acceptable limits, then the above mentioned process for those parameters will be repeated. Should the results again fail to fall within the allowable range, the entire system will be evaluated and the entire process again repeated for all parameters.

This procedure will be performed repeatedly until acceptable limits are met. The results of the above mentioned procedures will be documented and remain on file at the laboratory. This information will be made available upon request.

8.1.2 ROUTINE CALIBRATION

Calibration is done externally. A series of three concentrations of all parameters under investigation are prepared. One concentration being near, but above the method detection limit and the other standard concentrations corresponding to the working range of the method.

Each calibration standard is analyzed and the peak area versus concentration is tabulated. These results are then used to prepare a standard curve. If the ratio of response to concentration is a constant over the working range (<10%RSD), linearity through the origin is assumed and the average calibration factor is used in place of a calibration curve.

Bromofluorobenzene is added to each sample at the instrument. This is used as an external standard. The percent recoveries are calculated using the detector response of bromofluorobenzene. The peak area of bromofluorobenzene is plotted daily to monitor the performance of the detector.

8.1.3 ROUTINE QUALITY CONTROL

On an ongoing basis, 10% of all samples will be spiked. Sample spiking will be done once monthly, should less than ten samples per month be analyzed.

The sample spike will be produced by making a Q.C. check sample as described in section 8.1.1, paragraph 1. Ten ul of this check sample will be added to 5 ml of a sample.

The percent recovery (P) will be calculated as:

$$P = \frac{100 \quad (A - B)}{T}$$

where: A = Actual spike response
B = Background response
T = Known true value response

The calculated P will be compared with those limits set forth in 40CFR Part 136, Friday, October 26, 1984, page 34.

If any individual P falls outside the designated range for recovery, that parameter has failed the acceptance criteria. A check standard containing each parameter that failed the criteria will be reanalyzed. If the recovery is found to be acceptable, then the analyst may proceed with the analysis. If found to be unacceptable, then the system will be re-evaluated and the procedure described in section 8.1.1 will be undertaken until acceptable criteria is met.

8.2 EXTRACTABLE ORGANICS

INSTRUMENTATION -

- Varian Model 3400 Gas Chromatograph
- Varian Model 8034 Auto Sampler
- Flame Ionization Detector (FID)
- Electron Capture Detector (ECD)
- Megabore Columns(2)(J&W Brand DB-5, 30M X 0.53mm I.D.)

The above instrument is set up to analyze EPA 608 Chlorinated Pesticides and PCB's, and ethylene dibromide via EPA method 514. Both Methods using the electron capture detector. The flame ionization detector will be used to analyze polynuclear aromatic hydrocarbons via EPA method 610.

8.2.1 INITIAL METHOD VERIFICATION

The initial method verification will be done as described in Section 8.1.1 of this manual and as detailed in 40 CFR Part 136, Friday, October 26, 1984, pages 89 - 104 for EPA 608 and pages 112 - 120 for EPA method 610. Data verifying this method will be kept on file and available upon request.

8.2.2 CALIBRATION

A qualitative standard of each compound under investigation will be analyzed at the beginning of every analysis. A three point calibration curve will then be run when encountering any positive detector responses of a known ccompound.

For the analysis of ethylene dibromide, external calibration will be performed at the beginning of the analysis.

8.3 ATOMIC SPECTROSCOPY DEPARTMENT

INSTRUMENTATION -

- Varian Spectra 40A - Automatic Double Beam AA
- Varian GTA-96 Graphite Furnace
- Programmable Auto Sampler
- Varian VGA-76 Automatic Vapor Generator

8.3.1 CALIBRATION

Intitial calibration is performed with a three point curve and a reagent water blank. Calibration verification is done using a mid-range standard of an alternate source. The result of this calibration verification standard (CVS), must fall within ± 10% of the true result. The calibration verification standard is then run every 10 samples. Should the CVS value fall outside the allowable limits, the ten previous samples run are rejected and the instrument is then re-calibrated with a three point curve and blank, as at the beginning of the analysis run.

A minimum of 10% of all samples are spiked prior to digestion and preparation. The spike solution and the digested spike are analyzed. The percent recovery is calculated and recorded. The recovery values will be plotted and warning limits set at 2 sigma, control limits set at 3 sigma, based on statistical analysis of data obtained in this lab. See Section 14 for examples of calculations used to calculate warning and control limits.

The above procedures are used in all metal analyses. All quality control procedures for the analysis of metals are identical.

8.4 WET CHEMISTRY

INSTRUMENTATION-

FISHER pH METER MODEL 925
METTLER ANALYTICAL BALANCE MODEL AE200
METTLER TOP LOADING BALANCE AJ3600

8.4.1 pH METER

The pH meter is calibrated before each use. The meter is standardized first with a pH 4.0 buffer solution, then sloped against a pH 10.0 buffer. The calibration is then verified with a pH 7.0 buffer.

8.4.2 BALANCES

The balances are checked daily with standard NBS class 'S' weights. The results are recorded in a laboratory log book.

8.5 TRACEABILITY OF STANDARDS

All standards that are used in the laboratory are recorded in a "Standards Log Book." All pertinent information regarding the standard is listed in this book, i.e., manufacturers serial number, lot number, date of manufacture,etc is entered. All calculations and dilutions are also entered. Each standard is given a serial number that is unique to each concentration of each parameter. By using a the "Standards Log Book" we are able to trace each standard used.

9.0 ANALYTICAL PROCEDURES

Only approved EPA Procedures will be used by ENCO Laboratories. The following is a list of parameters to be analyzed and the analytical method used.

9.1 INORGANIC ANALYSIS

Arsenic	EPA 206.2	Furnace
Barium	EPA 208.2	Furnace
Cadmium	EPA 213.2	Furnace
Chromium	EPA 218.2	Furnace
Lead	EPA 239.2	Furnace
Selenium	EPA 270.2	Furnace
Mercury	EPA 245.1	Cold Vapor
Silver	EPA 272.2	Furnace

9.2.1 VOLATILE ORGANIC ANALYSIS

Bromodichloromethane	EPA 601	ELCD*
Bromoform	EPA 601	ELCD*
Bromomethane	EPA 601	ELCD*
Carbon Tetrachloride	EPA 601	ELCD*
Chlorobenzene	EPA 601	ELCD*
Chloroethane	EPA 601	ELCD*
2-Chloroethylvinylether	EPA 601	ELCD*
Chloroform	EPA 601	ELCD*
Chloromethane	EPA 601	ELCD*
Dibromochloromethane	EPA 601	ELCD*
1,2 - Dichlorobenzene	EPA 601	ELCD*
1,3 - Dichlorobenzene	EPA 601	ELCD*
1,4 - Dichlorobenzene	EPA 601	ELCD*
Dichlorodifluoromethane	EPA 601	ELCD*

* Electrolytic conductivity detector

9.2.1 VOLATILE ORGANICS (cont.)

1,1 - Dichloroethane	EPA 601	ELCD*
1,2 - Dichloroethane	EPA 601	ELCD*
1,1 - Dichloroethene	EPA 601	ELCD*
trans-1,2 Dichloroethane	EPA 601	ELCD*
1,2 - Dichloropropane	EPA 601	ELCD*
cis-1,3-Dichloropropene	EPA 601	ELCD*
trans-1,3-Dichloropropene	EPA 601	ELCD*
Methylene Chloride	EPA 601	ELCD*
1,1,2,2-Tetrachloroethane	EPA 601	ELCD*
Tetrachloroethene	EPA 601	ELCD*
1,1,1-Trichloroethane	EPA 601	ELCD*
1,1,2-Trichloroethane	EPA 601	ELCD*
Trichloroethene	EPA 601	ELCD*
Trichlorofluoromethane	EPA 601	ELCD*
Vinyl Chloride	EPA 601	ELCD*
Benzene	EPA 602	PID**
Chlorobenzene	EPA 602	PID**
1,2-Dichlorobenzene	EPA 602	PID**
1,3-Dichlorobenzene	EPA 602	PID**
1,4-Dichlorobenzene	EPA 602	PID**
Ethylbenzene	EPA 602	PID**
Toluene	EPA 602	PID**
Methyl Tert Butyl Ether	EPA 602	PID**
Xylenes	EPA 602	PID**
Acrolein	EPA 603	FID***
Acrylonitrile	EPA 603	FID***

* Electrolytic Conductivity Detector
** Photo Ionization Detector
*** Flame Ionization Detector

9.2.2 EXTRACTABLE ORGANICS

Aldrin	EPA 608	ECD*
α - BHC	EPA 608	ECD*
β - BHC	EPA 608	ECD*
δ - BHC	EPA 608	ECD*
γ - BHC	EPA 608	ECD*
Chlordane	EPA 608	ECD*
4,4'- DDD	EPA 608	ECD*
4,4'- DDE	EPA 608	ECD*
4,4' - DDT	EPA 608	ECD*
Dieldrin	EPA 608	ECD*
Endosulfan I	EPA 608	ECD*
Endosulfan II	EPA 608	ECD*
Endosulfan Sulfate	EPA 608	ECD*
Endrin	EPA 608	ECD*
Endrin Aldehyde	EPA 608	ECD*
Heptachlor	EPA 608	ECD*
Heptachlor Epoxide	EPA 608	ECD*
Toxaphene	EPA 608	ECD*
PCB - 1016	EPA 608	ECD*
PCB - 1221	EPA 608	ECD*
PCB - 1232	EPA 608	ECD*
PCB - 1242	EPA 608	ECD*
PCB - 1248	EPA 608	ECD*
PCB - 1254	EPA 608	ECD*
PCB - 1260	EPA 608	ECD*

* Electron Capture Detector

9.2.2 EXTRACTABLE ORGANICS (cont.)

Acenaphthene	EPA 610	FID**
Acenaphthylene	EPA 610	FID**
Anthracene	EPA 610	FID**
Benzo(a)anthracene	EPA 610	FID**
Benzo(a)pyrene	EPA 610	FID**
Benzo(b)fluoranthene	EPA 610	FID**
Benzo(g,h,i)perylene	EPA 610	FID**
Benzo(k)fluoranthene	EPA 610	FID**
Chrysene	EPA 610	FID**
Dibenzo(a,h)anthracene	EPA 610	FID**
Fluoranthene	EPA 610	FID**
Fluorene	EPA 610	FID**
Indeno(1,2,3 - cd)pyrene	EPA 610	FID**
Napthalene	EPA 610	FID**
Phenanthrene	EPA 610	FID**
Pyrene	EPA 610	FID**
1 - Methyl Naphthalene	EPA 610	FID**
2 Methyl Naphthalene	EPA 610	FID**
2,4 D	EPA 615	ECD*
2,4,5 - T (Silvex)	EPA 615	ECD*
1,2 - Dibromoethane (EDB)	EPA 504	ECD*
1,2 - Dibromochloropropane	EPA 504	ECD*

* Electron Capture Detector
** Flame Ionization Detector

9.2.3 MISCELLANEOUS PARAMETERS

Acidity	EPA 305.1
Chloride	EPA 325.3
Ignitability	EPA 1010
Reactivity	SW 846
Corrosivity	EPA 1110
Total Cyanide	EPA 9010
Cyanide amendable to Chlorine	EPA 9010
Sulfide	EPA 9030
pH	EPA 150.1
Total Residue	EPA 160.3
Filterable Residue	EPA 160.1
Non-filterable Residue	EPA 160.2
Volatile Residue	EPA 160.4

10.0 DATA REDUCTION, VALIDATION AND REPORTING

The following section details the process used in data reduction, validation and final report generation.

10.1 INORGANIC ANALYSIS

A three point calibration curve is established at the start of all metals analyses. A mid-range external source is then analyzed to verify the calibration curve. Concentrations are then read directly as a function of absorbance or transmittance.

10.1.1 DILUTION

If the concentration of the analyte is such that dilution is required, the following calculation is used:

$$\text{mg/L of Metal in sample} = \frac{A\ (\ C+B\ )}{(C)}$$

where: A = mg/L of metal in diluted aliquot from calibration curve

B = ml of deionized distilled water used for dilution

C = ml of sample aliquot

10.1.2 PARTICULATES

For samples containing particulates:

$$\text{mg/L of metal in sample} = \frac{A(V)}{(C)}$$

where: A = mg/L of metal in processed sample from calibration curve

V = final volume of the processed sample in ml.

C = ml of sample aliquot processed

10.1.3 SOLIDS

For solid samples, report all concentrations as:

mg/Kg dry weight

10.1.3.1 DRY SAMPLES

$$\text{mg Metal/ Kg Sample} = \frac{A \times V}{D}$$

where: A = mg/L of metal in processed sample from calibration curve

V = final volume of the processed sample in ml

D = weight of dry sample in grams

10.1.3.2 WET SAMPLES

$$\text{mg metal/Kg sample} = \frac{A \times V}{W \times P}$$

where: A = mg/L of metal in processed sample from calibration curve

V = final volume of the processed sample in ml

W = weight of wet sample in grams

P = % solids

10.1.4 DIFFERENT INJECTION VOLUMES

If different size furnace injection volumes are used for samples than standards, the calculation is:

$$\text{mg/L of metal in sample} = Z \frac{(S)}{(U)}$$

where: Z = mg/L of metal read from calibration curve

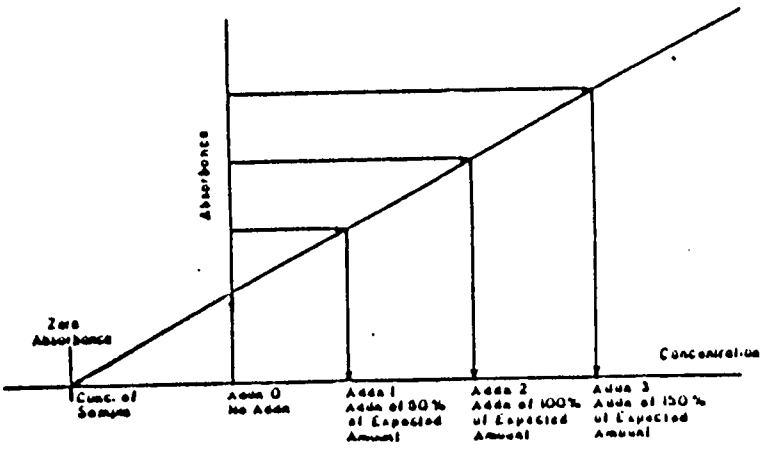
S = ml volume standard injected into furnace for calibration curve

U = ml volume of sample injected for analysis

10.1.5 METHOD OF STANDARD ADDITIONS

When the sample matrix is complex and cannot be accurately matched, the method of standard additions is used. In this method, equal volumes of sample are added to a water blank and to three standards containing different known amounts of the test element. The absorbance of each solution is determined and then plotted on the vertical axis of a graph, with the concentrations of the known standards plotted on the horizontal axis. When the resulting line is extrapolated back to zero absorbance, the point of interception on the abscissa is the concentration of the unknown. The abscissa on the left of the ordinate is scaled the same as on the right side, but in the opposite direction from the ordinate. An example of a plot of this type is given below.

FIGURE 10.1 Plot of Standard Additions



10.2 ORGANIC ANALYSES

Quanitation of organic constituents is done using a three point calibration curve. The amount of unknown present is calculated from the detector response and the calibration curve. The concentration in the sample is then determined by:

$$\text{concentration (ug/L)} = \frac{(A)(Vt)}{(Vi)Vs)}$$

where: A = amount of material injected (nanograms)

Vi = volume of extract injected (microliters)

Vt = volume of total extract (microliters)

Vs = volume of water extracted (milliliters)

10.3 DATA FLOW AND REPORTING

When a sample to be analyzed is submitted to the laboratory, it is 'logged in' and assigned a unique serial number. This number is marked on the sample container and all paper work and data generated for that sample is referenced to that unique number.

All raw data generated in the laboratory is recorded in bound notebooks; each analysis having its own notebook. A typical analysis run will have the data, analysts' initials, standards and sample I.D. number with actual raw data, dilution factors, calculations and remarks.

Each analyst will be responsible for calculating the results of their analyses. Upon completion of the calculations, including precision and accuracy, the result obtained will be entered on a bench sheet, which is unique to the sample or project. When all of the analyses requested have been completed with the appropriate quality control data entered, the data sheet will be dated, initialed and submitted for typing.

Upon completion of typing, the report and analysts' bench sheets are submitted to the laboratory manager for his approval and signature.

10.3.1 SCHEMATIC OF SAMPLE/DATA FLOW

CLIENT SUBMITS SAMPLE

|

LABORATORY
MANAGER

|

LABORATORY LOG IN

|

ANALYST

|

TYPING

|

LABORATORY
MANAGER

|

FINAL REPORT TO CLIENT

11.0 LABORATORY QUALITY CONTROL CHECKS

Quality control checks and method validation will be performed routinely. The system will be validated upon start up of each analytical procedure, ie. standards and blanks are run prior to the analysis of samples.

In addition to the start up quality control, 10% of all samples will be blanks, spikes and duplicates.

The duplicate and spike data will be recorded and plotted on quality control charts in order to determine trends. Warning limits will be set a 2 sigma and control limits at 3 sigma.

A value outside of the 2 sigma range signals the need for corrective action and a value outside of the 3 sigma range signals conditions which require that the system be shut down and corrective action be taken. No samples will be run during an out of control condition.

Calculations used in the statistical analysis of data are as follows:

Standard deviation, $S = \sqrt{\dfrac{\sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i^2/n}{n-1}}$

Range, R = (largest data point) - (smallest data point)

Average, $X = \dfrac{\sum_{i=1}^{n} x_i}{n}$

11.1 DUPLICATES

One sample in ten is duplicated for every analyses. All sample preparations, extractions, etc. are carried out and the sample is analyzed according to the standard procedures. This type of quality control checks the system for precision. Records are maintained by using precision charts for each test parameter. Records are checked routinely by the laboratory manager. See section 14.7 for calculations and examples of control charts for precision.

11.2 SPIKES

One sample in ten is dosed with the test constituent to a known value. After the sample has been spiked, it is prepared and analyzed exactly as a routine sample. This method of quality control measures the accuracy of the method. See section 14.3 for calculations and examples of control charts for accuracy.

11.3 PERFORMANCE SAMPLES

On a quarterly basis, the laboratory manager will submit a blind sample containing a known amount of an analyte into the system. Upon completion of the analysis, the report will be audited and the results discussed with the analysts involved in the data generation. This procedure will be done for all parameters routinely performed by this laboratory. Results of these in-house studies will be documented and be available upon request.

12.0 PERFORMANCE AND SYSTEM AUDITS

The laboratory manager is ultimately responsible for all data published by ENCO laboratories.

At least once per quarter the laboratory manager will submit to the system a blind Q.C. sample. Upon reciept of the results, a system audit will be performed.

This audit will include:

- validation of data
- review of quality control charts
- review of frequency of spikes, duplicates, and blanks
- verify calibration of instruments
- review frequency of which standards are made

Results of these in house audits will remain on file and be available upon request.

ENCO Laboratories routinely participates in EPA Round Robin studies in order to maintain certification. Results of these studies remain on file and are available upon request.

ENCO Laboratories welcomes any potential client or regulating agencies ie., DER, to perform on-site external system audits.

12.1 SYSTEM AUDITS

Internal audits are routinely conducted by the management of ENCO laboratories. The results of these audits are kept on file and available upon request. Some of the items reviewed during the system audits are:

- Analyses performed within the holding time?
- Proper sample container used?
- Proper preservatives?
- Analytical methodology?
- Frequency of check samples?

13.0 PREVENTATIVE MAINTENANCE

In order to minimize instrument down time, ENCO laboratories maintains on hand critical spare parts. Examples of such parts would be lamps, ignitors, columns and fuses.

In addition, ENCO laboratories is a joint venture of two businesses that maintain four independant laboratories throughout the United States. These laboratories also have on hand spare parts which are available for use at ENCO, should the need arise.

In the event that an analysis could not be done in accordance to the prescribed EPA method, the client would be contacted and the samples would be sub-contracted to another laboratory that is certified to perform the analysis in the state of Florida. This action would be noted on the final report.

13.1 ORGANICS ROUTINE MAINTENANCE

Weekly	- Replace injection port septum
Bi-weekly	- Fill solvent resevoir on ELCD detector Bake-out G.C. columns, injection ports, and detectors
500- hours	- Replace PID lamp
As needed	- replace gases Replace nickel tube in ELCD detector

13.2 INORGANIC ROUTINE MAINTENANCE

Monthly	- Clean quartz windows Clean chimney Clean graphite tube chamber
As needed	- Replace graphite tubes Replace gases

Maintenance records for all instruments are kept and will be made available upon request.

14.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

14.1 MEASURES OF VARIABILITY

14.1.1 PRECISION

Precision is the amount of reproducibility between replicate observations.

$$\frac{|\text{result A} - \text{result B}|}{\frac{(A+B)}{2}} \times 100 = \text{RPD (relative percent difference)}$$

14.1.2 ACCURACY

Accuracy refers to the degree of difference between observed and known values that are produced during an analysis.

For standards: $\frac{\text{observed value}}{\text{true value}} \times 100 = \text{accuracy as \% recovery}$

For samples: $\frac{\text{observed} - \text{background}}{\text{spiked amount}} \times 100 = \text{accuracy as \% recovery}$

14.1.3 PERCENT RELATIVE STANDARD DEVIATION

The percent relative standard deviation can also be used as a measure of precision. This value is used for any number of replicates.

$$\text{Percent Relative Standard Deviation} = \frac{\sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{(n-1)}}}{\bar{x}} \times 100$$

14.1 MEASURES OF VARIABILITY (cont.)

Ten percent of all samples are spiked in duplicate. The accuracy and precision from these results are recorded and plotted in order to document trends in the analytical method.

Precision and accuracy values are contained on each final report.

14.2 CENTRAL TENDENCY AND DISPERSION

14.2.1 ARITHMETIC MEAN

$$\text{Arithmetic mean}, \bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

14.2.2 RANGE

Range, R = | A - B |

where: A = largest observed value

B = smallest observed value

14.2.3 STANDARD DEVIATION

$$\text{Standard Deviation} = \sqrt{\frac{\sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i^2 / n}{n-1}}$$

14.2.4 CONFIDENCE LEVELS

Confidence levels are a degree of error associated with a number. The values are obtained by using the standard deviation values as explained above.

66% Confidence = $\overline{X}$ + 1s

95% Confidence = $\overline{X}$ + 1.96s

99% Confidence = $\overline{X}$ + 3s

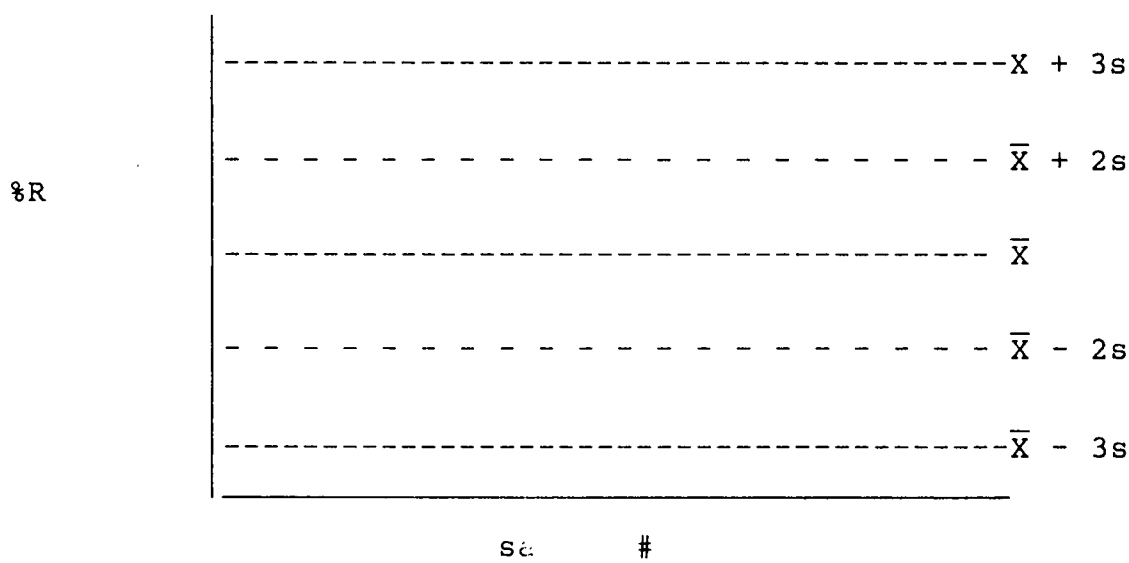
14.3 QUALITY CONTROL CHARTS FOR ACCURACY

The accuracy is plotted on a control chart by calculating the percent recovery as detailed in section 14.1.2. This value is plotted on a chart which has the warning limit of ±2 standard deviations and the control limit of ±3 standard deviations marked on it.

The system will be considered out of control if:

1. Any point is beyond the control limits
2. Seven successive points on the same. side of the X of the control chart.

FIGURE 14.1: QC Chart for Accuracy
% R v.s. sample #



14.4 QUALITY CONTROL CHARTS FOR PRECISION

The average Range, $\overline{R}$, is used to determine the control and warning limits for precision.

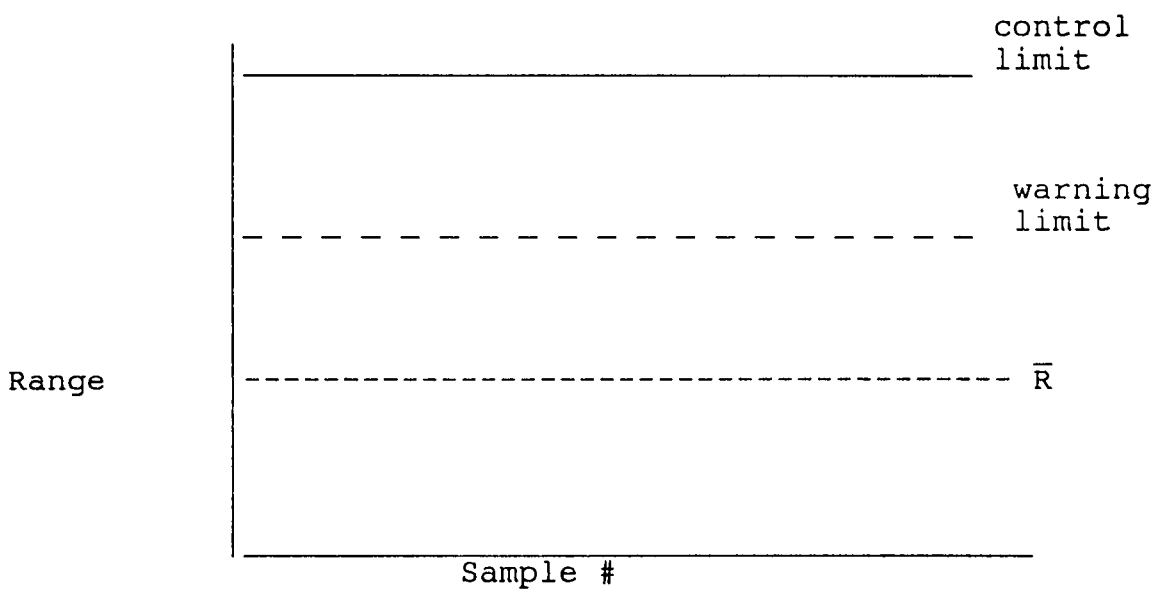
To calculate the control limit, multiply the average range by 3.27. (This figure is a constant based on the sample and its duplicate.)

$$\text{Control limit} = \frac{\sum_{i=1}^{n} |\text{Range}|}{n} \times 3.27$$

The upper warning limit corresponds to the 95% confidence level. It is calculated by multiplying the average range by the constant 2.51 (for duplicate samples).

$$\text{Warning limit} = \frac{\sum_{i=1}^{n} |\text{Range}|}{n} \times 2.51$$

FIGURE 14.1: QC Chart for Precision
Range v.s. sample #



15.0 CORRECTIVE ACTION

At the onset of any analysis, a standard curve is produces, the calibration is checked by an independent source and 10% of all samples are spiked in duplicate. This quality control work gives a firm picture of the caliber of the data being generated. During the analysis run, the calibration verification sample is run regularly. At any time during the run, when either the recovery, % difference or the calibration verification sample falls outside of the acceptable limits, all analyses preceeding the out of control check sample are rejected.

Example analysis run for a metal on a graphite furnace:

Run #	Sample I.D.
1	blank
2	5 ppb standard
3	50 ppb standard
4	100 ppb standard
5	50 ppb CVS (calibration verification sample)
6 - 15	samples 1 - 10
16	spike
17	spike duplicate
18	CVS
19	blank
20-29	samples 11-20
30	spike
31	spike duplicate
32	CVS
33	blank

Asssume the analysis of the first spike and duplicate are within the acceptable limits, but the analysis of the second set of spike and duplicates are found to be outside of the acceptable range, then the results of the analysis for samples numbered 11 through 20 would not be acceptable.

At this time the instrument would need to be re-calibrated and a re-analysis of the second spike and dup performed. Should the same results be obtained,the entire system would be re-evaluated and no further sample analysis performed until the results of the quality control samples fell within the allowable range.

15.1 CORRECTIVE ACTION FOR CONTAMINATION OF BLANKS

Laboratory blanks are run routinely in the analysis of all parameters. Should a blank show a positive response indicating contamination, the analysis is stopped and the source of the contamination is determined.

Blank contamination can come from several areas. A few of these are:

- Glassware
- Reagents
- Laboratory water
- Sample containers
- Field equipment
- Contamination picked up during transportaion.

There are several types of blanks that can identify the source of contamination. Examples of these are:

1. Equipment (Rinseate) Blank -The euipment blank is designed to address cross contamination in the field between sample sources due to deficient field cleaning procedures. This blank alsc addresses field preservation procedures, environmental site interference, integrity of the blank water for field cleaning and those concerns singularly addressed by the travel blank.

2. Field Blank - Field blanks are used to evaluate the sample container filling procedure, the effects of environmental contaminants at the site, purity of preservatives or additives and those concerns uniquely addressed by the travel blank.

3. Travel (Trip) Blanks - The travel blank is designed to address interferences derived from improper sample container cleaning preparation, contaminated source blank water, sample cross contaminationduring storage/transport, and extranoeus environmental conditions affecting the sampling event to and from the site, including delivery to the analyzing laboratory.

4. Laboratory Blanks - The laboratory blank is designed to evaluate the analytical system within the laboratory. It specifically monitors for contamination that can occur with in the lab, ie., glassware, reagents, analytical instrumention, and cross contamination.

15.1 CORRECTIVE ACTION FOR CONTAMINATION OF BLANKS (cont.)

Laboratory blanks are analyzed at a minimum of 5 % of all samples analyzed. Euipment, field and travel blanks are collected at a minimum of 5 % per parameter group per site per day.

If the source of contamination is found to be in the laboratory, the problem is corrected and all samples analyzed between the contaminated blank and the last contaminate free blank are re-analyzed.

Should contamination be found in the field, trip, or equipment blanks then all samples found to contain positive values must be re-sampled.

15.2 FAILURE OF INSTRUMENT OR METHOD TO CALIBRATE

All instruments are calibrated prior to each use. In the event that an instrument will not calibrate then the analyst will re - run the standards that were made for his standard curve. Should he again not be able to calibrate, the standards are made (diluted) again and calibration is attempted. If the instrument will again not calibrate, the system is evalutated to determine the source of the problem. No samples will be analyzed at this time.

Corrective action can be taken by any level of employee. Usually the analyst will discuss a problem with the laboratory manager and a course of action is agreed upon. Corrective action may also be initiated as a result of an audit, perfomance evaluation results, or results of an in-house blind.

ENCO laboratories welcomes any constructive criticism that will make the anaylsis of an analyte more valid and will subscribe to any corrective action deemed necessary by the DER QA Office.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

ENCO Laboratories will provide the Department of Environmental Regulation Office of Quality Assurance quarterly reports for any project requiring a site specific quality assurance plan. For short duration projects (three months or less) the laboratory will submit a final Q.A. Plan.

These reports will include:

- General assesment of measurement data, accuracy, precision and completeness .
- Results of performance audits.
- Results of system audits.
- Significant Q.A. problems and recommended solutions.
- Outcome of any corrective action.

The final report for each project will include a seperate Q.A. section which summarizes data quality information contained in the quarterly report.

These reports will be the responsibility of the laboratory manager.

17.0 RESUMES

PRESIDENT

Daniel J. McCabe

RESPONSIBILITIES

Mr. McCabe is responsible for adopting policies and the long term planning of the laboratory.

EXPERIENCE

Mr. McCabe is a registered professional engineer in the states of Ohio, Indiana and Kentucky.

He has extensive experience in the treatment of municiple and industrial wastewater, hazardous waste disposal and air pollution source sampling.

Mr. McCabe is currently acting as president of Environmental Enterprises, Inc., a hazardous waste treatment, storage and disposal company located in Cincinnati, Ohio.

Mr. McCabe is also currently serving as a consultant on hazardous waste disposal to several midwestern chemical and manufacturing concerns.

PROFESSIONAL AFFILIATIONS

Water Pollution Control Federation

Greater Cincinnati Chamber of Commerce,
Solid Waste Subcommittee

EDUCATION

B.S. Chemistry
June 1971
University of Cincinnati,Cincinnati, Ohio

M.S. Civil and Environmental Engineering
August 1972
University of Cincinnati, Cincinnati, Ohio

Graduate Studies in Business Administration
Wright State University

LABORATORY MANAGER

Jeffrey K. Richards

RESPONSIBILTIES

Mr. Richards responsibilties include the management of the laboratory on a daily basis. Mr. Richards oversees all laboratory operations and acts as a client consultant on analytical issues. Mr. Richards is ultimately responsible for the data published by the laboratory.

Mr. Richards reports directly to the president.

EXPERIENCE

Mr. Richards has participated in chemical analysis on the research level for several years. He has several years environmental experience including method development, method verification, research and quality control.

AREAS OF EXPERTISE

Computer Programming
Gas Chromatoghraphy
HPLC
Radiochemical Analyses
Biochemistry
Atomic Absorption

EDUCATION

B.S. Chemistry/ Biochemistry
April 1982
University of Pittsburgh
Pittsburgh, Pa.

ORGANIC ANALYIST

David Mix

RESPONSIBILITIES

Mr. Mix's responsibilities include management of the organic department. His responsibilties extend to the maintenance and operation of all organic instrumentation and equipment.

Mr. Mix reports directly to the laboratory manager.

EXPERIENCE

Mr. Mix has previous environmental laboratory exsperience which include supervision of extraction personnel, operation and maintenance of several gas chromatographic systems, operation of HPLC.

AREAS OF EXPERTISE

Volatile Organics Analyses
Organic Extraction Procedures
Computer Programming
HPLC

EDUCATION

B.S. Chemistry
May 1982
Penn State University
State College, Pa.

Graduate Studies in Chemistry
May 1984
Iowa State University
Ames, Ia.

INORGANIC ANALYST

James Patrick Sisk

RESPONSIBILITIES

Mr. Sisk is responsible for the operation and management of the inorganic department of the laboratory, including all metals analyses, operation and maintenance of the atomic absoprtion equipment.

Mr. Sisk reports directly to the laboratory manager.

EXPERIENCE

Mr. Sisk has been involved with chemical analysis on the quality control level for a number of years. His background includes experience in industrial, food, and pharmaceutical chemistry.

AREAS OF EXPERTISE

Computer Programming
Gas Chromatograpy
Atomic Absorption
HPLC
UV/VIS Spectroscopy
IR Spectroscopy

EDUCATION

B.A. Chemistry
minor: Math Physics
June 1983
Mercer University
Macon, Georgia

Undergraduate Studies
Georgia Institute of Technology
Atlanta, Georgia

REFERENCES

DER Guide for Preparing Quality Assurance Plans
DER- QA - 001/85 January 30, 1986

Federal Register, 40 CFR Part 136
Friday, October 26, 1984

Federal Register, Vol. 50 No. 3,
Friday, January 4, 1985

Federal Register, Vol. 51, No. 125
Monday, June 30, 1986

Federal Register, Vol. 52, No. 171
Thursday, September 3, 1987

Methods for Chemical Analysis of Water and Wastes,
EPA-600/4-79-020, Revised March 1983

Standard Methods for the Examination of Water and
Wastewater, 16th Edition 1985

Test Methods for Evaluating Solid Waste
U.S. EPA SW-846, 3rd Edition, November 1986

WADSWORTH/ALERT
LABORATORIES, INC. Route 3 - Box 235 / Bartow, FL 33830 / (813) 533-2150

Sampling, testing, mobile labs

Since 1938

WADSWORTH/ALERT LABORATORIES, INC.

GENERIC QUALITY ASSURANCE PLAN

HEADQUARTERS AND LABORATORY
P.O. Box 2912
4101 Shuffel Drive, N.W.
North Canton, OH 44720
(216) 497-9396

REGIONAL LABORATORY
P.O. Box 31454
5405 Schaaf Rd.
Cleveland, OH 44131
(216) 642-9151

REGIONAL OFFICE
1445 Pisgah Church Rd.
Lexington, SC 29072
(803) 957-8590

REGIONAL LABORATORY
Route 3 - Box 235
Bldg. 170, Bartow Airport
Bartow, FL 33830
(813) 533-2150

WADSWORTH/ALERT
LABORATORIES, INC.
Route 3 - Box 235 / Bartow, FL 33830 / (813) 533-2150
Sampling, testing, mobile labs
Since 1938

HEADQUARTERS AND
LABORATORY
P.O. Box 2912
4101 Shuffel Drive, N.W.
North Canton, OH 44720
(216) 497-9396

REGIONAL
LABORATORY
P.O. Box 31454
5405 Schaaf Rd.
Cleveland, OH 44131
(216) 642-9151

REGIONAL
OFFICE
1445 Pisgah Church Rd.
Lexington, SC 29072
(803) 957-8590

REGIONAL
LABORATORY
Route 3 - Box 235
Bldg. 170, Bartow Airport
Bartow, FL 33830
(813) 533-2150

TABLE OF CONTENTS

1.0 Introduction, Objectives, and Policies
- 1.1 Introduction - Not Used
- 1.2 Objectives and Policies

2.0 Project Description - Not Used

3.0 Laboratory Responsibility and Organization
- 3.1 Laboratory Operations Director
- 3.2 Technical Director
- 3.3 Sample Custodians
- 3.4 Analytical Group Coordinators
- 3.5 QC Manager
- 3.6 Analysts

4.0 Quality Assurance Objectives for Measurement Data in Terms of Precision, Accuracy, and Completeness
- 4.1 Sampling Procedures

5.0 Sample Custody
- 5.1 Field Operations
- 5.2 Laboratory Operations

6.0 Not Used

7.0 Calibration Procedures and Frequency
- 7.1 Not Used
- 7.2 Laboratory Instruments
- 7.3 Measurement Equipment, Glassware, Water, Reagents, and Industrial Gases

8.0 Analytical Procedures
- 8.1 Sample Receipt
- 8.2 Sample Preparation
- 8.3 Equipment Startup and Performance Check
- 8.4 Detection Limits
- 8.5 Not Used
- 8.6 Initial and Continuous Calibration
- 8.7 Analytical Methods
- 8.8 Analyses of QC Samples

9.0 Internal Quality Control Checks
- 9.1 Not Used
- 9.2 Analytical Quality Control Procedures
  - 9.2.1 Data Quality

10.0 Data Reduction, Validation, and Reporting
- 10.1 Not Used
- 10.2 Laboratory
  - 10.2.1 Data Reduction Methods
  - 10.2.2 Data Validation Criteria

11.0 Performance and Systems Audits
- 11.1 External Laboratory Certifications, Audits, and Approvals
- 11.2 Voluntary Intralaboratory Performance Evaluations
- 11.3 Internal Performance Evaluations

12.0 Preventative Maintenance
- 12.1 Field Instruments and Equipment - Not Used
- 12.2 Laboratory Instruments and Equipments
  - 12.2.1 Operator Training
  - 12.2.2 Routine Maintenance Procedures
  - 12.2.3 Instrument Downtime

13.0 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

14.0 Corrective Action
- 14.1 Not Used
- 14.2 Laboratory
  - 14.2.1 Determination of the Need for Corrective Action
  - 14.2.2 Procedures for Corrective Action

15.0 Quality Assurance Reports to Management
- 15.1 Internal QA Reports
- 15.2 Project Reports

FIGURES & TABLES

Lists of Figures

Figure 3-1	Laboratory Organization - North Canton
Figure 3-2	Laboratory Organization - Mobile Laboratory
Figure 5-1	Not Used
Figure 5-2	Not Used
Figure 5-3	Not Used
Figure 5-4	Laboratory Sample Log
Figure 10-1	Laboratory Worksheets
Figure 10-2	Laboratory Method Logbook
Figure 10-3	Laboratory Instrument Logbook
Figure 10-4	Laboratory Chromatography Data File

FIGURES & TABLES (CONTINUED)

Lists of Figures

Figure 10-5 Laboratory Processed Data Logbooks
Figure 10-6 Laboratory Quality Control Data Log

Lists of Tables

Table 4-1 Accuracy, Precision, and Completeness Objectives for Measurement Data
Table 4-2 Laboratory Sample Preservation Summary
Table 7-1 Instrument Calibration Procedures
Table 7-2 Laboratory Major Analytical Instrumentation
Table 8-1 Laboratory Analytical Methods Summary
Table 8-2 Laboratory Detection Limits Summary

APPENDICES

Appendix 1 Resumes of Key Project Personnel

Appendix 2 Key to Figures: Section 10

Appendix 3 Wadsworth/ALERT Laboratories Waste Compatibility and Consolidation Scheme

1.0 Introduction, Objectives and Policies

1.1 Introduction

Wadsworth/ALERT Laboratories is an independent testing laboratory organized to deliver comprehensive, reliable analytical services to its clients in a responsive, complete manner. Founded in 1938, Wadsworth/ALERT Laboratories has been a leading independent testing laboratory for over 50 years. The main laboratories and headquarters are located in North Canton, Ohio; with additional facilities in Cleveland, Ohio; Lexington, South Carolina; and Bartow, Florida.

Wadsworth/ALERT Laboratories offers conventional and mobile laboratory services with particular emphasis on providing full-service analytical capabilities for a wide spectrum of environmental programs. Both the fixed and mobile laboratories utilize state-of-the-art equipment, strict adherence to accepted methods and strenuous quality control procedures to maintain the responsiveness and quality demanded by current technology. The laboratory maintains a number of analytical programs designed to fulfill the needs of its clients in the technical aspects of environmental control and regulatory compliance. These analytical programs include:

CERCLA-ENVIRONMENTAL ASSESSMENTS AND RESTORATIONS

- Contamination Profiles and Assessments
  - Groundwater Monitoring/Surface Water Evaluations
    - Complete Analytical Characterizations
      - Organic
        - Priority Pollutants - Volatiles and Semi-Volatiles
        - Hazardous Substance List (HSL) Parameters
        - Appendix VII, IX Constituents
        - Herbicides, Pesticides, PCB's
        - Trihalomethanes (THM's)
      - Inorganic
        - Priority Pollutants - Phenols, Cyanide
        - Metals
  - Soil/Sediment, Subsurface Investigations
    - Complete Analytical Characterizations (as above)
- Surface Surveys and Investigations
  - Wipes, Scrapes, Swabs, Swipes, Smears, etc.
- Restoration Project Monitoring and Evaluations
  - Clean-up Monitoring and Evaluation
  - Treatment System Evaluation and Monitoring
  - Compliance Monitoring and Evaluation
    - Quality Control Verification
    - Long-term Compliance Verification

RCRA-INDUSTRIAL WASTE MANAGEMENT

- Hazardous Waste Analysis
  - Characteristic Waste Parameters
    - Ignitability
    - Reactivity
    - Corrosivity
    - EP Toxicity, TCLP
- Hazardous Waste Analysis
  - Waste Materials Profile Analysis
    - Descriptive Properties
    - Physical Properties
    - Disposal Parameters
    - Chemical Composition
      - Organic Constituents
      - Inorganic, Non-Metallic Constituents
      - Metals
  - Groundwater Monitoring
  - Quarterly Monitoring Parameters
    - Suitability, Quality, and Contamination Parameters
    - Radioactivity
  - Complete Analytical Characterizations
    - Appendix VII, IX Analysis
- Delisting Petitions
  - Lagoon, Pile, Sludge Pond, Waste Stream Characterizations

TSCA SURVEYS

- PCB Surveys
  - Environmental Surveys
    - Air, Water, Soil
  - Waste/Product Surveys
    - Oils, Fluids, Waxes, Sludges

NPDES-INDUSTRIAL PRETREATMENT

- Permitting, Compliance Monitoring and Evaluation
  - Water, Wastewater & Industrial Effluent Analysis
    - EPA Form 2C Analysis
      - Parts A, B, & C
      - Complete Analytical Characterizations

SDWA-DRINKING WATER

Compliance Monitoring and Evaluation
- Regulated Parameters
  - Herbicides, Pesticides
  - Trihalomethanes (THM's)
  - Metals
- Complete Analytical Characterizations

Treatment System Monitoring and Evaluation

1.2 Objectives and Polices

The objective of Wadsworth/ALERT Laboratories' Quality Assurance/Quality Control Program is to provide legally and scientifically valid laboratory services. This QA/QC program directs organizational adherence to a system of mandatory operating practices and procedures which ensure that all generated laboratory data are scientifically correct, legally defensible and fulfilling of applicable regulatory requirements. These component QA/QC operating procedures involve both technical and evidentiary aspects of all Wadsworth/ALERT Laboratories sampling and analytical services, including mobile laboratory operations. These procedures are documented in the Laboratory QA/QC manual, which is available for inspection at the laboratory.

Wadsworth/ALERT Laboratories' QA/QC program contains component Sampling and Analytical Quality Control Programs. The Sampling QC Program combines appropriate technical sample collection, preservation and transport considerations with evidentiary documentation and chain-of-custody possesstion requirements. The Analytical QC Program provides a system of standard operating procedures which maintain high quality standards of operation throughout all laboratory analytical activities. In addition, this Analytical QC Program provides continuous, documented surveillance and evaluation of acceptable analytical method performance through the systematic insertion of various quality control samples intor at least 10% of all laboratory analyses.

For the purpose of this document, the term Laboratory refers to Wadsworth/ALERT Laboratories and mobile operations refers to the mobile on-site laboratories operated by Wadsworth/ALERT Laboratories.

2.0 Project Description - Not Used

3.0 Laboratory Responsibility and Organization

The general responsibilities of key personnel with respect to QA/QC are as follows: (see Figures 3-1 and 3-2)

3.1 Laboratory Operations Director

The Laboratory Operations Director's duties and responsibilities include the following:

- Direct the laboratory's analytical programs, including mobile laboratory activities.
- Coordinate projects and associated workloads.
- Execute laboratory administrative functions.
- Ensure compliance with appropriate analytical method and instrument performance specifications (see Section 7 and 8).

The Laboratory Operations Director reports to the Corporate President.

3.2 Technical Director

The Laboratory Technical Director establishes and directs all activities (including mobile laboratory operations) relating to analytical QA/QC, and represents the organization accordingly. The Technical Director reports to the Corporate President.

3.3 Sample Custodians

The Sample Custodians' duties and responsibilities include the following:

- Ensure that all submitted samples are properly accepted into the laboratory in accordance with documented sample acceptance procedures (see Section 5.13).
- Ensures that associated sample acceptance data is entered into the laboratory data management systems (see Section 5.13).
- Arrange proper secure sample storage (see Section 5.13).

The Sample Custodian reports to the Laboratory Operations Director. The mobile laboratory Sample Custodian designee assumes on-site custodian duties and reports to the Laboratory Sample Custodian.

3.4 Analytical Group Coordinators

The Analytical Group Coordinators' duties and responsibilities include the following:

- Implement and supervise all analytical activities pertaining to their respective analytical groups (GC, GC/MS, Inorganics).

- Implement and supervise analytical programs.

- Coordinate projects and workloads.

- Review raw data and analytical results (see Section 7 and 8).

The Analytical Group Coordinator reports to the Laboratory Operations Director. The mobile laboratory GC Group Coordinator designee assumes on-site coordinator responsibilities and reports to the laboratory GC Group Coordinator.

3.5 QC Manager

The Laboratory QC Manager implements, supervises, and evaluates QC functions pertaining to all laboratory analytical operations, including mobile laboratory analyses. Primary duties include the following:

- Implement, supervise, and evaluate Internal Quality Control Checks (see Section 9).

- Administers and evaluates Performance and System Audits (see Section 11).

- Assesses data precision, accuracy, and completeness (see Section 13).

- Enforces corrective action measures (see Section 14).

The Laboratory QC Manager reports to the Technical Director. The mobile laboratory QC designee assumes the on-site QC duties and reports to the Laboratory QC Manager.

3.6 Analysts

Analysts' duties and responsibilities include the following:

- Equipment maintenance (see Section 12.0)

- Equipment calibration (see Section 7.0)

- Sample extraction and analysis (see Section 8.0)

- Raw data manipulation and reporting (see Section 10.0)

- Inclusion of appropriate QC samples and considerations into all laboratory operations (see Section 9.0)

Analysts report to their respective Analytical Group Coordinator. Mobile laboratory analysts report to the Mobile Laboratory GC Group Coordinator designee.

FIGURE 3-1
WADSWORTH/ALERT LABORATORIES

ORGANIZATIONAL CHART

NORTH CANTON, OHIO

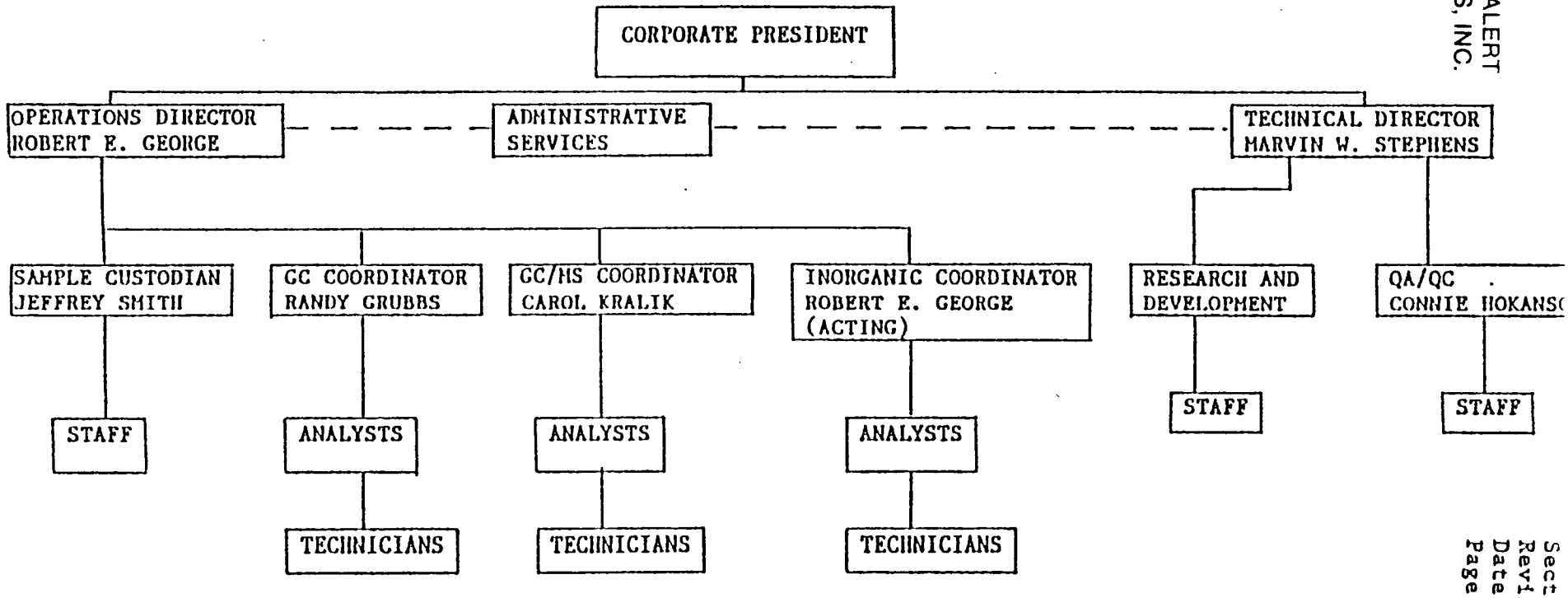
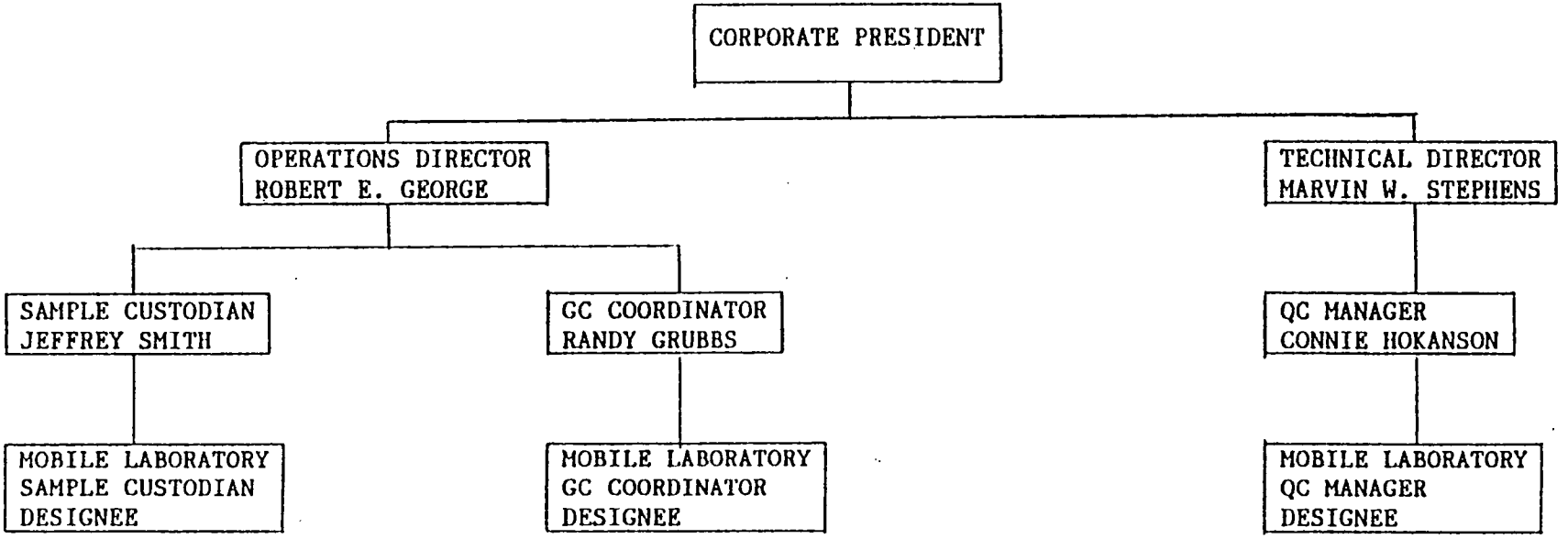


FIGURE 3-2

WADSWORTH/ALERT LABORATORIES, INC.
ORGANIZATIONAL CHART
MOBILE LABORATORY



4.0 Quality Assurance Objectives for Measurement Data in Terms of Precision, Accuracy, and Completeness

The objectives of Wadsworth/ALERT's Laboratory Quality Assurance Program are to provide legally and scientifically valid laboratory services which maintain acceptable analytical accuracy, precision, and completeness. These terms are defined as follows:

ACCURACY - The difference between the mean of a set of results and the true or correct value. The absolute accuracy is the difference between the mean and the true value, and the relative accuracy is the absolute accuracy divided by the true value. Relative accuracy is commonly expressed as percent accuracy.

PRECISION - The reproducibility of measurements within a set expressed as percent variance from a true value.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system.

The accuracy, precision, and completeness objectives are summarized in Table 4-1 - Accuracy, Precision, and Completeness Objectives for Measurement Data. The accuracy and precision control objectives are derived from published EPA method control limits (see Section 8). In absence of published EPA method guidance, project analytical objectives are derived from both initial and continuous method performance evaluations (see Section 10), if applicable. The listed objectives are representative for all project sample matrices and the conditions being measured.

The accuracy and precision measurements will be monitored by comparing the results of each spike and spike duplicate recovery to the appropriate objective. The quality control chart for each parameter will be reviewed to assure the completeness objective.

TABLE 4-1 - ACCURACY, PRECISION, AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA

VOLATILES

Parameter	Accuracy %		Precision %		Completeness
	GC	GC/MS	GC	GC/MS	
Acrolein	88-118	NA	20	NA	90%
Acrylonitrile	71-135	NA	20	NA	90%
Benzene	39-150	37-151	20	22	90%
Bromodichloromethane	42-172	35-155	23	21	90%
Bromoform	13-159	45-169	22	21	90%
Bromomethane	D-144	D-242	28	58	90%
Carbon tetrachloride	43-143	70-140	20	12	90%
Chlorobenzene	38-150	37-160	19	24	90%
Chlorobromomethane	NA	NA	NA	NA	NA
Chloroethane	46-137	14-230	17	36	90%
2-Chloroethyl vinyl ether	14-186	D-305	35	84	90%
Chloroform	49-133	51-138	18	17	90%
Chloromethane	D-193	D-273	41	59	90%
Dibromochloromethane	24-191	53-149	24	18	90%
Dibromochloropropane	NA	NA	NA	NA	NA
Dichlorobromomethane	42-172	35-155	22	19	90%
1,1-Dichloroethane	47-132	59-155	14	16	90%
1,1-Dichloroethane	28-167	D-234	28	48	90%
1,2-Dichloroethane	51-147	49-155	16	21	90%
t-1,2-Dichloroethene	38-155	54-156	18	20	90%
1,2-Dichloropropane	44-156	D-210	23	45	90%
c-1,3-Dichloropropene	22-178	D-227	32	52	90%
t-1,3-Dichloropropene	22-178	17-183	32	34	90%
Ethylbenzene	32-160	37-162	25	24	90%
Ethylene dibromide	NA	NA	NA	NA	NA
Methylene chloride	25-162	D-221	20	32	90%
Styrene	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	8-184	46-157	25	19	90%
Tetrachloroethane	26-162	64-148	19	17	90%
Toluene	46-148	47-150	18	20	90%
1,1,1-Trichloroethane	41-138	52-162	18	22	90%
1,1,2-Trichloroethane	39-136	52-150	17	17	90%
Trichloroethene	35-146	71-157	20	13	90%
Trichlorofluoromethane	21-156	17-181	24	34	90%
Vinyl chloride	28-163	D-251	26	65	90%
Xylenes	NA	NA	NA	NA	NA

TABLE 4-1 - ACCURACY, PRECISION, AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA (CONT.)

PESTICIDES/PCB'S

Parameter	Accuracy %	Precision %	Completeness
Aldrin	42-122	16	90%
a-BHC	37-134	19	90%
b-BHC	17-147	27	90%
g-BHC (Lindane)	32-127	20	90%
d-BHC	19-140	18	90%
Chlordane	45-119	15	90%
4,4'-DDD	31-141	23	90%
4,4'-DDE	30-145	24	90%
4,4'-DDT	25-160	29	90%
Dieldrin	36-146	15	90%
Endosulfan I	45-153	18	90%
Endosulfan II	D-202	44	90%
Endosulfan Sulfate	26-144	21	90%
Endrin	30-147	22	90%
Heptachlor	34-111	11	90%
Heptachlor epoxide	37-142	22	90%
Methoxychlor	56-137	23	90%
Toxaphene	41-126	17	90%
PCB-1016	50-114	13	90%
PCB-1221	15-178	33	90%
PCB-1232	10-215	35	90%
PCB-1242	39-150	21	90%
PCB-1248	38-158	24	90%
PCB-1254	29-131	17	90%
PCB-1260	8-127	22	90%

TABLE 4-1 - ACCURACY, PRECISION, AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA (CONT.)

BASE/NEUTRAL EXTRACTABLE ORGANICS

Parameter	Accuracy %		Precision %		Completeness
	GC	GC/MS	GC	GC/MS	
Acenaphthene	D-124	47-145	29	20	90%
Acenaphthylene	D-139	33-145	28	30	90%
Anthracene	D-126	27-133	25	21	90%
Benzidine	D-140	NA	28	NA	NA
Benzo(a)anthracene	12-135	33-143	25	22	90%
Benzo(b)fluoranthene	6-150	24-159	39	27	90%
Benzo(k)fluoranthene	D-159	11-162	41	30	90%
Benzo(ghi)perylene	D-116	D-219	26	49	90%
Benzo(a)pyrene	D-128	17-163	30	30	90%
Bis(2-chloroethoxy)methane	12-128	33-184	24	30	90%
Bis(2-chloroethyl)ether	11-152	12-158	29	30	90%
Bis(2-chloroisopropyl)ether	9-165	36-166	40	26	90%
Bis(2-ethylhexyl)phthalate	D-158	8-158	32	31	90%
4-Bromophenyl phenyl ether	D-189	53-127	41	15	90%
Butyl benzyl phthalate	30-136	D-152	21	35	90%
2-Chloronaphthalene	9-148	60-118	28	12	90%
4-Chlorophenyl phenyl ether	D-170	25-158	35	27	90%
Chrysene	D-199	17-168	51	30	90%
Dibenzo(a,h)anthracene	D-110	D-227	18	55	90%
Di-n-butyl phthalate	23-136	1-118	23	24	90%
1,2-Dichlorobenzene	9-160	32-129	30	20	90%
1,3-Dichlorobenzene	D-150	D-172	32	35	90%
1,4-Dichlorobenzene	13-137	20-124	26	21	90%
3,3'-Dichlorobenzidine	5-128	D-262	25	48	90%
Diethyl phthalate	D-149	D-114	32	23	90%
Dimethyl phthalate	D-156	D-112	32	21	90%
2,4-Dinitrotoluene	6-125	39-139	24	20	90%
2,6-Dinitrotoluene	8-126	50-158	24	20	90%
Di-n-octyl phthalate	D-114	4-146	22	29	90%
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA
Fluoranthene	14-123	26-137	22	22	90%
Fluorene	D-142	59-121	34	12	90%
Hexachlorobenzene	15-159	D-152	31	32	90%
Hexachlorobutadiene	D-139	24-116	32	19	90%
Hexachlorocyclopentadiene	D-111	NA	24	NA	NA
Hexachloroethane	8-139	40-113	27	13	90%
Indeno(1,2,3cd)pyrene	D-116	D-171	23	38	90%
Isophorone	D-117	21-196	24	38	90%
Naphthalene	D-122	21-133	24	23	90%

TABLE 4-1 - ACCURACY, PRECISION AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA (CONT.)

BASE/NEUTRAL EXTRACTABLE ORGANICS (CONT.)

Parameter	Accuracy %		Precision %		Completeness
	GC	GC/MS	GC	GC/MS	
Nitrobenzene	6-118	35-180	22	29	90%
N-Nitrosodimethylamine	13-109	NA	27	NA	NA
N-Nitrosodiphenylamine	D-139	NA	20	NA	90%
N-Nitroso-di-n-propylamine	45-146	D-230	29	47	90%
Phenanthrene	D-155	54-120	33	13	90%
Pyrene	D-140	52-115	29	13	90%
1,2,4-Trichlorobenzene	5-149	44-142	30	20	90%

ACID EXTRACTABLE ORGANICS

Parameter	Accuracy %		Precision %		Completeness
	GC	GC/MS	GC	GC/MS	
4-Chloro-3-methylphenol	99-122	22-147	15	26	90%
2-Chlorophenol	38-126	23-134	18	23	90%
2,4-Dichlorophenol	44-119	39-135	15	20	90%
2,4-Dimethylphenol	24-118	32-119	16	18	90%
2,4-Dinitrophenol	12-145	D-191	27	53	90%
2-Methyl-4,6-dinitrophenol	30-136	D-181	22	43	90%
2-Nitrophenol	43-117	29-182	15	31	90%
4-Nitrophenol	13-110	D-132	13	30	90%
Pentachlorophenol	36-134	14-176	20	33	90%
Phenol	23-108	5-112	8	16	90%
2,4,6-Trichlorophenol	53-119	37-144	13	22	90%

TABLE 4-1 - ACCURACY, PRECISION, AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA (CONT.)

METALS

Parameter	Accuracy %	Precision %	Completeness
Aluminum	97-105	20	90%
Antimony	NA	NA	NA
Arsenic	61-137	20	90%
Barium	83-115	20	90%
Beryllium	NA	NA	NA
Cadmium	75-115	20	90%
Calcium	96-104	20	90%
Chromium	73-117	20	90%
Copper	82-110	20	90%
Iron	73-108	20	90%
Lead	62-126	20	90%
Magnesium	82-111	20	90%
Manganese	88-112	20	90%
Mercury	80-120	20	90%
Nickel	79-111	20	90%
Osmium	NA	NA	NA
Potassium	86-118	20	90%
Selenium	50-130	20	90%
Silver	84-108	20	90%
Sodium	84-112	20	90%
Strontium	86-104	20	90%
Thallium	NA	NA	NA
Tin	NA	NA	NA
Vanadium	NA	NA	NA
Zinc	84-120	20	90

TABLE 4-1 - ACCURACY, PRECISION, AND COMPLETENESS OBJECTIVES FOR MEASUREMENT DATA (CONT.)

INORGANIC PARAMETERS

Parameter	Accuracy %	Precision %	Completeness
Ammonia	87-115		
Bromide	90-114		
Chloride	95-105		
Chemical Oxygen Demand	88-112		
Cyanide	84-108		
Fluoride	82-114		
Hardness	97-101		
Nitrate	83-119	NA	NA
Oil and Grease	NA		
pH	NA	NA	NA
Phenols	70-122		
Phosphates	86-110		
Sulfates	8-112		
Total Residue			
Total Filterable Residue			
Total Non-Filterable Residue			
Volatile Residue			
Specific Conductance	NA	NA	NA

Any analysis which is not performed by Wadsworth/ALERT Laboratories shall be performed by a certified subcontractor.

4.2 Sampling Procedures

4.2.1 Sample Collection Procedures

Wadsworth/ALERT Laboratories will utilize the USEPA-approved and/or proposed sample collection methods and equipment outlined in the following technical publications:

EPA/SW-846, "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," Third Edition, USEPA, 1986.

EPA/600/2-80-018, "Samples and Sampling Procedures for Hazardous Waste Streams."

EPA 600/4-84-076, "Characterization of Hazardous Waste Sites - A Methods Manual, Volume II: Available Sampling Methods," December 1984.

U.S. Army Corps of Engineers, "Interim Standard Air Monitoring Guide for Hazardous Waste Sites," June 1984.

EPA/SW-611, "Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities".

EPA 600/4-83-020, "Preparation of Solid Sampling Protocol: Techniques and Strategies," May 1983.

EPA 600/4-82-029, "Handbook for Sampling and Sample Preservation of Water and Wastewater," September 1982.

EPA Region IV Engineering Support Branch, "Standard Operating Procedures and Quality Assurance Manual," April 1986.

Specific guidelines for a project for sample site selection, selection of sampling equipment, types of samples to be collected, standard sample collection procedures, specific maintenance and calibration procedures for sampling equipment, and other considerations are based upon site-specific requirements.

4.2.2 Selection and Preparation of Sampling Equipment

The material of which sampling equipment is constructed can affect analytical results. The material selected for sampling certain parameters must not contaminate or alter the sample being collected, and must be easily cleaned so that samples are not cross-contaminated. Also, the action of the sampling device must not alter the sample being collected (e.g., using an air-lift pump for volatiles in water may purge the compounds of interest).

Wadsworth/ALERT sampling personnel select equipment based upon the medium and parameters being sampled following the guidance documents listed in section 4.2.1. All sampling equipment is prepared following the specifications of the guidance documents in section 4.2.1. Any deviation from standard procedures must be documented and reported to the Sample Procurement Manager.

4.2.3 Sample Containers, Preservatives and Holding Times

Wadsworth/ALERT Laboratories recognize that proper containers and approporiate preservatives are necessary for the collection of valid samples. In addition, the sample must be analyzed within a prescribed time frame for each parameter. The Laboratory Sample Preservation Summary (Table 4-1) details permissible sample containers, preservatives, holding times and the volume of sample needed. The requirements of this table correspond with the guidelines of the documents listed in section 4.2.1.

4.2.4 Sample Documentation

Wadsworth/ALERT Laboratories will utilize proper sample documentation measures to record pertinent field data and ensure the legal validity of all collected samples. These sample documentation measures will provide a detailed, legal record of all sampling activities including: sample collection, preservation, chain-of-custody possession, transportation and laboratory submittal. Key component sample documentation measures include utilization of the following record materials: Laboratory Field Sample Logbooks, Sample Labels, Sample Seals, Chain-of-Custody Forms and Laboratory Sample Log. These are described in section 5, Sample Custody.

4.2.5 Sample Collection Quality Control Procedures

4.2.5.1 Experience Requirements

All Wadsworth/ALERT Laboratories professionals and technicians must have at least six months field experience before conducting sampling programs without supervision. Each new field employee will accompany a qualified trainer on different types of field studies. During this training period, the employee receives instruction in sample site selection, selection and preparation of equipment and materials, sample collection for various media, preservation, documentation, packing and shipment.

4.2.5.2 Traceability Requirements

All sample collection activities shall be traceable, through field records, to the person collecting the sample and to the specific piece of sampling equipment utilized to collect that sample (where appropriate). In a similar fashion, all maintenance and calibration records for sampling equipment shall be kept so that they, too, are traceable.

4.2.5.3 Measurement of Sample Preservation, Sample Container, and Sample Equipment Integrity

To check on the integrity of the chemicals and techniques used to preserve samples in the field, a blank of deionized water will be transported to the field for each preservative used. The specific type of preservative used shall be added to the deionized water using the same preservation techniques used on the required sample. The preserved blank will be submitted for the same analyses as the required sample. Preservation blanks will be submitted on all large scale and enforcement investigations for each preservative used. Preservation blanks shall be submitted by each field investigator at least quarterly for other types of routine field investigations.

Only containers that have been properly prepared according to specific types of samples are used for sample collection. To ensure the integrity of containers, a representative container of each type (plastic and glass) will be filled with deoinized water, carried into the field, and returned without preservatives. The analyses typically run on samples stored in these containers shall then be performed. This quality assurance procedure shall be performed at least once per quarter.

Preserved and unpreserved volatile organic compound (VOC) blanks will be supplied for each investigation where VOCs will be collected. These blanks will be carried into the field, treated as regular VOC samples, and submitted for VOC analyses along with the required samples.

The sampler will log all sample container preservative and sample equipment blank data. Any problems noted with specific equipment, preservatives or personnel will be promptly reported to the Sample Procurement Manager so that corrective action can be initiated.

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Bacteriological				
Coliform, fecal and total	P,G	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	6 hours	250 ml
Fecal streptococci	P,G	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	6 hours	250 ml
Physical Properties				
Color	P,G	Cool, 4°C	48 hours	500 ml
Hardness	P,G	HNO_3 to pH 2	6 months	150 ml
Hydrogen ion (pH)	P,G	None required	Analyze immediately	NA
Residue, total	P,G	Cool, 4°C	7 days	250 ml
Residue, filterable	P,G	Cool, 4°C	7 days	250 ml
Residue, non-filterable (TSS)	P,G	Cool, 4°C	7 days	250 ml
Residue, settleable	P,G	Cool, 4°C	48 hours	250 ml
Residue, volatile	P,G	Cool, 4°C	7 days	250 ml
Specific conductance	P,G	Cool, 4°C	28 days	250 ml
Temperature	P,G	None required	Analyze immediately	NA
Turbidity	P,G	Cool, 4°C	48 hours	500 ml

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Parameter	Container[1]	Preservatives[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Inorganic Non-Metallics				
Acidity	P,G	Cool, 4°C	14 days	1 L
Alkalinity	P,G	Cool, 4°C	14 days	1 L
Ammonia	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days	1 L
Bromide	P,G	None required	28 days	150 ml
Chloride	P,G	None required	28 days	250 ml
Chlorine, total residual	P,G	None required	Analyze immediately	1 L
Cyanide, total and amenable to chlorination	P,G	Cool, 4°C NaOH to pH 12 0.6g ascorbic acid[6]	14 days[9]	1 L
Fluoride	P	None required	28 days	1 L
Kjeldahl and organic Nitrogen	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days	1 L
Nitrate	P,G	Cool, 4°C	48 hours	250 ml
Nitrate-Nitrite	P,G	Cool, 4°C	28 days	250 ml
Nitrite	P,G	Cool, 4°C	48 hours	250 ml

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Parameter	Container[1]	Preservatives[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Orthophosphate	P,G	Filter immediately	48 hours	1 L
Oxygen, dissolved-probe	G, bottle and top	None required	Analyze immediately	NA
Oxygen, dissolved Winkler	G, bottle and top	Fix on site with H_2SO_4/NaN_2 and store in dark	8 hours	300 ml
Phosphorus, elemental	G	Cool, 4°C	48 hours	1 L
Phosphorus, total	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days	250 ml
Silica	P,G	Cool, 4°C	28 days	250 ml
Sulfate	P,G	Cool, 4°C	28 days	500 ml
Sulfide	P,G	Cool, 4°C, add zinc acetate plus sodium hydroxide to pH 9	28 days	100 ml
Sulfite	P,G	Cool, 4°C	Analyze immediately	250 ml
Surfactants (LAS)	P,G	Cool, 4°C	48 hours	1 L
Metals				
Chromium VI[4]	P,G	Cool, 4°C	24 hours	250 ml
Mercury[4]	P,G	HNO_3 to pH 2	28 days	250 ml
Metals, except above	P,G	HNO_3 to pH 2	6 months	1 L

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Organic[5]				
Purgeable halocarbons	G, Teflon lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	14 days	2 x 40 ml
Purgeable aromatics	G, Teflon lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	14 days	2 x 40 ml
Acrolein and acrylonitrile	G, Teflon lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$[6] adjust pH to 4-5[11]	14 days	2 x 40 ml
Phenols/GC	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction	1 L
Chlorinated hydrocarbons	G, Teflon lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L
TCDD	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction	1 L
Benzidines	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction	1 L

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Phthalate esters	G, Teflon lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L
Nitrosamines[7]	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6]	7 days until extraction, 40 days after extraction	1 L
PCB's	G, Teflon lined cap	Cool, 4°C pH 5-9[8]	7 days until extraction, 40 days after extraction	1 L
Nitroaromatics and Isophorone	G, Teflon lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L
Polynuclear aromatic hydrocarbons	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6] store in dark	7 days until extraction, 40 days after extraction	1 L
Haloethers	G, Teflon lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$[6] store in dark	7 days until extraction, 40 days after extraction	1 L
Pesticides	G, Teflon lined cap	Cool, 4°C pH 5-9[8]	7 days until extraction, 40 days after extraction	1 L

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Parameter	Container[1]	Preservative[2,12]	Maximum Holding Time[3]	Amount of Sample Required
Radiological				
Alpha, beta and radium	P,G	HNO_3 to pH 2	6 months	1 L
Other Organic				
Biochemical oxygen demand	P,G	Cool, 4°C	48 hours	1 L
Biochemical oxygen demand, carbonaceous	P,G	Cool, 4°C	48 hours	1 L
Chemical oxygen demand	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days	250 ml
Oil and grease	P,G	Cool, 4°C HCl or H_2SO_4 to pH 2	28 days	1 L
Organic carbon	P,G	Cool, 4°C	28 days	1 L
Phenols	G only	Cool, 4°C H_2SO_4 to pH 2	28 days	1 L

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

1. Polyethylene (P) or Glass (G).

2. Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then sample may be preserved by maintaining 4°C until compositing and sample splitting is completed.

3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee or monitoring laboratory has data on file to show that the specific types of samples under study are stable for the longer time. Some samples may not be stable for the maximum time period listed in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

4. Samples should be filtered immediately on-site before adding preservative for dissolved metals.

5. Guidance applies to samples to be analyzed by GC, LC or GC/MS for specific compounds.

6. Should only be used in the presence of residual chlorine.

7. For the analysis of diphenylnitrosamine, add 0.008% sodium sulfate[6] and adjust pH to 7-10 with Sodium hydroxide within 24 hours of sampling.

8. The pH adjustment may be performed upon receipt at the laboratory and may be omitted if samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% Sodium sulfate.

9. Maximum holding time is 24 hours when sulfide is present.

10. Samples receiving no pH adjustment must be analyzed within seven days of sampling.

11. Sample for acrolein receiving no pH adjustment must be analyzed within three days of sampling.

12. When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation.

TABLE 4-2 - LABORATORY SAMPLE PRESERVATION SUMMARY (CONT.)

Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid in water solutions at concentrations of 0.04% by weight or less (pH approximately 1.96 or greater); Nitric acid in water solutions at concentrations of 0.15% by weight or less (pH approximately 1.62 or greater); Sulfuric acid in water solutions at concentrations of 0.35% by weight or less (pH approximately 1.15 or greater); and Sodium hydroxide in water solutions at concentrations of 0.08% by weight or less (pH approximately 12.30 or less).

Reference: Handbook for Sampling and Sample Preservation of Water and Wastewater, EPA 600/4-82-029, September, 1982.

4.2.5.4 Measurement of Relative Sampling Precision

The following duplicate sampling procedures will be utilized during the collection of sample to measure the presicion of the sample collection process:

Duplicate grab and composite samples for all matrices shall be collected during all investigations and studies conducted by Wadsworth/ALERT Laboratories. At a minimum, five percent of all samples shall be collected in duplicate. These samples shall be collected at the same time, utilize the same procedures, equipment, and containers as the required samples. They shall also be preserved in the same manner and submitted for the same analyses as the required samples. The collection of duplicate composite samples shall require the installation of duplicate automatic sampler setups if automatic samplers are utilized for sample collection. Duplicate samplers are utilized for sample collection. Duplicate sample data shall be reported to the Technical Director or his/her designee.

The resulting data will be periodically examined to determine if any problems are evident with specific types of media samples or with the procedures utilized by specific sampling personnel. The Technical Director shall be advised of any such problems so that corrective action may be taken as needed (Section 13).

4.2.6 Sample Transportation and Shipment

Samples will be delivered to the Laboratory for analysis as soon as practicable (1 to 2 days) after collection. The sample will be properly preserved, packaged for transport and accompanied by chain-of-custody documentation prior to shipment or transport to the Laboratory. The samples will also be submitted to the designated Laboratory Sample Custodian for proper acceptance into the Laboratory.

Non-Hazardous Samples

Environmental samples will be transported and/or shipped in the Laboratories' SAMPLE SAFE transport shippers. These SAMPLE SAFE shippers are designed and used exclusively by the Laboratory and will be provided upon request to clients conducting their own sampling operations.

Laboratory SAMPLE SAFE transport shippers are 16" x 24" x 12" high-density polyethylene (HDPE) heavy transit cases form-fitted with high-density insulating foam. Each shipper will contain packaging instructions, appropriate sample containers and preservatives, ice packs for refrigeration, various Laboratory sample documentation materials and Laboratory sample seals. Laboratory SAMPLE SAFE transport shippers will be delivered or shipped via overnight carrier to the laboratory as soon as practicable after collection.

Hazardous Samples

Hazardous samples as indicated in the DOT Hazardous Material Table (49 CFR 172.101) will be transported as specified in the regulations. Other potentially hazardous material samples will be packaged and shipped as follows:

1. Samples will be placed in 32 oz. amber-glass jars with teflon-lined lids or polyethylene bottles, as appropriate. All filled containers will have sufficient air-space to allow for sample expansion and for volatization. Samples to be analyzed for low level volatile organics will be placed in 40 ml vials (no headspace) with appropriate septum lids.

2. All sample containers will be sealed with tape.

3. Sample containers will be inserted and sealed within a four (4) ml thick polyethylene zip-lock bag. (1 container/bag).

4. Bagged container will be placed inside a 1 gallon metal paint can. Inert packing material (e.g. vermiculite) will then be placed into the can to prevent breakage. The can will be sealed and locked with lid clips.

5. The can will be placed in a DOT-12B fiberboard box or equivalent and sealed with sample labels.

6. The sealed box will be labelled in accordance with DOT specifications (see 49 CFR 172.101).

EXAMPLE

Proper Shipping Name	:	Hazardous Substance-Liquid, n.o.s
Hazard Class	:	ORM-E
Identification	:	NA-9188
Label	:	None

Note: If shipping quantity is greater than column 6a of 49 CFR 172.01 Hazardous Materials Table, then Danger/Peligro label will be required.

Proper Restricted Article Manifests will be completed to accompany the shipment.

a) UPS
b) Federal Express
c) Other

These papers will become part of the chain-of-custody documentation.

5.0 Sample Custody

A sample is physical evidence collected from a site or from the enviroment. As such, each sample must be documented in a manner that makes it legally defensible and which provides all data necessary for proper analysis. Wadsworth/ALERT sampling personnel must complete all proper forms and documents for each sample taken. This documentation is described below.

5.1 Field Operations

5.1.1 Field Sample Logbook

All samples taken by Laboratory personnel will be entered in a hard-cover, bound Laboratory Field Sample Logbook consisting of consisting of consecutively-numbered 8 1/2" x 11" pages. This Laboratory Field Sample Logbook will contain entries which document pertinent field data for each sample including:

Client
Name and Address of Field Contact
Project or Sampling Location
Exact Location of Sample Point
Sampling Methodology
Process Generating Sample (as applicable)
Sample Container Numbers and Volumes
Date and Time of Collection
Field Sample Identification Number or Designation
Field Observations and/or Measurements
References such as Maps, Sketches, Photographs
Preservation and Transport Statement
Name(s) and Signature(s) of Sample Collector(s)

The Field Sample Logbook will also document the preparation procedures for preservatives and other supplies which may become an integral part of the sample.

Location of Sample points will be referenced to an established system, or is this is not available, given in such a manner that it can be clearly identified.

FIGURE 5-4

Laboratory Sample Logbook

SAMPLE LOG-IN RECORD

DATE REC'D	FROM	CLIENT NAME	SAMPLE DESCRIPTION	DATE SAMPLED	SAMPLED BY	DATE ANALYZED	BOTTLES	SAMPLE	ANALYSIS REQUESTED	COMMENTS	CUSTODY	DATE/TIME

5.1.2 Sample Labels

Permanent Laboratory Sample Labels (Figure 5-1) will be used to ensure proper identification and management of collected samples. These gummed labels will be completed and affixed to each sample container at the time of collection. Entries on the sample label will include:

Field Sample Identification Number or Designation
Exact Location of Sample Point
Date and Time of Collection
Name of Sample Collector(s)
Additional Pertinent Field Information

All entries on the Laboratory Sample Label should correspond accordingly with the Laboratory Field Sample Logbook.

5.1.3 Sample Seals

Laboratory Sample Seals (Figure 5-2) will be used to detect unauthorized tampering of samples prior to laboratory acceptance. Laboratory Sample Seals will be affixed to the sample transport container in a manner that requires seal breakage in order to open the container. Unauthorized seal breakage indicates possible tampering and will render a sample suspect.

5.1.4 Chain-of-Custody Form

Chain-of-Custody documentation is necessary to track the possession of each sample from collection through analysis. This documentation is especially vital for legal concerns.

Samples submitted to the Laboratory will utilize Laboratory Chain-of-Custody Forms (Figure 5-3) to ensure adequate documentation. These forms will be completed and sealed within the sample transport container to be opened and examined by the Laboratory Sample Custodian. Pertinent information includes:

Client
Project or Sampling Location
Sample Identification Number or Designation
Sample Description
Sample Container Numbers and Volumes
Purpose of Analysis
Signatures of persons involved in chain-of-custody
Date and Time of Possession

All entries on the Laboratory Chain-of-Custody Form should correspond accordingly with the Laboratory Field Sample Logbook and Laboratory Sample Labels.

5.2 Laboratory Operations

Evidentiary documentation procedures continue with the laboratory. The designated Laboratory Sample Custodian will receive and document all sample submittals into the laboratory. The Laboratory Sample Custodian will examine the condition, preservation, and accompanying documentation of all submitted sample prior to approval and formal acceptance into the Laboratory. Any sample, preservation, or documentation discrepancies (i.e. broken sample container, improper preservations, inadequate sample volume, poor documentation, etc.) will be resolved before the sample is approved and actually accepted for analyses. All required acceptance data will then be recorded and documented in the Laboratory Sample Log (Figure 5-4) and Laboratory Computerized Data Management System. The sample will then be labelled and placed in the secure sample storage area for distribution to the appropriate analyst(s).

6.0 Not Used

7.0 Calibration Procedures and Frequency

7.1 Not Used

7.2 Laboratory Instruments

Wadsworth/ALERT Laboratories maintains specific procedures for the operation and calibration of all analytical instruments. Along with proper maintenance, these practices ensure optimum instrument performance and accuracy. These procedures include proper operator training and supervision; mandatory instrument performance specifications; and systematic instrument calibration, verification, and monitoring schedules.

The Laboratory utilizes mandatory instrument performance specifications to constantly ensure optimum instrumental performance. These performance specifications require acceptable instrument response to specific performance standards prior to initiating further instrument calibration and analyses. Acceptable instrument response criteria are based upon the manufacturer's or EPA's analytical method specifications.

Laboratory analysts record and document all instrumental runs in designated Laboratory Instrument Logbooks (Section 10.2.2). These Logbooks identify instrument operating parameters, settings, and performance data associated with each instrumental run. Instrumental runs pursuant to establishing instrument performance specifications and calibration are also recorded in these Laboratory Instrument Logbooks.

The Laboratory utilizes systematic instrument calibration procedures to constantly ensure analytical accuracy. Initial instrument calibration curves are generated, systematically verified, and routinely monitored throughout the duration of all instrumental analyses (see Table 7-1). Initial multipoint GC and GC/MS calibration curves are verified by injection of a known working standard every twelve (12) hours of instrument operations. An unacceptable working standard response (20% variation) requires construction of a new calibration curve. Other instrument calibration curves are constructed immediately prior to analyses of each batch of samples. All initial instrument calibrations and/or verifications are then routinely monitored by systematic, repeat injections of appropriate check standards throughout the duration of analyses. Additionally, all GC/MS analyses will utilize internal standards to ensure high quality data.

Specific calibration procedures for laboratory instruments including the frequency and standards used are listed in Table 7-1 - CALIBRATION PROCEDURES. Table 7-2 - LABORATORY MAJOR ANALYTICAL INSTRUMENTATION details the equipment that may be used in this project.

TABLE 7-1 - CALIBRATION PROCEDURES

GC/MS

- Every 12 hours, the instrument shall be tuned to DFTPP or BFB to assure that instrument response meets EPA specifications.
- Generation of five (5) point calibration curve for all method compounds monthly, or more frequently if needed.
- Verification of system cleanliness by the analysis of a reagent blank during every 12 hour tune.
- Analysis of a standard after the analysis of twenty (20) samples to assure the consistency of instrument response.
- Addition of internal standards to each sample.

GC

- Generation of three (3) point calibration curve for all analyzed compounds monthly or prior to any sample analysis, as needed.
- Monitor consistency of instrument response through the analysis of a standard after every twenty (20) sample analyses.
- Demonstrate system cleanliness through the analysis of a reagent blank prior to any sample analysis.
- Maintain sample response within the limits of the response of the standards.

AA, ICP

- Construction of a three (3) point calibration curve for an element prior to the analysis of any sample set.
- Verification of the cleanliness of the system for each element through the analysis of a reagent blank with any analytical set.
- Verification of instrumental consistency through the analysis of a standard after the analysis of every twenty (20) samples.
- Bracketing of sample response between the limits of standards response.

TABLE 7-1 - CALIBRATION PROCEDURES (Continued)

pH and Ion-Selective Electrode

- Construction of a three (3) point (2 point for pH) calibration curve weekly or prior to the analysis of any sample.
- Bracketing of sample response within the limits of standards response.
- Verification of cleanliness of the analytical system through the analysis of a reagent blank.
- Verification of instrument consistency through the analysis of standards after the analysis of every twenty (20) samples (where applicable).

Spectrophotometer

- Construction of a three (3) point calibration curve prior to the analysis of any sample.
- Monitor for the introduction of any interferents through the analysis of a reagent blank prior to any sample analysis.
- Bracket sample response within the standards response.
- Verification of the consistency of instrument response through the analysis of a standard after every twenty (20) sample analyses.

TABLE 7-2 - LABORATORY MAJOR ANALYTICAL INSTRUMENTATION

Finnigan OWAs (Organic Water Analyzer) - Gas Chromatograph/Mass Spectrometer/Data Systems (GC/MS/DS) with: Electron Impact/Chemical Ionization (EI/CI); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap) with Automatic Liquid Sampler (ALS); Varian 8000 Autosampler; 9 - Track Magnetic Tape Drive.

Finnigan 5100 - Gas Chromatograph/Mass Spectrometer/Data System (GC/MS/DS) with: Electron Impact/Chemical Ionization (EI/CI); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap); Automatic Liquid Sampler (ALS); 9 - Track Magnetic Tape Drive.

EXTREL 400s - Gas Chromatograph/Mass Spectrometer/Data System (GC/MS/DS) with: Electron Impact/Chemical Ionization (EI/CI); Liquid Chromatography/Mass Spectrometry (LC/MS Interface); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap) with Automatic Liquid Sampler (ALS); Varian 8000 Autosampler; 9 - Track Magnetic Tape Drive.

Hewlett Packard 5996 - Gas Chromatograph/Mass Spectrometer/Data System (GC/MS/DS) with: Election Impact (EI); 7672 Auto Sampler; Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap); 7914 Magnetic Tape Drive; Series 1000 F Computer.

Hewlett Packard 5995 - Gas Chromatograph/Mass Spectrometer (GC/MS) with: Electron Impact (EI); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap).

Hewlett Packard 5992 - Gas Chromatography/Mass Spectrometer (GC/MS) with: Electron Impact (EI); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap).

Hewlett Packard 5890 Gas Chromatographs (GC) with: Flame Ionization Detectors (FID); Ni-63 Electron Capture Detectors (ECD): Nitrogen Phosphorus Detectors (NPD); Hewlett Packard 7673 Autosampler.

Hewlett Packard 5880 Gas Chromatographs (GC) with: Flame Ionization Detectors (FID); Ni-63 Electron Capture Detectors (ECD); Thermal Conductivity Detector (TCD).

Perkin Elmer Sigma Gas Chromatographs (GC) with: Flame Ionization Detectors (FID); Ni-63 Electron Capture Detectors.

Tracor 540 Gas Chromatographs (GC) with: Hall Electrolytic Conductivity Detectors (HECD); Photoionization Detectors (PID); Tekmar Liquid Sample Concentrator LSC-2 (Purge & Trap).

Varian 6000 Gas Chromatographs (GC) with: Flame Ionization Detector (FID); Electron Capture Detectors (ECD); Thermionic Specific Detector (TSD); Hall Electrolytic Conductivity Detectors (HECD); Tekmar 4200 Autosampler; 8000 Autosamplers.

Perkin Elmer II Emission Spectrometer (ICAP) with Dual Independent Monochromators.

Perkin Elmer 3030 Atomic Absorption Spectrophotometer (AA) with: MHS-10 Mercury Hydride Generator; HGA-400 Graphite Furnace: Electrode Discharge Lamps (EDL).

Perkin Elmer 2380 Atomic Absorption Spectrophotometer (AA) with: HGA 400 Graphite Furnace; As40 Graphite Furnace Autosampler; Electrode Discharge Lamps (EDL).

Perkin Elmer 560 Atomic Absorption Spectrophotometer (AA) with: MHS-10 Mercury Hydride Generator; HGA-400 Graphite Furnace; Electrode Discharge Lamps (EDL).

Varian 975 Atomic Absorption Spectrophotometer (AA) with: GTA Graphite Furnace; PSC-55 Liquid Autosampler; VGA Vapor Generator; HP 86B Personal Computer.

Varian AA-20 Atomic Absorption Spectrophotometer(AA) with: VGA 76 Automatic Hydride Generator; PSC-56 Autosampler.

Mitsubishi Model TOX-10-C (Total Organic Halogen Analyzers)

O.I. Corporation Model 700 TOC (Total Organic Carbon Analyzer)

Lachat Quick Chem System IV Automated Colorimetric Analyzer

Pye Unicam 8650 Visible Spectrophotometers

Pye Unicam 350 Visible Spectrophotometers

7.3 Measurement Equipment, Glassware, Water, Reagents, and Industrial Gases

Wadsworth/ALERT Laboratories will adhere to proper standards of good laboratory practice in utilizing measuring equipment, glassware, water, chemical reagents, and industrial gases. Adherence to proper standards relating to these laboratory elements will validate analytical data. All laboratory glassware, balances, thermometers and subsequent volume, mass, and temperature measurements are directly traceable to primary standards. Chemical reagents and industrial gases are purchased and utilized as appropriate for various laboratory applications.

All Laboratory volumetric glassware conforms to National Bureau of Standards (NBS) Class A standards. All mechanical pipettes are calibrated annually with the MLS Pipette Volume Calibration Kit. Kuderna-Danish concentrator tubes are also calibrated annually using gravimetric techniques. All calibrations are recorded and documented in designated Laboratory Calibration Logbooks. Written procedures (SOP's) for cleaning and storing glassware will be posted at appropriate wash stations.

Laboratory balances are annually serviced and calibrated under the manufacturer's service contract. Additional balance performance evaluations are conducted routinely by comparison against NBS certified weights. Unacceptable performance require manufacturer's service adjustments. Both balance service and performance evaluations are recorded and documented in designated Laboratory Equipment Performance Logbooks.

Laboratory and field thermometers are calibrated against a NBS certified thermometer and recorded in the designated Laboratory Thermometer Calibration Logbook. Laboratory drying ovens, incubators, refrigerators, etc. contain calibrated thermometers. Temperature readings are recorded daily in Laboratory Temperature Logbooks. Unacceptable deviation from desired temperatures require immediate corrective action.

Laboratory pure water is generated by a commercial on-line water purification system consisting of mixed resin deionizing and carbon filtration cartridges. Cartridges are routinely replaced and serviced by manufacturer or as indicated by an on-line resistivity indicator or laboratory method blank contamination. All water purity information is recorded in the manufacturer's service file.

The Laboratory utilizes various types and purities of chemical reagents, solvents, and industrial gases depending upon their intended use. Laboratory stock and working standards are derived from commercially available primary standards and solvents whenever possible. These stock and working standards are properly labeled (content, concentration, date, analyst) and routinely checked for degradation and/or impurities in accordance with the appropriate analytical method specifications. On-line molecular sieves and oxygen traps are used where appropriate to remove impurities from desired industrial gases. All chemical reagents, solvents, and industrial gases are stored only in designated areas in accordance with the Laboratory Health & Safety Program.

8.0 Analytical Procedures

8.1 Sample Receipt (see Section 5.13)

8.2 Sample Preparation

All samples are prepared in accordance with the methods outlined in Table 8-1 - Laboratory Analytical Methods Summary.

8.3 Equipment startup and performance check (see Section 9.2.1.1)

8.4 Not Used

8.5 Not Used

8.6 Initial and continuous calibration (see Sections 9.2.1.1, 9.2.1.2 and 9.2.1.4).

8.7 Analytical Methods

A summary of common Laboratory analytical methods is outlined in Table 8-1 - Laboratory Analytical methods Summary.

8.8 Analyses of QC samples (see Section 9.2.1.2 and 9.2.1.3)

TABLE 8-1 - LABORATORY ANALYTICAL METHODS SUMMARY

Parameter	Methods	
	Liquid	Solid
PRIORITY POLLUTANT, HSL ORGANICS		
Purgeable Halocarbons	EPA Method 601	SW846 Method 8010
Purgeable Aromatics	EPA Method 602	SW846 Method 8020
Acrolein & Acrylonitrile	EPA Method 603	SW846 Method 8030
Phenols	EPA Method 604	SW846 Method 8040
Phthalate Esters	EPA Method 606	SW846 Method 8060
Nitrosamines	EPA Method 607	SW846 Method 607 (Mod)
Organochlorine Pesticides & PCB's	EPA Method 608	SW846 Method 8080
Nitroaromatics & Isophorone	EPA Method 609	SW846 Method 8090
Polynuclear Aromatic Hydrocarbons	EPA Method 610	SW846 Method 8100
Haloethers	EPA Method 611	SW846 Method 611 (Mod)
Chlorinated Hydrocarbons	EPA Method 612	SW846 Method 8120
TCDD & Dibenzofurans	EPA Method 613	SW846 Method 8280
Organophosphorus Pesticides	EPA Method 614	SW846 Method 8140
Chlorinated Herbicides	EPA Method 615	SW846 Method 8150
Organohalide Pesticides	EPA Method 617	SW846 Method 8080
Triazine Pesticides	EPA Method 619	SW846 Method 619 (Mod)
Organophosphorus Pesticides	EPA Method 622	SW846 Method 8140
Volatile Organics	EPA Method 524,624	SW846 Method 8240
Base/Neutral & Acid Extractables	EPA Method 625	SW846 Method 8270
ORGANICS		
TOC	EPA Method 415.1	SW846 Method 9060
TOX	EPA Method 450.1	SW846 Method 9020
Organo Chlorine	ASTM D-080-63	ASTM D-1305-55
Organo Sulfur	ASTM D-129-64	ASTM D-3177-75
Organo Nitrogen	EPA Method 351.3	CRL Method 468
Organo Phosphorus	SM Part 424	SM Part 424
BTU/lb	ASTM D-240	ASTM D-271-70
Flash Point	ASTM D-33278-78	SW846 Method 1010
BOD	EPA Method 405.1	
COD	EPA Method 410.1, 410.2, 410.3	CRL Method 35
Oil and Grease, Total Recoverable	EPA Method 413.1	SW846 Method 9071
Phenolics, Total	EPA Method 420.1	CRL Method 417
Methylene Blue Active Substances	EPA Method 425.1	

TABLE 8-1 - LABORATORY ANALYTICAL METHODS SUMMARY (CONT.)

Parameter	Method	
	Liquid	Solid
METALS		
Aluminum	EPA 202.1, 202.2	SW846 Method 7020
Antimony	EPA 204.1, 204.2	SW846 Method 7040, 7041
Arsenic	EPA 206.2, 206.3	SW846 Method 7060, 7061
Barium	EPA 208.1, 208.2	SW846 Method 7080, 7081
Beryllium	EPA 210.1, 210.2	SW846 Method 7090, 7091
Boron	EPA 212.3	SW846 Method 7000
Cadmium	EPA 213.1, 213.2	SW846 Method 7130, 7131
Calcium	EPA 215.1, 215.2	SW846 Method 7140
Chromium	EPA 218.1, 218.2	SW846 Method 7190, 7191
Chromium +6	EPA 218.4, 218.5	SW846 Method 7195
Cobalt	EPA 219.1, 219.2	SW846 Method 7200, 7201
Copper	EPA 220.1, 220.2	SW846 Method 7210, 7211
Iron	EPA 236.1, 236.2	SW846 Method 7380, 7381
Lead	EPA 239.1, 239.2	SW846 Method 7420, 7421
Magnesium	EPA 242.1	SW846 Method 7450
Manganese	EPA 243.1, 243.2	SW846 Method 7460, 7461
Mercury	EPA 245.1, 245.2	SW846 Method 7470, 7471
Molybdenum	EPA 246.1, 246.2	SW846 Method 7480, 7481
Nickel	EPA 249.1, 249.2	SW846 Method 7520, 7521
Osmium	EPA 252.1, 252.2	SW846 Method 7550
Potassium	EPA 258.1	SW846 Method 7610
Selenium	EPA 270.2, 270.3	SW846 Method 7740, 7741

TABLE 8-1 - LABORATORY ANALYTICAL METHODS SUMMARY (CONT.)

Parameter	Method	
	Liquid	Solid
Silver	EPA 272.1, 272.2	SW846 Method 7760, 7761
Sodium	EPA 273.1, 273.2	SW846 Method 7770
Thallium	EPA 279.1, 279.2	SW846 Method 7840, 7841
Tin	EPA 282.1, 282.2	SW846 Method 7870
Titanium	EPA 283.1, 283.2	SW846 Method 7000
Vanadium	EPA 286.1, 286.2	SW846 Method 7910, 7911
Zinc	EPA 289.1, 289.2	SW846 Method 7950, 7951
INORGANIC NON-METALLICS		
Acidity	EPA 305.1	
Alkalinity	EPA 310.1, 310.2	
Bromide	EPA 320.1	
Chloride	EPA 325.3	SW846 Method 9250
Chlorine, Total Residual	EPA 330.5	
Cyanide		
Amenable to Cl	EPA 335.1	SW846 Method 9010
Total	EPA 335.2	SW846 Method 9010
Fluoride	EPA 340.1	CRL Method 380
Iodide	EPA 345.1	
Nitrogen		
Ammonia	EPA 350.2	CRL Method 324
Kjeldahl, Total	EPA 351.3	CRL Method 468
Nitrate	EPA 353.3	SW846 Method 9200
Nitrite	EPA 353.3	
Nitrite-Nitrate	EPA 353.3	
Oxygen, Dissolved	EPA 360.2	
Phosphorus, All Forms	EPA 365.2	CRL Method 435
Silica, Dissolved	EPA 370.1	
Sulfate	EPA 375.4	SW846 Method 9035
Sulfide	EPA 376.1, 376.2	SW846 Method 9030
Sulfite	EPA 377.1	
PHYSICAL PROPERTIES		
Ash Content	ASTM D-482	ASTM D-482
Color	EPA 110.3	
Hardness, Total	EPA 130.1, 130.2	

TABLE 8-1 - LABORATORY ANALYTICAL METHODS SUMMARY (CONT.)

Parameter	Method	
	Liquid	Solid
Moisture %		CRL Method 445
Odor	EPA Method 140.1	
pH	EPA Method 150.1	SW846 Method 9040
Residue		
Filterable	EPA Method 160.1	
Non-Filterable	EPA Method 160.2	
Total	EPA Method 160.3	CRL Method 444
Volatile	EPA Method 160.4	CRL Method 447
Settleable	EPA Method 160.5	
Specific Conductance	EPA Method 120.1	SW846 Method 9050
Specific Gravity	ASTM D-70	ASTM C-188
Temperature	EPA Method 170.1	
Turbidity	EPA Method 180.1	
Viscosity, Kinematic	ASTM D-445	
Water %	ASTM E-203-75	
RCRA Corrosivity	SW846 Method 9040	SW846 Method 1110
RCRA Ignitability	SW846 Method 1010	ASTM D-56
RCRA Reactivity	SW846 Method 9010, 9030	
RCRA EP Toxicity	SW846 Method 1310	SW846 Method 1310
INDUSTRIAL HYGIENE ANALYSIS	AIR	
Organics, Inorganics, Metals, Microscopy		NIOSH

REFERENCES:

EPA Methods - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057, July 1982.

EPA - Methods for Chemical Analysis of water and Wastes EPA 600/4-79-020, March 1983.

SW846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition, EPA, September, 1986.

ASTM - American Society for Testing and Materials.

CRL - USEPA, Central Regional Laboratory.

TABLE 8-1 - LABORATORY ANALYTICAL METHODS SUMMARY (CONT.)

SM - Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 16th Edition.

NIOSH - NIOSH Manual of Analytical Methods, National Institute for Occupational Safety and Health, 2nd Edition, April 1977.

Wadsworth/ALERT Laboratories' Scheme for Waste Compatibility and Consolidation. (See Appendix III)

TABLE 8-2 - LABORATORY DETECTION LIMITS SUMMARY

Parameter	Water	Solids (and non-aqueous waste)
ORGANICS		
PCB's	1 ug/L	1 mg/kg
TOC	1 mg/L	NA
Organo Chlorine	------	.05 %
BTU/lb	1000 BTU/lb	1000 BTU/lb
METALS		
Antimony	.2 mg/L	4 mg/kg
Arsenic	.005 mg/L	.1 mg/kg
Barium	.01 mg/L	.2 mg/kg
Beryllium	.005 mg/L	.1 mg/kg
Cadmium	.01 mg/L	.2 mg/kg
Chromium	.02 mg/L	.4 mg/kg
Copper	.01 mg/L	.2 mg/kg
Lead	.05 mg/L	1 mg/kg
Mercury	.005 mg/L	.1 mg/kg
Nickel	.04 mg/L	.8 mg/kg
Selenium	.005 mg/L	.1 mg/kg
Silver	.01 mg/L	.2 mg/kg
Thallium	.1 mg/L	2 mg/kg
Zinc	.01 mg/L	.2 mg/kg
INORGANICS NON-METALLICS		
Chloride	2 mg/L	------
pH	------	------
Cyanide	.005 mg/L	------
Sulfide	1 mg/L	------
PHYSICAL PROPERTIES		
Ash Content	.5 %	.5 %
Solids-Total	5 mg/L	.5 %
Moisture Content	------	.5 %
Compatibility	------	------

TABLE 8-2 - LABORATORY DETECTION LIMITS SUMMARY (CONTINUED)

Parameter	Water	Solids (and non-aqueous waste)
RCRA ANALYSIS		
Corrosivity	.5 mmpy	------
Ignitability	------	------
Reactivity		
Cyanide	.01 mg/L	.5 mg/kg
Sulfide	2 mg/L	50 mg/kg
EP Toxicity	------	------

9.0 Internal Quality Control Checks

Wadsworth/ALERT Laboratories Sampling and Analytical Quality Assurance/Quality Control Program is designed to ensure the scientific and legal validity of all samples and analytical results. The QA/QC Program consists primarily of a thorough, legal laboratory documentation network in combination with systematic inclusion of various analytical quality control practices into all component laboratory operations. These quality control practices will provide constant, documented evaluation and surveillance of acceptable sampling and analytical method performance.

9.1 Internal Quality Control Checks (Field) - Not Used

9.2 Internal Quality Control checks (Laboratory)

Analytical quality control checks are performed in both the on-site mobile laboratory and the off-site laboratory in identical manner. These procedures are based upon USEPA analytical methods guidance and generally accepted standards of good laboratory practice as outlined in Table 8-1. Key components of the Laboratory Analytical Quality Control Program include the following quality control practices and considerations:

- designation of a Laboratory Quality Control Manager to implement the laboratory QA/QC Program (Section 2.2).
- adherence to specified Laboratory Sample Acceptance Procedures to ensure proper handling, processing, and storage of submitted samples (Section 5.2).
- utilization of the Laboratory Computerized Data Management System to record, document, and assimilate pertinent laboratory technical and administrative data (Section 10.1).
- utilization of USEPA-approved Analytical Methods and Instrumentation (Section 7.0).
- adherence to mandatory procedures for Operation, Calibration, and Maintenance of Laboratory and Field Instrumentation (Sections 7.0 and 12.0).
- utilization of proper Laboratory Measuring Equipment, Glassware, Water, Chemical Reagents, Industrial Gases (Section 7.3).
- constant surveillance and documentation of acceptable analytical method accuracy and precision through Initial Analytical Method Performance Evaluations (Section 9.2.1.1) and matrix spike/spike duplicate evaluations (Section 9.2.1.2).

- utilization of continuous Surrogate Spike Recovery Evaluations where appropriate to ensure acceptable method performance (Section 9.2.1.4).

- utilization of systematic Method Blank Evaluations to identify analytical system interferences and background contamination levels (Section 9.2.1.3).

- adherence to proper Laboratory Documentation measures to ensure the complete integrity and legal validity of all Laboratory analyses (Section 10.2).

- utilization of Voluntary Intralaboratory Performance Evaluations to internally assess and evaluate analytical performance (Section 11.0).

- participation in numerous Laboratory certifications, audits, and approval programs (Section 11.0).

9.2.1 Data Quality

The principle criteria for validating data quality is the continuous monitoring of acceptable analytical accuracy, precision, and overall method performance through systematic analysis of quality control samples. Wadsworth/ALERT Laboratories conducts both initial and continuous Analytical Method Performance Evaluations to ensure that all generated analytical data meet acceptable quality control method performance criteria established by the USEPA and the Laboratory. Each analytical method commonly used in the laboratory utilizes specific quality control procedures to continually monitor acceptatable analytical method accuracy and precision. These method quality control procedures primarily involve the mandatory systematic insertion of quality control samples into 10% of all laboratory analyses, in addition to strict adherence to instrumental performance and calibration specifications. These specific quality control procedures are thoroughly detailed in the Analytical Methods - Quality Control Procedures Section of the Laboratory Quality Control Manual and are based upon USEPA method guidance. (see Table 8-1).

9.2.1.1 INITIAL METHOD PERFORMANCE EVALUATION

Prior to the analysis of any samples, the Laboratory conducts Initial Method Performance Evaluations of each analytical method commonly used in the Laboratory to demonstrate the ability to achieve acceptable method accuracy and precision. Quality control data derived from these evaluations is compared to published USEPA method performance criteria in order to determine and document acceptable Laboratory analytical method capability. This Initial Method Performance Evaluation is conducted as summarized below.

A minimum of four (4) matrix spike samples are prepared using the particular representative sample matrix and analytical parameter(s) of interest. These matrix spike samples are prepared such that the parameter concentration(s) are within the working range of the method and at least two (2) times greater than the method's background level.

The matrix spike samples are analyzed in accordance with the method, and the average percent recovery (R) and the standard deviation of the percent recoveries (s) will be calculated from the analytical results. The Laboratory values of R and s are compared to the published EPA method performance values of average recovery (X) and standard deviation (p) (if applicable). The laboratory values are not acceptable if $s > 2p$ or $X-R > 2p$. Unacceptable values require the Laboratory to review potential analytical problems and repeat the Initial Method Performance Evaluation until acceptable values are obtained.

The Laboratory does not analyze any actual samples until the Initial Method Performance Evaluation demonstrates acceptable laboratory analytical method capability. Results from the Initial Method Performance Evaluation are entered into the analytical method's Initial Accuracy and Performance Record maintained in the Laboratory QC Manual.

9.2.1.2 MATRIX SPIKE/SPIKE DUPLICATE EVALUATIONS

The laboratory conducts continuous method performance evaluations for each analytical method commonly used in the Laboratory to continuously demonstrate and document the maintenance of acceptable method accuracy and precision. Laboratory quality control charts are constructed from this data in order to monitor and compare actual laboratory quality control data with acceptable published USEPA or Laboratory method performance criteria.

Quality control samples consist of method blanks and matrix spike/spike duplicate samples.

Mandatory matrix spike/spike duplicate samples are systematically analyzed in order to maintain continuous surveillance of acceptable method performance. Approximately sixty-seven percent (67%) of all quality control samples are matrix spike samples. Percent Recovery determinations (R) from these matrix spike results are monitored to provide a continuous measure of the overall accuracy and precision of the method in addition to determining extraction efficiencies and sample matrix effects (see Section 13.0).

9.2.1.3 METHOD BLANK EVALUATIONS

Wadsworth/ALERT Laboratories systematically prepare and analyze method blanks to continuously evaluate analytical system interferences and background contamination levels. Method blank analyses include all components (glassware, chemical reagents, environment, etc.) of actual, routine method analyses, substituting reagent water or other applicable clean matrix for the actual sample. Approximately thirty-three percent (33%) of all quality control samples are method blanks. Analyses of method blanks will provide a safeguard against interfering and/or contaminated reagents, glassware, and laboratory environments. The results of all method blank analyses will be recorded in the Laboratory Computer Data Management System. Unfavorable method blank performance will render associated data suspect and require corrective action (see Section 14.0).

9.2.1.4 CONTINUOUS SURROGATE SPIKE RECOVERY EVALUATION

Wadsworth/ALERT Laboratories conducts continuous surrogate spike recovery evaluations on all GC/MS volatile and semivolatile analyses to ensure acceptable method performance. Surrogate spikes consisting of similar, non-method compounds and/or method compound analogues are added to each GC/MS volatile and semivolatile fraction to continuously evaluate and document acceptable method performance, without interfering with actual method compounds. Surrogate spike recoveries must compare favorably to published USEPA method or statistically derived Laboratory performance limits in order for an analysis to be acceptable. Unfavorable surrogate spike recoveries render associated data suspect and require corrective action (see Section 14.0).

9.2.1.5 CORRECTIVE MEASURES

(see Section 14.0)

10.0 Date Reduction, Validation, and Reporting

10.1 Not Used

10.2 Laboratory

10.2.1 Data Reduction Methods

10.2.1.1 Data Management System

Wadsworth/ALERT Laboratories utilizes the Laboratory Computerized Data Management System to record, document, and assimilate pertinent laboratory technical and administrative data. This Laboratory Computerized Data Management System provides data management functions for a number of component laboratory activities including: Laboratory Sample Acceptance, Sample Analytical Results, Sample Status and Tracking, Analytical QA/QC, Final Report Generation, and Client Invoicing. The data management system enhances efficient coordination among these component laboratory activities by providing a highly automated, standardized communication network for data transfer and correlation. This system is summarized below.

The Laboratory Computerized Data Management System assigns an individual Laboratory Identification Number to each sample and records pertinent technical and administrative sample data. Pertinent technical sample data includes the client's sample identification, sample physical description, sampling date (if known), required analytical parameters, and requested completion date. Pertinent administrative data is necessary for final reporting and invoicing of results.

The data system assimilates the above data and generates Laboratory Work Sheets (Figure 10-1) for distribution to the appropriate analyst(s). These work sheets identify the appropriate analytical parameters and associated methods necessary to complete the requested sample analyses along with the turnaround time requirements. These turnaround requirements not only specify requested completion dates, but identify maximum allowable holding times for samples and/or extracts prior to analyses. The data management system also automatically generates appropriate work sheets for the analysis of systematic quality control samples in accordance with Laboratory QC procedures.

Laboratory personnel enter all completed sample analytical results and associated QC data into the Data Management System. The system's various data processing capabilities then automatically provide a number of component laboratory data management functions. These functions include generation of the following materials: QC Data statistical evaluations and associated quality control charts, final sample analytical result reports, and sample tracking and status reports.

10.2.1.2 Analytical Systems

All analytical results are calculated using the equations specified in the appropriate EPA method (see Table 8-1).

10.2.2 Data Validation Criteria

10.2.2.1 Data Validation - During Collection

The principle criteria to be used to validate data integrity during collection will be the following:

- Reagent blank results
- Method preparation blank results
- Calibration verification
- Matrix spike/spike duplicate results

- Quality Control check sample results

These measurements are to be made by the analyst, using specific acceptance criteria. The analyst will either proceed with the analyses or take corrective action (see Section 14.0). All QC data is reviewed by the appropriate group leader to ensure that all QA procedures have been completed. In addition, 10% of all raw data will be reviewed by the group leader to ensure that the method was in control during the analytical run. Group leaders are responsible for submitting data for computer data entry upon completion of their review.

10.2.2.2 Data Validation Documentation

Wadsworth/ALERT Laboratories utilizes complete laboratory documentation measures to ensure the integrity and legal validity of all sample analytical results. These documentation measures encompass all analytical activities to create a traceable, legal history of each sample and subsequent analysis. All documented information is recorded in bound, consecutively-numbered analytical logbooks and/or computer data systems. Component analytical documentation measures include:

10.2.2.2.1 Laboratory Sample Logbook

Samples submitted to Wadsworth/ALERT for laboratory analysis are recorded and documented in the Laboratory Sample Logbook. Individual log entries include client, laboratory sample identification number, sample description, analytical requests, chain-of-custody possession statements, and additional information (Figure 5-4).

10.2.2.2.2 Laboratory Work Sheets

The analytical specifications and subsequent results of each sample submitted to the Laboratory are recorded on various Laboratory Work Sheets (Appendix 2, Figure 10-1). These work sheets are generated by the Laboratory Computerized Data Management System from sample information initially entered by the Laboratory Sample Custodian. Pertinent information on the work sheets include Laboratory Sample Identification, requested analytical parameters, maximum holding times and turnaround requests, and analytical results. These work sheets will be retained by the Laboratory until all sample analytical results have been entered into the Laboratory Computerized Data Management System.

10.2.2.2.3 Laboratory Method Logbooks

All laboratory analyses are entered into various Laboratory Method Logbooks (Appendix 2, Figure 10-2, a-j) which categorically record and document the raw data for each analytical parameter commonly determined by Wadsworth/ALERT Laboratories. Each analytical parameter and/or activity is assigned a particular Laboratory Method Logbook which records pertinent preparation, extraction, and instrumental data for each sample. This includes laboratory identification number, initial sample volume or weight, extraction volumes, dilution factors, instrument values, and the name of the analyst(s). These logbooks also systematically include Wadsworth/ALERT Laboratories' ten percent (10%) Analytical Quality Control Program. Method Logbooks are maintained for ten years by Wadsworth/ALERT Laboratories.

10.2.2.2.4 Laboratory Instrument Logbooks

All laboratory analyses requiring analytical instrumentation are recorded in various Laboratory Instrument Logbooks (Appendix 2, Figure 10-3, a-b) which categorically record and document analytical instrument settings and performance data. These logbooks record instrument calibration data, specific sample volumes, instrument parameters, and corresponding performance data for each sample. Instrumental information has been included and combined with Laboratory Method Logbooks whenever possible to consolidate data. Laboratory Instrument Logbooks are retained for ten years.

10.2.2.2.5 Laboratory Instrument Service Log book

The maintenance, repair, adjustment, and service of all instruments is recorded in appropriate Service Logbooks. These logbooks, which are retained for five years, record the service histories of various instruments.

10.2.2.2.6 Laboratory Equipment Calibration Logbooks

All Laboratory measuring equipment calibrations are recorded in various Laboratory Calibration Logbooks. These logbooks record the dates and primary standard for calibration of various Laboratory thermometers, balances, and glassware items. The Laboratory Calibration Logbooks are retained for five years.

10.2.2.2.7 Laboratory Chromatography Data File

All chromatography data generated by Wadsworth/ALERT is categorically filed in the Laboratory Chromatography Data File. The files include labeled, numbered chromatograms with corresponding integrator print-outs and raw data sheets (Appendix 2, Figure 10-4, a-b). This file is retained for ten years.

10.2.2.2.8 Laboratory GC/MS/DS Data File

All chromatography data and corresponding quantitation lists generated by the Laboratory GC/MS/DS Systems are categorically filed in the Laboratory GC/MS/DS Data File. This file is combined with appropriate Laboratory Chromatography Data Files for GC data. Processed GC/MS Data is filed on a daily basis in the appropriate Laboratory Processed Data File (VOA, B/N/A, etc., Appendix 2, Figure 10-5, a-b). In addition, all GC/MS/DS chromatography data, quantitation lists, and processed data are recorded on magnetic media. Both hardcopy data and magnetic computerized data are retained by the laboratory for ten (10) years.

10.2.2.2.9 Analytical Quality Control Data Log

The Analytical Quality Control Data Log records and documents all data generated by the Analytical Quality Control Program. These files record the raw data and subsequent statistical calculations of various Laboratory quality control components including: continuous method performance evaluations, surrogate spike recovery evaluations, and method blank analyses. Laboratory QA/QC Data Summary Reports containing quality control data statistical summaries and associated quality control charts are routinely generated from this data file (Examples, Appendix 2, Figure 10-6, a,b) QA/QC data files are retained for five years by the laboratory.

10.2.2.3 Data Validation - Date Reporting

Subsequent to data entry, the Quality Assurance Officer is responsible for comparing analytical worksheets with actual data entered into the Data Management System. The Quality Assurance Officer also reviews the quality control report that accompanies the final report.

The Project Manager is then responsible for reviewing the final reports prior to release to the client. Reports are to be reviewed for:

- Completeness results for all parameters requested are present; detection limits, units, dates, and sample descriptions are complete and correct.

- Consistency - all parameters are reviewed for internal consistency (Cr VI Cr T, TKN NH3-N, TS TSS, etc.)

The final report is filed after the above documentation and kept for a minimum of five years.

10.2.2.3.1 Data Reporting Format

Laboratory Analytical Result Summary Final Reports includes appropriate introductory comments, analytical methods summaries, organizational QA/QC outlines, and invoices in addition to listing sample analytical results and associated QC data. Sample analytical result reports and associated QC data sheets are generated in the appropriate standardized form from the Laboratory Computerized Data Management System. The supporting materials previously mentioned are provided by administrative personnel as appropriate for inclusion in final reports. Additional technical narratives, along with supporting raw data may also be included as warranted by special circumstances (non-typical analyses, matrix interferences, etc.).

Abridged analytical result summary final reports are provided for small projects or those requiring rapid analytical turnaround times. These abridged materials primarily contain analytical results. Additional supporting materials may be provided if prearranged.

11.0 Performance and Systems Audits

Wadsworth/ALERT Laboratories participate in a number of performance and systems audits, both internal and external, to monitor the capability and performance of the laboratory and its operations.

11.1 External Laboratory Certifications, Audits, and Approvals

Wadsworth/ALERT Laboratories maintains an internal system of performance and systems audits to verify the quality of its measurement systems. These audits are conducted on a regular basis as a part of normal laboratory operations. In addition, the laboratory participates in a number of federal, state, and private Laboratory Certification, Audit and/or Approval Programs in order to demonstrate its analytical capabilities, professionalism, and expertise. Participation in these programs require the Laboratory to demonstrate acceptable laboratory performance through satisfactory completion of routine systems and/or performance audits. As a part of its certification by these various federal, state, and private agencies, Wadsworth/ALERT Laboratories submits to on-site external systems audits. The inspection audits evaluate the adequacy of laboratory personnel, equipment, documentation, and QA/QC. Performance audits require satisfactory blind analyses of unknown intralaboratory performance evaluation samples. A listing of Laboratory Certifications, Audits, and/or Approvals currently maintained by the Laboratory follows:

AGENCY	TYPE OF CERTIFICATION
USEPA	Contract #68-01-7156 - Chemical Analytical Services for Organics Expires 1-88; Awaiting CLP Bid Renewal Advertisement expected February 1988
USEPA	Zone I/III (Eastern US) ERCS Contract Team Participations Emergency Response and Mobile Analytical Services
US Army Corps of Engineers	Analytical Services for "Superfund" Sites
State of Ohio, EPA	Chemical Analysis of Drinking Water
State of Ohio, Health Department	Chemical Analysis of Drinking Water
State of Ohio, Department of Natural Resources	Analytical Services for Water Pollution Studies

State of West Virginia, Health Department	22 - Reciprocal (Ohio EPA) 11-5-84
State of New Jersey, Department of Environmental Protection	Chemical Analysis of Water and Wastewater - Certification #74487
State of West Virginia, Department of Health	Chemical Analysis of Drinking Water and THM's, Herbicides, Pesticides
State of Michigan, Department of Public Health	Chemical Analysis of Drinking Water and THM's, Herbicides, Pesticides
State of New York, Department of Environmental Conservation	Technically Acceptable Laboratory
State of Florida, Department of Health and Rehabilitative Services	Chemical Analysis of Metals, Extractable Organics, Pesticides, Herbicides, PCB's, Purgeable Organics, Hazardous Waste Characteristics ID # T84059
State of Wisconsin, Department of Natural Resources	Certification LC #999518190
State of South Carolina, Department of Health and Environmental Control	Reciprocal (Florida DHR) Agreement with the State of Florida - 4-87
State of Ohio, EPA Emergency Response Contractor	FY 1987 - 1988
State of South Carolina, Department of Health and Environmental Control	South Carolina Laboratory Certification ID #96004
State of Pennsylvania, Department of Environmental Resources, Bureau of Laboratories	Pending
State of Indiana, through USEPA Region 5	Pending

State of Illinois, Environmental Protection Agency, Department of Public Health	Pending
State of North Carolina, Division of Health Services, Laboratory Services	Pending

11.2 Internal Performance Evaluations

Wadsworth/ALERT Laboratories participates in Intralaboratory Performance Evaluations administered by the Laboratory QC Manager. The QC Manager periodically submits single blind performance evaluation samples from various sources into the laboratory to internally assess and evaluate analytical performance. These single blind performance evaluation standards are generated in-lab by the QC Manager or obtained from various commercial and regulatory sources. These sources and respective analytical parameters are outlined below.

SOURCE	PARAMETERS
USEPA - Environmental Monitoring and Support Laboratory (EMSL)	Trace Metals, Organics Inorganics, Pollutants
USEPA - Water Quality Survey Performance Standards	Interim Primary Water Quality Parameters, Trihalomethanes
USEPA - Research Triangle Park	Asbestos in bulk materials
American Industrial Hygiene Association - Performance Audit Testing (PAT)	Metals, Organic Solvents, Asbestos
Analytical Product Group, Inc. (commercial)	Various Organics and Inorganics

11.3 Internal Performance Evaluations

Representative analytical parameters are evaluated on a monthly basis by the QC Manager. Compliance with accuracy and precision standards is monitored, and monthly internal QC control charts are generated.

12.0 Preventative Maintenance

Wadsworth/ALERT Laboratories maintains a routine training and laboratory equipment maintenance program for all major instrumentation. Laboratory Instrument Service Logbooks are assigned to detail and document the service of all equipment included within this program.

12.1 Field Instruments and Equipment - Not Used

12.2 Laboratory Instruments and Equipment

12.2.1 Operator Training

All laboratory analysts receive proper training in the operation of applicable instruments prior to actual sample analyses. This training combines attendance at various instrument manufacturer's operator training classes and seminars with actual in-lab instruction and supervision by the group leader and Laboratory Technical Director. This training will be augmented and updated as appropriate.

12.2.2 Routine Maintenance Procedures

Wadsworth/ALERT Laboratories maintains a routine laboratory equipment maintenance program for all major instrumentation. For GC and GC/MS instruments, selectedoperators have been trained to perform routine maintenance procedures (i.e. changing oven fans, replacing electronic control boards, changing vacuum pump oil, cleaning quadruple rods, etc.). For the AA and ICP instruments the laboratory maintains a service contract with the manufacturer. For the other instrumentation operators perform routine maintenance (i.e. changing electrodes, changing bulbs, etc.). This program ensures minimal downtime, as well as proper performance. Laboratory Instrument Service Logbooks are assigned to detail and document the service of all equipment included within this program. A substantial spare parts inventory is also maintained to assure timely repair of instruments. Additional specific preventive maintenance procedures for laboratory instruments are listed below.

12.2.2.1 GC and GC/MS

- Utilization of high-quality industrial operating gases combined with on-line installation of molecular sieves and oxygen traps to remove impurities.

- Daily replacement of GC and GC/MS septa (or more frequent as needed).

- Daily "bake off" of GC and GC/MS columns and detectors to cleanse system.

- Periodic cleansing and reconditioning of detectors as indicated by operational consistency.

- Constant monitoring of detector response and overall instrument performance through calibration and verification.

12.2.2.2 AA

- AA lamps shall be warmed up for 15 minutes prior to any analyses.

- Periodic cleaning of windows with alcohol to assure optimal light transmission.

- Daily aspiration of 50 ml of deionized water through the flame assembly or the vapor generation assembly after analyses are complete.

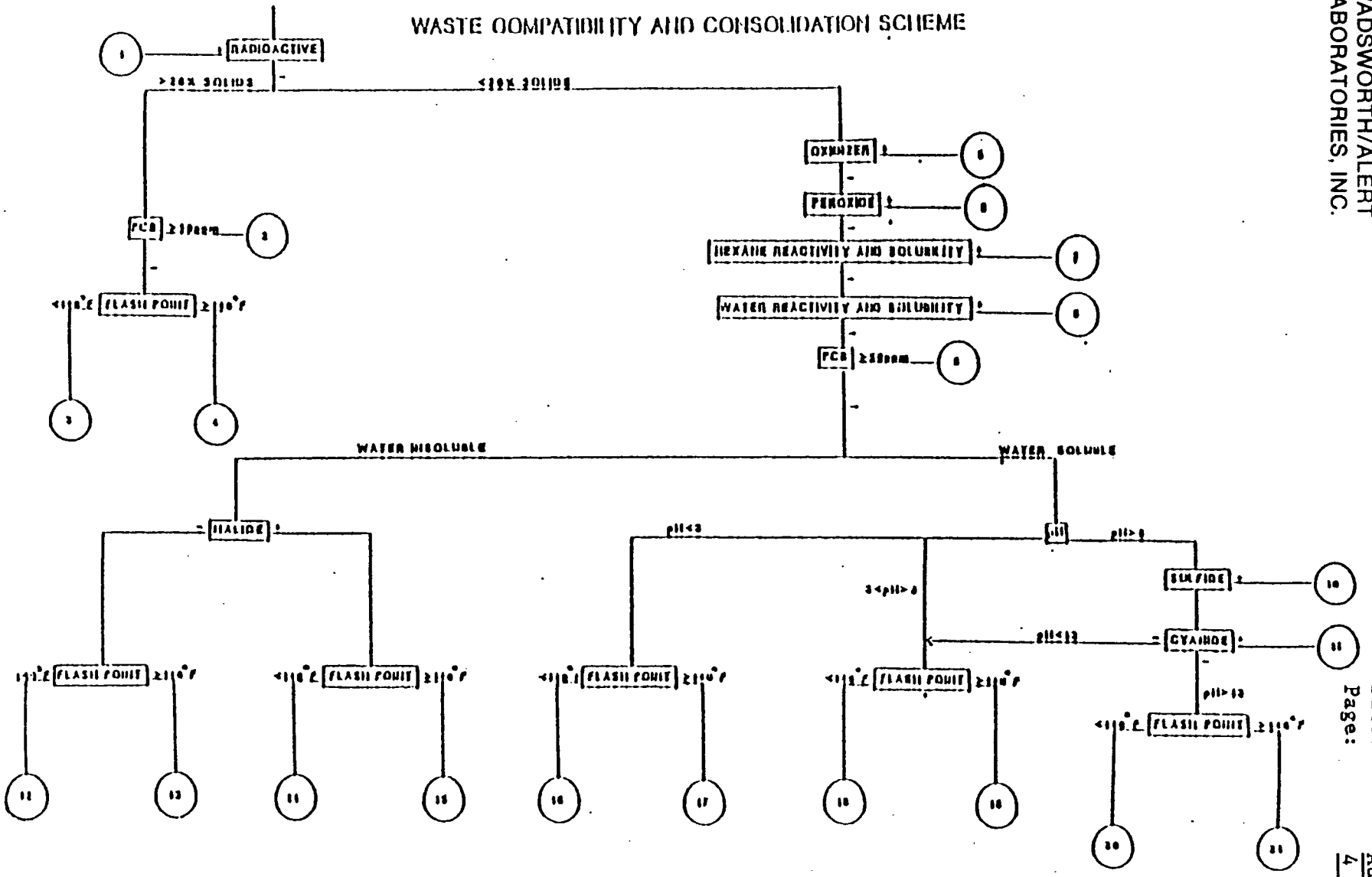
- Thorough wash of the burner assembly and spray chamber in hot water as indicated by instrument response.

- Periodic replacement of pyrolitic graphite furnace tubes as indicated by operational consistency.

- Utilization of high quality industrial operating gases.

WADSWORTH/ALERT LABORATORIES, INC.

WASTE COMPATIBILITY AND CONSOLIDATION SCHEME



- Constant monitoring of detector response and instrument performance through calibration and verification.

12.2.2.3 ICP

- Utilization of high quality operating gases.

- Constant monitoring of detector response and instrument performance through calibration and verification.

- Daily replacement of peristaltic pump tubing.

- Periodic cleaning of nebulizer and spray chamber.

- Daily aspiration of cleaning solution to maintain a clean operating system.

12.2.2.4 pH and Ion-Selective Electrodes

- Rinse probe with deionized water after every analysis and carefully blot off remaining deionized water prior to next analysis.

- Soaking of probe in a suitable solution when instrument is not operating.

- Periodic replacement of the electrodes as indicated by the consistency, repeatability, and stability of the response.

12.2.2.5 Spectrophotometer

- Rinse cuvette with deionized water between analyses.

- Periodic cleaning of windows with alcohol to assure optimal light transmission.

- Periodic replacement of lamps as indicated by the consistency, stability, and repeatability of the response.

- Warm up lamp for 10 minutes prior to any analysis.

12.2.3 Instrument Downtime

Routine maintenance procedures allow the laboratory workload to be scheduled around planned downtime. In the event of unscheduled downtime, samples will be diverted to alternate, certified laboratories. A substantial spare parts inventory is maintained to assure timely repair of instruments and minimize the likelihood of having to send samples out of the laboratory.

13.0 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

Wadsworth/ALERT Laboratories uses specific routine procedures to assess the precision and accuracy of its analytical data. These measures include the validation and internal quality control procedures discussed in sections 8 and 9.

Specific procedures for assessing data accuracy and precision include calculation of percent recoveries and relative percent differences for all duplicate spike sample analyses. These calculations are summarized below, and apply to all analytical parameters.

1. Accuracy = Percent Recovery (R%) = $\frac{[\text{Observed Conc.}]}{[\text{Expected Conc.}]} \times 100$

2. Precision = Relative Percent Difference (RPD) = $\frac{/C1-C2/}{\frac{C1+C2}{2}} \times 100$

   Where C1 and C2 are concentrations of duplicate spikes.

Analytical control limits are derived from statistical manipulation of each data category. These limits are outlined below.

	Accuracy	Precision
Upper Control Limit (UCL)	%R + 3S	RPD + 3S
Lower Control Limit (LCL)	%R - 3S	RPD - 3S

Where S is Standard Deviation

Percent Recovery determination (%R) are entered into the Laboratory Computer Data Management System. This Laboratory Computer Data Management System will formally record the percent recovery data and calculate the mean, standard deviation and the relative percent difference of each pair, and generate continuous R-S quality control charts of the accuracy and precision for each method commonly used in the Laboratory. The quality control charts will provide a continuous indication of method performance by visibly comparing actual quality control recovery data to acceptable USEPA (if available) and/or Laboratory method performance criteria.

Laboratory method performance criteria are utilized to evaluate quality control data in the absence of published USEPA method performance criteria. Laboratory method performance criteria are statistically derived from duplicate matrix spike quality control data as follows:

$$\text{Warning Limit (WL)} = \pm 2s$$
$$\text{Control Limit (CL)} = \pm 3s$$

s = standard deviation of the method percent recoveries

A minimum of six (6) matrix spike sample percent recovery determinations are required to establish the above-stated performance limits. These Laboratory method performance limits are continually redefined as quality control information accumulates.

The mean value percent recovery (R) and standard deviation(s) determinations calculated from the matrix spike quality control results are used to generate Laboratory Method Accuracy Statements for each analytical method commonly used in the Laboratory. Method Accuracy Statements are defined as $R \pm 3s$ and are based upon a minimum of six (6) matrix spike sample determinations. These statements are updated annually as calculated from quality control data accumulated during the previous year. All laboratory Method Accuracy Statements are maintained in the QC manual and should be within the recommended EPA criteria.

14.0 Corrective Action

14.1 Not Used

14.2 Laboratory

Wadsworth/ALERT Laboratories routinely utilizes its quality control data to assess the need for corrective action. Frequent review of data permits rapid identification of the source of analytical or sampling error and implementation of corrective action.

14.2.1 Determination of the Need for Correction Action

Percent recovery determinations from the systematic matrix spike quality control samples must compare favorably to the published USEPA or laboratory method performance criteria outlined previously in order to validate and approve a corresponding batch of sample analyses. The method analyses are out of control and therefore unacceptable if:

1. One data point recovery value is outside of published USEPA performance limits or laboratory control limits (CL).

2. Two consecutive percent recovery values are outside of the Laboratory warning limits (WL).

3. Seven consecutive percent recovery values are on one side of R line.

4. Percent recovery values increase or decrease over five consecutive analyses.

Unacceptable values will render the corresponding batch of sample analyses suspect, as will unacceptable results for method blank analyses, until corrective action demonstrates the return of acceptable method performance.

14.2.2 Procedures for Corrective Action

The analyst who reviews and compiles raw data from analyses and associated matrix blank and matrix spike samples must immediately notify the QC Manager of deviation from accepted standards. In addition, the QC Manager reviews all QC data on a monthly basis to monitor the performance of the analytical system. If any values are outside of QC limits, corrective action will be instituted at once.

Corrective action may also be implemented as a result of external performance and systems audits, intralaboratory comparisons, QA project audits conducted by concerned agencies, or other QA/QC activities.

These corrective actions may involve any phase of the analytical or sampling method including: reagent quality, sample extraction, equipment cleaning, instrument calibration and/or performance, calculations, etc. Specific procedures for corrective action are detailed in the Analytical Methods - Quality Control Procedures section of the Laboratory Quality Control Manual.

15.0 Quality Assurance Reports to Management

Two types of Quality Assurance reports will be issued by Wadsworth/ALERT Laboratories: Internal reports to management and project reports to clients.

15.1 Internal QA Reports

On a routine basis, the QC Manager and Technical Director will prepare a Quality Assurance Report for Laboratory Management. This report shall include the monthly assessments of: data accuracy, precision, and completeness; the results of any internal or external systems and performance audits; a description of any significant QA problems and suggested solutions; and the outcome of any corrective actions undertaken.

15.2 Project Reports

At the completion of a sampling and/or analytical project, the Laboratory Manager shall present a QA report, if applicable, to the appropriate client representative. In most cases, this will be a portion of the Analytical Result Summary Final Report. The project report will include the same components as the internal report but be restricted to that information pertinent to a particular project.

APPENDIX 1

Resumes of Key Wadsworth/ALERT Laboratories
Quality Assurance/Quality Control:

Marvin W. Stephens - Technical Director
Connie Hokanson - QC Manager
Robert E. George - Operations Director
Carol Kralik - GC/MS Coordinator
Randy Grubbs - GC Coordinator
Jeff Smith - Customer Service Representative
J. William Botimer - Cleveland Laboratory Manager

MARVIN W. STEPHENS

Education:

Doctor of Philosophy, Chemistry
University of Nebraska, 1972

Bachelor of Science, Chemistry
Cedarville College, 1965

Work Experience:

1980 - Present Wadsworth/ALERT Laboratories Inc., Vice President & Technical Director

1969 - 1980 Professor of Chemistry, Malone College

Summary of Work - Research, Development, and Quality Assurance/Quality Control of Corporate Analytical Programs for: CERCLA-Environmental Assessments and Restorations; RCRA-Industrial Waste Management and Groundwater Monitoring; SDWA-Drinking Water Standards Compliance Monitoring and Water/Wastewater Treatment Evaluations; NPDES-Industrial Effluents Discharge and Pretreatment Permitting and Monitoring; Surface Water Evaluations; TOSCA-PCB Surveys; OSHA-Industrial Hygiene Analysis.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Analytical Methods Research, Development, and Implementation; Laboratory Quality Control Procedures and Programs; Laboratory Data Management and Analytical Program Documentation; Proposal Preparation and Presentation; Technical Report Writing; Contract Administration.

Technical Development and Management

Environmental Analytical Programs - Sampling and Analysis of Air, Water, and Soil: Complete Organic Chemical Characterizations, Priority Pollutants, HSL Parameters by GC/MS; Herbicides, Pesticides, PCB's, Organics by GC; Metals by AA, ICAP; TOC; TOX; IR; Conventional Pollutants by UV/VIS Spec., Wet Chemistry; Biological Pollutants; Microbiological Analysis-Coliforms.

Hazardous Waste Management Analytical Programs - Complete Analytical Characterizations and Waste Product Surveys by GC/MS, GC, IR, ICAP, AA, Bomb Calorimetry, Flash Pt. App., UV/VIS Spec., Assorted Wet Chemistry; Waste Compatibility and Consolidation Studies; RCRA Hazardous Waste Characteristic Testing; Decontamination Studies.

Health and Safety Analytical Programs - OSHA Industrial Hygiene Sampling and Analysis; Charcoal Tube, Tenax, Impinger, Fiter by GC/MS, GC, AA, ICAP, etc.; Personnel Monitoring; Ambient Air Monitoring; Noise Surveys; Industrial Hygiene Surveys.

CONNIE HOKANSON

Education:

Bachelors of Science
Olivet Nazarene University, 1981

Additional Training: GC Audio Course, ACS
HPLC Training Course, Waters Company
HPLC Training Course, Milton Roy

Work Experience:

1988 - Present Wadsworth/ALERT Laboratories Inc., Quality Assurance/Manager

1987 - 1988 Wadsworth/ALERT Laboratories Inc., Senior Chemist

1986 - 1987 Armour Pharmaceutical Company, GC Group Coordinator

1981 - 1986 Armour Pharmaceutical Company, QC Analyst

Summary of Work - Management of Laboratory Quality Assurance/Quality Control Programs for: CERCLA-Environmental Assessments and Restorations; RCRA-Industrial Waste Management and Groundwater Monitoring; SDWA-Drinking Water Standards Compliance monitoring and Water/Wastewater Treatment Evaluations; NPDES-Industrial Effluent Discharge and Pretreatment Permitting and Monitoring; Surface Water Evaluations; TOSCA-PCB Surveys.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Laboratory Quality Assurance/Quality Control Program Administration; Laboratory Data Management and Analytical Program Documentation.

Technical Research, Development, and Management

Environmental Assessment Programs - Analysis of Air, Water and Soil; Surface Water Evaluations; Groundwater Monitoring; Industrial Discharge Monitoring; Soil Surveys; Subsurface Investigations.

Analytical Methods and Instrumentation - Priority Pollutants, Herbicides, Pesticides, PCB's, Organics by GC; HPLC.

Laboratory Quality Control Program - Formulation of Laboratory Quality Control Sample Spikes, Reference Samples, Control Charts, Accuracy Statements, etc.

ROBERT E. GEORGE

Education:

Master of Science, Environmental Engineering
University of Iowa, 1982
Bachelor of Science, Chemistry
University of Wisconsin, 1971

Work Experience:

1987 - Present Wadsworth/ALERT Laboratories Inc., Vice President & Director of Laboratory Operations

1986 - 1987 Wadsworth/ALERT Laboratories, Inc., Laboratory Manager, Cleveland Facility

1979 - 1986 Serco, Technical Services Director

1978 - 1979 Corning Laboratories, Inc., Laboratory Director

1975 - 1978 Carborundum Company, Senior Engineer

1974 - 1975 Norton Company, Marketing Representative

1971 - 1974 Elyria Health Department, Assistant Chemist

Summary of Work - Supervision and Management of Corporate Technical and Analytical Programs for: CERCLA-Environmental Assessments and Restorations; RCRA-Industrial Waste Management and Groundwater Monitoring; SDWA-Drinking Water Standards Compliance Monitoring and Water/Wastewater Treatment Evaluations; NPDES-Industrial Effluents Discharge and Pretreatment Permitting and Monitoring; Surface Water Evaluations; TOSCA-PCB Surveys; OSHA-Industrial Hygiene Analysis.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Analytical Methods Research, Development, and Implementation; Laboratory Data Management and Analytical Program Documentation; Proposal Preparation and Presentation; Technical Report Writing; Contract Administration; Public Relations; Media Relations; Business Marketing and Promotion.

Technical Development and Management

Environmental Analytical Programs - Sampling and Analysis of Air, Water, and Soil: Complete Organic Chemical Characterizations, Priority Pollutants, HSL Parameters by GC/MS; Herbicides, Pesticides, PCB's, Organics by GC; Metals by AA, ICAP; TOC; TOX; IR; Conventional Pollutants by UV/VIS Spec., Wet Chemistry.

Hazardous Waste Management Analytical Programs - Complete Analytical Characterizations and Waste Product Surveys; Waste Compatibility and Consolidation Studies; RCRA Hazardous Waste Characteristic Testing.

Health and Safety Analytical Programs - Supervision and Implimentation of Health and Safety Practices Programs; Personnel Monitoring; Personnel and Respiratory Protection; Industrial Hygiene Practices.

CAROL KRALIK

Education:

Bachelors of Science, Duquesne University, 1973
Masters of Science, Duquesne University, 1977

Additional Training: Chemical Toxicology
Capillary Chromatography
Extrel ELQ 400 Operator Training Course
Finnigan 4500 In-house Training

Work Experience:

1987 - Present - Wadsworth/ALERT Laboratories, Inc., GC/MS Group Coordinator

1986 - Present Wadsworth/ALERT Laboratories Inc., Senior Chemist

1972 - 1986 NUS - GC/MS Group Leader

Summary of Work - GC/Mass Spectroscopist for USEPA Contract #68-01-7156, Chemical Analytical Services for Organics; Supervision and Management of GC/MS Analytical Programs for: CERCLA-Environmental Assesments and Restorations; RCRA-Industrial Waste Management and Groundwater Monitoring; SDWA-Drinking Water Standards Compliance Monitoring and Water/Wastewater Treatment Evaluations; NPDES-Industrial Effluent Discharge and Pretreatment Permitting and Monitoring; Surface Water Evaluations.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Laboratory Quality Control Procedures and Programs; Laboratory Data Management and Analytical Program Documentation.

Technical Development and Management

Analytical Programs - Analysis of USEPA Contract #68-01-7156 samples by GC/MS, Priority Pollutants, HSL Parameters by GC/MS; Herbicides, Pesticides, PCB's.

RANDY GRUBBS

Education:

Bachelor of Science, Chemistry
Kent State University, 1985

Work Experience:

1987 - Present - Wadsworth/ALERT Laboratories, Inc., GC Group Coordinator

1985 - 1987 - Wadsworth/ALERT Laboratories Inc., Chemist

Summary of Work - Supervision and Management of GC Analytical Group Programs for: CERCLA-Environmental Assessments and Restorations; RCRA-Industrial Waste Management and Groundwater Monitoring; SDWA-Drinking Water Standards Compliance Monitoring and Water/Wastewater Treatment Evaluations; NPDES-Industrial Effluent Discharge and Pretreatment Permitting and Monitoring; Surface Water Evaluations; TOSCA-PCB Surveys.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Laboratory Quality Control Procedures and Programs; Laboratory Data Management and Analytical Program Documentation.

Technical Research, Development and Management

Environmental Assessment Programs - Sampling and Analysis of Air, Water, and Soil: Surface Water Evaluations; Groundwater Monitoring; Industrial Discharge Monitoring; Soil Surveys; Subsurface Investigations.

Hazardous Waste Management and Clean-Up Programs - Sampling and Analysis of Hazardous Waste: Waste Compatibility and Consolidation Studies; Waste Product Survey Characterizations; Laboratory Waste Categorizations (Lab Packing); Surficial Swab Sampling and Analysis; Decontamination Studies; On-Site Treatment and Stabilization Operations.

Analytical Methods and Instrumentation - Priority Pollutants, Herbicides, Pesticides, PCB's, Organics by GC; Volatile Organics by GC/P&T; TOC; TOX; Conventional Pollutants by UV/VIS Spec. and Wet Chemistry.

JEFF SMITH

Education:

Associate Degree, Applied Science
Stark Technical College, 1985
Bachelor of Science, Chemistry
Akron University, to be completed

Additional Training:

Coursework, Kent State University, 1980
Fire Science Instructor Certification,
Ohio Department of Education, Trade and
Industrial Division, 1982
Air Transportation of Dangerous Goods,
Seminar/Workshop, Federal Express, 1987

Work Experience:

1987 - Present Wadsworth/ALERT Laboratories Inc., Sample Control Coordinator

1986 - 1987 Wadsworth/ALERT Laboratories Inc., Sample Preparation Coordinator

1985 - 1986 Wadsworth/ALERT Laboratories Inc., Field Chemist - Technician

1981 - 1985 Ream and Haager Labs, Laboratory Assistant

Summary of Work - Management and Implementation of Technical Sampling and Analytical Programs for: Uncontrolled Hazardous Waste Site Clean-Up Operations; Emergency Spill Containment and Clean-Up Projects; Environmental Assessment and Restorations; Industrial Environmental Impact Surveys; Industrial Hygiene Surveys.

Fields of Competence:

Administrative Development and Management

Project Management and Supervision - Laboratory Quality Control Procedures and Programs; Laboratory Data Management and Analytical Program Documentation; Laboratory Sample Management.

Technical Development and Management

Environmental Assessment Programs - Sampling and Analysis of Air, Water and Soil: Surface Water Evaluations; Groundwater Monitoring; Industrial Discharge Monitoring; Soil Surveys; Subsurface Investigations.

Hazardous Waste Management and Clean-Up Programs - Sampling and Analysis of Hazardous Waste: Waste Compatibility and Consolidation Studies; Waste Product Survey Characterizations; Laboratory Waste Categorizations (Lab Packing); Surficial Swab Sampling and Analysis; Decontamination Studies; On-Site Treatment and Stabilization Operations.

Analytical Programs - Extraction of BNA, Pesticides, PCB's, Volatiles (Soil) Fractions of USEPA Contract 68-01-7156 Samples.

J. WILLIAM BOTTMER

Education:

Bachelors, Chemistry and Mathematics
Malone College, 1979

Additional Training:

1020/CWA Electronics Course - Finnigan MAT Institute, 1985

Work Experience:

1979 - Present Wadsworth/ALERT Laboratories Inc., Technical Manager

Summary of Work - Management and Implementation of Technical Sampling and Analytical Programs for: USEPA Zone I-III ERCS Contract Participations; Uncontrolled Hazardous Waste Site Clean-Up Operations; Emergency Spill Containment and Clean-Up Projects; Environmental Assessments and Restorations; Industrial Environmental Impact Surveys; Industrial Hygiene Surveys. Management and Implementation of Laboratory Maintenance Programs.

Fields of Competence:

Administrative Development and Management

Project Development and Management - Instrument Maintenance Program Administration; Laboratory Quality Control Procedures and Practices; Laboratory Data Management and Analytical Program Documentation.

Technical Development and Management

Environmental Assessment Programs - Sampling and Analysis of Air, Water, and Soil: Surface Water Evaluations; Groundwater Monitoring; Industrial Discharge Monitoring; Soil Surveys; Subsurface Investigations; Ambient Air Sampling.

Hazardous Waste Management and Clean-Up Programs - Sampling and Analysis of Hazardous Waste: Waste Compatibility Studies; Waste Product Survey Characterizations; Laboratory Waste Categorizations (Lab Packing); Surficial Swab Sampling and Analysis; Decontamination Studies; On-Site Treatment and Stabilization Operations.

Health and Safety Programs - Supervision and Implementation of Health and Safety Practices and Programs: Personnel and Respiratory Protection; Personnel and Equipment Decontamination; Health and Safety Monitoring; Personnel Monitoring; Industrial Hygiene Practices.

Analytical Methods and Instrumentation - Priority Pollutants, HSL Parameters by GC/MS; Herbicides, Pesticides, PCB's, Organics by GC; Volatile Organics by GC/P&T; TOC; TOX.

Key to Figures: Section 10

Figure 10-1 Laboratory Work Sheet

Figure 10-2 Laboratory Method Logbooks

- Figure 10-2a Bomb Methods Logbook
- Figure 10-2b Chromatography Methods Logbook
- Figure 10-2c EP Toxicity Leachate Logbook
- Figure 10-2d Flashpoint Method Logbook
- Figure 10-2e Gravimetric Method Logbook
- Figure 10-2f Metals Method Logbook
- Figure 10-2g Organic Characterization Logbook
- Figure 10-2h pH Method Logbook
- Figure 10-2i Spectrophotometric Method Logbook
- Figure 10-2j Titrimetric Method Logbook

Figure 10-3 Laboratory Instrument Logbooks

- Figure 10-3a GC Instrument Logbook
- Figure 10-3b GC/MS Instrument Logbook

Figure 10-4 Laboratory Chromatography Data File

- Figure 10-4a Plotting Integrator Printout
- Figure 10-4b Chromatography Raw Data Sheet

Figure 10-5 Laboratory Processed Data File

- Figure 10-5a VOA Data File
- Figure 10-5b B/N/A Data File

Figure 10-6 Laboratory Quality Control Data Log

- Figure 10-6a MS/MSD Data
- Figure 10-6b Percent Recovery QC Chart

WADSWORTH/ALERT
LABORATORIES, INC.

FIGURE 10-1
Laboratory Work Sheet
Example: Metals

SERVICE REQUEST

CLIENT: _____ LAB ID: 7313

SAMPLE ID: _____ DATE REC'D: 7/23/87

MATRIX: EXTRACT DATE EXT'D: _____

DATE COMP'D: _____

DUE DATE: 7/24/87

VOC _____ BNA ____ PEST/PCB ____ METALS XX . MISC ____

METALS

TOTAL _____ EPTOX _____

CONC or OIL	PARAMETER	RESULT	DETECTION LIMIT mg/L	mg/kg	DER
	Arsenic (As)	NO	0.01	0.1	0.05
R	Barium (Ba)	NO	1.0	20.	1.0
	Cadmium (Cd)	NO	0.05	1.0	0.01
C	Chromium (Cr)	NO	0.2	4.0	0.05
R	Chromium (Cr VI)	NO	0.2	4.0	
	Lead (Pb)	NO	0.5	10.	0.05
A	Mercury (Hg)	NO	0.002	0.04	0.002
	Selenium (Se)	NO	0.01	0.1	0.01
	Silver (Ag)	NO	0.1	2.0	0.05
P	Antimony (Sb)	NO	2.0	40.	
R	Beryllium (Be)	NO	0.05	1.0	
I	Copper (Cu)	NO	0.2	4.0	1.0
P	Nickel (Ni)	NO	1.0	20.	
O	Thallium (Tl)	NO	1.0	20.	
L	Zinc (Zn)	NO	0.05	1.0	5.0
	Aluminum (Al)	NO	5.0	100.	
	Calcium (Ca)	NO	0.05	1.0	
O	Cobalt (Co)	NO	1.0	20.	
	Iron (Fe)	NO	1.0	20.	0.3
T	Magnesium (Mg)	NO	0.1	2.0	
	Manganese (Mn)	NO	0.05	1.0	0.05
H					
.	Potassium (K)	NO	0.1	2.0	
E	Sodium (Na)	NO	5.0	100.	150.
	Tin (Sn)	NO	5.0	100.	
R	Vanadium (V)	NO	10.	200.	
	Other	NO			
	Other	NO			

Digestion: HNO3

Sample Weight (Volume) _____

HZSO4

Final Volume _____

HCL

Moisture _____ %

FIGURE 10-23
Bomb Methods Logbook

WADSWORTH TESTING LABORATORIES/ALERT INC.
BOMB LOGSHEET

SAMPLE ID	MATRIX	SAMPLE WEIGHT	CRUCIBLE INITIAL	CRUCIBLE FINAL	DIFFERENCE	CONC %	COMMENTS	DATE	ANALYST
DUPLICATE									
SPIKE									

WADSWORTH/ALERT
LABORATORIES, INC.

Section No.: Appendix 2
Revision No.: August 29, 1988
Date:
Page: 4 of 20

FIGURE 10-2b
Chromatography Method Logbook

WADSWORTH TESTING LABORATORIES / ALERT INC.

SAMPLE DATA		EXTRACTION									ANALYSIS							COMMENTS
ID	SAMPLE ID	DATE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	DATE	[illegible]	
	DUPLICATE																	
	BLANK																	
	SPIKE																	

FIGURE 10-2c
EP Toxicity Leachate Logbook

WADSWORTH TESTING LABORATORIES / ALERT INC.

EP TOXICITY LEACHATE LOGSHEET

SAMPLE ID:					SAMPLE ID:				
WEIGHT:					WEIGHT:				
COMMENTS:					COMMENTS:				
TIME	pH	Acid/Base	DATE	ANALYST	TIME	pH	Acid/Base	DATE	ANALYST

№ 701

WADSWORTH/ALERT
LABORATORIES, INC.

FIGURE 10-2a
Flashpoint Method Logbook

WADSWORTH TESTING LABORATORIES/ALERT INC.
FLASHPOINT LOGSHEET

SAMPLE ID	MATRIX	METHOD PM	METHOD CC	METHOD CC	START TEMP	FLASH TEMP	COMMENTS	DATE	ANALYST
CALIBRATION	STANDARD						EXPECTED TEMP:		
CALIBRATION	STANDARD						EXPECTED TEMP:		
CALIBRATION	STANDARD						EXPECTED TEMP:		

Nº 102

FIGURE 10-2e
Gravimetric Method Logbook

WADSWORTH/ALERT LABORATORIES

GRAVIMETRIC LOGSHEET

Sample Number	Date	Analyst Initials	Sample Size	Wt. Before	Wt. After	Dif-ference	Wt. after Ignition	mg/l or mg/kg Ortho	Total Solids mg/l	Total Suspended Solids mg/l	Total Volatile Solids mg/l	Total Dissolved Solids mg/l

WADSWORTH/ALERT
LABORATORIES, INC.

FIGURE 10-2f
Metals Method Logbook

WADSWORTH TESTING LABORATORIES/ALERT INC.
METALS LOGSHEET

SAMPLE ID	ELEMENT	CONC. LENGTH	TUBE WIDTH	METHOD CALIBRATION			VOLUME/WEIGHT FACTOR	DILUTION	WATER VALUE	FINAL CONC	QC	COMMENTS	DATE	ANALYST
SPIKE														
BLANK														
DUPLICATE														

Nº . 2501

FIGURE 10-28
Organic Characterization Logbook

WADSWORTH TESTING LABORATORIES / ALERT INC.
ORGANIC CHARACTERIZATION LOGSHEET

LAB NUMBER	PROJECT CODE	STATION NO.	SEQUENCE NO.	MONDAY	TIME	STATION LOCATION

AT LAB MONDAY	AMOUNT RECEIVED	COMMENTS:	SAMPLE MATRIX				PARAMETER			
			AIR	WATER	SEDIMENT	OTHER	VOLATILE	BASE/NEUT	ACID	OTHER

AMOUNT EXTRACTED	INITIAL pH	COMMENTS:

EXTRACT	ADJUSTED pH	SOLVENT	SOL. VOL. ml	SOL. REC. ml	% REC.	EXCIL SOL.	EXCIL VOL. ml	CONC. ml	DATE	ANALYST
VOLATILE										
BASE/NEUT										
ACID										
OTHER										

INSTRUMENT	VOLATILE			BASE/NEUT			ACID			OTHER		
	DATE	FILE	% SOL/VOL	DATE	FILE	% SOL/VOL	DATE	FILE	% SOL/VOL	DATE	FILE	% SOL/VOL
GC												
GC/MS												
IDENT.	DATE	ANALYST		DATE	ANALYST		DATE	ANALYST		DATE	ANALYST	
QUANT.	DATE	ANALYST		DATE	ANALYST		DATE	ANALYST		DATE	ANALYST	

Form II

№ 301

FIGURE 10-2h
pH Method Logbook

WADSWORTH TESTING LABORATORIES / ALERT INC.
pH LOGBOOK

SAMPLE ID	MATRIX	pH. S.U.	TEMP	4.0 STD	7.0 STD	10.0 STD	COMMENTS	DATE	ANALYST

N3 76

FIGURE 10-2i
Spectrophotometric Method Log

WADSWORTH TESTING LABORATORIES.
SPECTROPHOTOMETRIC LOG S

SAMPLE ID	MATRIX	WAVELENGTH	VOLUME/WEIGHT	DILUTION	[illegible] VALUE	[illegible]
SPIKE						
BLANK						
DUPLICATE						

FIGURE 10-2j
Titimetric Method Logbook

WADSWORTH [illegible] LABORATORIES, INC.

Analyst

Titimetric Analysis Bench Sheet

Sample No.	Date	Analysis	Sample Vol.	Dil.	Titrant Identity	Titrant Vol.	Conc. mg/L	Q. C. Data	

WADSWORTH/ALERT
LABORATORIES, INC.

FIGURE 10-3a
GC Instrument Logbook

WADSWORTH TESTING LABORATORIES / ALERT INC.
GC INSTRUMENT LOGSHEET

SAMPLE DATA						GC PARAMETERS									DETECTOR				PERFORMANCE STANDARDS				COMMENTS	ANALYST
DATE	[illegible]	FILE	[illegible]	% [illegible]	[illegible]	COLUMN	INJ °C	[illegible] °C	[illegible] min	RATE °C/min	FINAL °C	FINAL min	FLOW ml/min	INJ'D µl	TYPE	[illegible]	[illegible]	°C	A RT	A RESPONSE	B RT	B RESPONSE		

Form #

[illegible]

FIGURE 10-3b
GC/MS Instrument Logbook

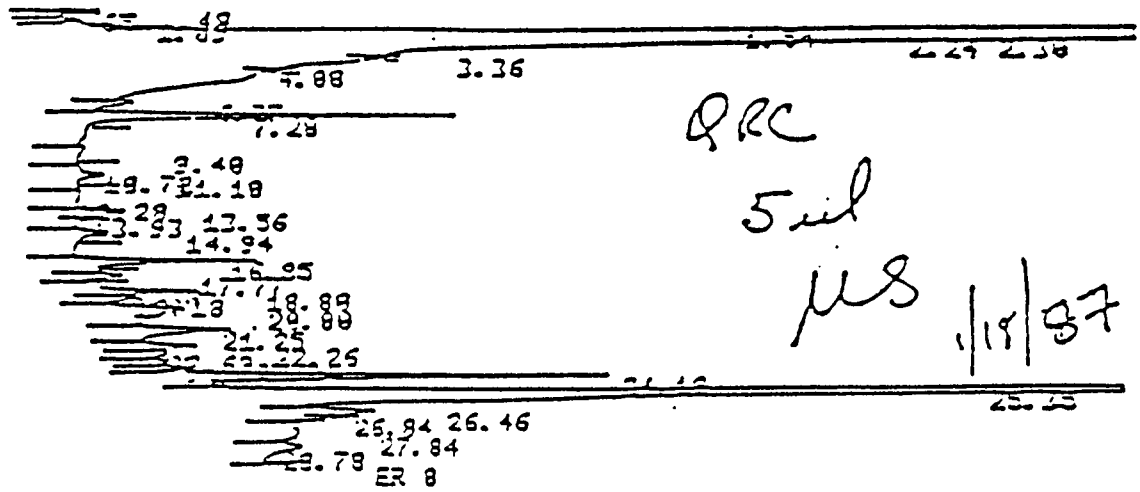
WADSWORTH TESTING LABORATORIES / ALERT INC.

GC/MS INSTRUMENT LOGSHEET

| SAMPLE DATA | | | | | | | | | GC PARAMETERS | | | | | | | | |

FIGURE 10-4a
Laboratory Chromatography Data File
Example: Plotting Integrator Printout

CHANNEL A INJECT 02:09:21 STORED TO BIN # 66



QRC
5 ml
MS 1/19/87

DATA SAVED TO BIN # 66

02:09:21 CH= "A" PS= 1

FILE 9. METHOD 8. RUN 48 INDEX 48 BIN 66

PEAK#	AREA%	RT	AREA	BC
1	0.057	0.49	15268	02
2	0.084	0.65	22383	03
3	0.074	1.09	19577	02
4	0.335	1.54	89161	02
5	35.011	2.24	9318635	02
6	27.682	2.3	7361633	08
7	0.146	3.36	38791	05
8	0.059	4.08	15568	05
9	0.152	6.37	49445	05
10	2.198	7.28	584559	05
11	0.075	9.4	19858	01
12	0.033	10.72	8844	02
13	0.176	11.1	46687	03
14	0.076	12.28	29233	02
15	0.38	13.56	101165	02
16	0.178	13.93	47278	02
17	0.236	14.94	62838	03
18	0.959	16.85	254934	01
19	0.155	17.77	41258	01
20	0.071	18.38	18871	02
21	0.546	18.8	145173	02
22	0.262	19.18	69733	02
23	1.072	20.	285078	02
24	0.875	21.25	232791	02
25	0.344	22.26	91381	02
26	0.181	22.69	48129	02
27	0.104	23.24	27658	02
28	0.166	23.65	44168	02
29	2.941	24.19	782829	02
30	27.647	[illegible]	7288638	08

FIGURE 10-4b

Laboratory Chromatography Data

Example: Chromatography Raw Data

CL:
DET:
COL:

DATA SHEET

SAMPLE-ID				
DATE				
INITIAL				
FINAL				
INJECTION				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
RT				
AREA				
TOTAL AREA				
RF USED				
CONC.				
OPERATOR				
NOTES:				

FIGURE 10-5a
Laboratory Processed Data File
Example: VOA

QUANT REPORT

Operator ID: MIKE Quant Rev: 4 Quant Time: 880407 03:33
Output File: ^VOL31::AQ Injected at: 880407 02:46
Data File: >VOL31::01 Dilution Factor: 1.00
Name: 8018-10,MIM CLARK
Misc: 250NG13355,1ZEP1000,VOC,250UL/5ML MW=17

ID File: IDVOL::UP
Title: ALL VOLATILE COMPOUNDS AND INT STDS AND SURROGATES
Last Calibration: 880407 02:32

	Compound	R.T.	Scan#	Area	Conc	Units	q
1)	******BROMOCHLOROMETHANE*****	14.50	323	108149	250.00	NG	62
6)	CHLOROETHANE	8.43	164	428808	2037.75	NG 8100	91
13)	1,1-DICHLOROETHENE	14.10	310	31423	33.00	NG 130	89
14)	1,1-DICHLOROETHANE	15.51	349	533311	237.33	NG 950	95
18)	1,2-DICHLOROETHANE-d4 SURR>>	17.43	386	408329	331.19	NG	80 132
19)	******1,4-DIFLUOROBENZENE*****	24.55	530	906447	250.00	NG	89
20)	2-BUTANONE (MEK)	17.32	383	18831	32.93	NG	97
35)	******CHLOROBENZENE-d5*****	30.20	725	1115006	250.00	NG	93
40)	TOLUENE	28.92	632	18942	5.38	NG	85
41)	TOLUENE-d8 SURROGATE	28.78	628	1530249	245.46	NG	55 98
45)	BROMOFLUOROBENZENE SURROGATE	33.91	872	333303	204.93	NG	68 82
	Acetone						
* Compound is ISTD		11.61	246	54021	63.	NG	250

FIGURE 10-5b
Laboratory Processed Data File
Example: B/N/A

Operator ID: MIKE Quant Rev: 4 Quant Time: 851105 23:38
Output File: [illegible] Injected at: 851101 01:49
Data File: [illegible] Dilution Factor: 1.00
Name: SRNS APPENDIX IX
Misc: 40N613.2N.3P85.2UL BTL#19

ID File: IDAP[illegible]
Title: APPENDIX IX SPECTRA
Last Calibration: 851105 23:31

	Compound		R.T.	Scan#	Area	Conc	Units	Q
1)	1,4-DICHLOROBENZENE-d4	15	10.79	381	15031	49.09	NG	95
2)	PYRIDINE	110861	5.03	17	14234	42.53	NG	76
3)	ETHYL METHACRYLATE		5.37	99	21852	49.50	NG	97
4)	2-PICOLINE	109958	7.54	123	12363	47.34	NG	94
5)	3-CHLOROPROPIONITRILE	542767	7.69	128	11531	49.05	NG	94
6)	4-PICOLINE	108894	8.34	157	6912	46.55	NG	95
7)	METHYL METHANESULFONATE		8.80	191	15488	51.24	NG	87
8)	P-BENZOQUINONE	106514	10.45	259	7824	49.31	NG	85
11)	PENTACHLOROETHANE	76017	11.35	348	8992	53.44	NG	86
12)	ACETOPHENONE	98862	14.09	445	32288	47.89	NG	88
13)	N-NITROSOPYRROLIDINE	930552	14.05	447	8950	44.27	NG	50
14)	*NAPHTHALENE-D8	15	15.67	572	51108	48.88	NG	88
16)	N-NITROSOPIPERIDINE	100754	15.05	492	10703	45.63	NG	63
17)	2,6-DICHLOROPHENOL	87650	17.04	538	18523	48.34	NG	94
18)	N-NITROSODI-N-BUTYLAMINE	924160	18.24	549	10758	45.81	NG	97
19)	RESORCINOL		18.39	555	8052	41.77	NG	95
20)	SAFROLE	94597	18.77	573	18423	49.22	NG	95
20)	SAFROLE	94597	19.79	721	2346	7.07	NG	92
21)	*ACENAPHTHENE-d10	15	22.23	849	30335	48.80	NG	97
22)	1,2,4,5-TETRACHLOROBENZENE		19.60	715	23998	54.60	NG	98
24)	ISOSAFROLE (cis or trans)		19.79	721	2346	5.18	NG	97
24)	ISOSAFROLE (cis or trans)		20.48	755	14503	50.28	NG	97
25)	1,4-NAPHTHOQUINONE	130154	21.05	797	15913	51.04	NG	95
26)	1,4-DINITROBENZENE	100254	21.23	799	5124	41.32	NG	87
27)	PENTACHLOROBENZENE	608935	22.95	881	20924	52.05	NG	98
28)	1-NAPHTHYLAMINE	134327	23.14	890	25831	49.90	NG	90
29)	1-NAPHTHYLAMINE	134327	23.33	902	22362	45.53	NG	88
29)	2-NAPHTHYLAMINE	91598	23.14	899	25831	54.42	NG	95
29)	2-NAPHTHYLAMINE	91598	23.33	902	22362	49.71	NG	95
30)	2,3,5,6-TETRACHLOROPHENOL		23.39	838	8532	47.49	NG	96
30)	2,3,5,6-TETRACHLOROPHENOL		23.39	891	5232	55.39	NG	94
31)	2,3,4,6-TETRACHLOROPHENOL		23.38	838	8532	49.21	NG	97
31)	2,3,4,6-TETRACHLOROPHENOL		23.38	891	5232	50.85	NG	95
32)	*PHENANTHRENE-d10	15	25.88	1074	43338	49.00	NG	98
33)	5-NITRO-O-TOLUIDINE	99558	24.12	928	8431	47.19	NG	94
34)	DIPHENYLAMINE	122394	24.42	950	31818	48.51	NG	98
35)	PHORATE		25.52	1007	13818	45.55	NG	92
37)	PHENACETIN	62442	25.54	1008	8331	52.43	NG	88
38)	4-AMINOBIPHENYL	92671	25.37	1043	22588	48.15	NG	98
39)	PENTACHLORONITROBENZENE	82688	25.78	1053	4270	48.83	NG	80
40)	PRONAMIDE		25.75	1055	10453	45.52	NG	99
41)	DISULFOTON	298044	27.17	1088	14108	48.15	NG	97
42)	METHYL PARATHION		26.33	1145	7540	48.12	NG	90
43)	ISODRIN		30.34	1244	6249	51.98	NG	96
44)	*CHRYSENE-d12	15	35.34	1450	41706	49.00	NG	98
45)	O-DIMETHYLAMINOAZOBENZENE		32.55	1350	13192	47.10	NG	89

WADSWORTH/ALERT
LABORATORIES, INC.

FIGURE 10-6a
Laboratory Quality Control Data Log
MS/MSD Data

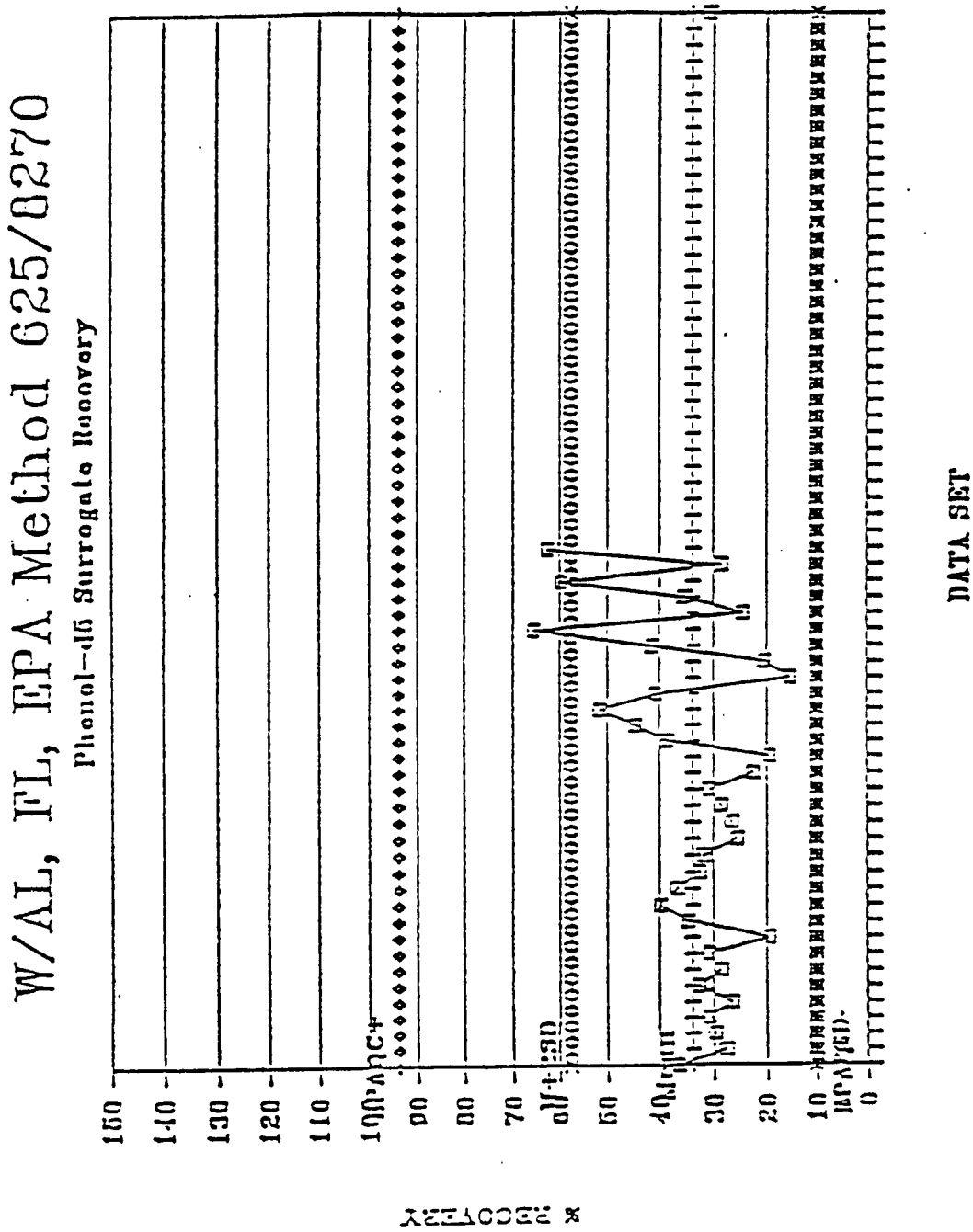
WADSWORTH/ALERT LABORATORIES, INC., BARTOW REGIONAL LABORATORY
RECOVERY STATISTICS - SURROGATE COMPOUNDS- EPA METHODS 625/8270

Enter Date in col. B, then data in cmp'd. col.
QC limit error tracking period(.) OK, plusest(++++).
_indicate that laboratory QC limit has exceeded EPA control limit
All data calc's at entry, auto updating, ALWAYS SAVE LATEST VERSION.

Col.	Type	Cmp'd.
C	BNA SS	2-Fluorophenol
D		Phenol-d5
E		2,4,6 Tribromophenol
F		Nitrobenzene-d5
G		2-Fluorobiphenyl
H		Terphenyl-d14

	Date	Cmp'd. #1	Cmp'd. #2	Cmp'd. #3	Cmp'd. #4	Cmp'd. #5	Cmp'd. #6
1	12/10/86	56.00	37.00	89.00	87.00	99.00	100.00
2		43.00	29.00	77.00	74.00	66.00	81.00
3		44.00	30.00	71.00	72.00	63.00	80.00
4		46.00	31.00	79.00	75.00	57.00	66.00
5		40.00	27.00	64.00	75.00	63.00	80.00
6		47.00	33.00	66.00	77.00	65.00	90.00
7		41.00	29.00	58.00	81.00	67.00	90.00
8		47.00	31.00	80.00	75.00	61.00	68.00
9		22.00	21.00	38.00	80.00	56.00	72.00
10		50.00	35.00	77.00	84.00	64.00	72.00
11		57.00	40.00	85.00	99.00	83.00	84.00
12		52.00	37.00	67.00	63.00	75.00	94.00
13	12/15/86	41.00	33.00	88.00	81.00	66.00	68.00
14		44.00	32.00	67.00	68.00	56.00	75.00
15		35.00	25.00	68.00	64.00	54.00	74.00
16		32.00	27.00	64.00	58.00	54.00	89.00
17		39.00	29.00	74.00	72.00	64.00	85.00
18	12/31/86	32.00	31.00	46.00	77.00	78.00	66.00
19		36.00	23.00	63.00	65.00	62.00	85.00
20		33.00	20.00	74.00	57.00	63.00	92.00
21		54.00	39.00	99.00	76.00	80.00	72.00
22		51.00	45.00	100.00	91.00	78.00	94.00
23		68.00	52.00	110.00	102.00	85.00	93.00
24	1/20/87	43.00	41.00	43.00	48.00	50.00	51.00
25		21.00	16.00	48.00	54.00	55.00	65.00
26		25.00	21.00	58.00	62.00	54.00	100.00
27	1/25/87	40.00	42.00	75.00	52.00	72.00	68.00
28		75.00	66.00	92.00	89.00	100.00	78.00
29		23.00	25.00	68.00	24.00	56.00	85.00
30		36.00	36.00	56.00	51.00	62.00	71.00
31		63.00	68.00	96.00	88.00	105.00	78.00
32		34.00	29.00	49.00	71.00	95.00	53.00
33		63.00	63.00	95.00	88.00	104.00	72.00
34							
35							
36							

FIGURE 10-6b
Laboratory Quality Control Data Log
Percent Recovery QC Chart



APPENDIX III

Wadsworth/ALERT Laboratories' Waste Compatibility and Consolidation Scheme

Wadsworth/ALERT Laboratories developed the following analytical scheme for th purpose of determining the compatibility and ultimate consolidation of unknow waste streams. It incorporates the use of commercial test strips and standar analytical methods and drum consolidation protocols as outlined in this section.

WASTE COMPATIBILITY AND CONSOLIDATION SCHEME

Compatibility and Consolidation Groups
(See Flowchart)

1. Radioactive
2. PCB Solid
3. Flammable Solid
4. Nonflammable Solid
5. Oxidizer
6. Peroxide
7. Reactive
8. Water Reactive
9. PCB Liquid
10. Sulfide Liquid
11. Cyanide Liquid
12. Flammable Nonhalogenated Organic Liquid
13. Nonflammable Nonhalogenated Organic Liquid
14. Flammable Halogenated Organic Liquid
15. Nonflammable Halogenated Organic Liquid
16. Flammable Aqueous Acid
17. Nonflammable Aqueous Acid
18. Flammable Aqueous Neutral
19. Nonflammable Aqueous Neutral
20. Flammable Aqueous Base
21. Nonflammable Aqueous Base

ANALYTICAL METHODS

RADIOACTIVITY	- National Conference on Management of Uncontrolled Hazardous Wastes Sites (USEPA Hazardous Materials Control Research Institute), October 1981 110
PEROXIDE	- Ether Peroxide Test Strips
*	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.11
OXIDIZER	- Potassium Iodide - Starch Test Strips
*	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.11
WATER REACTIVITY & SOLUBILITY	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.11
FLAMMABILITY	- Open Flame Test
pH	- pH Indicator Strips
CYANIDE	- Standard Methods for Examination of Water & Waste Water, 14th Edition, 1979 413-I
*	- Standard Methods for Examination of Water & Waste Water, 14th Edition, 1979 412-E
SULFIDE	- Lead Acetate Test Strips
*	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.5
HALIDES	- The Systematic Identification of Organic Compounds, Shriner et al, 5th Edition, Jon Wily & Sons, New York, NY, 1964
*	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.6
PCB'S	- Drum Consolidation Protocol (DRAFT) USEPA (August 1981) 15.5.8

* - Confirmation Test