POST CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL FOR LANDFILL CELLS NO. 1 AND NO. 2 AT THE SKW ALLOYS, INC. WITMER ROAD SITE

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1.0 INTRODUCTION

The following provides a post closure maintenance and monitoring plan for SKW Alloys, Inc.'s landfill Cells No. 1 and No. 2. These facilities are located at a 37 acre site adjacent to Witmer Road in the Town of Niagara. Waste disposed in Cell No. 1 includes ferrosilicon and ferro-chromium metal baghouse dusts and waste disposed in Cell No. 2 includes ferrosilicon and silicon metal baghouse dusts.

Cell No. 1 was constructed in 1980 per a New York State Department of Environmental Conservation (NYSDEC) Part 360 Permit (#2133). It was closed in 1990 per a NYSDEC approved closure plan. Cell No. 2 was constructed in 1983 per a NYSDEC Part 360 Permit (#2585). Per NYSDEC Order on Consent 87-152A waste deposition into Cell No. 2 was stopped on September 30, 1991. Upon receipt of NYSEC approval for Cell No. 2's closure plan (submitted to NYSDEC on October 30, 1991), Cell No. 2 will be closed prior to August 1, 1992.

The principal objective of this manual is to provide the necessary instructions for the following:

1) Proper maintenance of all facility components,
2) Ground water, surface water, and leachate monitoring sampling and analysis, and

3) Interpretation of ground and surface water monitoring data.

Adherence to this post closure monitoring and maintenance program is required by 6 NYCRR Part 360 for a minimum period of thirty (30) years after final closure of Cells No. 1 and 2.

The information provided in this post closure monitoring and maintenance operations manual will be utilized by SKW Alloys personnel upon completion of Cell No. 2's final closure. This final closure will be completed by August 1, 1992 as required by Order on Consent 87-152A.

2.0 PROCEDURE FOR AMENDING POST CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL

This post closure monitoring and maintenance operations manual should be reviewed at regular intervals (initially once every three years) to ensure that it remains consistent with both the regulations and the technology concerning post closure monitoring and maintenance at the Witmer Road site. All necessary modifications will be made under the direction of a professional engineer licensed in the State of New York.

Since this plan (after approval) will be incorporated as a binding agreement between SKW Alloys, Inc. and the NYSDEC, any proposed modifications to this plan will be submitted to the NYSDEC for approval.

Upon receipt of NYSDEC approval, the changes will be made and the updated plan will be placed on file at the SKW Alloys, Inc.'s Highland Avenue facility.

3.0 POST CLOSURE MAINTENANCE REQUIREMENTS

The goals of the post closure maintenance plans for the SKW Alloys, Inc. Witmer Road Site are as follows:

1) Ensure that structural integrity of closed Cell No. 1 and Cell No. 2 is being properly maintained,
2) Correct any problems that might occur at the site before they have a chance to develop to such a degree that adverse environmental impacts might result, and
3) Follow a program in which all involved parties (SKW Alloys, regulatory agencies, and the public) have a sense of confidence that the site will not create problems which cannot be reasonably handled with minimum impacts.

The post closure maintenance plan can be summarized as follows:

1) SKW will designate a person or persons who will be responsible for filing a Waste Management Facility maintenance inspection report. Included in this inspection report will be a check list which covers the following:

    a) Bank and cover erosion,
    b) Settlement,
    c) Cover soil integrity,
    d) Condition of vegetative cover,
    e) Condition of leachate control systems, and
    f) Condition of monitoring wells.

2) Contingent upon approval of the maintenance inspection plan by the NYSDEC the SKW portion of the Witmer Road site will be physically walked by the responsible individual or individuals once a month for the first year after completion of Cell No. 2 closure, once every three months beginning the second year through the fifth year, and semi-annually for the duration of the post closure period.
3) If any problems are encountered during the inspections that may be of significant environmental concern, the necessary corrective actions will be undertaken as expeditiously as possible. Notice of these actions will be reported to the NYSDEC explaining the nature and location of the problem and the corrective action taken.

Post closure maintenance requirements are expected to be minimal. However, areas where some maintenance may be necessary include landfill cover, berms, surface water drainage ditch, leachate collection system and ground water monitoring wells.

Adequate information is not available to actually calculate how much subsidence will occur with Cells No. 1 and 2. However, only an insignificant amount of subsidence is expected. This is based on the results from compaction tests previously done on waste materials contained in Cells No. 1 and No. 2. In addition the materials contained in these cells will not undergo any decomposition. Slopes utilized in the closures of Cells No. 1 and 2 will insure that their final slope after settling and subsidence will be greater than three percent. A slope greater than three percent will allow for adequate surface water

runoff rates.

Any deficiencies noted either during the site's scheduled or unscheduled inspections will be corrected as expeditiously as possible. While each situation must be evaluated on a case by case basis, a plan of action has been prepared to deal with those situations which are most likely to occur.

Landfill cover deterioration should be minimal. However, some will undoubtedly occur due to freeze-thaw effects, water erosion, etc. Such deterioration must be corrected as quickly as possible if infiltration and associated leachate generation is to be minimized.

The vegetative growth covering the closed cells will be allowed to return to its natural state. Therefore no mowing will be performed. If significant bare spots should develop, an attempt will be made to determine the cause. Factors which will be considered include the presence of excessive moisture, excessive dryness, wrong pH or the absence of the proper soil nutrients. If a specific cause can be determined, remedial action will be taken.

Both wind and water erosion of the landfill cover can occur. While this is not expected to be a significant problem, any erosion which does

occur must be taken care of expeditiously. Repair will bring lines and grades to their original configuration. If the erosion can be attributed to inadequate original design, the necessary design modifications will be made and implemented (after receipt of NYSDEC approval). Future modifications could include changes in slope gradients or protection of slopes by riprap.

Normal maintenance of the site drainage ditch will consist of removing sediments and other obstructions. Additional work will be required if the site's drainage ditch proves to be inadequate or exhibits evidence of significant erosive. Leachate collection system standpipes, piping, and transfer pump can all require maintenance. In the event the leachate pump fails, it will be removed from service and repaired. Under normal circumstances, a spare replacement pump will be installed. In the event one is not available, a portable pump will be utilized on a temporary basis.

The facility's log book will include notations concerning both scheduled and unscheduled facility inspections. Information will include the date and time of the inspection, inspector's name and a summary of all problems observed and remedial actions taken.

Records of all inspections will be retained for a minimum period of seven (7) years. In addition, summary reports and records of all incidents requiring initiation of the site's contingency plan or resulting in human health or environmental damage will be prepared and maintained for a minimum period of seven (7) years.

4.0 POST CLOSURE GROUND WATER, SURFACE WATER, AND LEACHATE SAMPLING AND ANALYSIS PLAN

The following provides a post closure site ground water, surface water, and leachate sampling and analysis plan for the Witmer Road landfill site. Its primary objective is to provide data relating to the site's ground water, surface water, and leachate quality during the solid waste management facility's post closure period.

Factors which were given consideration in the design of this plan include the following:

1) Ground and surface water monitoring requirements at a non hazardous waste management landfill facility as stipulated in 6 NYCRR Part 360 Solid Waste Management Facilities (effective December 31, 1988),
2) Physical and chemical characteristics of waste materials deposited in Cells No. 1 and 2,
3) Site's hydrological conditions,
4) Geologic and man-induced features which could affect the

generation and movement of leachate,
5) Pollution potential of site as exemplified by the type of waste materials present, and
6) Ground water use.

Items which are addressed in this post closure ground water, surface water, and leachate sampling and analysis plan include the following:

1) Locations and construction of monitoring points,
2) Discussion of monitoring frequency and parameters,
3) Sampling personnel and equipment requirements,
4) Sampling procedures,
5) Sample handling,
6) Analytical procedures,
7) Laboratory quality assurance plan,
8) Data analysis,
9) Contingency monitoring requirements, and
10) Data reporting requirements.

By developing and implementing a comprehensive, site specific ground water sampling and analysis program the potential for problems to arise when obtaining, handling, preserving, and analyzing samples will be minimized.

4.1 LOCATION AND CONSTRUCTION OF MONITORING POINTS

The post closure monitoring program for Cells No. 1 and 2 includes ground water, surface water, and leachate monitoring. Implementation

of this program during the facility's post closure period will provide the required data to evaluate the effects of Cells No. 1 and 2 on both the site's ground and surface water. A series of four (4) wells will be utilized to monitor the quality of the ground water contained in the permeable sediments overlying the bedrock. These wells were utilized to monitor the effects of Cells No. 1 and 2 on the site's ground water during the operation of these facilities. Based upon previous data from these monitoring wells, ground water flows in a southerly direction across the site. Surface water quality will be monitored using samples obtained from the site's drainage ditch. Leachate quality will be monitored using samples from the leachate collection sump.

4.1.1 Monitoring Well Location and Construction

Sample points (wells) # 3R, 5R, 12, and 14N are indicated on the site survey map showing baseline location and monitoring well coordinates and elevations. Based upon the site's previously noted ground water flow direction (southerly), monitoring well #3R can be used to provide upgradient data while monitoring wells #5R, 12, and 14N provide data on ground water quality down gradient of the site's disposal areas (Cells No. 1 and 2).

The wells are installed at the depth of refusal. Well #12 is constructed of four inch PVC with the lower two feet slotted with 1/16 inches wide horizontal slots spaced approximately 1 inch apart. The slots are covered with a stainless steel well screen. A sand pack was placed from the bottom of the well upward for approximately five feet. Bentonite pellets were utilized to provide a seal at the clayey-silt level. Loose bentonite was then placed around the monitoring well through most of the impervious lake sediment zone to the surface to prevent water seepage from the "perched" water table. Monitoring wells #3R, 5R, and 14N are constructed of two inch PVC risers attached to five foot lengths of PVC 10 slot screen. The PVC screens were installed immediately above the dense loamy glacial till which overlies the site's bedrock. The screen interval and associated sand column surrounding the screens extend partially above the screens. Bentonite pellet seals were utilized to separate the sand pack from the cement-bentonite grout seal. Each well casing is surrounded at the ground surface by a continuous pour concrete cap and well apron (minimum radius of 3 feet and minimum thickness of 4 inches).

In the event that any of the existing wells require repair or replace-

ment, a new or repaired well will be developed in the following manner:

1) Water levels will be measured prior to pumping/bailing.
2) After the volume of water contained in the well is determined, a total of five (5) well volumes will be removed from each well. The water will be either pumped or bailed, dependent upon field conditions.
3) After pumping or bailing, water levels will be measured upon recovery to determine the well recharge rates.

A new well will be developed as soon as possible after its seal and grout have set. Every reasonable attempt will be made to develop each monitoring well until the recommended turbidity value of 50 NTU is achieved.

Both well replacement and various maintenance activities can disturb the equilibrium of the ground water system. Well redevelopment can result in aeration of the ground water, introduction of large amounts of water with a different quality, stripping of mineral coatings from formation materials or filter pack materials. Well maintenance activities will be documented since such activities can alter water quality. Such activities must be considered when evaluating the site's ground water quality.

4.1.2 Surface Water Monitoring Points

Cell No. 1 closure resulted in all waste materials being covered with a minimum of 18 inches of low permeability compacted soil

(maximum permeability of 1.0×10^{-7} cm/sec) and 6 inches of soil capable of supporting vegetative growth. Cell No. 2 closure will result in all waste materials being covered with 18 inches of low permeability compacted soil (maximum permeability of 1.0×10^{-7} cm/sec), 24 inches of soil to provide a protective barrier layer for the low permeability soil, and 6 inches of soil capable of supporting vegetative growth. It is very unlikely that surface water runoff from the closed facilities will have any contact with the waste materials previously deposited in Cells No. 1 and 2. However, samples will be taken from the drainage ditch which collects surface water drainage from the site. Samples will be taken at the location where the drainage ditch enters the site (sampling Point #6A) and at the location where the drainage ditch leaves the site (sampling Point #7).

4.1.3 Leachate Monitoring Point

The leachate collection laterals contained in Cells No. 1 and 2 route collected leachate to transfer piping. This piping routes the leachate to a collection sump. Leachate samples normally will be obtained from this collection sump. Leachate samples from either Cell No. 1 or 2 can

be obtained from the Cell's leachate collection stand pipes.

4.2 MONITORING FREQUENCY AND PARAMETERS

Ground water sample points will include wells #3R, 5R, 12, and 14N. Based upon isopotential map of the site's ground water, monitoring well #3R will will provide upgradient data while monitoring wells #5R, 12, and 14N will provide data on ground water quality downgradient of Cells No. 1 and 2. Surface water samping will be performed at points #6A and 7. Leachate samples will be obtained from the leachate collection sump. During the first three years after final closure of Cell No. 2, site monitoring will be performed on a quarterly basis. If no problems are identified during the first three years of the post closure monitoring program, site monitoring frequency will be reduced to a semi-annual basis. Each sample will be analyzed for pH, specific conductance, total dissolved solids, COD, TOC, iron, manganese, arsenic, selenium, total chromium, hexavalent chromium, barium, and silica.

4.3 SAMPLING PERSONNEL AND EQUIPMENT REQUIREMENTS

The laboratory utilized to implement the site's post closure ground

water, surface water, and leachate monitoring program must be approved by the New York State Health Department under its ELAP program. The laboratory must be approved to perform the required analyses for all parameters of concern. All sampling personnel must be properly trained in the collection and handling of ground water, surface water, and leachate samples. They must be familiar with all equipment required to collect a representative sample of ground water from wells such as those present at the Witmer Road site. Sampling personnel must have a minimum two years of technical training in chemistry, environmental science, or other technical discipine. This educational requirement may be waived for personnel with a minimum of five years experience in the collection of environmental samples.

4.4 SAMPLING PROCEDURES

No sampling equipment or techniques will be used which may alter the chemical composition of the samples. Water standing in a well prior to sampling may not be representative of in-situ ground water quality. Therefore such standing water is removed from the well and the filter pack so that formation water can replace the stagnant water. The

evaucation procedure must ensure that all stagnant water is replaced by fresh formation water upon completion of the process. The primary objective of well purging is to create a situation that will allow the well to provide a sample which is representative of formation water while creating a minimal disturbance to the ground water flow regime. Prior to purging and sampling wells the water level in each well will be measured from the top of the well casing to the nearest 0.01 foot using an electric or weighted tape. The reference points for measuring water levels in the existing wells have been established by a licensed land surveyor. The procedure used for well evacuation depends on the hydraulic characteristics of the well. Well evacuation methods will not lower a well's water level below the top of the sand pack. For low yield wells (wells that are incapable of yielding three well casing volumes of water), each well should be evacuated to dryness once. For high yield wells the sampling technician will purge a minimum of three (3) casing volumes of water at a rate that does not cause recharge water to be excessively agitated. The calculation for the volume of water to be purged is based on the diameter of the monitoring well. Each well will contain its own dedicated piece of polyethylene tubing. This tubing will

be connected to a peristaltic pump. A 6 ft. x 4 ft. plastic tarp is positioned around the monitoring well prior to purging and sampling. Well sampling will take place as soon as recharge allows. However, in some cases due to low well recharge rates, sampling will take place 24 hours after purging of a well. Samples will be collected using bottom-loading PVC bailers. Each well at the Witmer Road site contains its own bailer. The bailer must be lowered at a rate less than 1 inch/sec into the water in order to minimize the surging of the well due to the bailer. A turbidity measurement will be taken on the water removed from the well. If the sample's turbidity is greater than 50 N.T.U. additional well purging will be performed. When turbidity measurement is less than 50 N.T.U. the sample will be obtained for laboratory analysis.

Sample bottles will not be prerinsed with samples. They will be filled to overflowing unless they already contain preservatives placed in them at the laboratory. All sampling equipment which comes in contact with potentially contaminated water must be washed with alconox, rinsed with methanol, and final rinsed with distilled water. Samples will be collected and containerized in the order of the parameters volatilization potential. Each sample will be transferred

directly from the bailer to the appropriate sample bottle.

4.5 SAMPLE HANDLING

Each sample will be given a label which contains the sample identification number, date, time, sample location, sampler's name, project name, parameters, and comments relative to sample collection. Each label will be firmly secured to the bottle by water resistant tape or wire. Each sample will be sealed with a sample seal or water resistant tape.

Each sample will be recorded on a chain of custody form. The completed custody form will remain with the sample shipping container at all times. Each sample possession exchange must be noted and acknowledged on the custody form to confirm that the sample's seal is intact.

The sampling technician will maintain a field log book which contains the following information:

Identification of wells sampled,
Well information (depth, casing diameter),
Static water levels in each well prior to sampling,
Description of sampling methods,
Physical appearance of samples (including presence of any immiscible

layers in samples),
Purge volumes from wells,
Date and time of sample collection,
Weather conditions,
Types of sample containers and sample identification numbers,
Preservatives used with samples,
Field measurements and field equipment calibration data, and
Miscellaneous field observations.

Analytical parameters have been chosen based on site specific and waste specific conditions. A list of sample parameters, sample bottles, preservatives, and holding times is as follows:

pH - 125 ml. glass sample bottle, no preservative, holding time is 1 hr.
specific conductance - 125 ml. glass sample bottle, no preservative, holding time is 1 hr.
total dissolved solids - 250 ml. glass sample bottle, no preservative, holding time is 28 days
COD - 125 ml. glass sample bottle, utilize sulfuric acid to adjust pH to 2.0, holding time is 28 days
TOC - 125 ml. glass sample bottle, utilize sulfuric acid to adjust pH to 2.0, holding time is 28 days
iron - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days
manganese - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days
chromium (total) - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days
chromium (hexavalent) - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days
barium - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days
silicon - 250 ml. plastic sample bottle, utilize nitric acid to adjust pH to less than 2.0, holding time is 28 days

A list of specific proposed analytical methods and detection limits is as follows:

pH - Method No. 423 (field measurement); quantifiable limit of 0.01 pH unit
specific conductance - Method No. 120.1 (field measurement); quantifiable limit unknown
temperature - (Field measurement); quantifiable limit + or - 0.1 degree C
turbidity - (Field measurement); quantifiable limit unknown
total dissolved solids - Method No. 160.1; quantifiable limit of 1.0 ppm
alkalinity - Method No. 310.1; quantifiable limit of 1.0 ppm
ammonia (as N) - Method No. 350.1; quantifiable limit of .01 ppm
BOD5 - Method No. 507; quantifiable limit of 1.0 ppm
C.O.D. - Method No. 410.4; quantifiable limit of 1.0 ppm
T.O.C. - Method No. 505B; quantifiable limit of 1.0 ppm
boron - Method No. 404A; quantifiable limit of .25 ppm
chloride - Method No. 325.2; quantifiable limit of 5.0 ppm
color (color units) - Method No. 110.2; quantifiable limit of 5
cyanide - Method No. 335.3; quantifiable limit of .01 ppm
hardness - Method No. 314B; quantifiable limit of 1.0 ppm
total chromium - Method No. 218.1; quantifiable limit of .005 ppm
hexavalent chromium - Method No. 7196; quantifiable limit of .01 ppm
nitrate - Method No. 353.2; quantifiable limit of .01 ppm
total Kjeldahl nitrogen - Method 351.2; quantifiable limit of .1 ppm
dissolved oxygen - Method No. 360.1; quantifiable limit of 1.0 ppm
total rec. phenol - Method No. 420.2; quantifiable limit of .005 ppm
sulfates - Method No. 375.2; quantifiable limit of 2.0 ppm
iron - Method No. 236.1; quantifiable limit of .005 ppm
manganese - Method No. 243.2; quantifiable limit of .001 ppm
silicon - Method No. 425C; quantifiable limit of.005 ppm
aluminum - Method No. 202.1; quantifiable limit of 5.0 ppm
cadmium - Method No. 213.2; quantifiable limit of .0005 ppm
calcium - Method No. 215.1; quantifiable limit of.25 ppm
lead - Method No. 239.2; quantifiable limit of .005 ppm
magnesium - Method No. 242.1; quantifiable limit of 1.0 ppm
manganese - Method No. 243.1; quantifiable limit of .1 ppm

potassium - Method No. 258.1; quantifiable limit of 1.0 ppm
sodium - Method No. 273.1; quantifiable limit of 2.5 ppm
antimony - Method No. 204.1; quantifiable limit of 1.0 ppm
arsenic - Method No. 206.2; quantifiable limit of .005 ppm
barium - Method No. 208.1; quantifiable limit of 1.0 ppm
beryllium - Method No. 210.1; quantifiable limit of .05 ppm
copper - Method No. 220.1; quantifiable limit of.2 ppm
mercury - Method No. 245.2; quantifiable limit of.001 ppm
nickel - Method No. 249.1; quantifiable limit of .3 ppm
selenium - Method No. 270.2; quantifiable limit of .005 ppm
silver - Method No. 272.2; quantifiable limit of .001 ppm
thallium - Method No. 279.1; quantifiable limit of 1.0 ppm
zinc - Method No. 289.1; quantifiable limit of .05 ppm
purgeable halocarbons - Method No. 601; all compounds have quantifiable limit of 1.0 ppb except for methylene chloride which has a quantifiable limit of 5.0 ppb
volatile organics - Method No. 602; all compounds have quantifiable limit of 1.0 ppb

Standard solutions (pH 4.0, 7.0, and 10.0) are utilized to calibrate the pH meter prior to well sampling. Meter calibration is checked using standard solutions prior to each well sampling. Between each sampling point, the pH probe is rinsed with laboratory grade de-ionized water and wiped clean with "Kimwipes".

The calibration of the specific conductance meter is determined by the range each sample falls within. Sample ranges are 100 uhmos, 1,000 uhmos, 10,000 uhmos. Between each sampling point the specific conductance probe is rinsed with laboratory grade de-ionized water and wiped clean with "Kimwipes".

4.6 LABORATORY QUALITY ASSURANCE PLAN

The primary objective of the Quality Assurance Plan for SKW Alloys, Inc.'s ground water, surface water, and leachate monitoring program is to insure that the analytical results obtained from the program are reliable, statistically valid, and properly documented. As previously noted SKW will only utilize a laboratory for program implementation which has been approved by the New York State Health Department under its ELAP program. The basis of this quality assurance program is the establishment of methods which will be followed in obtaining the analytical results for each sample. Procedures (including quality assurance samples, replicates, spikes, and standards calibration) will be established and used for validating the methods utilized by the analytical laboratory and as an indicator of potential sources of cross contamination. This will help ensure that the laboratory generates precise, accurate, and reliable data.

4.6.1 Personnel Responsibilities

The Environmental Manager at the SKW Alloys, Inc. facility in Niagara Falls, New York or his designated representative will be responsible for ensuring that the required ground water, surface water, and

leachate monitoring program at the Witmer Road site is correctly carried out. His responsibilities will include the following:

1) Overall responsibility for management of the analytical program and validity of all data,
2) Selection of an analytical laboratory to perform sample analyses,
3) Performance monitoring of analytical laboratory and review of all analytical protocols required for measuring and monitoring,
4) Submission of all analytical data to New York State Department of Environmental Conservation, Town of Niagara, and Niagara County Health Department.

A project coordinator is to be designated by the analytical laboratory. This individual is to have responsibility for the following:

1) Communication with SKW Enviromental Manager or designated representative regarding ground water,surface water, and leachate analysis program,
2) Monitor sampling and/or analytical techniques and recommend modifications as required,
3) Verify that laboratory quality control and analytical procedures are being followed as specified in the Quality Control Plan when laboratory personnel are analyzing SKW Alloys ground water, surface water, and leachate samples,
4) Review raw analytical data and check arithmetic calculations for a minimum of 20% of the samples analyzed (includes inspection of reduced data, calibration curves and bound laboratory notebooks),
5) Receive ground water,surface water and leachate samples at the laboratory and verify that incoming samples correspond to the chain of custody sheet,
6) Maintain records of all incoming samples and track samples while they are being processed,
7) Prepare quality control samples for analysis as required to satisfy quality assurance requirements,
8) Approve completed data and analytical report before transmittal

to SKW Alloys, Inc.

A sampling coordinator is to be designated by the analytical laboratory. This individual is to have responsibility for the following:

1) Determine appropriate sampling equipment and sample containers,
2) Train field personnel in the necessary sampling and field analytical procedures,
3) Insure that all samples are collected, labeled, preserved, and stored as specified in other sections of this report,
4) Check that all required sample documentation is correct and is transmitted with the samples,
5) Check on field sampling to insure that it is being done correctly.

4.6.2 Analytical Quality Assurance

Specific analytical methods often prescribe the necessary specific quality assurance procedures. In order to achieve a high degree of accuracy (degree of measurement or average of measurements agreement with an accepted reference or true value obtained from executing a method in a particular laboratory using an interference free matrix) the laboratory must do the following:

1) References used as reference standards must be the highest purity commercially available materials and must be certified by the supplier.
2) Each instrument utilized in performing the analyses must be checked on each day that the samples are run in order to demonstrate performance.
3) Recovery factors for individual contaminants are determined for the analytical method which is utilized.
4) Analytical results for spiked level of the contaminant under evaluation

in a replicate sample must be within the required limits for the contaminant under evaluation.

Full documentation of all analyses must be kept in notebooks and be available for inspection at the designated laboratory by either a representative of SKW Alloys, Inc. or the NYSDEC.

4.6.3 Data Validation and Reporting

The principal steps that will be used to verify the data integrity during data collection and reporting are as follows:

1) Project coordinator will review raw data generated by the laboratory chemist. It will be reviewed against calibration and quality control records, to ensure both the adequacy of documentation and the reliability of the data.
2) When the previously noted review has been completed the data will be considered validated and a report will be prepared for submission to SKW Alloys, Inc.
3) All laboratory notes and records will be maintained and stored in an accessible place.

A variety of samples will be analyzed at regular intervals to assess possible contamination from either the field and/or the laboratory. These include blank, spiked, and replicate samples. Blank samples include:

1) Field blanks are exposed to field and sampling conditions and analyzed in order to assess possible contamination from the field. A bottle is filled with de-ionized water and is transported to the sampling location and is returned to the laboratory in a manner identical to the handling procedure used for the samples.
2) Method blanks are prepared in the laboratory and are analyzed in order to determine the background of each of the reagents or

solvents used in an analysis.

Spiked samples will be spiked (as prescribed by the analytical method) with one or more selected compounds prior to extraction and analysis. Concentration data will be used to calculate the recovery of the compounds. Such samples will provide a measure of sample preparation and analysis procedures accuracy.

Replicate samples are analyzed in order to establish control and assess the precision of an analysis and/or of sampling. Field replicates are obtained in order to assess the adequacy of overall sampling and handling procedures. Laboratory replicates are prepared in the laboratory and analyzed in order to assess the reproducibility of the laboratory procedures used.

4.7 DATA ANALYSIS

A Student's t-test will be utilized to determine whether there has been a statistically significant increase in any ground water contamination indicator parameter in the Witmer Road site's monitoring wells. This test will be utilized to trigger mechanisms for initiating contingency water quality monitoring. Regardless of the t-test used,

SKW must collect a background data set (upgradient monitoring well) and compare these data to the data from each downgradient monitoring well individually each time they are sampled. Statistical analyses will aid in data interpretation and in comparing different sets of data. Analyses will aid in identifying data which is indicative of ground water contamination.

Analytical data for each parameter from individual monitoring wells will be evaluated on a yearly basis. The calculations involved in this evaluation are as follows:

Mean - Arithmetic average of N observations

$$\bar{X} = \frac{X1 + X2 + X3}{N} = \frac{1}{N}\sum_{i=1}^{N} Xi$$

where:

N = total number of analyses
Xi = values for individual analyses

Variance - Sum of the squared differences in values from the mean for individual analyses

$$S^2 = \frac{1}{(N-1)} \sum_{i=1}^{N} (Xi-\bar{X})^2$$

The student's t-test is utilized to determine whether individual monitoring wells contain contaminant concentrations greater than background. It will be utilized to compare the mean chemical concentrations of samples from well #3R (upgradient of Cells No. 1 and 2) and from wells #5R, 12, and 14N (downgradient of Cells No. 1 and 2). The t statistic is calculated as follows:

$$t = \frac{\bar{X}2 - \bar{X}1}{\sqrt{\frac{N1 + N2}{N1N2}\,\frac{(N1 - 1)\,s1^2 + (N2 - 1)\,s2^2}{N1 + N2 - 2}}}$$

where:

$\bar{X}1$ = average value for parameter analyses from upgradient well 2

$\bar{X}2$ = average value for parameter analyses from downgradient wells

N1 = number of analyses from upgradient wells

N2 = number of analyses from downgradient wells

$S1^2$ = variance for upgradient well data

$S2^2$ = variance for downgradient well data

The t statistic is analyzed using normal distribution tables. The

student's t-test is based on the assumption that the input data approximates a normal distribution.

4.8 CONTINGENCY MONITORING REQUIREMENTS

All waste materials which have been deposited by SKW Alloys, Inc. in Cells No. 1 and 2 at the Witmer Road site were approved by the NYSDEC. In the unlikely event that significant ground water contamination is detected, a contingency plan will be enacted. Objectives of this ground water contingency plan will be as follows:

1) Confirm whether significant quantities of contaminants have entered the ground water at the SKW Alloys, Inc. Witmer Road site from the waste materials previously deposited by SKW Alloys, Inc. in Cells No. 1 and 2,
2) If significant quantities of contaminants have entered the ground water determine their consequences and the rate and extent of their migration.

Under normal circumstances, objective 1 will be satisfied by the site's groundwater monitoring program as previously described. However, if a statistical analysis of monitoring data from upgradient and downgradient wells utilizing the Student's t-test at the 0.01 level of significance indicates a significant difference in ground water quality, additional samples will be obtained and analyzed. If the difference

cannot be attributed to sampling or analytical errors, a written notice that the facility may be affecting the ground water must be sent within 14 days to Region 9 of the New York State Department of Environmental Conservation.

During the next quarterly sampling event each monitoring well involved in triggering the contingency monitoring plan will be sampled and analyzed for the baseline parameters as defined by Water Quality Analysis Table in 6 NYCRR Part 360-2.11(c)(6). Every attempt will be made to report the analytical results to the NYSDEC within thirty (30) days after the sampling date. In any case the results will be reported to the NYSDEC within 14 days after receipt of results from the certified analytical laboratory.

In the event that the NYSDEC determines that any potential contamination as reflected by the baseline monitoring results poses an immediate threat to public health or the environment, SKW will provide the NYSDEC with a corrective action plan. Upon receipt of plan approval from the NYSDEC, SKW will implement the corrective action plan.

When the corrective action plan is implemented the sampling and

analysis for baseline parameters will be performed at least semi-annually until the conditions for curtailing contingency water quality monitoring are satisfied as follows:

1) Elevated parameter(s) is demonstrated not to be landfill derived or
2) Remediation of release by landfill is demonstrated to be complete.

In addition the contingency water quality monitoring may be reduced or discontinued with the approval of the NYSDEC if such monitoring is no longer necessary to protect public health or the environment.

If during analysis for baseline parameters, contamination by any toxic metal, cyanide, volatile organic compound, or other substance identified in Appendix 33 of 6 NYCRR Part 373-2 occurs, SKW will sample the appropriate environmental monitoring points in the next scheduled sampling event after receiving the analytical results from the laboratory. Each sample will be analyzed for all the expanded parameters listed in the Water Quality Analysis Table. Unless the NYSDEC requires more frequent sampling to evaluate a potential or adverse environmental impact or perceived health risk or until the previously noted conditions for curtailing contingency water quality monitoring are satisfied, subsequent annual analyses of these monitoring points will include all routine parameters and those baseline and expanded

parameters that were elevated or were implicated in the expected pattern.

4.9 DATA REPORTING AND RECORD KEEPING REQUIREMENTS

Copies of all quarterly monitoring reports will be sent to the following:

1) Solid Waste Regional Engineer
   New York State Department of Environmental Conservation
   270 Michigan Avenue
   Buffalo, New York 14203-2999

2) New York State Department of Environmental Conservation
   Bureau of Municipal Waste
   50 Wolf Road
   Albany, New York 12233

3) Town of Niagara
   7105 Lockport Road
   Niagara Falls, New York 14305

In addition SKW will prepare and submit an annual summary report concerning facility post closure maintenance and monitoring. It will be submitted to the NYSDEC Region 9 Solid Waste Regional Engineer no later than sixty (60) days after the first day of January each year. These records will be retained for a minimum period of seven (7) years.

Analytical data records which will be retained during the post closure period include the following:

1) All chemical analyses of waste materials,
2) All EP toxicity and TCLP test data performed on waste material samples,
3) All chemical analyses and associated monitoring well elevations obtained as part of the site's ground water, surface water, and leachate monitoring program.

APPENDIX A

Laboratory Quality Assurance and Quality Control Manual for Advanced Environmental Services of Niagara Falls, New York

ADVANCED ENVIRONMENTAL SERVICES

LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL MANUAL

MAY 1991

Paul T. McMahon
Quality Control Director

Date: 8/09/91

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QUALITY POLICY

The analytical laboratory provides qualitative and quantitative data for use in decision making. To be valuable, the data must accurately describe the characteristics and concentrations of constituents in all samples submitted for analysis. The objective of this laboratory is to generate high-quality data that are reliable, accurate, and adequate for the intended purpose.

The Quality Control/Quality Assurance Program at Advanced Environmental Services, Inc. is designed to ensure the highest degree of confidence in the data reported to our clients.

Sampling procedures, record keeping, data reporting, analytical procedures, and quality control plans are designed to fulfill all United States Environmental Protection Agency and New York State Department of Health requirements.

The objective of our Quality Control/Quality Assurance Program is to provide data that are representative, reliable, and verifiable. Accordingly, management is committed to excellence in testing, providing the necessary environment and resources conducive to its achievement. These resources include properly trained technicians, advanced instrumentation, technical support from experienced management personnel, and an organizational structure designed for the implementation of an effective system of quality operations. Responsibilities for maintaining quality within the laboratory are clearly defined for all personnel. The Quality Control Director and Quality Assurance Manager are ultimately responsible for the development and implementation of the program as it is described in this manual.

DESCRIPTION OF THE QUALITY MANUAL

This manual is designed to cover all analyses performed by Advanced Environmental Services, Inc., as well as the operations performed within the company necessary to provide quality data. Fields of testing are divided within the laboratory into two sections; inorganic and organic. Testing is performed on a variety of matrices, with water, soil, and air sample testing constituting the majority of analyses.

The Quality Control Director is responsible for the updating, production, and distribution of this manual. Amendments to the manual are submitted to the QC Director for review and approval. Discussions will be held with the Laboratory Director and/or Supervisors prior to all amendments. All laboratory personnel will have access to this manual for information and review. Distribution of the manual to clients will be made upon request.

It is the responsibility of each department supervisor to maintain all standard operating procedures, updating them as necessary. Updates should be submitted to the QC Director and the Quality Assurance Manager for approval.

DESCRIPTION OF THE LABORATORY

Advanced Environmental Services, Inc. is an environmental monitoring, support, and consulting firm with in-house capabilities. These services are provided to public and private sectors, including industrial firms, municipalities, and county, state, and federal governmental agencies.

AES was founded by Dr. W. Joseph McDougall in 1980 as a private, independent environmental firm. In 1986, AES moved into the new customized facility where it is located presently. The company's 6000 square feet Laboratory and General Office is located at 2186 Liberty Drive, Niagara Falls, New York.

The laboratory design stresses maximum efficiency and safety. Preparatory and analytical laboratories are separated to avoid cross-contamination problems. Sample control is conveniently located for receipt of samples, and is equipped with a walk-in Cold Room for catalogued storage and secure custody of samples. The layout of the laboratory can be found in Appendix A.

The President of the company is Dr. McDougall. The Quality Control Director is Paul McMahon, and the Quality Assurance Manager is Bonnie Simpson. These latter two positions report directly to the President. The Organic Laboratory Supervisor is Denise Tuhovak, and the Inorganic Technical Supervisor is Gary Amato. Frank Scrivano serves as the Inorganic Administrator. A Senior Technician in each department is prepared to assume the responsibilities of the laboratory supervisor in his absence. Michael Simpson is the Systems Coordinator, responsible for the quality of the company information and management systems. Dennis Hoyt is the Projects Engineer, and the Senior Field Technician is Scott Abel. These employees all have defined management responsibilities in the areas covered in this manual. The AES organizational chart can be found in Appendix B.

LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL PROGRAMS

Advanced Environmental Services, Inc. employs a series of quality assurance and quality control programs to ensure the integrity of sampling and the validity of analytical results. These programs begin with bottle preparation, continue through sampling and analysis, and do not end until final report validation by the Quality Control Director.

For the purpose of this manual, laboratory quality programs have been divided into two sections. The first are the quality control programs, which regulate each procedure the laboratory follows to ensure the accuracy of the final report for all environmental analyses. The second program regards laboratory quality assurance. These programs provide the internal procedures the laboratory follows to check the quality control programs, and the corrective actions necessary to improve the operation of the laboratory.

The Quality Control Director is responsible for the management of the quality control programs. Management of the quality assurance programs is performed collectively by the Quality Assurance Manager and the Quality Control Director.

I. LABORATORY QUALITY CONTROL PROGRAMS

The laboratory quality control programs are designed around a series of Standard Operating Procedures (SOPs) generated by key laboratory personnel and reviewed by laboratory management. These SOP's must be followed by laboratory personnel. Deviations from the program are addressed by the corrective action procedures developed for the enforcement of the program. Violations will lead to reprimands, suspensions, and possible termination of employment.

Test methods employed by the laboratory are referenced from several sources. These methods have corresponding laboratory SOPs which tailor method procedures to laboratory equipment and instrumentation. The vast majority of the analyses performed by the laboratory are referenced from the Environmental Protection Agency. These references are:

1. EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.

2. EPA 600/4-79-057, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", 1982.

3. EPA-SW-846, "Test Methods for Evaluating Solid Waste, Physical /Chemical Methods", Third Edition, 1986.

Many of the analyses performed in our wet chemistry department are referenced from "Standard Methods for the Examination of Water and Wastewater", 16th Edition, 1985. These manuals are located in the laboratories for available reference.

Calibration standards and analytical reagents are generally purchased from laboratory suppliers. New standards are validated through the use of reference standards, or measured against standards in use. All chemicals ordered from suppliers are at least reagent grade chemicals. Records are kept of all expiration dates, as well as lot numbers and suppliers.

A. SAMPLE COLLECTION AND CUSTODY

1. Glassware Department

All bottles which are used by the company are prepared by the glassware department. The bottles are ordered, washed, and stocked by the glassware technician. Sample bottle orders are filled according to EPA protocols by the technician. These protocols include bottle construction and proper preservation. Analytes with identical protocols may be combined in the same sample bottle, provided the volume is adequate for the analyses required. The laboratory SOP for glassware describes the bottle types and preservations required for all the environmental analyses performed by the company.

All plastic bottles are discarded following completion of the analyses and the post-report holding time. Glass bottles may be washed and reused provided the bottle is not stained, cloudy, or odorous. This decision is made by the glassware technician. A thorough washing is performed, including a final deionized water rinse. Volatile organic sample bottles, caps, and septa are always discarded, and never reused. The bottle quality control program periodically checks reused bottles to ensure that no contamination can possibly occur.

2. Field Sampling

The field crew is responsible for the quality of all sampling performed by the company. The prepared bottles are taken to the field , and filled at the sampling site. They must be correctly filled to provide sample integrity. Proper techniques are also required to collect representative samples, and decontamination procedures are performed to eliminate the possibility of cross-contamination of sample sites. Field duplicates and field blanks are sampled upon request in order to validate the sampling event. The field duplicate site is not identified until the completion of all analyses for the project. This ensures that the analytical results are not biased by the laboratory.

Detailed field notes are kept by the field technicians to describe sampling sites, dates, times, influent and effluent flows, well depths, sample characteristics, the weather, sampling methods, and any field testing performed at the site.

These notes are summarized and included in the final report. The samples are securely transported in coolers packed with "blue ice" directly to the laboratory, and a chain of custody is completed in triplicate, and included in the final report.

3. Sample Control

The sample control department is responsible for the proper receipt, identification, storage, and traffic of samples in the laboratory. Samples received are checked against the chain of custody to confirm the accuracy of the document. The chain of custody is signed by the sample control representative and the person relinquishing custody. A check with pH paper is performed on all samples, except those for selected parameters. The samples are computer logged, and labeled with company identifications, which includes a specific three letter project code, sample number, preservation, and the parameters to be performed on each bottle. A record of these identifications is kept in the sample control room. The samples are placed in cold storage, with specific locations designated.

Sample control is also responsible for distributing the project sheets to the laboratory with all the proper information. This includes all the instructions for the project, any parameters which require immediate attention due to EPA holding times, and the sample locations. Once the work is scheduled by the laboratory supervisor, requests are made by the laboratory technicians for the sample bottles needed, by means of an internal chain of custody. Sample control is responsible for the maintenance of this record, in order to track the traffic of all samples within the laboratory. Upon completion of the analyses by the laboratory, samples are returned to sample control and held for one week after the final report is mailed. This allows time for the client's review of the data and possible requests for reanalysis of the sample. Samples are either disposed of or returned to the customer, depending on the nature of the sample and/or the client's wishes. Special arrangements are sometimes made by clients to retain the samples for more than one week. A record of the final status of all samples is kept in the sample control room.

B. ANALYTICAL AND REPORTING QUALITY CONTROL MEASURES

Quality control of environmental analyses is a vital part of the company's quality policy. The preparation, analyses, validation, and reporting of testing data must be accurate in order to provide the client with the level of service necessary in the environmental area. Standard operating procedures have been established to govern the system necessary to accomplish these goals. These SOPs are designed to provide data that is not only accurate, but legally defensible as well. Legally defensible data will be produced if quality control measures regarding the analytical method and laboratory operations are followed without exception.

Control charts are recognized as one of the best methods for documenting statistical control of an environmental analyses. For this reason, control charts will be maintained in a real-time mode for all the analytical methods performed in the laboratory. Our company uses the Shewhart control chart for percent recovery on spikes and reference standards. Control limits are calculated on the basis of at least 15 past analyses. The standard deviation is calculated, and control limits are set at +/- three standard deviations. Warning limits for the analyses are set at +/- two standard deviations. The SOP for control charts lists all the possible conditions that would constitute an analysis that is out of control. While a point outside of control limits is an out of control situation, there are many others. The SOP details the corrective action steps necessary to resolve an out of control situation. Until the problem is resolved, all analyses for this method must cease. An example of a company control chart can be found in Appendices D and E. Duplicate analyses are also charted on control charts.

Laboratory notebooks must also be kept properly, in order to provide quick and descriptive reference to the analyses performed. At no time will notebooks be altered by editing or removing pages. Any changes made to original entries will be made with a single line through the entry, with the date of the change and the initials of the technician making the change entered. All notebook entries must be made in ink, using a consecutively numbered bound book. The SOP for laboratory notebooks provides more detailed information on how to keep an analytical notebook.

1. Preparatory Methods

Several of the analytical methods performed in the laboratory require sample preparation prior to analyses. Preparatory methods include extractions, distillations, and digestions. These preparatory methods are specified within the analytical manuals referenced earlier. Proper sample preparation is essential to accurate environmental data. Digestions are necessary in order to analyze the total metal content of many samples, as well as eliminate several matrix interferences. Distillations convert various compounds into the analyte of interest; for example, ferrous cyanide is converted to the cyanide radical through the magnesium chloride macro-distillation. Extractions serve several preparatory purposes, from landfill leaching simulations (EP Toxicity and TCLP) to separation of the analytes of interest from the sample matrix.

Notebooks for sample preparation must be as exact and descriptive as possible. Odors, colors, and reactions must be noted along with the preparatory reference. Weights, initial volumes, final volumes, and all other information necessary in calculating analytical values must be accurate. Units of measurement must always be listed. Dates and times must be recorded, and the samples promptly indexed for easy reference. Reagents must be tracked and recorded in accordance with the reagents and solutions SOPs. This ensures that only unexpired, reagent grade chemicals are used, and that solutions are properly prepared.

Quality control extends to all preparatory methods. Samples are lab duplicated and spiked prior to digestion, distillation, and extraction. Method blanks are carried through the prep method to monitor reagent, glassware, and atmospheric contamination. The frequency of the duplicates and matrix spikes is the same regardless of whether the sample requires preparation or not. This frequency is at least 10% of the analytical batch, and at least one per batch. Method blanks must be performed with each analytical batch. This information will be recorded in the notebook, with the spiked concentration noted.

2. Instrumental Calibration

Prior to the actual analyses of environmental samples, the technician must demonstrate that the instrument measuring the concentration of analytes is accurately calibrated. Calibration can be as simple as running a laboratory blank and a reference standard with acceptable results, or as difficult as running a five point curve with an acceptable correlation prior to validation with a reference standard. Several methods (particularly organic) dictate the procedure for calibration of the instrument. Other methods are less specific in regards to calibration. For these parameters, calibration must meet or exceed the calibration specifications listed by the New York State DOH Environmental Laboratory Approval Program. Also, instrument manuals are used as guidance in calibration. In all cases, the calibration method stated in the laboratory SOP for each parameter must be fulfilled.

Stock standards are purchased primarily from laboratory suppliers. This eliminates inaccuracy and contamination problems. However, all stock standards must be received with a certificate of accuracy documenting the analyte value. Stock standards must be dated upon receipt, and again upon use. At no time will an expired standard be used for an analysis. Standards will be disposed of on the expiration date. Each department's reagent SOP must be followed in order to control the use and ordering of purchased standards.

Dilutions of the stock standards to produce calibration standards must be documented each time new standards are made. These dilutions are entered in the solutions or reagent notebook. The container the calibration standard is placed in must be labelled with the analyte, the concentration, the date, and the initials of the preparer. Standards must be placed in appropriate containers, and stored with the proper refrigeration, light sensitivity and compatibility.

After instrument calibration is completed, a reference standard must be analyzed when available. The best examples of reference standards are US-EPA samples and NIST (formerly NBS) standards. Independent standards are acceptable as long as the manufacturer is not the manufacturer of the calibration standards. Inorganic tests must run a reference or independent standard with each run and chart the recoveries. Due to the strict calibration requirements of the organic methodologies, reference standards are run at least monthly to validate the accuracy of the calibration standards. Check standards are run daily for all 8000 series organic methods. Acceptance limits dictate whether the calibration curve is valid or not.

3. Analytical Testing Quality Control- Terminology and Frequency

The following is the nomenclature Advanced Environmental Services uses to describe quality control functions. Some functions must be performed with each analytical batch. The frequency for these functions is listed here and must be adhered to within the laboratory.

Field Blanks

Field blank is the general term for the use of laboratory pure water to validate that field operations are free from contamination during sampling operations. Two specific field blanks are trip blanks and equipment (rinsate) blanks. A trip blank is a sample prepared in the laboratory, using laboratory pure water contained in a sample bottle appropriate for the analyte(s) to be determined, including any preservative that is required. Trip blanks must be present but unopened throughout the sampling and transported to the laboratory with the environmental samples taken. Equipment blanks are produced by rinsing the decontaminated sampling equipment with laboratory pure water and collecting the rinsate. This is performed in order to evaluate if the equipment is properly cleaned in between each sampling site. If reportable levels of the analyte(s) of interest are detected in a field blank, resampling may be required.

Blind Field Duplicate

A field duplicate is the blind sampling site from which two samples are taken in the field during a sampling event. The site is recorded in the field notes for future identification. The sample is given two different identification numbers, so that analytical personnel are unaware that the samples should be identical. This is performed to check consistency of both sampling and analyses. Upon report compilation, the Quality Control Director and the Project Manager identify the duplicated site and compare the results. Significant variations must reported to the client, and resampling may be required.

Certified Reference Standard

A certified reference standard is one which is used to validate proper calibration and recovery of a method. The two laboratory certified reference standards are US-EPA lots and NIST standards. When available, reference standards are the preferred calibration check in the laboratory. They must be run at least monthly for all environmental methods, with the recoveries charted.

Independent Standards

An independent standard is one which is used to validate proper calibration and recovery of a method prior to sample analysis. The standard must be produced by a manufacturer different from the manufacturer of the calibration standards, and the recoveries must be charted and be in statistical control. Reference standards are preferable, but other standard sources (ERA, Hach) can be used where certified reference samples are not available. These standards must be run daily with each inorganic analyses. Once proper recovery of the independent standard has been demonstrated, the standard must be reanalyzed after every 15 sample analyses and at the conclusion of the run to validate that no shift of the calibration curve has occurred.

Daily Calibration Check Standard

In the Organics Department, many methods require three and five point calibration curves prior to analyses. However, once linearity has been established, a mid-range calibration standard can be run daily to validate that the curve is still accurate. The recovery on this standard must be within the range specified in the method of analysis. If the recovery is outside of this range, a new calibration curve must be run.

Laboratory Blanks

This is the general term used to describe the analysis of laboratory pure water or organic solvent to monitor laboratory contamination. Laboratory blanks are divided into two types; instrument and method blanks. An instrument blank is simply analyzing laboratory pure organic solvent or water directly, in order to ascertain whether any contamination is present in the instrument itself or in the laboratory diluent. Instrument blanks must always be free of measurable concentrations of the analyte(s) of interest. Instrument blanks must be analyzed daily with each analysis.

A method blank consists of laboratory pure water which is processed as if it were a sample, undergoing the preparation and analytical process. This is performed in order to validate that no significant contamination is present in the laboratory glassware and reagents involved in the method's preparatory work. Samples correspond to the method blank by means of a date or batch identifier. A method blank must be performed with each preparatory batch, and each day for those methods which do not involve instrumental calibration during analysis. Examples of these methods would be oil and grease, total suspended solids, and total dissolved solids.

Acceptance criteria for a method blank is a result equal to or less than three times the method detection limit.

Laboratory Duplicate

A laboratory duplicate is simply splitting a sample into two separate aliquots prior to preparation and analysis to measure method precision. The relative percent difference on samples with a positive result is calculated and charted in the laboratory. The difference is calculated by dividing the range between the two analyses by the average of the two results, and multiplying by 100. Duplicates must be performed with each preparatory batch, and on at least ten percent of the sample batch.

Laboratory Replicate

A laboratory replicate is analyzing the same sample aliquot twice to measure instrumental precision. This is performed when environmental samples require a duplicate result but no sample preparation is necessary. Replicate analyses are calculated the same as duplicate analyses are, and run at the same frequency.

Matrix Spikes

Matrix spikes are performed by dividing the sample into two aliquots. The first aliquot is prepared and analyzed according to method protocol. The second aliquot is spiked with a known concentration of the analyte of interest. The spike volume must be less than one percent of the total aliquot volume. A spiked sample is analyzed at a frequency of ten percent of the sample batch, or at least once per method analyses. The spike recovery is a measure of the accuracy of the method. It is calculated by subtracting the actual analyte concentration in the original sample aliquot (O) from the observed result of the spiked sample aliquot (S), and dividing this result by the known concentration of the analyte spiked (K). This value is multiplied by 100 to make it a percent recovery:

$$\frac{(S - O)}{K} \times 100 = \text{percent recovery}$$

Spikes are calculated and charted the day they are performed. The control charts have warning and control limits based on at least 7 previous spikes. Any spikes outside of control limits warrant reanalysis, and possibly the use of internal calibration methods, such as standard additions.

Standard Additions

Standard additions are performed on a sample when matrix interferences are discovered or expected. Unacceptable spike recoveries dictate the use of standard additions to accurately determine the analyte concentration in the sample.

Standard additions are a series of four spikes performed on the sample. These spikes include a blank spike, and three standard spikes so that all values fall within the analytical range of the method. The correlation coefficient is calculated to measure the linearity of the standard addition curve. This is best performed on a statistical calculator, such as the Texas Instruments TI-60. The correlation coefficient must be equal to or greater than .995 to validate that the analysis is free of matrix interferences. The concentration of the analyte is calculated using the (x') intercept function on the calculator. This value must be negative in order to be reportable. All positive values are below analytical detection limits.

Duplicate Spikes

Duplicate spikes are sometimes performed in the Organic Chemistry department. In this case, the sample is divided into three aliquots prior to preparation and analysis. Two aliquots are identically spiked, and the third aliquot is the original sample. Duplicate spikes measure the accuracy of the method, as well as the precision. The relative percent difference of the spike recoveries is calculated and charted, and the percent recoveries of the spikes are charted separately.

Surrogate Standard

A surrogate standard is a compound or mixture of compounds which, when spiked into a sample, behaves in the same manner as the analyte or analytes of interest. When surrogate standards are applicable to an Organic Chemistry methodology, the method details what surrogates are to be performed, and the required percent recoveries for each surrogate. If required percent recoveries are not stated, control limits must be established by use of the Shewhart charts, with at least ten points used for the standard deviation. Methods with stated limits will be charted with those limits as controls.

Should a surrogate fall beyond the control limits of a method, the samples should be reanalyzed. If this is impossible, the results must be flagged as "estimated concentrations" for that method.

4. Verification of Results

Advanced Environmental Services employs three quality checks prior to the delivery of analytical reports. The three checks are made by the Department Supervisor, the Project Manager, and the Quality Control Director. Each check is vital to the accuracy and validity of each report.

The Department Supervisor checks every report prior to printing. The Supervisor confirms that all the data generated for a report was conducted according to the quality requirements of this manual, including control chart verifications. After the report is printed, either the Supervisor or the Department Clerk proofreads the report for typing errors. After any changes have been made, the Supervisor signs the report, attesting to its completeness and accuracy.

The report is compiled and then forwarded to the Quality Control Director. The report is checked for accuracy and is technically evaluated. The QC Director makes the final decision as to the acceptance of all reports. Changes are sometimes made, while some reports may be held for reanalysis. A historical check is made for data which is continually produced for a specific project. Significant variations may dictate reanalysis. Spot checks are conducted using notebooks and quality control charts for data and recoveries that appear questionable. After the report is validated, it is signed by the QC Director and forwarded to the project manager.

The Project Manager checks the report to confirm that all requested analyses have been performed. The Project Manager also performs historical data checks on existing projects. Upon completion of this check, the Project Manager signs the report and the document is delivered to the customer by mail or special delivery.

5. Report Format

An example of a report format can be found in Appendix C of this manual. Several report formats are available, as are customized report formats. Clients are urged to contact their customer service representative regarding specific formats. Reports vary depending on the sampling, the analyses requested, and the quality control package requested. However, all reports include an analytical traceability sheet signed by the technicians performing the analyses. This is the technician's pledge that the data was generated in accordance with the referenced method and the company's quality program.

6. Subcontracting

On occasion, analyses are requested which the company can not perform. Subcontracting is necessary on these occasions. AES subcontracts to New York State certified laboratories whenever possible. When out of state labs must be used, AES uses laboratories certified by their state programs. NIOSH certified labs are used for some air and all asbestos subcontracting. In all cases, clients will be notified prior to making arrangements with another laboratory for subcontracted work. In the future, laboratory assessments will be conducted by AES personnel on frequently utilized laboratories.

7. General QC Practices

AES also performs general laboratory quality control practices such as daily temperature monitoring of refrigerators and ovens. Corrective measures are taken if the observed temperature is outside of the required NYSDOH temperature ranges. Analytical balances are also calibrated, using class S weights, on a daily basis. Incubator temperatures are checked and recorded twice daily, and corrective measures are taken if they are outside of the required NYSDOH temperature ranges for each use.

Thermometers in use are checked against a NBS thermometer annually, and corrections are made and used for each thermometer. The NBS thermometer is sent out for calibration checks once per year. The dial thermometer is checked against the NBS thermometer on a quarterly basis.

An annual check on our deionized water is performed, certifying that it is acceptable for microbiology use. This check is initiated by the QC Director each May.

II. LABORATORY QUALITY ASSURANCE PROGRAMS

The objective of the Quality Assurance Program is to monitor the quality control systems in place in the company, as well as the information systems. Systems presently in place must be followed by all employees for total effectiveness. Quality assurance programs check that procedures are followed, and provide corrective actions when systems are not followed or found to be ineffective. The goal of the quality assurance program is to provide final reports with zero defects. This is obtained by investigating any problems that arise, and improving the conditions that led to the problem. Quality assurance checks are made by the Quality Control Director, the Quality Assurance Manager, and by programs that are formulated outside of company management. These programs include proficiency test samples and laboratory audits.

The Quality Assurance Program provides checks on both the quality of the analyses performed in the laboratory, and the quality of service which we provide to our clients. The Quality Control Director monitors the quality of the analyses performed in the laboratory by means of notebook checks, quality control chart checks, laboratory assessments, blind proficiencies, certification of new employees, and bottle quality control checks. The Quality Assurance Manager is responsible for the efficiency of company operation. This includes monitoring all company procedures to ensure that they are followed by employees. Corrective action programs are instituted to deal with deficiencies in company systems.

The quality production of test results involves every employee being aware at all times of the proper policies, procedures, and practices of the laboratory. This awareness minimizes testing inconsistencies and provides prompt corrective actions when such discrepancies do occur.

1. Quality Control Reviews

The Quality Control Director periodically reviews laboratory notebooks, quality control charts, and laboratory practices to evaluate if they meet the criteria set by the company in the Quality Control Program. The notebook and QC chart checks are conducted unannounced. Work is reviewed, and conclusions are reached and recorded. A meeting is scheduled with the laboratory supervisor to discuss any problems that may have been discovered. The findings are submitted to the company president for possible further discussions. The records of these reviews are kept in the quality control manual, located in the QC office. Laboratory supervisors are held ultimately responsible for the quality of laboratory notebooks and QC charts.

The QC Director also evaluates laboratory safety and good laboratory practices on a quarterly basis. Scheduled meetings are held among the QC Director and the laboratory supervisors to assess whether good laboratory practices are being followed, and to record the employees assigned to specific tasks. These laboratory practices include items such as temperature records for ovens, refrigerators, and incubators, deionized water records, and other laboratory details of this nature. It is important that these tasks be monitored and completed. The QC Director uses several sources to assess the laboratory, including the New York State ELAP assessments.

2. Employee Certification

In March of 1989, a company program was instituted which stated that all employees learning new environmental analyses would have to be certified by the QC Director prior to performing the method for production. This certification involves two parts. The first part is an oral exam given by the QC Director to the employee. This exam tests the employees knowledge of the method and the QC requirements specified for the method. Employees are expected to know holding times, preservations, calibration requirements, and company QC requirements. The technician training the employee for the method is also present during the exam to note any discovered deficiencies in the training process. If the employee's knowledge of the method is found to be acceptable, a proficiency test sample is forwarded to the employee. If there are notable deficiencies in the knowledge of the method, the QC Director provides the employee and the trainer with a written report of the findings.

The second part of the certification program is the proficiency examination. The employee is given a blind QC sample for analysis. EPA samples are used when available, but laboratory standards may also be used. The QC Director records the value and the standard preparation used. Acceptance limits are based on EPA 95% confidence intervals, or on laboratory control chart limits. If the employee provides an acceptable analysis of the parameter, a certification of proficiency for the method is awarded. An unacceptable result is investigated by the QC Director, and a course of action is decided. In some cases, the employee may go through the training process again.

Analyses performed by technicians in training must be reviewed and verified by the trainer and the Laboratory Supervisor. The QC Director also reserves the right to revoke employee certification if circumstances warrant that action.

3. In-House Proficiency Test Samples

In addition to the various external proficiency testing that AES performs, an annual blind proficiency test is given to the inorganics and organics chemistry departments. The QC Director prepares the standards or orders them from an outside manufacturer. These proficiency samples are given a laboratory job code and sample number, and processed as an environmental sample by the laboratories. Only the QC Director and one Project Manager are aware that the samples are for proficiency testing.

The report is kept by the QC Director, and reported values are checked against acceptable ranges as published by the supplier, or against control limits for standards prepared internally. The findings are forwarded to the laboratory management, and any unacceptable values are investigated and re-tested. Continuing unacceptable results indicate a problem with the method, the technician, or the instrumentation. These possibilities are investigated by the QC Director, and corrective actions are taken.

4. Corrective Action Programs

The contents of this QA/QC manual are the guidelines for the operation of our company. It is expected that all employees will follow the manual when conducting environmental analyses. However, a corrective action program is in place to address any deficiencies noted in company operations. This program covers both quality control and quality assurance programs.

Deficiencies are assigned a priority based on the severity of the problem. Most corrective actions consist of a notice to an employee which serves as a reminder of a quality rule which has been violated. Repeated violations of these rules by an employee become a serious matter, and will be dealt with by a suspension or termination. It is expected that the first notice will be sufficient to correct the problem.

Serious violations of quality rules by an employee will result in a suspension. A second violation of a rule of this type will result in termination of employment. The standard operating procedure for our corrective action program classifies the quality rules into their priorities. All employees have read and understand this quality manual and the corrective action SOP. It follows that employee knowledge of the work assigned is expected. Corrective actions are necessary to maintain the quality of operation and analysis expected in an environmental laboratory.

5. Bottle Quality Control

On a continuing basis, the QC Director will evaluate all trip blank results. If a problem is discovered, or trends indicate the potential for a problem developing, the QC Director will fill the bottle types listed in the standard operating procedure for bottle QC with laboratory grade water, and preserve the bottles appropriately. These bottles will be distributed to the laboratories for analysis. The labs will be instructed to run the samples without any preparation, in order to properly evaluate the results of the tests on the bottles and water only. Results will be evaluated by the QC Director, and corrective actions will be taken in the event of a positive result. This program is necessary in order to monitor and evaluate glassware preparatory procedures.

6. Laboratory Assessment

One of the requirements of the New York State Environmental Laboratory Approval Program is an unscheduled annual audit of our laboratory by the state. A laboratory assessor spends a full day at AES each year, and performs a comprehensive audit of all the good laboratory practices on the New York State checklist. These items range from control charts to incubator temperatures. A report of the findings of the audit is sent to AES, and corrective actions are immediately taken to address any deficiencies noted by the state. These corrective actions must be sent to the state for their approval.

Our laboratory also welcomes assessments from qualified personnel on behalf of our clients. These meetings can be scheduled with the project managers. In addition, clients are welcome to tour and inspect the facility at any time.

7. Proficiency Testing

AES participates in several proficiency testing programs for the purpose of accreditations. New York State proficiency analyses are performed on a quarterly basis; accreditations are held for potable and non-potable water, bacteriology, solid and hazardous waste, and air and emissions. Satisfactory performance on each parameter is necessary to maintain accreditation. Proficiencies are also performed for the state of New Jersey in the areas of drinking water and water pollution parameters. Certification for the state of New Jersey is pending.

Our laboratory is also certified by the National Institute of Occupational Safety and Health for air analyses. The areas certified are metals and organics in air. Proficiencies are performed on a bi-monthly basis for NIOSH certification.

On occasion, our laboratory also performs proficiency tests administered by our clients. Project managers handle proficiencies of this nature. The DMR-QA proficiencies administered annually by the US-EPA are an example of this type.

8. Report Corrections

In the event a question arises after a client receives a report, our company encourages the client to contact the Project Manager. If it is determined that a correction is needed on the report, the change is made after consulting with the QC Director. The corrected pages are then sent to the client, and copies of the corrected pages are kept in the project file for future reference.

9. Records

All project files, test reports, and laboratory records are securely stored at Advanced Environmental Services. Due to space limitations, some records are securely stored at an off-site location for one year.

EQUIPMENT AND INSTRUMENTATION

Advanced Environmental Services relies on several pieces of equipment and major instrumentation in order to complete analyses in an accurate and timely manner. Lists of the instruments and equipment follow this page.

All laboratory departments have backup instrumentation to eliminate lost time due to instrument malfunctions. The exception is the Total Organic Carbon Analyzer in the wet chemistry department. Service contracts are kept current on major instrumentation to ensure high priority service, as well as to obtain information to improve the equipment and techniques involved.

The proper scheduled maintenance recommended by the manufacturer is performed on all departmental equipment and instrumentation. This information is recorded in the maintenance notebook.

MAJOR INSTRUMENTATION

Inorganics Department

Total Organic Carbon Analyzer- Dohrmann Model DC-80

Technicon Model II Autoanalyzer- Dual Track System

Altex SelectIon 5000 Analyzer

Orion Model SA 720 Fluoride Meter

Bausch and Lomb Spectrophotometer Model 21

HG Instruments Model DRT 100 Turbidity Meter

Parr Adiabatic Calorimeter

Fischer/Tag Pensky-Martens Flashpoint Tester (closed cup)

Precision Scientific Inc. Flash Tester (open cup)

Yellow Springs Instruments Model 58 Oxygen Meter

Perkin-Elmer 700 Infrared Spectrophotometer

Perkin-Elmer Model 4000 Atomic Absorption Spectrophotometer with HGA 400 Graphite Furnace and Model AS-40 Autosampler

Perkin-Elmer Model 5000 Atomic Absorption Spectrophotometer with HGA 500 Zeeman Graphite Furnace and Model AS-40 Autosampler

Technicon Model II Autoanalyzer- Dedicated for Mercury Analysis

Organics Department- All Systems Equipped with Autosamplers

Varian Model 3700 Gas Chromatograph
- Detectors- Photoionization (PID)
  - Halogen Specific (ELCD)
- Purge and Trap- Tekmar Model LSC-2

Varian Model 3700 Gas Chromatograph
Electron Capture (EC) and Flame Ionization Detectors (FID)

Varian Model 3700 Gas Chromatograph
FID and Electrolytic Conductivity Detector

Hewlett-Packard Model 5370 Gas Chromatograph
Electron Capture Detector

(2) Hewlett-Packard Model 5970- GC/MS Systems
Purge and Trap- Tekmar Model LSC-2

Hewlett-Packard Model 5890A Gas Chromatograph
Detectors- PID - ELCD in series
MPM 16 Autosampler

Hewlett-Packard Model 5890A Gas Chromatograph
Detectors - Dual EC Detectors
7376A Dual Tower Autosampler

Dohrmann Model MC-1 Total Organic Halide Analyzer

Dohrmann Model MC-3 Total Organic Halide Analyzer

MAJOR EQUIPMENT

INORGANICS DEPARTMENT

Mettler H33 Analytical Scale

Lab-Line Incubator Model 120-D

VWR Incubator Model 22

Boekel Dessicator

Reichert Darkfield Colony Counter Model 3325

Canadian Standards Assoc. Heating Mantle

OHAUS Digital Top Scale Model 1500D

(8) Electromantle MA Solid Spinners

(8) Powerstar Heat Regulators

(2) Forma-Scientific Bath and Circulators

National Autoclave Model 704-9000-D

Hach COD Digestor Model 16500-01

O.I. Corp. COD Reactor

(4) Corning Hotplate/Stirrers

Scientific Products Vortex Mixer

VWR Stirrer Model 310

(2) Thermolyne Hotplates Model 2200

Scientific Block Digestor Model AD-4020

Thermolyne Muffle Furnace Model 1500

ORGANIC DEPARTMENT

(2) Lindberg Hotplates

Branson Ultrasonic Cleaner B-72 452E

Mettler H51AR Scale

Dynac II Centrifuge

PERSONNEL

AES draws from a nucleus of scientists, technicians, and administrators to achieve quality production. Resumes of personnel with direct responsibility for the quality functions described in this manual are provided.

NAME: W. Joseph McDougall

TITLE: President

EDUCATION/DEGREES:

B.S./1960/(Niagara University)/Natural Sciences

Ed.M./1964/(State University of New York at Buffalo)/ Biology

Ph.D./1976/(University of Sarasota)/Microbiology

Dissertation- "Biological Treatment of Wastewater: Nitrification/Denitrification"

YEARS EXPERIENCE AT AES: 11

RELATED EXPERIENCE AND QUALIFICATIONS:

Cancer Research Scientist at Roswell Park Memorial Institute
6 Years

Established Research Scientist at Medical Foundation of Buffalo
3 Years

Sanitary Chemist/Bacteriologist for the City of Niagara Falls
4 Years

Love Canal Project Manager
2 Years

OSHA 40 hour training for Hazardous Waste Operation and Emergency Response

NAME: Paul T. McMahon

TITLE: Quality Control Director

EDUCATION/DEGREE:

B.A./1986/(Niagara University)/English (Literature)

YEARS EXPERIENCE WITH AES: 6

3 Years Atomic Spectroscopy Technician
1 Year Atomic Spectroscopy Supervisor

RELATED EXPERIENCE AND QUALIFICATIONS:

University education included two years of science related courses (General and Organic Chem and labs, Physics, Calculus, specialized courses in the science of nuclear and chemical waste).

American Association for Laboratory Accreditation Course- "Laboratory Quality Assurance and Assessment for Environmental Testing"

Center for Energy and Environmental Management Course- "Statistical Measurement Control"

NAME: Michael J. Simpson

TITLE: Systems Manager

EDUCATION/DEGREE:

A.A.S/1989/(Niagara County Community College)/
Business Administration

YEARS EXPERIENCE WITH AES: 7

5 Years Laboratory Manager

RELATED EXPERIENCE AND QUALIFICATIONS:

Currently attending Niagara University in pursuit of a B.S. degree in Chemistry

American Chemical Society Short Course - "The Electronic Laboratory: A Hands-On Experience in Laboratory Automation"

NAME: Dennis J. Hoyt

TITLE: Field Services Manager/Project Engineer

EDUCATION/DEGREE:

B.S./1989/(Clarkson University)/Engineering-Chemical

YEARS EXPERIENCE WITH AES: 2

RELATED EXPERIENCE AND QUALIFICATIONS:

One year of architectural engineering at Alfred State College

NAME: Denise R. Tuhovak

TITLE: Organics Supervisor

EDUCATION/DEGREE:

B.S./1986/(Canisius)/Chemistry

YEARS EXPERIENCE WITH AES: 1

RELATED EXPERIENCE AND QUALIFICATIONS:

Varian GC Training Course
DuPont DSC Training Course
Mattson FTIR Training Course

Research Chemist - Wilson Greatbatch Ltd.

2 Years

Analytical Chemist - Recra Environmental Inc.

2 Years

Research Assistant - Buffalo Color Corporation

1 Year

NAME: Susan C. Scrocchi

TITLE: Senior Organics Chemist

EDUCATION/DEGREE:

B.S./1983/(Canisius College)/Chemistry

YEARS EXPERIENCE WITH AES: 7

5 Years Organic Chemistry Supervisor

RELATED EXPERIENCE AND QUALIFICATIONS:

Organic Chemistry Laboratory Assistant at Canisius

Major Emphasis on Organic Chemistry and Instrumentation

Capillary Chromatography Seminar, SUNY at Buffalo

NAME: James G. Figler

TITLE: Senior GC/MS Chemist

EDUCATION/DEGREE:

B.A./1988/(SUNY at Buffalo)/Chemistry

YEARS EXPERIENCE WITH AES: 4

RELATED EXPERIENCE AND QUALIFICATIONS:

Hewlett Packard High Resolution Gas Chromatography Seminar

Hewlett Packard 59970 Mass Spectrometry Operator Training Course

Sentex Scentograph Portable G.C. Training Course

NAME: Gary L. Amato

TITLE: Inorganics Technical Supervisor

EDUCATION/DEGREE:

A.A./1986/(Niagara County Community College)/Humanities

B.A./1988/(State University of New York at Buffalo)/Biology

YEARS EXPERIENCE WITH AES: 2

RELATED EXPERIENCE AND QUALIFICATIONS:

Laboratory Technician for Standard Oil

1 Year

Course work included several courses in Microbiology

NAME: Linda A. Ratka

TITLE: Senior Inorganics Chemist

EDUCATION/DEGREES:

B.A./1985/(SUNY at Buffalo)/Biological Sciences

M.A./1988/(SUNY at Buffalo)/Biological Sciences

YEARS EXPERIENCE WITH AES: 2 YEAR

RELATED EXPERIENCE AND QUALIFICATIONS:

Extensive Laboratory Work for M.A. Degree

Implemented Teaching Laboratories on the College and Grade School Levels

Extensive Teaching Experience in College

NAME: Frank J. Scrivano

TITLE: Inorganics Laboratory Administrator

YEARS EXPERIENCE WITH AES: 4

1 year - Atomic Spectroscopy Assistant
1 year - Atomic Spectroscopy Technician
1 year - Project Manager

RELATED EXPERIENCE AND QUALIFICATIONS:

Attended Perkin Elmer Seminar- "Techniques in Graphite Furnace Atomic Absorption" November 1988

Attended Career Track Publications Seminar- "Exceptional Customer Service" September 1989

NAME: Scott A. Abel

TITLE: Senior Field Technician

EDUCATION/DEGREE:

Presently taking courses at SUNY at Buffalo in Environmental Science and Industrial Hygiene

YEARS EXPERIENCE WITH AES: 6

RELATED EXPERIENCE AND QUALIFICATIONS:

40 Hour OSHA 1910.20 Hazardous Waste Health and Safety Training Course

Seminar on the Survey of Industrial Hygiene-U. of Cincinnati

NAME: Bonnie J. Simpson

TITLE: Quality Assurance Manager

EDUCATION/DEGREE:

B.A./1987/(Niagara University)/English

YEARS EXPERIENCE WITH AES: 4

Company Experience in Glassware, Sample Control, Customer Service, and Administrative Duties

NAME: Mildred J. Brass

TITLE: Administrative Supervisor

EDUCATION/DEGREE:

Presently pursuing a B.A. Degree in Business Administration from Niagara University

YEARS EXPERIENCE WITH AES: 6

Receptionist- 2 Years
Office Manager- 2 Years

RELATED EXPERIENCE AND QUALIFICATIONS:

Present duties include supervising Customer Service, Office Personnel, and Sample Control

Seminar- "Exceptional Customer Service" - Career Track Publications

Customer Service Representative- New York Telephone

5 Years

Owner and Manager of the Barton House Restaurant Youngstown, New York

3 Years

NAME: Catherine Mocniak

TITLE: Project Manager / Industrial Hygiene

EDUCATION/DEGREE:

B.A./1977/(Buffalo State College)/Liberal Arts/Language

YEARS EXPERIENCE WITH AES: 5

1 Year Sample Controler
3 Years Project Manager/Customer Service

RELATED EXPERIENCE AND QUALIFICATIONS:

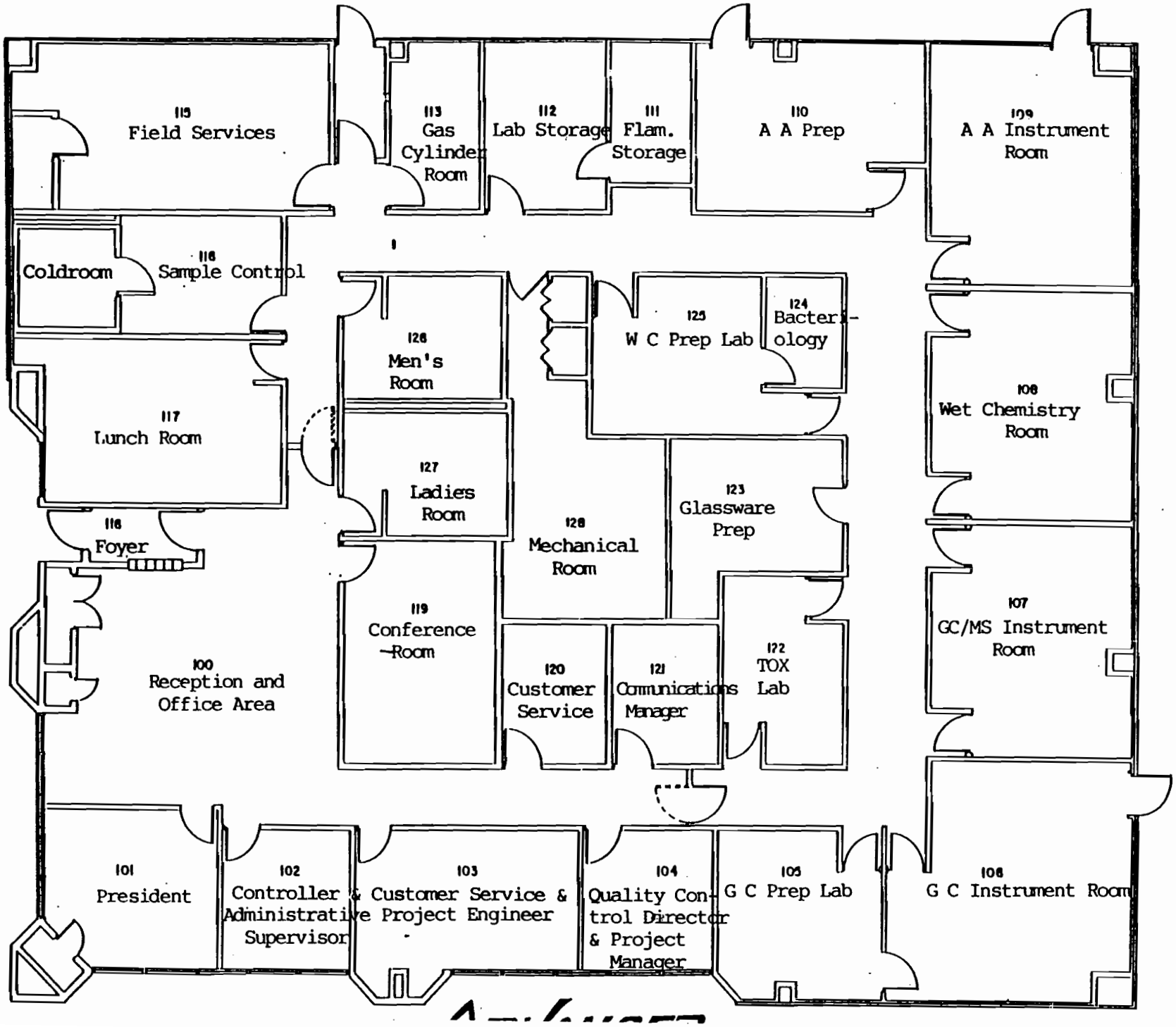
(Fred Pryor)Project Manager Seminar - Sept. 1989

Survey of Industrial Hygiene (University of Cincinnati) - Dec. 1989

Marketing/Merchandising/Management - 7 Years

Public Relations Director - 1 Year

APPENDIX A


115
Field Services
113
Gas
Cylinder
Room
112
Lab Storage
111
Flam.
Storage
110
A A Prep
109
A A Instrument
Room
Coldroom
116
Sample Control
125
W C Prep Lab
124
Bacteri-
ology
126
Men's
Room
108
Wet Chemistry
Room
117
Lunch Room
127
Ladies
Room
123
Glassware
Prep
116
Foyer
128
Mechanical
Room
119
Conference
Room
107
GC/MS Instrument
Room
100
Reception and
Office Area
120
Customer
Service
121
Communications
Manager
122
TOX
Lab
101
President
102
Controller &
Administrative
Supervisor
103
Customer Service &
Project Engineer
104
Quality Con-
trol Director
& Project
Manager
105
G C Prep Lab
106
G C Instrument Room

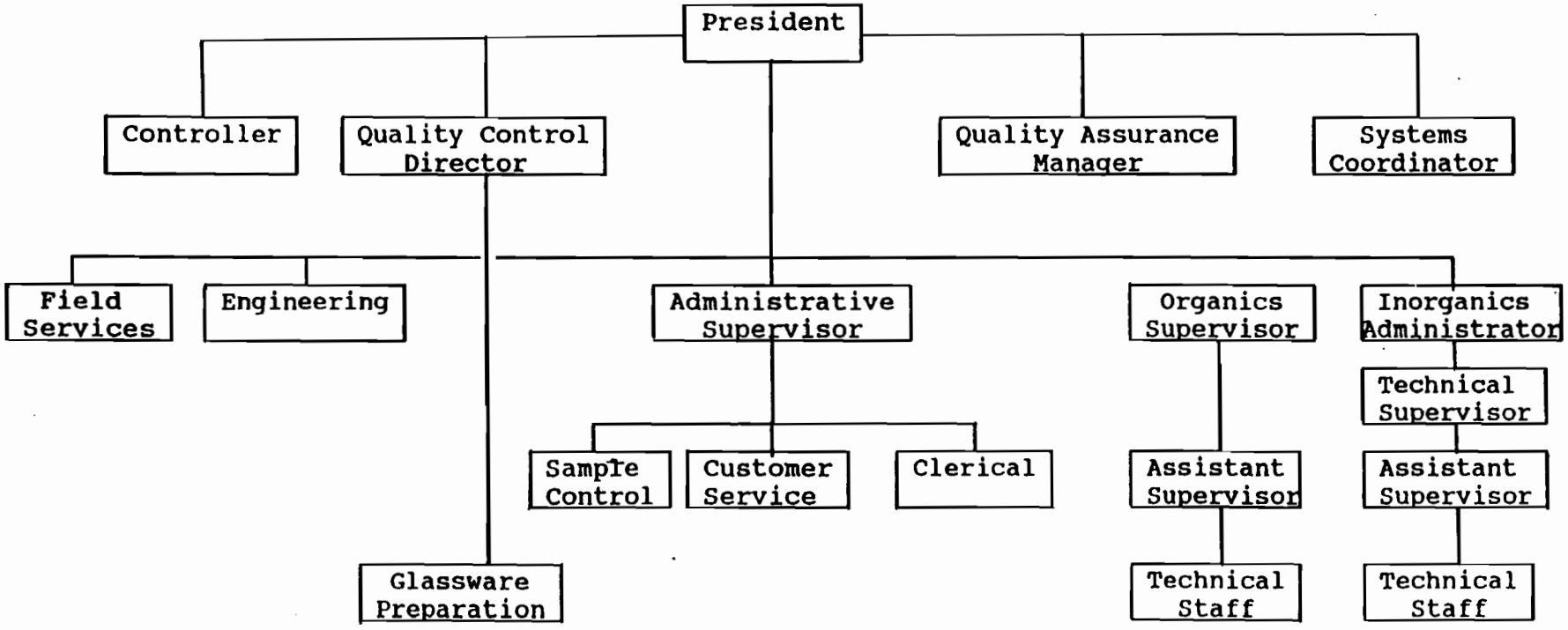
APPENDIX B

APPENDIX C

ADVANCED ENVIRONMENTAL SERVICES

ORGANIZATIONAL CHART

1991



ADVANCED
ENVIRONMENTAL SERVICES INC.

TITLE

Report Prepared For

COMPANY

_____

Project Manager

_____

Paul T. McMahon
Quality Control Officer

Date
AES Report

COMMITMENT
TO
HONESTY - QUALITY - SERVICE

ADVANCED ENVIRONMENTAL SERVICES, INC.

FIELD REPORT

CUSTOMER: _____ AES JOB CODE: _____

WEATHER: _____ BEGINNING DATE: _____

NUMBER OF SAMPLES: _____ ENDING DATE: _____

SAMPLING LOCATIONS (1)_____ (2)_____ (3)_____

TIME _____ _____ _____

SAMPLING VOLUME _____ _____ _____

SAMPLE APPEARANCE (1)_____

(2)_____

(3)_____

Parameters	Date	Preservative	Flow Comp.	Time Comp.	Grab Comp.	Grab

FIELD PARAMETERS: pH (1)_____(2)_____(3)_____ F°C° Temp (1)_____(2)_____(3)_____

Dissolved Oxygen (1)_____(2)_____(3)_____ Rc12 (1)_____(2)_____(3)_____

Specific Conductivity (1)_____(2)_____(3)_____

COMMENTS: _____

_____

_____

_____

Sampled By Date

ADVANCED ENVIRONMENTAL SERVICES, INC.
LABORATORY REPORT

Type of Analysis:

Client: A.E.S. JOB CODE

AES Lab No. -
Sample ID -

Analytical Parameter(s)	Method No.	Quant. Limits	Sample Date-

Gary L. Amato
Technical Supervisor

ADVANCED ENVIRONMENTAL SERVICES, INC.
LABORATORY REPORT

Type of Analysis:

Units of Measure:
Client: A.E.S. Job Code

AES Lab No.-
Sample ID -

Analytical Parameter(s)	Method No.	Quant. Limits	Sample Date-

Denise R. Tuhovak
Organics Supervisor

ADVANCED ENVIRONMENTAL SERVICES, INC.
LABORATORY REPORT
QUALITY CONTROL - PRECISION

Type of Analysis: Duplicate Analysis
Units of Measure:
Client: A.E.S. Job Code:

Analytical Parameters	Sample Code	Original Conc.	Duplicate Conc.	Average Conc.	Range	Rel. % Difference

Relative Percent Difference =
Range/Average X 100

ADVANCED ENVIRONMENTAL SERVICES, INC.
LABORATORY REPORT
QUALITY CONTROL - ACCURACY

Type of Analysis: Matrix Spikes and E.P.A. Standards
Client: A.E.S. Job Code:

(Units: / or pp)

Analytical Parameters	Sample No.	Type	Observed Conc.	Original Conc.	Added Conc.	Percent Recovery*

* % Recovery=100 x ((Observed Conc. - "background" Original Conc.)/"Spike" Added Conc.)

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
ADVANCED ENVIRONMENTAL SERVICES, INC.
LABORATORY REPORT

Type of Analysis: Metals
Client: A.E.S. Job Code

(All results are in mg/l)

A.E.S. Lab No.-
Sample ID -

Analysis	Method No.	Allowable Conc. (mg/l)	Quant. Limits	Analysis Date
Arsenic	7060	5.0	0.005	
Barium	7080	100.0	1.00	
Cadmium	7130	1.0	0.04	
Chromium	7190	5.0	0.50	
Lead	7420	5.0	1.00	
Mercury	7471	0.2	0.001	
Selenium	7740	1.0	0.005	
Silver	7760	5.0	0.10	

Gary L. Amato
Technical Supervisor

ADVANCED ENVIRONMENTAL SERVICES

STANDARD ADDITIONS DATA SHEET

CUSTOMER:
JOB CODE:

UNITS: MILLIGRAMS/LITER, OR PPM

S.#	ELEMENT	0/ABS.	1 SPK/1 ABS	2 SPK/2 ABS	3 SPK/3 ABS	FIN CONC	s*

*"s" is the correlation coefficient.

COMMENT: Extract(s) analyzed by the method of standard additions, as specified in EPA Reference SW-846 (3rd Edition, 1986). Correlation coefficient equal to or greater than .995 fulfill the requirements for an analysis free of sample matrix interference.

AES ORGANIC DEPARTMENT TRACEABILITY
JOB CODE: _____

Technician Signature	AES Sample #	Method	Date of Analysis

AES INORGANIC DEPARTMENT TRACEABILITY

JOB CODE: _____

Technician Signature	AES Sample #	Method	Date of Analysis

ADVANCED
ENVIRONMENTAL SERVICES INC.

2186 LIBERTY DRIVE
NIAGARA FALLS, NY 14304
(716) 283-3120

CHAIN OF CUSTODY RECORD	JOB CODE	PROJECT NAME

SAMPLER'S SIGNATURE					GRAB	COMP	SAMPLE TYPE	NO. OF CONTAINERS	REMARKS
SAMPLE NO.	SEQ. NO.	DATE	TIME	SAMPLE LOCATION					
							TOTAL CONTAINERS		

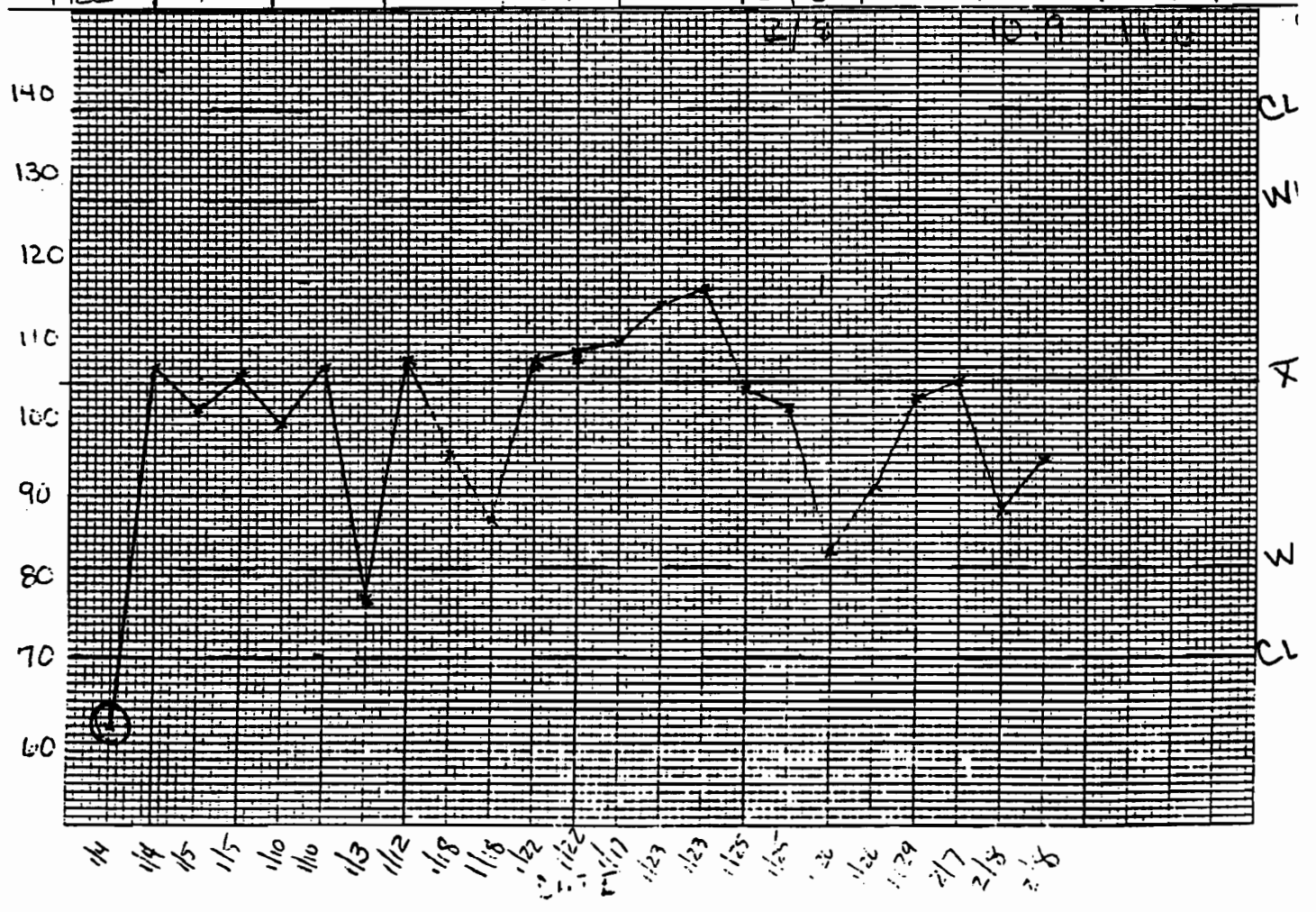
RELINQUISHED BY (Sign)	DATE	TIME	RECEIVED BY (Sign)
1			2
RELINQUISHED BY (Sign)	DATE	TIME	RECEIVED BY (Sign)
2			3
RELINQUISHED BY (Sign)	DATE	TIME	RECEIVED BY (Sign)
3			4
RELINQUISHED BY (Sign)	DATE	TIME	RECEIVED BY (Sign)
4			5

REMARKS:

APPENDIX D

Chloroform (spike)

DATE	TYPE	obs - orig	added	% Recovery		DATE	TYPE	obs - orig	added	% Recc
1/4/90	spk	9.3	15.0	62		1/22/90	spk	12.5	11.6	108
1/4/90	spk	15.9	15.0	106		1/[illegible]/90		12.6	11.6	10
1/5		15.1	15.0	101		1/23		13.2	11.6	114
1/5		15.9	15.0	106		1/23		13.4	11.6	116
1/10		14.9	15.0	99		1/25		12.0	11.6	103
1/10		15.9	15.0	106	$\bar{x}$=104	1/25		11.7	11.6	101
1/3		11.5	15.0	77		1/26		9.56	11.6	83
1/12		16.1	15.0	107	45% 81-127	1/26		10.6	11.6	91
1/18		14.3	15.0	95	99% 70-138	1/29		11.9	11.6	10
1/18		13.0	15.0	87		2/7		12.1	11.6	104
1/22		12.4	11.6	107		2/8		10.2	11.6	88
						2/8		10.9	11.6	



APPENDIX E

TOC/SOC SUSB

Date	Type	Original	Obs.	%	Analyst	Date	Type	Original	Obs.	%	A
3-26-90	IND STD	30.0	32.2	107	LR	4-16-90	IND STD	30.0	28.3	94	
3-26-90			33.9	113	LR	4-17-90			33.4	110	M
3-27			32.0	107	MK	4-24-90			32.9	110	M
3-28			32.0	110	MK	4-24-90			31.4	105	M
3-28			33.4	111	MK	4-25-90			32.4	108	M
3-4-2			32.7	110	MK	4-26			33.0	110	M
4-2			33.5	112	MK	4-26-90			31.2	107	M
4-3			32.0	107	MK						
4-5			33.3	111	LR						
4-5			31.8	106	LR						
4-6			30.6	102	MK						
4-9	↓	↓	31.4	105	MK		↓	↓			

Footnotes listed on back

Statistic Data

sd 2