WORK PLAN FOR COMPREHENSIVE GROUNDWATER MONITORING ACTIVITIES

GENERAL MOTORS FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

SEPTEMBER 1998
REF. NO. 12559 (1)
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1.0 INTRODUCTION AND BACKGROUND

Conestoga-Rovers & Associates (CRA) has prepared this Work Plan for Comprehensive Groundwater Monitoring at the General Motors (GM) Fairfax I/II Plants in Kansas City, Kansas (Site). Refer to Figure 1.1 for project location. The Fairfax I Plant Site is vacant as operations ceased in 1986/87 and the facility was demolished in 1987. A large number of monitoring wells, however, remain on the Fairfax I Plant Site. The Fairfax II Plant was constructed adjacent to the Fairfax I property beginning in 1998. The Fairfax II Plant Site is an active facility. Monitoring wells are also present on the Fairfax II property and these are monitored routinely. Appendix A presents the approximate locations of known existing monitoring wells.

The Site is located in the floodplain of the Missouri River. Underlying Site geology soils typically consist of an upper layer of silty clay ranging in thickness from approximately 7 to 15 feet. This layer is underlain by fine to medium sands to depths of 25 to 40 feet, grading into medium to coarse sands with some gravel and clay interbeds to depths of 60 to 80 feet. This layer is underlain by medium to coarse sands and gravels to the top of the bedrock. Shale bedrock occurs at approximately 102 to 117 feet below grade. Groundwater is expected to flow to the northwest and toward the Missouri River.

Soil and groundwater contamination were discovered at the Site in 1987 during a Environmental Site Assessment which was completed prior to demolition of the Fairfax I Plant. The primary sources of contamination were determined to be gasoline and paint thinner from a tank farm along with suspect historic releases of perchloroethylene from prior to GM operations. GM initiated a voluntary cleanup program in 1988, which included semi-annual groundwater monitoring, groundwater contamination plume definition, and remedial design and construction. The remediation system for the small tank farm area comprised groundwater extraction and treatment by air stripping along with soil vapor extraction and treatment by thermal oxidation. The remedial action was initiated in 1991 and shutdown in 1994. The semi-annual groundwater monitoring at the Fairfax I Plant Site, (which included analysis for benzene, toluene, ethylbenzene, and xylenes (BTEX); and 1,2-dichloroethylene) was also discontinued in 1994.

The Fairfax II Plant was constructed beginning in 1988. Monitoring wells were installed on the Fairfax II property prior to and during its construction. These have continued to be monitored since 1988 on a semi-annual basis for volatile organic compounds (VOCs) and metals.

GM and the Kansas Department of Health and Environment (KDHE) prepared a Consent Order for the Fairfax I/II Site. Negotiation of the Consent Order was

apparently delayed pending the finalization of KDHE's Voluntary Cleanup and Property Redevelopment Program (VCPRP). More recently, the KDHE contacted GM in April 1998 to determine if GM wishes to continue ether the Consent Order negotiations or if they would apply for the VCPRP. GM deferred this decision on the VCPRP matter until a comprehensive sampling of groundwater on both the Fairfax I and II properties could be completed and a assessment of current groundwater conditions could be established. This work plan identifies scope of work for a groundwater sampling and analysis of key existing wells at the Fairfax I/II properties. The results of this program will be used in conjunction with other Site data and FOIA information to determine current conditions on and off the Site, and to aid GM in determining the best course of action (regulatory and technical strategies) for both the Fairfax I and II Plant Sites.

2.0 SCOPE OF WORK

Based on a review of available Site documentation, there are approximately 70 groundwater monitoring wells which were installed by various contractors on behalf of GM between 1985 and 1990. It is unknown at this time which of these wells is still existing in an operable condition at the Site. A summary of known installed groundwater monitoring wells is presented in Table 2.1. One round of groundwater sampling will be completed for 38 of the existing groundwater monitoring wells, assuming the wells can be located and are found to be in operable condition. Key monitoring wells were selected based upon their spatial distribution and depth of screened intervals. Monitoring wells in close proximity to each other (<500 ft) were not selected and the intermediate depth wells at clusters of three wells or more were not selected for the comprehensive sampling. Because the groundwater flows through a large sequence of sands and gravels without vertical stratification, CRA considers the analyses of samples from the shallow wells (approximately 30 feet below grade) and from the deeper wells (approximately 100 feet below grade) to be sufficient for vertical characterization of VOC contamination. Collected groundwater samples will be analyzed for VOCs by Method SW-846 8260.

All monitoring wells to be sampled will be surveyed in for location and vertical control by Anderson Survey Company. A complete round of water level measurements will be collected prior to the sampling event at all (planned) 38 monitoring wells.

3.0 SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan (SAP) details the investigative sampling and analytical protocols to be used during the groundwater sampling.

3.1 EQUIPMENT CLEANING

A temporary equipment decontamination facility will be constructed and operated at the Site. Decontamination will be conducted using a high-pressure, low volume steam cleaner. All decontamination will be conducted on Site at the temporary equipment decontamination facility to be determined by Fairfax II-GM personnel. Decontamination water will be discharged to the ground surface on Site.

All sampling tools will be thoroughly washed in the wash sequence as follows:

- Use a still brush to remove any debris or soil;
- Clean with a potable wash water and a laboratory grade detergent (e.g. Alconox);
- Rinse with distilled water; and
- Allow to air dry and wrap in aluminum foil, if applicable, until required.

All decontamination of sampling tools and equipment will be conducted at the temporary equipment decontamination facility.

3.2 SAMPLING PROTOCOLS

3.2.1 SAMPLE LABELING

Each sample will be labeled with a unique sample code that will facilitate tracking and cross-referencing of sample information. An example of the sample identification code system is as follows:

Sample ID: GW-060198-XX-001

GW - designates media (GW-groundwater, S-soil)
060198 - designates date of collection presented as month/day/year
XX - sampler's initials
001 - sequential number starting with 001 at the start of the project

Quality Control (QC) samples also will be numbered with a unique sample number, consistent with the numbering system described above.

3.2.2 CHAIN-OF-CUSTODY FORMS

CRA chain-of-custody records will be used to track all samples from time of sampling to the arrival of samples at the laboratory. Each sample container being shipped to the laboratory will contain a chain-of-custody form. The chain-of-custody form consists of four copies, which are distributed to the sampler, to the shipper, to the contract laboratory, and to the office file of CRA. The sampler and shipper will maintain their copies while the other two copies will be enclosed in a waterproof enclosure within the sample container.

The laboratory, upon receiving the samples, will complete the remaining copies. The laboratory will maintain one copy for its records. The executed original will be returned to CRA with the data deliverables package.

3.2.3 SAMPLE CONTAINERS AND HANDLING

All samples will be placed in appropriate sample containers, labeled and properly sealed. Foam chips or bubble pack will be used to cushion sample containers. Samples will be kept cool by the use of sealed plastic bags of ice. A trip blank will accompany each shipment of groundwater samples submitted for analysis.

Samples will be shipped by commercial courier or transported by hand to the project laboratory. Two seals of CRA chain-of-custody tape will be placed over the lid on the front and back of each shipping cooler. The seal will secure the lid and provide evidence that the samples have not been tampered with en route to the laboratory. Clear tape will be placed over the seals to ensure that they are not accidentally broken during shipment.

Upon receipt of the cooler by the laboratory, the designated sample custodian will inspect the cooler. The condition of the cooler and seal will be noted on the chain-of-custody form. The sample custodian will then check the contents of the cooler against the information noted on the chain-of-custody form. If damage or discrepancies are observed, they will be duly recorded in the remarks column of the chain-of-custody form, the form then will be signed and dated. Moreover, any observed damage or

discrepancies will be reported immediately to the laboratory project manager who will contact CRA for guidance.

3.2.4 GROUNDWATER SAMPLING PROTOCOLS

One round of groundwater samples will be collected from the existing groundwater monitoring wells. Each groundwater sample collected will be submitted to the laboratory and analyzed for SW-846 8260 VOCs.

Groundwater samples will be collected in accordance with the following protocols:

i) A new pair of disposable gloves (nitrile or latex) will be used for each sample.

ii) Prior to sampling, each well will be purged using a bailer or pump. The monitoring wells will be purged by removing a minimum of three standing well volumes of groundwater. Where the volume of standing water is calculated as follows:

$V = 23.5 \cdot r^2 \cdot h$

where:

V = volume of standing water in gallons
r = radius of the well in feet (0.0833 for a 2-inch well)
h = depth of water in feet

iii) Field measurements of pH, conductivity and temperature of the evacuated water will be collected and recorded following removal of each standing well volume and prior to sample collection. Field instruments will be calibrated as specified by the manufacturer prior to use. Well purging will be performed for a minimum of three well volumes and until three consecutive and consistent stabilization parameters (±1 pH unit, ± 10 percent for conductivity and temperature) are obtained. Well purging will continue until a maximum of five standing well volumes have been removed. In the event that a well is bailed/pumped dry prior to achieving five well volumes, groundwater will be permitted to recover to a level sufficient for sample collection. The time that the well was bailed dry will be recorded and the well will be monitored for recovery. Upon recovery, the sample will be collected.

iv) After purging the required volume of well water, water samples will be collected using a bailer or pump. Water will be emptied directly into the appropriate sample containers. Containers will be filled with minimal sample agitation. The groundwater samples may be collected from the bailer or pump used to purge the monitoring well as described above.

v) Field duplicate samples will be collected at a frequency of one per ten investigative samples collected or at a minimum of one per sampling event.

3.2.5 ANALYTICAL PROTOCOLS AND METHODS

Groundwater samples to be collected from the existing monitoring wells will be analyzed for VOCs by U.S. EPA SW-846 Method 8260. CRA's project chemist will complete a data quality assessment and validation of all analytical results.

3.2.6 QUALITY ASSURANCE/QUALITY CONTROL

To ensure the validity of the sampling and analysis program, field quality control (QC) samples will be collected with the investigative samples. Field QC samples will consist of collection of one duplicate groundwater sample during each monitoring event and analyzed by the laboratory to provide information on the precision of the sampling procedures. In addition, trip blank samples will be prepared by the laboratory, shipped with the sample containers, and returned with the field samples.

The laboratory's quality assurance (QA) program includes analyzing method blank samples, surrogate spikes, and matrix spike/matrix spike duplicate (MS/MSD) samples. MS/MSD samples are designated/collected in the field and analyzed by the laboratory to provide information regarding the accuracy and precision of the analyses relative to the sample matrices. MS/MSD samples will be designated/collected at a frequency of one per twenty investigative samples. Method blank samples and surrogate spikes are internal laboratory QC samples that are analyzed to determine if laboratory conditions or procedures have resulted in sample contamination, and to evaluate laboratory instrument performance on an individual sample basis, respectively. Method blank samples are analyzed at a minimum frequency of one per twenty investigative samples. Surrogate compounds are added to every sample being analyzed for organic constituents.

3.2.7 HYDRAULIC MONITORING

Prior to collecting groundwater samples, the groundwater level in each monitoring well will be measured using an electronic sounding device. Water levels will be recorded in the field log to the nearest 0.01 foot. Measurements will be in referenced to a surveyed point on the well casing. All monitoring wells to be sampled will be surveyed for vertical and horizontal control. Measuring devices will be decontaminated after each use.

3.2.8 MATERIALS AND EQUIPMENT

Bailers

Reusable or disposable bailers may be used for well development, purging, and sampling. Reusable bailers will be constructed of stainless steel. Disposable single-use bailers will be constructed of polyethylene, PVC, or Teflon®.

Rope

Rope will be made of braided nylon. New rope will be used for each well or sampling point.

Pumps

The following pumps may be used for well development and purging:

- submersible impeller driven pumps (e.g., Grundfos® pumps, whale pumps); and
- submersible pneumatic pumps (e.g. bladder pumps)
- peristaltic pumps.

The following pumps may be used for well sampling:

- Submersible impeller driven pumps – stainless steel construction (e.g., Grundfos® pumps);
- Submersible impeller driven pumps – PVC construction (e.g., whale pumps) may be not be used for collecting VOC samples (including formaldehyde);
- Submersible pneumatic pumps (e.g. bladder pumps); and
- Peristaltic pumps may only be used if conditions prohibit the use of the other types of pump (e.g., a well with a bent casing).

3.3 SITE SURVEYING

Anderson Surveying Company will be retained to locate and layout all existing monitoring well locations, and survey top of casing elevations and ground surface elevations. The survey will locate horizontal coordinates to an accuracy of ±1 foot and vertical elevations to ±0.01 feet based on a Site-specific datum.

3.4 WASTE HANDLING PROTOCOLS

Waste materials generated during equipment decontamination, monitoring well development and purging, and monitoring well sampling will be handled according to the procedures outlined below:

i) Purge water removed during monitoring well sampling will be discharged directly on the nearby ground surface as previous sample events indicate that only low concentrations of VOCs have been detected in the groundwater.

ii) Liquids resulting from equipment decontamination will be containerized in 55-gallon capacity DOT 17-H/E steel drums or polyethylene temporary storage tanks. Upon completion of investigation activities, a sample of the containerized water will be obtained for waste characterization and profiling. The final disposition of the water, including potential discharge to the Fairfax II process wastewater treatment system, will be based on the sample results.

iii) Disposable personal protective equipment (PPE) used during the investigation will be containerized and disposed of properly.

All drums will be labeled as to their origin and contents and stored at a suitable location on Site pending final disposal disposition.

4.0 HEALTH AND SAFETY

A Site-specific Health and Safety Plan (HASP) has been developed for the work described herein. The Site-specific HASP will be kept on Site at all times during performance of the work, and is included in Appendix B.

5.0 REPORTING

A draft report will be prepared that documents all field procedures, field observations, and analytical data generated. Any comments from GM will be incorporated into a final report which will contain an interpretation of the data obtained and, as necessary, recommendations for future investigative activities. The report will include observations and conclusions which can be made in regards to VOCs detected in groundwater and in regards to off-Site sources through use of environmental database searches and FOIA requests.

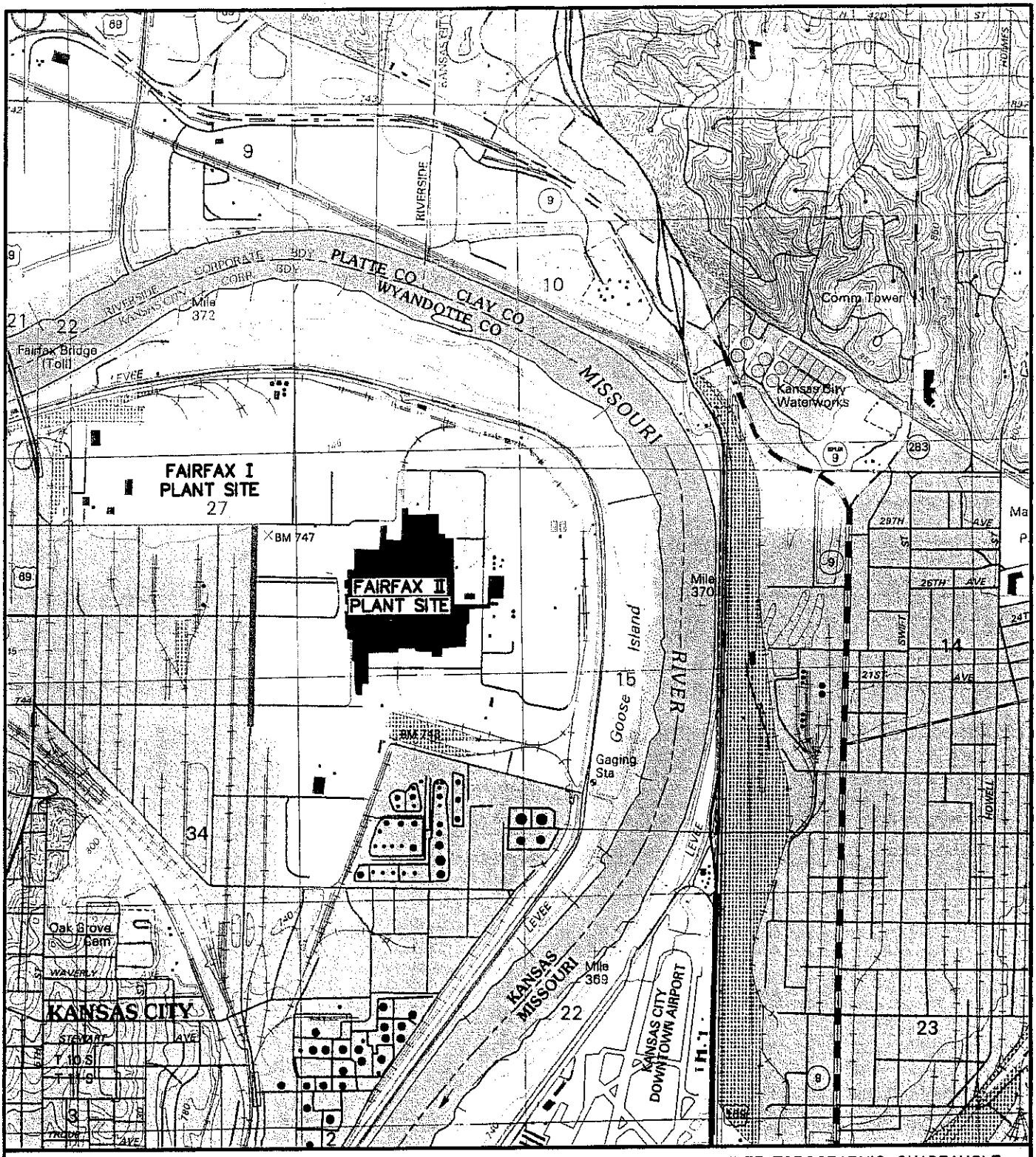
6.0 PROJECT TEAM

The following individuals from CRA's Chicago, Illinois office will be utilized for completion of this project:

Project Manager:	Phil Harvey
Project Engineer	Sara Anderson
Project QC Officer	Steve Day/Nancy Bergstrom
Project HSO	Matt Lazaric
Sampling Team	CRA Field Staff

7.0 SCHEDULE AND REPORTING

CRA estimates that approximately 6 weeks will be required to complete the sampling and that a summary report providing the data can be provided in draft form 6 weeks after completion of sampling. Figure 7.1 presents a schedule for major tasks associated with groundwater sampling at the Fairfax I and II Plant Sites.



BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE;
NORTH KANSAS CITY, MO–KS 1990

Kansas City
MISSOURI

figure 1.1

SITE LOCATION MAP
FAIRFAX I/II PLANT SITES
GENERAL MOTORS CORPORATION
Kansas City, Kansas

CRA

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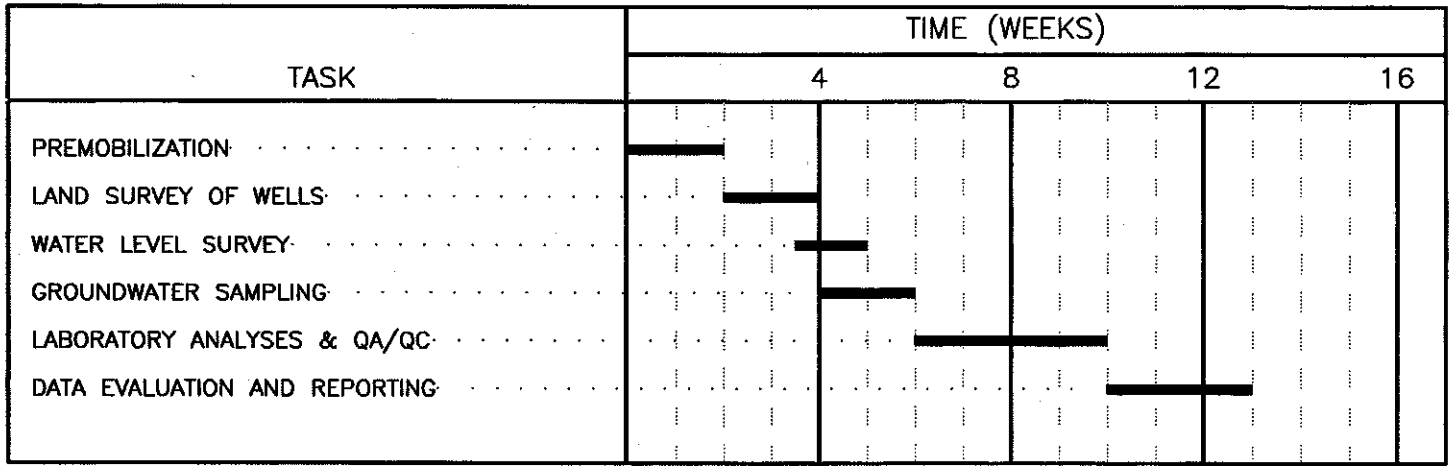

figure 7.1

PROJECT SCHEDULE
COMPREHENSIVE GROUNDWATER SAMPLING
FAIRFAX I/II PLANT SITES
GENERAL MOTORS CORPORATION
Kansas City, Kansas

CRA

12559-00(001)GN-C0001 AUG 25/98

TABLE 2.1

SUMMARY OF AVAILABLE WELL INFORMATION
GM FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

Well ID	*Date Installed*	*Construction*	*Stickup?*	*T.O.C. Elevation (feet AMSL)*	*Depth (ft bgs)* [1]	*Water Level (ft btoc)* [2]	*Date of Water Level*	*Survey Location* [3,4] *North*	*E/W*
TERRACON									
Fairfax I Locations									
MW-1*	9/2/1987	PVC	yes	NA[5]	31.5	19.53	Jun-94	6033.1	915.9 W
MW-2	9/1/1987	PVC	no	NA	30.9	NA	--	NA	NA
MW-3*	9/2/1987	PVC	yes	NA	31.5	NA	--	7360.1	2425.6 W
MW-4*	9/2/1987	PVC	yes	NA	32.5	NA	--	7938.8	1406 W
MW-101*	1/7/1988	PVC	yes	NA	32.5	NA	--	***7750***	***940 W***
MW-102A*	1/9/1988	PVC	yes	NA	33	20.52	Jun-94	7976.8	1026.9 W
MW-102B	1/13/1988	PVC	yes	NA	64	20.95	Jun-94	7981.3	1020.3 W
MW-102C*	1/12/1988	PVC	yes	NA	104.5	20.96	Jun-94	7980.4	1005.7 W
MW-103A	Jan-88	SS	NA	NA	NA	19.8	Jun-94	7846.2	802.4 W
MW-103B	Jan-88	SS	NA	NA	NA	18.41	Jun-94	7840	793.6 W
MW-103C	Jan-88	SS	NA	NA	NA	18.01	Jun-94	7837	808.3 W
MW-104	1/10/1988	SS	yes	NA	32	18.75	Jun-94	7882.2	699.6 W
MW-105	1/8/1988	PVC	yes	NA	33	18.84	Jun-94	7858	555.9 W
MW-106*	1/6/1988	PVC	yes	NA	32.8	19.85	Jun-94	7858	141.5 W
MW-107	1/7/1988	PVC	yes	NA	32.5	NA	--	7735.7	84.9 W
MW-108*	1/6/1988	PVC	yes	NA	32	19.66	Jun-94	7612.4	234.8 W
MW-109	Jun-89	NA	NA	NA	NA	19.1	Jun-94	6639.6	825 W
MW-110*	Apr-90	NA	NA	NA	NA	18.43	Jun-94	7127.8	780.76 W
MW-111*	Apr-90	NA	NA	NA	NA	19.12	Jun-94	6563.3	537.3 W
S-103	1/11/1988	PVC	yes	NA	32	19.07	Jun-94	6648.1	1524.4 W
S-113	1/12/1988	PVC	yes	NA	32.6	19.55	Jun-94	7639	744.2 W
Fairfax II Locations									
MW-6B	3/23/1989	PVC	yes	NA	80.5	29	INSTALL[6]	NA	NA
MW-10B (100B)	4/17/1989	PVC	yes	NA	75	28	INSTALL	***8125***	***125 E***
MW-16A (200A)*	3/27/1989	PVC	yes	NA	35	(727.74 AMSL)[7]	Nov-97	***3500***	***1300 E***
MW-16B (200B)	NA	PVC	yes	NA	95	(728.87 AMSL)	Aug-97	***3500***	***1300 E***

TABLE 2.1

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Well ID	*Date Installed*	*Construction*	*Stickup?*	*T.O.C. Elevation (feet AMSL)*	*Depth (ft bgs)* [1]	*Water Level (ft btoc)* [2]	*Date of Water Level*	*Survey Location* [3,4] *North*	*E/W*
MW-16C (200C)*	NA	PVC	yes	NA	110	(728.83 AMSL)	Aug-97	***3500***	***1300 E***
MW-17A (210A)	4/19/1989	PVC	yes	NA	34.5	22.7	Jan-90	***3850***	***2400 E***
MW-17B (210B)	4/18/1989	PVC	yes	NA	95	25	INSTALL	NA	NA
MW-17C (210C)	4/20/1989	PVC	yes	NA	110	28	INSTALL	NA	NA
MW-18A (220A)*	3/16/1989	PVC	yes	NA	35	(727.54 AMSL)	Nov-97	***3800***	***4200 E***
MW-19A (230A)*	3/16/1989	PVC	yes	NA	34.5	(727.33 AMSL)	Nov-97	***2350***	***4500 E***
MW-19B (230B)	NA	NA	NA	NA	NA	(729.69 AMSL)	Aug-97	***2350***	***4500 E***
MW-19C (230C)*	NA	NA	NA	NA	NA	(727.75 AMSL)	Aug-97	***2350***	***4500 E***
MW-20A (240A)*	3/20/1989	PVC	yes	NA	35	(727.54 AMSL)	Nov-97	***3000***	***3500 E***
MW-20B (240B)	3/22/1989	PVC	yes	NA	85	28.1	Jan-90	***3000***	***3500 E***
MW-20C (240C)*	3/20/1989	PVC	yes	NA	100	23	Jan-90	***3000***	***3500 E***
BURNS/MCDONNELL									
Fairfax II Locations									
MW-1A*	3/27/1985	PVC	yes	745.9	35	16.66	Nov-97	7136.2	521 E
MW-1B	3/27/1985	PVC	yes	745.4	85	15.65	Aug-97	7141.7	521 E
MW-1C*	3/29/1985	PVC	yes	746.09	107	16.36	Aug-97	7149.7	521.1 E
MW-2A	4/2/1985	PVC	yes	741.78	35	17.91	INSTALL	5234.3	2893.4 E
MW-3A*	4/2/1985	PVC	yes	744.9	35	16.81	Nov-97	6532.2	4219.9 E
MW-3B	4/2/1985	PVC	yes	744.76	85	21	Jun-89	6524.8	4212.7 E
MW-3C*	4/3/1985	PVC	NA	744.84	120	21.5	Jun-89	6517	4204.6 E
MW-4A*	4/8/1985	PVC	yes	743.25	35	14.89	Nov-97	3523.3	2737.8 E
MW-4B	4/8/1985	PVC	yes	743.15	85	15.35	Nov-97	3521.6	2749.1 E
MW-4C*	4/9/1985	PVC	NA	743.48	116	12.83	Aug-96	3519	2761.1 E
MW-5A*	4/11/1985	PVC	NA	744.14	35	15.65	Nov-97	4609.7	732.9 E
MW-5B	4/11/1985	PVC	NA	743.65	85	14.59	Aug-97	4609.6	743.9 E
MW-5C*	4/11/1985	PVC	NA	743.79	113	14.78	Aug-97	4610	756 E
MW-6A*	4/18/1985	PVC	NA	743.84	35	15.06	Nov-97	2193.6	536.3 E
MW-6B	4/18/1985	PVC	NA	743.5	85	13.32	May-93	2182.4	536.2 E
MW-6C*	4/22/1985	PVC	NA	743.7	106	13.77	May-93	2169.5	536.8 E

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Well ID	*Date Installed*	*Construction*	*Stickup?*	*T.O.C. Elevation (feet AMSL)*	*Depth (ft bgs)* [1]	*Water Level (ft btoc)* [2]	*Date of Water Level*	*Survey Location* [3,4] *North*	*E/W*
MW-7A*	4/15/1985	PVC	NA	742.33	35	18.25	INSTALL	4495.9	3682.5 E
MW-7B	4/15/1985	PVC	NA	742.19	85	18.91	INSTALL	4487.8	3689.7 E
MW-7C*	4/16/1985	PVC	NA	742.26	107	18.21	INSTALL	4479.4	3696.8 E
MW-8A*	4/15/1985	PVC	NA	743.67	35	20.2	INSTALL	6613	1997.9 E
MW-8B	4/16/1985	PVC	NA	743.66	85	20.75	INSTALL	6625.5	1989.9 E
MW-8C*	4/17/1985	PVC	NA	743.86	109	NA	INSTALL	6636.3	1983.8 E
LAYNE-WESTERN CO.									
Fairfax II Locations									
MW-10A (100A)	Mar-87	NA	NA	NA	35	(729.92 AMSL)	Nov-97	***8125***	***125 E***
MW-10C (100C)	Mar-87	NA	NA	NA	88	NA	--	***8125***	***125 E***
MW-11A (110A)*	Mar-87	NA	NA	NA	35	(728.69 AMSL)	Nov-97	***5650***	***100 E***
MW-12C (120C)*	Mar-87	NA	NA	NA	117.5	(727.6 AMSL)	Aug-97	***3650***	***100 E***
MW-13A (130A)*	Mar-87	NA	NA	NA	35	(728.17 AMSL)	Nov-97	***2350***	***1900 E***
MW-13C (130C)*	Mar-87	NA	NA	NA	107	24.1	Dec-89	***2350***	***1900 E***
MW-14A (140A)	Mar-87	NA	NA	NA	10.5	NA	--	NA	NA
MW-15A (150A)*	Mar-87	NA	NA	NA	35	(728.37 AMSL)	Nov-97	***5600***	***4050 E***
MW-15B (150B)	Mar-87	NA	NA	NA	85.5	728.66	Aug-95	***5600***	***4050 E***
MW-15C (150C)*	Mar-87	NA	NA	NA	126	728.64	Aug-95	***5600***	***4050 E***
MW-16A (160A)*	Mar-87	NA	NA	NA	35	(729.56 AMSL)	Nov-97	***7750***	***1650 E***

* To be sampled as part of the comprehensive groundwater monitoring program.

[1] ft bgs = feet below ground surface

[2] ft boc = feet below top of casing

[3] Survey locations in italics are approximate

[4] Survey coordinates from Anderson Surveying Company Plan

[5] NA = Information not available in files reviewed

[6] INSTALL = Measured at well installation

[7] (727.74 AMSL) = Elevation above mean sea level

APPENDIX A

MAP WITH MONITORING WELL LOCATIONS

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

GENERAL MOTORS FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

SEPTEMBER 1998
REF. NO. 12559 (2)
This report is printed on recycled paper.

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1.0 GENERAL

An Phase II Investigative Program will be implemented at the General Motors (GM) Fairfax I/II Plants (Site), by Conestoga-Rovers & Associates (CRA). The activities outlined in the Scope of Work (SOW), may involve drilling, monitoring and sampling within the limits of, and adjacent to, the property known as the General Motors (GM) Fairfax I/II Plants in Kansas City, Missouri (Site). During this program, personnel may come in contact with soils, groundwater and debris that may contain hazardous materials. This Health & Safety Plan (HASP) has been developed to ensure that contact with hazardous materials is minimized.

This HASP is designed to ensure the following:

i) that Site personnel are not adversely exposed to the compounds of concern as well as the physical and biological hazards present on Site;

ii) that public welfare or the environment are not adversely impacted by off-Site migration of contaminated materials due to work activities at the Site; and

iii) that all operations, procedures and equipment at the Site will meet the requirements of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and the applicable subparts of 29 CFR 1926 and 29 CFR 1910.

For the purpose of this HASP, all investigative activities carried out on Site involving contact with potentially contaminated materials will be considered contaminated operations requiring personal protective equipment (PPE). Similar activities occurring off Site are considered non-contaminated operations requiring a modified level of PPE from that for on-Site work.

All investigative operations at the Site will be conducted in accordance with the provisions of the HASP. Cost and/or scheduling considerations will not be considered as justification for modifying this plan.

2.0 SITE CHARACTERIZATION AND HAZARD ANALYSIS

The Site is located at 100 Kindelberger Road, in Kansas City, Kansas as depicted in Figure 1. A Site plan is provided as Figure 2 of the HASP.

The Site consists of several buildings, a tank farm, rail support, and drum storage areas. The assembly building is the largest building on the Site and covers over 2.2 million square feet. The other buildings are support structures such as a powerhouse.

This plant was originally constructed by the U.S. Government in 1940 for North American Aviation. North American Aviation assembled B-25 bombers at the facility through 1944 for use in World War II. In 1945, GM negotiated a lease for this facility from the U.S. Government. GM has operated at the facility continually since 1945, except during the Korean conflict.

The primary sources of contamination at the Site are a gasoline/paint thinner tank farm, and a historic release of perchloroethylene prior to 1945. In 1988 GM committed to a Kansas voluntary cleanup program. The voluntary cleanup program included, semi-annual groundwater monitoring, groundwater contamination plume definition and studies, and remedial design and construction. A summary of the contaminants of concern and their related health effects are presented in Table 1 of this HASP.

The Phase II activities to be performed as part of the SOW may include:

- mobilization;
- land survey of existing wells;
- water level survey; and,
- groundwater sampling;

Risks associated with these activities will be minimized by implementing engineering controls, safe work practices, and the proper use of personal protective equipment. Table 2 summarizes the potential hazards associated with activities at the Site.

3.0 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, CFR, Parts 1910 and 1926 (29 CFR 1910 and 1926) including the amended sections in 29 CFR 1910.120 and current Threshold Limit Values (TLVs) as provided by the American Conference of Governmental Industrial Hygienists (ACGIH) provide the basis for this Health and Safety Plan. Some of the specifications within this section are in addition to OSHA regulations and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH) and the United States Coast Guard (USCG) regarding procedures required to ensure safe operations at potential hazardous waste sites.

The safety and health of the public and on-Site personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work.

4.0 RESPONSIBILITIES AND ADMINISTRATION

The following individuals are designated to carry out stated job responsibilities related to this project.

-Project Manager:	Phil Harvey
-Project Engineer:	Sara Anderson
-Project Chemist:	Steve Day
-Project Industrial Hygienist:	Matthew Lazaric
-Project Sampling Team:	CRA Staff

CRA will ensure that an on-Site individual is designated as the Site Health and Safety Officer (HSO). The HSO will supervise the implementation of the Health and Safety Plan and will be responsible for all decisions regarding operations and work stoppages due to health and safety considerations. The HSO will have first aid/CPR training.

The responsibilities of the HSO are as follows:

i) be responsible for controlling and maintaining Site access;

ii) be responsible for implementation of the HASP at the initiation of Site work;

iii) conduct the pre-entry safety briefing for all on-Site personnel with regard to the HASP and other safety requirements to be observed during field sampling, including:

   a) potential hazards,
   b) personal hygiene principles,
   c) personal protective equipment,
   d) respiratory protection equipment usage, and
   e) emergency response procedures.

iv) review and modify the HASP as more information becomes available concerning the hazardous materials involved;

v) supervision and enforcement of safety equipment usage;

vi) supervision and inspection of equipment cleaning;

vii) personnel training in safety equipment usage and emergency procedures;

viii) monitoring of the health and safety program under direction of an industrial hygienist;

ix) suspend work activity if unsafe working conditions develop;

x) inform workers of the nature of chemical exposure risk as required by the "Right-to-Know" Law;

xi) recommend a medical examination when a worker appears to require it;

xii) coordination of the Emergency Response Plan;

xiii) assure that safety equipment is provided, maintained and accessible to Site personnel;

xiv) maintain a log with a sign in/out sheet for personnel performing activities and visitors entering the Site;

xv) assure that workers comply with the "buddy system" while working on Site; and

xvi) investigate all accidents, injuries, illnesses, spills, fires, incidents, and near misses.

5.0 MEDICAL SURVEILLANCE

In accordance with requirements detailed in 29 CFR 1910.120(f), all Site personnel (including contractors and/or subcontractors) who may be exposed to potentially contaminated materials will have received, within one year prior to starting field activities, medical surveillance by a licensed physician or physician's group.

Medical records for all on-Site personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the employee's suitability for work.

Each employer will ensure that its personnel involved in on-Site work will have all necessary medical examinations prior to commencing work which requires respiratory protection or exposure to hazardous materials. Personnel not obtaining medical certification will not perform work within contaminated areas.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to on-Site activity or when accidental exposure to elevated concentrations of contaminants occurs.

6.0 TRAINING

CRA will require that all Site personnel, prior to entering the Site, complete training sessions in accordance with 29 CFR 1910.120(e). This training shall consist of a minimum of 40 hours of instruction off Site and three days of actual field experience under the direct supervision of a trained, experienced supervisor. Each employer will maintain documentation stating that its on-Site personnel have complied with this regulation.

Prior to commencing Site activities, a Site-specific pre-entry safety briefing will be conducted. Topics covered during the pre-entry safety briefing will include:

i) Site-specific health and safety hazards;
ii) level of PPE required;
iii) safe use of equipment;
iv) decontamination procedures; and
v) emergency response procedures.

All personnel who attend this briefing will sign the Health and Safety Plan Acknowledgment Form presented as Appendix A.

All personnel working on Site shall attend regular safety ("tailgate") meetings. These meetings will be conducted by the HSO, and will cover specific health and safety issues, Site activities, changes in Site conditions, and a review of topics covered in the Site-specific pre-entry briefing. Topics discussed in the safety meetings will be documented along with the signatures of personnel who attend.

7.0 WORK AREAS

Specific work areas, as defined below, will be delineated by temporary fencing or a flagged line.

a) Exclusion Zone (EZ) - This zone will include all areas where potentially contaminated soils or materials are to be handled and all areas where contaminated equipment or personnel travel.

b) Contaminant Reduction Zone (CRZ) - This zone will occur at the interface of the EZ and Support Zone and will provide access for the transfer of construction materials and Site equipment to the EZ, the decontamination of vehicles prior to leaving the EZ, the decontamination of personnel and clothing prior to entering the Support Zone, and for the physical segregation of the Support Zone and EZ.

c) Support Zone (SZ) - This area is the portion of the Site defined as the area outside the zone of significant air and soil contamination. The Support Zone will be clearly delineated and procedures implemented to prevent active or passive migration of contamination from the work Site.

8.0 PERSONAL PROTECTIVE EQUIPMENT

CRA will require that engineering controls and work practices designed to reduce and maintain employee exposure at or below the permissible exposure limits (PELs) for the contaminants of concern will be implemented. Whenever engineering controls and work practices are not feasible, a reasonable combination of engineering controls, work practices and PPE shall be used to reduce and maintain employee exposure at or below the permissible exposure limits for the contaminants of concern.

CRA will require that all on-Site personnel are equipped with PPE appropriate for the nature of work being completed. CRA will require that all safety equipment and protective clothing are kept clean, well-maintained, and that their integrity is intact.

Safety equipment and apparel as required will be Level D, Modified Level D and Level C personal protective equipment (as determined by the action levels set forth in Section 9.0) within the Exclusion Zone. Any decision regarding the upgrading of personal protective equipment will be in conjunction with the Project Industrial Hygienist.

For intrusive activities, Level C or Modified Level D PPE will be required. For intrusive activities conducted off the landfills, and for all monitoring and sampling activities, it is anticipated that Level D PPE will be required. Level C PPE may be required during these activities if the action levels in Section 9.0 are exceeded.

Level D PPE

Type	*Properties*	*Item*
Foot protection	Steel-toe/reinforced shank	Boots
Head protection	Meets ANSI Z89.1 standard	Hard hat
Hand protection	Puncture/tear resistant	Leather/cotton gloves
Eye protection	Meets ANSI Z87.1 standard	Glasses/goggles with side shields

Modified Level D PPE

Type	*Properties*	*Item*
Foot protection	Steel-toe/reinforced shank	Boots
Foot protection	Chemical resistant (latex)	Overboots
Head protection	Meets ANSI Z89.1 standard	Hard hat
Hand protection	Chemical resistant (nitrile)	Inner gloves
Hand protection	Chemical resistant, puncture/ tear resistant (nitrile)	Outer gloves
Eye protection	Meets ANSI Z-87.1 standard	Glasses/goggles with side shields
Body protection	Chemical resistant (tyvek)	Coverall

Level C PPE

Type	*Properties*	*Item*
Foot protection	Steel-toe/reinforced shank	Boots
Foot protection	Chemical resistant (latex)	Overboots
Head protection	Meets ANSI Z89.1 standard	Hard hat
Hand protection	Chemical resistant (nitrile)	Inner gloves
Hand protection	Chemical resistant, puncture/ tear resistant (nitrile)	Outer gloves
Eye protection	Meets ANSI Z87.1 standard	Glasses/goggles with side shields
Body protection	Chemical resistant (tyvek)	Coverall
Respiratory protection	NIOSH approved	Full-face air-purifying respirator with organic vapor/ acid gas/HEPA filter

Additional protective equipment guidelines to be implemented include:

i) prescription eyeglasses in use on the Site will be safety glasses with side shields;

ii) protective gloves (leather palm) will be worn over nitrile gloves by Site personnel involved in drilling activities;

iii) during periods of respirator usage, respirator cartridges and filters will be changed daily, or upon breakthrough, whichever occurs first;

iv) on-Site personnel who have not passed a respirator fit test will not be permitted to enter or work in the Exclusion Zone;

v) personnel required to wear a respirator will not be permitted to have beards, or long sideburns or mustaches that interfere with the proper fit of the respirator;

vi) all PPE worn on Site will be decontaminated or discarded at the end of each work day;

vii) duct tape will be used to ensure that disposable coveralls and gloves are tightly secured when personnel are working within the Exclusion Zone; and

9.0 RESPIRATOR PROGRAM

Prior to arriving at the Site, all on-Site personnel will have received training in the use of, and have been fit tested for a full-facepiece respirator. Companies employing individuals required to perform intrusive work at the Site shall have a written respiratory program that complies with 29 CFR 1910.134.

During intrusive activities, a photo-ionization detector (PID) will be used to determine if organic vapors and some inorganic gases are present in the breathing space. A background reading will be established prior to commencing work activities at each work location.

Sustained (greater than 2-3 minutes) vapor monitoring action levels to determine the level of respiratory protection necessary during field activities will be:

Sustained Photoionization Organic Vapor Reading Above Background	*Protection Level*
0 - 1 ppm	Level D
1 - 25 ppm	full-facepiece air purifying respirator (Level C)
>25 ppm	shut down activities

Work will be stopped and the work area will be allowed to vent if monitoring indicates that organic vapors are present at concentrations which present Immediate Danger to Life and Health (IDLH) conditions, or in excess of the protection factor afforded by the air purifying respirator (whichever is lower).

Air monitoring should continue, at a safe distance, if operations are stopped due to action level exceedences, to determine if a threat to the surrounding community exists.

10.0 JUSTIFICATION

These action levels assume that all NIOSH criteria for using an air purifying respirator (APR) have been met. An APR can typically be worn in concentrations of up to 50 times the TLV for a given contaminant. All of the contaminants of concern have TLVs or PELs equal to or greater than higher than 1 ppm. Because of differences in sensitivities with direct reading instruments, a 50 percent safety factor is included when determining action levels. Therefore, the calculation to determine when a respirator could no longer be used would be:

1 ppm (TLV) x 50 (protection factor) x 0.5 (50% safety factor) = 25 ppm

The primary routes of exposure of contaminants to individuals performing field investigative tasks include direct contact, ingestion and inhalation. The risk of exposure due to direct contact and ingestion will be minimized through the proper use of PPE as described in Section 8.0 and by exercising ordinary caution during sampling activities. In order to minimize exposure by the inhalation pathway, the respirator and air monitoring programs discussed in Sections 9.0 and 12.0 will be undertaken.

11.0 PERSONAL HYGIENE

CRA will require that all personnel performing or supervising work within the Exclusion Zone observe and adhere to the personal hygiene-related provisions of this section.

On-Site personnel found to be disregarding the personal hygiene-related provisions of this HASP will, at the discretion of the HSO, be barred from the Site.

CRA will ensure that the following equipment/facilities are available for the personal hygiene of all on-Site personnel:

i) suitable disposable outerwear, gloves, respiratory protection and footwear on a daily basis for the use of on-Site personnel;

ii) disposal containers for used disposable outerwear; and

iii) potable water and a suitable sanitation facility.

CRA also will enforce the following regulations for personnel actively participating in the field sampling program:

i) on-Site personnel will wear appropriate PPE when in the Exclusion Zone;

ii) used disposable outerwear will not be reused if deemed to be unsuitable to provide the necessary protection, and when removed, will be placed inside disposal containers provided for that purpose;

iii) smoking, eating and drinking will be prohibited within the Exclusion Zone. These activities will be permitted only within designated areas; and

iv) on-Site personnel will thoroughly cleanse their hands, face, neck area and other exposed areas before smoking, eating or drinking and before leaving the Site.

12.0 AIR MONITORING

During work, air quality will be monitored on a periodic basis.

The air monitoring program will consist of monitoring with a PID for organic vapors in the breathing space. Operation and calibration procedures will be according to manufacturers' instructions. Calibration and maintenance records will be kept in the field log.

Identification of volatile organic vapor levels in excess of the action levels cited in Section 9.0 shall be reported to the HSO who, in conjunction with the Project Industrial Hygienist, will determine when PPE should be upgraded or operations be shut down and restarted.

If work is stopped because action levels have been exceeded, air monitoring will continue from a safe distance to determine if there is a threat to the surrounding community.

13.0 COMMUNICATIONS

Emergency numbers including the police department, fire department, ambulance, hospital and appropriate Regulatory agencies (Table 3) will be prominently posted near the Site telephone(s).

Prior to initiating Site activities, the emergency medical facility will be notified of Site activities to ensure preparedness to respond to any Site-related injuries. To ensure familiarity with the hospital route, at least one CRA Site representative will drive the route to the hospital, prior to Site activities.

14.0 EMERGENCY AND FIRST AID EQUIPMENT

Safety equipment will be available for use by Site personnel and will be located and maintained on Site. The safety equipment will include, but is not limited to, the following:

i) a portable emergency eye wash;

ii) one ABC type dry chemical fire extinguishers; and

iii) a first-aid kit for a minimum of 10 personnel.

15.0 EMERGENCY RESPONSE PLAN

Prior to commencing work, CRA will coordinate the development of an emergency contingency plan. The plan is intended to provide immediate response to a serious Site occurrence such as injury, explosion or fire. A list of emergency contact numbers is presented as Table 3 of this HASP.

In the event of injury to on-Site personnel, the following protocol will be followed:

i) notify the Health and Safety Officer;

ii) evacuate all personnel upwind;

iii) exit Site;

iv) contact the designated hospital and describe the injury;

v) decontaminate personnel if possible, and administer appropriate first aid. If personnel cannot be decontaminated, alert hospital to possible problems of contamination; and

vi) transport personnel to the medical facility along a predefined route.

16.0 EQUIPMENT AND PERSONNEL DECONTAMINATION

During the Phase II field investigative program, procedures will be implemented to reduce the amount of contact of both personnel and equipment with potentially contaminated materials. These procedures include the following:

i) proper work practices that will lead to minimal direct contact with potentially contaminated material; and

ii) use of disposable equipment and clothing as much as practicable.

All equipment used for the collection of samples for chemical analysis will be cleaned according to the following protocol:

- wash and scrub with low phosphate detergent;
- tap water rinse and steam clean;
- thorough rinse with deionized distilled water;
- air dry; and
- wrap in aluminum foil for transport.

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.

All cleaned equipment will be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface before use.

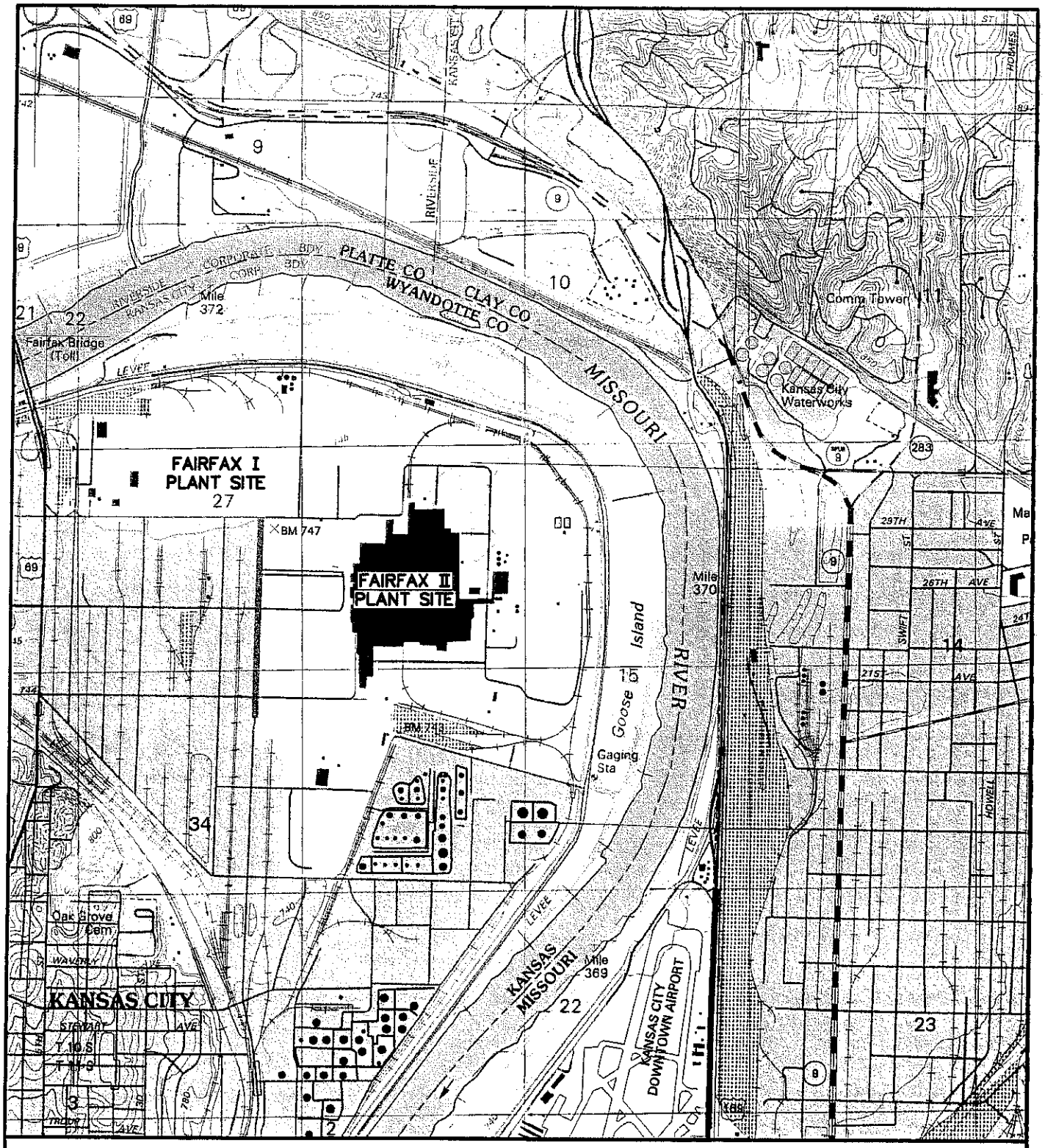
Before use and between monitoring at each well, the water level measuring device will be cleaned by rinsing the unit with a detergent solution followed by a deionized water rinse.

All personnel will remove their protective clothing and wash their hands, face, neck area and other exposed areas before entering the lunch and break areas to eat, drink or smoke.

17.0 CONTAMINATION MIGRATION CONTROL

All vehicles and equipment used within the Exclusion Zone will be decontaminated on Site as determined necessary by the HSO prior to leaving the Site. Decontamination, when required, will consist of the thorough cleaning of those parts of the equipment which come in contact with potentially contaminated material. The HSO will certify that each piece of equipment is clean or has been decontaminated prior to removal from the Site.

Personnel engaged in vehicle decontamination will wear protective equipment including suitable disposable clothing, respiratory protection and face shields.



BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE;
NORTH KANSAS CITY, MO–KS, 1990

0 1/4 1/2 mile

CRA

figure 1

SITE LOCATION MAP
FAIRFAX I/II PLANT SITES
GENERAL MOTORS CORPORATION
Kansas City, Kansas

12559–00(001)GN–C0001 SEP 02/98

TABLE 1

CONTAMINANTS OF CONCERN
GENERAL MOTORS FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

Contaminant	TLV	PEL	IDLH	IP (eV)	Flammability Range	Routes of Exposure	Symptoms of Exposure	Other
Benzene	0.5ppm	1ppm	500ppm	9.2	1.2% - 7.8%	Inhalation, Ingestion, Contact	Eye, skin, nose and upper respiratory system irritant	Human carcinogen and skin absorptive
1,2-dichloroethylene	200ppm	200ppm	1000ppm	9.8	5.6% - 12.8%	Inhalation, Ingestion, Contact	Eye and skin irritant, and central nervous system depressant	None
Ethylbenzene	100ppm	100ppm	800ppm	8.8	0.8% - 6.7%	Inhalation, Ingestion, Contact	Eye, skin and mucous membrane irritant, headaches, and dermatitis	None
Perchloroethylene	25ppm	100ppm	150ppm	9.3	NA	Inhalation, Ingestion, Contact	Eye, nose, and throat irritant, nausea, flush face, dizziness, headaches, and kidney damage	Animal carcinogen
Toluene	50ppm	200ppm	500ppm	8.8	1.1% - 7.1%	Inhalation, Ingestion, Contact	Eye and nose irritant, dizziness, headaches, liver and kidney damage	Skin absorptive
Xylene	100ppm	100ppm	900ppm	8.5	0.9% - 6.7%	Inhalation, Ingestion, Contact	Eye, skin, nose and throat irritant, dizziness, exitement, nausea and vomiting	None

NA - Not Applicable
NL - Not Listed
PEL - Permissible Exposure Limit
IDLH - Immediate Danger to Life and Health
IP - Ionization Potential
ppm - parts per million
eV - electron volts

TABLE 2

SITE HAZARD ANALYSIS
GENERAL MOTORS FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

Site Activities	*Hazards*	*Prevention*
Well Monitoring and Surveying Activities	Chemical hazards due to inhalation and dermal contact.	Proper use of PPE.
	Exposure to temperature extremes.	Monitor for heat or cold stress.
	Physical hazards including steep grades and unstable surfaces	Use "buddy system" during Site activities
	Biological Hazards	Proper PPE, exercising ordinary caution, use of buddy system during Site activities

TABLE 3

EMERGENCY CONTACTS
GENERAL MOTORS FAIRFAX I/II PLANTS
KANSAS CITY, KANSAS

Agency/Firm	*Emergency Telephone Number*	*Business Telephone Number*
Local Emergency Services		
Fire Department	911	
Police Department	911	
Ambulance	911	
Hospital (North Kansas City) 2800 Clay Edwards Drive North Kansas City, Missouri 64116		(816) 691-2000
National Poison Center		(800) 942-5969
National Response Center		(800) 424-8802
CRA Industrial Hygiene - Chicago (Matthew Lazaric)		(773) 380-9933
CRA Project Manager - Phil Harvey		(773) 380-9933
CRA Project Engineer - Sara Anderson		(773) 380-9933
CRA Project Chemist - Steve Day		(773) 380-9933

Directions to the Hospital: Go **southeast** on **US 24** to **I 70** approximately 0.6 miles. Proceed **southeast** on **I 70** approximately 2.9 miles to **I 29**. Take **I 29 north** about 4.1 miles and exit onto **Clay Edwards Drive.**

APPENDIX A

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

APPENDIX A

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM

The following employees have read and understood the attached Health and Safety Plan:

Name	*Employer*	*Date*

APPENDIX B

RESPIRATORY PROTECTION PROGRAM

TABLE OF CONTENTS

1.0 RESPIRATORY PROTECTION

1.1 PRACTICE

The primary control of respiratory hazards shall be accomplished, whenever feasible, through the use of engineering controls, hazard substitution, revised work practices or other administrative controls. However, when such controls are not feasible, appropriate respiratory protection shall be used in accordance with the procedures established in this SOP. Any deviation from the requirements set forth must have approval from an IH.

1.1.1 AUTHORIZATION

CRA employees requiring respiratory protection must have authorization from an IH. Office management shall notify an IH of respirator needs. The work situation will then be assessed and a respirator will be issued based on the hazard(s) the individual is exposed to. Reassessment of the hazard and the individual's needs will be repeated periodically.

1.1.2 MEDICAL SURVEILLANCE

All personnel designated to use respirators must successfully complete a physical exam as part of the medical requirements placed on persons exposed to hazardous substances and for users of respiratory protection (29 CFR 1910.134 and 1910.120). The medical exam will be repeated annually. All medical data will be reviewed by a consulting occupational physician. The physician will generate a written opinion on the suitability of the employee to wear a respirator.

1.1.3 AIR QUALITY

When air supplied respirators are used, the breathing air shall meet the Compressed Gas Association (CGA-CG7.1) Standards for Grade D breathing air or better.

1.1.4 AIR CYLINDERS

Cylinders used to supply breathing air are tested and maintained as prescribed in Shipping Container Specifications (49 CFR 178). SCBA cylinders are approximately 2400 psi pressure when full. Compressed air cylinders are visually inspected annually and hydrostatically tested once every five years for steel cylinders and once every three years for composite cylinders. These test dates are stamped on the cylinder for future reference.

1.2 FIT TESTING

1.2.1 QUALITATIVE OR QUANTITATIVE FIT TESTING

Fit testing of the respirator will be conducted by an IH or other designated, trained personnel following the medical evaluation. All users of respirators must be fit tested to assure proper protection. Only the brand and size a person is fitted for is allowed to be used in the field. DO NOT SUBSTITUTE RESPIRATORS FOR A BRAND AND SIZE THAT YOU HAVE NOT BEEN PROPERLY FITTED FOR. The fit test will be accomplished quantitatively for full face APRs. Records will be maintained by the Corporate IH with copies available in CRA field offices for audit purposes. After fit testing, the employee will be issued an authorization card. This card serves as a reference for the proper type of respirator to use as well as prima facie proof of proper medical and training clearance for regulatory purposes. The user shall have the card available at any time when on CRA business where respiratory protection is used or hazardous waste cleanup sites are being entered.

1.2.2 POSITIVE & NEGATIVE FIT TESTING

All personnel will be instructed in the proper method of testing respirator fit by use of the **Positive & Negative** pressure test. This test is to be done by the user each and every time a respirator is donned. This test is performed to help the wearer assess respirator function and find gross leaks between the face and facepiece. This positive-negative pressure test checks the presence and functioning of the respirator valves as well as leakage that may occur due to improper cartridge seal or respirator face fit.

1.2.2.1 POSITIVE PRESSURE

1) Block off the exhalation valve cover openings.

MSA: Exhalation valve cover can be blocked with the palm of the hand.

Scott: Exhalation valve covers have front openings as well as four small side openings. These openings are difficult to block off with the hands. However, a small piece of flexible material such as Saran wrap or latex can be used.

North: Exhalation valve cover has long narrow openings around its perimeter. These can be blocked by encircling the fingers around the valve cover.

2) The person exhales gently, creating a slight positive pressure within the facepiece. The positive pressure should be maintained for at least 10 seconds.

3) If no outward leakage is detected, the person has passed the test.

4) If leakage is detected (usually felt as a cool sensation against the skin or a loss of pressure), the respirator is either malfunctioning or a gross leak between the face and facepiece is present. The following should be done when a failure occurs: Re-don or readjust the respirator.

If the facepiece continues to lose pressure, although previous positive or negative pressure tests performed with that respirator had passed, it is probably malfunctioning. Consult Industrial Hygiene. It is also possible that there are new scars or wrinkles, beard growth, missing teeth or dentures, significant weight gain or loss, etc. to cause gross leakage into the facepiece. When such new conditions exist, reevaluation of the respirator in a test atmosphere is necessary.

1.2.2.2 NEGATIVE PRESSURE

1) Block off the respirator cartridge inlet openings.

MSA: Cartridges can be blocked with the palms of the hands or with disposable latex gloves.

Scott: Cartridges can be blocked by using the palms of the hands or with gloves.

North: Cartridges can be blocked only with gloves.

2) Inhale gently, holding the negative pressure for at least 10 seconds.

3) If no inward leakage of air is detected, the person has passed the test.

4) If leakage is detected, see 4 above.

1.2.3 EXCEPTIONS

1.2.3.1 FACIAL HAIR

Any individual with facial hair which protrudes into the sealing surface of the masks will be refused fitting. Fitting, issuance and use will be based on clean shaven faces only. Employees with facial hair which interferes with respirator fit are not permitted to work at sites where respiratory protection must be worn.

1.2.3.2 GLASSES

Employees who wear prescription glasses and must wear a full face respirator shall be fitted with special eyeglass adapters. Contact lenses are not permitted to be worn with any type of respiratory protection.

1.3 TRAINING

Proper training of respirator users is required to insure that all respirators will provide adequate protection against respiratory hazards and so that the user will understand the device's limitations. The training will include the following elements:

1) An explanation of the nature of respiratory hazards and what may happen if the respirator is not used properly.

2) A description of what engineering and administrative controls may be utilized to reduce the effects of the respiratory hazard and why respirators are required.

3) An explanation of the various types of respirators and why specific types have been selected.

4) A discussion of the function, capabilities and limitations of respirator cartridges.

5) Instruction in the inspection, fit and maintenance of the respirator.

6) Instructions in recognizing and handling emergency situations.

1.4 MAINTENANCE AND CARE OF RESPIRATORS

A program for the maintenance and care of respirators will include the following:

1) Inspection for defects;
2) Cleaning and disinfecting;
3) Repair/miscellaneous maintenance; and
4) Storage.

1.4.1 INSPECTION FOR DEFECTS

Employees shall inspect their respirators before each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory condition. SCBA shall be inspected monthly if kept for emergency response (i.e., long duration site remediation).

Inspection shall include a check of the tightness of the connections and the condition of the face piece, headbands, valves, breathing tubes and canisters. Rubber or elastic parts shall be inspected for pliability and signs of deterioration. Any respirator with worn or defective parts will be immediately taken out of service.

Before and after each use, respirators will be inspected for the following:

1) Tightness of connections and condition of the facepiece;

2) The headstraps or head harness should be examined for: breaks, loss of elasticity, broken or malfunctioning buckles and attachments, and excessively worn head-harness serrations that might permit slippage;

3) Valves and valve seats;

4) Connecting tube and canisters, air or oxygen cylinders;

5) Rubber or elastomer parts for pliability and deterioration; and

6) Regulators, fittings and gauges.

The following contains inspection information for various types of respirators.

Air Purifying Respirators

1) Check rubber facepiece for dirt, pliability of rubber, deterioration and cracks, tears, holes or distortion from improper storage.

2) Check straps for breaks, tears, loss of elasticity, broken snaps and proper tightness.

3) Check valves (exhalation and inhalation) for holes, warpage, cracks, etc. After removing its cover, the exhalation valve should be examined for: foreign material, distortion, defective or missing valve cover or improper installation of valve into the valve seat.

4) Check filters or cartridges for dents, corrosion, etc. (loose or missing gaskets, improperly seated cartridges).

5) Check for cracked or badly scratched lenses in full facepieces; incorrectly mounted lens, broken or missing mounting clips.

Atmosphere-Supplying Respirators

1) Check appropriate items above.

2) Check air supply system for breaks or kinks in supply hoses and detachable coupling attachments.

3) Follow manufacturer's recommendations for the specific equipment.

4) Check air supply level and warning devices.

1.4.2 CLEANING AND DISINFECTING

The respirator must be washed after each day's use. If the respirator is shared it must also be disinfected according to the manufacturer's instructions. Organic solvents of any kind must not be used for cleaning. Air purifying filters must not be wetted.

1.4.2.1 CLEANING

1) Remove any filters, cartridges or canisters and, if required by the manufacturer, straps and speaking diaphragms from the facepiece. Remove regulators on airline or SCBA.

2) Wash respirator parts excluding cartridges and canisters in warm (not to exceed 140°F), soapy water or in a product specifically designed by respirator manufacturers for this purpose. A plastic bristle hand brush may be helpful in removing dirt from respirator parts.

3) Rinse all parts thoroughly in warm water.

4) Air dry all parts.

5) Reassemble the respirator and insert new cartridges if needed.

6) Place the respirator in a plastic bag or container and seal it for storage. The respirator facepiece should be stored in its normal position so as not to distort the elastomer.

1.4.2.2 DISINFECTION

1) Disinfection should be done with a cleaner/disinfection agent purchased from the respirator vendor. If that material is not available the following NIOSH procedures can be followed:

   a) Immerse the respirator body for two minutes in a 50 ppm chlorine solution (about 2 ml bleach to 1 liter of water). Rinse thoroughly in clean water and air dry.

   b) Immerse the respirator body for two minutes in an aqueous solution of iodine (add 0.8 ml of iodine in 1 liter water). The iodine is about 7% ammonium and potassium iodide, 45% alcohol and 48% water. Rinse thoroughly in clean water and air dry.

2) Immersion times have to be limited to minimize damage to the respirator. The solutions can age rubber and rust metal parts.

   NOTE: The air-purifying elements must be removed from the respirator prior to cleaning and sanitizing the respirator. Never allow the air-purifying elements to come in contact with water or cleaning/sanitizing solution.

1.4.3 STORAGE

Respirators must be stored to protect them from contamination and mechanical damage at all times when not in use. New, cleaned or reconditioned respirators are to be kept in a clean, sealed plastic bag or container, stored in a normal position. The plastic bag should be labeled with the users name. A suitable cabinet or drawer should be used to protect respirators and supplies from dirt, extremes of temperature or bright sunlight. They are not to be left in vehicles or on site perimeter fences, in change sheds, etc.

APPENDIX C

HEAT STRESS AND COLD STRESS PROCEDURES

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1.0 COLD STRESS

1.1 OVERVIEW

Fatal exposures to cold have been reported in employees failing to escape from low environmental air temperatures or from immersion in low temperature water. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F, can be life threatening. A drop in core temperature to 95°F or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind-chill must be considered as it contributes to the effective temperature. The body's physiologic defense against cold includes constriction of the blood vessels, inhibition of the sweat glands to prevent loss of heat via evaporation, glucose production and involuntary shivering to produce heat by rapid muscle contraction.

The frequency of accidents increases with cold temperature exposures as the body's nerve impulses slow down, individuals react sluggishly and numb extremities make for increased clumsiness. Additional safety hazards include ice, snow blindness, reflections from snow and possible skin burns from contact with cold metal.

There are certain predisposing factors that make an individual more susceptible to cold stress. It is the responsibility of the project team members to inform the Health and Safety Officer to monitor an individual, if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a cold related illness or disorder.

1.2 PREDISPOSING FACTORS

Predisposing factors that will increase an individual's susceptibility to cold stress are listed below:

- Dehydration: The use of diuretics and/or alcohol, or diarrhea can cause dehydration. Dehydration reduces blood circulation to the extremities.

- Fatigue During Physical Activity: Exhaustion reduces the body's ability to constrict blood vessels. This results in the blood circulation occurring closer to the surface of the skin and the rapid loss of body heat.

- Age: Some older and very young individuals may have an impaired ability to sense cold.

- Alcohol Consumption: Alcohol dilates the blood vessels near the skin surface resulting in excessive body heat loss.

- Sedative Drugs: Sedatives may interfere with the transmission of impulses to the brain, thereby interfering with the body's physiological defense against cold. Some prescription drugs may react the same way.

- Poor Circulation: Vasoconstriction of peripheral vessels reduces blood flow to the skin surface.

- Heavy Work Load: Heavy work loads generate metabolic heat and make an individual perspire even in extremely cold environments. If perspiration is absorbed by the individual's clothing and is in contact with the skin, cooling of the body will occur.

- The Use of PPE: PPE usage which traps sweat inside the PPE may increase an individual's susceptibility to cold stress.

- Lack of Acclimatization: Acclimatization, the gradual introduction of workers into a cold environment, allows the body to physiologically adjust to cold working conditions.

- History of Cold Injury: Previous injury from cold exposures may result in increased cold sensitivity.

1.3 PREVENTION OF COLD STRESS

There are a variety of measures that can be implemented to prevent or reduce the likelihood of employees developing cold related ailments and disorders. These include acclimatization, fluid and electrolyte replenishment, eating a well balanced diet,

wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules and employee education.

- Acclimatization: Acclimatization is the gradual introduction of workers into the cold environment to allow their bodies to physiologically adjust to cold working conditions. However, the physiologic changes are usually minor and require repeated uncomfortably cold exposures to induce them.

- Fluid and Electrolyte Replenishment: Cold, dry air can cause employees to lose significant amounts of water through the skin and lungs. Dehydration affects the flow of blood to the extremities and increases the risk of cold injury. Warm, sweet, caffeine-free, non-alcoholic drinks and soup are good sources to replenish body fluids.

- Eating a Well-Balanced Diet: Restricted diets including low salt diets can deprive the body of elements needed to withstand cold stress. Eat high energy foods throughout the day.

- Warm Clothing: It is beneficial to maintain air space between the body and outer layers of clothing in order to retain body heat. However, the insulating effect provided by such air spaces is lost when the skin or clothing is wet.

The parts of the body most important to keep warm are the feet, hands, head and face. As much as 40 percent of body heat can be lost when the head is exposed.

Recommended clothing includes:

- Inner layers (t-shirts, shorts, socks) should be of a thin, thermal insulating material.

- Wool or thermal trousers. Denim is not a good protective fabric.

- Felt-lined, rubber-bottomed, leather-upper boots with a removable felt insole is preferred. Change socks when wet.

- Wool shirts/sweaters should be worn over inner layer.

- A wool cap is good head protection. Use a liner under a hard hat.

- Mittens are better insulators than gloves.
- Face masks or scarves are good protection against wind.
- Tyvek/poly-coated Tyvek provides good wind protection.
- Wear loose fitting clothing, especially footwear.
- Carry extra clothing in your vehicle.
- Shelters with heaters should be provided for the employees' rest periods if possible. Sitting in a heated vehicle is a viable option. Care should be taken that the exhaust is not blocked and that windows are partially open to provide ventilation.
- At temperatures of 30°F (-1°C) or lower, cover metal tool handles with thermal insulating material if possible.
- Schedule work during the warmest part of the day if possible, rotate personnel and adjust the work/rest schedule to enable employees to recover from the effects of cold stress.

1.3.1 EMPLOYEE EDUCATION

Employees have already been trained to recognize and treat the effects of cold stress during their 40-hour training. Signs, symptoms and treatment of cold stress should be reviewed in project safety meetings where applicable. The buddy system will help in preventing cold stress once the employees are trained to recognize the signs and symptoms of cold stress.

1.3.2 COLD STRESS PREVENTION GUIDELINES

It may not be practically feasible to implement all the above prevention measures. Follow the guidelines given below when the ambient air temperature is -5°F (-20°) or lower:

- Contact the project manager or the industrial hygienest to determine if the project team should be on-site in such temperatures;
- Dress warm;
- Replenish fluids and electrolytes at regular intervals;
- Provide shelter from the cold; and
- Adjust work/rest schedules.

1.3.3 ADJUST WORK-REST SCHEDULES

Follow the work/rest schedule on Table A.1. It is based on the cooling power of air which is a function of wind speed and ambient air temperature.

1.4 FIRST-AID TREATMENT GUIDELINES

The following describes symptoms of different stages in cold stress and the related first-aid treatment guidelines.

1.4.1 FROSTBITE

Stages

Incipient (frost nip)	May be painless. Tips of ears, nose, cheeks, fingers, toes, chin affected. Skin blanched white.
Superficial	Affects skin/tissue just beneath skin; turns purple as it thaws. Skin is firm, waxy; tissue beneath is soft, numb.
Deep	Tissue beneath skin is solid, waxy, white with purplish tinge. Entire tissue depth is affected.

First-Aid

Incipient	Warm by applying firm pressure - blow warm breath on spot or submerge in warm water (102°F to 110°F) (39°C to 43°C). Do not rub the area.
Superficial	Provide dry coverage, steady warmth; submerge in warm water.
Deep	Hospital care is needed. Do not thaw frostbitten part if needed to walk on. Do not thaw if there is danger of refreezing. Apply dry clothing over frostbite. Submerge in water; do not rub.

1.4.2 GENERAL HYPOTHERMIA

Stages

- Shivering
- Indifference
- Decreased Consciousness
- Unconsciousness
- Death

Symptoms

- Muscle Tension
- Uncontrollable Shivering
- Glassy Stare
- Decreased Muscle Function
- Speech Distortion
- Blue, Puffy Skin
- Slow Pulse
- Shallow Breathing
- Coordination Loss

- Stumbling
- Forgetfulness
- Freezing Extremities
- Dilated Pupils
- Fatigue

Emergency Response

- Keep person dry; replace wet clothing
- Apply external heat to both sides of patient using available heat sources, including other bodies.
- Give warm liquids - not coffee or alcohol - after shivering stops and if conscious.
- Handle gently.
- Transport to medical facility as soon as possible.
- If more than 30 minutes from a medical facility, warm person with other bodies.

2.0 HEAT STRESS

2.1 OVERVIEW

Heat induced occupational illnesses, injuries and reduced productivity occur in situations in which the total heat load (environmental plus metabolic) exceeds the body's capacities to maintain normal body functions without excessive strain. Heat stress is the sum of the heat generated in the body plus the heat gained from the environment minus the heat lost from the body to the environment. The body's response to heat stress is called heat strain. The level of heat stress at which excessive heat strain will result depends on the heat tolerance of the individual. Certain predisposing factors may reduce an individual's ability to tolerate heat stress.

Using PPE may put a hazardous waste worker at an increased risk of developing heat stress. Health effects may range from heat rash or heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions such as temperature and relative humidity, protective clothing which limits natural heat loss through perspiration, workload and the individual characteristics of the worker.

It is the responsibility of the project team members to inform the HSO or industrial hygienest if any of the predisposing factors listed below apply to them. This enables the HSO to monitor the individual if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a heat related illness or disorder.

2.2 PREDISPOSING

Predisposing factors that will increase the individual's susceptibility to heat stress are listed below:

- Lack of Physical Fitness: Such individuals experience more physiological strain including a higher heart rate, a higher body temperature, less efficient sweating and slightly higher oxygen consumption as compared to fit individuals.

- Obesity: Overweight individuals produce more heat per unit surface area than thin individuals and have a lowered ability to dissipate heat.

- Age: Older individuals may have a decreased ability to cope with heat stress.

- Dehydration: Dehydrated individuals will have a decreased ability to cool the body by sweating. Diarrhea can cause dehydration.

- Alcohol, Medications and Drug Use: Alcohol consumption may dehydrate individuals and certain medications/drugs may act as diuretics. Hence, the individual may have a decreased ability to lose heat by sweating.

- Infection, Sunburn, Illness and Certain Chronic Diseases: These factors may interfere with the body's normal mechanisms to lose heat.

- Heart Conditions or Circulatory Problems: Heat stress may place an additional strain on the heart and circulatory system that could harm the individual as well as decrease the individual's physiologic response.

- Low Salt Diet: Could affect the individual's electrolyte balance.

- Pregnancy

- Previous History of Heat Stroke or Heat Exhaustion: May increase the individual's susceptibility to heat stress.

- Heavy Work Load: Will generate metabolic heat thereby increasing the heat stress placed on the individual

- The Use of PPE Over Light Summer Clothing: This will decrease the ability of an individual to lose heat by sweating as evaporative cooling can no longer occur.

- Lack of Acclimatization: Acclimatization is the gradual introduction of workers into a hot environment to allow their bodies to physiologically adjust to hot working conditions. Acclimatized individuals generally have lower heart rates and lower body temperatures. In addition, they sweat sooner and more profusely and even have more dilute sweat (thereby losing less electrolytes) than non-acclimatized individuals.

2.3 PREVENTION OF HEAT STRESS

There are a variety of measures that can be implemented to prevent or reduce the likelihood of employees developing heat stress related disorders. These include fluid and electrolyte replenishment, the provision of shelter from the sun and heat, work schedule adjustment, the use of cooling devices, acclimatization, heat stress monitoring and employee education, as discussed below:

- Fluid and Electrolyte Replenishment: Personnel should drink about 16 ounces of water before starting work and drink water at every break. To encourage water consumption, cool water and disposable cups should be made available. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, personnel should be encouraged to drink more. Replacing body fluids with Gatorade is an option. It is advisable to have Gatorade on-site if the air temperature is 70°F (21°C) or more and the workers are performing tasks with a moderate to heavy work load in chemical resistant clothing.

- Shelter From the Sun and Heat: Air-conditioned (if possible) or shaded areas should be made available for rest periods. Sitting in an air-conditioned truck is an acceptable option.

- Work Schedule Adjustment: Scheduling work for early mornings and/or late afternoons will avoid the hottest parts of the day and reduce the heat stress placed on personnel. Rotation of personnel will help reduce overexertion of workers and adjusting the work-rest schedule will help personnel recover from the effects of heat stress periodically.

- Use of Cooling Devices: The use of cooling devices like field showers, hose-down areas or cooling vests should be considered for project tasks that involve heavy work loads in chemical resistant clothing.

- Acclimatization: Acclimatization is the gradual introduction of workers into a hot environment to allow their body to physiologically adjust to hot working conditions. Acclimatized individuals generally have lower heart rates and lower body temperatures. In addition, they sweat sooner and more profusely and even have more dilute sweat (thereby losing less electrolytes) than non-acclimatized individuals.

- Heat Stress Monitoring: Monitoring hot environments for potential heat stress should be initiated when the ambient air temperature is in excess of 70°F. There are several ways to monitor heat stress: measuring heart rate, oral temperature, loss of body weight and the Wet Bulb Globe Temperature using a Reuter-Stokes or Quest Electronics heat stress monitor.

- Employee Education: Workers have already been trained to recognize and treat the effects of heat stress during the 40-hour training course. Signs, symptoms and treatment of heat stress should be discussed in site safety meetings. The buddy system will help in preventing heat stress once the employees are trained to recognize the signs and symptoms of heat stress.

2.3.1 PREVENTION PRACTICES

It may not be practically feasible to implement all of the above prevention measures. The following has been developed as a field guide for use in actual field situations.

Ambient air temperature is 70°F (21°C) or more:

- Replenish fluids and electrolytes. Drink cool (50°F to 60°F/10°C to 15°C) fluids hourly. The fluids should be caffeine-free and non-alcoholic. Do not wait until you are thirsty. Your normal thirst mechanism is not sufficient to overcome the effects of dehydration. If you feel thirsty, you are already becoming dehydrated.

- Provide shelter from the sun and heat.

Ambient air temperature is 70°F (21°C) or more and chemical-resistant clothing is being used:

- Same as above;
- Adjust work schedules if feasible; and
- Initiate heat stress monitoring and/or the use of cooling devices.

2.3.2 HEAT STRESS MONITORING

Heat stress monitoring may be performed by monitoring the heart rate. Heart rate should be measured at the beginning of the work shift, at regular intervals and at the start of each rest period.

1) If the heart rate is <110 beats per minute (bpm), personnel may continue the current work/rest schedule.

2) If the heart rate is >110 bpm, take a 10 minute break. Monitor heart rate at the end of the rest period. If not <110 bpm, rest until the heart rate is <110 bpm. Reduce the current work time between breaks by approximately one hour. If the next scheduled monitoring session shows a heart rate of >110 bpm once again, reduce the work time between breaks by one hour.

2.4 HEAT STRESS FIRST AID

2.4.1 HEAT CRAMPS

Cause: Excessive water loss/electrolyte imbalance.

Symptoms	First-Aid Guidelines
Muscular pain in arms, legs, abdomen Faintness, dizziness, exhaustion Normal temp, cool moist skin person	Administer sips of Gatorade (1/2 glass every 15 minutes) Do not massage cramping muscles Relax

2.4.2 HEAT EXHAUSTION

Cause: Large amount of water loss; blood circulation diminishes.

Symptoms	First-Aid Guidelines
Moist, clammy, skin, usually pale	Move to a cool place
Dilated pupils	Apply cold, wet compresses to skin
Weak, dizzy, nauseous, headache	Raise feet 8 to 12 inches
Normal or low body temperature	Administer sips of Gatorade (1/2 glass every 15 minutes)
	Get medical attention

2.4.3 HEAT STROKE

Cause: Body overheats; temperature rises; no sweating occurs

Symptoms	First-Aid Guidelines
No sweating occurs	Get emergency medical assistance ASAP
Dry, hot skin, usually red	Remove from sunlight
Constricted pupils	Wet down body with cool water or rubbing alcohol
Hot body temperature (105°F to 110°F/40.5°C to 43.5°C)	Elevate head/shoulders
Strong, rapid pulse	Wrap in wet, cold wrapping
Unconsciousness may occur	Once cooled to 102°F (38.9°C), stop cooling measures
Muscular twitching	