MEMORANDUM

Martin Overhiser
City Planning

Chuck, Here another copy for you

DATE: April 12, 1990

TO: Del Borgsdorf, City Administrator
Mayor Jernigan
City Council Members

FROM: Ron Olson, Superintendent of Parks and Recreation

SUBJECT: Environmental Test results on 415 W. Washington Street site, North Main Garage and Hawkins Property

Attached is the summary section of the above report.

The Garage Committee will review the test results on Wednesday, April 25, 1990 at 7:00PM 2nd Floor Conference Room/Fire Station. A representative from ENCOTEC will be present to discuss the testing and answer questions.

RO:mc

ENVIRONMENTAL
CONTROL
TECHNOLOGY
CORPORATION

3985 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48108
313/761-1389

5 March, 1990

Mr. Ron Olson
City of Ann Arbor
Parks and Recreation Dept.
100 North Fifth Ave.
P. O. Box 8647
Ann Arbor, MI 48107

RE: Environmental Property Assessments for Hawkins, 415 W. Washington Street, and Municipal Garage Properties

Dear Ron:

Enclosed are two copies of the Environmental Property Assessment that was done under RFP No. 250. This assessment should provide sufficient data and evaluation to characterize the properties mentioned above. I must personally apologize for the delay in forwarding this report to you as I had hoped to have time to review more pertinent sections with you. This report shows that there may be some areas in need remediation on each of the properties. These areas appear to be localized spills or "hot spots." However, there should be additional sampling and analytical work performed prior to conducting any remedial activities to better delineate the size of these areas and limit the extent of excavation necessary.

If there are any questions or comments, please feel free to contact Randy Ponitz, ENCOTEC Geologist, or myself at your convenience.

Thank you for allowing ENCOTEC the opportunity to serve your environmental needs.

Sincerely,

Douglas L. Humbert
Senior Environmental Scientist

Enclosure

dlh

Project No. 79110

City of Ann Arbor
Environmental Property Assessment
26 Februarv, 1990

I INTRODUCTION

Environmental Control Technology Corporation (ENCOTEC), Ann Arbor, Michigan, has been contracted by the City of Ann Arbor Parks and Recreation Department (COAA) to perform an environmental site investigation and assessment which will evaluate and identify any potential contamination from hazardous wastes in soils and waters at certain City of Ann Arbor properties. This assessment was performed on the three properties identified in COAA 6 July, 1989, Request for Proposal No. 250 as amended by 4 August, 1989, Addendum No. 1.

II SCOPE OF PROJECT

The specific goal of this project was to identify site contamination for the following properties identified in COAA Proposal:

A HAWKINS PROPERTY

This property is located off of North Main St. at Lakeshore Drive and the Huron River in Ann Arbor. The property incorporates two parcels that comprise approximately 8 acres of land abutting the Huron River on the East side. The West side is bordered by an active railroad. Current uses of the site include an auto body repair shop, a towing service, a rowing club and an artist's studio. Previously, the western-central portion of this property was leased by Michigan Automotive Research Corp (MARC). This portion of property contained two buildings which MARC used for engine testing. There were 5 underground storage tanks, 4 - 10,000 and 1 - 1,000 gallon, that held gasoline for engine testing. These tanks have been removed since this contract's approval and implementation.

Being a low-lying area, this property has been filled over the years to facilitate continued use during times of flood. The origin of fill material(s) is not known and can be better determined by conducting numerous soil borings at the property. This task will be performed as a portion of this evaluation. It is not suspected however that the fill material(s) would be located below the water table, (probably at or near the elevation of this property's soil surfaces). Should there be any contamination present, the water table should not provide any type of barrier that could prevent migration. Therefore, samples will be taken from the ground water after it is encountered at each boring location.

Additional samples will be taken from the soils adjacent to the railroad to delineate and potentially define contamination from polychlorinated biphenyl compounds (PCB's). These are suspect contaminants from railroad usage and may have been transported onto the site through particulate dispersion. A grid pattern will be developed from existing maps and sampled as specified in ENCOTEC's proposal with one sample being removed from the center of each grid.

B NORTH MAIN STREET MUNICIPAL GARAGE

The Municipal Garage is located at 717 through 725 North Main Street. This property is presently being utilized for vehicle and equipment maintenance, road salt storage, fuel storage, and miscellaneous equipment storage and comprises 5.13 acres. Numerous buildings exist on site including a large COAA maintenance complex and several miscellaneous storage buildings. The property is bordered by North Main St. to the East, an active railroad to the West, residential housing to the south and Summit St. to the north. A single underground storage tank was identified in the property survey. This

tank was reported to contain waste oils. Since the implementation of subsurface investigation and sampling, the tank has been removed. Fuel storage tanks are located above ground with only the dispenser piping traversing the site below soil surfaces. On the east side of this property, adjacent to the railroad, is a spur that was reported by COAA employees to have been a coal unloading station. The northern most section of the property is presently used for parking. The Allen Creek Drain traverses the North Main Street property from the southwest to the northeast.

Surface and sub-surface investigations will be necessary to evaluate potential contamination from fuel spillage, unknown fill materials potentially placed during early years of operation, waste oil from leaking underground storage tanks and leaking dispenser piping for the existing refueling station. Ground water is expected to be encountered for each subsurface investigation borehole. Ground water may be sampled and analyzed to determine if contamination has occurred from any of the potentially identified or other unidentified sources.

C WEST WASHINGTON OFFICE AND MAINTENANCE FACILITY

This property is located at 415 West Washington Street. The property comprises 3.40 acres of land and contains a large building complex with some smaller outlying buildings. This parcel is bordered by West Washington St. to the North, West Liberty St. to the south, an active railroad to the east and residential housing to the west. Property usage includes COAA vehicle maintenance, city sign production and maintenance shop, various departmental offices, and miscellaneous equipment storage. Two existing underground storage tanks were identified on-site. These are both of relatively recent

construction. Two above ground storage tanks were also identified. The first is located on the east property boundary adjacent to West Washington Street and the railroad; the second is located at the east end of north building complex. Both tanks are believed to be empty. The tank attached to the building complex is suspected to once have held fuel oil for building heat systems. No information could be obtained regarding the contents of the other tank.

Interviews with COAA employees revealed that this property once belonged to Washtenaw County. Details of activities conducted by the County were somewhat restricted to information obtained during these interviews. COAA employees stated that this property was utilized as a highway maintenance and engineering facility, similar to present usage.

This site may have been contaminated from refueling activities, sign production and finishing, vehicle and equipment maintenance, pesticide and herbicides used by COAA and Washtenaw County, and leaking underground and above ground storage tanks. A surface and sub-surface soil investigation will be performed in selected areas to determine if contamination has occurred by COAA or Washtenaw County. Additionally, groundwater samples may be taken in select areas suspected of contamination.

III PROCEDURES UTILIZED TO CONDUCT SITE ASSESSMENTS

Based on the information presented within COAA RFP 250, ENCOTEC submitted a general proposal to investigate the above mentioned properties. The intent of this investigation was to identify areas with an associated risk from the improper management of hazardous and toxic materials during past and present property usage. The procedures ENCOTEC utilized for investigative purposes were typical to the

environmental industry for the evaluation of property involved in this type of assessment. An assessment is usually multi-phasic. Each action ends with a decision making step that determines whether to continue further into the investigative process. Although this process incurs more expense (e.g. re-mobilization of drilling crew) should additional sub-surface investigations be necessary subsequent to an initial event, the process is considerably less costly when no contamination is detected.

A SITE VISITATION AND SURVEY

The site visitation is an essential portion of a property assessment to locate areas of potential contamination and better define the assessment process by identifying past and present areas of heavy industrial usage. Within the property survey process the visiting crew typically covers all areas of the property to determine the type of activities for which the property has been used. At a minimum these include: current operating conditions which the owner or tenant is undertaking or has undertaken that could result in the contamination of soils and groundwaters, identifying areas that have been filled and/or areas on which stressed vegetation is obvious, and surveying businesses adjacent to the property were contamination could have migrated on-site. The survey crew will make every attempt to interview employees in order that knowledge of the site history be obtained.

ENCOTEC typically performs site visitations with both the project manager and a geologist. These individuals carefully survey the property to be investigated. Notes are taken with regard to the topography of the site, suspected direction of groundwater flow, obvious indications of soil contamination such as soil staining or stressed vegetation, abandoned drums or other empty hazardous

material containers, locations of underground storage tanks appurtenances and dispensers, areas of equipment storage, equipment maintenance areas, on-site locations of electrical transformers, abandoned batteries and the adjacent properties' usage. During this site visitation, utilities are duly noted as they may affect the sub-surface soil investigations. If personnel are available, interviews will be conducted to better determine activities that have occurred within and adjacent to property boundaries.

Usually, the information obtained within an initial visitation is sufficient to select boring locations. These boring locations are determined while on-site and clearly marked so that the drilling crew and ENCOTEC geologist can relocate the boring points while the investigation is taking place. Should additional information be required prior to selecting boring locations, (e.g. drainage tile locations, abandoned underground storage tanks, property boundaries, etc.), this information will be obtained and the site revisited to select the boring locations.

Once all the necessary information has been obtained from the site visitation and boring locations have been selected, some additional activities must take place prior to conducting the soil borings. First and foremost, a utility locater service must be contacted and a request made for underground utilities locations to be clearly identified at the property undergoing the investigation prior to conducting any soil boring activities. Contractual agreements are made between the drilling contractor and ENCOTEC to conduct soil borings for the days necessary to investigate the property. These contracts typically specify the property locations and dates on which drilling is to be conducted. The drilling contractor is also given specific instructions with

regards to sampling depths and procedures, equipment decontamination, health and safety, and any associated hazards which may be at the site while the investigation is taking place. Finally, ENCOTEC laboratory personnel are contacted through inter-company correspondence and made aware of the date(s) for the incoming samples to expedite the analytical process and data production phase for this type of investigation.

B SUBSURFACE INVESTIGATION AND SAMPLE COLLECTION

1 Soil Sampling

The next phase of a site assessment will normally be subsurface investigation and sample collection. For this investigation, series of bore holes were drilled on each property and subsurface core samples were removed from each bore hole for lithologic logging, VOC field screening and chemical analysis. Soil borings were performed using CME 55 and/or CME 75 truck mounted auger drilling rigs with 4 inch diameter hollow stem augers in 5 foot sections. Core samples were taken from the bore holes in 24 inch sections using split spoon samplers in accordance with ASTM D-1586. Samples were collected at the surface and thereafter at 5 foot depth intervals to a total depth of 20' or until ground water was encountered, whichever occurred first.

For the surface samples, split spoons were driven directly into the surface using a 140 lb. drop hammer. Subsurface sampling requires that the bore hole be advanced to the predetermined depth using hollow stem auger. The drill bit is then removed from the lead auger and withdrawn from the bore hole by hoisting 10 foot sections of drilling rod through the hollow stem of the auger string. The bit is removed from the lead rod and replaced by a split spoon sampler that is then

lowered through the hollow stem of the auger string by connecting successive 10 foot sections of the drilling rod and lowering these to the bottom of the bore hole. When the split spoon contacts the bottom, it is driven into the soil below with a series of repetitive blows from the drop hammer until the predetermined depth has been reached. The split spoon and drilling rod are removed from the hole to recover the sample. Upon recovery the split spoon is opened, the core sample inside visually inspected and logged for lithology, appearance, moisture content and odors by the project geologist.

To guard against cross contamination, all down-hole equipment is steam cleaned between holes. Additionally, all field utensils are scraped clean, rinsed with hexane, washed with lab detergent and rinsed repeatedly with deionized water between samples.

All samples were screened in the field for VOC emissions using a Photovac TIP II photoionization detector. This procedure involves placing the sample in its respective container, sealing the container, and allowing the organic vapor phase to reach equilibrium in the container; this takes approximately 15 minutes. Once equilibrium has been reached, the container lid is lifted in a fashion that minimizes the escape of the soil gases but permits entry of the instrument probe. A reading is taken on the gases contained in the headspace and recorded on the field log.

2 Photovac TIP II

The Photovac TIP II operates on the principle that individual chemical compounds have specific ionization potentials which are measured in electron volts (eV). Most of the atmospheric gases have ionization potentials of 12 eV or greater. The vast majority of

organic compounds, in particular those considered pollutants, have ionization potentials of 10.5 eV or less.

A small internal pump draws air (along with any contaminants) into the ionizations chamber of the TIP. This chamber is flooded with ultraviolet light emitted from a miniature lamp having an energy of 10.6 eV. Atmospheric gases such as nitrogen, oxygen, hydrogen and carbon dioxide have higher ionization energies (i.e. greater than 12 eV) and will not be detected by the TIP. However, the organic compounds, especially pollutants, with ionization potentials below the energy (10.6 eV) of the ultraviolet lamp in the TIP are ionized. Two small electrodes are located inside the ionization chamber, one positive and the other negative. The positive ions are attracted to the negative electrode; the negative ions are attracted to the positive electrode. A very sensitive current measuring circuit, or electrometer, detects these ions and produces a current. This current is in turn used to express "Total Ionizables Present" through the digital readout as they are relative to ambient air.

3 Groundwater Sampling

When bore hole depths are sufficient to reach the water table, groundwater will enter an open hole. Groundwater samples are collected when this condition occurs.

A stainless steel or Teflon(R) bailer is used to collect groundwater samples from the bore hole. These bailers are first washed with a non-phosphate detergent and triple rinsed with deionized water. Sometimes special sampling requirements mandate that additional rinses are necessary with nitric and hydrochloric acids, acetone or methanol and hexane. The clean

bailer is then lowered down the bore hole using clean polypropolene or nylon rope. Upon reaching groundwater, the bailer is submerged and allowed to fill with water. Care is taken not to agitate the groundwater unnecessarily so as to avoid oxygenation to the sample. The first bailer of water is emptied without any sampling. This serves to rinse the bailer. The bailer is lowered down the hole again and filled to begin sampling. Sample containers are filled directly from the bailer.

4 Common Field Practices and Procedures

To protect the sample and maintain sample integrity while minimizing possible cross contamination, numbers' of persons who handle samples in the field are kept to a minimum. Persons handling samples are required to wear clean latex or vinyl gloves. Soil samples are placed in borosilicate glass sample jars with Teflon(R) lined lids. Groundwater samples are placed in 40 mL. borosilicate glass vials with Teflon(R) lined septum tops for VOC analyses. Groundwater samples analyzed for metals content are placed in 1 L polyethylene containers. If groundwater sample filtering is necessary to determine dissolved metals, filtering will be performed in the field or by the laboratory as soon as possible after sampling. All sample containers have been specially cleaned prior to use. This cleaning meets or exceeds US EPA protocols. If new containers are to be used, then these containers are shipped from the factory under chain-of-custody seals and are not opened until the container is to be used for sampling.

All samples requiring refrigeration are promptly placed in ice chests that have been pre-cooled to a temperature of approximately 4°C with ice or "Blue Ice" freeze packs. Strict Chain-of-Custody procedures are

always observed. Chain-of-Custody forms are completed to the fullest extent possible prior to sample transport or shipment to the designated laboratory. These forms include the following information: Person Collecting Sample, Client whose sample was collected, Sample Identification, Time Collected, Source of Sample and Location, Analyses Required, Preservatives, Sample Matrix (e.g. soil, water, sludge, etc.), Receiving Laboratory, and Method of Shipment. The Chain-of-Custody forms are signed to identify the sample collector and to relinquish the sample to the receiving laboratory. At the laboratory receipt of the samples is acknowledged by signature. Should the primary laboratory subcontract any of the analysis to be performed on the sample(s), the Chain-of-Custody record is maintained by each sub-contracting laboratory. In the event of transport by common carrier, the packaging used to ship the samples is sealed with custody seals signed by the person sending the samples. In the event these seals have been broken or tampered with, the receiving laboratory must duly note any breach of custody seal integrity. The Chain-of-Custody forms for COAA site survey samples have been attached as Appendix I.

C ANALYTICAL PARAMETERS

ENCOTEC was contracted by the COAA to perform suitable site characterization for the properties described within this report. Using the soil boring and sampling procedures described above, ENCOTEC has chosen the following analytical parameters to identify any contamination resulting from activities conducted at these three COAA sites.

1 US EPA Method 8010, SW-846. Third Edition.

Method 8010 is a gas chromatographic (GC) analysis that determines the concentrations of certain haloge-

nated volatile organic compounds in water, soil and waste samples. This method requires the gas chromatograph to heat the column sufficiently to separate volatile organic compounds (VOC's) of interest as the sample is carried though the column by helium gas. The VOC's are separated as the sample passes through the column and detected by a electrolytic conductivity detector or halogen specific detector. Results are determined by comparing machine response for sample constituents, if any, to calibration reference standards that contain compounds of interest run on the same machine under the same operating conditions.

This list of compounds from Method 8010 are of particular interest in evaluating the COAA properties. These are common to degreasing solvents and other industrial chemicals that may have been used in previous years of operation.

Carbon tetrachloride	Cis-1,2-dichloroethene
Chlorobenzene	1,2-Dichloropropane
1,2-Dichlorobenzene	Cis-1,3-dichloropropene
1,3-Dichlorobenzene	Trans-1,3-dichloropropene
1,4-Dichlorobenzene	Methylene Chloride
1,1-Dichlorethane	1,1,1-Trichlorethane
1,2-Dichloroethane	1,1,2-Trichloroethane
Trans-1,2-dichloroethene	Trichloroethene

2 US EPA Method 8020, SW-846. Third Edition.

Method 8020 is a gas chromatographic (GC) analysis that determines the concentrations of certain aromatic volatile organic compounds in water, soil and waste samples. This method requires the gas chromatograph to heat the column sufficiently to separate volatile organic compounds (VOC's) of interest as the sample is carried though the column by helium gas. The VOC's are separated as the sample passes through the column and

detected by a photoionization detector (PID). Results are determined by comparing machine response for sample constituents, if any, to calibration reference standards that contain compounds of interest run on the same machine under the same operating conditions.

This list of compounds from Method 8020 are of particular interest in evaluating the COAA properties. The non-chlorinated compounds listed below are common to paints and petroleum compounds including automotive fuels. Chlorinated aromatic VOC's may be associated with certain pesticide and herbicide breakdown products or result directly from the formulation of these chemicals.

Benzene
Chlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethyl Benzene
Toluene
Xylenes

3 MICHIGAN ACT 64 METALS

Act 64 contains the rules and regulations governing Michigan's hazardous waste, hazardous waste generators and disposal facilities. There are 10 metals identified as potentially hazardous under these laws: Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Selenium, Silver and Zinc. Accordingly, these metals have been selected to determine whether any characteristic wastes, (i.e. those with any of the 10 potentially leachable metals at or above regulatory action levels), have contaminated surface or subsurface soils and the groundwaters underlying COAA properties investigated in this assessment.

These 10 metals are common to most all industrial activities. Heavy metals are used in plating and metal finishing processes, in various metal alloys, and as

pigment compounds for paints and dyes. They are also used as wear reducing agents in fuels and lubricating oils, and in the power generating cells of industrial batteries. Contamination from heavy metals may be present at the three COAA properties from any or all of the above mentioned industrial applications.

Soil boring samples and groundwaters will be sampled and analyzed for the 10 Michigan Act 64 metals using the following methodologies. For metals barium, cadmium, chromium, copper, lead and zinc, SW-846 Method 6010 will be utilized. Arsenic and selenium will be analyzed using Methods 7061 and 7741, respectively. Mercury analysis is performed using Method 7470 for groundwaters and Method 7471 for soil boring samples.

4 POLYCHLORINATED BIPHENYL COMPOUNDS (PCB'S)

PCB's are regulated under the Toxic Substance Control Act (TSCA) of 1976 and its subsequent reauthorizations. Strict clean-up standards were placed into effect for areas where spills were known to have occurred and for areas of incidental PCB contamination. Samples will be taken to verify that none of the common forms of PCB's have contaminated the Hawkin's Property site. The analyses will conform to methodology described in SW-846 Method 8080. In the event that significant PCB's are discovered on this site, resampling and further characterization will be necessary to delineate the extent of contamination.

IV ASSESSMENT RESULTS AND DISCUSSION

Generally, analytical results reveal the properties to be relatively free of contamination with the exception of a few areas. Survey results showed little or no contamination in the majority of samples taken at all three of the COAA properties. Property assessments indicated little that could be considered indicative of contamination. Vegetation

appeared healthy and unstressed regardless of the activities ongoing at each site. Some surface soil staining was obvious, but not unexpected considering the number of vehicles and ongoing maintenance operations being performed. This was anticipated when considering past property usage. Analytical results reveal other areas of contamination that indicate potential spillage or inadvertent discharge of common industrial materials has occurred. Certain analyses show levels of some contamination above those that would be considered a site specific background level. The contaminates most obvious are the heavy metals, although trace levels of organics were detected in certain areas. These contaminates most likely include paints and fuels which were discharged to the surface soils.

A HAWKINS PROPERTY

The investigation of the Hawkins property was expanded over the other two properties due to the size of the site and the lack of knowledge regarding past activities that took occurred. Delays were encountered in gaining access to the property from its current owner. The property visitation was initially conducted in November, 1989. However, ENCOTEC was requested to leave the premises prior to survey completion. Approval was finally obtained on 28 November, 1989 per Ron Olson transmittal for Hawkins property access. Surface and sub-surface investigations took place on 4, 5 and 6 January, 1990.

1 GEOLOGICAL EVALUATION - HAWKINS PROPERTY

Eight exploratory soil borings were cored to a total depth of 20.5 feet below ground level on the Hawkins property. Boring logs have been included in this report as Appendix II. Subsurface soil conditions at the Hawkins property show some variability with depth. In general soils are predominantly sand and clay with minor inclusions of gravel and silt. In most

soil borings the uppermost two to three feet were composed of fine to coarse sand, fine to medium gravel and topsoil or mixed sand, gravel and topsoil with brick and concrete rubble. The source of the fill material is not known although expected in this low-lying area. A fine to medium sand was typically present below the fill to a depth of approximately six to ten feet below ground level. A sandy and/or silty clay was encountered below this sand in most cases. This usually extended beyond termination depth.

The Photovac TIP II(R) headspace reading were taken on all core samples collected. Overall, soil headspace readings were near background levels. The highest reading observed in the Hawkins property borings was 22.0ppm (H-1, 9.5-11ft.) and the lowest was 0.0 (H-2, 19-20.5ft.).

Groundwater was generally encountered at depths three to seven feet below surface level. All soil borings on the Hawkins property produced medium to heavy volumes of groundwater except H-6. Here groundwater volumes varied from light to heavy.

According to the Soil Survey of Washtenaw County, soil at the Hawkins site is described as Wasepi sandy loam (WaA). This soil has low available water capacity, slow to very slow runoff and moderately rapid permeability.

2 ANALYTICAL DATA INTERPRETATION

Appendix III contains the analytical data for Hawkins' Property surface and subsurface soil borings. Cluster charts have been prepared and attached as Appendix IV for inorganic parameters analyzed within the scope of this project. These specifically represent metals data in relation to a basic statistical

format of mean and a three sigma upper control limit specific to the soils of this particular site. The upper control or 3 sigma line is simply the mean for a particular parameter added to three times the standard deviation. In most remedial actions this type of basic statistical analyses determines clean levels of soil and areas of exceedance that are suspect to contamination. For comparison purposes ENCOTEC elected to use the Michigan Department of Natural Resources' "Michigan Background Soil Survey", compiled by the MDNR Waste Management Division, attached as Appendix V. It appears that the higher metals concentrations reside in upper elevations for the COAA assessment borings. Therefore, ENCOTEC chose the n-Saginaw topsoil results to do this comparison.

Groundwaters show no significant contamination by organic compounds. The only detectable contaminants were those common to all analytical laboratories. Metals analysis indicated only trace levels of heavy metals thus suggesting the groundwaters at the water table is relatively clean.

a Organics Data

Analysis of Hawkins property data show no specific organics contaminating the site at any significant concentrations within the list of compound that were screened.

i Soils

Samples taken from Hawkin's property soils show indication of past and present industrial activities. Debris and fill are duly noted over the entire property. Soil staining is obvious in areas surrounding buildings and in the vehicle yards and parking areas. Soils around the underground stor-

age tanks were stockpiled after removal, awaiting analyses. However, no organic compounds were detected at specific 8010 and 8020 detection levels. TIP II readings (discussed above) indicate light hydrocarbon (C9-C12) fractions may be present in bore samples taken around the underground storage tanks. However, these were not analyzed for nor specified in the proposal. Analytical data for Hawkins' site soil borings has been attached as Appendix III.

ii Groundwaters

Methylene chloride was evident in only one sample. This is common laboratory extraction solvent and routinely found in both method blanks and samples analyzed for volatile organic compounds. All other compounds were below the analytical detection limit.

b Metals Data

i Soil Borings

Heavy metals occur naturally in all soils. ENCOTEC believes that the existence of these metals in soils does not automatically indicate a contaminated site. Therefore, each heavy metal is addressed individually regarding its natural existence as opposed to being a site contaminant when that metal occurs above the analytical detection limit. This task is completed using the cluster chart mean and 3 sigma values specific to each analyses as discussed above.

Inorganic analyses reveal this site to relatively clean and free of heavy metals contamination when compared to Appendix V, "Michigan Background Soil Survey."

aa - The MDNR soil survey indicates arsenic at a typical concentration of 3.8 mG/kG. The average for the Hawkins Property was only 3.2 mG/kG. However, the MDNR soil survey standard deviation differed from that of the Hawkins Property by an additional 1.1. This would be expected in a site specific survey.

bb - Barium analyses revealed a mean of 57mG/kG with a standard deviation of 9.9 for the Hawkins property. This compares favorably to the MDNR Soil Survey at 41mG/kG and standard deviation values of 8.7.

cc - Cadmium measured 0.94 mG/kG with a standard deviation of 0.37. The MDNR Soil Survey indicates 1.0 mG/kG as typical background concentration with no standard deviation. Statistical results of this type suggest that the analytical result, 1.0mG/kG, was also the analytical detection limit for the MDNR survey.

dd - Chromium measured an average of 8.7 mG/kG with a standard deviation of 3.6 at the Hawkins site. The MDNR survey reveals typical background concentration for chromium at 12.4 with a standard deviation of 4.1.

ee - Hawkins Property copper concentrations were determined to be slightly higher than those of the MDNR Soil Survey. The total copper analytical mean was 21mG/kG with a standard deviation of 18 where as the MDNR soil survey reported typical copper concentrations at

11.6mG/kG with a standard deviation of 3.4. One sample, H-6 0-2ft., exceeded all other samples concentrations by almost an order of magnitude.

ff - Lead concentrations at the Hawkins site showed significantly higher concentration and variability than those reported in the MDNR Soil Survey. Hawkins Property soils samples measured between 5mG/kG and 350mG/kG for total lead concentrations. The majority were at or below 40 mG/kG. Those samples measuring above 40mG/kG are suspect site contaminates.

gg - Mercury concentrations in Hawkins' Property soils reveals a variability due to extreme outliers of two samples. The mean for mercury at the Hawkins site was determined to be 0.13mG/kG with a standard deviation of 0.21 as compared to the MDNR Soil Survey typical concentration of 0.11 with a standard deviation of 0.16. This comparison is misleading because five of the mercury values in this assessment were assumed to be the analytical detection limit and included on the cluster charts for graphical purposes. ENCOTEC believes this situation also applies to the mercury data present in the MDNR Soil Survey when considering the low average concentration and relatively high standard deviation. The Hawkins site samples H-2 0-2ft. and H-3 0-2ft. mercury results' are significantly higher than others sampled and analyzed at that location. These areas require further investigation as mercury contamination may be present.

hh - Selenium analysis shows acceptable concentrations when compared to MDNR Soil Survey typical concentrations. Soil samples from the Hawkins site show selenium concentrations to range from the analytical detection limit to 0.31mG/kG with a mean concentration of 0.12mG/kG and a standard deviation of .08. The MDNR Soil Survey reports typical selenium concentrations at 0.28mG/kG with a 0.09 standard deviation.

ii - Analysis for silver revealed concentrations below the analytical detection limit for almost all samples. Those samples with detectable silver barely exceeded the analytical detection limit. Therefore, further silver evaluation and discussion is not warranted.

jj - Statistics for zinc concentrations at the Hawkins site are biased by a single outlying sample, H-8 0-2ft., having a concentration of 141mG/kG. Zinc concentrations in soils at the Hawkins site range between 22 and 141mG/kG with a mean of 58mG/kG and a standard deviation of 27. Typical background soils concentrations as reported in the MDNR Soil Survey have a mean of 39mG/kG with a standard deviation of 19. The majority of the Hawkins property samples have concentrations less than 75mG/kG. The surface soils around H-8 may be suspect of zinc contamination and merit additional investigation.

ii Groundwaters

Groundwater samples taken for metals analysis were total metals samples. A total groundwater metal analysis includes any silts and sediments

that may be removed with the sample from the bore hole by the bailer. Therefore, some metals are resultantly reported above the analytical detection limit.

aa - Arsenic values for Hawkins site groundwaters range from the analytical detection limit to 0.046mG/L.

bb - Barium values for Hawkins site groundwaters range from 1.7 to 5.9mG/L.

cc - Cadmium values for Hawkins site groundwaters range from the analytical detection limit to 0.028mG/L.

dd - Chromium values for Hawkins site groundwaters range from the analytical detection limit to 0.28mG/L.

ee - Copper values for Hawkins site groundwaters range from 0.12 to 0.58mG/L.

ff - Lead values for Hawkins site groundwaters range from the analytical detection limit to 0.39mG/L.

gg - Mercury values for Hawkins site groundwaters were below the analytical detection limit.

hh - Selenium values for Hawkins site groundwaters range from the analytical detection limit to 0.012mG/L.

ii - Silver values for Hawkins site groundwaters were below the analytical detection limit.

jj - Zinc values for Hawkins site groundwaters range from 0.10 to 1.4mG/L.

c PCB's

Of the 10 surface soils sampled for PCB's, none contained measurable PCB's at 1part per million. See data attached as Appendix VI.

B NORTH MAIN STREET MUNICIPAL GARAGE

The investigation of the North Main Street Municipal Garage initiated with a site visitation on 12 October, 1989. Surface and sub-surface investigations took place on 16 and 20 October, 1989.

1 GEOLOGICAL EVALUATION - MUNICIPAL GARAGE

Four exploratory soil borings were drilled to a total depth of 20.5 feet below ground level at the Municipal Garage. Boring logs have been included in this report as Appendix VII. Subsurface soil conditions at the Municipal Garage site show only minor variations with depth. Soils are composed predominantly of fine and coarse sand and clayey sand with minor inclusions of fine to medium gravel. Heterogeneous composition of the uppermost four to five feet suggests that this material is fill. The source of the fill material is not known. Thin layers of silt are penetrated in soil borings NM-1 (18.5-20.5ft) and NM-3 (14.5-17.5ft). A silty clay was encountered in NM-3 (17.5-20.5ft).

The Photovac TIP II(R) headspace reading were taken on all core samples collected. Overall, soil headspace readings were near background levels. The highest readings were observed in the Municipal Garage property boring NM-1. These readings ranged from a low of 4.0ppm, NM-1 (19-20.5ft), and a high of 48ppm, NM-1 (4.0-6.0ft).

Groundwater was generally encountered at three feet below surface level in borings NM-1 and NM-3 and 6.8 feet in boring NM-4. Boring NM-2 did not encounter ground water although some water intrusion occurred at the bore hole depth of 20.5 feet to permit sampling and analysis.

According to the Soil Survey of Washtenaw County, soil at the Municipal Garage site is described as Fox sandy loam. This soil has moderate available water capacity, slow runoff and moderate permeability.

2 ANALYTICAL DATA INTERPRETATION

Appendix VIII contains the analytical data for Municipal Garage surface and subsurface soil borings. Cluster charts have been prepared and attached as Appendix IX for inorganic parameters analyzed within the scope of this project. These specifically represent metals data in relation to a basic statistical format of mean and a three sigma upper control limit specific to the soils of this particular site. In most remedial actions this type of basic statistical analyses determines clean levels of soil and areas of exceedance that are suspect to contamination. For comparison purposes ENCOTEC elected to use the Michigan Department of Natural Resources' "Michigan Background Soil Survey", compiled by the MDNR Waste Management Division, attached as Appendix V. It appears that the higher metals concentrations reside in upper elevations for the COAA assessment borings. Therefore, ENCOTEC chose the n-Saginaw topsoil results to do this comparison.

Groundwaters show no significant contamination by organic compounds. The only detectable contaminants were those common to ENCOTEC's analytical laboratories

during the time of analysis. Metals analysis indicated only trace levels of heavy metals thus suggesting the groundwater at the water table is relatively clean.

a Organics Data

Analysis of Municipal Garage data show no specific organics contaminating the site at any significant concentrations within the list of compound that were screened.

i Soils

Samples taken from Municipal Garage soils show indication of past and present industrial activities. Debris and fill are duly noted over the entire property. Soil staining is obvious in areas surrounding buildings and in the vehicle yards and parking areas. No organic compounds were detected at specific 8010 and 8020 detection levels. TIP II readings (discussed above) indicate light hydrocarbon (C9-C12) fractions may be present in bore samples taken from NM-1. However, these compounds were not analyzed for nor specified in the proposal. Data for Municipal Garage soil borings has been attached as Appendix VIII.

ii Groundwaters

Methylene chloride was evident in several samples. This is common laboratory extraction solvent and routinely found in both method blanks and samples analyzed for volatile organic compounds. Toluene was also detected but not quantified due to laboratory contaminants related to ENCOTEC construction activities. All other compounds were below analytical detection limits.

b Metals Data

i Soil Borings

Heavy metals occur naturally in all soils. ENCOTEC believes that the existence of these metals in soils does not automatically indicate a contaminated site. Therefore, each heavy metal is addressed individually regarding its natural existence as opposed to being a site contaminant when that metal occurs above the analytical detection limit. This task is completed using the cluster chart mean and 3 sigma values specific to each analyses as discussed above.

Inorganic analyses reveal this site to relatively clean and free of heavy metals contamination when compared to Appendix V, "Michigan Background Soil Survey."

aa - The MDNR soil survey indicates arsenic at a typical concentration of 3.8mG/kG. The average for this property was only 2.8mG/kG. However, the MDNR soil survey standard deviation, 0.8, differed from that of the Municipal Garage by an additional 1.3. This would be expected in a site specific survey.

bb - Barium analyses revealed a mean of 66mG/kG with a standard deviation of 28 for the Municipal Garage property. If the 129 and 85mG/kG results from borings NM-1 5-7ft and NM-3 0-2ft were excluded, the other analyses would compare favorably to the MDNR Soil Survey at 41mG/kG and a standard deviation value of 8.7.

cc - Cadmium measured an average of 0.35 mG/kG with a standard deviation of 0.17. The MDNR Soil Survey indicates 1.0 mG/kG as typical background concentration with no standard deviation. Statistical results of this type suggest that the analytical result, 1.0mG/kG, was also the analytical detection limit for the MDNR survey.

dd - Chromium measured an average of 7.1 mG/kG with a standard deviation of 3.1 at the Municipal garage. The MDNR survey reveals typical background concentration for chromium at 12.4 with a standard deviation of 4.1.

ee - Copper concentrations were comparable to those of the MDNR Soil Survey. The Municipal Garage copper analytical mean was 16mG/kG with a standard deviation of 9 where as the MDNR soil survey reported typical copper concentrations at 11.6mG/kG with a standard deviation of 3.4.

ff - Lead concentrations at the Municipal Garage showed significantly higher concentration and variability than those reported in the MDNR Soil Survey. Soil samples measured between 9.8 and 163mG/kG for total lead concentrations. The majority were at or below 30mG/kG. Those samples measuring above 40mG/kG are suspect site contaminates.

gg - Mercury concentrations in soils reveals little variability. The mean for mercury at the Municipal Garage was determined to be 0.04mG/kG with a standard deviation of 0.019 as compared to the MDNR Soil Survey typical concentration of 0.11 with a standard deviation of 0.16.

hh - Selenium analysis shows acceptable concentrations when compared to MDNR Soil Survey typical concentrations. Soil samples show selenium concentrations to range from the analytical detection limit to 1.4mG/kG with a mean concentration of 0.26mG/kG and a standard deviation of 0.46. The MDNR Soil Survey reports typical selenium concentrations at 0.28mG/kG with a 0.09 standard deviation. The 1.4mG/kG sample, NM-1 5-7ft, also contained other elevated metals results and suspected to be contaminated.

ii - Analysis for silver revealed concentrations below the analytical detection limit for almost all samples. Those samples with detectable silver barely exceeded the analytical detection limit. Therefore, further silver evaluation and discussion is not warranted.

jj - Zinc concentrations in soils at the site range between 31 and 92mG/kG with a mean of 56mG/kG and a standard deviation of 19. Typical background soils concentrations as reported in the MDNR Soil Survey have a mean of 39mG/kG with a standard deviation of 19.

ii Groundwaters

Groundwater samples taken for metals analysis were total metals samples. A total groundwater metal analysis includes the silts and sediments that may be removed with the sample from the bore hole by the bailer. Therefore, some metals are resultantly reported above the analytical detection limit.

aa - Arsenic values for this site's groundwaters range from the analytical detection limit to 0.052mG/L.

bb - Barium values for This site's groundwaters range from 2.9 to 5.2mG/L.

cc - Cadmium values for this site's groundwaters range from the analytical detection limit to 0.028mG/L.

dd - Chromium values for this site's groundwaters range from the analytical detection limit to 0.14mG/L.

ee - Copper values for this site's groundwaters range from 0.16 to 1.4mG/L.

ff - Lead values for this site's groundwaters range from 0.03 to 1.3mG/L.

gg - Mercury values for this site's groundwaters were below the analytical detection limit.

hh - Selenium values for this site's groundwaters range from the analytical detection limit to 0.012mG/L.

ii - Silver values for this site's groundwaters were below the analytical detection limit.

jj - Zinc values for this site's groundwaters range from 1.0 to 4.0mG/L.

c Total Petroleum Hydrocarbons

Per verbal request by COAA Risk Manager, total petroleum hydrocarbon samples were analyzed for borings NM-4 5-7 and NM-4 15-17 to identify potential UST leakage. When compared to standards issued by the Michigan State Fire Marshall's office for UST

remediations, these total petroleum hydrocarbon analyses exceed the 100ppm standard. The underground waste oil storage tank just to the west of boring NM-4 is suspect of leakage. See data attached as Appendix X.

C WEST WASHINGTON ST. OFFICES AND MAINTENANCE

The investigation of the North Main Street Municipal Garage initiated with a site visitation on 12 October, 1989. Surface and sub-surface investigations took place on 13 October, 1989.

1 GEOLOGICAL EVALUATION - WASHINGTON STREET

Four exploratory soil borings were drilled to a total depth of 20.5 feet below ground level at the Municipal Garage. Boring logs have been included in this report as Appendix XI. Subsurface soil conditions at the Washington Street site show little variation with depth. Soils are composed predominantly of fine and coarse sand with minor inclusions of fine to medium gravel. In most cases the upper 5 to 10 feet appeared to be highly heterogeneous suggesting that this material is fill. The source of the fill material is not known.

The Photovac TIP II(R) headspace reading were taken on all core samples collected. Overall, soil headspace readings were near background levels. However, somewhat elevated readings were observed at soil boring W-2 in the core sample recovered from the 10ft. depth interval. A significant oil and/or solvent odor was noted on the sample bore log along with significant soil staining.

Groundwater was generally encountered seven feet below surface level in all borings except W-4 where it

was encountered at 14.5ft. This corresponds to the location of the bore hole and the higher elevation of ground level.

According to the Soil Survey of Washtenaw County, soil at the Washington Street site is described as Matherton sandy loam (MdA). This soil has moderate available water capacity, slow to very slow runoff and moderate to rapid permeability.

2 ANALYTICAL DATA INTERPRETATION

Appendix XII contains the analytical data for Municipal Garage surface and subsurface soil borings. Cluster charts have been prepared and attached as Appendix XIII for inorganic parameters analyzed within the scope of this project. These specifically represent metals data in relation to a basic statistical format of mean and a three sigma upper control limit specific to the soils of this particular site. In most remedial actions this type of basic statistical analyses determines clean levels of soil and areas of exceedance that are suspect to contamination. For comparison purposes ENCOTEC elected to use the Michigan Department of Natural Resources' "Michigan Background Soil Survey", compiled by the MDNR Waste Management Division, attached as Appendix V. It appears that the higher metals concentrations reside in upper elevations for the COAA assessment borings. Therefore, ENCOTEC chose the n-Saginaw topsoil results to do this comparison.

Groundwaters show no significant contamination by organic compounds. The only detectable contaminants were those common to ENCOTEC's analytical laboratories during the time of analysis. Metals analysis indicated only trace levels of heavy metals thus suggesting the groundwaters at the water table is relatively clean.

a Organics Data

Analysis of Washington Street data show no specific organics contaminating the site at any significant concentrations within the list of compound that were screened.

i Soils

Samples taken from Municipal Garage soils show indication of past and present industrial activities. Debris and fill are duly noted over the entire property. Soil staining is obvious in areas surrounding buildings and in the vehicle yards and parking areas. No organic compounds were detected at specific 8010 and 8020 detection levels. TIP II readings (discussed above) indicate light hydrocarbon (C9-C12) fractions may be present in bore samples taken from W-2. However, these compounds were not analyzed for nor specified in the proposal. Chlorinated solvents were also detected in borings W-4 0-2ft and W-4 10-12ft. However, these were not quantified due to air contaminants occurring in the ENCOTEC laboratory and probably related to laboratory construction activities. Data for Washington Street soil borings has been attached as Appendix XII. No sample was obtained for boring W-2 0-2ft because a brick plugged the split spoon sampler opening.

ii Groundwaters

Methylene chloride was evident in several samples. This is common laboratory extraction solvent and routinely found in both method blanks and samples analyzed for volatile organic compounds. All other compounds were below analytical detection

limits. Analyses for Method 8010 and 8020 were not done on groundwater samples from W-4 due to sampling difficulties.

b Metals Data

i Soil Borings

Heavy metals occur naturally in all soils. ENCOTEC believes that the existence of these metals in soils does not automatically indicate a contaminated site. Therefore, each heavy metal is addressed individually regarding its natural existence as opposed to being a site contaminant when that metal occurs above the analytical detection limit. This task is completed using the cluster chart mean and 3 sigma values specific to each analyses as discussed above.

Inorganic analyses reveal this site to relatively clean and free of heavy metals contamination when compared to Appendix V, "Michigan Background Soil Survey."

aa - The MDNR soil survey indicates arsenic at a typical concentration of 3.8mG/kG. The average for this property was only 2.4mG/kG. However, the MDNR soil survey standard deviation, 0.8, differed from that of the Washington Street site by an additional 2.8. This can be attributed to boring W-2 5-7ft which had a reported 12mG/kG for total arsenic. This layer indicates potential contamination as is indicated by the other metals analyses.

bb - Barium analyses revealed a mean of 70mG/kG with a standard deviation of 55 for the Municipal Garage property. If the 211mG/kG

results from borings W-2 5-7ft and W-2 10-12ft were excluded, the other analyses would compare favorably to the MDNR Soil Survey at 41mG/kG and a standard deviation value of 8.7.

cc - Cadmium measured an average of 0.67mG/kG with a standard deviation of 0.90. The MDNR Soil Survey indicates 1.0 mG/kG as typical background concentration with no standard deviation. Statistical results of this type suggest that the analytical result, 1.0mG/kG, was also the analytical detection limit for the MDNR survey. Sample W-3 0-2 feet yielded a statistical outlier with a reported result of 3.0mG/kG.

dd - Chromium measured an average of 7.1 mG/kG with a standard deviation of 4.2 at Washington Street site. The MDNR survey reveals typical background concentration for chromium at 12.4 with a standard deviation of 4.1.

ee - Copper concentrations were biased by a single outlier at boring W-2 5-7ft. Washington Street samples ranged from 7.6 to 348mG/kG. The MDNR soil survey reported typical copper concentrations at 11.6mG/kG with a standard deviation of 3.4. Copper is a suspect contaminant at boring W-2.

ff - Lead concentrations at showed significantly higher concentration and variability than those reported in the MDNR Soil Survey. Soil samples measured between 7.7 and 348mG/kG for total lead concentrations. Many of these samples were above 40mG/kG. Lead is a suspect site contaminate as it was very common to paints, automotive fuels and lubricants.

gg - Mercury concentrations in soils reveals some variability. The mean for mercury at the Municipal Garage was determined to be 0.10mG/kG with a standard deviation of 0.17 as compared to the MDNR Soil Survey typical concentration of 0.11 with a standard deviation of 0.16. One outlier occurred at W-2 5-7ft with reported result of .51mG/kG.

hh - Selenium analysis shows acceptable concentrations when compared to MDNR Soil Survey typical concentrations for most of the samples taken from Washington Street. These samples show selenium concentrations to range from the analytical detection limit to 1.1mG/kG with a mean concentration of 0.21mG/kG and a standard deviation of 0.35. The MDNR Soil Survey reports typical selenium concentrations at 0.28mG/kG with a 0.09 standard deviation. The 1.1mG/kG sample, W-2 5-7ft, also contained other elevated metals results and suspected to be contaminated.

ii - Analysis for silver revealed concentrations below the analytical detection limit for almost all samples. Those samples with detectable silver barely exceeded the analytical detection limit. Therefore, further silver evaluation and discussion is not warranted.

jj - Zinc concentrations in soils at the site range between 31 and 307mG/kG with a mean of 96mG/kG and a standard deviation of 97. Typical background soils concentrations as reported in the MDNR Soil Survey have a mean of 39mG/kG with a standard deviation of 19. Outliers occurred at borings W-2 and W-3 that severely impact the mean and standard deviation for zinc.

ii Groundwaters

Groundwater samples taken for metals analysis were total metals samples. A total groundwater metal analysis includes any silts and sediments that may be removed with the sample from the bore hole by the bailer. Therefore, some metals are resultantly reported above the analytical detection limit. Metals' analysis for boring W-1 and W-4 groundwaters' is not reported due to sampling difficulties.

aa - Arsenic values for this site's groundwaters range from 0.043mg/L to 0.048mG/L.

bb - Barium values for This site's groundwaters range from 3.5 to 5.7mG/L.

cc - Cadmium values for this site's groundwaters range from 0.053 to 0.092mG/L.

dd - Chromium values for this site's groundwaters range from 0.40mG/l to 0.75mG/L.

ee - Copper values for this site's groundwaters range from 0.99 to 2.6mG/L.

ff - Lead values for this site's groundwaters range from 5.4 to 5.8mG/L.

gg - Mercury values for this site's groundwaters range from 0.0015 to 0.0020mG/L.

hh - Selenium values for this site's groundwaters range from 0.003 to 0.009mG/L.

ii - Silver values for this site's groundwaters range from below the analytical detection limit to 0.01mG/l, the analytical detection limit.

jj - Zinc values for this site's groundwaters range from 5.4 to 11mG/L.

V CONCLUSIONS

The evaluation of all data and data summaries submitted with this assessment reveals that limited contamination has occurred at the properties assessed within this survey. The most prevalent form of contamination for these properties appears to be heavy metals. These metals are common to paints, fuels and lubricating compounds that may have been spilled or improperly disposed over the years of municipal and industrial use. Also qualitatively identified but not quantified were petroleum hydrocarbons in the soils at all three sites. Some contamination was anticipated considering past and present usage of these properties. Underground storage tanks were present at all three sites. Only vague information could be obtained regarding the contents, operation and maintenance of these tanks. Most older storage tanks are suspect to leakage under these conditions.

Certain remedial activities may be necessary depending on the future intended use of these locations. ENCOTEC advises that further investigation be done before any remediation is performed. The following are tables of areas suspect to contamination and the contaminants believed present:

A HAWKINS' PROPERTY

SAMPLE LOCATION	SUSPECT CONTAMINANT
H-1 0-2ft	Total petroleum hydrocarbons, not quantified
H-1 5-7ft	Total petroleum hydrocarbons, not quantified
H-2 0-2ft	Mercury, 0.84mG/kG
H-6 0-2ft	Total Petroleum Hydrocarbons, not quantified; Copper, 75mG/kG; Lead, 366mG/kG
H-8 0-2ft	Zinc, 141mG/kG

B NORTH MAIN STREET MUNICIPAL GARAGE

SAMPLE LOCATION	SUSPECT CONTAMINANT
NM-1 0-2ft	Total Petroleum Hydrocarbons, not quantified
NM-1 5-7ft	Total Petroleum Hydrocarbons, not quantified; Barium, 129mG/kG; Selenium, 1.4mG/kG; Zinc, 92mG/kG
NM-3 0-2ft	Lead, 163mG/kG
NM-3 5-7ft	Lead, 42mG/kG
NM-4 5-7ft	Total Petroleum Hydrocarbons, 186mG/kG
NM-4 15-17ft	Total Petroleum Hydrocarbons, 225mG/kG

C WASHINGTON STREET SIGN SHOP, MAINTENANCE FACILITY AND OFFICES

SAMPLE LOCATION	SUSPECT CONTAMINANT
W-1 0-2ft	Mercury, 0.24mG/kG
W-2 5-7ft	Total Petroleum Hydrocarbons, not quantified; Arsenic, 12mG/kG; Barium, 211mG/kG; Copper, 348mG/kG; Lead, 228mG/kG; Mercury 0.51mG/kG; Selenium, 1.1mG/kG; Zinc, 307mG/kG
W-2 10-12ft	Total Petroleum Hydrocarbons, not quantified; Lead, 71mG/kG
W-3 0-2ft	Cadmium, 3.0mG/kG; Zinc, 215mG/kG
W-3 5-7ft	Lead, 113mG/kG

VI RECOMMENDATIONS

Although some soil contamination is evident, if remediated these soils probably would not be determined characteristically hazardous under Michigan Act 64 Regulations. There exist a few "hot spots" that have been located by this assessment. COAA has several options depending on future intended usage of these properties.

"Hot spots" contaminated with heavy metals and converted to residential or recreational areas should be remediated to eliminate the potential for incidental contact with the soils having these elevated metals. Estimation of necessary remediation costs and activities can only be determined by

performing sufficient additional sampling and analysis, adequate to define boundaries of contamination. Excavated soils would most likely be disposed in a sanitary landfill as it is doubtful that these soils have any hazardous characteristics associated with them under current hazardous waste regulations. Project costs would include additional sampling and analysis, preparation of detailed engineering drawings, excavation and removal contracts, contaminated soil disposal, and excavation backfilling.

Since no listed hazardous wastes were known to be generated or managed on these properties, there are no Act 64 Closure Standards to be met. Therefore, if the areas remain industrial, the soils contaminated with heavy metals could remain in place. This is not advisable, however, as there may be some long term liability associated with these actions depending on current and future statutes implemented by the State of Michigan. The cost of this scenario can not be estimated.

As an alternative to remediating these sites, a risk, based assessment could be performed to determine any associated hazards to human health and the environment. Risk assessments measure associated hazards at a site by looking at potential pathways for migration of contamination offsite when transported by air, surface water, or ground water and may also include risk factors associated with incidental contact. Values are assigned to each aspect of the risk evaluation. These values are entered into a computer model which assesses the site and determines the associated risk by the number of increased cases of cancer to humans and any potential negative impact to the environment. The cost of performing a risk assessment is usually site specific and can be high depending on the level of certainty required.

The underground storage tanks suspected of leaking must be remediated as mandated in Act 478 and amended by Act 150. Simply stated, the underground storage tank, free product from the tank that is uncovered in the excavation, contaminated soils and all appurtenances must be removed and properly disposed of. Clean-up recommendations have been assembled by MDNR and The Department of State Police, Fire Marshall's Division. Although these standards are published as draft guidance, enforcement will most likely be strictly interpreted to these standards as published. Costs of implementing these remediations can be controlled but not limited depending on the length of time the tank was leaking and quantity of tank contents released to the environment.