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CENTRAL REMEDIAL ACTION

INTERIM REMEDIAL MEASURES WORKPLAN
FORMER GE COURT STREET BUILDING 5/5A

GROUNDWATER COLLECTION AND TREATMENT SYSTEM

DEWITT, NEW YORK

Prepared for

Lockheed Martin Corporation
Syracuse, New York

APPROVED

August 1997
Revised November 1997

Prepared by

Crossroads Corporate Center
One International Blvd., Suite 700
Mahwah, New Jersey 07495

Project 86143-003.000

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7010

John P. Cahill
Commissioner

MEMORANDUM

TO: Distribution

FROM: Alyse Peterson AP

SUBJECT: Lockheed Martin - Former GE Court Street 5/5A Site (734070)
Groundwater Collection and Treatment Interim Remedial Measure

DATE: December 1, 1997

Enclosed, for your files, is Lockheed Martin Corporation's (LMC) final IRM Workplan (design) and Technical Specifications Addendum. These documents reflect the changes agreed to by the Department and LMC.

Construction of this IRM is underway and is expected to be completed in January of 1998. I anticipate that we will receive a draft Engineering Certification Report for this IRM approximately one month after completion of construction. That document will be forwarded to you for your review when it is received.

If you have any questions, do not hesitate to call me at (518) 457-1641. Thank you.

Distribution: A. Hess, USEPA
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Enclosures

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ADDENDUM TO TECHNICAL SPECIFICATIONS

GROUNDWATER COLLECTION AND TREATMENT SYSTEM

FORMER GE COURT STREET 5/5A SITE
DEWITT, NEW YORK

Prepared for

Lockheed Martin Corporation
Syracuse, New York

November 1997

Prepared by

EMCON/Wehran-New York, Inc.
Crossroads Corporate Center
One International Blvd., Suite 700
Mahwah, New Jersey 07495

Project 86143-003.000

The following changes and additions to the Technical Specifications (EMCON/Wehran-New York, Inc., August 1997) are to be incorporated into the construction of the Groundwater Collection and Treatment System for the Former GE Court Street 5/5A Site.

1. In Section 01010, Part 1.2.D.5.a., DELETE the third sentence and SUBSTITUTE the following: "Excavated soils exhibiting the presence of VOCs (based on field screening) will be staged in stockpiles not more than 10 feet in height, on minimum 40 mil polyethylene sheeting, and covered by minimum 20 mil polyethylene sheeting."

2. In Section 01041, Part 2.2, ADD the following:

   "D. Additional Attendee - NYSDEC Representative"

3. In Section 01041, Part 2.4, ADD the following:

   "E. Additional Attendee - NYSDEC Representative"

4. In Section 01502, Part 3.5, ADD the following:

   "E. Dust suppression and monitoring will meet the requirements of NYSDEC TAGM HWR-89-4031 "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites."

5. In Section 02220, Part 3.2, ADD the following:

   "B. Excavated soils exhibiting the presence of VOCs (based on field screening) will be staged in stockpiles not more than 10 feet in height, on minimum 40 mil polyethylene sheeting, and covered by minimum 20 mil polyethylene sheeting."

11/20/97

Mark A. Swyka, P.E.
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Interim Remedial Measures Workplan
Former GE Court Street Building 5/5A
Groundwater Collection and Treatment System
DeWitt, New York

The material and data in this report were prepared under the supervision and direction of the undersigned.

To the best of my knowledge, information and belief, the information, conclusions and recommendations contained in this document are factual, represent my understanding of conditions and circumstances at the subject area, represent my engineering judgment, comply with all appropriate New York State Department of Environmental Conservation (NYSDEC) Standards, Criteria and Guidance documents (SCGs), and demonstrate sound engineering practice and principles to protect human health and the environment.

EMCON

Patrick Gillespie

Patrick G. Gillespie, P.E.
Vice President

Curtis Taylor, CHMM
Project Manager

CONTENTS

TABLES

FIGURES

TABLES AND ILLUSTRATIONS (Continued)

1 INTRODUCTION

This workplan is prepared for the former GE Court Street Building 5/5A site (site). The site is located near Deere Road and Route 298, in the Town of DeWitt, Onondaga County, New York (Figure 1). In October 1991, EMCON (formerly Wehran-New York, Inc.) on behalf of GE Aerospace, investigated the extent and concentration of aromatic solvents in subsurface soils and groundwater. The results of this investigation were outlined in the "Interim Subsurface Investigation Report" (Wehran 1992). Three solvent spill areas were identified, and soil excavation was performed as an Interim Remedial Measure (IRM) to remove the existing sources of groundwater contamination. In March and October 1993, Wehran prepared a Remedial Action Plan (RAP) and Remedial Action Plan Addendum which outlined preliminary information for a proposed groundwater collection and treatment system to control the migration of impacted groundwater.

In May 1996, Lockheed Martin Corporation (LMC) entered into an Order on Consent with the New York State Department of Environmental Conservation (NYSDEC). The Order on Consent requires LMC to submit an IRM Workplan to the NYSDEC. This document is the IRM Workplan which describes the design, installation, and operation of the proposed groundwater collection and treatment system.

2 IRM DESIGN

2.1 Basis of Design

2.1.1 Collection Trench

The groundwater collection trench for the site has been designed to intercept groundwater containing residual volatile organic compounds (VOCs) from migrating to the South Branch of Ley Creek and to Sander's Creek. The design of the collection trench is described below.

Final Trench Alignment and Depth

The conceptual design of the collection trench presented in the Remedial Action Plan (RAP) Addendum, dated October 1993, was based on subsurface data from test borings and monitoring wells that paralleled the planned collection trench alignment. To prepare the final design, eight additional monitoring wells were installed to confirm the vertical and horizontal extent of VOCs in groundwater and to add details regarding the depth and continuity of sand lenses. These monitoring wells were installed as part of the Remedial Investigation (RI) performed in accordance with the NYSDEC-approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan. The collection trench layout specifically intercepts those areas where sand lenses have been confirmed as the pathways for VOC migration.

Based on evaluation of the test boring logs and groundwater sampling results obtained in support of this design, the depth, alignment and length of the collection trench were modified to intercept the affected subsurface media. Drawing 1 shows the final alignment of the collection trench. The trench will have a total length of approximately 830 feet, with a slope of 0.2 percent. Based on variations of the surface elevation, the final depth of the collection trench ranges from 8 to 14 feet below ground surface. The approximate elevation of the collection trench is 372 feet. A profile of the trench elevations superimposed on the geologic cross-section for the entire alignment is presented in Drawing 2. The analytical results from the remedial investigation confirm that there are no detectable VOCs present in groundwater at both ends of the trench (MW-12 and MW-19S), and below the base elevation of the trench (MW-16B, MW-17B, and MW-18B).

The location of all monitoring wells utilized in preparing the design are shown on Drawing 1. Boring logs for the recently installed monitoring wells MW-6D, MW-16D, MW-16S, MW-17D, MW-17S, MW-18D, MW-18S, and MW-19S are provided in Appendix A. All other boring logs are provided in the RAP (Wehran, 1993a), and RAP Addendum (Wehran, 1993b).

Groundwater sampling results used to confirm current conditions with regard to VOC concentrations have been provided to the NYSDEC under separate cover. Additional historical groundwater quality results presented in the RAP and RAP Addendum were also utilized to characterize the inorganic quality of groundwater that would be extracted for treatment.

Collection Media Selection

Concrete sand (NYSDOT Specification 703-07) has been selected as the primary collection media to be placed in the groundwater collection trench. Concrete sand has been selected on the basis of hydraulic conductivity and grain size. Concrete sand typically exhibits a hydraulic conductivity on the order of 1×10^{-3} cm/sec. Since the hydraulic conductivity of the existing site soils is several orders of magnitude lower than that of the concrete sand, the sand will represent the preferential flow path for all groundwater intersecting the groundwater collection trench.

Concrete sand will be placed from the bottom of the excavation to a minimum elevation of 2 feet above the top of the collection pipe. The elevation of concrete sand will be increased in areas where sand lenses have been identified to extend above that depth. In these zones, the depth of concrete sand will extend to the top of the sand lens. The anticipated elevations of concrete sand placement are shown on the groundwater collection system profile (Drawing 2). If additional sand lenses are identified during trench excavation, the concrete sand elevation will be extended to intercept any significant sand lenses which may be encountered above the collection pipe. The actual placement of concrete sand will be based in the field upon the judgment of the on-site engineer and the NYSDEC.

The remainder of the trench will be backfilled with unimpacted soils from the excavation. The native site soils have been identified to have relatively low hydraulic conductivity and will create a barrier to horizontal groundwater flow over the concrete sand in the collection trench. The unimpacted soils will be homogenized prior to use as backfill. Only soils which exhibit PID readings of zero or ambient background will be suitable for reuse as backfill. During trench excavation, all soils exhibiting elevated PID readings will be containerized for off-site disposal.

Perforated Pipe Selection

Perforated pipe will be the primary carrier of collected groundwater. The perforated pipe selected for use is 4-inch PVC well screen. The well screen will have slots which are 0.01-inch wide placed on 0.25-inch centers. The slot size has been selected based upon U.S. Army Corps. of Engineers methodology for maintaining filter compatibility with the concrete sand. Six rows of slots will be evenly spaced around the circumference of the pipe. The size and number of slots are adequate to convey the anticipated quantity of groundwater to be collected.

Groundwater Collection Sump

Collected groundwater will drain by gravity to a collection sump. The collection sump selected for use is a polyethylene manhole with a precast concrete slab top. High density polyethylene (HDPE) has been selected on the basis of its demonstrated chemical compatibility with the materials anticipated to be collected. Penetrations through the wall of the collection sump will be fabricated of HDPE and will be welded to the sump wall to create complete containment of the collected liquid. The concrete slab top will be supported on a pre-cast concrete manhole wall section for structural support. The annulus between the concrete and HDPE will be grouted to complete the containment. The bottom of the HDPE manhole will be ballasted with concrete to prevent flotation under high groundwater conditions.

Geotextile

A geotextile was added to the bottom of the collection trench based on the observance of excessively soft soils at this interface. Boring logs and prior excavation activities at the site indicate that the soils to be encountered at or near the bottom of the trench are soft and may require stabilization during trenching and installation of the collection pipe. In the interest of maintaining the stability of the trench and the collection pipe during construction, a geotextile was added. The geotextile was added to function principally to stabilize the bottom of the trench while construction was in progress. The geotextile chosen will not appreciably prevent groundwater flow.

2.1.2 Groundwater Quantity and Quality

Design Collection Rate

An idealized section and conservative horizontal gradients were used to determine a conservative estimate of the groundwater collection rate of the proposed trench. The resulting estimate was approximately 8.7 gallons per minute (gpm), and therefore a maximum design flow rate of 10 gpm has been used for collection/treatment design. See Attachment 1 of Appendix B for details of the determination of groundwater flow rate.

Design Groundwater Characteristics

The collection trench is designed to intercept and transport groundwater containing residual VOCs. The design influent concentrations are listed in Tables 1 through 3.

Design influent levels for conventional parameters were determined based on averages of site data from a representative number of monitoring wells. Available data on the total suspended solids (TSS) content of the groundwater is based on monitoring well samples collected in 1993. It is expected that influent TSS levels will decrease after startup of the collection system, as solids sort in the soils adjacent to the trench. After construction and initial startup, solids are not anticipated to remain at the levels identified in the monitoring well samples and shown in Table 1.

Influent concentrations of metals were determined by taking the geometric mean of available site data. The design influent was selected from the higher of the geometric mean of the total (unfiltered), or dissolved (field-filtered) metals concentrations. As the system operates, it is anticipated that the metals concentrations in the influent will tend to decrease (typically toward dissolved concentrations) as the solids sort in the soils adjacent to the trench.

The influent concentration of VOCs was determined, using all groundwater concentration data and permeability data generated for the site to date. The site was divided into 9 areas. Permeability and VOC concentration data from each area was used to predict that area's contribution of VOCs (based on predicted flow contribution to the trench). In that way, the 9 area concentrations were combined using weighted averages to predict an influent concentration for each VOC detected. The method used to determine the anticipated VOC content is described in detail in Attachment 2 of Appendix C.

2.1.3 Groundwater Pumping

The groundwater which is collected in the proposed sump will be transferred to the treatment facility by a set of sump pumps. Due to the potential for variability in the groundwater collection rate, two submersible sump pumps will be placed in the collection sump: a low flow and a high flow pump. The low and high flow pumps are designed for pumping rates of 2 gpm and 10 gpm, respectively. The actual transfer rate of the pumps can be adjusted by throttling a diaphragm valve in each of the influent lines. The pumping rate ranges for the low and high flow pumps (i.e., representing 25 to 100 percent opening of the diaphragm valve) are 1 to 4 gpm and 8 to 16 gpm, respectively. These pumping ranges provide adequate coverage of potential collection rates from the trench. The flow rate and totalized flow for each pump will be monitored separately prior to the lines combining in the air stripper influent.

2.1.4 Treatment Area Site Plan

As shown on the Site Plan (Sheet 1 of the Construction Drawings), all process equipment will be placed within a pre-engineered metal building. This building will provide access for maintenance and installation of any future equipment. The foundation for the process building will be a concrete pad adjacent to Building 5. Equipment pads will be provided for the air stripper stand and the blower stand to allow level installation. The blower pad/stand will also elevate the blower motor above the 100-year flood elevation. The building will be heated and ventilated.

2.1.5 Process Equipment

In this section, the proposed effluent limitations are considered to determine the parameters which must be addressed by the treatment system. The basis for the sizing of the treatment equipment for each parameter is then discussed.

Effluent Limitations

The effluent limitations and monitoring requirements are summarized in Table 4, as defined by NYSDEC. A comparison of design influent concentrations and proposed discharge limitations indicate that treatment is required for volatile organics and iron.

VOC Removal

Volatile organic compounds will be removed from the groundwater by air stripping. Air stripping can be accomplished in packed towers, tray aerators or diffused aeration tanks. A diffused aeration system was chosen primarily because it is less susceptible to fouling and is easier to clean than packed towers or tray aerators. It does require more air to attain the same efficiency, however, the fouling issue is important for this site in which the groundwater has relatively high iron and hardness concentrations.

The limiting VOC with regards to groundwater treatment at this site is 1,1-dichloroethane. For diffused aeration, the fraction removal of a compound can be estimated by the following relationship:

$$C_e/C_i = 1/(1 + aw_t*H_u*[1\text{-}\exp(-K_L*h*6/v/H_v/d)])$$

where:

C_e = Effluent VOC Concentration (30 µg/l for 1,1-DCA)

C_i = Influent VOC Concentration (7,600 µg/l for 1,1-DCA)

aw_t = Theoretical Air-to-Water Ratio

H_u = Unitless Henry's Law Constant

K_L = Mass Transfer Coefficient (cm/sec)

h = Stripper Depth (38 cm [15 inches])

v = Rise Velocity of Air Bubble (cm/sec)

d = Bubble Diameter (cm)

The Henry's Law Constant (H) can be determined from the following relationship based on temperature:

$$\log H = -\Delta H/R/T + J$$

where:

H = Henry's Law Constant [atm (mol gas/mol air)/(mol gas/mol water)]

ΔH = Heat of Evaporation from Solution (3,556 cal/mol for 1,1-DCA)

R = Gas Constant (1.987 cal/mol)

T = Temperature (K)

J = Empirical Constant (8.483 1/K for 1,1-DCA)

For 1,1-dichloroethane at 10°C (283.15 K), the Henry's Law Constant is 145 atm (mol gas/mol air)/(mol gas/mol water). The unitless Henry's Law Constant can be calculated by the following relationship:

$$H_u = H/4.56/T$$

At 10°C, the H_u for 1,1-DCA is 0.112. Applying a safety factor of 1.5, the design H_u is 0.075. The air stripper employs coarse bubble diffusers that form bubbles with diameters (d) in the range of 0.635 cm (0.25 inches). The rise velocity of bubbles in this range is estimated by the following relationship:

$$v = 1.82*[(\rho_L - \rho_G)*d*g/\rho_L]^{0.5}$$

where:

g = Acceleration due to Gravity (980 cm/s^2)

ρ_L = Liquid Density (1 g/cm^3)

ρ_G = Gas Density (0.00125 g/cm^3)

The rise velocity is 45.4 cm/sec. The mass transfer coefficient for coarse bubble can be estimated by the following relationship:

$$K_L = D_L*0.42*(\mu_L/\rho_L/D_L)^{1/2}*[\rho_L*(\rho_L - \rho_G)*g/\mu_L^2]^{1/3}$$

where:

D_L = Diffusivity of Gas in Liquid (cm^2/sec)

μ_L = Liquid Viscosity (0.013 g/cm/sec)

The only unknown parameter is the diffusivity of 1,1-DCA in water. This parameter, D_L, can be estimated by the following relationship:

$$D_L = [7.4 \times 10^{-10}*(\Phi_B*M_B)^{0.5}/V_b^{0.6}]*T/\mu_L$$

where:

Φ_B = Association Parameter of Water (2.6)

M_B = Molecular Weight of Water (18 g/mol)

V_b = Molecular Volume of VOC (86.2 cm^3/mol for 1,1-DCA)

At 10°C, the mass diffusivity of 1,1-dichloroethane is 7.6×10^{-6} cm^2/s. This diffusivity placed in the mass transfer relationship results in a K_L estimate of 0.023 cm/sec.

The air stripper has six stages. In order to obtain an overall C_o/C_i of 0.0039 (i.e., 30/7600), the C_o/C_i for each stage must be 0.35. In other words, each stage must remove 65 percent of the compound entering the stage. In order to attain this C_o/C_i, the required air-to-water ratio would be approximately 30. Based on a groundwater flow rate of 10 gpm, the air flow rate per stage would need to be 40 cfm. The total flow rate to the air stripper would need to be at least 240 cfm. The design air flow rate of the stripper is 370 cfm which allows for maintaining adequate treatment as the diffusers become fouled.

Iron Removal

The analytical data on total and dissolved iron indicates that approximately 65 to 99 percent iron is present in suspended form. Based on the influent concentration of

6.4 mg/l and the effluent limitation of 1.7 mg/l, approximately 75 percent of the iron must be removed from the groundwater prior to discharge. While it may be necessary to remove a fraction of the dissolved iron to comply with the effluent limitations, iron removal is primarily a suspended solids removal process. The existing suspended solids data, as noted previously, is based on monitoring well data which typically provides a conservative estimate of actual groundwater solids which will come from the collection trench.

Several methods of solids removal were considered: sedimentation, multi-media filtration (sand and anthracite), bag filtration, manganese greensand filtration, and ion exchange (zeolite softening). Bag filters were chosen as the preferred technology for the following reasons:

1. Bag filtration avoids the handling of chemicals to promote settling and sludge associated with sedimentation, processing backwash water associated with multi-media filtration or greensand filtration, and bed regenerating associated with greensand filtration and ion exchange.

2. Bag filtration will not unnecessarily remove the hardness from the groundwater as is the case with ion exchange. While bag filtration will indiscriminately remove additional suspended solids other than iron, this is the case with all of the technologies.

3. Bag filtration requires the least floor space and provides for simplest operation.

In addition, the iron could be removed upstream or downstream of the air stripper. The design of the treatment system has employed removal of iron downstream of the air stripper for the following reasons:

1. The air stripping process will convert dissolved iron to suspended iron. As indicated, it may be necessary to remove a fraction of the dissolved iron to comply with the effluent limitations.

2. The air stripping process which has been employed (i.e., diffused aeration) can handle high levels of hardness, iron and suspended solids making pre-stripper filtration unnecessary.

3. The clogging of bag filters would result in varying head on the sump pumps (i.e., pressure drop across filters can rise from less than 1 psig to 25 psig). Sump pumps are not primarily designed to handle this level of head and the flow rate to the stripper could vary widely.

4. Filter bags would be used to filter treated groundwater (i.e., effluent from the air stripper) and could be disposed as non-hazardous waste.

The air stripping process will convert most of the dissolved ferrous bicarbonate to suspended ferric hydroxide. The removal of carbon dioxide via air stripping will raise the pH of the groundwater from approximately 7 to 8. The air stripper detention time at the design flow rate of 10 gpm is 15 minutes. Based on this detention time and the groundwater pH, approximately 90 percent of the dissolved iron would be converted to suspended iron.

Grain-size distribution tests performed on site soils indicate that the site soils are approximately 50 to 70 percent silt ($75\ \mu > d_p > 5\ \mu$) and 30-50 percent clay ($d_p < 5\ \mu$). The selection of concrete sand for the collection trench media was based on its high hydraulic conductivity and relatively fine grain size. Under steady-state conditions (post-construction and start-up), the solids content of the influent is expected to be lower than the levels shown in Table 1, because of the following:

1. The majority of the collected groundwater will be coming from the sand lenses not the silt and clay;

2. The groundwater velocities are extremely low and are not expected to disturb the native soil materials.

3. The clay, in particular, is expected to remain in place due to its cohesive nature.

The suspended solids in the system will be associated with suspended iron and calcium carbonate. Based on an influent iron concentration of 6.4 mg/l, this will be converted to approximately 13 mg/l of ferric hydroxide. It is estimated that (as a result of the stripping of carbon dioxide in the air stripper) approximately 5 mg/l of $CaCO_3$ will precipitate out. Therefore, the TSS concentration in the air stripper effluent would be approximately 20 mg/l. Using a safety factor of 1.5, the design TSS concentration for sizing the bag filtration system will be 30 mg/l. Unflocculated suspended iron has a d_p of approximately 5 μ (i.e., lower end for suspended particles). To accomplish iron removal, 3 μ bag filters will be employed.

Based on a flow of 10 gpm and the design influent TSS concentration (30 mg/l), approximately 3.6 pounds of solids must be removed daily from the groundwater. Tests on standard filter bags (3 μ) indicate dirt holding capacities on the order of 0.2 pounds at 10 gpm. Therefore, if standard filter bags were used, the system would go through 18 bags a day. This would not be acceptable from an O&M perspective. Tests on bag-sized pleated cartridges (3 μ) indicate dirt holding capacities on the order of 2.9 pounds at 10 gpm. Dirt holding capacity is inversely proportional to the square root of the flow rate. The dirt holding capacity can be increased by oversizing. For instance, if a given flow is passed through 4 cartridges at one time rather than one, the dirt holding capacity doubles (i.e., $4^{1/2}$). The number of filter bags required in a system to spread out changeouts over a given period is given by the following:

$$N_f * DHC * N_{fb}^{\ 1/2} * N_{fb} = SRR * t_c$$

where:

N_f = Number of Multi-Bag Filters (2 for a duplex system)

DHC = Dirt Holding Capacity at Q for a Single Filter Bag (2.9 lbs)

N_{fb} = Number of Filter Bags in each Multi-Bag Filter

SRR = Solids Removal Rate (3.6 lbs/day)

t_c = Time between Changeouts (days)

If the changeout of the filter bags was to be done every 2 weeks, the duplex filtration system would need to provide a minimum of 4 bags per filter. A system such as this could handle 800 gpm so it can be seen that at these high solids loadings it is O&M considerations, not the flow rate, that dictates sizing.

2.1.6 Process Instrumentation and Controls

As previously discussed, groundwater will be pumped from the collection sump to the treatment building by two pumps, a low flow (2 gpm) pump, and a high flow (10 gpm) pump. Flow sensors and totalizers in the treatment building will measure and display the flow transferred by each pump. The operation of this duplex pump station is controlled by a set of 5 level switches. As long as the sump level rises only above the first high level, the low flow pump is used to transfer groundwater. When the second high level is reached, the low flow pump is shut down and the high flow pump is used to transfer groundwater. High-high and low-low levels in the sump, indicative of the pumps not keeping up with influent flow or the pumps not shutting down when the sump is near empty, respectively, result in alarm signals.

The instantaneous flow discharged from the collection sump pumps can be manually controlled by throttling a diaphragm valve in each influent pipe line at the treatment building.

The pressures in the influent lines are monitored to protect the pumps. If the pressure exceeds the setpoints, indicating blockage in the influent line, the sump pumps are shut down and an alarm signal is sent.

The air stripper blower line is monitored for temperature, pressure and differential pressure. These three process variables can be used to determine the air flow rate by the following relationship:

$$Q = \{[\Delta P * K^2 * D_i^4 * P * 16{,}590]/[S_s * (T + 460)]\}^{1/2}$$

where:

Q	=	Flowrate (scfm)
ΔP	=	Differential Pressure (inches of water column)
K	=	Flow Coefficient (0.67 for 4" pitot tube)
D_i	=	Inside Pipe Diameter (inches)
P	=	Static Line Pressure (psia)
S_g	=	Specific Gravity @60 °F (1 for air)
T	=	Temperature (°F)

A high temperature and pressure in the line would indicate potential blockage between the air stripper and the blower or clogging of the diffusers. The stripper air piping manifold is constructed of PVC, therefore, protection against excessive temperatures is essential.

The air stripper tank is monitored for lid pressure and water level. An abnormal lid pressure would indicate blockage in the vent. An abnormal air stripper tank water level would indicate either blockage in the line to the transfer tank or a problem with the pumps in the transfer tank. The air stripper effluent transfer tank duplex pumps are operated in a manner similar to that of the collection sump.

High differential pressure across the bag filters would indicate that the filter cartridges would require cleaning/replacement.

The collection sump pumps and air stripper blower are shutdown for the following process conditions:

1. Blockage in the influent lines.
2. Blockage in air stripper tank air vent.
3. High level in the air stripper tank.
4. Low blower air flow.
5. High blower air temperature.
6. High blower air pressure.
7. High-high level in the air stripper effluent transfer tank.
8. High differential pressure at the bag filters.

These alarm conditions will result in a signal being delivered by auto dialer to the LMC project engineer and O&M Contractor. Once in alarm mode, the system will not restart, until a reset button has been depressed locally or remotely. The operator will be able to monitor the system remotely via modem and the programmable logic controller (PLC) to determine flow rates, totalized flow, pressures, equipment operating status, temperatures, as well as, input operating set points.

In general, the system is set up for a time delay between the shutdown of the influent pumps and the blower to ensure against the discharge of untreated groundwater.

2.1.7 Effluent Outfall

The effluent from the treatment system will flow by gravity via an existing storm sewer (Drawing 1). The receiving water for this discharge is Sanders Creek. Sanders Creek (Water Index No. P 154-3-3) is a Class C Stream. The effluent line to the storm sewer is a 4-inch line with a capacity of 100 gpm.

Installation of a separate effluent outfall to Sanders Creek will be considered based on maintenance experience during system operation, or as a result of future site development and usage. At this time, LMC does not anticipate installing a separate effluent outfall to Sanders Creek. However, LMC will maintain this alternative as a contingency.

2.1.8 Utilities

The treatment facility will be furnished with water, electricity, and telephone. The electric service will be rated at 120/208 V, 3 phase, 200 amp. Two telephone lines will be installed at the facility: one for voice and the other for the PLC modem.

2.2 Construction Drawings and Technical Specifications

The construction drawings and technical specifications will be provided to the NYSDEC in accordance with the schedule contained in Section 4. Lists of construction drawings and technical specifications are presented in Tables 5 and 6, respectively.

3 PERMIT EQUIVALENCIES

The IRM treatment facility will be required to meet equivalencies of an effluent discharge permit and an air emissions permit. These are discussed in the following sections.

3.1 Effluent Discharge

On May 23, 1997, EMCON submitted a letter to the NYSDEC requesting discharge criteria. The letter included information on the receiving stream, the design flow rate and influent concentrations, the treatment system and the duration and frequency of discharge. In a July 9, 1997 letter, the NYSDEC provided LMC with effluent limitations and monitoring requirements for the groundwater collection and treatment system.

The correspondence with regards to effluent discharge requirements is provided in Appendix B.

3.2 Air Emissions

On August 5, 1997, EMCON submitted a letter to the NYSDEC requesting approval of the air emissions that will be discharged from the treatment system. The letter included information regarding the anticipated air contaminant emission rates, and an ambient air quality impact evaluation. The ambient air quality impact model determined that the air emissions from the treatment system would result in air quality impacts below the Annual Guideline Concentrations (AGCs) and the Short Term Guideline Concentrations (SGCs) of NYSDEC's Guidelines for the Control of Toxic Ambient Contaminants - Air Guide 1 (draft 1991). Based on this analysis, no emission controls will be required.

Subsequent correspondence between NYSDEC and LMC regarding the air emissions are dated August 27, 1997, September 15, 1997, September 29, 1997, October 16, 1997, October 24, 1997, and November 5, 1997. The correspondence with regards to the air emissions is provided in Appendix C.

4 SCHEDULE

The schedule for completion of the IRM work described herein includes final NYSDEC review and approval of this Work Plan, contractor procurement, construction activities, startup activities and preparation of a final engineering (certification) report. It is anticipated that the IRM construction activities described herein will be completed within 3 months from receipt of NYSDEC approval of this Work Plan. The detailed schedule is included in Figure 2.

5 CONTINGENCY PLAN

This Contingency Plan has been developed in the event that any element of the groundwater collection and treatment system fails to operate in accordance with the remedial design. The Contingency Plan addresses design, installation and operations and maintenance phases of the IRM.

5.1 Design Contingency

The contingency elements which will be incorporated into the Contract Documents (Construction Drawings and Technical Specifications) as part of the design include:

- The system can handle higher than design concentrations. The air stripper has been designed based on the conservative flow rate of 10 gpm, influent concentration safety factors of at least 2, a safety factor for the Henry's Law Constant of 1.5, and additional overall safety factor of 1.5 (i.e., 370 cfm [actual air flow rate]/240 cfm [required air flow rate]).

- The system can handle higher than design flow rates. The air stripper has been designed based on the conservative flow rate of 10 gpm. The hydraulic capacity of the air stripper and the filters is 100 gpm and 800 gpm, respectively. The buried influent lines from the collection sump can handle approximately 40 gpm. In the event that higher flow rates are encountered, the high and/or low flow pumps can be replaced with higher capacity pumps.

- The system has piping connection capability to add water from decontamination and collection piping/trench cleaning activities to the treatment system for treatment.

- The system has piping connection capability for bypassing direct discharge from the filters. Bypassing will be used during startup and, in the future, if additional treatment units are required.

- The system has provisions for temporary shut down in the event of flooding in the area of the treated effluent discharge.

5.2 Installation Contingency

The contingency elements which have been incorporated into the field installation phase of the IRM include:

- If unknown physical constraints exist, placement of yard piping and utilities may be modified.

- The selection of the filter bag sizing will be based on the results of startup testing.

- As appropriate, LMC will dispose of water collected during construction through the on-site treatment system, once the system has been proven to be effective.

5.3 Operations and Maintenance Contingency

The contingency elements which have been incorporated into the operations and maintenance phase of the IRM include:

- The development of an O&M manual for the treatment system which will require scheduled maintenance and troubleshooting procedures. Adequate inspection, prompt repair, and quality control of repair work will keep unscheduled maintenance to a minimum.

- The O&M Contractor will maintain spare parts to perform normal maintenance of all equipment. Spare parts for equipment have been included in the Technical Specifications. Back-up pumps will be maintained at the treatment facility in case of pump failure.

6 SITE-SPECIFIC HEALTH AND SAFETY PLAN

The purpose of the Site-Specific Health and Safety Plan (HASP) Addendum No. 1 and Addendum No. 2 is to provide specific guidelines and establish procedures for the protection of personnel performing the scope of activities described in this Work Plan. The original HASP developed for the site by Blasland, Bouck & Lee, Inc. in August 1996, will be used in conjunction with these addenda as the site-specific HASP for this work. The HASP Addendum No. 1 is included as Appendix D, and Addendum No. 2 is presented in Appendix E.

7 STARTUP PLAN

7.1 General

Following the construction of the IRM, a 2-week startup period will be conducted to initiate the operation of the groundwater collection and treatment system. The startup of the groundwater collection and treatment system will be the combined effort of the general contractor, equipment manufacturer representatives, the LMC project engineer and the O&M Contractor. The startup will be conducted by the O&M Contractor. The general contractor will be responsible for testing all pumps, pipes and other equipment as required by the Technical Specifications prior to startup. The general contractor will also provide the services of the equipment manufacturers' representatives who will train the LMC project engineer and O&M Contractor related to operation of the system. Instruction shall include equipment operation, maintenance and service requirements including a review of the operation and maintenance manual.

Although not intended to be a step-by-step procedure, the following sections address the primary concerns during the pre-startup and startup periods.

7.2 Pre-Startup

The pre-startup period of the IRM includes the general contractor's testing of the equipment and piping in accordance with the Technical Specifications, as well as programming the logic controller. The following address primarily the settings required at the PLC control panel prior to system startup.

Sump Pumps

- Place pump power switches to "OFF" position.
- Open all diaphragm valves on the inlet manifold.
- Close influent and effluent sampling valves.
- Set low flow influent high pressure at 10.5 psi.
- Set high flow influent high pressure at 17.5 psi.

Air Stripper

- Place air stripper blower power switch in "AUTO" position.
- Set blower high pressure at 20 psi.
- Set blower high temperature at 120 °F.
- Set blower low flow at 250 cfm.

Duplex Bag Filter System

- Set the filter high differential pressure for 20 psi.

7.3 Startup

During startup, potable water will be used initially to determine the operability of all components and instrumentation. Once it has been determined that all systems are operational, impacted groundwater will be pumped into the system.

During initial operation using collected groundwater, LMC will discharge the treated groundwater into a temporary storage tank. LMC will collect one effluent sample after the initial 12 hours of system operation (approximately 7,200 gallons treated). This sample will be analyzed (for 24-hour turnaround) to determine VOC (as listed in the Effluent Limitations and Monitoring Requirements for the system) and iron concentrations. During this time, treated effluent will continue to be contained in the tank. Once the laboratory data are received documenting effluent concentrations below the discharge limitations, the tank contents (fully treated groundwater meeting discharge limitations) will be discharged directly to the storm sewer. Following this confirmation of effluent discharge criteria, treated effluent will be discharged directly from the treatment system to catch basin CB-20, and weekly effluent monitoring will continue, as required in the Effluent Limitations and Monitoring Requirements for the system.

In the event that discharge limitations are not met, the containerized groundwater will be recirculated through the treatment system until proper treatment conditions are established.

LMC will review the initial analytical data on effluent quality and operational experience during startup. If the analysis indicates that effluent concentrations are only slightly below discharge criteria, or if operational problems are encountered, LMC will repeat the containment/effluent sampling procedure followed during the startup period.

8 IRM O&M PLAN

This Operations and Maintenance (O&M) Plan for the groundwater collection and treatment system addresses the post-construction activities associated with operating, monitoring and maintaining various aspects of the treatment system.

The purpose of this plan is to provide an overview and general working knowledge of the groundwater collection and treatment system and its individual components. As part of the requirements of the construction of the treatment system, the general contractor will submit an Equipment and Instrumentation Manual which will provide a detailed explanation of operation, maintenance, and repair of individual pieces of equipment.

This O&M Plan addresses operation and maintenance activities associated with post-construction, including the following items:

- Process Description
- Operation and Maintenance
- Record Keeping and Reporting
- System Shutdown Procedures
- Routine Monitoring and Laboratory Testing
- Troubleshooting

8.1 Process Description

The groundwater collection and treatment system provides a means for collecting VOC-impacted groundwater at the site and treating the water to remove the compounds. In addition to VOC removal, the effluent limitations also require the removal of iron prior to discharge.

The redemption system includes a collection trench and sump from which impacted groundwater is pumped to the treatment system. The collection sump has a low flow (P-1, 2 gpm) pump and high flow (P-2, 10 gpm) pump. The pumps are turned on and off by a series of 5 level sensors in the collection sump.

The pumps discharge groundwater to a common header pipe located within the treatment building. The flow rate and totalized flow from each pump is monitored separately. The header pipe discharges into the 6-stage diffused aeration tank. The blower (B-1), which is turned on when the sump pumps are started, forces air through diffuser orifices causing

VOCs to be stripped from the groundwater flow. The effluent from the air stripper flows by gravity to a transfer tank. From this tank, the groundwater is pumped (Pumps P-3 and P-4) through bag filters. When the setpoint differential pressure for the bag filters is reached, the bags must be cleaned or replaced.

The treated water will flow by gravity to a catch basin (CB-20) and through storm piping to Sanders Creek (Outfall OF-1A). Alternatively, a separate effluent line to Sanders Creek may be installed. The air emissions are discharged to the atmosphere through a 33-foot high stack adjacent to Building 5.

All major system components are activated from the control panel. The control panel contains a programmable logic controller (PLC) which is programmed to monitor all system operations and to automatically shut down the system when an alarm condition occurs.

8.2 Operation and Maintenance

8.2.1 Personnel

Personnel will be knowledgeable in the operation and maintenance of groundwater treatment systems. Personnel shall have current training in health and safety and emergency response in accordance with OSHA, the Site-specific Health and Safety Plan, and will have successfully completed LMC Contractor Safety Training. The O&M Contractor will be experienced in:

- Remediation system operation and maintenance.
- Pump, electrical control and instrumentation system operation and maintenance.
- Environmental sampling.

8.2.2 Startup Inspection and Maintenance

During system startup, all components of the system will be inspected daily until all components are determined to be in proper working order and initial monitoring results confirm that the effluent limits are achieved. Normal inspection and maintenance procedures, as described below, will be implemented during the startup period. The startup period will take approximately 2 weeks.

8.2.3 Normal Inspection and Maintenance

Normal inspection and maintenance tasks will focus on the groundwater collection system, pump station, discharge pipe line, treatment system, and outfall. Normal maintenance of the system will be accomplished by on-site inspections, scheduled maintenance, and remote monitoring.

On-Site Inspections

The treatment system will be inspected on a bi-weekly basis during the first 3 months of operation following startup, and monthly thereafter. The following will be done during the on-site inspections:

- Observe condition of collection sump and collection system clean-out risers. Check for damage to the access hatch and protective covers.
- Check collection sump for build-up of sediment. Remove sediment if sediment has accumulated to a point half way between the floor of the collection sump and the inlet to the pump. At the same time, remove the sump pumps and remove any build-up from pump intake strainer.
- Clean any biological or mineral buildup from probes and sensors.
- Check system for any signs of tampering or loose fittings.
- Check electrical components in control panel for signs of wear, moisture, damage, etc.
- Visually check system components for excessive wear due to mechanical or chemical problems. Replace as necessary.
- Check LED alarm lights on outside of central control panel.
- Record air delivery pressure, temperature and differential pressure and calculate air delivery flow rate to determine that it is acceptable and as a check on the PLC calculated value.
- Check the condition of the air diffusers in the air stripper. One additional air diffuser for the air stripper will be stored on-site. This will allow for change out of the diffuser for cleaning purposes without interrupting the operation of the treatment system.
- Record influent pressure readings as sump pumps actuate.
- Record the time of day and total gallons pumped on flowmeter and flow rate when pump is on.

- Note frequency of pump cycling. If cycling more than designed, adjust discharge flow rate by throttling the diaphragm valve on the respective discharge line.

- Record differential pressure across bag filters. Replace bags as necessary. The bag filters are a duplex filter which allow flow to be redirected to the side with the clean filters while maintenance is being completed on the other filter.

- Sample the influent and effluent of the treatment facility in accordance with the effluent monitoring requirements. It should be noted that monitoring for both VOCs and iron is required on a weekly basis during the first 16 weeks of operation.

Scheduled Maintenance

The groundwater collection pipe shall be cleaned after the first year of operation, or as needed to support effective operation of the treatment system. Cleaning shall be performed by jet cleaning from the clean-out risers toward the collection sump. Water and sediment collected in the collection sump during cleaning will be introduced into the on-site treatment system (i.e., some form of settling of sediment may be carried out prior to pumping into the treatment system).

The scheduled maintenance for pumps and blowers will be addressed in the Equipment and Instrumentation Manual prepared by the general contractor who completes system installation.

Remote Monitoring

A local control and alarm panel will be installed within the treatment building. Any alarm condition, such as blower failure or high sump well level, will be transmitted to the LMC project engineer and the O&M Contractor. Remote monitoring of the operating status will also be available. A power failure alarm will immediately be transmitted and will remain active until an acknowledgment has been received.

8.3 Recordkeeping and Reporting

Procedures will be employed to monitor the O&M of the treatment system, including a program of self-inspection, record keeping, and reporting. The procedures are discussed in the following sections.

8.3.1 Operating Logs

Records will be maintained to evaluate the inspection, operating, maintenance, and monitoring of the treatment system. Monthly inspection, operations and maintenance conducted for the treatment system will be summarized in operating logs. Monthly inspection and operating logs will include the date, weather, on-site personnel, visitors, description of work performed, equipment utilized, and comments. These logs will be recorded and maintained at the site. Some of the information will be reported to the NYSDEC through progress reporting in accordance with the Consent Order.

8.3.2 Laboratory Records

Records will be maintained regarding the results of all laboratory analysis. Reports will be prepared and submitted to the NYSDEC, as necessary, on environmental monitoring and laboratory testing.

8.3.3 Reporting Requirements

As part of the monitoring program, progress reports will be submitted to NYSDEC in accordance with the Consent Order. Site inspection and maintenance activities related to operation and maintenance of the treatment system will be reported The following items will be included in the progress reports:

- A summary of the monitoring results obtained.
- The quantities of groundwater treated and quality of effluent.
- Maintenance activities, noting any problems and corrective actions taken.

8.4 System Shutdown Procedures

8.4.1 Normal Shutdown Procedures

To shutdown the system for routine maintenance or any non-emergency reason, follow the procedure described below:

1. Turn the sump pump selector switches to "OFF".

2. The air stripper effluent transfer tank pumps will automatically stop when the transfer tank reaches the low level switch (LSL-2).

3. Manually shut off the air stripper blower at the control panel after the air stripper effluent transfer tank pump stops.

4. Do not shut off PLC unless system is shut down for an extended period of time.

8.4.2 Emergency Shutdown Procedures

Although the normal shutdown procedure is the preferred method for shutting down the system, the following procedure is recommended when rapid shutdown is necessary during emergency conditions such as fire or catastrophic failure of tanks, pipes, etc.

1. Shut off electrical power to the system by placing the system selector switch, located on the main control panel, to the "OFF" position.

8.5 Routine Monitoring and Laboratory Testing

Monitoring of the groundwater collection and treatment system will serve the following purposes:

1. To demonstrate that hydraulic control is being maintained along the collection trench.
2. To demonstrate that the treated groundwater meets the effluent limitations established by the NYSDEC .
3. To demonstrate that air emissions from the air stripper do not exceed NYSDEC short-term guideline concentrations (SGCs) or annual guideline concentrations (AGCs).

8.5.1 Hydraulic Control

Groundwater level monitoring at all on-site monitoring wells and piezometers is not necessary to demonstrate hydraulic control along the groundwater collection trench. However, groundwater elevation data will be useful in preparing the Feasibility Study for the site. Based on the results of the RI, and an evaluation of groundwater remedial technologies, LMC anticipates recommending the IRM as a final remedy for site groundwater.

The ability of the groundwater collection trench to collect groundwater from the site will be demonstrated by establishing a hydraulic gradient in the shallow groundwater on either side of the collection trench toward the collection trench. To demonstrate hydraulic control, groundwater elevations will be determined from the following shallow monitoring wells, piezometers, and staff gauges (i.e., MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S, MW-7S, MW-9, MW-10, MW-11, MW-12, MW-13, MW-15, MW-16A, MW-17A, MW-18A, MW-19S, T1-EAST, T2-EAST, T3-EAST, SG-1, SG-2, SG-3, SG-4, and SG-5), and the cleanout risers and collection sump. These measurements will be completed prior to system startup, twice during the 2-week startup period, and monthly for 6 months following startup. Groundwater contour maps will be prepared for each round of data collected. These maps will be submitted to the NYSDEC at the end of the 6-month period.

Following the initial 6-month period, the groundwater level monitoring program will be based on the results of the first 6 months of monitoring and will be mutually agreed upon by the NYSDEC and LMC.

8.5.2 Effluent Limitations

Monitoring of the treatment system effluent will be in accordance with the requirements set forth in NYSDEC's Effluent Limitations and Monitoring Requirements. Monitoring frequency will be in accordance with the schedule below. Laboratory testing will be performed by a New York State certified laboratory. The influent will only be sampled for iron and VOCs to assess treatment efficiency.

Parameter	Frequency	Sample Type
Flow	Weekly	Instantaneous
pH (Range)	Weekly	Grab
Solids, Total Dissolved	Weekly	Grab
Arsenic, Total	Monthly	Grab
Chromium, Total	Monthly	Grab
Copper, Total	Monthly	Grab
Iron, Total	Weekly	Grab
Lead, Total	Monthly	Grab
Nickel, Total	Monthly	Grab
Selenium, Total	Monthly	Grab
Silver, Total	Monthly	Grab
Thallium, Total	Monthly	Grab
Vanadium, Total	Monthly	Grab
Zinc, Total	Monthly	Grab
Vinyl Chloride	Weekly	Grab
Chloroethane	Weekly	Grab
1,1-Dichloroethane	Weekly	Grab
1,2-Dichloroethene (Total)	Weekly	Grab
1,1,1-Trichloroethane	Weekly	Grab
Trichloroethene	Weekly	Grab
Benzene	Weekly	Grab
Toluene	Weekly	Grab
Ethylbenzene	Weekly	Grab
Xylenes (Total)	Weekly	Grab

8.5.3 Air Emissions

Modeling (Industrial Source Complex Short Term — Version 3 (ISCST3)) was performed to establish the ambient concentrations which may occur at off-site areas as a result of the air stripper emissions. The modeling was based on certain mass loadings of VOCs from the collected groundwater, and 100 percent stripping and emissions to the atmosphere. Since the treatment system has not been constructed, the mass loadings used were determined theoretically. To demonstrate that SCGs and AGCs are met during the operation of the groundwater collection and treatment system, influent samples of the groundwater (prior to air stripping) will be collected and analyzed for VOCs. The VOC concentrations and the flow quantity will be used to demonstrate that the mass loadings used for the ambient air quality modeling are not exceeded. Mass loadings of VOCs used for the model are provided below:

Parameters (VOCs)	Maximum Hourly Emissions (lb/hr)	Average Hourly Emissions (lb/hr)
Vinyl Chloride	1.57×10^{-3}	1.36×10^{-3}
Chloroethane	6.51×10^{-5}	5.66×10^{-5}
1,1-DCE	5.01×10^{-7}	4.36×10^{-7}
1,1-DCA	9.52×10^{-3}	8.28×10^{-3}
1,1,1-TCA	5.01×10^{-5}	4.36×10^{-5}
1,2-DCE	1.35×10^{-4}	1.18×10^{-4}
TCE	1.50×10^{-6}	1.31×10^{-6}
Benzene	8.11×10^{-5}	7.06×10^{-5}
Toluene	1.95×10^{-4}	1.70×10^{-4}
Ethylbenzene	6.56×10^{-5}	5.71×10^{-5}
Xylenes	7.83×10^{-4}	6.81×10^{-4}

In the event that flow rate or influent concentrations are found to be more than 10 percent higher than the design criteria (on a monthly basis), LMC will reevaluate ambient air quality impacts. This will consist of confirmation that the mass emissions of individual VOCs are not greater than those listed above. If the mass VOC emissions are not greater than those listed above, no additional ambient air quality modeling will be performed. If during any month, the mass emissions of VOCs are greater than those listed above, an ambient air quality evaluation will be performed using the actual mass removal of VOCs encountered that month to determine compliance with AGCs and SGCs. The ambient air quality evaluation will be provided to the NYSDEC within 14 days.

8.5.4 Groundwater Quality

Groundwater quality monitoring is not required to demonstrate the effectiveness of the IRM collection trench to establish hydraulic control. However, monitoring for groundwater quality will be useful in preparing the Feasibility Study for the site. Based on the results of the RI and an evaluation of groundwater remedial technologies, LMC anticipates recommending the IRM as a final remedy for site groundwater.

Groundwater samples for VOCs will be collected and analyzed from MW-12, MW-11, MW-18A, MW-10, MW-17A, MW-16A, MW-8S, and MW-19S on a quarterly basis for a period of 1 year beginning during the startup period, with the RI groundwater quality data serving as baseline groundwater quality. This will provide comparative data upgradient and downgradient of the groundwater collection system. After 1 year, because groundwater quality changes associated with this IRM are not expected to occur rapidly, the sampling frequency will be reduced to annually until site monitoring requirements are established as part of the selected remedy.

Procedures for collecting these groundwater samples will be as described in the NYSDEC-approved RI/FS Work Plan. Sample analysis for VOCs will be performed using ASP 95-4. However, the requested laboratory deliverable will consist of data summary reports (i.e., Form I and QC Report)."

8.6 Troubleshooting

Some equipment malfunctions will cause an alarm message to be generated by the programmable logic controller (PLC). Section 8.6.1 outlines these malfunctions. Section 8.6.2 addresses malfunctions that are not programmed into the PLC.

8.6.1 PLC Programmed Alarms

The PLC is programmed to display the following alarm messages on the message display unit located on the main control panel. Each alarm message will initiate a general system shutdown and will require action by the operator to restore system operation.

Alarm Message	Cause and Remedy
High-High Level in Sump (LAH-1)	**Cause:** Pump P-2 unable to keep up with influent flow to sump Pump P-2 not being turned on as designed. **Remedy:** Verify that Pump P-2 is pumping in accordance with pump curve. If P-2 is pumping in accordance with pump curve, open diaphragm valve wider to reduce head on pump until sufficient flow rate is obtained. Check pump screens for clogging. Check to ensure that when LSH-2 is reached that P-2 is activated. If not, replace level sensor.
Low-Low Level in Sump (LAL-1)	**Cause:** Pumps P-1 or P-2 not being turned off as designed. **Remedy:** Check to ensure that when LSL-1 is reached that P-1 or P-2 (whichever is operating) is deactivated. If not, replace the level sensor.
High Influent (Low Flow) Pressure (PAH-1)	**Cause:** Plugging of the low flow influent line. **Remedy:** Check the setting on the diaphragm valve. Cleanout the Y-check valve. Cleanout the flow sensor.
High Influent (High Flow) Pressure (PAH-2)	**Cause:** Plugging of the high flow influent line. **Remedy:** Check the setting on the diaphragm valve. Cleanout the Y-check valve. Cleanout the flow sensor.

Alarm Message	Cause and Remedy
High Air Stripper Lid Pressure (PAH-4)	**Cause:** Plugging of the air stripper/building vent. **Remedy:** Check to ensure that nothing is blocking the air stripper/building vent.
High Air Stripper Water Level (LAH-3)	**Cause:** Plugging of the air stripper effluent line. **Remedy:** Check to ensure that nothing is blocking the air stripper effluent line. Check the operation of the transfer tank operation.
Low Blower Flow (FAL-1)	**Cause:** Air flow to air stripper insufficient to ensure treatment of groundwater. **Remedy:** Verify that Blower B-1 is operating in accordance with blower curve. If B-1 is operating in accordance with blower curve, check air distribution piping in air stripper for clogging and replace or clean diffusers, if necessary.
High Blower Pressure (PAH-3)	**Cause:** High pressure in line between blower and air stripper. **Remedy:** Check air distribution piping in air stripper for clogging and clean, if necessary. Check air inlet filter for clogging.

Alarm Message	Cause and Remedy
High Blower Temperature (TAH-1)	**Cause:** High temperature in line between blower and air stripper. **Remedy:** Check air distribution piping in air stripper for clogging and clean, if necessary. Summer operation may not be able to handle the same amount of fouling as winter operation.
High-High Level in Transfer Tank (LAH-3)	**Cause:** Pump P-4 unable to keep up with influent flow to transfer tank. Pump P-4 not being turned on as designed. **Remedy:** Verify that Pump P-4 is pumping in accordance with pump curve. If P-4 is pumping in accordance with pump curve, open diaphragm valve wider to reduce head on pump until sufficient flow rate is obtained. Check to ensure that when LSH-5 is reached that P-4 is activated. If not, replace level sensor.
Low-Low Level in Sump (LAL-2)	**Cause:** Pumps P-3 or P-4 not being turned off as designed. **Remedy** Check to ensure that when LSL-2 is reached that P-3 or P-4 (whichever is operating) is deactivated. If not, replace the level sensor.
High Differential Pressure at Bag Filters (DPAH-1)	**Cause:** Allowable pressure drop across bag filters has been exceeded. **Remedy:** Clean or change filter bags according to manufacturer's procedures.

8.6.2 Additional Operating Problems

The following additional problems could occur with the collection and treatment system.

Problem	Cause and Remedy
No Flow to Collection Sump	**Cause:** Collection lines are clogged. **Remedy:** Collection line blockage can be cleaned by rodding the line from the clean-outs provided.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

Table 1

Design Conventional Parameter Influent Concentrations
Former GE Court Street Building 5/5A
DeWitt, New York

Parameters	Design Influent Concentration (mg/l, unless otherwise specified)
Biochemical Oxygen Demand (BOD)	<15
Chemical Oxygen Demand (COD)	120
Ammonia (NH_4-N)	<0.5
Total Kjeldahl Nitrogen (TKN)	0.8
Total Organic Carbon (TOC)	7.0
Total Suspended Solids (TSS)	146
Total Dissolved Solids (TDS)	843
Hardness (As $CaCO_3$)	817
Alkalinity (As $CaCO_3$)	577
pH	6.5 - 7.0 S.U.

Note: milligrams per liter (mg/l) or parts per million (ppm).

Table 2

Design Metal Influent Concentrations
Former GE Court Street Building 5/5A
DeWitt, New York

Parameter	Design Influent Concentration (mg/l)
Aluminum	3.5
Antimony	0.001
Arsenic	0.006
Barium	0.182
Beryllium	<0.001
Cadmium	<0.001
Calcium	223.1
Chromium	0.005
Cobalt	0.002
Copper	0.006
Iron	6.4
Lead	0.004
Magnesium	63.5
Manganese	0.131
Mercury	<0.001
Nickel	0.005
Potassium	3.8
Selenium	0.001
Silver	0.001
Sodium	24.8
Thallium	0.003
Vanadium	0.006
Zinc	0.049

Note: milligrams per liter (mg/l) or parts per million (ppm).

Table 3

Volatile Organic Compound Influent Concentrations
Former GE Court Street Building 5/5A
DeWitt, New York

Parameters	Anticipated Influent Concentration (µg/l)	Stripper Design Concentration (µg/l)
Benzene	16	32
Chloroethane	13	26
1,1-Dichloroethane (1,1-DCA)	1902	7,606
1,1-Dichloroethene (1,1-DCE)	0.1	0.2
1,2-Dichoroethene (1,2-DCE)	27	54
Ethylbenzene	44	88
Toluene	39	78
1,1,1-Trichloroethane (1,1,1-TCA)	10	20
Trichloroethene (TCE)	0.3	0.6
Vinyl Chloride	313	1,250
Xylenes	156	313

Note: micrograms per liter (µg/l) or parts per billion (ppb).

Table 4

Effluent Limitations
Former GE Court Street Buildings 5/5A
DeWitt, New York

Parameter	Effluent Limitations
Conventional	
pH	6 - 9 (SU)
Metals (total, mg/l)	
Arsenic	0.03
Chromium	0.025
Copper	0.03
Iron	1.7
Lead	0.02
Nickel	0.025
Selenium	0.01
Silver	0.01
Thallium	0.015
Vanadium	0.03
Zinc	0.4
Volatile Organic Compounds (μg/l)	
Benzene	6
Chloroethane	170
1,1-Dichloroethane (1,1-DCA)	30
1,2-Dichoroethene (1,2-DCE)	30
Ethylbenzene	10
Toluene	10
1,1,1-Trichloroethane (1,1,1-TCA)	10
Trichloroethene (TCE)	10
Vinyl Chloride	50
Xylenes	10

Table 5

Construction Drawing List
Former GE Court Street Building 5/5A
DeWitt, New York

Drawing Number	Drawing Name
	Title Sheet and Location Plan
1	Site Plan
2	Groundwater Collection System Profile
3	Treatment System Plan and Sections
4	Process & Instrumentation Diagram
5	Collection System Details
6	Miscellaneous Details
7	Electrical

Table 6

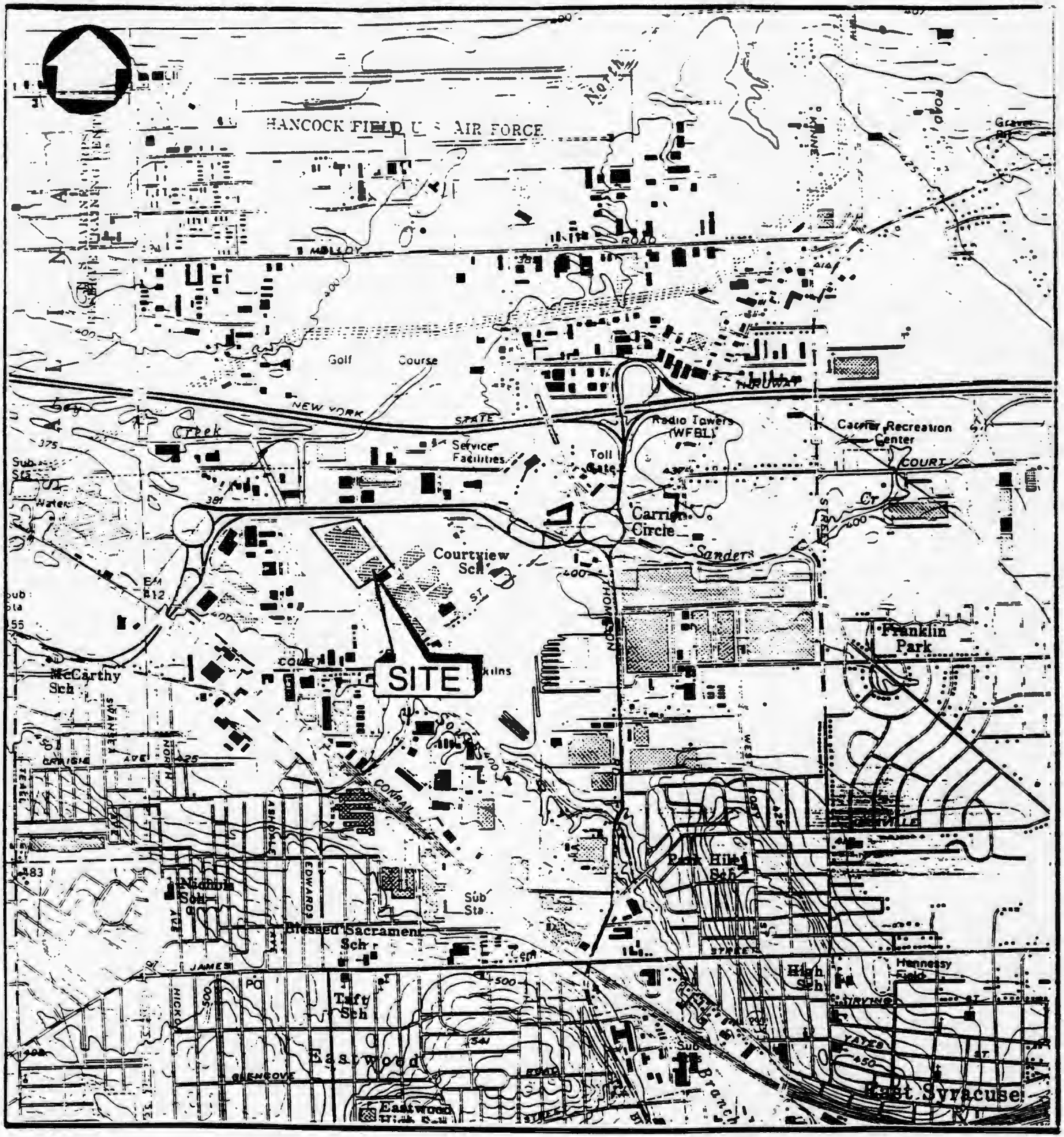
Technical Specifications List
Former GE Court Street Building 5/5A
DeWitt, New York

Specification Number	Specification Title
Division 1 - General Requirements	
01010	Summary of Work
01025	Measurement and Payment
01041	Project Coordination and Meetings
01050	Field Engineering
01090	Reference Standards
01201	Supervision by Contractor
01300	Submittals
01311	Network Analysis Schedules
01340	Shop Drawings
01400	Quality Control
01410	Testing Laboratory Services
01420	Inspection Services
01501	Health and Safety Provisions
01502	Environmental Protection
01600	Materials and Equipment
01650	Starting of Systems
01700	Contract Closeout
Division 2 - Site Work	
02110	Site Clearing
02140	Dewatering
02150	Shoring and Bracing
02220	Excavation
02223	Backfill and Fill
02228	Waste Material Disposal
02235	Topsoil
02519	Paving
02595	Geotextile
02601	Manholes and Appurtenances
02650	PVC Pipe
02660	HDPE Pipe
02936	Seeding

Table 6

Technical Specifications List
Former GE Court Street Building 5/5A
DeWitt, New York

Specification Number	Specification Title
Division 3 - Concrete	
03002	Field Concrete
03200	Concrete Reinforcement
03300	Cast-In-Place Concrete
Division 13 - Special Construction	
13121	Pre-Engineered Metal Building
Division 15 - Mechanical	
15060	Pipe, Fittings and Valves
15094	Pipe Hangers and Supports
15141	Centrifugal Pumps
15252	Air Stripping Equipment
15385	Duplex Bag Filter System
15540	Fire Extinguishers and Accessories
Division 16 - Electrical	
16100	Electrical - General
16200	Electrical - Controls
16300	Electrical - Instrumentation



2000 0 2000

SCALE IN FEET

SOURCE: 1957 U.S.G.S EAST SYRACUSE QUADRANGLE
7.5 MIN. SERIES PHOTOREVISED 1978

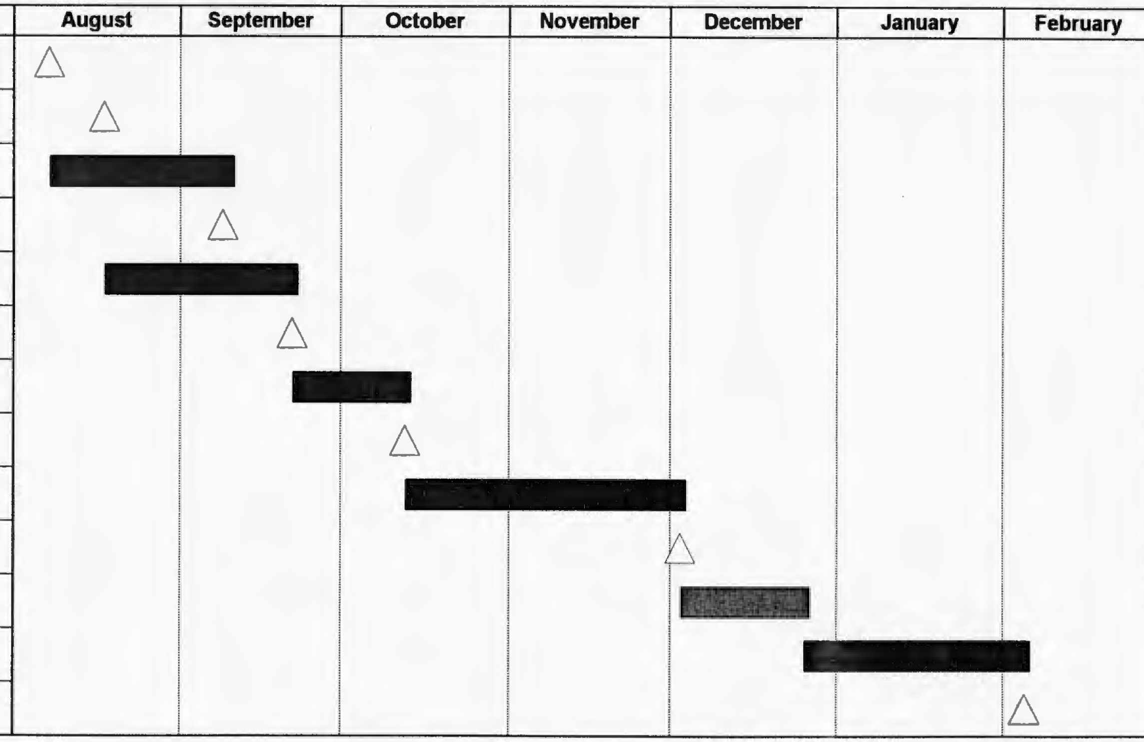
FIGURE 1

SITE LOCATION MAP

FORMER GE COURT STREET 5/5A SITE
DEWITT, NEW YORK

Figure 2
IRM Schedule - Groundwater Collection and Treatment System
Former GE Court Street Building 5/5A Site, Dewitt, New York

ID	Task Name
1	LMC Submits Work Plan to NYSDEC
2	LMC Submits Technical Specifications and Construction Drawings to NYSDEC
3	NYSDEC Review of Work Plan
4	NYSDEC Approval of Work Plan, Technical Specifications and Construction Drawings
5	IRM Contractor Procurement
6	Select IRM Contractor
7	Contractor Preparation of Submittals
8	Begin Construction
9	IRM Construction
10	Complete IRM Construction
11	System Testing and Startup
12	Prepare Engineering Report
13	LMC Submits Engineering Report to NYSDEC



Project:
Date: 8/11/97

Task — Milestone

J:\MartinM\86143-002.000\LMCPROJ

APPENDIX A

BORING LOGS

EMCON

TEST BORING LOG

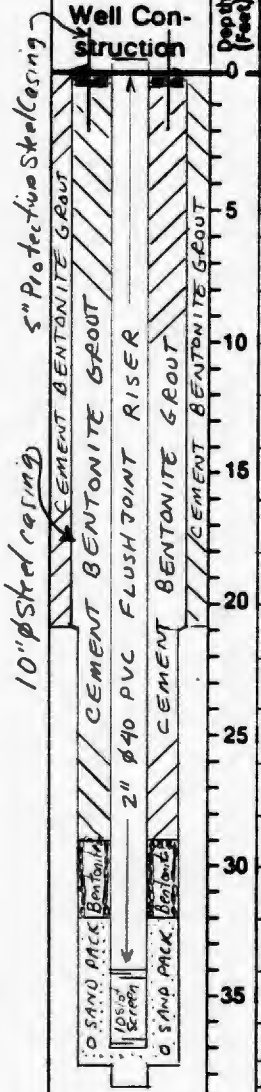
Boring No. MW-6D

Project RIFS COURT STREET S/SA SITE	Sheet No. 1 of 1
Client Lockheed Martin Corporation	Job No. 86143-001.000
Boring Contractor Parratt-Wolff	G.S. Elevation
	W.L. Ref. Elev.
	Date Started 2-10-97
	Date Finished
	Driller Mark Eaves
	Inspector JHK

Groundwater

Date	Water Depth	Water Elev.	Intake
2/20/97	4.54' BPVC		

	Cas.		Samp.	Core	Tube
Type	Steel	HSA	SS	–	–
Diam.	10"	4 1/4" ID	2"	–	–
Weight	–	–	140#	–	–
Fall	–	–	30"	–	–



No.	Type	Rec.	Blows per 6 inches	HNU** (ppm) Spoon	HNU** (ppm) HSA
1	SS	18	2-2 / 5-5	0	0
2	SS	6	5-5 / 6-5	0	0
3	SS	10	2-3 / 4-4	0	0
4	SS	22	4-5 / 5-6	0	1.5
5	SS	15	5-6 / 5-6	0	6
6	SS	6	2-2 / 2-2	0	5
7	SS	22	2-2 / 2-2	0.2	9
8	SS	18	WH-WH / WH-WH	0.2	0.5
9	SS	14	WH-WH / WH-WH	0	0
10	SS	18	WH-WH / WH-1	0	0
11	SS	9	WH-WH / WH-WH	0	0
12	SS	18	WH-WH / WH-2	0	0
13	SS	21	WH-WH / WH-WH	0	0
14	SS	17	WH-WH / WH-WH	0	0
15	SS	19	WH-WH / WH-2	0	0
16	SS	16	WH-WH / 2-4	0	0
17	SS	20	1-1 / 1-1	0	0
18	SS	16	4-5 / 5-8	0	0
19	SS	16	7-9	0	0
20	SS	4	50/4" / 17	0	0

Classification

SILT & CLAY W/ SAND

Black SILT & CLAY, trace f-m sand, trace Roots
@1.0' Br. gy mottled SILT & CLAY, tr(-) vf Sand
@2.0' Org br mottled Clayey SILT, trace roots with occassional parting f Sand.
@4.0' Org br gy SILT & CLAY medium
@7.25' Gray Green Clayey SILT, little f Sand.
@7.75 Red br Clayey SILT, some f-c Sand, tr(-) f Gvl.
@8.0' Org brown SILT & CLAY
@9.25' Org, red br. Clayey SILT, some f-m Sand sat
@9.75' Yl br Clayey SILT, some f-m Gvl, little cf Sand
@9.95 Gray SILT & CLAY
@10.0' Gray SILT & CLAY, with occassional parting of f Sand @ 11.5 & 11.75'

13.5

@12.0' Gray SILT & CLAY
@12.75' Gray F-M SAND, little silt
@12.8 Orange br SILT and f-m Sand
@12.9' Gray CLAY & SILT
@13.0' Gray F SAND, and SILT.
@13.2' Gray CLAY & SILT, occassional parting of SILT.

CLAY & SILT

Gray CLAY & SILT, soft, sat.
@14.0 Gray CLAY & SILT, very soft
@21.0' Gray Clayey SILT with occ 3" to 4" thin beds SILT & CLAY
@23.75 Gray CLAY & SILT
@24' Gray Clayey SILT
@27.7' Gray SILT, trace(-) vf Sand.
@28' Gray Clayey SILT, occ very thin bed 1/2" of SILT & CLAY
@30' Gray Clayey SILT
@31.5 Gray Clayey SILT, some f Sand.
@32' Gray Clayey SILT, tr(+) f-m Sand

32.5

SAND

Gray F-C SAND, tr(+) Silt
@32.8' Gray SILT, tr(-) f Sand

37.0

@32.9' Gy CF SAND, tr(-) vf Gvl, tr silt with thin bed Clayey SILT @ 33.2'
@33.8 Gray SILT, trace f-m Sand.
@33.9' Gy CF SAND, tr f Gvl, tr silt
@34 Gy MF SAND, tr+ Silt
@35' Gray F GRAVEL, some cf Sand, tr Silt
@35.25 Gray MF SAND, tr+ Silt
@36.0' Gy CF SAND, little f Gvl, tr silt
@36.5' Gy CF SAND, tr(+) f Gvl, tr silt.

38.5

GLACIAL TILL

Red brown gray F-C SAND, little(+) Clayey SILT, little(-) f-m Gravel, very dense to dense
@38' Red br gy F-M SAND, little Clayey SILT, tr f Gvl

END OF BORING 38.5'

Remarks

** HNU equipped with an 11.7 eV lamp

10.10/89.4251020

emcon

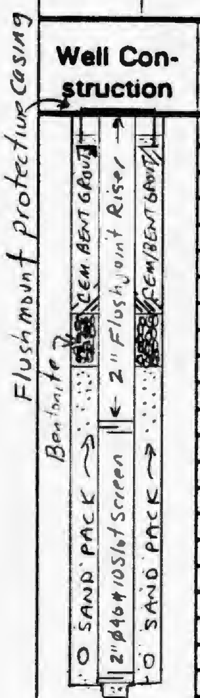
TEST BORING LOG

Boring No. MW-16D

Project RIFS COURT STREET 5/5A SITE	Sheet No. 1 of 1
Client Lockheed Martin Corporation	Job No. 86143-001.000
Boring Contractor Parratt-Wolff	G.S. Elevation

Groundwater					Cas.	Samp.	Core	Tube
Date	Water Depth	Water Elev.	Intake	Type	HSA	SS	–	–
2/20/97	1.91' BPVC			Diam.	4 1/4" ID	2"	–	–
				Weight	–	140#	–	–
				Fall	–	30"	–	–

W.L. Ref. Elev.	
Date Started	2-11-97
Date Finished	2-11-97
Driller	Mark Eaves
Inspector	JHK



Depth (feet)	No.	Type	Rec.	Blows per 6 inches	HNU** (ppm) Spoon	HNU** (ppm) HSA
0	1	SS	13	X - 9 / 8 - 5	0	0
	2	SS	16	4 - 5 / 5 - 6	0.2	0
5	3	SS	2	1 - 1 / WH - WH	0	0
	4	SS	4	3 - 3 / 2 - 2	0.2	0
	5	SS	24	WH - WH / WH - WH	0	0
10	6	SS	24	WH - 1 / 1 - 1	0.2	0
	7	SS	18	WH - WH / WH - WH	0	0.4
15	8	SS	20	WH - WH / WH - WH	0.2	0
	9	SS	21	WH - WH / WH - WH	0	0
	10	SS	24	WH - WH / WH - WH	0.2	0
20	11	SS	24	WH - WH / WH - WH	0.2	0

Depth scale (feet): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Classification

ASPHALT / SAND GVL FILL Asphalt to 0.5'
@0.5' Red brown CF SAND, and(-) f-m gvl, trace(+) SILT — 1.75

SILT & CLAY
Gray Yellow brown SILT & CLAY, stiff — 3.5

SAND w/ SILT
Or gy F-M SAND, some(+) clayey SILT, saturated
@4' Rd yl br CF SAND, little silt, little f-m Gvl — 8.3
@6.0' Red yellow brown F-C SAND, some(+) Clayey SILT, little(-) f Gravel.

Clayey SILT occ sand parting
Gray Clayey SILT, very soft, sat
@13.5' Gray clayey SILT with frequent partings of SILT & CLAY
@14.0' Gray Clayey SILT, occassional parting SILT & CLAY @15.5' with one parting 1/64" F SAND, some silt @15.6'
@16.0' Gray Clayey SILT,
@17.0' Gray SILT & CLAY, occ parting F SAND (1/16") occ parting SILT
@18.0' Gray Clayey SILT occassional parting SILT
@18.5' Gray SILT & CLAY
@20.0' Gray Clayey SILT, partings of SILT @ 20.5' & @ 20.75' — 22.0

END OF BORING 22.0'

Remarks

** HNU equipped with an 11.7 eV lamp

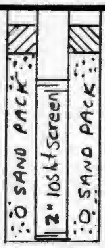
TEST BORING LOG

emcon®

Boring No. MW-16 S

Project RIFS COURT STREET 5/5A SITE	**Sheet No.** 1 of 1
Client Lockheed Martin Corporation	**Job No.** 86143-001.000
Boring Contractor Parratt-Wolff	**G.S. Elevation**

Groundwater					Cas.	Samp.	Core	Tube	
Date	**Water Depth**	**Water Elev.**	**Intake**	**Type**	HSA				**W.L. Ref. Elev.**
2/20/97	2.33' BPVC			**Diam.**	4 1/4" ID				**Date Started** 2-12-97
				Weight	—				**Date Finished** 2-12-97
				Fall	—				**Driller** Mark Eaves
									Inspector JHK

Well Construction	Depth (Feet)	Samples No.	Samples Type	Samples Rec.	Blows per 6 inches	Classification	Remarks
	0	1	AC			ASPHALT / SAND GVL FILL Brown c F SAND, and (+) f-m Gvl, tr+ silt 1.75	
		2	AC			SILT & CLAY Gy-yl brown SILT & CLAY, stiff 3.5	
	5	3	AC			SAND w/ SILT Org gy F-m SAND, some (+) Clayey SILT to yl br F-C SAND, some (+) Clayey SILT, little (+) F Gvl 8.5	
	10					END OF BORING 8.5'	
	15						
	20						
	25						
	30						
	35						
	40						
	45						
	50						

EMCON

TEST BORING LOG

Boring No. MW-17 D

Project RIFS COURT STREET S/SA SITE									**Sheet No.** 1 of 1
Client Lockheed Martin Corporation									**Job No.** 86143-001.000
Boring Contractor Parratt-Wolff									**G.S. Elevation**
Groundwater					**Cas.**	**Samp.**	**Core**	**Tube**	**W.L. Ref. Elev.**
Date	**Water Depth**	**Water Elev.**	**Intake**	**Type**	HSA	SS	–	–	**Date Started** 2-12-97
2/20/97	5.15' BPVC			**Diam.**	4 1/4" ID	2"	–	–	**Date Finished** 2-12-97
				Weight	–	140#	–	–	**Driller** Mark Eaves
				Fall	–	30"	–	–	**Inspector** JHK

Well Construction: 5" Steel/Protective casing; CEM./BENT GROUT; 2" PVC F.J. RISER; Bentonite; 0 SAND PACK; 2" PVC #10 Screen

Depth (feet)	No.	Type	Rec.	Blows per 6 inches	HNU** (PPM) Spoon	HNU** (PPM) HSA
0	1	SS	15	1-2 / 3-3	0	0
	2	SS	10	3-3 / 4-4	0	0.2
5	3	SS	15	3-3 / 4-5	0	0
	4	SS	19	5-6 / 6-5	0	0
	5	SS	18	WH-WH / WH-WH	0	0
10	6	SS	16	WH-WH / WH-2	0	0
	7	SS	20	2-2 / 2-2	0	0
15	8	SS	18	WH-WH / WH-WH	0	0
	9	SS	18	WH-WH / WH-WH	0	0
20	10	SS	21	WH-WH / WH-WH	0	0
	11	SS	22	WH-WH / WH-WH	0	0
	12	SS	20	WH-WH / WH-WH	0	0
25						
30						
35						
40						
45						
50						

Classification

SILT & CLAY

Black SILT & CLAY, little Root matter
@0.5' Black SILT, little f Sand, trace Roots
@1.0 Org br SILT & CLAY
@1.5' DK br SILT & CLAY, tr cf Sand, occ piece mf Gvl
@2.0' DK br w/org mottled SILT & CLAY stiff
@4.0' Orange brown gy SILT & CLAY, stiff

7.5

Clayey SILT, w/ SAND / Reeds

Gray Clayey SILT, little f Sand soft saturated.
@8.0' Org br SILT & CLAY
@9.0' Gray SILT & CLAY, little (-) f Sand
@9.5 Gray Clayey SILT, some f Sand

12.75

@10.0' Gray Clayey SILT
@11.0' Gray black Clayey SILT, with frequent 1/64" Partings Lt gy F-SAND, occ piece part decomposed veg. Reed
@11.5' Gray Clayey SILT, and mf gravel, little cf Sand, 3/4" piece of Reed @11.75' occ shell fragment @ 11.8
@12.0 DK gray Clayey SILT, little f Sand
@12.5' DK gy Clayey SILT, some (+) f Sand, occ piece Reed.

24.0

Clayey SILT

Gray SILT & CLAY, occ lamination 1/4" Clayey SILT
@14.0' Gray Clayey SILT, with thin bed 1" Gray mf GVL and cf Sand trace silt @14.5'
@15' Gray SILT & CLAY with thin bed 3/4" of Clayey SILT @15.7'
@16.0' Gray SILT & CLAY Soft
@20.0' Gray w/ Red SILT & CLAY, occ thin bed Clayey SILT
@22.0' Gray SILT & CLAY, occ thin bed Clayey SILT

END OF BORING 24.0'

Remarks

** HNU equipped with an 11.7 eV lamp

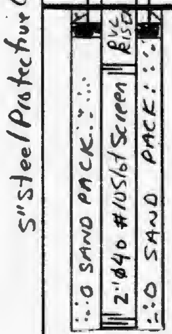
EMCON

TEST BORING LOG

Boring No MW-17S

Project RIFS COURT STREET S/SA SITE	Sheet No. 1 of 1
Client Lockheed Martin Corporation	Job No. 86143-001.000
Boring Contractor Parratt-Wolff	G.S. Elevation

Groundwater					Cas.	Samp.	Core	Tube	
Date	Water Depth	Water Elev.	Intake	Type	HSA				W.L. Ref. Elev.
2/20/97	5.12' BPVC			Diam.	4¼" ID				Date Started 2-12-97
				Weight	—				Date Finished 2-12-97
				Fall	—				Driller Mark Eaves
									Inspector JHK



Well Construction	Depth (Feet)	Samples No.	Type	Rec.	Blows per 6 inches	Classification	Remarks
	0–7.5	1	AC			SILT & CLAY Black SILT & CLAY, little Root Matter to Orange brown SILT & CLAY 7.5'	
	7.5–12.0	2	AC			Clayey SILT, w/ Sand Gray clayey SILT, little f Sand to Gy clayey SILT and mf Gvl, little f Sand, occ Root 12.0'	
						END OF BORING 12.0'	

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

emcon

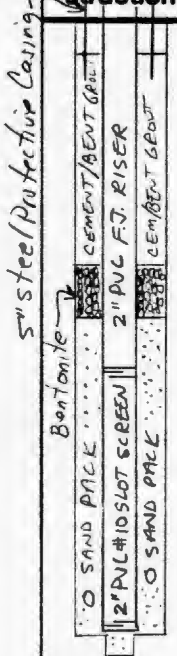
TEST BORING LOG

Boring No. MW-18D

Project RIFS COURT STREET S/SA SITE	**Sheet No.** 1 of 1
Client Lockheed Martin Corporation	**Job No.** 86143-001.000
Boring Contractor Parratt - Wolff	**G.S. Elevation**

Groundwater					Cas.	Samp.	Core	Tube	
Date	**Water Depth**	**Water Elev.**	**Intake**	**Type**	HSA	SS	–	–	**W.L. Ref. Elev.**
2/20/97	6.49' BPV			**Diam.**	4¼" ID	2"	–	–	**Date Started** 2-12-97
				Weight	–	140#	–	–	**Date Finished** 2-12-97
				Fall	–	30"	–	–	**Driller** Mark Eaves
									Inspector JHK

Well Construction



Depth (Feet)	No.	Type	Rec.	Blows per 6 inches	HNU** (PPM) Spoon	HNU** (PPM) HSA
0	1	SS	16	2 - 2 / 2 - 2	0	0
	2	SS	20	2 - 2 / 3 - 2	0.2	0.7
5	3	SS	16	3 - 3 / 3 - 3	0	0
	4	SS	22	5 - 5 / 6 - 5	0	0
	5	SS	10	2 - 2 / 1 - 2	0.1	0.3
10	6	SS	18	WH - WH / WH - 1	0.2	0.3
	7	SS	20	2 - 3 / 4 - 4	0	0
15	8	SS	18	WH - WH / WH - WH	0	0
	9	SS	20	WH - WH / WH - WH	0	0
20	10	SS	21	WH - WH / WH - WH	0	0.1
	11	SS	22	WH - WH / WH - WH	0	0
	12	SS	19	WH - WH / WH - WH	0	0.1
25						
30						
35						
40						
45						
50						

Classification

FILL

Bl.br Clayey SILT, little f-m Sand, tr(-) Roots
@1.0' Gy Org br Clayey SILT, tr(-) Roots
@1.5' White chalk like material Ceramic — 2.5

Clayey SILTS w/ Sand.

Gray w/ Org br SILT & CLAY stiff
@4.0' Ylgy br SILT & CLAY
@7.25' Light gray SILT
@7.3 Gray/org SILT & CLAY
@7.5' Gray SILT & CLAY, occ. black Root
@8.0' Gray SILT & CLAY
@9.0 Gray Clayey SILT
@10.0' Gray Clayey SILT, trace f-m Sand — 13.0
@11.0' DK & Lt gray Clayey SILT, little f-m Sand occ parting f-M SAND
@11.7' Gray Clayey SILT, freq. pieces of PDU Reeds.
@12.0' Gray Clayey SILT, and f-m Gvl, little c-f Sand, trace roots.

Clayey SILT

Gray SILT & CLAY with occ. parting Clayey SILT — 24.0
@14.0' Gray SILT & CLAY
@16.0 Gray SILT & CLAY with occ very fine parting Clayey SILT.
@18.0 Gray SILT & CLAY
@20' Gray SILT & CLAY with occ thin bed Clayey SILT
@22.0' Gray SILT & CLAY with frequent thin beds 1" or 1½" of Clayey SILT @ 23.25, 23.7 & 23.8

END OF BORING 24.0'

Remarks

** HNU equipped with an 11.7 eV lamp

emcon®

TEST BORING LOG

Boring No. MW-18S

Project RIFS COURT STREET 5/5A SITE	Sheet No. 1 of 1
Client Lockheed Martin Corporation	Job No. 86143-001.000
Boring Contractor Parratt-Wolff	G.S. Elevation

Groundwater					Cas.	Samp.	Core	Tube
Date	Water Depth	Water Elev.	Intake	Type	HSA			
2/20/97	7.57' BPVC			Diam.	4¼" ID			
				Weight	—			
				Fall	—			

W.L. Ref. Elev.	
Date Started	2-12-97
Date Finished	2-12-97
Driller	Mark Eaves
Inspector	JHK

5" steel/Protective Casing

Well Construction	Depth (Feet)	Samples No.	Type	Rec.	Blows per 6 inches	Classification	Remarks
SAND PACK; PVC RISER; 2" Ø40 #10 Slot Screen; SAND PACK	0	1	AC			FILL Black brown clayey SILT, little F-M Sand, tr Root white chalk? ceramics	
	5	2	AC			Clayey SILT Gray with orange br SILT & CLAY to Gray SILT to Gray Clayey SILT 10.0	
	10					END OF BORING 10.0'	
	15						
	20						
	25						
	30						
	35						
	40						
	45						
	50						

EMCON

TEST BORING LOG

Boring No. MW-19 S

Project RIFS COURT STREET S/SA SITE	**Sheet No.** 1 of 1
Client LOCKHEED MARTIN CORPORATION	**Job No.** 86143-001.000
Boring Contractor PARRATT - WOLFF	**G.S. Elevation**

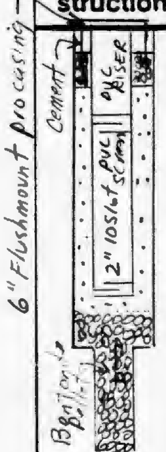
Groundwater

Date	Water Depth	Water Elev.	Intake
6-10-97	2.25' BGS		3-10'

	Cas.	Samp.	Core	Tube
Type	HSA	SS	—	—
Diam.	4 1/4" ID	2"	—	—
Weight	—	140#	—	—
Fall	—	30"	—	—

W.L. Ref. Elev.	
Date Started	6-9-97
Date Finished	6-9-97
Driller	Doug Thoma
Inspector	JHK

Well Construction



Depth (Feet)	No.	Type	Rec.	Blows per 6 inches	PID** ppm Spoon	PID** ppm HSA
0	1	SS	16	X - 5, 5 - 6	0	0
	2	SS	12	6 - 8, 8 - 12	0	0
5	3	SS	24	4 - 4, 4 - 4	0	0
	4	SS	24	4 - 3, 3 - 2	0	0
	5	SS	24	1 - 1, 1 - 1	0	0
10	6	SS	24	1 - 1, 1 - 1	0	0
	7	SS	14	1 - 1, 1 - 2	0	0
15	8	SS	16	2 - 2, 2 - 2	0	0

Classification

ASPHALT / SAND GVL FILL Asphalt to 0.3'
@0.3' Rd gy CF SAND, some Clayey SILT, little f-m Gvl
@0.5' Rd br. F-M GRAVEL and cf Sand, little Silt
1.3

SILT & CLAY
Orange br gy mottled SILT & CLAY stiff moist
@3.25' Or, br gy SILT & CLAY with occ parting 1/64" Clayey SILT
@3.75' Org br red br clayey SILT Saturated
@4.0' Org br SILT & CLAY
@5.0' Gray Clayey SILT, little f Sand
5.3

CLAY & SILT
Gray CLAY & SILT, soft, sat
@8.0' Gray SILT & CLAY, tr(+) f-m Gravel, tr f-c Sand
@8.3' Gray SILT & CLAY
@15.0' Gray SILT, trace f Sand
@15'6" Gray Clayey SILT
16.

END OF BORING 16.0'

Remarks

Saturated @ 3'9"

** PID equipped with an 11.7 eV lamp

Depth scale (feet): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

APPENDIX B

EFFLUENT DISCHARGE REQUIREMENTS

EMCON
Crossroads Corporate Center • One International Blvd. • Suite 700 • Mahwah, NJ 07495 • **(201) 512-5700** • Fax (201) 512-5786

May 23, 1997

Ms. Alyse Peterson
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, NY 12233-7010

TRANSMITTED BY FACSIMILE: (518)457-7925

Re: Former GE Court Street 5/5A Plant
Town of Dewitt, Onondaga County, New York
NYSDEC Site No. 734070
Effluent Limitations for Groundwater Treatment System

Dear Ms. Peterson:

As we discussed during our May 16, 1997 conference call, on behalf of Lockheed Martin Corporation (LMC) we are requesting the New York State Department of Environmental Conservation (NYSDEC) to identify effluent discharge limitations which will apply to the groundwater collection and treatment system proposed for the Court Street 5/5A site. This information is required to support ongoing design efforts. In that regard, we are providing the NYSDEC with requested information to determine applicable effluent limitations.

As discussed, the following information is provided herein:

- Receiving Water
- Design Influent Concentration and Flow Rate
- Type of Treatment
- Duration and Frequency of Discharge

These items are addressed below.

Receiving Water

The receiving water proposed for this discharge is Sanders Creek (via the storm sewer system). Sanders Creek (Water Index No. P 154-3-3) is a Class C Stream. Instream sampling results from the adjacent South Branch of Ley Creek (Water Index No. 154-3-2) are shown on Table 1 as an indication of existing surface water quality characteristics. LMC does not have surface water quality data for Sanders Creek.

Design Influent Concentration and Flow Rate

The proposed groundwater collection trench is approximately 830 feet long and approximately 8 to 14 feet deep, extending along the western and northern (i.e., downgradient) portions of the site. An idealized section and conservative horizontal gradients were used to determine a conservative estimate of the groundwater collection rate of the proposed trench (Attachment 1). The resulting estimate was approximately 8.7 gallons per minute, and therefore a design flow rate of 10 gallons per minute is being considered for collection/treatment design.

The collection trench is proposed to control groundwater containing residual volatile organic compounds (VOC's) from migrating toward the South Branch of Ley Creek (to the west) and to Sanders Creek (to the north). The design influent concentrations are listed in Tables 2 through 4.

The estimate of design influent concentration of VOC's has been determined, using all groundwater concentration data and permeability data generated for the site to date (Attachment 2). The site was divided into 9 areas. Each area was assumed to be representative of permeability and concentration data available from within that area. In that way, the various area concentrations were combined using weighted averages (based on predicted flow contribution to the trench) to predict an influent concentration for each VOC detected. Safety factors were then applied to the estimate. The safety factors used were either 2 or 4, based on whether the VOC was considered a controlling parameter for discharge (of water or air). A safety factor of 4 was applied to vinyl chloride (limiting VOC for air emission) and 1,1-dichloroethane (limiting VOC for water discharge). All other VOCs were assigned a safety factor of 2.

Design influent levels for conventional parameters were determined based on averages of site data from a limited number of wells (Attachment 3).

Metals influent concentrations were determined by taking the geometric mean of available site data. For the metals, the design influent was selected from the higher of the geometric mean of the total (unfiltered), or dissolved (field filtered) metals concentrations. As the system operates, it is anticipated that the metals concentrations in the influent will tend to decrease (typically toward dissolved concentrations) as the solids sort in the soils adjacent to the trench.

Type of Treatment

The groundwater collection trench is proposed to control groundwater containing residual volatile organic compounds (VOC's) from migrating toward the South Branch of Ley Creek (to the west) and to Sanders Creek (to the north). Final design of the groundwater treatment system is anticipated to be limited to site contaminants (i.e., VOC's identified in Table 4), and will be based on effluent limitations determined by the NYSDEC. However, based upon anticipated influent concentrations of site contaminants (i.e., VOC's), the proposed treatment system will include a submersible pump installed in the collection system sump, an air stripper and appurtenances. It will be located in an insulated enclosure located on an existing concrete slab adjacent the northwest corner of Building 5. The system will be designed for a capacity of 10 gallons per minute.

The collection trench will be approximately 830 feet in length, and approximately 8 to 14 feet in depth. The collection trench will consist of granular backfill with a slotted PVC collection pipe with an approximate 0.2% slope towards a sump. The sump pump will be installed in a four foot diameter sump in the collection trench. Groundwater will be pumped from the sump to the treatment building, where VOC's will be removed by a multi-staged diffused bubble aeration stripper designed to effectively remove VOC's from the water. Water effluent will be discharged to a nearby storm sewer which has an outfall to Sanders Creek. Air from the stripper will discharge to the atmosphere approximately 8 feet above the roofline of Building 5.

Available data on solids content (Table 2) of the groundwater is based on monitoring well samples collected in 1993. It is expected that influent solids levels will decrease after startup of the collection system, as solids sort in the soils adjacent to the trench. In addition, solids reduction will occur in the collection trench, the sump, and the diffused bubble aeration stripper. After construction, and initial startup, solids are not anticipated to remain at the levels found in the monitoring well samples and shown in Table 2.

Duration and Frequency of Discharge

The continued operation of the groundwater collection trench is intended to be a final remedy for groundwater remediation at the site. Therefore, this discharge would be ongoing for several years. The treatment process will be designed to operate on a continuous discharge basis. However, if actual flow rates encountered are significantly lower than anticipated, the system will operate on a cyclical pattern triggered by groundwater levels present in the collection sump.

We look forward to receiving the effluent limitations for the treatment system in order to move ahead with the treatment system design, and completion of the IRM Work Plan. If you have any questions regarding the information contained herein, please contact me at (201)512-5700.

Sincerely,

EMCON

Curtis B. Taylor
Project Manager

Enclosure

cc: Patrick D. Salvador, P.E. - Lockheed Martin

Table 1
Former GE Court Street Building 5/5A
Groundwater Treatment System
Ambient Water Quality in South Branch of Ley Creek

Parameters	
Total Calcium[1]	140 mg/l
Total Magnesium[1]	22 mg/l
Total Iron[1]	7.4 mg/l
Total Manganese[1]	0.37 mg/l
Calculated Hardness[1]	440 mg/l
Trichlorethene[2]	0.006 mg/l

[1] June 1993 sample
[2] March 1997 sample

Table 2
Former GE Court Street Building 5/5A
Groundwater Treatment System
Conventional Parameter Design Influent Characteristics

Parameters	Average of Well Results (mg/l)	Design Influent Concentration (mg/l)
BOD	<24	<15
COD	120	120
NH_4-N	<0.5	<0.5
TKN	0.8	0.8
TOC	7.0	7.0
TSS	146	146
TDS	843	843
Hardness (As $CaCO_3$)	817	817
Alkalinity (As$CaCO_3$	577	577
pH	6.5 - 7.0	6.5 - 7.0

Table 3
Former GE Court Street Building 5/5A
Groundwater Treatment System
Metals Design Influent Characteristics

TAL Metals	Geometric Mean Total (mg/l)	Geometric Mean Dissolved (mg/l)	Design Influent (mg/l)
Aluminum	3.5	0.1	3.5
Antimony	0.001	0.001	0.001
Arsenic	0.006	0.003	0.006
Barium	0.095	0.182	0.182
Beryllium	<0.001	<0.001	<0.001
Cadmium	<0.001	<0.001	<0.001
Calcium	223.1	216.8	223.1
Chromium	0.005	0.001	0.005
Cobalt	0.002	0.001	0.002
Copper	0.006	0.002	0.006
Iron	6.4	0.2	6.4
Lead	0.004	0.001	0.004
Magnesium	63.5	60.6	63.5
Manganese	0.131	0.036	0.131
Mercury	<0.001	<0.001	<0.001
Nickel	0.005	0.002	0.005
Potassium	3.8	2.2	3.8
Selenium	0.001	0.001	0.001
Silver	0.001	0.001	0.001
Sodium	24.8	27.3	24.8
Thallium	0.003	0.003	0.003
Vanadium	0.006	<0.001	0.006
Zinc	0.018	0.049	0.049

Table 4
Former GE Court Street Building 5/5A
Groundwater Treatment System
Volatile Organic Compound Design Influent Characteristics

Parameters (VOCs)	Average of Well Results (ug/l)	Design Influent Concentration (ug/l)
Vinyl Chloride	313	1,250
Chloroethane	13.1	26
1,1-DCE	0.1	0.2
1,1-DCA	1,902	7,606
1,1,1-TCA	10	20
1,2-DCE	27	54
TCE	0.3	0.6
Benzene	16.2	32
Toluene	39	78
Ethylbenzene	43.9	88
Xylenes	156	313

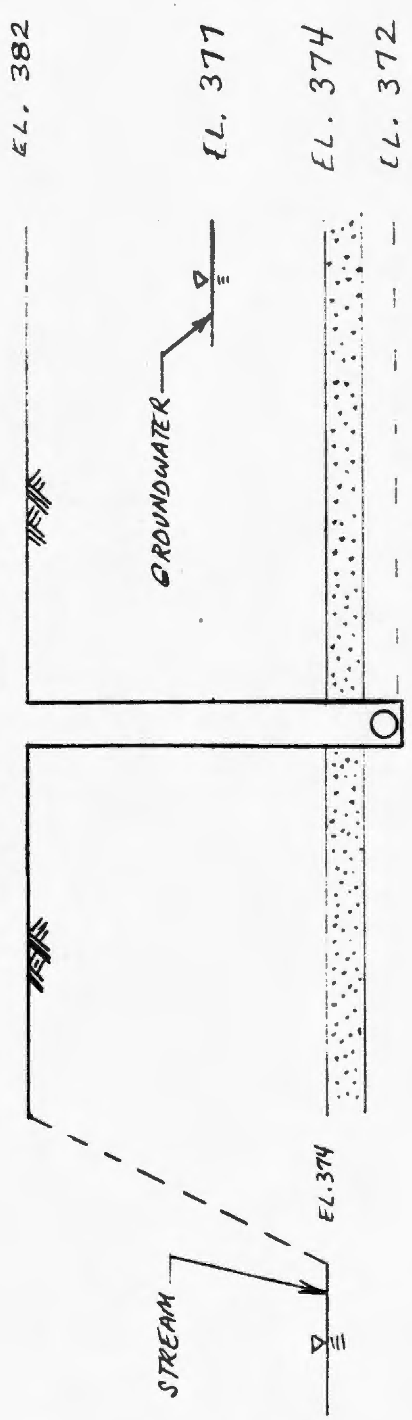
ATTACHMENT 1

DETERMINATION OF DESIGN FLOW RATE

EMCON

By CBT Date 5-20-97
Chkd. by NK Date 5/20/97
Subject FLOW CAPACITY DETERMINATION FOR GROUNDWATER COLLECTION TRENCH

Job No. 86143-004.000



IDEALIZED SECTION

1. FOLLOWING INSTALLATION OF THE TRENCH, FLOW IN THE UPPER CLAY/SILT WOULD BE VERTICALLY DOWN, AND HORIZONTAL IN THE SAND.

$$K_{CLAY} \approx 5 \times 10^{-5} \text{ cm/sec} \approx 10 \times 10^{-5} \text{ ft/min}$$

$$K_{SAND} \simeq 1 \times 10^{-3} \text{ cm/sec} \approx 2 \times 10^{-3} \text{ ft/min}$$

2. THE SAND LAYER IS APPROXIMATELY 1 FOOT THICK. IT IS MOST LIKELY THAT ALMOST ALL OF THE FLOW TO THE TRENCH WILL TAKE PLACE FROM THE SAND LAYER.

3. FROM THE UPGRADIENT SIDE (SOUTH AND EAST):

ASSUME CONSERVATIVE GRADIENT, $i = 0.5$

$$\text{FLUX} = q = k\,i \Rightarrow \left(2 \times 10^{-3} \tfrac{ft}{min}\right) \cdot (0.5) = 1 \times 10^{-3} \tfrac{ft}{min}$$

LENGTH OF TRENCH $\approx$ 830 ft

FLOW CAPACITY OF 1 ft SAND LAYER FROM UPGRADIENT SIDE

$$Q = q\,A \Rightarrow \left(1 \times 10^{-3} \tfrac{ft}{min}\right) \cdot (830 \text{ ft} \times 1 \text{ ft}) = 0.83 \text{ ft}^3/\text{min}$$

$$= 6.2 \text{ gal/min}$$

4. FROM THE STREAM SIDE (NORTH AND WEST):

ASSUME CONSERVATIVE GRADIENT, $i = 0.2$

$$\text{FLUX} \Rightarrow \left(2 \times 10^{-3} \tfrac{ft}{min}\right) \cdot (0.2) = 4 \times 10^{-4} \tfrac{ft}{min}$$

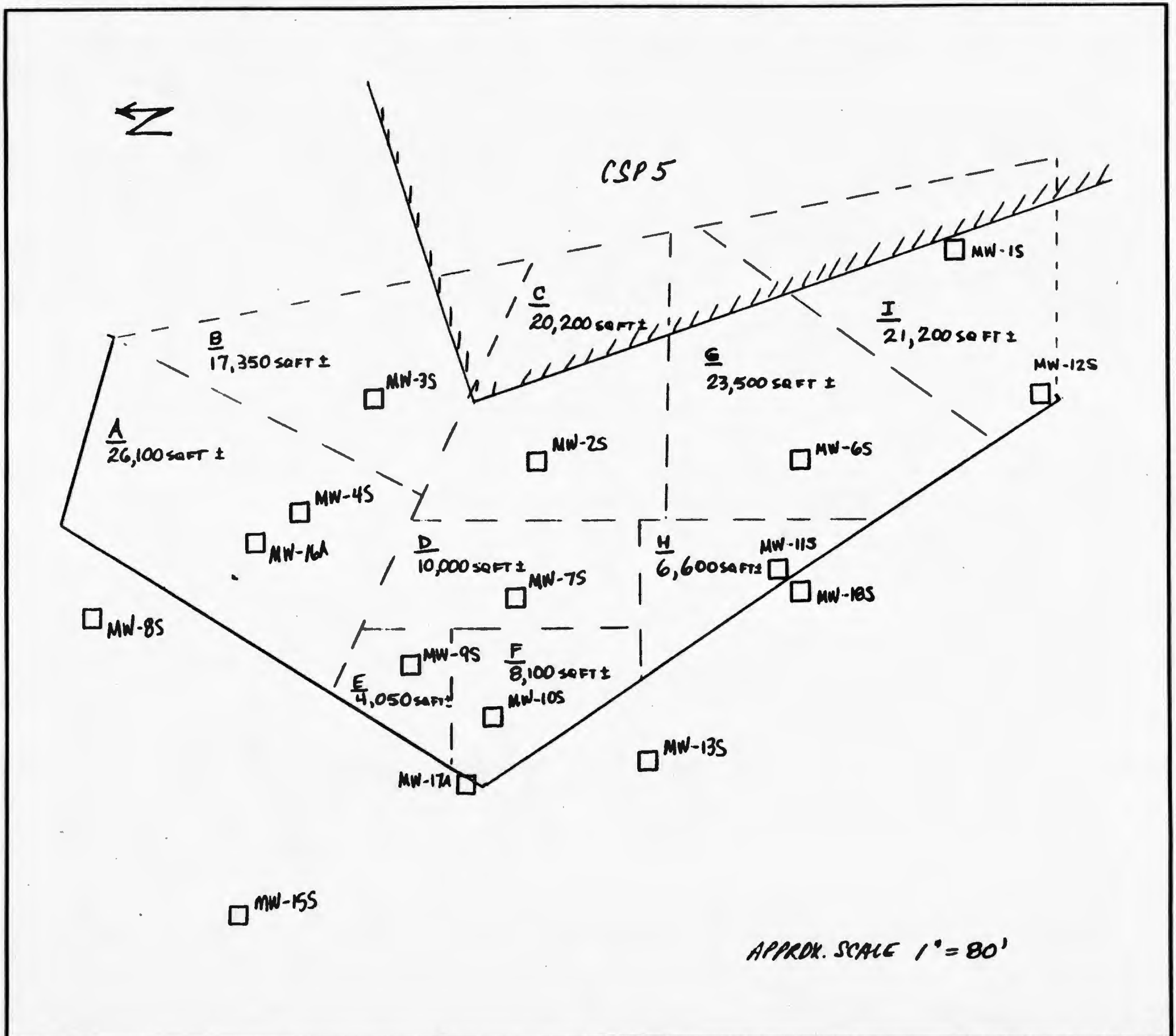
$$\text{FLOW CAPACITY} \Rightarrow \left(4 \times 10^{-4} \tfrac{ft}{min}\right) \cdot (830 \text{ ft} \times 1 \text{ ft}) = 0.33 \text{ ft}^3/\text{min}$$

$$= 2.5 \text{ gal/min}$$

5. $Q_{TOTAL} = Q_{UPGRADIENT} + Q_{STREAM} = 6.2 \text{ gal/min} + 2.5 \text{ gal/min} = 8.7 \text{ gal/min}$

ATTACHMENT 2

DETERMINATION OF VOC DESIGN INFLUENT



EMCON

By CBT Date 5-20-97

Chkd. by PJ Date 5-21-97

Subject AREAS OF INFLUENCE FOR VOC DESIGN INFLUENT DETERMINATION

Job No. 8643-004.000

Sheet No. 1 of 1

Former GE Court Street 5/5A Site
Design Influent Quality
TCL Volatile Organic Compounds

Area Designation	Area (sq. ft.)	Permeability (cm/sec)*	Product (A X K)	Influence Weighting
A	26100	7.32E-05	1.91	0.145
B	17350	9.75E-05	1.69	0.129
C	20200	5.40E-05	1.09	0.083
D	10000	3.90E-05	0.39	0.030
E	4050	7.19E-05	0.29	0.022
F	8100	7.19E-04	5.82	0.443
G	23500	6.10E-06	0.14	0.011
H	6600	2.44E-04	1.61	0.122
I	21200	9.80E-06	0.21	0.016
Total	137100		13.16	1.000

* From permeability tests conducted on Area-specific monitoring wells.

Former GE Court Street 5/5A Site
Design Influent Quality
TCL Volatile Organic Compounds

Area Designation	Computed Weighting Factor	Vinyl Chloride (ug/l)	Chloro-ethane (ug/l)	1,1-DCE (ug/l)	1,1-DCA (ug/l)	1,1,1-TCA (ug/l)	1,2-DCE (ug/l)	TCE (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethyl-benzene (ug/l)	Xylenes (ug/l)
A (MW-4S/16A)	0.145	1145			1480		52		11			
B (MW-3S)	0.129				4		1.2					
C (MW-2S)	0.083	1600	90		4540					470	530	1886
D (MW-7S)	0.030	453			2583	132	35					
E (MW-9S)	0.022	9			180							
F (MW-10S/17A)	0.443				643		38		33			
G (MW-6S)	0.011				13350							
H (MW-11S/18A)	0.122	1	46	1	1103		12	2.5				
I (MW-1S)	0.016				42080	388						
Weighted Average		312.6	13.1	0.1	1901.6	10.0	27.0	0.3	16.2	39.0	43.9	156.3
Safety Factor		4.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Design Influent		1250	26	0.2	7606	20	54	0.6	32	78	88	313

Monitoring Well Location
Analytical Data To Date

(Note: No measurable VOC's were detected @ MW-5S, MW-8S, MW-12S, and MW-15S)

1 VOC's

Parameter	Sample Date	MW-1S µg/l	MW-2S µg/l	MW-3S µg/l	(MW-16A) MW-4S µg/l	MW-6S µg/l	MW-7S µg/l	MW-9S µg/l	(MW-17A) MW-10S µg/l	(MW-18A) MW-11S µg/l	MW-13 µg/l
Vinyl Chloride	1/7/92	—	—	—	—						
	11/30/92	—	2,800	—	580						
	3/92	—	3,600	—	1,300						
	8/92	—	—	—	3,200	—	—				
	5/93	—	2,000	—	1,400	—	450	17	—	—	
	6/93						1,000	—	—	—	—
	3/97			—	(390)		360		— (-)	4 (-)	—
Average		—	1690	—	1,145	—	453	9	—	1	—
Chloroethane	1/7/92	—	—	—	—						
	11/30/92	—	450	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	56	—
	6/93										
	3/97				(-)		—		— (-)	88 (-)	—
Average			90							46	—
1,1-DCE	1/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	—
	6/93						—	—			
	3/97				(—)		—		— (-)	4 (-)	—
Average		—	—	—	—	—	—	—	—	1	—
1,1-DCA	1/7/92	49,000	3400	2	790						
	11/30/92	77,000	3,100	2	1100						
	3/92	8,400	4,900	3	1,600						
	8/92	80,000	8,800	5	2,400	19,000	4,100				
	5/93	26,000	2,500	4	2,400	7,700	1,900	120	990	1800	
	6/93						3600	240	1200	1600	—
	3/97			8	(590)		730		380 (3)	880 (130)	2
Average		42,080	4,[illegible]	4	1,480	13,350	2588	180	643	1,103	1
Chloroform	1/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97				(-)		—		— (-)	— (-)	—
Average		—	—	—	—	—	—	—	—	—	—
1,1,1-TCA	1/7/92	—	110	—	—						
	11/30/92	—	130	—	—						
	3/92	—	—	—	—						
	8/92	—	1700	—	—	—	—				
	5/93	—	—	—	—	—	130	—	—	—	
	6/93						350	—	—	—	—
	3/97				(-)		48		— (-)	— (-)	—
Average		—	388	—	—	—	132	—	—	—	—
1,2-DCE (TOTAL)	1/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			7	(310)		140		150 (-)	47 (-)	1
Average		—	—	1.2	52	—	35	-	38	12	0.5
TCE	1/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—		—	—	
	6/93						—	—		—	—
	3/97				(-)		—		—	10 (-)	—
Average		—	—	—	—	—	—	—	—	2.5	—
Bromoform	1/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—						
	5/93	—	—	—	—	—	—				
	6/93						—	—	—	—	
	3/97				(-)		—		—	— (-)	—
Average		—	—	—	—	—	—	—	—	—	—

Monitoring Well Location
Analytical Data To Date

(Note: No measurable VOC's were observed @ MW-5S, MW-8S, MW-12S, and MW-15S)

Σ VOC's

Parameter	Sample Date	MW-1S µg/L	MW-2S µg/L	MW-3S µg/L	(MW-16A) MW-4S µg/L	MW-6S µg/L	MW-7S µg/L	MW-9S µg/L	(MW-17A) MW-10S µg/L	(MW-18A) MW-11S µg/L	MW-13S µg/L
Benzene	[illegible]	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	65						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	130	—	
	6/93						—	—	—	—	—
	3/97			—	(–)		—		— (-)	— (-)	—
Average					11				33		
Toluene	[illegible]	—	160	—	—						
	10/?/92	—	230	—	—						
	3/92	—	—	—	—						
	8/92	—	1,500	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	I	
	6/93						—	—	—		—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			470								
Ethylbenzene	[illegible]	—	430	—	—						
	11/30/92	—	390	—	—						
	3/92	—	—	—	—						
	8/92	—	1300	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			530								
Xylenes	[illegible]	—	2,300	—	—						
	11/30/92	—	1,800	—	—						
	3/92	—	630	—	—						
	8/92	—	3,100	—	—	—	—				
	5/93	—	1,100	—	-	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			1886								

ATTACHMENT 3

DETERMINATION OF CONVENTIONAL PARAMETER DESIGN INFLUENT

By PRF Date 6/12/93

Chkd. by ______ Date ______

Subject DESIGN INFLUENT QUALITY

BUILDING 5 DESIGN

WehranEnviroTech

Job No. 0154?.03

Sheet No. 6 of 10

3. CONVENTIONAL PARAMETERS (SUMMARY OF ANALYTICAL DATA)

PARAMETER	SAMPLE DATE	MW-1S UNITS AS SHOWN	MW-2S UNITS AS SHOWN	MW-3S UNITS AS SHOWN	MW-4S UNITS AS SHOWN
pH (S.U.)	1/7/92	6.56	6.57	6.45	6.17
	1/30/92	6.57	6.84	7.06	6.76
	3/92	7.02	6.68	6.86	7.3
	8/92	7.08	6.89	7.18	6.89
TEMPERATURE °C	1/7/92	7.0	8.9	10.0	9.7
	1/30/92	7.5	6.5	7.0	7.1
	5/92	7.0	7.0	6.7	5.9
	8/92	18.3	18.3	21.5	22.5

PARAMETER	SAMPLE DATE	MW-10S mg/L
BOD	6/93	<24
COD	6/93	120
TOC	6/93	7
NH_4-N	6/93	<0.5
TKN	6/93	0.8

PARAMETER	SAMPLE DATE	MW-7S mg/L	MW-10S mg/L	MW-11S mg/L
TSS	5/93	160	47	230
	6/93	200		
TDS	5/93	890	990	650
	6/93	850		
HARDNESS (AS $CaCO_3$)	5/93	560	1,300	490
	6/93		1,500	
ALKALINITY (AS $CaCO_3$)	5/93	510	810	410

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7010

John P. Cahill
Commissioner

July 9, 1997

Patrick D. Salvador, P.E.
Principal Engineer
Lockheed Martin Corporation
P.O. Box 4840
Syracuse, New York 13221-4840

Re: Former GE Court Street 5/5A Plant (Site ID# 734070)

Dear Mr. Salvador:

The Department has received and reviewed Lockheed Martin's May 23, 1997 application for effluent discharge to surface water limitations applicable to the groundwater collection and treatment system proposed for the Court Street 5/5A site. The effluent discharge limitations and conditions are enclosed.

The Department has not yet received Lockheed Martin's application for effluent discharge to air limitations. It is assumed that this application will be submitted as part of the draft Interim Remedial Measure (IRM) Design Report. As has previously been discussed, processing of this application may take several weeks. To avoid any delays in IRM implementation, Lockheed Martin should submit the application for air discharge as soon as possible.

If you have any questions, feel free to contact me at (518) 457-1641.

Sincerely,

Alyse Peterson

Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation

cc: R. Heerkens (NYSDOH)

91-20-2a (1/89)

DHWR Site No.: 7-34-070

Part 1, Page 1 of 2

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning Startup of remediation activities

and lasting until 5 years after startup of remediation activities
the discharges from the treatment facility to Sanders Creek and/or Ley Creek shall be limited and monitored by the operator as specified below:

Outfall Number & Effluent Parameter	Discharge Limitations: Daily Avg.	Discharge Limitations: Daily Max.	Units	Minimum Monitoring Requirements: Measurement Frequency	Minimum Monitoring Requirements: Sample Type
Outfall 001: Treated Effluent from Groundwater Collection Trench					
Flow	Monitor	Monitor	GPM	Weekly	Instantaneous
pH (Range)	Monitor	(6.0 - 9.0)	SU	Weekly	Grab
Solids, Total Dissolved	Monitor	Monitor	mg/l	Weekly	Grab
Arsenic, Total	Monitor	0.03	mg/l	Monthly	Grab
Chromium, Total	Monitor	0.025	mg/l	Monthly	Grab
Copper, Total	Monitor	0.03	mg/l	Monthly	Grab
Iron, Total	Monitor	1.7	mg/l	Weekly	Grab
Lead, Total	Monitor	0.02	mg/l	Monthly	Grab
Nickel, Total	Monitor	0.025	mg/l	Monthly	Grab
Selenium, Total	Monitor	0.01	mg/l	Monthly	Grab
Silver, Total	Monitor	0.01	mg/l	Monthly	Grab
Thallium, Total	Monitor	0.015	mg/l	Monthly	Grab
Vanadium, Total	Monitor	0.03	mg/l	Monthly	Grab
Zinc, Total	Monitor	0.4	mg/l	Monthly	Grab
Vinyl Chloride	Monitor	0.05	mg/l	Weekly	Grab
Chloroethane	Monitor	0.17	mg/l	Weekly	Grab
1,1-Dichloroethane	Monitor	0.03	mg/l	Weekly	Grab
1,2-Dichloroethene (Total)	Monitor	0.03	mg/l	Weekly	Grab
1,1,1-Trichloroethane	Monitor	0.01	mg/l	Weekly	Grab
Trichloroethene	Monitor	0.01	mg/l	Weekly	Grab
Benzene	Monitor	0.006	mg/l	Weekly	Grab
Toluene	Monitor	0.01	mg/l	Weekly	Grab
Ethylbenzene	Monitor	0.01	mg/l	Weekly	Grab
Xylenes, Total	Monitor	0.01	mg/l	Weekly	Grab

Special Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to the following DER contact person: ALYSE PETERSON.

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

91-20-2a (1/89)

DHWR Site No.: 7-34-070

Part 1, Page 2 of 2

Special Conditions (ctd.):

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) Samples and measurements, to comply with the monitoring requirements specified above, shall be taken from the effluent side of the treatment system prior to discharge to either Sanders Creek or Ley Creek.

(6) The minimum measurement frequency for all the parameters (unless otherwise noted) shall be Monthly following a period of 16 consecutive Weekly sampling events showing no exceedances of the stated discharge limitations. If a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall again be Weekly, until a period of 8 consecutive sampling events shows no exceedances at which point Monthly monitoring may resume.

Lockheed Martin Ocean, Radar & Sensor Systems
Post Office Box 4840 Syracuse, NY 13221-4840

LOCKHEED MARTIN

September 15, 1997

Ms. Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-7010

Re: Air Emissions from Groundwater Treatment System
Former GE Court Street 5/5A Site
Town of Dewitt, Onondaga County, New York
NYSDEC Site No. 734070

Dear Ms. Peterson:

Lockheed Martin Corporation (LMC) has reviewed the New York State Department of Environmental Conservation's (NYSDEC) letter dated August 27, 1997 regarding LMC's application to discharge air emissions from the proposed groundwater treatment system at the Former GE Court Street 5/5A Site. The NYSDEC requested that LMC estimate flow quantity from the groundwater collection trench using actual permeabilities measured from site monitoring wells, as well as area specific sand thickness values. NYSDEC also requested that LMC evaluate the flow generated from the silts and clays. The estimated flow calculated based on NYSDEC's request is approximately 8.0 gallons per minute, and is consistent with the flow previously calculated to determine effluent discharge limits and air emissions. The revised calculations based on NYSDEC's request are enclosed.

The horizontal permeabilities measured for site monitoring wells are reflective of the aggregate of the surficial geologic materials at the site, including the clays, silts and sands. Therefore, by using the measured permeabilities to estimate flow, the varying sand lens thicknesses across the shallow saturated interval are accounted for. Similarly, the flow contribution from silts and clays are also included, although flow from these finer textured materials will be minor relative to the sand lenses.

The areas of influence for volatile organic compound design influent determination and area permeabilities (both provided as attachments to LMC's August 5, 1997 submittal) were used for calculating the estimated flow based on horizontal permeabilities. In addition, the saturated thickness for each area was determined based on the Groundwater Collection System Profile (Drawing No. 2) of the Construction Drawings for the Groundwater Collection and Treatment System.

LMC believes that the information contained herein responds to NYSDEC comments on the air emissions that will be discharged from the groundwater treatment system and therefore, LMC requests NYSDEC's approval as soon as possible in order to support the construction schedule.

Please contact me at (315) 456-3199 if you have any questions.

Sincerely,

Patrick D. Salvador

Patrick D. Salvador, P.E.
Principal Engineer

Enclosure

cc: Robert K. Davies, Esq. - NYSDEC (with enclosure)
Sandra Lee Fenske, Esq. - Lockheed Martin (with enclosure)
Henriette Hamel - Bureau of Environmental Exposure Investigation, NYSDOH (with enclosure)
Kenneth P. Lynch, Esq. - NYSDEC Director, Region 7 (with enclosure)
Virginia C. Robbins, Esq. - Bond, Schoeneck & King, LLP (with enclosure)

1. AREAS OF INFLUENCE AND CORRESPONDING HORIZONTAL PERMEABILITIES HAVE BEEN COMPILED PREVIOUSLY (SEE EXHIBITS A AND B). HORIZONTAL PERMEABILITIES RANGE FROM 10^{-4} CM/SEC TO 10^{-6} CM/SEC OR 10^{-3} TO 10^{-5} FT/MIN

2. AREAS A, E, F, H, G AND I ARE CONTIGUOUS TO THE TRENCH. THESE AREAS WILL TRANSMIT 100% OF THE FLOW TO THE COLLECTION TRENCH.

3. SATURATED THICKNESS FOR EACH AREA IS DETERMINED BASED ON DRAWING No. 2 OF THE AUGUST 1997 CONSTRUCTION DRAWINGS FOR THE GROUNDWATER COLLECTION AND TREATMENT SYSTEM.

4. CALCULATE FLOW INTO TRENCH FROM UPGRADIENT SIDE (SOUTH AND WEST) FOR AREA A:

ASSUME CONSERVATIVE GRADIENT, $i = 0.5$

FLUX $\Rightarrow q = ki \Rightarrow (1.4 \times 10^{-4}) \cdot (0.5) = 7 \times 10^{-5}$ FT/MIN

SATURATED AREA A VERTICAL AREA =

$\Rightarrow$ 310 FT LONG × 5.5 FT (SATUR. DEPTH) = 1,705 FT^2

FLOW $\Rightarrow Q = qA \Rightarrow (7 \times 10^{-5}$ FT/MIN$)(1{,}705$ $FT^2) = 0.12$ FT^3/MIN

5. SIMILARLY, CALCULATE FLOW INTO TRENCH FROM UPGRADIENT SIDE FOR AREAS E, F, H, G AND I (SEE TABLE 1, PAGE 3 OF 3)

6. CALCULATE FLOW INTO TRENCH FROM DOWNGRADIENT SIDE (NORTH AND EAST) FOR AREA A:

ASSUME CONSERVATIVE GRADIENT, $i = 0.2$

FLUX $\Rightarrow q = ki \Rightarrow (1.4 \times 10^{-4}) \cdot (0.2) = 2.8 \times 10^{-5}$ FT/MIN

SATURATED AREA A VERTICAL AREA = 1,705 FT^2

FLOW $\Rightarrow Q = qA \Rightarrow (2.8 \times 10^{-5}$ FT/MIN$)(1,705$ $FT^2) = 0.05$ FT^3/MIN

7. SIMILARLY, CALCULATE FLOW INTO TRENCH FROM DOWNGRADIENT SIDE FOR AREAS E, F, H, G AND I (SEE TABLE 1, PAGE 3 OF 3)

8. TOTAL FLOW INTO TRENCH IS THE SUM OF UPGRADIENT FLOW AND DOWNGRADIENT FLOW FROM ALL AREAS CONTIGUOUS TO THE COLLECTION TRENCH.

TOTAL FLOW = 8.0 GALLONS PER MINUTE (SEE TABLE 1, PAGE 3 OF 3)

Table 1

Area	Saturated Thickness (ft)	Length @ Trench (ft)	Saturated Area (sq. ft.)	K (cm/sec)	K (ft/min)
A	5.5	310	1705	7.3E-05	1.4E-04
E	5	90	450	7.2E-05	1.4E-04
F	4.5	135	607.5	7.2E-04	1.4E-03
H	4.5	165	742.5	2.4E-04	4.7E-04
G	4	90	360	6.1E-06	1.2E-05
I	3.5	50	175	9.8E-06	1.9E-05

	From South and East			From North and West		
Area	Flux (ft/min)	Flow (cu.ft/min)	Flow GPM	Flux (ft/min)	Flow (cu.ft/min)	Flow GPM
A	7.19E-05	0.12	0.92	2.87E-05	0.05	0.37
E	7.09E-05	0.03	0.24	2.83E-05	0.01	0.10
F	7.09E-04	0.43	3.22	2.83E-04	0.17	1.29
H	2.36E-04	0.18	1.31	9.45E-05	0.07	0.52
G	6.00E-06	0.002	0.02	2.40E-06	0.001	0.01
I	9.65E-06	0.002	0.01	3.86E-06	0.001	0.01
		Total=	5.7		Total=	2.3

Total= 8.0 GPM

EMCON

By CBT Date 5-20-97
Chkd by PJ Date 5-21-87
Subject AREAS OF INFLUENCE FOR VOC DESIGN INFLUENT DETERMINATION

Job No. 86U3-004.000
Sheet No. 1 of 1

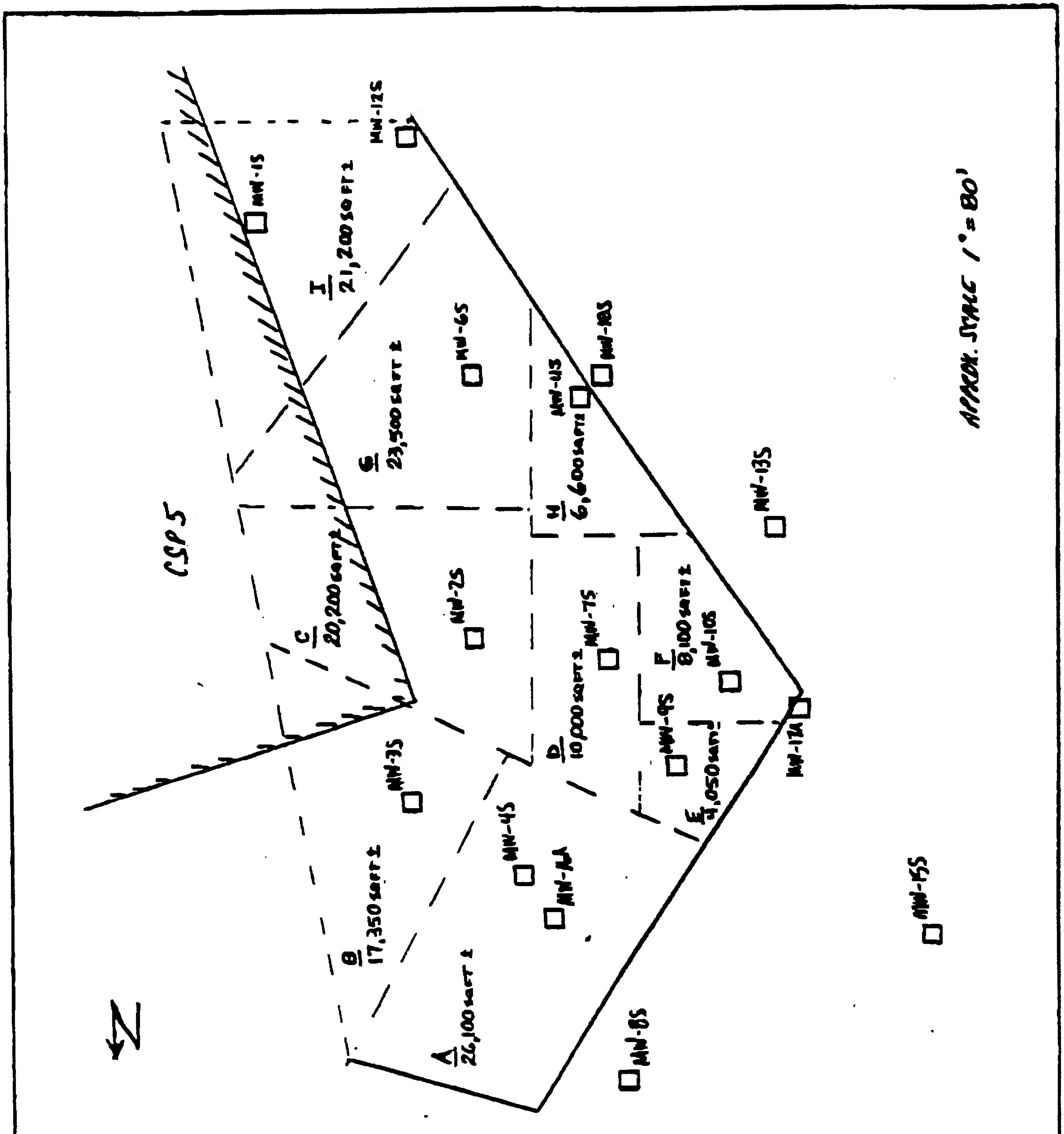


EXHIBIT A

Former GE Court Street 5/5A Site
Design Influent Quality
TCL Volatile Organic Compounds

Area Designation	Area (sq. ft.)	Permeability (cm/sec)*	Product (A X K)	Influence Weighting
A	26100	7.32E-05	1.91	0.145
B	17350	9.75E-05	1.69	0.129
C	20200	5.40E-05	1.09	0.083
D	10000	3.90E-05	0.39	0.030
E	4050	7.19E-05	0.29	0.022
F	8100	7.19E-04	5.82	0.443
G	23500	6.10E-06	0.14	0.011
H	6600	2.44E-04	1.61	0.122
I	21200	9.80E-06	0.21	0.016
Total	137100		13.16	1.000

* From permeability tests conducted on Area-specific monitoring wells.

EXHIBIT 8

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7010

John P. Cahill
Commissioner

September 29, 1997

LOCKHEED MARTIN
OR & SS
01
OCT 1997
-nvironment Safety
& Health

Patrick D. Salvador, P.E.
Principal Engineer
Lockheed Martin Corporation
P.O. Box 4840
Syracuse, New York 13221-4840

Re: Former GE Court Street 5/5A (Site ID# 734070)

Dear Mr. Salvador:

This letter responds to two recent submissions by Lockheed Martin Corporation (LMC). On September 11, 1997, LMC submitted to the New York State Department of Environmental Conservation (DEC) a request to extend the required Remedial Investigation Report (RIR) submission schedule. Because of DEC's request for a change in scope for the site Risk Assessment from qualitative to quantitative, LMC requests that DEC allow LMC to submit the RIR within 45 days following DEC's approval of the quantitative risk assessment scope of work. This request is approved.

On September 15, 1997, LMC submitted to DEC a response to DEC comments on LMC's application to discharge air emissions from the proposed groundwater treatment system at the Former GE Court Street 5/5A Site. Based on the response and subsequent discussion during our September 25, 1997 telephone conference, the application is complete. Discharge of air emissions based on the flow rate and influent concentrations indicated in the application is approved. Should either the flow rate or influent concentrations rise more than 10% on a monthly average, reevaluation will be needed.

If you have any questions, you may contact me at (518) 457-1641.

Sincerely,

Alyse Peterson

Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation

cc: H. Hamel (NYSDOH)
A. Hess (USEPA)

Lockheed Martin Ocean, Radar & Sensor Systems
Post Office Box 4840 Syracuse, NY 13221-4840

LOCKHEED MARTIN

October 16, 1997

Ms. Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-7010

Re: Air Emissions from Groundwater Collection and Treatment System
Former GE Court Street 5/5A Site
Town of Dewitt, Onondaga County, New York
NYSDEC Site No. 734070

Dear Ms. Peterson:

Lockheed Martin Corporation (LMC) has reviewed the New York State Department of Environmental Conservation's (NYSDEC) letter dated September 29, 1997 which provided NYSDEC approval for the discharge of air emissions from the groundwater collection and treatment system. The September 29, 1997 letter included a requirement for "reevaluation" if either flow rate or influent concentrations are more than 10 percent higher than the design criteria. LMC is providing this letter to clarify the evaluation process which will be used to reevaluate air emissions under those conditions.

In the event that flow rate or influent concentrations are found to be more than 10 percent higher than the design criteria (on a monthly basis), LMC will reevaluate ambient air quality impacts. This will consist of confirmation that the mass emissions of individual Volatile Organic Compounds (VOC) are not greater than those listed in Section 8.5.3 of the IRM Work Plan (i.e., the mass VOC emissions used for the ambient air quality model). If the mass VOC emissions are not greater than those listed, no additional ambient air quality modeling will be performed.

Mass removal of VOCs will be determined based on the difference between influent (i.e., collected untreated groundwater) and effluent (i.e., treated groundwater) concentrations and the quantity of groundwater treated during a specified period. No air emissions sampling will be performed.

If during any month, the mass emissions of VOC's from the groundwater treatment system are greater than those listed in Section 8.5.3 of the IRM Work Plan, an ambient air quality evaluation will be performed using the actual mass removal of VOC's encountered that month to determine compliance with Annual Guideline Concentrations (AGC's) and Short Term Guideline Concentrations (SGC's).

Please contact me at (315) 456-3199 if you have any questions or require further information.

Sincerely,

Patrick D. Salvador

Patrick D. Salvador, P.E.
Principal Engineer

cc: Robert K. Davies, Esq. - NYSDEC
Sandra Lee Fenske, Esq. - Lockheed Martin
Henriette Hamel - NYSDOH
Kenneth P. Lynch, Esq. - NYSDEC, Director Region 7
Virginia C. Robbins, Esq. - Bond, Schoeneck & King, LLP

Lockheed Martin Ocean, Radar & Sensor Systems
Post Office Box 4840 Syracuse, NY 13221-4840

LOCKHEED MARTIN

October 24, 1997

Ms. Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-7010

Re: Air Emissions from Groundwater Collection and Treatment System
Former GE Court Street 5/5A Site
Town of Dewitt, Onondaga County, New York
NYSDEC Site No. 734070

Dear Ms. Peterson:

As you are aware, Lockheed Martin Corporation (LMC) has been requested by the Building 5 property owner, DE & JD Associates, to relocate the groundwater treatment building to accommodate site redevelopment plans. The new location of the treatment building in the northwest corner of Building 5, on the western side of the building, results in an air stripper discharge approximately 60 feet from the western property boundary (i.e., within the cavity region of Building 5). Therefore, the emissions from the air stripper were reevaluated to consider the cavity effects of Building 5.

The attached evaluation (completed by O'Brien and Gere Engineers, Inc.) indicates that the plume from the air stripper will not be influenced by the Building 5 cavity and no cavity impacts will occur. Thus, the maximum air quality impacts previously reported in the Interim Remedial Measures (IRM) Work Plan (EMCON, August 1997), also reflect impacts from the new location of the treatment building. All concentrations of contaminants of concern will be below Annual Guideline Concentrations (AGC's) and Short Term Guideline Concentrations (SGC's), and emissions controls will not be required.

LMC requests New York State Department of Environmental Conservation approval to relocate the groundwater treatment building to the west side of Building 5, while maintaining the air discharge requirements provided in previous correspondence. Please contact me at (315) 456-3199 if you have any questions or require further information.

Sincerely,

Patrick D. Salvador

Patrick D. Salvador, P.E.
Principal Engineer

Attachment

cc: Robert K. Davies, Esq. - NYSDEC
Sandra Lee Fenske, Esq. - Lockheed Martin
Henriette Hamel - NYSDOH
Kenneth P. Lynch, Esq. - NYSDEC, Director Region 7
Virginia C. Robbins, Esq. - Bond, Schoeneck & King, LLP

O'BRIEN & GERE
ENGINEERS, INC.

October 24, 1997

Mr. Curtis B. Taylor
Project Manager
EMCON
Crossroads Corporate Center, Suite 700
One International Boulevard
Mahwah, New Jersey 07495

Re: Former GE Court Street 5/5A Plant
Cavity Impact Analysis

File: 6655.001

Dear Mr. Taylor:

As requested by EMCON, and in accordance with O'Brien & Gere Engineers, Inc.'s (O'Brien & Gere) October 10, 1997 proposal, O'Brien & Gere conducted an air dispersion modeling evaluation of projected emissions from the air stripper to be located at the former GE Court Street 5/5A Plant. This evaluation considered the potential air quality impacts associated with the cavity region of Building 5, based on the relocation of the air discharge closer to the property line (to accommodate site redevelopment plans).

This letter report supplements the previous air quality analysis report prepared by O'Brien & Gere for this emission source, dated August 4, 1997. Please refer to that report for detailed information concerning source parameters, building information and general site conditions.

The cavity region is an area on the leeward (downwind) side of a structure, characterized by highly turbulent flow patterns. The air quality impacts from sources with poor dispersion characteristics, such as short stacks or stacks with little plume rise, are often elevated within the cavity region. When the plume rise from such sources is not high enough to escape the aerodynamic influences of the structure, the plume may become entrained into the cavity region, leading to elevated concentrations of air contaminants.

Typically, the length of a cavity region extends a distance equal to approximately three times the building height affecting the emission source. The height of Building 5 is 25 feet above grade; thus, the cavity length for the air stripper stack is approximately 75 feet. It is O'Brien & Gere's understanding that the air stripper stack is to be relocated approximately 60 feet from the nearest property line to accommodate site redevelopment plans by the property owner. Therefore, since the cavity region potentially extends beyond the site boundary, EMCON has requested that a cavity analysis be performed.

The following sections of this report present the general air dispersion modeling methodology employed as the basis of this evaluation and an analysis of these results.

1. Model description

The NYSDEC- and USEPA-approved SCREEN3 air dispersion model was used to evaluate the maximum ground-level air quality impact concentrations within the cavity region of Building 5. The SCREEN3 model was selected for the following reasons:

- EPA and NYSDEC have approved the general use of this model for evaluating air quality impacts within the cavity regions.
- The SCREEN3 model is consistent with the cavity analysis procedures outlined in NYSDEC's *Guidelines for the Control of Toxic Ambient Air Contaminants (Air Guide-1)*.

2. Model options

The SCREEN3 model has several options and features that enable it to be adapted to a wide range of specific applications. These options include the following: simple or complex terrain specification; urban or rural classification; good engineering practice stack height analysis; meteorological data options; and receptor locations. The following sections present the model options utilized in this air dispersion modeling evaluation and the basis for their selection.

2.1. Terrain

Since the terrain surrounding the former GE Court Street 5/5A Plant is generally flat and impacts from the air stripper are anticipated to occur in the vicinity of property line boundaries, terrain fluctuations were not incorporated into the model.

2.2. Urban/rural classification

An analysis of the land-use types within a 3-kilometer radius of the former GE Court Street 5/5A Plant was performed. Less than 50% of the area consisted of Auer[1] land-use categories Heavy Industrial, Light-moderate Industrial, Commercial and Compact Residential. Therefore, rural dispersion coefficients were used.

---

1 Auer, Jr., A.H. Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology*. Vol. 17. May 1978.

2.3. Good engineering practice stack height analysis

USEPA provides specific guidance for calculating Good Engineering Practice (GEP) stack height and for evaluating whether building downwash will occur. GEP stack height is defined as the height of the structure plus 1.5 times the lesser of the structure height or projected width. If the stack height for the proposed source is less than the height identified using GEP guidelines, based upon the dimensions of the buildings, then the potential for building downwash to occur exists and is required to be considered in the modeling analysis.

The procedures used for addressing the effects of building downwash are those recommended in the USEPA's SCREEN3 Dispersion Model User's Guide and were incorporated into the SCREEN3 model. The height and maximum and minimum wind direction-dependent width of Buildnig 5 are input to the model and are used to modify the dispersion parameters. In the SCREEN3 model, building wake effects are calculated using the Schulman-Scire or Huber-Snyder procedures.

2.4. Meteorological data

The SCREEN3 model accommodates a full range of meteorological conditions (various combinations of wind speed and atmospheric stability) or selected meteorological conditions. A full range of meteorological data was incorporated as part of this cavity analysis.

3. Source input

O'Brien & Gere conducted the air dispersion modeling evaluation for the following compounds, which are anticipated to be emitted from the stripper:

- 1,1-dichloroethane
- 1,1-dichloroethene
- 1,1,1-trichloroethane
- 1,2-dichloroethene
- benzene
- xylenes
- chloroethane
- ethylbenzene
- toluene
- trichloroethene
- vinyl chloride

3.1. Stack parameters

The following stack parameters were included in the air dispersion modeling evaluation:

Stack height:	33 ft (above grade)
Stack diameter:	0.5 ft
Stack gas exit velocity:	1884 ft/min
Stack gas exit temperature:	70°F
Building Height:	25 ft

3.2. Emission rates

Emission rate estimates for the compounds of concern were developed from design data for the stripper system, including water flow rate and weighted-average estimated influent concentrations. For the purposes of comparing stripper air quality impacts to the AGCs and SGCs, O'Brien & Gere conducted the air dispersion modeling evaluation utilizing actual and potential emission rates.

The use of actual emissions results in a reasonable representation of the long-term, annual ambient concentrations that will occur as a result of operation of the air stripper. Modeling of potential emissions results in a reasonable representation of the short-term, one-hour ambient concentrations that may occur under peak flow and ground water concentration conditions.

Actual emission estimates were based on an average ground water flow rate of 8.7 gal/min, as calculated using site permeability and ground water concentration data. Potential emissions were predicated upon the peak design flow rate of the stripper system of 10 gal/min. The same average-weighted influent concentrations of the compounds of concern were used to calculate both actual and potential emission estimates, since these concentrations represent a reasonable worst-case estimate of anticipated ground water quality.

4. Results

A typical SCREEN3 model output for this source has been included as Attachment 1. A review of this model output indicates that the momentum plume rise associated with emissions from the air stripper stack is sufficient enough to escape the aerodynamic effects of Building 5, such that there are no cavity impacts. Thus, the maximum air quality impacts for the contaminants of concern previously reported (*i.e.*, in the August 4, 1997 report) reflect the anticipated worst-case impacts from the proposed air stripper. Maximum ambient concentrations will be below the AGCs and SGCs for the contaminants of concern and emission controls will not be required.

We trust that this letter report meets the needs of EMCON as it relates to the proposed project. If you have any questions, or need additional information, please do not hesitate to contact me at (315) 437-6100.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Matthew Traister

Matthew Traister, P.E.
Managing Engineer

MT:djb
(i:52\6655001\5_\cavity.wpd)

Enclosure: Attachment 1 - SCREEN3 Model Output

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7010

John P. Cahill
Commissioner

November 5, 1997

Patrick D. Salvador, P.E.
Principal Engineer
Lockheed Martin Corporation
P.O. Box 4840
Syracuse, New York 13221-4840

Re: Former GE Court Street 5/5A Plant (Site ID# 734070)

Dear Mr. Salvador:

This letter responds to two recent submissions by Lockheed Martin Corporation (LMC). Both submissions regard air emissions from the proposed groundwater collection and treatment system for the Court Street 5/5A site.

LMC's October 16, 1997 submission responded to the Department's requirement for reevaluation if either flow rate or influent concentrations are more than 10 percent higher than design criteria. LMC's reevaluation proposal is acceptable provided that the proposed ambient air quality evaluation be submitted to the Department within 14 days and that any necessary controls be implemented within 14 days after that.

LMC's October 24, 1997 submission presents a reevaluation of air emissions due to a change in the proposed location of the groundwater treatment building. The submission requests Department approval to relocate the building as described while maintaining the air discharge requirements provided previously. This request is approved.

If you have any questions, feel free to contact me at (518) 457-1641.

Sincerely,

Alyse Peterson

Alyse Peterson
Environmental Engineer
Bureau of Central Remedial Action
Division of Environmental Remediation

cc: H. Hamel (NYSDOH)
A. Hess (USEPA)

APPENDIX C

AIR EMISSIONS REQUIREMENTS

emcon

Crossroads Corporate Center • One International Blvd. • Suite 700 • Mahwah, NJ 07495 • **(201) 512-5700** • Fax (201) 512-5786

TRANSMITTED BY FACSIMILE: (518)457-7925

August 5, 1997

Ms. Alyse Peterson
Environmental Engineer
Bureau of Central Remediation
Division of Environmental Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-7010

Re: Emission Approval - Air Emissions from Groundwater Treatment System
Former GE Court Street 5/5A Site
Town of Dewitt, Onondaga County, New York
NYSDEC Site No. 734070

Dear Ms. Peterson:

On behalf of Lockheed Martin Corporation (LMC), we are requesting New York State Department of Environmental Conservation (NYSDEC) to approve the air emissions that will be discharged from the groundwater treatment system proposed for the Former GE Court Street 5/5A site. The treatment system will remove volatile organic compounds (VOC's) from collected groundwater using an air stripper. In that regard, we are providing the NYSDEC with the following information relating to the treatment system and air emissions:

- Design Influent Concentration and Flow Rate
- Type of Treatment
- Duration and Frequency of Discharge
- Calculated Contaminant Discharge Rates

These items are addressed below.

Design Influent Concentration and Flow Rate

The proposed groundwater collection trench is approximately 830 feet long and approximately 8 to 14 feet deep, extending along the western and northern (i.e., downgradient) portions of the site. Attachment 1 presents the methodology used to determine the anticipated groundwater influent quantity. It is estimated that groundwater influent quantity will be approximately 8.7 gallons per minute, and therefore, a conservative design flow rate of 10 gallons per minute is being used for collection/treatment design.

The calculations relating to influent VOC concentrations are contained in Attachment 2. The influent concentration of VOC's was determined, using all groundwater concentration data and permeability data generated for the site to date. The site was divided into 9 areas. Permeability and VOC concentration data from each area was used to predict that area's contribution of VOC's (based on predicted flow contribution to the trench). In that way, the nine area concentrations were combined using weighted averages to predict an influent concentration for each VOC detected.

In our May 23, 1997 letter to the NYSDEC, design influent concentrations of VOC's for the determination of water effluent discharge limits for the treatment system were developed using the same methodology. However, in that case, the design VOC concentrations were elevated by a safety factor of either 2 or 4 to ensure adequate design of the air stripper.

Type of Treatment

The groundwater collection trench is proposed to control groundwater containing residual VOC's from migrating toward the South Branch of Ley Creek (to the west) and to Sanders Creek (to the north). Based on anticipated influent concentrations of site contaminants (i.e., VOC's), the proposed treatment system will include a submersible pump installed in the collection system sump, an air stripper and appurtenances. The treatment system will be located in an insulated building located on an existing concrete slab adjacent the northwest corner of Building 5. The system will be designed for a capacity of 10 gallons per minute.

Groundwater will be pumped from the sump to the treatment building, where VOC's will be removed by an air stripper designed to effectively remove VOC's from the water. Water effluent will be discharged to a nearby storm sewer which has an outfall to Sanders Creek. Air from the stripper will discharge to the atmosphere approximately 8 feet above the roofline of Building 5 (33 feet above grade) at a rate of approximately 370 cubic feet per minute.

Duration and Frequency of Discharge

The continued operation of the groundwater collection trench is intended to be a final remedy for groundwater remediation at the site. Therefore, this groundwater discharge is expected to occur for several years. The treatment process will be designed to operate on a continuous basis. However, if actual flow rates encountered are significantly lower than anticipated, the system will operate on a cyclical pattern triggered by groundwater levels present in the collection sump. The blower for the air stripper will operate continuously during treatment of groundwater. During intermittent groundwater treatment, the blower will cycle on and off with the treatment (although a delay will be used to ensure complete removal of VOC's from groundwater which remains in the stripper unit).

Calculated Air Contaminant Emission Rates

The air contaminant emission rates for VOC's were conservatively determined using a mass balance based on 100 percent stripping efficiency, and the design influent groundwater flow rate and VOC concentration (Attachments 1 and 2, respectively). The resulting VOC discharge rates are shown in Table 1, and the ambient air quality impact screening analysis is presented in Attachment 3.

The ambient air quality impacts of the system emissions were modeled by O'Brien & Gere Engineers, Inc. using the NYSDEC and USEPA-approved Industrial Source Complex Short Term - Version 3 (ISCST3) air dispersion model. The anticipated emission rates are shown in Table 1. As shown in Attachment 3, the air emission from the stripper system will result in ambient air quality impacts below the Annual Guideline Concentrations (AGCs) and Short Term Guideline Concentrations (SGCs) of the New York State Air Guide-1 (NYSDEC, 1991). Based on this analysis, no emission controls will be required.

Actual air contaminant emission rates, during system operation, will be determined by calculating the mass removal of VOC's by the stripper. Mass removal will be calculated using influent and effluent VOC concentrations and measured groundwater flow rates through the treatment system.

We look forward to your approval of the proposed air emissions from the treatment system. If you have any questions regarding the information contained herein, please contact me at (201) 512-5700.

Sincerely,

EMCON

Curtis B. Taylor
Project Manager

Attachments

cc: Patrick D. Salvador, P.E. - Lockheed Martin

Table 1
Former GE Court Street Building 5/5A Site
Groundwater Treatment System
Proposed Air Emissions

Parameters (VOCs)	Maximum Hourly Emissions (lb/hr)	Average Hourly Emissions (lb/hr)
Vinyl Chloride	1.57×10^{-3}	1.36×10^{-3}
Chloroethane	6.51×10^{-5}	5.66×10^{-5}
1,1-DCE	5.01×10^{-7}	4.36×10^{-7}
1,1-DCA	9.52×10^{-3}	8.28×10^{-3}
1,1,1-TCA	5.01×10^{-5}	4.36×10^{-5}
1,2-DCE	1.35×10^{-4}	1.18×10^{-4}
TCE	1.50×10^{-6}	1.31×10^{-6}
Benzene	8.11×10^{-5}	7.06×10^{-5}
Toluene	1.95×10^{-4}	1.70×10^{-4}
Ethylbenzene	6.56×10^{-5}	5.71×10^{-5}
Xylenes	7.83×10^{-4}	6.81×10^{-4}

ATTACHMENT 1

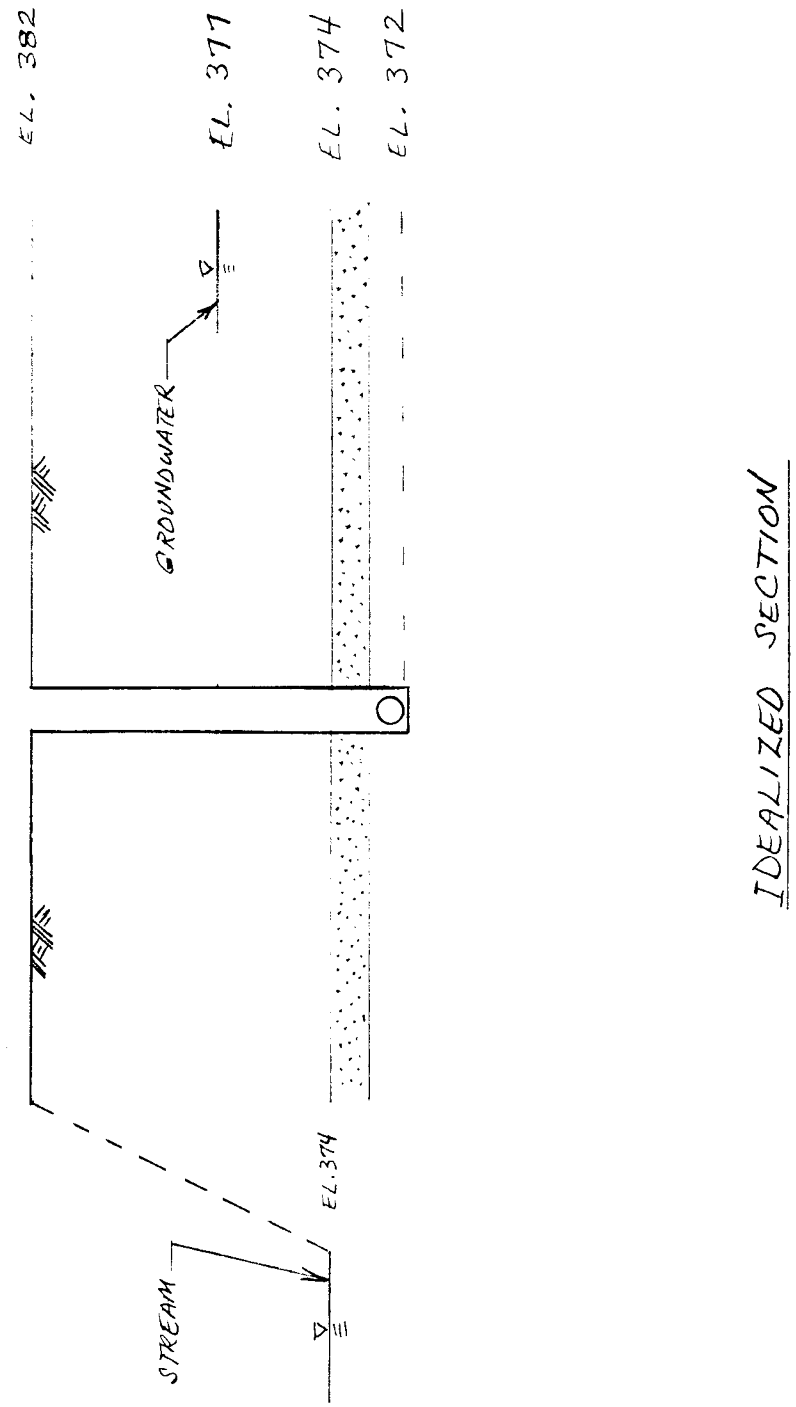
DETERMINATION OF DESIGN FLOW RATE

EMCON

By CBT Date 5-20-97 Job No. 86143-004.000

Chkd. by NK Date 5/20/97 Sheet No. 1 of 2

Subject FLOW CAPACITY DETERMINATION FOR GROUNDWATER COLLECTION TRENCH



Form DR001

1. FOLLOWING INSTALLATION OF THE TRENCH, FLOW IN THE UPPER CLAY/SILT WOULD BE VERTICALLY DOWN, AND HORIZONTAL IN THE SAND.

$$K_{CLAY} \approx 5 \times 10^{-5} \text{ cm/sec} \approx 10 \times 10^{-5} \text{ ft/min}$$

$$K_{SAND} \simeq 1 \times 10^{-3} \text{ cm/sec} \approx 2 \times 10^{-3} \text{ ft/min}$$

2. THE SAND LAYER IS APPROXIMATELY 1 FOOT THICK. IT IS MOST LIKELY THAT ALMOST ALL OF THE FLOW TO THE TRENCH WILL TAKE PLACE FROM THE SAND LAYER.

3. FROM THE UPGRADIENT SIDE (SOUTH AND EAST):

ASSUME CONSERVATIVE GRADIENT, $i = 0.5$

FLUX $= q = k\,i \Rightarrow \left(2 \times 10^{-3} \frac{ft}{min}\right) \cdot (0.5) = 1 \times 10^{-3} \frac{ft}{min}$

LENGTH OF TRENCH $\approx$ 830 ft

FLOW CAPACITY OF 1 ft SAND LAYER FROM UPGRADIENT SIDE

$$Q = q\,A \Rightarrow \left(1 \times 10^{-3} \frac{ft}{min}\right) \cdot (830 \text{ ft} \times 1 \text{ ft}) = 0.83 \text{ ft}^3/\text{min}$$

$$= 6.2 \text{ gal/min}$$

4. FROM THE STREAM SIDE (NORTH AND WEST):

ASSUME CONSERVATIVE GRADIENT, $i = 0.2$

FLUX $\Rightarrow \left(2 \times 10^{-3} \frac{ft}{min}\right) \cdot (0.2) = 4 \times 10^{-4} \frac{ft}{min}$

FLOW CAPACITY $\Rightarrow \left(4 \times 10^{-4} \frac{ft}{min}\right) \cdot (830 \text{ ft} \times 1 \text{ ft}) = 0.33 \text{ ft}^3/\text{min}$

$$= 2.5 \text{ gal/min}$$

5. $Q_{TOTAL} = Q_{UPGRADIENT} + Q_{STREAM} = 6.2 \text{ gal/min} + 2.5 \text{ gal/min} = 8.7 \text{ gal/min}$

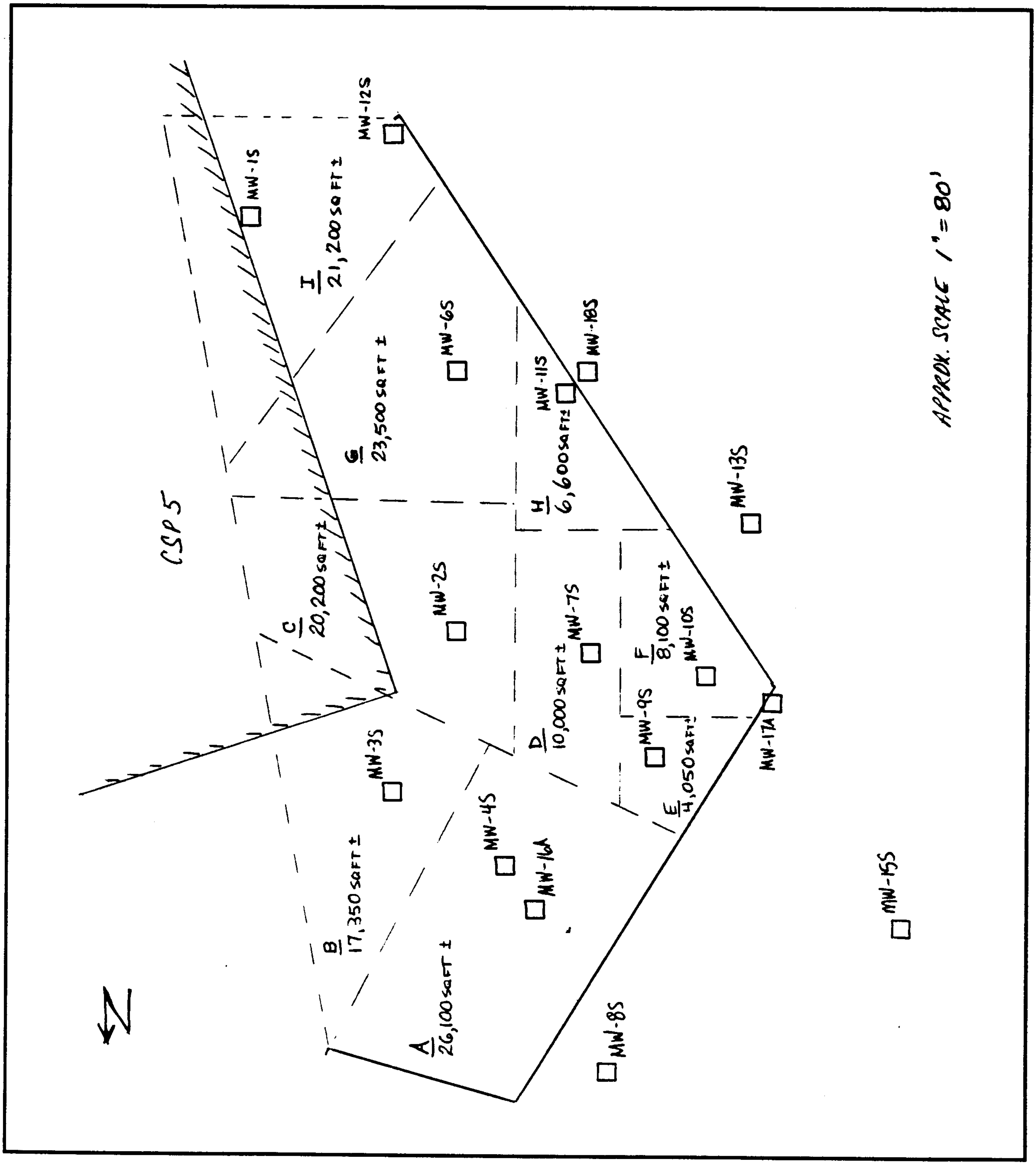
ATTACHMENT 2

DETERMINATION OF ANTICIPATED VOC INFLUENT

EMCON

By CBT Date 5-20-97
Chkd. by PJ Date 5-21-87
Subject AREAS OF INFLUENCE FOR VOC DESIGN INFLUENT DETERMINATION

Job No. 8643-004.000
Sheet No. 1 of 1



Former GE Court Street 5/5A Site
Design Influent Quality
TCL Volatile Organic Compounds

Area Designation	Area (sq. ft.)	Permeability (cm/sec)*	Product (A X K)	Influence Weighting
A	26100	7.32E-05	1.91	0.145
B	17350	9.75E-05	1.69	0.129
C	20200	5.40E-05	1.09	0.083
D	10000	3.90E-05	0.39	0.030
E	4050	7.19E-05	0.29	0.022
F	8100	7.19E-04	5.82	0.443
G	23500	6.10E-06	0.14	0.011
H	6600	2.44E-04	1.61	0.122
I	21200	9.80E-06	0.21	0.016
Total	137100		13.16	1.000

* From permeability tests conducted on Area-specific monitoring wells.

Former GE Court Street 5/5A Site
Design Influent Quality
TCL Volatile Organic Compounds

Area Designation	Computed Weighting Factor	Vinyl Chloride (ug/l)	Chloro-ethane (ug/l)	1,1-DCE (ug/l)	1,1-DCA (ug/l)	1,1,1-TCA (ug/l)	1,2-DCE (ug/l)	TCE (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethyl-benzene (ug/l)	Xylenes (ug/l)
A (MW-4S/16A)	0.145	1145			1480		52		11			
B (MW-3S)	0.129				4		1.2					
C (MW-2S)	0.083	1600	90		4540					470	530	1886
D (MW-7S)	0.030	453			2583	132	35					
E (MW-9S)	0.022	9			180							
F (MW-10S/17A)	0.443				643		38		33			
G (MW-6S)	0.011				13350							
H (MW-11S/18A)	0.122	1	46	1	1103		12	2.5				
I (MW-1S)	0.016				42080	388						
Weighted Average		312.6	13.1	0.1	1901.6	10.0	27.0	0.3	16.2	39.0	43.9	156.3

Monitoring Well Location
Analytical Data To Date

(Note: No measurable VOC's were observed @ MW-5S, MW-8S, MW-12S, and MW-15S)

1 VOC's

Parameter	Sample Date	MW-1S µg/L	MW-2S µg/L	MW-3S µg/L	(MW-16A) MW-4S µg/L	MW-6S µg/L	MW-7S µg/L	MW-9S µg/L	(MW-17A) MW-10S µg/L	(MW-18A) MW-11S µg/L	MW-13S µg/L
Vinyl Chloride	11/7/92	—	—	—	—						
	11/30/92	—	2,800	—	580						
	3/92	—	3,600	—	1,300						
	8/92	—	—	—	3,200	—	—				
	5/93	—	2,000	—	1,400	—	450	17	—	—	
	6/93						1,000	—	—	—	—
	3/97			—	(390)		360		— (-)	4 (-)	—
Average		—	1690	—	1,145	—	453	9	—	/	—
Chloroethane	11/7/92	—	—	—	—						
	11/30/92	—	450	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	56	—
	3/97				(-)		—		— (-)	88 (-)	—
Average			90							46	—
1,1-DCE	11/7/92		—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97				(—)		—		— (-)	4 (-)	—
Average		—	—	—	—	—	—	—	—	/	—
1,1-DCA	11/7/92	49,000	3,400	2	790						
	11/30/92	77,000	3,100	2	1100						
	3/92	8,400	4,900	3	1,600						
	8/92	50,000	8,800	5	2,400	19,000	4,100				
	5/93	26,000	2,500	4	2,400	7,700	1,900	120	990	1800	
	6/93						3,600	240	1200	1,600	—
	3/97			8	(590)		730		380 (3)	880 (130)	2
Average		42,080	~~4,540~~	4	1,480	13,350	2588	180	643	1,103	1
Chloroform	11/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97				(-)		—		— (-)	— (-)	—
Average		—	—	—	—	—	—	—	—	—	—
1,1,1-TCA	11/7/92	—	110	—	—						
	11/30/92	—	130	—	—						
	3/92	—	—	—	—						
	8/92	—	1700	—	—	—	—				
	5/93	—	—	—	—	—	130	—	—	—	
	6/93						350	—	—	—	—
	3/97				(-)		48		— (-)	— (-)	—
Average		—	388	—	—	—	132	—	—	—	—
1,2-DCE (Total)	11/7/92		—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			7	(310)		140		150 (-)	47 (-)	1
Average		—	—	1.2	52	—	35	-	38	12	0.5
TCE	11/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—						
	5/93	—	—	—	—	—	—				
	6/93					—	—	—	—	—	
							—	—	—	—	—
	3/97				(-)		—		—	10 (-)	—
Average		—	—	—	—	—	—	—	—	2.5	—
Bromoform	11/7/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	—						
	8/92	—	—	—	—						
	5/93	—	—	—	—	—	—				
	6/93					—	—	—	—	—	
							—	—	—	—	—
	3/97				(-)		—		—	— (-)	—
Average		—	—	—	—	—	—	—	—	—	—

Monitoring Well Location
Analytical Data To Date

(Note: No measurable VOC's were observed @ MW-5S, MW 8S, MW-12S, and MW-15S)

I. VOC's

Parameter	Sample Date	MW-1S ug/L	MW-2S ug/L	MW-3S ug/L	(MW-16A) MW-4S ug/L	MW-6S ug/L	MW-7S ug/L	MW-9S ug/L	(MW-17A) MW-10S ug/L	(MW-18A) MW-11S ug/L	MW-13S ug/L
Benzene	11/92	—	—	—	—						
	11/30/92	—	—	—	—						
	3/92	—	—	—	65						
	8/92	—	—	—	—	—	—				
	5/93	—	—	—	—	—	—	—	130	—	
	6/93						—	—	—	—	—
	3/97			—	(—)		—		— (-)	— (-)	—
Average					11				33		
Toluene	11/92	—	160	—	—						
	11/30/92	—	230	—	—						
	3/92	—	—	—	—						
	8/92	—	1,500	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—		—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			470								
Ethylbenzene	11/92	—	430	—	—						
	11/30/92	—	390	—	—						
	3/92	—	—	—	—						
	8/92	—	1300	—	—	—	—				
	5/93	—	—	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			530								
Xylenes	11/92	—	2,300	—	—						
	11/30/92	—	1,800	—	—						
	3/92	—	630	—	—						
	8/92	—	3,600	—	—	—	—				
	5/93	—	1,100	—	—	—	—	—	—	—	
	6/93						—	—	—	—	—
	3/97			—	(-)		—		— (-)	— (-)	—
Average			1886								

ATTACHMENT 3

AMBIENT AIR IMPACT ANALYSIS

O'BRIEN & GERE
ENGINEERS, INC.

August 4, 1997

Mr. Curtis B. Taylor
Project Manager
EMCON
Crossroads Corporate Center, Suite 700
One International Boulevard
Mahwah, New Jersey 07495

Re: Former GE Court Street 5/5A Plant
Air Dispersion Modeling Assessment

File: 6655.001

Dear Mr. Taylor:

As requested by EMCON, and in accordance with O'Brien & Gere Engineers, Inc.'s (O'Brien & Gere) July 18, 1997 proposal, O'Brien & Gere conducted an air dispersion modeling evaluation of projected emissions from the air stripper to be located at the former GE Court Street 5/5A plant. This evaluation considered the potential air quality impacts associated with emissions from the continuous operation of the air stripper, which is designed to treat up to 10 gallons per minute (gpm) of influent ground water. The ground water to be treated contains detectable concentrations of several chemicals, including vinyl chloride, 1,1-dichloroethane and xylene.

The results of the air dispersion modeling evaluation were subsequently compared to the Short-Term Guideline Concentrations (SGCs) and Annual Guideline Concentrations (AGCs) established by the New York State Department of Environmental Conservation (NYSDEC). AGCs and SGCs are defined in NYSDEC's *Guidelines for the Control of Toxic Ambient Contaminants - Air Guide 1 (draft 1991)*.

The following sections of this report present the general air dispersion modeling methodology employed as the basis of this evaluation, the air dispersion modeling results for the individual chemicals anticipated to be emitted from the stripper system, and an analysis of these results.

1. Model description

Version 3.04 of BREEZE for Windows Industrial Source Complex Short Term version 3 (ISCST3) dispersion model (Trinity Consultants, Inc., 1996) was used to evaluate the maximum ground-level air quality impact concentrations due to emissions from the air stripper. The ISCST3 model was selected for the following reasons:

- EPA and NYSDEC have approved the general use of the model for air quality dispersion analyses as a result of the model assumptions and methods being consistent with those referenced in the Guideline on Air Quality Models.

- The ISCST3 model is capable of predicting the impacts from point sources that are located in urban or rural areas comprising simple or complex terrain.
- The results from the ISCST3 model are appropriate for addressing compliance with SGCs and AGCs, since the model is capable of predicting 1-hour and annual averaging periods at individual receptors for each full year of actual hourly meteorological data used.
- The ISCST3 model is capable of incorporating wake effects caused by surrounding building structures.
- An assumption of a single wind direction is not required, since the ISCST3 model incorporates actual meteorological data.

2. Model options

The ISCST3 model has several options and features that enable it to be adapted to a wide range of specific applications. These options include the following: simple or complex terrain specification; urban or rural classification; good engineering practice stack height analysis; meteorological data options; and receptor locations. The following sections present the model options utilized in this air dispersion modeling evaluation and the basis for their selection.

2.1. Terrain

Since the terrain surrounding the former GE Court Street facility is generally flat and impacts from the stripper are anticipated to occur in the vicinity of property line boundaries, terrain fluctuations were not incorporated into the model.

2.2. Urban/rural classification

An analysis of the land-use types within a 3-kilometer radius of the former Court Street facility was performed. Less than 50% of the area consisted of Auer[1] land-use categories Heavy Industrial, Light-moderate Industrial, Commercial and Compact Residential. Therefore, rural dispersion coefficients were used.

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1 Auer, Jr., A.H. Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology*. Vol. 17. May 1978.

2.3. Good engineering practice stack height analysis

USEPA provides specific guidance for calculating Good Engineering Practice (GEP) stack height and for evaluating whether building downwash will occur. GEP stack height is defined as the height of the structure plus 1.5 times the lesser of the structure height or projected width. If the stack height for the proposed source is less than the height identified using GEP guidelines, based upon the dimensions of the buildings, then the potential for building downwash to occur exists and is required to be considered in the modeling analysis.

The procedures used for addressing the effects of building downwash are those recommended in the USEPA's ISCST3 Dispersion Model User's Guide and are incorporated into the ISCST3 model. The height and wind direction-dependent width of major structures are input to the model and are used to modify the dispersion parameters. In the ISCST3 model, building wake effects are calculated using the Schulman-Scire or Huber-Snyder procedures. Since the proposed stack height (33 feet above grade) of the stripper is less than GEP, wind-specific building heights and widths data were estimated using the USEPA Building Profile Input Program (BPIP) and were incorporated into the model.

It should be noted, however, that the projected cavity region associated with the stripper is contained within the former GE Court Street facility boundary. Thus, in accordance with Appendix B of Air Guide-1, the evaluation of cavity impacts is not required.

2.4. Meteorological data

The air quality modeling analysis incorporated hourly pre-processed National Weather Service (NWS) surface meteorological data from Syracuse, New York and concurrent twice-daily upper air soundings from Buffalo, New York for the years 1990 through 1994. The pre-processed hourly meteorological data file for each year of record used was obtained from Trinity Consultants. These files contain randomized wind direction, wind speed, ambient temperature, atmospheric stability, and mixing heights. The anemometer height of 10 meters was used in the modeling analysis and was obtained from NWS Local Climatological Data summaries for Syracuse-Buffalo.

2.5. Receptor locations

Receptors were placed at locations considered to be "ambient air," which USEPA has defined as "that portion of the atmosphere, external to buildings, to which the general public has access" [40 CFR 50.1(e)]. The nearest off-site receptor is the southwestern property boundary, which is approximately 100 feet from the proposed stripper location.

In order to evaluate ambient air quality impacts, a polar receptor grid coordinate system with receptors every 10° and ring distances ranging from approximately 100 to 1500 feet in increments of 50 feet was established. Thus, the polar grid included approximately 1044 receptors (29 rings along 36 radials).

3. Source input

O'Brien & Gere conducted the air dispersion modeling evaluation for the following compounds, which are anticipated to be emitted from the stripper:

- 1,1-dichloroethane
- 1,1-dichloroethene
- 1,1,1-trichloroethane
- 1,2-dichloroethene
- benzene
- xylenes
- chloroethane
- ethylbenzene
- toluene
- trichloroethene
- vinyl chloride

3.1. Stack parameters

The following stack parameters were included in the air dispersion modeling evaluation:

Stack height:	33 ft (above grade)
Stack diameter:	0.5 ft
Stack gas exit velocity:	1884 ft/min
Stack gas exit temperature:	70°F
Building Height:	25 ft

3.2. Emission rates

Emission rate estimates for the compounds of concern were developed from design data for the stripper system, including water flow rate and weighted-average estimated influent concentrations. For the purposes of comparing stripper air quality impacts to the AGCs and SGCs, O'Brien & Gere conducted the air dispersion modeling evaluation utilizing actual and potential emission rates.

The use of actual emissions results in a reasonable representation of the long-term, annual ambient concentrations that will occur as a result of operation of the air stripper. Modeling of potential emissions results in a reasonable representation of the short-term, one-hour ambient concentrations that may occur under peak flow and ground water concentration conditions.

Actual emission estimates were based on an average ground water flow rate of 8.7 gal/min, as calculated using site permeability and ground water concentration data. Potential emissions were predicated upon the peak design flow rate of the stripper system of 10 gal/min. The same average-weighted influent concentrations of the compounds of concern were used to calculate both actual and potential emission estimates, since these concentrations represent a reasonable worst-case estimate of anticipated ground water quality.

4. Results

The results of this modeling evaluation are summarized in Table 1. The model output have been included as Appendix A to this report. A review of Table 1 indicates that the compound of concern that exhibits the highest relative short-term exposure is benzene; however, the maximum off-site 1-hour impact of benzene is less than 0.1% of benzene's SGC. Vinyl chloride is the compound that possesses the highest relative long-term exposure. The maximum off-site annual impact of vinyl chloride is 0.0093 $\mu g/m^3$, which is less than 50% of the AGC for vinyl chloride.

Thus, these data indicate that the projected emissions from the former GE Court Street air stripper system will not result in adverse air quality impacts. Furthermore, these results indicate that air emissions control is not required.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Matthew Traister

Matthew Traister, P.E.
Managing Engineer

MT:djb
(i:52\6655001\5_\model.wpd)

Enclosures: Table 1 - Summary of Modeling Results
Appendix A - Model Output (based on 1990 - 1994 meteorological data)

Table 1

Former GE Court Street 5/5A Site

Maximum Off-site Air Quality Impacts

Design influent flow rate (gpm): 10
Average influent flow rate (gpm 8.7

Chemical	Design Influent Conc. (in water) (µg/l)	Maximum Hourly Emissions (lb/hr)	Max. 1-hour Impact Conc'n (ug/m3)	Comparison Threshold SGC (ug/m^3)	Percent of Comparison Threshold	Average Hourly Emissions (lb/hr)	Max. Annual Impact Conc'n (ug/m3)	Comparison Threshold AGC (ug/m^3)	Percent of Comparison Threshold
1,1 DCA	1901.6	9.52E-03	3.08	190000	0.00%	8.28E-03	0.057	500	0.01%
1,1 DCE	0.1	5.01E-07	0.000162	2000	0.00%	4.36E-07	0.00000297	0.02	0.01%
1,1,1 TCA	10	5.01E-05	0.0162	450000	0.00%	4.36E-05	0.000297	1000	0.00%
1,2 DCE	27	1.35E-04	0.0438	190000	0.00%	1.18E-04	0.000802	1900	0.00%
Benzene	16.2	8.11E-05	0.0263	30	0.09%	7.06E-05	0.000481	0.12	0.40%
Chloroethane	13	6.51E-05	0.0211	630000	0.00%	5.66E-05	0.000386	63000	0.00%
Ethylbenzene	13.1	6.56E-05	0.0212	100000	0.00%	5.71E-05	0.00039	1000	0.00%
Toluene	39	1.95E-04	0.0632	89000	0.00%	1.70E-04	0.00116	2000	0.00%
Trichloroethene	0.3	1.50E-06	0.000486	33000	0.00%	1.31E-06	0.00000891	0.45	0.00%
Vinyl chloride	312.6	1.57E-03	0.51	1300	0.04%	1.36E-03	0.0093	0.02	46.44%
Xylenes	156.3	7.83E-04	0.253	100000	0.00%	6.81E-04	0.00464	300	0.00%

Note:

1) Results are based on 5 years of meteorological data (1990-1994). The maximum, normalized 1-hour impact of 323.8 (ug/m3)/(lb/hr) occurred using 1990 meteorological data. The maximum, normalized annual impact of 6.822 (ug/m3)/(lb/hr) occurred using 1991 meteorological data.

Source: O'Brien & Gere Engineers, Inc.

APPENDIX D

HEALTH AND SAFETY PLAN ADDENDUM NO. 1

EMCON

SITE - SPECIFIC HEALTH AND SAFETY PLAN

ADDENDUM # 1 to

Site Specific Health and Safety Plan (Blasland, Bouck and Lee, August 1996)

Site Name: Former GE Court Street 5/5A Site
Site Location: Town of Dewitt , New York

Purpose

The purpose of this Site-Specific Health and Safety Plan (HASP) Addendum is to provide specific guidelines and establish procedures for the protection of personnel performing the scope of activities, as described below. The information in this HASP has been developed in accordance with applicable standards and is, to the extent possible, based on previous studies and information available to date. This HASP is intended to be a living document in that it must continually evolve as site conditions and knowledge of the site work activities develop further. This HASP provides the guidance necessary to initiate the work and to monitor site conditions to determine required personnel protection during work activities. The HASP-required levels of protection will be based on the monitoring results, and implementation of any adjustments specified herein. This Addendum will be used in conjunction with the original HASP developed by Blasland Bouck & Lee, Inc. in August 1996.

Site and Project Description

Project personnel will be conducting remedial construction services and engineering oversight for the installation of a groundwater collection system and storm sewer modifications as specified in NYSDEC-approved IRM Work Plans developed for the site.

Personnel Requirements

All personnel conducting activities on site for which potential exposure exists must be in compliance with all applicable Federal/State rules and regulations, including OSHA 29 CFR 1910.120, and OSHA 29 CFR 1926. On-site personnel must also be familiar with the procedures and requirements of this HASP. In the event of conflicting safety procedures/requirements, personnel must implement those safety practices which afford the highest level of protection. In addition, all personnel conducting activities on site for which potential exposure exists must have successfully completed the Lockheed Martin Corporation

Contractor's Safety Course, and must perform work in accordance with the Lockheed Martin Contractor's Safety Handbook.

A pre-entry briefing, as required by the Site Specific Health and Safety Plan (BB&L, August 1996) for the site will serve to familiarize on-site personnel with the procedures, requirements, and provisions of the HASP. All on-site personnel, including the Engineer, Contractors and Subcontractors, shall attended a pre-entry briefing of the HASP requirements. The content of this Addendum will also be discussed in the briefings, as attested by the signature of site personnel on the signature form attached hereto.

Site Health and Safety Information

Potential exposure to chemical hazards is discussed in section 3.3 of the original HASP (BB&L, August 1996). Physical hazards associated within this scope of work are close proximity to heavy equipment, excavation and trenching, noise and slip/trip/fall type injuries. Procedures and safety guidelines for heavy equipment and excavations are included in this Addendum.

Personnel Protective Requirements

Field and site activities shall initiate in Modified **Level D,** which shall consist of safety shoes or boots, Hardhat, hearing protection, safety glasses, and Nitrile gloves. Due to very low ppm sample results obtained from previous investigations secondary silver shield gloves will not be required for Modified Level D. Level C and B shall follow the requirements set forth in the original HASP (BB&L, August 1996).

Monitoring

Air monitoring requirements shall follow the original HASP (BB&L, August 1996) as stated in section 8.

The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the evacuation of site personnel and reevaluation by the safety officer and project manager of the hazard and the level of protection.

Decontamination

Decontamination procedures shall follow section 7 of the original the HASP (BB&L, August 1996)

Emergency Information

The emergency information shall follow section 11 of the original HASP (BB&L, August 1996).

HEAVY EQUIPMENT OPERATIONS

Working around heavy equipment can be dangerous because of the size and power of the equipment, the limited operatory field of vision and the noise levels that can be produced by the equipment. Heavy equipment to be utilized at the site shall include a variety of backhoes, dozers, track loaders, and off-road trucks.

The following practices shall be followed by operators when using heavy equipment:

- Equipment should be inspected daily by the operator to ensure that the equipment is in safe operating condition.
- When not in use, hydraulic and pneumatic components should be left in down or "dead" position.
- Roll-over protection shall be provided on hilly sites.
- No riding on vehicles or equipment except in fixed seats.
- Seat belts should be worn at all times.
- Backup alarms, automatically activated and loud enough to be heard above background noise are required on all heavy equipment.
- Parking brakes should always be applied on parked equipment.
- Equipment should never be operated closer than 10 feet from utility lines.
- Windshields must be maintained clean and free of visual obstructions.

To ensure the safety of personnel in the work area, the following safety procedures regarding heavy equipment must be reviewed prior to and followed during work activities:

- Ensure that equipment operators are trained and/or experienced in the operation of the specific equipment.
- Personnel should never approach a piece of heavy equipment without the operators acknowledgement and stoppage of work or yielding to the employee.
- Never walk under the load of a bucket or stand beside an opening truck bed.
- Maintain visual contact with the operator when in close proximity to the heavy equipment.

- Wear hearing protection while on or around heavy equipment, when normal conversation cannot be heard above work operations.
- Steel-toed shoes, safety glasses, and a hard hat shall be worn for all work conducted near heavy equipment.

Excavation and Trenching

All excavation and trenching operations shall be in compliance with OSHA 29 CFR 1926.650 through 652.

Excavation and Development

The following safety guidelines shall be adhered to while conducting excavation and trenching development:

- Prior to opening an excavation, effort shall be made to determine whether underground installation (i.e., sewer, telephone, water, fuel electric lines, etc.), will be encountered and the estimated location. When the excavation approaches the estimated location of such installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

- Ladders will be used in any trench greater than 4 feet in depth, and must be available with every 25 feet of lateral travel. The ladders must extend above the trench at least 3 feet or greater.

- Protective systems (i.e., shoring/bracing, sloping or benching) shall be used if personnel are to enter an excavation with a depth greater than 5 feet.

- Sloping or benching shall be in accordance with the OSHA standard and shall correspond to the proper ratio (i.e., 1½:1) as per soil type.

- Air monitoring for hazardous atmospheres shall be conducted prior to personnel entering the trench with a depth at 4 feet or greater.

- Barriers shall be erected around excavations in remote work locations. Backfill all excavations, temporary wells, pits, and shafts when work is completed.

- Vehicular traffic and heavy equipment shall remain at least 4 feet from the face of the excavation. All excavated or other materials shall be stored and retained at least 2 feet from excavation.

- The excavation shall be inspected by the selected competent person throughout the work day, during any change in conditions (i.e., rain, cracking/fissures), and at a minimum twice daily.

- During infiltration of water into the excavation dewatering activities shall be conducted.

Excavation Entry Safety

The sides of all excavations in which personnel are exposed to potential cave-in shall be guarded by a shoring system, sloping of the ground, or equivalent means.

Sides, slopes, and faces of all excavation shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing or other equally effective means. The angle of repose shall be flattened when an excavation has water conditions; silty materials; loose boulders; and areas where erosion, deep frost action, and slide planes appear. Excavations shall be inspected by a competent person after every rain storm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased, if necessary.

SIGNATURE FORM FOR

SITE - SPECIFIC HEALTH AND SAFETY PLAN

ADDENDUM # 1 to

Site Specific Health and Safety Plan (Blasland, Bouck and Lee, August 1996)

Site Name: Former GE Court Street 5/5A Site

Site Location: Town of Dewitt , New York

Each employee conducting field work shall sign this form after the pre-entry briefing is completed and prior to commencing work on site. A copy of this signed form shall be kept at the site, and the original located in the project file.

Site Personnel Sign-off

☐ I have received a copy of the Site-Specific Health and Safety Plan.

☐ I have read the Plan and will comply with the provisions contained therein.

☐ I have attended a pre-entry briefing outlining the specific health and safety provisions on this site.

Name: ______________________________ Date: __________

______________________________ Date: __________

______________________________ Date: __________

______________________________ Date: __________

APPENDIX E

HEALTH AND SAFETY PLAN ADDENDUM NO. 2

EMCON

SITE-SPECIFIC HEALTH AND SAFETY PLAN

ADDENDUM No. 2 to

Site Specific Health and Safety Plan (Blasland, Bouck and Lee, August 1996)

Site Name: Former GE Court Street 5/5A Site
Site Location: Town of Dewitt, New York

CONFINED SPACE ENTRY

A confined space is defined as a space or work area which is not designated or intended for normal human occupancy, has limited means of egress, and poor natural ventilation. A confined space may be subject to the accumulation of toxic or flammable materials, and/or the deletion of oxygen. An example of a confined space is: storage tanks, process vessels, ventilation or exhaust ducts, sewers/manholes, underground utility vaults, tunnels, pipelines, open top spaces more than four feet in depth such as , trenches and vaults.

Confined Space Entry Procedures

Requirements must be established for safe entry, conducting work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910.146, and NIOSH Publication Number 80-106.

No task(s) involving confined space entry may begin until an appropriate Confined Space Entry Permit (CSEP) is issued. A CSEP shall be initiated by the supervisor(s) of personnel who are to enter into or work in a confined space. The CSEP will be completed by the personnel involved in the entry, and approved by the confined space entry supervisor before personnel will be permitted to enter the confined space. The CSEP shall be valid only for the performance of the work identified, and for the location and time specified. Permits must be reissued at the beginning of each work day, each work shift, or if the confined space has not been monitored within one-half hour. The CSEP shall be considered void if work in the confined space significant changes within the confined space atmosphere or job scope occurs. A copy of a blank CSEP is attached.

The posted CSEP shall be removed at the completion of the job or the end of the day whichever is first. The CSEP must be posted at the work site, and a copy placed in the project health and safety file after use.

The following are general procedures for confined space entry activities:

- Evaluate the job and identify the potential hazards before a job in a confined space is scheduled.

- If possible, ensure removal of any materials that may produce toxic or air displacing gases, vapors ,or dust.

- Initiate a CSEP.

- Ensure that any hot work (welding, burning, open flames, or spark-producing operation) that is to be performed in the confined space has been approved by the confined space entry supervisor and is indicated on the CSEP.

- Ensure that the space is ventilated (if necessary) before starting work in the confined space and for the duration of the time that the work is to be performed in the space. If space cannot be ventilated properly then supplied-air respiratory protection must be used.

- Ensure that the personnel who enter the confined and the confined space entry attendant(s) are familiar with the contents and requirements of the HASP.

- Ensure that remote atmospheric testing of the confined space is conducted prior to employee entry and before validation/revalidation of a CSEP, to confirm the following:

  - Oxygen content between 19.5 percent and 23.5 percent.

  - No concentration of combustible gas in the space is above 10 percent LEL. Sampling will be done throughout the confined space, and specifically at the lowest point in the space.

  - If remote testing is not possible, Level B protection is required.

- Monitor for oxygen content and combustible gases will be carried into the confined space with the entry team.

- Confined spaces should be identified with a posted sign which reads, "Caution - Confined Space".

- Only personnel trained and knowledgeable of the requirements of these Confined Space Entry Procedures will be authorized to enter a confined space or be a confined space observer.

- The CSEP will become a part of the permanent and official record of the site.

- If flammable liquids, gases, or vapors may be contained within the confined space, explosion-proof equipment will be used. All electrical equipment shall be positively grounded.

- The contents of any vessel shall, when necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.

- Hand tools used in confined spaces shall be in good repair, explosion-proof and spark-proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.

- Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with bulb, and must be explosion-proof.

- Compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space.

- If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space.

- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.

- A retrieval system shall be used by each authorized entrant. The retrieval system shall include a chest or full body harness, with a retrieval line attached to the center of the entrants back, near shoulder level. The other end of the retrieval line shall be attached to a mechanical device (winch) at a fixed point outside of the space. The retrieval system shall be operated by the attendant from outside the space. A mechanical retrieval device is required for vertical permit spaces greater than four feet in depth.

- Where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.

- Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.

- Any deviation from these confined space entry procedures requires the prior approval of the HSO.

Confined Space Entrant Responsibilities

The confined space entrant shall be informed of the hazards before entry, communicate with the entry attendant and exit the space upon any change in conditions that may impact the safety of herself/himself.

Confined Space Entry Attendant Responsibilities

A confined space entry attendant is an individual assigned to monitor the activities of personnel working within a confined space. The confined space attendant monitors and provides external assistance to those inside the confined space. The duties of the attendant are:

- While personnel are inside the confined space, a confined space entry attendant will monitor the activities and provide external assistance to those in the space. The attendant will have no other duties which may take his attention away from the work or require him to leave his post at the confined space at any time while personnel are in the space.
- The confined space attendant shall maintain some form of contact with all personnel in the confined space. Visual contact is preferred, if possible.
- The attendant shall contact the Entry Supervisor in the event of an emergency in accordance with the HASP.
- If irregularities within the space are detected by the observer, personnel within the space will be ordered to exit.
- The rescue of an unconscious person within the confined space shall never be attempted without the use of supplied air respiratory protection and contacting a replacement observer. Removal of personnel should first be attempted from the outside using a lifeline.
- An alternate person shall be designated to provide assistance to the confined space attendant in case the attendant must enter the confined space to retrieve personnel.

Confined Space Entry Supervisor Responsibilities

- Know the hazards.
- Verify appropriate entries are made on the permit and procedures are in place.
- Terminate the entry (if necessary).
- Verify that rescue services are available.
- Remove all unauthorized personnel.
- Assure that entry procedures are in compliance with the CSEP and are consistent from operation to operation.

SIGNATURE FORM FOR

SITE-SPECIFIC HEALTH AND SAFETY PLAN

ADDENDUM No. 2 to

Site Specific Health and Safety Plan (Blasland, Bouck and Lee, August 1996)

Site Name: Former GE Court Street 5/5A Site

Site Location: Town of Dewitt , New York

Each employee conducting field work shall sign this form after the pre-entry briefing is completed and prior to commencing work on site. A copy of this signed form shall be kept at the site, and the original located in the project file.

Site Personnel Sign-off

☐ I have received a copy of the Site-Specific Health and Safety Plan.

☐ I have read the Plan and will comply with the provisions contained therein.

☐ I have attended a pre-entry briefing outlining the specific health and safety provisions on this site.

Name: ______________________________ Date: ____________

______________________________ Date: ____________

______________________________ Date: ____________

______________________________ Date: ____________

CONFINED SPACE ENTRY PERMIT

Location and Description of Confined Space:	Purpose of Entry:

Permit is valid for one eight-hour shift:

From:		To:	
Date	Time	Date	Time

Potential Hazards (check all identified or suspected hazards):

☐ Low oxygen	☐ High pressure steam lines/leaks	☐ Unsecured ladder
☐ Flammable atmosphere	☐ High temp condensate lines/leaks	☐ Slippery surfaces
☐ Toxic atmosphere	☐ High surface and ambient temps	☐ Liquid engulfment
☐ Atmospheric irritants	☐ Live electrical circuits/cables	☐ Standing sludge/debris
☐ Asbestos pipes/insulation	☐ Electro-mechanical hazards	☐ Low overhead
☐ Excessive heat	☐ Collapse of grating/support	☐ Entrapment
☐ Moisture	☐ Collapse of space	☐ Cramped space
☐ Excessive noise	☐ Falling off access ladder	☐ Standing water
☐ Poor lighting/visibility	☐ Falling through opening	☐ Hot liquids
☐ High temp steam lines/leaks	☐ Overhead objects falling	☐ Other:

Appropriate Personal Protective/Safety Equipment (note: R = required, V = verified):

	R	V		R	V		R	V
Safety glasses/goggles	☐	☐	Rubber gloves	☐	☐	SCBA	☐	☐
Face shield	☐	☐	Gloves, other:	☐	☐	Ventilation fan	☐	☐
Hard hat	☐	☐	Tyvek suit	☐	☐	Escape harness	☐	☐
Hearing protection	☐	☐	PVC/Splash suit	☐	☐	Tripod escape unit/hoist	☐	☐
Steel toe shoes	☐	☐	Air-purifying respirator	☐	☐	Other:	☐	☐
Rubber boots	☐	☐	Airline/5 minute escape	☐	☐	Other:	☐	☐

On-site Security and Communication (note: R = required, V = verified):

	R	V		R	V		R	V
Off-site ERT notified	☐	☐	Intrinsically safe radio	☐	☐	Barricade erected	☐	☐
Attendant posted	☐	☐	Area roped off	☐	☐	Warning flags or cones	☐	☐
Telephone available	☐	☐	Warning signs posted	☐	☐	Other:	☐	☐

Hazard Isolation, Elimination, and Control Procedures (note: R = required, V = verified):

	R	V		R	V
Pump out any standing water	☐	☐	Verify intrinsically safe tools/equipment	☐	☐
LOTO electric/mechanical deactivation	☐	☐	Ventilate space with portable fan	☐	☐
LOTO lines broken, capped, or blanked	☐	☐	Inert and purge flammable atmosphere	☐	☐
Verify adequate explosion-proof lighting	☐	☐	Visually inspect space for physical hazards	☐	☐

Hot Work:
(requires prior approval of HSO)

	Circle		Circle
Is permit required?	Yes/No	Is permit attached?	Yes/No

CONFINED SPACE ENTRY PERMIT (PAGE 2)

Direct Reading Air Monitoring:

Test(s) Required	Instrument/Model & Serial Number	Permissible Entry Level	Date: Time:	Date: Time:	Date: Time:	Date: Time:	Date: Time:
% O_2		>19.5% and <23.5%					
% LEL		<10%					
ppm CO		<35 PPM					
ppm H_2S		<10 PPM					
ppm VOC		See HASP					
		Tester's Initials:					

Instruments must be calibrated daily, within a one 8-hour shift, according to all applicable manufacturer's requirements. If instrument calibrator is different from tester, indicate here:

Authorized Entrants within Permit Space:

Entrant's Name	Time in	Time out	Authorized site attendants

Permit Authorization:

	Printed Name	Signature	Date
Attendant in charge of entry			
Supervisor authorizing entry			

A signature in this section certifies that the employee is familiar with the contents and requirements of the HASP and that the information provided on front and back of this form is complete and accurate.

Attendant's General Emergency Rescue Procedures:

1. Immediately call for help (or notify appropriate emergency rescue team by radio).
2. Clearly state NAME, LOCATION, PROBLEM and request immediate EMERGENCY ACTION.
3. Maintain communication and DO NOT ENTER SPACE.
4. Display permit and advise rescue team of problem.
5. Assist rescue team as necessary. Again, DO NOT ENTER SPACE.

Remember, qualified emergency response personnel, including fire departments, police departments, ambulance services, emergency medical technicians, and hospitals have been provided in the health and safety plan.