93 MAIN STREET

Binghamton (C),Broome County, New York
Site No. 7-04-027

PROPOSED REMEDIAL ACTION PLAN

February 2000

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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Binghamton, Broome County, New York
Site No. 7-04-027
January 2000

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health is proposing a remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the 93 Main Street Site, a class 2 inactive hazardous waste disposal site. As more fully described in Sections 3 and 4 of this document, spills and alleged dumping have resulted in the disposal of a number of hazardous wastes at the site, consisting of a variety of pesticides, including DDT, chlordane, lindane and dieldrin. These disposal activities have resulted in the following significant threats to the public health and/or the environment:

- a significant threat to human health associated with pesticide and petroleum contaminated subsurface soil impacting local groundwater.
- a significant threat to the area's sole source aquifer.

In order to eliminate or mitigate the significant threats to the public health and/or the environment that the hazardous wastes disposed at the 93 Main Street Site have caused, the following remedy is proposed:

- Hydraulic containment and chemical oxidation, consisting of a system to collect contaminated groundwater and leachate generated during treatment. An oxidizing agent, such as hydrogen peroxide, would be used to break down the contamination in the subsurface soils.

The proposed remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for this site in Section 6 of this Proposed Remedial Action Plan (PRAP), in conformity with applicable standards, criteria, and guidance (SCGs).

This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Remedial Investigation (RI), Feasibility Study (FS) and other relevant reports and documents, available at the document repositories.

To better understand the site and the investigations conducted, the public is encouraged to review the project documents at the following repositories:

Broome County Public Library
122 State St.
Binghamton, NY 13901

NYSDEC Region 7 Headquarters
615 Erie Boulevard West
Syracuse, NY 13204-2400
(315) 426-7551
Attn. Gina Alito
(By appointment only)

NYSDEC Central Office
50 Wolf Road, Room 348
Albany, NY 12233-7010
(518) 457-4343
Attn: James Candiloro
(By appointment only)

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from February 15, 2000 to March 17, 2000 provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for March 2, 2000 at the Methodist Tabernacle Church beginning at 7:00 p.m.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which you can submit verbal or written comments on the PRAP.

The NYSDEC may modify the preferred alternative or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision. The Record of Decision is the NYSDEC's final selection of the remedy for this site. Written comments may be sent to Mr. Candiloro at the above address through March 17, 2000.

SECTION 2: <u>SITE LOCATION AND DESCRIPTION</u>

The 93 Main Street Site consists of four parcels of land, 89-91 and 93 main street and 25 and 25½ Arthur street, located in the City of Binghamton, Broome County. An abandoned former apartment building existed on the 93 Main Street parcel and a partially completed motel building existed on the 89-91 Main Street parcels. Both of these deteriorated structures were demolished by the city of Binghamton in September of 1999. The 93 Main Street parcel was at one time home to the McMahon Brothers Pest Control company. The 25½ Arthur street property contains a house that is currently occupied, while the 25 Arthur Street property is a vacant lot. The areas of contamination are centered around a dry well located on 89-91 Main Street and two drains on 93 Main Street.

Figure 1 shows the properties described above. The surrounding area is a mix of residential and commercial buildings, all of which are served by the municipal water system.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

From the 1950's to the 1980's the McMahon Brothers Pest Control company operated at the 93 Main Street Site. It was reported that the site was used as a pesticide/herbicide storage and handling location for the company. There were also allegations of spills having taken place at the Site.

3.2: Remedial History

In 1995 Gaynor Associates of Cortland, NY performed a Phase II environmental audit on the 93 Main Street property for a financial institution. The results of the investigation revealed elevated concentrations of herbicides and pesticides in the soil, specifically 2,4,5-T at 12,000 µg/kg; 2,4-D at 4,030 µg/kg; and Chlordane at 15,000 µg/kg.

During the investigation, Gaynor determined that a back area of the building had been used by McMahon for pesticide storage and handling. This area had since been converted to apartments, and the concrete floor covered with tile or carpet. During the Gaynor study strong pesticide odors were noted in the abandoned apartments, which were in serious disrepair.

In 1995 the City, in response to these and other complaints, entered into a Voluntary Cleanup Agreement (VCA) with the NYSDEC in order to perform a limited investigation of the site. This investigation focused on the rear of the 93 Main Street building and consisted of Geoprobe sampling of the soil and groundwater. The results of this investigation revealed elevated concentrations of pesticides/herbicides such as chlordane, aldrin, dieldrin, and 2,4,5-T in the Site's groundwater and/or soil. These pesticide concentrations exceeded, in some instances, the NYSDEC's groundwater standards by orders of magnitude. Soil guidance value exceedences were also significant. The presence of these pesticides indicate a threat to the area's sole source aquifer and was the basis for the Site's class "2" designation on the New York State Registry of Inactive Hazardous Waste Disposal Sites.

The VCA only required the City implement an agreed to level of effort to investigate the site. With the completion of the investigation this commitment has been satisfied.

SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health or the environment posed by the presence of hazardous waste, the NYSDEC has recently conducted a Remedial Investigation/Feasibility Study (RI/FS).

4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

The RI was conducted in 2 phases. The first phase was conducted between November 1998 and August 1999 the second phase between September 1999 and November 1999. A report entitled Remedial Investigation Report for the 93 Main Street Inactive Hazardous Waste Disposal Site has been prepared which describes the field activities and findings of the RI in detail.

The RI included the following activities:

1. Surface and subsurface soil samples were collected using a Geoprobe rig. The samples were then analyzed for pesticides and herbicides using immunoassay test kits. Ten percent of the samples collected were also sent to a laboratory for confirmatory analysis.

2. Groundwater samples were collected, also using a Geoprobe, and analyzed to help determine the extent of groundwater contamination.

3. Monitoring wells were installed to define groundwater flow direction and determine the extent of groundwater contamination.

4. A test pit investigation was conducted to determine if there were any pipes connected to the drywell on 89-91 Main, the drain on 93 Main or to determine whether other underground structures existed.

5. Borings were made through the slab of the garage area of the 93 Main Street building to obtain soil samples.

6. The concrete slab in the garage area was removed to obtain additional samples and investigate a floor drain found in the garage.

To determine which media (soil, groundwater, etc.) are contaminated at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater, drinking water and surface water SCGs identified for the 93 Main Street site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of New York State Sanitary Code. For soils, NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 provides soil cleanup guidelines for the protection of groundwater, background conditions, and health-based exposure scenarios. In addition, for soils, site specific background concentration levels can be considered for certain classes of contaminants.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb), parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

4.1.1: Site Geology and Hydrogeology

As part of the RI, an extensive investigation of the overburden geology was conducted. This investigation included Geoprobe, test pit and monitoring well investigations. These investigations revealed the following stratigraphic units from the ground surface: fill, silt with gravel and sand, gravel and sand

and till. A more detailed description of these units is presented in the Remedial Investigation Report.

Groundwater exists at depths ranging from 7 to 23 feet below ground surface, depending on location, under unconfined conditions within a thin saturation zone directly above the lodgment till across the study area. Measured groundwater elevations consistently show flow direction to be north-northeast towards the aquifer to the north, similar to the dip of the surface of the till unit. Recharge to the water table in this area occurs as downward infiltration of precipitation. Apparently, once it reaches the relatively impermeable till unit, groundwater flow is controlled by gravity as it flows along the surface of the till into the sand and gravel aquifer to the north.

While no formal aquifer tests have been performed during this investigation, recovery rates observed during monitoring well development suggest a range of moderate to low hydraulic conductivity within the saturated sand and gravel unit. The moderately steep hydraulic gradient across the site further supports this interpretation.

4.1.2: Nature of Contamination

As described in the RI report, many soil, groundwater and sediment samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their SCGs are, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and pesticides.

The VOC contaminants of concern are xylene, ethylbenzene, tetrachloroethene, chlorobenzene, 1,2-dichloroethane.

The SVOC contaminants of concern are 1,2,4-Trichlorobenzene, naphthalene, 2-Methylnaphthalene, 2,4,5-trichlorophenol, 2,4-dichlorophenol, pentachlorophenol, phenol, 2-chlorophenol, 1,4-dichlorobenzene, 2-methylphenol and 4-nitrophenol. As well as the carcinogenic polyaromatic hydrocarbons (PAHs), benzo(a)anthracene, benzo(k)anthracene, chrysene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, dibenz(a,h,)anthracene.

The pesticide contaminants of concern are lindane, aldrin, dieldrin, 4,4'-DDT, 4,4-DDD, 4,4'-DDE, heptachlor, heptachlor epoxide, 2,4-D, chlordane, 4,4'-DDE, endrin, endosulfan I, endosulfan II, beta-BHC, and delta-BHC. These are all listed hazardous wastes and some, such as DDT and chlordane, have been banned from use as pesticides.

4.1.3: Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in subsurface soils and groundwater and compares the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Soil

Three areas of subsurface soil contamination were identified at the 93 Main Street site. One area, the drywell, is located on the 89-91 Main Street property. The other two areas, the drain and the former garage area, are located on the 93 Main Street property.

An extensive survey of the remainder of the site did not identify any other areas of subsurface contamination. Since the site was either covered by buildings or paved, limited surface soil sampling was conducted which determined that surface soils were not contaminated.

The drywell area consists of mainly shallow pesticide contamination. The area of contamination extends from four to six feet below ground surface and two feet radially. This area contains approximately 16 cubic yards of contaminated soil. In this area the predominate contaminant was chlordane which was detected at 149,000 ppb.

In the area of the drain on the 93 Main Street parcel, subsurface soils are contaminated with pesticides and petroleum products. Contamination extends from approximately four to twenty three feet below ground surface, and extends 6 feet radially. The total volume of contaminated soil in this area is estimated to be 600 cubic yards. Chlordane was detected in this area at up to 490,000 ppb, xylene was also detected at 100,000 ppb. lindane, aldrin, 4,4-DDD, and 4,4-DDT were also detected at concentrations orders of magnitude higher than their respective SCG.

Demolition of the 93 Main Street building revealed a floor drain in the slab of the garage floor. The garage drain was found to lead to a subsurface void approximately five feet in diameter and 13 feet deep. Subsurface soil samples taken from this area were found to be contaminated with pesticides and herbicides. The contamination extends from the garage drain to approximately twenty three feet below ground surface and six feet radially. This area contains an estimated 620 cubic yards of contaminated soil. Chlordane was detected at 560,000 ppb in this area, along with silvex at 2700 ppb and 4,4'-DDT at 28,000 ppb. Figure 1 shows the location of the areas of contamination.

Groundwater

Out of the five usable monitoring wells, installed during phase I of the RI, MW-1 and MW-6 were the only two contaminated. MW-6 was located directly in the area of highest contamination, associated with the drain on 93 Main Street, and exhibited levels many times higher than SCG's for volatiles, semivolatiles, and pesticides. Xylene was detected at 130 ppb in MW-6 along with 2,4,5-Trichlorophenol at 440 ppb and dieldrin at 11 ppb. MW-1 was located down gradient and northeast of MW-6. Only pesticide contamination was detected in MW-1 at levels significantly lower than those in MW-6, such as dieldrin at 1.5 ppb.

During the phase II investigation contamination was also detected in two of the four newly installed monitoring wells, MW-8 and MW-10. MW-8 and MW-10 are located down gradient of MW 6. MW-8 and MW-10 were also contaminated with low levels of the same pesticides. Overall pesticide levels in the groundwater decline from MW-6 to MW-10. During the last round of groundwater sampling MW-6 exhibited dieldrin contamination of 11 ppb and, down gradient, MW-10 exhibited dieldrin contamination of 0.27 ppb. Figure 2 shows the location of all monitoring wells and sampling points, lab results are included in Table 1.

4.2: Summary of Human Exposure Pathways:

This section describes the types of potential human exposures that could present added health risks to persons at or around the site. A more detailed discussion of the exposure can be found in Section 6.3 of the RI report.

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Potential pathways which are known to or may exist at the site include:

- Dermal contact could exist as a pathway at the site if the surface soil is removed and the contaminated subsurface soil is exposed.
- Ingestion/ dermal contact could exist as a pathway at the site if a drinking water well was installed immediately down gradient of the source areas on 93 Main Street.

4.3: Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures and ecological risks which may be presented by the site. During the RI it was determined that a Fish and Wildlife Impact Assessment was not necessary, due to its urban location and lack of any migration pathways to sensitive environmental areas. No pathways for environmental exposure and/or ecological risks have been identified other than a threat to the sole source aquifer.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The Potential Responsible Party (PRP) for the site, documented to date, is the estate of Robert McMahon.

The PRP declined to implement the RI/FS at the site when requested by the NYSDEC. After the remedy is selected, the PRP will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRP, the NYSDEC will evaluate the site for further action under the State Superfund. The PRP is subject to legal actions by the State for recovery of all response costs the State has incurred.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria and Guidance (SCGs) and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate, to the extent practicable, off-site migration of groundwater that does not attain NYSDEC Class GA Ambient Water Quality Criteria.
- Reduce, control, or eliminate to the extent practicable the contamination present within the soils/waste on-site.
- Eliminate the threat to the sole source aquifer by removing or treating the source of contamination and curtailing, to the extent possible, migration of contaminated groundwater off the site.
- Eliminate the potential for direct human or animal contact with the contaminated soils or groundwater at the site.
- Attain groundwater standards to the extent practicable.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the 93 Main Street site were identified, screened and evaluated in the report entitled Feasibility Study Report for the 93 Main Street Inactive Hazardous Waste Disposal Site, January 2000.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Remedial Alternatives

The potential remedies are intended to address the contaminated subsurface soils and groundwater at the site.

Alternative 1- No Action

The No Action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2- Excavation of Contaminated Soils with Off-site Treatment and Disposal

Present Worth:	$ 1,848,760
Capital Cost:	$ 1,828,754
Annual O&M:	$ 4,600
Time to Implement	6 Months

The soil from areas of the site exhibiting contamination greater than the site remedial goals (see Table 3) would be excavated and hauled offsite for treatment and/or disposal. Soil contaminated with pesticides/herbicides and/or petroleum products would be excavated within the known limits of contamination. Confirmatory samples would be collected from the floor and walls of the excavation to determine whether remedial goals have been achieved, or if further removal and sampling was necessary. Excavation would continue vertically and laterally until confirmatory samples demonstrate complete removal of contaminated soil above remedial goals. It is expected that only limited dewatering of the excavations would be necessary due to the relatively small amount of contaminated soil in contact with the groundwater. Water collected during excavation dewatering would be treated as necessary with either an onsite water treatment system or at an off-site treatment facility. Active dewatering of the excavation would take place to recover contaminated groundwater as possible.

Contaminated soil that is disposed of off-site must comply with applicable Federal and State regulations. In particular, any hazardous waste (as defined in 6NYCRR Part 371) disposed of must meet the requirements of the Federal and State Land Disposal Restrictions (LDRs). The Remedial Investigation determined that soil contaminated with pesticides/herbicides qualified as listed (D020, D016, D012, D031, D013) hazardous waste. Therefore, this waste cannot be disposed of until contaminant concentrations are below those required under the Federal LDRs. To meet those requirements, the waste would have to be incinerated prior to disposal in a hazardous waste landfill.

All excavations would be backfilled with clean fill. Six inches of top soil would be spread over the excavated areas. The site would then be seeded to promote vegetative cover to control erosion. The Remedial Investigation identified only limited groundwater contamination in the vicinity of the subsurface soil contamination. It is expected that with the removal of the contaminant source, groundwater contamination would attenuate below groundwater standards. To confirm this monitoring wells would be sampled for pesticides for a short time. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted.

A decontamination pad and pressure wash station would be constructed so all excavation equipment could be properly decontaminated. Showers would be on-site for personnel decontamination. All decontamination water would be containerized and treated prior to discharge to the environment. Excavation would be carried out in Level D personal protection, with contingency for Level C. A Community Air Monitoring Plan would be implemented to monitor VOCs and dust. Dust suppression equipment (water sprinklers) would remain on hand to prevent airborne migration of contaminated soil off-site. Other techniques would be used as necessary to prevent contaminants or nuisance odors from leaving the site. Temporary fencing and warning signs would be placed around the site during the remediation to keep trespassers out.

<u>Alternative 3- In-situ Vitrification</u>

Present Worth:	$ 1,217,293
Capital Cost:	$ 1,197,377
Annual O&M:	$ 4,600
Time to Implement	9 Months

Pesticide and petroleum contaminated soil from the drywell area (approximately 16 cubic yards) would be excavated and consolidated with the contaminated soil in the drain area. The contaminated soil would then be vitrified in-situ. Vitrification involves the electric melting of earthen materials at high temperature for the purposes of destroying organic contaminants and permanently immobilizing nonvolatile inorganic contaminants in a glassy, rock-like product, thereby rendering the treated product nonhazardous. The process typically operates in the range of 1600 to 2000°C for most earthen materials. Any off gas that is produced during treatment would be collected by a special hood and treated. A large volume reduction (25-50% for soils) occurs due to elimination of void volume and vaporization of the organic content of the soil during processing. Only limited backfilling would be necessary to restore site grade since the vitrified product would be left in place. Since the source area would be treated groundwater would be left to naturally attenuate. Air monitoring would be conducted during treatment. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted. Health and safety measures would be taken as in alternative 2.

Alternative 4- Excavation of Contaminated Soils with On-site Thermal Desorption

Present Worth:	$ 733,448
Capital Cost:	$ 713,532
Annual O&M:	$ 4,600
Time to Implement	9 Months

Soil would be excavated as described in Alternative 2 and stockpiled onsite.

The stockpiled pesticide and petroleum contaminated soil would be processed through a thermal desorption unit. Thermal desorption is an effective technology for the treatment of organic contaminated soils, sediments, and sludges which generates a lower volume of off-gas, has less environmental impact, and fewer permitting requirements than other onsite thermal treatment technologies. Thermal desorption technologies use heat to physically separate organic compounds from a media (such as soil) by heating to volatilize the contaminants. The heat is provided by hot oil, electric, or other source through a metal surface to the wastes. For heavy organic and chlorinated organic compounds, a thermal desorption unit capable of heating the process materials up to 1200°F may be required. The organic compounds that have been desorped are condensed and recovered from the off-gas. The recovered contaminants would then either be treated further on-site or sent off-site for treatment and disposal. Once soil has been treated, it would be analyzed to determine the effectiveness of treatment. Soil that does not meet remedial goals would be re-treated until goals were achieved. Treated soil meeting the remedial goals would be used to fill the excavations. Groundwater would be collected and treated during excavation of the contaminated soil and health and safety measures during excavation would be similar to Alternative 2 but would require more extensive air monitoring for the thermal unit.

Backfilling operations and five years of monitoring would occur as in Alternative 2. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted

Alternative 5- Hydraulic Containment of Contaminated Groundwater with In-situ Chemical Oxidation

Present Worth:	$ 450,903
Capital Cost:	$ 230,063
Annual O&M:	$ 28,600
Time to Implement	6 months - 1 year

Soil from the drywell area would be consolidated, consistent with the remedy identified in Alternative 3.

This alternative would treat the remaining contaminated soil associated with the two drains in place. The contaminated subsurface soil would be flushed with a strong oxidizing agent, such as hydrogen peroxide, which would chemically breakdown the organic contaminants in the soil. During the oxidation process carbon bonds within the contaminant are broken resulting in a less hazardous compound and ultimately breaking down into carbon dioxide and water, along with some halides (i.e.,. salts). A groundwater pump and treat system would be used to collect the impacted groundwater in the area and the leachate generated during the oxidation treatment. The water would then be treated with continued oxidation and/or carbon treatment and either discharged or re-injected. While it is expected complete hydraulic control would be achieved with a pump and treat system, should this not be the case a grout wall or other hydraulic barrier would be installed to achieve hydraulic containment of the contaminated leachate/groundwater in the treatment area. Groundwater monitoring would be carried out periodically to ensure that the pump and treat system was operating properly. Health and safety measures during treatment would be similar to Alternative 2 but would require provisions for handling of the oxidizing agent.

Alternative 6- Capping of Contaminated Soil with Pump and Treat

Present Worth:	$ 576,550
Capital Cost:	$ 135,836
Annual O&M:	$ 28,600
Time to Implement	3 Months

Soil from the drywell area would be excavated and consolidated as in alternative 3.

This alternative would leave the contaminated soil in place, while preventing dermal contact and reducing infiltration of surface run off. A low permeability barrier would be constructed over the contaminated soil in conjunction with a pump and treat system to address the contaminated groundwater. Although surface water infiltration would be minimized, groundwater would continue to be impacted since approximately two feet of contaminated soil is located below the water table. A pump and treat system would be used to collect the impacted groundwater. The water would then be treated with granular activated carbon system and discharged. Groundwater monitoring would be carried out periodically to ensure that the pump and treat system was operating properly. Health and safety measures during excavation and construction would be similar to Alternative 2.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

The no action (alternative 1) and cap/pump and treat (alternative 5) would not meet SCGs since both alternatives would leave high levels of pesticides and petroleum compounds on-site.

The vitrification, low temperature thermal desorption, off-site disposal, and hydraulic containment/chemical oxidation alternatives all meet applicable SCGs for contaminated soil since it would be treated to below remedial goals, eliminating likely exposure pathways.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The no action alternative would not be protective of human health and the environment since high concentrations of pesticides and petroleum compounds would be left on-site. The cap/pump and treat alternative would be slightly more protective since it would eliminate the likely exposure pathways. Off-site disposal and treatment, vitrification, low temperature thermal desorption, and hydraulic containment/chemical oxidation would all be protective of human health and the environment since contaminated soil would be removed from the site and/or the pesticide/petroleum compounds would be destroyed.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

The no action alternative would cause little or no increased short-term impacts since no intrusive work would take place. All the remaining alternatives would involve some degree of excavation, although in the vitrification, hydraulic containment/chemical oxidation, and cap/pump and treat alternatives the excavation and handling of contaminated media is relatively minor. These actions could potentially impact worker health and safety, the environment, and the local community. On-site thermal desorption would involve more extensive handling than off-site disposal and treatment since material would be stockpiled and processed for treatment over a longer period of time. However, the use of engineering controls would minimize and/or eliminate any possible impact. The controls would include air monitoring, personal protective equipment, and dust suppression measures.

The Off-site Disposal and Treatment alternative would involve hauling contaminated materials off-site. This would involve a short-term risk due to possible spilling of contaminated media off-site. This could be mitigated by properly covering contaminated media and by establishing proper emergency spill response measures.

The Thermal Desorption and Vitrification alternatives both utilize technologies that would create air emissions that must be treated. This poses a short-term risk should the air emissions control device be breached. This risk could be reduced through the use of air treatment devices, and establishment of emergency procedures to be utilized in the event of a release of air emissions.

Off-site disposal, and thermal desorption would all result in a large disruption to the surrounding neighborhood. Thermal desorption would results in excess noise levels along with the difficulties associated with the excavation of the contaminated soil due to the depth of excavation and the relatively small area available to work in. In order to stage and excavate soil at the site it may be necessary to utilize adjacent vacant parcels. In order to remove the contaminated soil in the two areas of major contamination, where the contamination extends to twenty five feet below ground surface, soil stabilization would be necessary. The installation of sheet piling to stabilize the soil could result in damage to surrounding structures due to the geologic conditions.

4. <u>Long-term Effectiveness and Permanence</u>. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

The no action alternative would not be effective in the long-term since high levels of pesticides/petroleum compounds would remain on-site and continue to migrate. The Cap/Pump and Treat alternative would only remain effective as long as the cap was intact and the pump and treat system was operating.

The off-site disposal and treatment, vitrification, low temperature thermal desorption, and hydraulic containment/chemical oxidation would be effective in the long-term since all likely exposure pathways would be eliminated. This would be achieved by removing and/or treating the contaminated soil.

5. <u>Reduction of Toxicity, Mobility or Volume</u>. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

The No Action and Cap/Pump and Treat alternatives would not reduce the toxicity, mobility, or volume. The Off-site Disposal and Treatment, Vitrification, Low Temperature Thermal Desorption, and Hydraulic Containment/Chemical Oxidation alternatives would reduce the toxicity, mobility and volume of material contaminated with pesticides/petroleum compounds by removing or treating them in place.

6. <u>Implementability</u>. The technical and administrative feasibility of implementing each alternative are evaluated. Technical

feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

The No Action alternative would be the easiest to implement since no construction would be necessary. The Cap/Pump and Treat would be easily implemented since it involves only limited excavation activities and utilizes readily available equipment. Hydraulic Containment/Chemical Oxidation would be slightly more difficult to implement because it involves an injection and treatment system. Off-site disposal and treatment and thermal desorption would be difficult to implement because they involve the excavation of the contaminated soil, thermal desorption also requires specialized equipment. Vitrification would be extremely difficult to implement because it utilizes highly specialized equipment and is a proprietary technology.

Off-site disposal, and thermal desorption would all result in a large disruption to the surrounding neighborhood. Thermal desorption would results in excess noise levels along with the difficulties associated with the excavation of the contaminated soil due to the depth of excavation and the relatively small area available to work in. In order to stage and excavate soil at the site it may be necessary to utilize adjacent vacant parcels. In order to remove the contaminated soil in the two areas of major contamination, where the contamination extends to twenty five feet below ground surface, soil stabilization would be necessary. The installation of sheet piling to stabilize the soil could result in damage to surrounding structures due to the geologic conditions.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. **Community Acceptance** - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing Alternative 5, Hydraulic Containment and Chemical Oxidation as the remedy for this site. This remedy would involve the collection of contaminated groundwater and leachate generated during treatment. An oxidizing agent, such as hydrogen peroxide, would be introduced and allowed to infiltrate through the areas of contamination to break down the compounds of concern in the subsurface soils.

This selection is based upon the evaluation of the six alternatives developed for this site. With the exception of the no action alternative, each of the alternatives would comply with the threshold criteria. Alternative 3 would be very difficult to implement due to the lack of vendors. Alternative 2 and Alternative 4 would be difficult to implement due to the nature of the excavations necessary to remove the subsurface soil. Alternatives 2 and 4 would also cause an considerable amount of disruption to the surrounding neighborhood. Alternatives 5 and 6 are similar with respect to the majority of the balancing criteria. The major differences between these alternatives are cost and permanence. Alternatives 5 and 6 were the lowest cost alternatives. Alternative 6 is the only alternative which would not actively treat and/or remove the contaminated subsurface soil, which is contributing to groundwater contamination, however, it would treat the resulting contaminated groundwater. Further more this alternative would potentially limit future use of the site. Alternative 5 would provide for the in-situ treatment of all the subsurface soil containing compounds of concern (COCs) in excess of the proposed remedial goals. Alternative 5 would also be the lower cost of the two alternatives

Despite the high concentrations of pesticides and petroleum products in subsurface soils, the groundwater has remained only locally impacted. This is due to the relatively low solubility of the contaminants of concern in water. It is anticipated that the levels of contamination in groundwater would attenuate once the source of contamination, the subsurface soil, has been treated. To be sure this occurs , groundwater samples would be collected from impacted wells and analyzed for pesticides, VOCs, and SVOCs. Following implementation of the selected remedy the site would be reclassified as a class 4 (Properly closed -requiring further management). The site would be periodically evaluated to determine whether a change in classification (i.e.,. delisting) on the Registry of Inactive Hazardous Waste Disposal Sites was warranted. It is anticipated that the remedy would allow unrestricted use of the site once completed.

The estimated present worth cost to implement the remedy is $450,903. The cost to construct the remedy is estimated to be $230,063 and the estimated average annual operation and maintenance cost for 10 years is $28,600.

The elements of the proposed remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. This would include batch and/or pilot testing of oxidizing agents. Any uncertainties identified during the RI/FS would be resolved.

2. The area surrounding the drywell on the 89-91 Main street property would be excavated to a depth of six feet. Confirmatory samples would be

collected from the walls and floor of the excavation to insure that all contaminated soil above remedial objectives was removed. Contaminated soil would be treated and/or disposed of off-site as appropriate.

3. Infiltration galleries would be constructed, in each of the remaining areas of concern, as necessary to facilitate application of the oxidizing agent to the contaminated subsurface soil. It is anticipated that injection wells would also be necessary to properly distribute the oxidizing agent to the lower portion of the contaminated subsurface soil. The infiltration galleries would consist of an excavated area directly above the area of subsurface soil which would be filled with gravel, to allow for rapid infiltration of the oxidizing agent. The injection wells would be constructed with materials amenable to the oxidizing agent to be used and would be capable of injecting the oxidizer under pressure, if necessary.

4. Groundwater extraction wells would be constructed in order to create a hydraulic zone of containment large enough to collect any leachate produced either during treatment of the contaminated soil as well as the natural groundwater flow in the areas being treated. The extraction well(s) would also be connected to a treatment system which would allow for the removal of residual contamination by additional oxidation, carbon treatment or a combination of the two. In the event that hydraulic containment could not be achieved, alternative methods of groundwater control would be evaluated such as physical containment (i.e., slurry wall, grout curtain, etc.).

5. Since the remedy would result in an onsite treatment of hazardous waste over a period of time, a long term monitoring program would be instituted. Impacted monitoring wells would continue to be monitored, along with the leachate collected by the hydraulic containment system. Groundwater quality outside the treatment areas would be expected to attenuate once the source of contamination is treated or controlled. Monitoring of the leachate collected by the hydraulic containment system would give an indication of the effectiveness of the chemical oxidation and the amount of untreated contaminants remaining. This program would allow the effectiveness of the hydraulic containment and chemical oxidation to be monitored and would be a component of the operation and maintenance for the site.

Table 1
Nature and Extent of Contamination

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Benzene	ND (.001) to 72	3 of 24	1
		Tetrachloroethene	ND (.001) to 34	3 of 24	5
		Chlorobenzene	ND (.001) to 120	3 of 24	5
		Ethylbenzene	ND (.001) to 120	3 of 24	5
		1,2-Dichloroethane	ND (.001) to 83	4 of 24	0.6
		Toluene	ND (.001) to 89	3 of 24	5
		Xylene	ND (.001) to 650	3 of 24	5
Groundwater	Semivolatile Organic Compounds (SVOCs)	2,4-Dichlorophenol	ND (.001) to 1,400	4 of 24	5
		Naphthalene	ND (.001) to 140	2 of 24	10
		2,4,5-Trichlorophenol	ND (.001) to 1,500	4 of 24	1
		Pentachlorophenol	ND (.001) to 25	2 of 24	1
		Phenol	ND (.001) to 2	1 of 24	1
		2-Chlorophenol	ND (.001) to 5	1 of 24	1
		1,4-Dichlorobenzene	ND (.001) to 4	1 of 24	3
		2-Methylphenol	ND (.001) to 2	1 of 24	1
		4 - Methylphenol	ND (.001) to 4	1 of 24	1
		benzo(a)anthracene	ND (.001) to 1	1 of 24	0.002
		Chrysene	ND (.001) to 1	1 of 24	0.002
		Bis(2-Ethylhexyl)-phthalate	ND (.001) to 7	1 of 24	5
		Benzo(b)fluoranthene	ND (.001) to 2	1 of 24	0.002
		Benzo(a)pyrene	ND (.001) to 1	1 of 24	ND
Groundwater	Pesticides	Endrin	ND (.001) to 0.15	2 of 24	ND
		Beta-BHC	ND (.001) to 0.89	5 of 24	0.04
		Lindane	ND (.001) to 91	3 of 24	0.05
		Aplha-BHC	ND (.001) to 1.5	1 of 24	0.01

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppb)
Groundwater	Pesticides	Delta-BHC	ND (.001) to 1.2	4 of 24	0.04
		Heptachlor Epoxide	ND (.001) to 0.11	3 of 24	0.03
		Dieldrin	ND (.001) to 13	7 of 24	0.004
		Chlordane	ND (.001) to 1	3 of 24	0.05
Groundwater	Herbicides	Dicamba	ND (.001) to 3	3 of 24	0.44
Groundwater	Metals	Sodium	ND (.001) to 60,200	4 of 24	20,000
Soil	Volatile Organic Compounds (VOCs)	Chlorobenzene	ND (.001) to 3,200	1 of 16	1,700
		Ethylbenzene	ND (.001) to 17,000	1 of 16	5,500
		Xylene	ND (.001) to 100,000	2 of 16	1,200
Soil	Semivolatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	ND (.001) to 24,000	2 of 16	3,400
		Naphthalene	ND (.001) to 30,000	2 of 16	13,000
		2-Methylnaphthalene	ND (.001) to 190,000	1 of 16	36,400
		2,4,5-Trichlorophenol	ND (.001) to 7,000	1 of 16	100
		4-Nitrophenol	ND (.001) to 2,600	1 of 16	100
		Benzo(a)anthracene	ND (.001) to 700	2 of 16	224
		Chrysene	ND (.001) to 570	3 of 16	400
		Benzo(b)fluoranthene	ND (.001) to 880	5 of 16	224
		Benzo(k)fluoranthene	ND (.001) to 450	3 of 16	224
		Benzo(a)pyrene	ND (.001) to 540	6 of 16	61
		Dibenz(a,h)anthracene	ND (.001) to 280	3 of 16	14
Soil	Pesticides	Heptachlor	ND (.001) to 22,000	5 of 16	100
		Heptachlor Epoxide	ND (.001) to 8,300	5 of 16	20
		Dieldrin	ND (.001) to 97,000	4 of 16	44
		4,4'-DDE	ND (.001) to 24,000	6 of 16	2,100
		Endrin	ND (.001) to 37,000	5 of 16	100
		Endosulfan II	ND (.001) to 1,000	1 of 16	900

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppb)
Soil	Pesticides	Endosulfan I	ND (.001) to 8,200	1 of 16	900
		Alpha-BHC	ND (.001) to 5,600	5 of 16	110
		Beta-BHC	ND (.001) to 5,600	3 of 16	200
		Delta-BHC	ND (.001) to 12,000	6 of 16	300
		Lindane	ND (.001) to 44,000	8 of 16	60
		Aldrin	ND (.001) to 46,000	6 of 16	41
		4,4'-DDT	ND (.001) to 150,000	9 of 16	2,100
		Chlordane	ND (.001) to 560,000	8 of 16	540
Soil	Metals	Arsenic	ND (.001) to 39	4 of 16	7.5
		Beryllium	ND (.001) to 0.5	7 of 16	0.16
		Copper	ND (.001) to 81	5 of 16	25
		Iron	ND (.001) to 34,200	7 of 16	2,000
		Mercury	ND (.001) to 1.1	4 of 16	0.1
		Zinc	ND (.001) to 416	7 of 16	20
		Nickel	ND (.001) to 20	3 of 16	13

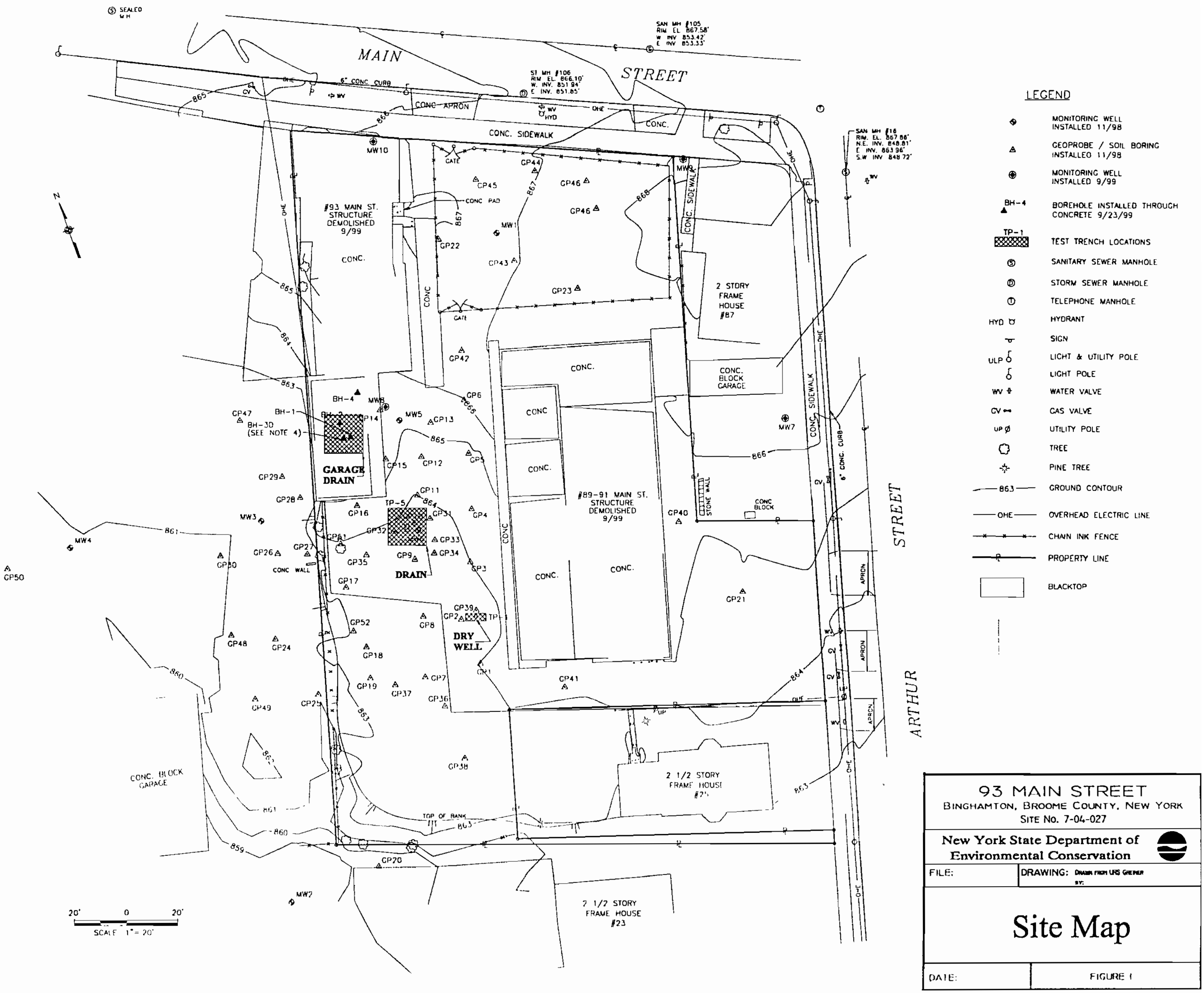
Table 2
Remedial Alternative Costs

Alternative	Capital Cost	Annual O&M	Present Worth Cost
1. No Action	$0	$0	S0
2. Off-site Treatment/Disposal	$1,828,754	$4,600	S1,848,760
3. Vitrification	$1,197,377	$4,600	S1,217,293
4. On-Site Thermal Desorption	$713,532	$4,600	S733,448
5. Hydraulic Containment w/ Chemical Oxidation	$230,063	$28,600	S450,903
6. Capping w/Pump & Treat	$135,836	$28,600	S576,550

Table 3 **Proposed Remedial Goals**			
Contaminant	Media of Concern	Remedial Goal	SCG Cited
Volatiles (PPB)			
1,2 - Dichloroethane	Groundwater	0.6	T.O.G.S. 1.1.1
Benzene	Groundwater	1	T.O.G.S. 1.1.1
Tetrachloroethene	Groundwater	5	T.O.G.S. 1.1.1
Toluene	Groundwater	5	T.O.G.S. 1.1.1
Chlorobenzene	Groundwater Soil	5 1700	T.O.G.S. 1.1.1 TAGM 4046
ethylbenzene	Groundwater Soil	5 5500	T.O.G.S. 1.1.1 TAGM 4046
Xylene	Groundwater Soil	5 1200	T.O.G.S. 1.1.1 TAGM 4046
Semivolatiles (PPB)			
1,2,4-Trichlorobenzene	Soil	3400	TAGM 4046
2,4 - Dichlorophenol	Groundwater	5	T.O.G.S. 1.1.1
Naphthalene	Groundwater Soil	10 13000	T.O.G.S. 1.1.1 TAGM 4046
2,4,5 - Trichlorophenol	Groundwater Soil	1 100	T.O.G.S. 1.1.1 TAGM 4046
Pentachlorophenol	Groundwater	1	T.O.G.S. 1.1.1
2-Methylnaphthalene	Soil	36400	TAGM 4046
4 - Nitrophenol	Soil	100	TAGM 4046
Benzo(a)anthracene	Soil	224	TAGM 4046
Chrysene	Soil	400	TAGM 4046
Benzo(b)fluoranthene	Soil	224	TAGM 4046
Benzo(k)fluoranthene	Soil	224	TAGM 4046
Benzo(a)pyrene	Soil	61	TAGM 4046

Table 3 - Continued Proposed Remedial Goals			
Contaminant	Media of Concern	Remedial Goal	SCG Cited
Semivolatiles (PPB)			
Dibenz(a,h)anthracene	Soil	14	TAGM 4046
Pesticides (PPB)			
alpha - BHC	Groundwater Soil	0.01 110	T.O.G.S. 1.1.1 TAGM 4046
Beta - BHC	Groundwater Soil	0.04 200	T.O.G.S. 1.1.1 TAGM 4046
delta - BHC	Groundwater Soil	0.04 300	T.O.G.S. 1.1.1 TAGM 4046
Gamma - BHC	Groundwater Soil	0.05 60	T.O.G.S. 1.1.1 TAGM 4046
Aldrin	Soil	41	TAGM 4046
Heptachlor	Groundwater	0.04	T.O.G.S. 1.1.1
Heptachlor Epoxide	Groundwater Soil	0.03 20	T.O.G.S. 1.1.1 TAGM 4046
4,4' - DDD	Groundwater Soil	0.3 2900	T.O.G.S. 1.1.1 TAGM 4046
4,4' - DDT	Groundwater Soil	0.2 2100	T.O.G.S. 1.1.1 TAGM 4046
Alpha - Chlordane	Groundwater	0.05	T.O.G.S. 1.1.1
gamma - Chlordane	Groundwater Soil	0.05 540	T.O.G.S. 1.1.1 TAGM 4046
Endosulfan - I	Soil	900	TAGM 4046
Endosulfan - II	Soil	900	TAGM 4046
Endrin	Soil	100	TAGM 4046
Herbicides (PPB)			
Dicamba	Groundwater	0.44	T.O.G.S. 1.1.1

Table 3 - Continued Proposed Remedial Goals			
Contaminant	Media of Concern	Remedial Goal	SCG Cited
Metals (PPB)			
Arsenic	Groundwater Soil	25 7.5	T.O.G.S. 1.1.1 TAGM 4046
Barium	Groundwater	1000	T.O.G.S. 1.1.1
Beryllium	Groundwater Soil	3 0.16	T.O.G.S. 1.1.1 TAGM 4046
Chromium	Groundwater	50	T.O.G.S. 1.1.1
Copper	Groundwater Soil	200 25	T.O.G.S. 1.1.1 TAGM 4046
Lead	Groundwater	25	T.O.G.S. 1.1.1
Magnesium	Groundwater	35000	T.O.G.S. 1.1.1
Zinc	Soil	20	TAGM 4046
Iron	Soil	2000	TAGM 4046
Nickel	Soil	13	TAGM 4046


MAIN STREET
ARTHUR STREET
LEGEND
MONITORING WELL INSTALLED 11/98
GEOPROBE / SOIL BORING INSTALLED 11/98
MONITORING WELL INSTALLED 9/99
BOREHOLE INSTALLED THROUGH CONCRETE 9/23/99
TEST TRENCH LOCATIONS
SANITARY SEWER MANHOLE
STORM SEWER MANHOLE
TELEPHONE MANHOLE
HYDRANT
SIGN
LIGHT & UTILITY POLE
LIGHT POLE
WATER VALVE
GAS VALVE
UTILITY POLE
TREE
PINE TREE
GROUND CONTOUR
OVERHEAD ELECTRIC LINE
CHAIN INK FENCE
PROPERTY LINE
BLACKTOP
#93 MAIN ST. STRUCTURE DEMOLISHED 9/99
#89-91 MAIN ST. STRUCTURE DEMOLISHED 9/99
2 STORY FRAME HOUSE #87
CONC. BLOCK GARAGE
GARAGE DRAIN
DRAIN
DRY WELL
2 1/2 STORY FRAME HOUSE #23
SCALE 1" = 20'
93 MAIN STREET
BINGHAMTON, BROOME COUNTY, NEW YORK
SITE No. 7-04-027
New York State Department of Environmental Conservation
FILE:
DRAWING:
Site Map
DATE:
FIGURE 1