Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

McKesson Envirosystems Site
Syracuse (C), Onondaga County
Site Number 7-34-020
Operable Unit No. 2

March 1997

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* JOHN P. CAHILL, *Acting Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

McKesson Envirosystems Inactive Hazardous Waste Site
Operable Unit No. 2 - Saturated Soils and Groundwater
Syracuse (C), Onondaga County, New York
Site No. 7-34-020

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the McKesson Envirosystems inactive hazardous waste disposal site, Operable Unit No. 2, which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the McKesson Envirosystems Inactive Hazardous Waste Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the McKesson Envirosystems Site and the criteria identified for evaluation of alternatives, the NYSDEC has selected In-Situ Anaerobic Bioremediation.

The remedy involves installation of an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, of the portions of the site identified as Areas 1, 2 and 3 on Figure 3 (see page 12). Groundwater from the withdrawal trenches will be amended, as necessary, with nutrients prior to discharge to the upgradient infiltration trench. The infiltration trench will facilitate distribution of the amended groundwater to enhance the naturally occurring anaerobic biodegradation of the contaminants of concern (COCs). Shallow well points will also be installed

within each of the impacted areas for the purpose of distributing small quantities of amended groundwater, thus augmenting the system. As a component of the site operation and maintenance (O&M) program, a process control monitoring program will be instituted which will allow the effectiveness of the selected remedy to be monitored. Upon discontinuation of system operations, estimated to be about five years subsequent to system initiation, a post-remedial monitoring program will be established.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

3/19/97
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

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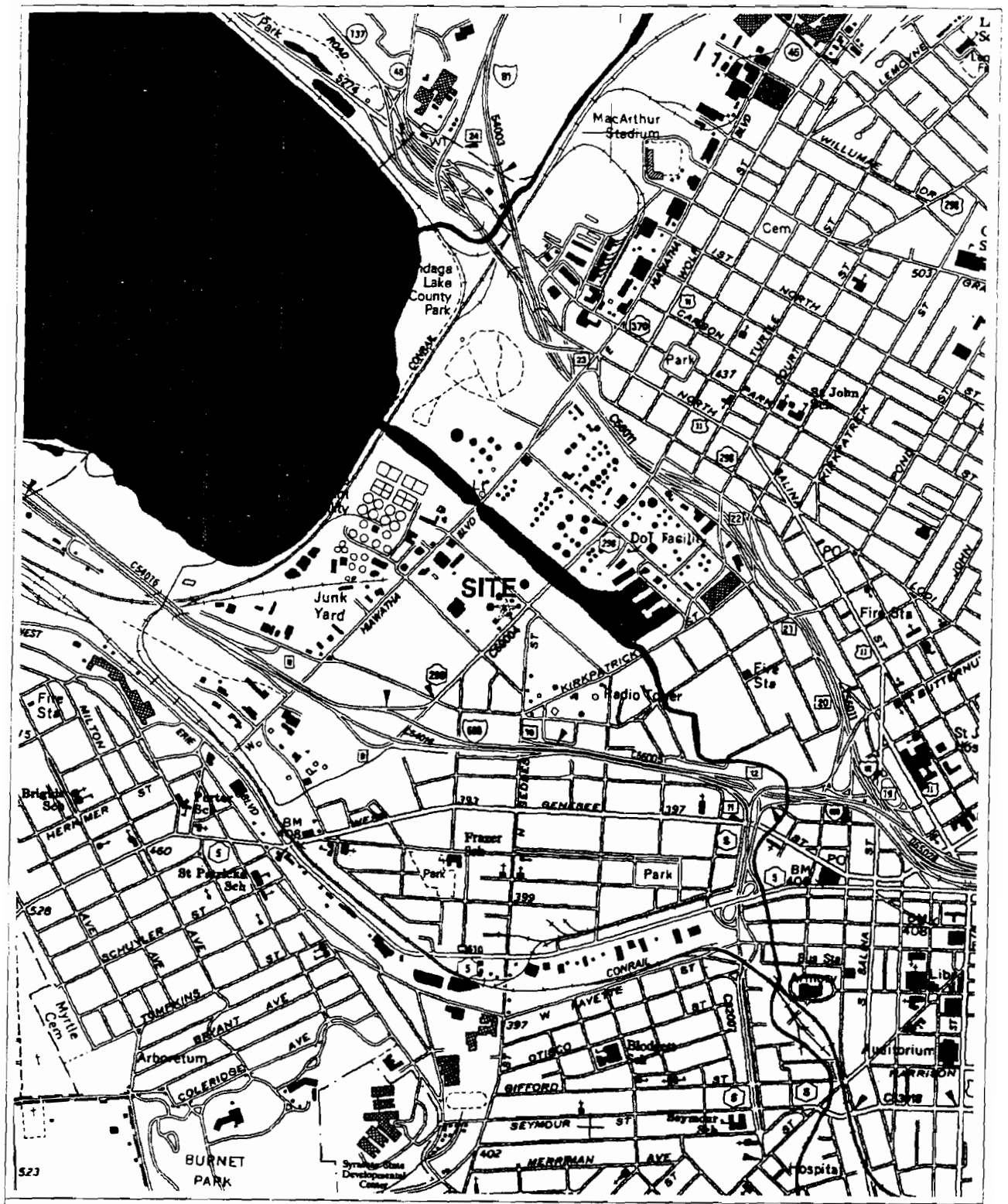
SECTION 1: SITE LOCATION AND DESCRIPTION

The McKesson Envirosystems Site is located in the City of Syracuse to the south of Onondaga Lake, adjacent to the west bank of the New York State Barge Canal Terminal channel. The site was formerly used for bulk storage of petroleum products and in later years, as storage for a variety of chemical waste streams. The site is approximately 8.8 acres in size and is separated by Van Rensselaer Street into two parcels (Figure 1). The parcel north of Van Rensselaer Street is within 150 feet of the Barge Canal. The largest of the former aboveground storage tanks (Tank 7) was located on this portion of the site. The majority of previous material storage and handling took place in the area south of Van Rensselaer Street, where ten former aboveground storage tanks were located.

The site is within one-quarter mile of Onondaga Lake, which is a major surface water body in the greater Syracuse area. Land use in the surrounding area is characterized as industrial/light industrial, being on the edge of the "Oil City" area of Syracuse, although there are current plans for significant non-industrial development in this area. Like the surrounding land, the McKesson property is zoned for industrial use.

The site is generally flat with a grass cover. It is fenced and access is restricted to authorized persons only.

Investigations have revealed that past site operations resulted in significant soil and groundwater contamination. Operable Unit No. 2, which is the subject of this PRAP, consists of the saturated soils (soils located below the groundwater table) and the groundwater beneath areas of the site. An Operable Unit represents a portion of the site remedy which for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Another operable unit, Operable Unit No. 1 (OU-1) - the Unsaturated Soils, was the subject of a 1994 Record of Decision. The remedial work for OU-1 was completed in 1995 (ref. Section 2.2).



Site Location Map

734020 McKesson Envirosystems (Inland Site)

NYSDOT Planimetric Quadrangle(s):

FIGURE 1

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

1920's: Occupied by various salt companies.

1928-1969: Petroleum Storage Facility (ARCO), Tanks 1-6 (South Parcel)

1951: Tank 7 installed (North Parcel)

1969-1973: Petroleum Storage Facility BP Oil Company (BP)

1973: Inland Chemical Corporation (ICC) purchases site from BP Oil Company for recycling waste streams and chemical storage including: methanol, methylene chloride and other solvents.

1982: ICC operations discontinued.

2.2: Remedial History

1980: ICC filed a Part A Permit Application for interim status as a hazardous waste storage facility under the Resource Conservation Recovery Act (RCRA).

1987: Revised part A application for closure submitted to NYSDEC. Remediation Consent Order signed 6/10/87.

1988: McKesson Corporation submitted a RCRA closure plan entitled "Verification of Aboveground Storage Tank Decontamination Protocol" to NYSDEC.

1989: RCRA Closure certification is submitted to NYSDEC. Aboveground tanks removed from the site.

1990: Notification from NYSDEC that facility was officially closed and that corrective actions would proceed under the Remediation Consent Order which was amended to include both McKesson Corporation and Safety-Kleen Environsystems Company as Respondents.

The Final Remedial Investigation Report was issued in April 1990. The RI revealed significant soil and groundwater contamination. A PAH Distribution Report was issued at the same time.

1992: A residential Risk Assessment and FS Screening of Alternatives were completed.

1993: A Soil Bioremediation Pilot study was conducted at the site using both in-situ and ex-situ techniques. A Feasibility Study and results of the Pilot Study were completed for OU-1, the Unsaturated Soils.

March 1994: A Record of Decision for Operable Unit No. 1 (OU-1), the Unsaturated Soils, was issued by the NYSDEC. The selected remedy was In-Situ Aerobic Bioremediation.

May 1994: An RD/RA Work Plan was developed and approved and remedial work was initiated for OU-1.

September 1995: The NYSDEC approved the RD/RA Report and declared the remedy for OU-1 complete.

September 1996: The PRP completed a "Supplemental Saturated Soil and Groundwater Investigation" in anticipation of the FS for OU-2.

December 1996: The NYSDEC approved the FS for OU-2.

January 1997: The NYSDEC released the PRAP for OU-2.

SECTION 3: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the site presents a significant threat to human health and the environment, the McKesson Corporation has completed a Remedial Investigation/Feasibility Study (RI/FS).

3.1: 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 1988 and 1989. A report entitled *Final Remedial Investigation Report, April 1990,* has been prepared describing the field activities and findings of the RI in detail. To update existing data regarding the distribution of COCs in the saturated soil and groundwater, a supplemental investigation of saturated soil and groundwater was planned and initiated in 1995. This work was conducted as a preliminary component of the FS for Operable Unit No. 2. A report entitled *Supplemental Saturated Soil and Groundwater Investigation Report, Operable Unit No.2 - Saturated Soil and Groundwater, September 1996,* has been prepared describing the field activities and findings of the investigation in detail. The investigation tasks and findings are discussed below.

The RI activities consisted of the following:

- Installation of 136 soil borings
- Installation of 13 piezometer clusters
- Installation of 22 monitoring wells and related groundwater sampling
- Collection of 159 soil samples

The Supplemental Investigation field activities consisted of the following:

- Installation of 31 temporary well points and related groundwater sampling
- Installation of 7 monitoring wells and related groundwater sampling
- EM-39 geophysical "downhole" logging of 4 monitoring wells

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater, drinking water and surface water SCGs identified for the McKesson Site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. NYSDEC TAGM 4046 soil cleanup guidelines for the protection of groundwater, background conditions, and risk-based remediation criteria were used as SCGs for soil.

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

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

3.1.1 Nature of Contamination:

As described in the RI Report and Supplemental Report, many soil and groundwater samples were collected at the site to characterize the nature and extent of contamination.

The primary contaminants detected at this site are those associated with past storage activities. These include various volatile and semi-volatile compounds. The investigations have identified that the contaminants of concern (COCs) at this site are: methylene chloride, trichloroethene, benzene, toluene, ethylbenzene, xylene, N,N-dimethylaniline, aniline, methanol and acetone.

3.1.2 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern and compares the data with the proposed remedial action levels (SCGs) for the site. The following is a summary of the findings of the investigations for these media.

Soils

The soil stratigraphy is relatively consistent across the site. The surface fill material consists of the unsaturated soil addressed by the OU-1 remedy and the overlying sand and gravel cover placed as a component of the remedy. The surface fill is underlain by silt and clay ranging in depth from approximately 8 to 15 feet below ground surface (bgs), followed by a layer of sand and silt from approximately 15 to 22 feet bgs. A silt and clay lacustrine deposit is present across the entire site at approximately 22 to 24 feet bgs. Underlying the lacustrine silt and clay are varying compositions of sand and gravel to approximately 62 feet bgs.

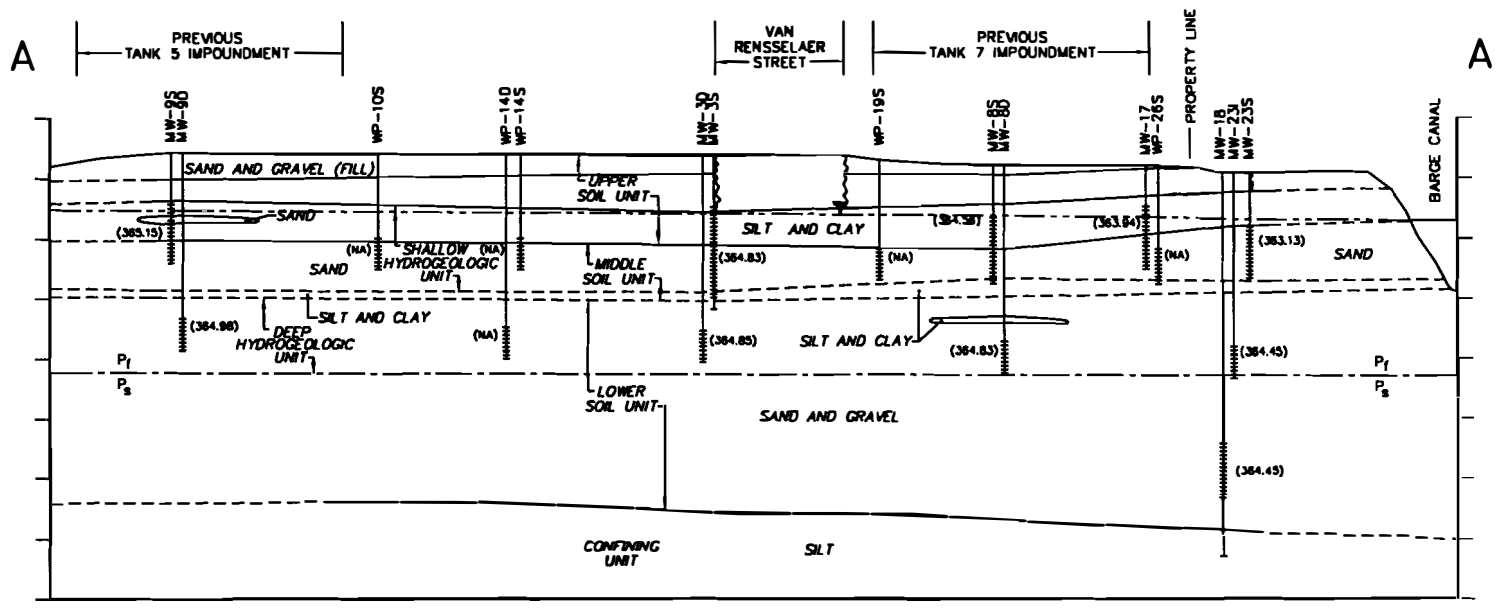
Sampling of the site soils during the RI revealed the presence of the above-mentioned COCs. In general, the COCs were detected near the former materials loading area and the former locations of the aboveground storage tanks. The RI sampling program, however, focused on the unsaturated soils which, as discussed, have since been remediated.

The investigation of the saturated zone, the subject of this operable unit, relied on analysis of groundwater. Since the groundwater and any associated contamination are coincident with the saturated soils, the findings of the investigation of this zone are discussed below.

Groundwater

Two hydrogeological units have been identified at this site. The lacustrine deposit separates a shallow hydrogeologic unit (15-22 feet bgs) from a deep hydrogeologic unit (24-62 feet bgs). This deposit appears to be a semi-confining unit which limits the vertical migration of groundwater between the two hydrogeologic units. Both the shallow and deep horizontal groundwater flow directions are generally to the northeast, toward the Barge Canal. Figure 2 illustrates the site hydrogeology.

The groundwater quality results indicate the presence of chemical compounds at concentrations above groundwater quality standards (ref. Table 1). The identified chemicals in groundwater are: methylene chloride, trichloroethene, benzene, toluene, ethylbenzene, xylenes, N,N-dimethylaniline, aniline, trans-1,2-dichloroethene, methanol, and acetone. Groundwater data from the RI, the Supplemental Sampling program and semi-annual monitoring events indicate that COCs, though present in on-site groundwater have not, with only one exception (aniline at 7 ppb), migrated beyond the site property boundaries. This off-site contaminant "hit" was detected during the August 1996 semi-annual sampling event.



NOTE:

1. WATER LEVEL MEASUREMENTS CONDUCTED ON AUGUST 21-22, 1995. WATER ELEVATION IN THE BARGE CANAL WAS MEASURED NOVEMBER 15, 1989.
2. STRATIGRAPHY BASED ON DATA GATHERED DURING THE SUPPLEMENTAL INVESTIGATION (1995) AND THE REMEDIAL INVESTIGATION (1989).
3. GROUND-WATER ELEVATION AT MW-18 IS CORRECTED FOR SALTWATER DENSITY.

SCALE:
80' 0 80'

McKESSON CORPORATION
BEAR STREET FACILITY SYRACUSE, NEW YORK
FEASIBILITY STUDY

GEOLOGIC CROSS SECTION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

While recent information may indicate limited migration of contamination toward the Barge Canal, recent groundwater information (Supplemental Investigation) also supports that the concentration and areal distribution of COCs in groundwater appears to have decreased in comparison to historic (RI) data. Also, the data supports that contamination is generally confined to the shallow hydrogeologic unit. This was evidenced by the lack of groundwater standard contravention in samples from the deep well points installed during the Supplemental Investigation. Furthermore, within the deeper hydrogeologic unit there is a freshwater/saltwater interface. This interface exists at a depth of approximately 35 feet bgs. The groundwater in this deeper unit has historically been unusable for drinking because of its high chloride concentrations.

The shallow hydrogeologic unit, therefore, is the subject of this operable unit. As described above, this unit consists of two distinct soil layers, a silt and clay layer and an overlying sand layer.

Investigations have identified that the highest concentration and areal distribution of COCs in saturated soil and groundwater at this site are associated with three distinct on-site areas within the shallow hydrogeologic unit. Two of these "impacted areas" are located on the south parcel, in the vicinity of temporary well point locations WP-7S and WP-12S ("Area 1" and "Area 2", respectively). A third area is located on the north parcel in the vicinity of monitoring well cluster MW-8 ("Area 3")e Based on these findings, the potential remedies evaluated in the FS focused on these "impacted areas" (ref. Figure 3).

Groundwater data for the chemicals of concern are presented in Table 1 (page 22).

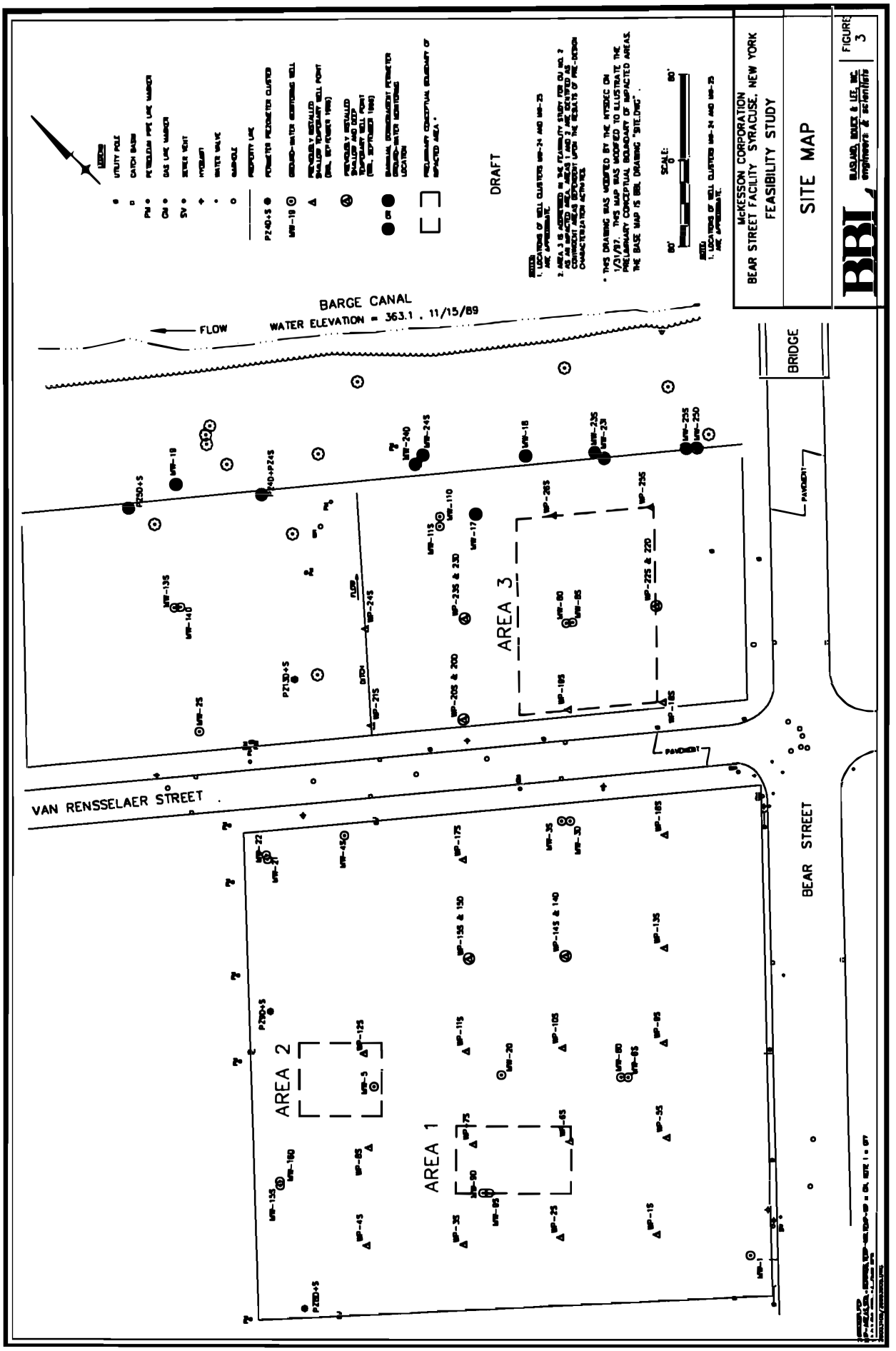
3.2 Summary of Human Exposure Pathways:

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

An exposure pathway is the route by which an individual comes into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental medium 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. Completed pathways which are known to or may exist at the site in the future include:

- Dermal contact with groundwater by construction workers during possible future excavation activities;

- Inhalation of COCs volatilized from groundwater or potential ingestion of groundwater, should the site be redeveloped;


DRAFT
McKESSON CORPORATION
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FEASIBILITY STUDY
SITE MAP
BRBI
FIGURE 3
BARGE CANAL
WATER ELEVATION = 363.1 , 11/15/89
FLOW
BRIDGE
VAN RENSSELAER STREET
BEAR STREET
AREA 1
AREA 2
AREA 3
PAVEMENT
DITCH

3.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. The Habitat Based Assessment included in the RI presents a more detailed discussion of the potential impacts from the site to fish and wildlife resources. The following pathways for environmental exposure have been identified:

- Potential for contaminants leaching into groundwater and then discharging into Barge Canal/ Onondaga Creek and thence to Onondaga Lake.

SECTION 4: ENFORCEMENT STATUS

The NYSDEC and the McKesson Corporation entered into a Consent Order on June 10, 1987. The Order obligates the responsible parties to implement a full remedial program. The order was amended on May 9, 1990 to incorporate Safety Kleen Environsystems Company as a PRP. Under the terms of the order, the PRPs will implement the remedy selected for this operable unit by the Record of Decision.

The following is the chronological enforcement history of this site.

Date	Index No.	Order Subject
6/10/87	R7-0766-84-03	Remedial Program
5/09/90	R7-0766-84-03	Amended Rem. Prog.

SECTION 5: 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 should eliminate or mitigate all significant threats to public health and to 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:

- Reduce, control, or eliminate the concentrations of COCs present within the saturated soils at the McKesson Corporation Bear Street Facility;

- Attain the NYSDEC Class GA Groundwater Quality Standards, to the extent practicable, for the COCs present in onsite groundwater; and

- Mitigate the potential for migration beyond the site boundary of groundwater that contains concentrations of COCs in excess of their respective NYSDEC Class GA Groundwater Quality Standard.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should 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 McKesson Envirosystems site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled *Feasibility Study for Operable Unit No. 2 - Saturated Soils and Groundwater, January 1997.*

A summary of the detailed analysis follows. As used in the following text, the time to implement reflects only the time required to implement the remedy (e.g. estimated duration of system operation), 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.

6.1: Description of Alternatives

The potential remedies are intended to address the contaminated saturated 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
Limited Action

Present Worth:	$257,000
Capital Cost:	$3,000
Annual O&M:	$16,500
Time to Implement	6 months

This alternative also would not include remedial actions to address the COCs present within the saturated soils and groundwater at the site, and would rely on natural attenuation processes to attain the remedial goal and RAOs identified for OU No. 2. This alternative, however, would include long-term groundwater monitoring to document groundwater quality.

Alternative 3
In-Situ Anaerobic Bioremediation

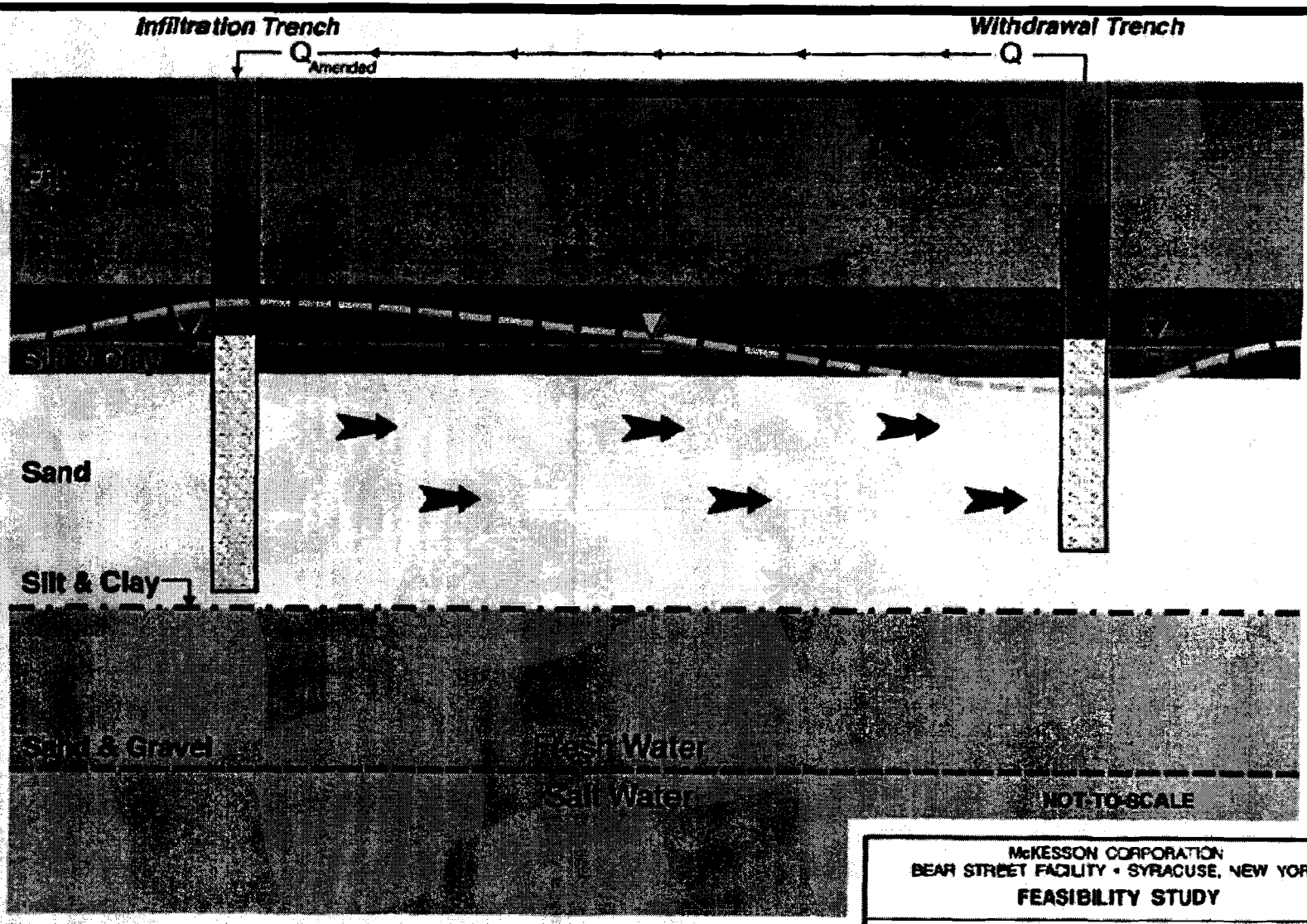
Present Worth:	$1,401,000
Capital Cost:	$844,000
Annual O&M:	$107,900
Time to Implement	5 years

This alternative would involve enhancing the naturally occurring anaerobic biodegradation process at Area Nos. 1, 2 and 3. This would be accomplished by adding nutrients to stimulate and increase the anaerobic biodegradation of the COCs present in each area. The process would function in a hydraulically-contained system, thus eliminating the potential for migration of contaminants from these areas.

To evaluate the feasibility of implementing bioremediation techniques to address the COCs present in the saturated soils and groundwater at the site, bench-scale biological treatability studies were conducted as a component of the Supplemental Investigation. The primary objective of these studies was to evaluate the effectiveness of aerobic and anaerobic bioremediation treatment in reducing the concentration of COCs present in these media. Each of the techniques involves stimulating the natural biological/microbial activity that is occurring in the saturated soils and groundwater on site. The treatability study involved chemical and biological characterization of these media by evaluating the effects of various amendments (methane, hydrogen peroxide, phosphorous, nitrogen, etc.) under both aerobic and anaerobic conditions. The study concluded that both aerobic and anaerobic treatment techniques could be effective at reducing the mass of COCs present, under appropriate conditions.

The specific components which would be included in this alternative, In-Situ Anaerobic Bioremediation, are as follows:

- Installing an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, in Area Nos. 1, 2 and 3. These trenches would be installed within the shallow hydrogeologic unit, but would not penetrate the underlying silt and clay lacustrine deposit, which appears to separate the shallow and deep hydrogeologic units. The infiltration trench would be installed in the sand layer (lower portion of the shallow hydrogeologic unit) to facilitate distribution of the amended groundwater to enhance the naturally occurring anaerobic biodegradation of COCs. The actual locations and configurations of these trenches would be determined based on the data obtained from pre-design activities (ref. Figure 4).



Note:
The upper portion of the silt and clay layer was addressed during the remediation of OU No. 1.

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FEASIBILITY STUDY

Conceptual Closed-Loop Hydraulic Cell

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4

- Withdrawing groundwater from the withdrawal trenches and amending the recovered groundwater, as necessary, with macro-nutrients (e.g., phosphorous, nitrogen) and Revised Anaerobic Mineral Media (RAMM) micro-nutrients (i.e., sulfate, iron(III)) prior to infiltration into the shallow hydrogeologic unit. These nutrients are among those which were evaluated and shown to be effective at stimulating biological growth during the bench-scale treatability study.

- Installing shallow well points in the silt and clay layer of the impacted areas (upper portion of the shallow hydrogeologic unit), for the purposes of distributing small quantities of amended groundwater and to provide locations to monitor the effectiveness of the groundwater withdrawal/infiltration system.

This alternative would also include long-term groundwater monitoring to document groundwater quality, monitor biological activity, and determine any migration of COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

Alternative 4
In-Situ Aerobic and Anaerobic Bioremediation

Present Worth:	$1,922,000
Capital Cost:	$995,000
Annual O&M:	$193,000
Time to Implement	5 years

This alternative would involve the enhancement of naturally occurring microorganisms present in the saturated soils/groundwater of the sand layer located within the shallow hydrogeologic unit. While the permeable nature of the sand layer is conducive to an aerobic system, the relatively "tight" nature of the silt and clay layer is undesirable for such a system. Therefore, this alternative would consist of a dual aerobic/anaerobic approach. This would be accomplished by adding nutrients and dissolved oxygen to stimulate the degradation of COCs in the impacted areas of the site, to change the anaerobic system that currently exists within the sand (lower portion of the shallow hydrogeologic unit) unit into an aerobic system. In addition, nutrient-enriched groundwater would be introduced into the silt and clay layer (upper portion of the shallow hydrogeologic unit) to enhance the naturally occurring anaerobic biodegradation of the COCs in each impacted area. The specific components of In-Situ Aerobic and Anaerobic Bioremediation would include:

- Installing an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, in the impacted areas similar to the trenches described under Alternative 3. As with Alternative 3, the actual locations and configurations of these trenches would be determined based on the data obtained from pre-design activities;

- Withdrawing groundwater from the withdrawal trenches and amending the recovered groundwater with macro-nutrients (e.g., phosphorous, nitrogen) and hydrogen peroxide (a source for dissolved oxygen) prior to infiltration into the sand layer (only) of the shallow hydrogeologic unit. Hydrogen peroxide had a demonstrated effectiveness during the treatability study, in supplying the oxygen necessary for aerobic bioremediation.

- Installing shallow well points in the silt and clay layer of the impacted areas for the purpose of distributing small quantities of RAMM-amended groundwater to promote anaerobic degradation of the COCs as well as and to provide locations to monitor the effectiveness of the anaerobic bioremediation system.

This alternative would also include long-term groundwater monitoring to document groundwater quality, monitor biological activity, and determine any migration of COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

Alternative 5
Ex-Situ Aerobic Soil Bioremediation and In-Situ Anaerobic Bioremediation

Present Worth:	$3,155,000
Capital Cost:	$2,741,000
Annual O&M:	$78,400
Time to Implement	5 years

This alternative would involve excavating impacted soils from within the silt and clay layer (upper portion of the shallow hydrogeologic unit) at the impacted areas. The estimated average depth of the excavations would be approximately 18 feet bgs. Excavated soils would be treated on site using aerobic biological techniques to reduce the concentrations of COCs to less than the NYSDEC site-specific soil cleanup guidelines. In conjunction with the ex-situ treatment program, to address the COCs present in the sand layer (lower portion of the shallow hydrogeologic unit), naturally occurring anaerobic biodegradation processes would be enhanced. This would be accomplished by adding nutrients to stimulate and increase the biodegradation of the COCs as described above for Alternative 3. The specific components of this remedial approach would include:

- Excavating impacted soils from within the silt and clay layer (shallow hydrogeologic unit) at the impacted areas. The estimated average depth of the excavations would be approximately 18 feet bgs. Excavated soils would be treated on site using aerobic biological techniques to reduce the concentrations of COCs to less than the NYSDEC approved soil cleanup levels used for OU No. 1 - the Unsaturated Soils;

- The aerobic biological treatment technique would consist of mechanically blending the excavated soils to enhance the growth and activity of naturally occurring microorganisms that use the COCs as a source of carbon and energy, to convert the COCs to carbon dioxide

and water. The soils would be blended in a treatment unit that would be constructed on site. Upon confirmation that soil cleanup levels had been met, treated soils would be backfilled on site.

- To address the COCs present in the sand layer (lower portion of the shallow hydrogeologic unit) this alternative would involve enhancing the naturally occurring anaerobic biodegradation processes at each of the impacted areas. Enhancement of the naturally occurring anaerobic biodegradation processes would be accomplished by adding nutrients to stimulate and increase the biodegradation of the COCs present in these areas. This could be accomplished by adding nutrients directly into the open excavation or by implementing the specific components for in-situ bioremediation, as described above for Alternative 3, with the following exceptions: The infiltration and extraction trenches would not be installed in the impacted areas, because the silt and clay layer within the shallow hydrogeologic unit would be addressed by the excavation and ex-situ bioremediation treatment activities described above. Instead, vertical extraction and infiltration wells would be installed downgradient and upgradient, respectively, of the impacted areas. These wells would be screened in the sand layer. Groundwater from the sand layer would be extracted from the downgradient vertical extraction wells and amended with anaerobic nutrients (e.g., RAMM) prior to infiltration into the sand layer using the upgradient wells. The specific method(s) for enhancing the naturally occurring anaerobic biodegradation process would be determined during the remedial design using the information obtained during the pre-design characterization activities.

This alternative would also include long-term groundwater monitoring to document groundwater quality and to determine any migration of COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

6.2 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 (6NYCRR 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 contained in the Feasibility Study.

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.

All of the remedial alternatives would be designed and implemented to meet action-specific SCGs, however, the no-action and limited action alternatives include no measures to address contravention

of pertinent standards, should this occur. The remaining remedial alternatives would comply with pertinent SCGs.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

All of the alternatives would provide for a reduction in the concentrations of COCs present in OU No.2, though no-action and limited-action would rely on natural attenuation. Natural attenuation would take years and off-site migration, which has now been evidenced, could impose increased threats to public health and the environment. The in-situ bioremediation alternatives (Alternatives 3 and 4) and the ex-situ soil bioremediation and in-situ anaerobic bioremediation alternative (Alternative 5) would provide better protection of the environment by providing a greater reduction in the total mass of COCs present in OU No. 2. However, implementation of Alternative 5 would pose greater potential impacts during the excavation and ex-situ treatment of impacted soils.

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.

All of the remedial alternatives, except for the no-action alternative and the limited-action alternative, involve the excavation and handling of impacted soils. However, the excavation activities that would be implemented under Alternative 5 are much more extensive and present a higher potential for short-term risks to on-site workers and the community during implementation. For this alternative, a greater degree of mitigative measures would need to be implemented to control potential short-term environmental impacts to ambient air quality associated with off-site dust migration and volatilization of the chemicals of concern.

4. Long-term Effectiveness and Permanence. 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 and limited-action alternative may not meet the RAOs for OU No. 2. Neither of these alternatives include any remedial activities to address the COCs present within OU No. 2. These alternatives rely on natural attenuation processes to meet the RAOs. The remaining remedial alternatives would meet the RAOs for the site within an estimated five year period. In the

interim, the groundwater treatment system(s) would serve to contain the contaminated groundwater, mitigating the potential for off-site migration.

5. Reduction of Toxicity, Mobility or Volume. 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 limited-action alternatives rely on natural attenuation processes to reduce the toxicity, mobility, or volume of the COCs present within OU No. 2. The remaining remedial alternatives would reduce the toxicity, mobility, and volume of the COCs through treatment. In addition, because the treatment system(s) would be hydraulically contained, concerns relative to off-site migration of contamination (i.e. contaminant mobility) during the remedy, would be allayed.

6. Implementability. 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.

All of the remedial alternatives are technically feasible and can be implemented at the site. Alternatives 4 and 5 require a greater degree of coordination than Alternative 3, however, which relies on a single, in-place treatment system. Alternative 4 involves two distinct biological systems. This would entail additional monitoring and maintenance and therefore, increased cost. Alternative 5, likewise, in light of the in-situ and ex-situ technologies, would require greater engineering, monitoring and maintenance. Further, implementation of the ex-situ aerobic bioremediation component of Alternative 5 would present numerous issues due to the potential site of the excavations, including volatilizing COCs during excavation activities, maintaining the stability of the excavation sidewalls, and potentially spreading the distribution of COCs (e.g. during the installation of sheet piling).

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 focused upon 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 have been evaluated. The "Responsiveness Summary", included as Appendix A, presents the public comments received and the Department's response to the concerns raised. No significant public comments were received.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 6, the NYSDEC is selecting **Alternative 3, In-Situ Anaerobic Bioremediation**, as the remedy for this site.

This selection is based upon the comparative analysis of alternatives. In-situ Anaerobic Bioremediation (Alternative 3) will be the most effective remedial alternative capable of meeting the RAOs for the site. This is supported by the bench-scale treatability study which demonstrated the ability of this technology to address the contamination present. Further, this alternative, which involves a single anaerobic system, will also be best suited to address the physical characteristics of the zone of contamination (i.e. the silt layer overlying the sand layer). Biological treatment using in-situ anaerobic bioremediation techniques will be a destructive technology which has been proven effective at addressing the COCs present. When implemented at the site, this alternative will result in a permanent and significant reduction of the total mass of the COCs in the soil and groundwater in the impacted areas of OU No.2. The remedy will have the added benefit of providing hydraulic containment during the time required to biologically treat the COCs. Accordingly, In-Situ Anaerobic Bioremediation is the recommended remedial alternative.

The estimated present worth cost to implement the remedy will be $1,401,000. The cost to construct the remedy is estimated to be $844,000 and the estimated average annual operation and maintenance cost for 5 years will be $107,900.

The elements of the selected remedy will be 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. Any uncertainties identified during the RI/FS will be resolved.

2. Installation of an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, of Areas 1, 2 and 3 (ref. Figure 3). These trenches will be installed within the sand unit, but will not penetrate the underlying silt and clay lacustrine deposit. The infiltration trench will be installed in the sand layer to facilitate distribution of the amended groundwater to enhance the naturally occurring anaerobic biodegradation of COCs.

3. Groundwater from the withdrawal trenches will be amended, as necessary, with macro-nutrients (e.g., phosphorous, nitrogen) and Revised Anaerobic Mineral Media (RAMM) micro-nutrients (i.e., sulfate, iron(III)) prior to discharge to the upgradient trench for infiltration back into the shallow hydrogeologic unit.

4. Installation of shallow well points in the silt and clay layer of the impacted areas for the purpose of distributing small quantities of amended groundwater and to provide locations to monitor the effectiveness of the groundwater withdrawal/infiltration system.

5. Since the remedy results in untreated hazardous waste remaining at the site, a process control monitoring program will be instituted which will allow the effectiveness of the selected remedy to be monitored and will be a component of the operation and maintenance for the site. Upon attainment of the remedial action objective for groundwater quality and discontinuation of system operations, estimated to be about five years subsequent to system initiation, a post-remedial monitoring program will be established.

6. Upon completion of the remediation, as demonstrated by the monitoring programs, the site will be considered for delisting from the New York State Registry of Inactive Hazardous Waste Disposal Sites. Once the remedy is in place, the site will be reclassified as a class 4, indicating that the remedial action is in place and only operation and maintenance will be required.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation (CP) activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for this Operable Unit at the site:

- A repository for documents pertaining to the site was established.

- A site mailing list was established which included nearby property owners, local political officials, local media and other interested parties.

- In January 1997 a Fact Sheet was sent to the site mailing list announcing the availability of the Proposed Remedial Action Plan and plans for a public meeting to accept comments of the NYSDEC's proposed remedy.

- On February 18, 1997 the NYSDEC and the NYSDOH held a Public Meeting to explain the State's proposed remedy and to accept comments on the PRAP.

- In March 1997 a Responsiveness Summary was prepared and made available to the public, to address the comments received during the public comment period for the PRAP.

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs	SCG* (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Benzene	ND-2,000	19 of 175	0.7
		Toluene	ND-430(JD)	12 of 175	5
		Ethylbenzene	ND-610	14 of 175	5
		Xylene	ND-2,800	14 of 175	5
		Trichloroethylene	ND-60,000(JD)	4 of 175	5
		Methylene Chloride	ND-7,700,000(D)	22 of 175	5
		Methanol	ND-430,000	NA	NA
		Acetone	ND-470,000	4 of 175	50
	Semivolatile Organic Compounds (SVOCs)	Aniline	ND-39,000(D)	31 of 175	5
		N,N-dimethylaniline	ND-380,000(D)	21 of 175	5

* NYS Ambient Water Quality Standards and Guidance Values (TOGS 1.1.1)
D - Sample Diluted
J- Estimated Concentration

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
No Action	$0	$0	$0
Limited Action	$3,000	$16,500	$257,000
In-Situ Anaerobic Bioremediation	$844,000	$107,900	$1,401,000
In-Situ Aerobic and Anaerobic Bioremediation	$995,000	$193,000	$1,922,000
Ex-Situ Aerobic and In-Situ Anaerobic Bioremediation	$2,741,000	$78,400	$3,155,000

APPENDIX A

RESPONSIVENESS SUMMARY

McKesson Envirosystems Site
Operable Unit No. 2 - Saturated Soils and Groundwater
Proposed Remedial Action Plan
Syracuse(C), Onondaga County
Site No. 7-34-020

The Proposed Remedial Action Plan (PRAP) for Operable Unit No. 2 at the McKesson Envirosystems Site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on January 31, 1997. This Plan outlined the preferred remedial measure proposed for the remediation of the saturated soils and groundwater at the McKesson Envirosystems Site. The preferred remedy is In-Situ Anaerobic Bioremediation.

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on February 18, 1997 which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site.

The public comment period for the PRAP officially closed on March 5, 1997.

This Responsiveness Summary responds to all questions and comments raised at the February 18, 1997 public meeting.

The following are the comments received at the public meeting, with the NYSDEC's responses:

COMMENT 1: The depth of the soils addressed by the Operable Unit No. 1 remedy was approximately eight feet?

RESPONSE 1: The groundwater table was used as the basis for the depth selected for the soils remediated by the Operable Unit No. 1 remedy. The groundwater table was typically situated five to six feet below the ground surface with maximum depths of approximately eight feet. As a component of the Operable Unit No. 1 remedy, subsequent to the bioremediation process, clean fill was brought onsite to raise the existing site grade. The water table, therefore, is now situated approximately eight to ten feet below the ground surface at the site.

COMMENT 2: Are there any off-site concerns associated with this type of remediation, whether it is odor, noise or visual? Is there anything that adjoining property owners would be concerned about?

RESPONSE 2: Implementation of this remedy will not result in any odor, noise or visual concerns to adjacent property owners or passersby.

COMMENT 3: You indicated that the remedy will take approximately five years to complete. Does the remediation preclude something from going on top of the soil, something being built or being used in any fashion, or should one assume that for the next five years these eight acres will not be developed?

RESPONSE 3: If monitoring supports that the remedial program is effectively addressing the contamination, it is likely that the site classification would be revised from a Class 2 Registry designation (significant threat to human health and/or the environment - action required) to a Class 4 (site properly closed - requires continued management). However, the site would remain on the Registry of Inactive Hazardous Waste Disposal Sites until such time as the remedy is declared by the NYSDEC to have been successfully completed. Therefore, for the duration of the remedial project (estimated at five years), development of the entire parcel is not possible. Development of a portion(s) of the site, however, is a possibility (see Response 4).

COMMENT 4: Could you pave the site, for instance install a parking lot, while the remediation effort is ongoing?

RESPONSE 4: Details on the system configuration and necessary space will be determined during the remedial design. There are large areas of the site, however, which are not impacted by the zones of contamination to be addressed by the proposed remedial program. A parking lot (for example) on these areas of the site, therefore, is a possibility. Any development of the property, however, is at the discretion of the site owner and would require the approval of the NYSDEC while the site remains on the Registry of Inactive Hazardous Waste Disposal Sites.

COMMENT 5: What is the McKesson Corporation planning to do with the site when the remediation is complete?

RESPONSE 5: The McKesson Corporation has not indicated their future intentions for the property.

COMMENT 6: Why did the data show that the level of aniline increased recently?

RESPONSE 6: Site data supports that to date there have been no off-site impacts associated with the site with the exception of one recent (August 1996) groundwater quality standard exceedence for aniline. This "hit" was detected in one of monitoring wells situated immediately beyond the

property line. This detection of 7 parts per billion (ppb) of aniline exceeded the standard of 5 ppb. This downgradient "hit" is indicative of contaminant migration. This exceedence was noted in well MW-23S, which is situated immediately downgradient and in relatively close proximity to Area 3. Area 3 has historically been shown to contain high concentrations of both aniline and dimethylaniline. While the close proximity of Area 3 may be factor, the re-working of soils associated with the Operable Unit No. 1 remedy, is also a possible factor for the detection of aniline at this location.

COMMENT 7: Are the three areas highlighted the only areas of concern? If the property line shifted, would there be areas of the site considered "clean"?

RESPONSE 7: There are significant portions of the site which are not affected by the contamination. These areas are considered "clean". The property is not particularly conducive to sub-division at this time, in light of the discontinuous nature of the three areas of concern, and because contamination has been identified on both of the McKesson-owned parcels (north of Van Rensselaer Street and south of Van Rensselaer Street).

COMMENT 8: The plan indicates there will be trenches. This will be a closed, under-the-ground system?

RESPONSE 8: The system in each of three areas of concern will have two under-the-ground trenches, one upgradient and one downgradient. This will create a closed "hydraulic cell" in each of the areas. There will some aboveground apparatus (piping, holding tanks, etc.), but the majority of the system will be situated below the ground surface.

COMMENT 9: There is a proposed Creek Walk being developed approximately 100 feet from the fence line. Do you envision any problems with the desire to place a Creek Walk in this area?

RESPONSE 9: There should not be any problems associated with the placement of a Creek Walk in the area proposed. The areas of contamination are located on the McKesson Corporation-owned property and situated approximately eight feet below the ground surface. The area of the proposed Creek Walk is sufficiently removed from the area of contamination and, accordingly, should in no way be impacted by the site.

COMMENT 10: What is the estimated project duration?

RESPONSE 10: The remedial project's duration is estimated at five years. The project will involve the simultaneous operation of three individual units in each of their respective areas of concern. If monitoring data supports that a shorter duration is appropriate for one or more of the systems, operation of that system(s) will be discontinued. Conversely, the data suggests additional treatment is required to meet the cleanup goals, consideration will be given to the continued operation of the system(s), beyond the five year duration.

COMMENT 11: Are there any detrimental side-effects associated with the usage of the proposed groundwater amendment?

RESPONSE 11: There will be no detrimental side-effects associated with the application of the groundwater amendment. The proposed amendment, a recipe which has beed developed to stimulate the growth of the bacteria required for the process, consists of various minerals and nutrients for the bacteria. The recipe is referred to as a Revised Anaerobic Mineral Media (RAMM). The treatability study supports that the addition of the RAMM will increase the health of the microorganisms, providing for a very effective treatment process. To gauge the effectiveness of the remedial program, regular monitoring will be conducted in each of the areas of concern and the systems will be adjusted to insure an optimum environment exists for the bacteria. The routine monitoring will also provide for maintaining a safe level of these ingredients within each of the designated hydraulic cells.

One written comment letter was received during the comment periode This letter is attached. No response is required.

Lakefront
Development
Corporation

February 19, 1997

Michael J. Ryan, P.E.
NYS Department of Environmental Conservation
50 Wolf Road, Room 242
Albany, NY 12233-7010

re: Inner Harbor Creekwalk

Dear Mike,

It was a pleasure meeting you last night at the Public Hearing regarding the Proposed Remedial Action Plan for the McKesson Site.

As we discussed, the Inner Harbor Creekwalk in an integral part of the overall redevelopment of this area. While there were no concerns expressed when we discussed this item, rest assured I am available to speak with you at anytime regarding this matter.

Again thank you for your time and interest in this important project.

Best regards,

Bart Bush, Executive Director
Lakefront Development Corporation

cc: Susan Miller, NYSDEC

WBB/ms

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APPENDIX B

ADMINISTRATIVE RECORD

The following documents, which have been available at the document repositories, constitute the Administrative Record for the McKesson Envirosystems Site, Remedial Investigation/Feasibility Study.

APRIL 1990:	Remedial Investigation Report
NOVEMBER 1993:	Feasibility Study Report, Operable Unit No. 1
JANUARY 1994:	Proposed Remedial Action Plan, Operable Unit No. 1
MARCH 1994:	Record of Decision, Operable Unit No. 1
SEPTEMBER 1995:	RD/RA Report, Operable Unit No. 1
SEPTEMBER 1996:	Supplemental Saturated Soil and Groundwater Investigation Report
DECEMBER 1996:	Feasibility Study Report, Operable Unit No. 2
JANUARY 1997:	Proposed Remedial Action Plan, Operable Unit No. 2