BUFFALO COLOR
AREA "D" SITES
SITE Nos. 9-15-012A&B

RECORD OF DECISION

NOVEMBER 1991

PREPARED BY
NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

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DECLARATION STATEMENT - RECORD OF DECISION

Buffalo Color Site
Buffalo, New York
Site No. 9-15-012 A&B

STATEMENT OF PURPOSE:

This Record of Decision (ROD) sets forth the selected Remedial Action Plan (RAP) for the Buffalo Color Site. This RAP was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the New York State Environmental Conservation Law (ECL). The selected remedial plan complies to the maximum extent practicable with the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, of 1985 as revised in 1990.

STATEMENT OF BASIS:

This decision is based upon the Record of the New York State Department of Environmental Conservation (NYSDEC) for the Buffalo Color Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A copy of all the pertinent documents is on file at the Dudley Branch Library, 2010 South Park Avenue, Buffalo, New York and at the office of the NYSDEC, 270 Michigan Avenue, Buffalo, New York and 50 Wolf Road, Albany, New York. A bibliography of the documents included as a part of the Record is included in Attachment 3.

DESCRIPTION OF SELECTED REMEDY:

The selected RAP will control the off-site migration of contaminants from the site and will provide for the protection of public health and the environment. It is technically feasible and it complies with statutory requirements. Briefly, the selected RAP includes the following:

- Installation of a soil-bentonite (SB) slurry wall completely surrounding the Area "D" site, and keyed into underlying clay layer. The slurry wall will act as a groundwater cutoff wall, preventing leachate escape to the Buffalo River.

- Installation of a flexible membrane liner (FML) cap over the entire site. The cap will consist of, from the bottom up, six inches of compacted subgrade, a 40 mil high density polyethylene (HDPE) or very low density polyethylene (VLDPE) membrane, 24 inches of soil cover and six inches of top soil. The cap will minimize the infilteration of surface water thereby reducing leachate generation.

- Pumping of groundwater and NAPL from perimeter collection drains located along the downgradient sides. The groundwater will be pretreated before discharge to the Buffalo Sewer Authority (BSA) sewer system.

- The contaminated soil outside the slurry wall will be removed and replaced by clean fill. Up to two feet of sediments from the River bank will be removed. This will virtually eliminate the amount of contaminants from the soil entering the River.

- Installation of geotextile liner and concrete fabriform or rip rap for shore stabilization. This will prevent erosion of the shoreline soils.

- Limited action alternatives which will include the fencing of the site, deed restrictions and monitoring.

DECLARATION:

The selected RAP is protective of human health and the environment. The remedy selected will meet the substantive requirements of the Federal and State laws, regulations and standards that are applicable or relevant and appropriate to the remedial action. The remedy will satisfy the statutory preference for remedies that employ treatment that reduce toxicity, mobility or volume as a principal element. This statutory preference will be met by eliminating the mobility of contaminants with a direct pathway of migration to the Buffalo River (groundwater and shoreline soils); and by treating contaminated groundwater to reduce the toxicity. The long term health risk associated with contact with the surface soils will be eliminated by the installation of the soil cap.

November 22, 1991
Date

Edward O. Sullivan

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SECTION 1: SITE LOCATION AND DESCRIPTION

Buffalo Color Corporation's (BCC) Area "D" is an inactive hazardous waste site located at 340 Elk Street off South Park Avenue in the City of Buffalo, Erie County, New York (see Figure 1-1). This site consists of a 19-acre peninsula surrounded on three sides by the Buffalo River and on the fourth side by a railroad yard and BCC's dye manufacturing facility.

Three waste management units were operated in Area "D"; iron sludge ponds, a metal sludge weathering area and an incinerator area (see Figure 1-2). Two of the areas, the iron sludge ponds (Site Code 9-15-012 A) and the metal sludge weathering area (Site Code 9-15-012 B) are currently listed as Class 2 sites in the Registry of Inactive Hazardous Waste Disposal Sites by the New York State Department of Environmental Conservation (NYSDEC). The site and immediate surrounding area are zoned for heavy industry. The nearest residential area is approximately 1,200 feet northwest of the site. The topography of the Area "D" site, and the surrounding area, is relatively flat. Surface run-off at the site is entirely to the Buffalo River.

SECTION 2: SITE HISTORY

A) Site Use:

Area "D" was used from 1905 to 1974 as a chemical manufacturing, handling and disposal site. From 1905 to 1920, acids, chemicals and dye intermediates were produced by Contact Process Company and by National Aniline Chemical Company which merged into Allied Chemical and Dye Corporation in 1920. Phosgene gas was produced during 1917-1918 by National Aniline and Edgewood Arsenal. Allied Chemical and Dye Corporation manufactured petroleum-based detergents, dye intermediates, picric acid; and other chemicals at Area "D" during 1920-1974. During this period a number of structures, railroad tracks, and tank parks were built at the site. All chemical manufacturing operations ceased in 1974 and chemical waste handling ceased in 1976 at Area "D".

In 1977, the property was sold to BCC and has remained idle since that time. All structures on the site were demolished to grade by Buffalo Color in 1984.

B) Area of Concern:

The portions of the Area "D" which are of concern include:

1. The "Weathering Area" located at the tip of the peninsula which was utilized for the storage of metal oxide sludges for weathering before shipment to metal recyclers (1916-1976);

2. The "Iron Oxide Sludge Lagoons" which were used for storage of iron oxide sludge from the manufacturer of dyes and intermediates (1916-1976);

3. Tank farm areas used for the bulk storage of petroleum products and process chemical; and

4. The area on the eastern side of the peninsula formerly occupied by open buring pits (1922-1954) and later by an incinerator (1954-1972) was used for burning of organic wastes generated during dye manufacturing processes.

   These areas of concern cover most of the Area "D" site as is evident from Figure 1-2. In addition, the analytical results of the samples collected during the present Remedial Investigation (RI) have demonstrated contamination at the Area "D" to be both widespread and variable with respect to its character and concentration. Contamination was found in the soil and/or groundwater at virtually every location of the site investigated. Any attempt to isolate the hot spots for remediation will be extremely difficult and will ultimately result in remediation of the whole site. Therefore, the Area "D" is considered as a whole for remediation.

C) **Previous Investigations**:

1. An initial investigation was performed between 1979 and 1981. Under this investigation, BCC installed three monitoring wells at the weathering area and two at the iron sludge ponds and analyzed the groundwater.

2. A field investigation was conducted by BCC during 1982-1985 in compliance with a NYSDEC March 1982 Order on Consent. Upon review of the investigation report by the NYSDEC, it was determined that Area "D" constituted a significant threat to the environment due to soil, groundwater and surface water contamination.

SECTION 3: CURRENT STATUS

A) **Introduction**:

Based on the information gained during the 1982-1985 investigation, it was determined that Area "D" poses a significant threat to the environment. Therefore, on December 14, 1987, Allied Signal and BCC jointly signed a Consent Order and agreed to conduct a Remedial Investigation and Feasibility Study (RI/FS) of Area "D" in accordance with a approved Work Plan. The RI involved the following tasks:

1. A geophysical survey;
2. Drilling and sampling of seven (7) deep test borings;
3. Installation of four (4) piezometers and 13 monitoring wells within shallow and deep water bearing zones;
4. Determine the geological and hydrogeological features of the region and the area;
5. Measurement of groundwater and river water levels; and
6. Sampling of groundwater, surface water river sediments, and surficial soil.

B) **Remedial Investigation Results**:

1. Geology of Site: The Area "D" site is underlain by five stratigraphic units (fill, alluvium, glaciolacustrine deposits, glacial till and bedrock). Fill consists of mixtures of gravel, sand, silt, clay, demolition debris, chemical wastes and other foreign materials and averages 9.0 feet thick.

   Alluvium underlies fill and generally consists of black to gray silty sand with traces of clay, and averages 17.8 feet thick. Glaciolacustrine deposits underlie the alluvium and consist of gray and brown-gray clayey silt and silty clay, and average 27.9 feet thick. Glacial till is the lowest surficial deposit and consists of gray and brown sandy silt, with small percentages of clay and gravel and averages 12.0 feet thick. The bedrock beneath the site consists of hard, dark gray limestone of the Middle Devonian Onondaga Formation.

2. Hydrogeology: Three (3) hydrostratigraphic units were defined at the Area "D" site. The Shallow Water-bearing Zone is located in the fill/alluvium deposits and yields an average hydraulic conductivity of 2.2 E-03 cm/sec and an average seepage velocity of 1.4 E-05 cm/sec. The groundwater flow in this zone is primarily from the north and flows directly to the Buffalo River. Overburden aquitard has a hydraulic conductivity of only 1.2 E-09 cm/sec. Hydraulic conductivity in the bedrock aquifer ranges from 1.4 E-02 cm/sec and flow probably occurs under confined conditions (see Hydrogeological Cross-Section RI, Figure 4-3).

3. Nature and Extent of Contamination: The results of sample collection and analysis have demonstrated contamination at the Area "D" to be both widespread and variable with respect to its character and concentration. Contamination was found in the soil and/or groundwater at every location of the site investigated during the RI. The fill layer exhibited elevated levels of polynuclear aromatic hydrocarbons (PAHs) and chlorinated benzenes. Also, variable concentrations of heavy metals and arsenic were found. Comparison of surface water concentration differences between upstream and downstream sampling were inconclusive, but sediments adjacent to the site exhibited elevated levels of PAHs, arsenic and several heavy metals. Contamination of the groundwater relative to background was found in the surficial glacial/till formations, with the principal contaminants being volatile organics, chlorinated benzenes, iron and other heavy metals. In addition, an oily sheen was observed in the soils at a number of locations and a six-foot layer of light non-aqueous phase liquid (NAPL) was found floating on the groundwater in the area of former tank park 910.

   A summary of the specific chemical substances detected along with the frequency of detection and concentration range is presented in Tables 6-14 through 6-17 Attachment 2.

   The following table summarizes the ranges of various notable contaminants found at the site:

Type of Analysis	Analyte	Range
a. Organics/Surface Soils (0-2') mg/kg	Nitrobenzene	0.21 - 580
	Benzoic Acid	2.8
	Naphthalene	470
	2-Chloronaphthalene	66
	Phenanthrene	4.6 - 270
	Fluoranthene	4.8 - 330
	Pyrene	3.9 - 310
	Benzo(a)Anthracene	1.9 - 180
	Chrysene	2.1 - 180
	Benzo(b)Fluoranthene	3.1 - 150
	Benzo(k)Fluoranthene	140
	Benzo(a)Pyrene	1.7 - 140
	Indeno(1,2,3-cd)Pyrene	0.76 - 77
	Benzo(g,h,i)Perylene	0.78 - 63
	EOX (mg/kg)	11 - 2780
b. Inorganics/Surface Soils (0-2') mg/kg	Arsenic	4.5 - 77.2
	Cadmium	0.82 - 24.8
	Chromium	44.2 - 1990
	Copper	36.2 - 3580
	Iron	15200 - 537000
	Lead	8.9 - 27300
	Mercury	0.07 - 6.2
c. Organics/Subsurface Soils mg/kg	1,4-Dichlorobenzene	1.7 - 13
	1,2-Dichlorobenzene	0.91 - 110
	Nitrobenzene	0.21 - 1100
	1,2,4-Trichlorobenzene	1.2 - 150
	Naphthalene	1.9 - 8.2
	2-Chloronaphthalene	0.55 - 140
	Fluoranthene	0.19 - 14
	Pyrene	0.14 - 13
	Benzo(a)Anthracene	1.1 - 6.7
	Chrysene	0.35 - 8.2
	Benzo(b)Fluoranthene	1.6 - 9.7
	Benzo(a)Pyrene	0.09 - 5.5
	EOX (mg/kg)	11 - 360
d. Inorganics/Subsurface Soils mg/kg	Arsenic	4 - 2860
	Cadmium	0.7 - 7
	Chromium	5.7 - 440
	Copper	6 - 14500
	Iron	1750 - 360000
	Lead	8.4 - 83200
	Mercury	0.19 - 14

Type of Analysis	Analyte	Range
e. Organics/Groundwater ug/l		
	2-Chlorophenol	0.8 - 1800
	1,4-Dichlorobenzene	1 - 4900
	1,2-Dichlorobenzene	2 - 21000
	1,2,4-Trichlorobenzene	8 - 1200
	Naphthalene	0.3 - 4900
	4-Chloroaniline	8 - 11000
	2,4-Dinitrotoluene (2)	2000
	2,6-Dinitrotoluene	1500 - 1700
	Benzidine	90 - 360
	1-Naphthylamine	6 - 42000
	Aniline (3)	5 - 660
	Benzene	0.1 - 28000
	Toluene	0.09 - 4700
	Chlorobenzene	0.6 - 48000
	Ethylbenzene	0.2 - 43000
	Xylene (Total)	1 - 1700
f. Inorganics/Groundwater ug/l		
	Arsenic	5.7 - 1820
	Cadmium	5 - 127
	Chromium	13 - 2140
	Copper	15 - 78700
	Iron	3940 - 405000
	Lead	5 - 3030
	Mercury	0.29 - 50

The analytical results of the subsurface soil samples indicates that no organic contaminants were found below the 30 foot depth. Also, the groundwater data indicates that only the uppermost saturated zone is contributing the contaminants to the Buffalo River. Therefore, it is apparent that the underlying clay/till layer is effective in providing a barrier for contamination migration downwards.

C) **Contaminant Fate and Transport**:

The Buffalo River receives contamination which migrates off of the Area "D" site. The chemical constituents of the waste enter the groundwater through dissolution, and the groundwater then flows into the Buffalo River. Likewise, the soluble constituents of the NAPL are present in the groundwater within the shallow overburden. The waste fill itself is entering the River through mechanical transport of soil waste particles during surficial run-off and erosion of the River banks surrounding the site. Each of these sources was evaluated to estimate the total contaminant loading to the River.

Based on the data collected during the RI, a daily loading of 1.2 pounds volatile organic compounds (VOCs) and 3.4 pounds semi-volatile organic compounds (SVOCs) is estimated to be migrating from the site to the River via groundwater. The total organic carbon loading to the River from groundwater is estimated to be 44.5 pounds per day. The loadings of 17.4

pounds per day iron and 2.0 pounds per day of other metals is based on total metals analysis of groundwater.

The free product found in and around W-8 is assumed to be immobile. However, the soluble constituents of the free product are assumed to enter the groundwater and move at the same rate as the groundwater flow.

Mechanical transport due to erosion of the banks and overland run-off is estimated to contribute approximately 575 cubic yards per year of fill material to the Buffalo River. This is the primary pathway for off-site migration of iron (270 lbs/day) and other metals (6.2 lbs/day). Contaminant loading to the Buffalo River via groundwater pathway is presented in Table 7-1 and via mechanical erosion pathway is presented in Table 7-3.

SECTION 4. ENFORCEMENT STATUS

A) Potential Responsible Parties:

The following potentially responsible parties (PRPs) for BCC Area "D" site have been identified:

1. Past Owner/Operator:

   Allied Signal, Inc.
   Engineered Material Sector
   P.O. Box 1139R
   Morristown, NJ 07962-1139

2. Current Owner:

   Buffalo Color Corporation
   P.O. Box 7027
   Buffalo, NY 14240-7027

B) Enforcement Actions:

1. On April 13, 1982, an Order on Consent was signed between the BCC and the NYSDEC (Index No. 947T032682) to undertake a field investigation of both the lagoons and the weathering area. The field investigation was completed in 1985.

2. On December 14, 1987 both Allied Signal and the BCC jointly signed an Order on Consent (Index No. B9-0014-84-01) with the NYSDEC to conduct a RI/FS of the entire BCC's Area "D" containing iron lagoons and weathering area. The RI Report was approved by the NYSDEC on September 18, 1990.

   At this stage in the process the NYSDEC will start negotiations with PRPs to perform the remedial design and construction of the chosen remedial alternative.

SECTION 5: GOALS AND OBJECTIVES FOR THE REMEDIAL ACTION

Remedial action objectives consist of medium-specific goals for protecting human health and the environment. The main purpose of stating remedial action objectives is to establish an acceptable contaminant level or range of levels for each exposure route. The media of concern identified for Buffalo Color Area "D" are upper unconfined groundwater and surface and subsurface soil/waste. Any offsite receptors will be mitigated by remediation of Area "D" groundwater and soil/waste.

A) Groundwater:

The groundwater under Area "D" contains significant concentrations of metals such as chromium, iron, lead, arsenic, cadmium and mercury, and significant concentrations of organic compounds. The contaminants which are found in the groundwater beneath the Area "D" site are presented in Table 6-16.

Groundwater beneath the Area "D" site flows directly into the Buffalo River. The groundwater at Area "D" is not used as a potable or other water supply. There is, therefore, no opportunity for direct exposure to groundwater and no receptors. However, River biota may bioconcentrate groundwater contaminants which are released into the Buffalo River through groundwater to surface water migration. This may result in health risks to humans who consume fish from the River. It may also result in environmental impacts on the River's ecosystem.

The following regulatory requirements (or their latest revisions) have each been identified as being either applicable or relevant and appropriate requirements (ARARs) to the remediation of the groundwater at Area "D" (see Table 2-1):

- 6 NYCRR 703.5(a)(3) Groundwater Standards for Class GA Waters.
- 10 NYCRR Subpart 5-1 Standards for Drinking Water Supplies.
- 40 CFR 141.11 Standards for Public Drinking Water Systems.
- 6 NYCRR 701.19 Fresh Surface Water Standards (Class C).
- NYSDEC TOGS 1.1.1 (9-25-90) Ambient Water Quality Standard.
- Clean Water Act 303-304 Water Quality Criteria (Aquatic Life).
- Clean Water Act 303-304 Water Quality Criteria (Fish Consumption).

Where each regulation has a different standard for one of the chemicals of concern, the more stringent value given in the latest revision will be applied. 6 NYCRR Parts 700-705 were revised on September 1, 1991 to incorporate the more stringent standards of 10 NYCRR Part 5-1 and the Safe Drinking Water Act. These revised standards are made part of the Record of Decision (ROD).

B) Soils/Wastes:

The contamination at the Area "D" is both widespread and variable with respect to its character and concentration. Therefore, soil/waste throughout the entire Area "D" is considered as a whole for remediation. The principal contaminants were chlorinated benzene compounds and PAHs and metals such as iron, copper, chromium, lead and arsenic. A summary of contamination found in the surface and subsurface soils of Area "D" is presented in Tables 6-14 and 6-15.

The site is surrounded on three sides by the Buffalo River and by fenced, patrolled private property on the fourth side. However, because the site is theoretically accessible from the Buffalo River, there is potential for exposure to the soils and wastes on the site. The theoretical trespasser's exposure to soils and wastes is possible through the dermal contact, incidental ingestion and fugitive dust inhalation routes. There is also a potential for offsite residential receptors to be exposed to surface materials via inhalation of fugitive dust. Although erosion of soils/waste from the banks of Area "D" into the Buffalo River provides a potential source of contaminants to the sediments, the contaminants bind strongly to the sediments under ambient conditions and have low bioavailability. Consequently, significant aquatic impact is unlikely, and thus the exposure to humans through incidental ingestion of fish is low.

The following guidelines have been identified as being either applicable or relevant and appropriate to the remediation and/or treatment of Area "D" soils eroding to the Buffalo River:

- o USEPA Sediment Classification Guidelines (Region V: 4/77)
- o NYSDEC Site Specific Guidelines for Area "D" soils, based on USEPA Resource Conservation and Recovery Act (RCRA) Facility Investigation Guidance Report-Interim Final, May 1989; Protection of Groundwater; or Background Values.

Based on these guidelines, the chemical-specific ARARs and Standards, Criteria and Guidance (SCGs) for the treatment of soil at Area "D" are as follows:

- o Arsenic - 7,500 ug/kg.
- o Cadmium - 1,000 ug/kg.
- o Chromium - 10,000 ug/kg.
- o 1,2-Dichlorobenzene - 425 ug/kg.
- o 1,4-Dichlorobenzene - 425 ug/kg.
- o Iron - 550,000 ug/kg.
- o Lead - 32,500 ug/kg.
- o Mercury - 100 ug/kg.
- o Phenanthrene - 35,000 ug/kg.

C) <u>Goals and Objectives</u>:

A report entitled "Buffalo River Remedial Action Plan (RAP)" dated November 1989 was prepared by the NYSDEC in cooperation with the Buffalo River Citizens' Committee. In that report Buffalo Color sites are listed as potential soruces of contaminants to the Buffalo River. The RAP has identified two goals. The first (short term) goal is related to the restoration of impaired best uses of the River. The second (long term) goal is related to the elimination of pollutant discharges to the Buffalo River, which is the goal of the Federal Clean Water Act and a policy of the parties to the Great Lakes Water Quality Agreement.

Therefore, the virtual elimination of the pollutant discharges from the Area "D" sites to the Buffalo River will be one of the goals for the remediation of the Buffalo Color Area "D" site.

Based upon the discussion above, the following remedial action objectives have been established for the Buffalo Color Area "D" sites:

1. Prevent direct exposure with on-site surface soils so the potential risk to human health through exposure is at an acceptable level.

2. Prevent erosion of contaminated on-site surficial and shoreline soil and waste from the Buffalo Color Area "D" sites into the Buffalo River; thereby eliminating contaminant loading to the Buffalo River through mechanical erosion and eliminating a potential source of contaminants to the sediments.

3. Limit the migration of contaminated groundwater and Non-Aqueous Phase Liquid (NAPL) constituents from the site into the Buffalo River; thereby limiting contaminant loading to the Buffalo River via subsurface groundwater.

4. Limit the migration of contaminants to the groundwater.

SECTION 6: <u>DESCRIPTIONS AND EVALUATION OF REMEDIAL ALTERNATIVES</u>

In order to develop the remedial alternatives for the Buffalo Color sites, the general response actions to satisfy the remedial action objectives were identified for each media. Table 3-1 lists the general response actions, technology type associated with each general response, process options available for each technology type and the applicability of the process option to the Buffalo Color site. A brief description and screening comments for each process option is provided below:

A) <u>Containment</u>:

1. Capping

Capping as a containment option is used to reduce or eliminate the infiltration of precipitation; control volatile emissions (airborne contaminants) and prevent human and wildlife contact with the contaminants.

a. Synthetic Membrane Cap

The snythetic membrane cap (or flexible membrane liner, FML) is designed to minimize infiltration or precipitation by means of a synthetic barrier between the surface and the waste material. The membrane would then be covered with soil and vegetated to control erosion and dust. This type of cap would have the proper stability characteristics for the Area "D" site; and is potentially applicable at this site.

b. Low Permeability Soil Layer Cap

Single layer caps, e.g. two feet of low permeability soil (permeability of 1.0E-07 cm/sec) cover are not effective in reducing infiltration because they are subject to dessication cracking, freeze/thaw damage and root penetration root penetration after construction. Therefore, a low permeability soil cap will not be considered further for the Area "D" site.

c. Multi-Media Cap

A multi-media cap combines a number of layers of different materials, such as a synthetic membrane, compacted clay layer, sand drainage layer, and topsoil/vegetation to increase the performance of the cap in minimizing infiltration, physical transport of waste by surface run-off, and volatile emissions. Multi-media caps could be designed to meet RCRA guidance and New York State Part 360 closure requirements, and are therefore potentially applicable at this site.

2. Barriers

Subsurface barriers are used for in situ waste containment, control of groundwater, and erosion control. This would reduce the migration of contaminants off-site. To completely contain groundwater, subsurface barriers are keyed into an underlying confining layer. The depth to a till and glacial/lacustrine clay confining layer at the Area "D" site is approximately 20 to 30 feet.

a. Slurry Walls

Slurry walls are constructed by excavating an open trench with a slurry of bentonite and water and as excavation proceeds, the trench is backfilled with a soil/bentonite or plastic concrete mixture. Slurry walls are considered reliable containment technology which can be used to provide long-term waste containment, groundwater containment, and dewatering. Slurry walls are considered potentially applicable to the Area "D" site.

b. Vitrified Wall Barriers

Vitrified wall barriers are a relatively new technology in long-term in situ waste containment. The barrier is formed by applying an electric current to melt the soil and contaminants into a solid mass of barrier material. Because of the heterogeneous nature of the fill material, uncertainties and need for pilot study, vitrified wall barriers will not be considered further for the Area "D" site.

c. Sheet Piles

Sheet pile walls are formed by driving interlocking sheets (e.g., steel) from the surface to an underlying low permeability layer to impede groundwater flow. Sheet piles do not form a complete low, impermeable barrier to groundwater flow and are not as resistant to attack by chemical contaminants as slurry walls. Therefore, sheet piles are not considered potentially applicable for groundwater containment but will be considered to provide shore stabilization.

d. Grout Curtains

Grout curtains are subsurface barriers created by injecting grout under pressure into a geologic formation through closely spaced holes in order to form a low permeability barrier. This technology is not reliable for groundwater control in unconsolidated materials and therefore is not considered for the Buffalo Color site.

e. Bottom Sealing

Bottom sealing involves placing a horizontal barrier by injecting grout under pressure beneath an area to prevent vertical migration of contaminants. Because of the existing underlying clay layer at the Area "D" site (at a depth of approximately 20 to 30 feet), bottom sealing is not necessary and therefore, will not be considered further.

f. Fabriform

Fabriform is an effective, adaptable and durable erosion control technology which protects against erosive forces with a monolithic concrete armor structure formed by pumping fine aggregate concrete into specially woven synthetic fabric forms. Due to the fact that a large semi-continuous mat of concrete can be installed by this process without heavy equipment, this technology is considered applicable to the Area "D" site for erosion control.

g. Rip Rap

Rip rap consists of large boulders and rock placed on the shore to reduce the erosion potential of the site. The rock size and thickness of the layer is based upon the velocity of the stream/River and conditions at the shore. Although rip rap does not have the same continuity as afforded by Fabriform, it can be designed to provide suitable shore stabilization and is considered applicable to the Area "D" site for erosion control.

B) <u>Waste Removal</u>:

1. Excavation

The excavation of the soil and waste material at the Area "D" site may be performed as part of an on-site treatment alternative, or to remove the material for treatment and disposal elsewhere. The use of conventional heavy construction equipment, such as backhoes and loaders, is potentially applicable. Because of the heterogeneous nature of the soil/waste and subsurface structures, materials handling would be extremely difficult. Excavation, although extremely difficult to implement, may be potentially applicable to the Area "D" site.

C) <u>Waste Treatment</u>:

1. Contaminant Containment

The contaminants of concern at the Area "D" site (SVOCs, VOCs, metals) can be immobilized or contained through various treatment processes. Although the soil/waste was not analyzed for VOCs during the RI, because the groundwater exhibited VOC contamination, the soil/waste treatment options presented do apply to VOC contamination.

a. In Situ Stabilization/Solidification

This process would involve in situ mixing of stabilizing agent to form a structurally sound matrix. Because of the heterogeneous nature of the soils/waste and subsurface structures, in situ mixing of reagent and waste with gang auguers would be difficult if not impossible. Therefore, in situ stabilization/solidification will not be considered further for the site.

b. On-Site Stabilization/Solidification

This process is similar to the in situ stabilization/ solidification, except the soil/waste would be excavated and treated in an on-site plant. Mixing of the reagent with the waste materials would be performed in an on-site plant. Treatability studies would be required. Because of the need to excavate all the soils/waste prior to on-site pretreatment and potential interference of organics in the process, this process will not be considered further.

2. In Situ Contaminant Removal

The SVOCs, VOCs and heavy metals could be extracted form the soil/ waste through various in situ treatment techniques.

a. In Situ Soil Washing

This process involves infiltrating a solvent or surfactant solution into the contaminated soil to increase the solubility of the contaminants and recovering the contaminated groundwater for treatment. Because of the presence of underground structures, the ability to provide complete soil washing is questionnable and, therefore, will not be considered further.

b. On-Site Soil Washing

This process is the same as described under in situ soil washing except for excavation of the soils/waste and treatment in an on-site plant. Treatability studies would be required to evaluate this process. This process is potentially applicable for the Area "D" site.

3. Contaminant Stripping

a. In Situ Soil Vacuum Extraction

In situ soil vacuum extraction involves application of vacuum to remove the volatile organic and some semi-volatile organic compounds from the waste. The air stream is then treated or vented to the atmosphere. Due to the existence of the building foundations over a large area, this process will be difficult to implement and the effectiveness will be questionable, therefore the process will not be considered further.

4. Contaminant Destruction

SVOCs, VOCs and heavy metals can be destroyed via treatment in a variety of in situ processes. Examples of these processes follow.

a. Bioremediation

Bioremediation involves the use of introduced microorganisms to biodegrade organic contaminants in the soil. Process variations include in situ or on-site processes after excavation. Several bioremediation processes are discussed below.

(i) On-Site Composting/In Situ Bioremediation

This process involves aerobic decomposition of organic matter. Proper aeration, temperature, moisture and nutrient content, and the presence of suitable microorganisms are required for decomposition to occur. Bioremediation generally applied to wastes containing significant organic matter, e.g., sewage sludge, manure and not to contaminated soils containing toxic materials. Therefore, composting will not be considered further.

(ii) On-Site Slurry Bioreactor

This process requires the introduction of waste slurry into a bioreactor along with nutrients, oxygen, and acid or alkali for pH control to create optimum conditions for biodegradation. The microorganisms are added to the treatment. This process is potentially applicable for treatment of organic contaminants.

(iii) On-Site Leach Bed

An on-site leach bed system is an open aerobic treatment system consisting of a lined bed and drainage for bioremediation fluid. This process is potentially applicable.

b. Vitrification

Vitrification is the transformation of soil and waste material into a durable glass-like material similar in composition and weathering characteristics to obsidian.

(i) In Situ Vitrification

This process involves the in situ melting of the soil/waste at very high temperatures, using heat generated by an electrical current to destroy or contain the contaminants of concern. Because of the presence of underground structures, this process will not be considered further.

(ii) On-Site Vitrification

This process transforms excavated waste material into a stable glass-like form in an on-site plant. Temperatures of approximately

1,650 degrees C in the reactor reduce the organic compounds to carbon monoxide, hydrogen, and carbon. The inorganic contaminants are incorporated in the molten glass. Off-gas emissions are then treated before discharge to the atmosphere. The resulting glass material might then be able to be placed back on-site or removed for off-site disposal. This process is considered potentially applicable to the Area "D" site.

c. Incineration

Incineration would involve the thermal destruction of the excavated waste material at high temperatures. There are several types of incineration processes that have been used in destroying hazardous wastes and soils such as rotary kilns, fluidized beds and infrared incineration.

(i) On-Site Rotary Kiln

Rotary kiln incinerators consist of a refractory-lined, rotating, cylindrical primary combustion chamber and a secondary combustion chamber. Organic wastes, usually hazardous waste solids or sludges, are oxidized by means of controlled combustion. This process is considered potentially applicable for the Area "D" sites.

(ii) On-Site Fluidized Bed

Fluidized bed incinerators consist of a refractory-lined vessel containing an inert fluidizing medium such as sand. The excavated waste material is injected into the sand bed which is fluidized by combustion air forced up through the bed. Because the restrictions on allowable feed size are stricter for this process than those for the rotary kiln, this process will not be considered further for this project.

d. Chemical Treatment

(i) In Situ Chemical Treatment

The goal of in situ chemical treatment would be to provide oxidation of VOCs and SVOCs in place using chemical oxidizing agents. This process would not remove metals. Because of the presence of underground structures, the ability to provide complete distribution of reagents is questionnable. Therefore, this process will not be considered further.

D) **<u>Waste Disposal</u>**:

1. Off-Site Landfill

If the soil/waste is not considered a RCRA hazardous waste, it could be disposed off-site at a landfill accepting industrial waste. This option could be applicable.

2. Off-Site TSDF

If the soil/waste is considered a RCRA hazardous waste it could be disposed at an off-site Treatment, Storage and Disposal Facility (TSDF) after treatment using Best Demonstrated Available Technology (BDAT) to meet allowable constitutent levels in the treated soil/waste. This option could be applicable.

3. On-Site RCRA Vault

If the soil/waste is considered a RCRA hazardous waste, it could possibly be disposed on-site in a RCRA vault after treatment to meet allowable constituent levels. This option could be applicable.

4. On-Site Landfill

If the soil/waste is not considered a RCRA hazardous waste it could possibly be landfilled on-site after construction of a solid waste landfill meeting the requirements of 6 NYCRR Part 360. This option could be applicable.

E) **Groundwater Collection**:

A groundwater collection system serves two purposes: 1) It provides the first step in most forms of groundwater treatment by pumping the water from the formation so that it can be treated; and 2) By creating zones of influence which extend across the downgradient side of the contaminant source, it serves as an effective barrier to groundwater migration.

1. Well-Point Dewatering

Well-point collection systems due to suction head limitation (usually 15 feet), will not be considered further for applicability to the Area "D" site.

2. Pumping Wells

A pumping well is typically a fully penetrating well which can be used to precisely control groundwater levels. This is potentially applicable for groundwater collection at the Area "D" site.

3. Perimeter Drains (Trench)

Perimeter drains for dewatering are constructed by excavation of a trench into the stratum of concern, by placement of a perforated drainage pipe in the base of the trench, and backfilling the trench with aggregate. These are potentially applicable for groundwater collection at the Area "D" site.

F) **Groundwater Treatment**:

There are two possible groundwater treatment situations that are applicable to the Area "D" site. Specifically, pretreatment for discharge to the Buffalo Sewer Authority (BSA) and treatment for discharge to surface water (the Buffalo River). The pretreatment option would involve treatment of the groundwater to meet effluent standards or to attain BSA discharge limitations. The other treatment option would involve groundwater treatment that would attain the ARARs/SCGs for discharge to the Buffalo River.

1. Physical/Chemical Processes

a. Chemical Precipitation

Chemical precipitation in wastewater treatment involves the addition of chemicals to alter the physical state of dissolved and suspended solids and facilitate their removal by sedimentation. Given the nature of groundwater contamination at the Area "D" site, chemical precipitation is potentially applicable for treatment of metals, however not for SVOCs and VOCs.

b. Neutralization

Neutralization involves adjusting pH levels. It may be utililzed for pretreatment or post-treatment, but not as the main treatment for VOCs, SVOCs or metals removal.

c. Granular Activated Carbon

Carbon adsorption is a viable process for the removal of dissolved organics and control of parameters such as chemical oxygen demand (COD), total organic carbon (TOC) and specific organic compounds in the contaminated groundwater. Granular activated carbon (GAC) can be used for pretreatment, complete treatment or effluent polishing. This process will be considered further for applicability at the Area "D" site.

d. Air-Stripping

Air stripping of volatile organics from the aqueous stream has proven to be a viable treatment for dilute as well as concentrated wastewater. This option will be evaluated further.

e. Steam Stripping

Steam stripping of volatile organics is a proven technology which is used extensively in industry for the recovery of solvents from concentrated waste streams. However, steam stripping present no advantage over air stripping. Therefore, steam stripping will not be considered further.

f. Solids Filtration

Filtration may be used as an ancillary process to polish the effluent generated by other processes used at the Area "D" site.

g. Chlorination

Chlorination may be required as an ancillary post-treatment process when biological treatment is utilized.

2. Biophysical Processes

Biophysical processes provide additional flexibility and enhanced treatment over biological processes. It is applicable to treatment of raw, high-strength contaminated groundwaters.

a. Powdered Activated Carbon Treatment (PACT)

While potentially applicable for VOC removal, PACT is generally applicable only to high-strength waste streams and will not be considered further for the Area "D" site.

b. Fluidized Carbon Bed

Fluidized carbon beds for high-rate treatment of high-strength leachates and wastewaters can be operated aerobically or anaerobically. The adsorption onto carbon enhances the availability of substrate for biodegradation microorganisms. This process is applicable to high-strength waste streams and will not be considered further for the Area "D" site.

G) **Groundwater Disposal/Discharges**:

1. Local/Public Owned Treatment Works (POTW)

Disposal of pretreated groundwater to the Buffalo Sewer Authority (BSA) is a viable option for the Area "D" site. The levels of contaminants allowable into the BSA would have to be developed specifically for the Area "D" effluent and subsequently a permit issued. Due to the proximity of the Area "D" site to the BSA, this option will be considered further.

2. Surface Water

Surface water discharge ARARs/SCG for the Buffalo River could be met through treatment of groundwater. The discharge of treated groundwater is considered potentially applicable for the Area "D" site.

3. Groundwater

Recharge of treated groundwater has no particular advantage over surface water or POTW disposal, it will not be considered further.

4. Off-Site TSDF

Small amounts of untreated groundwater (thousands of gallons per day) could be transported and disposed of economically at an off-site treatment, storage and disposal facility. Because this is a viable and effective option, it will be considered further for this site.

H) **Remedial Alternatives**:

Potentially applicable technologies were combined into 21 alternatives and further evaluated (see Table 4-1). The following alternatives were screened out during initial screening based on effectiveness and implementability:

Alternative 2 - Limited Action

This alternative would involve groundwater monitoring with deed restriction and fencing of the entire site. The limited action alternative will not ensure compliance with ARARs/SCGs. This alternative is clearly implementable. However, it is not effective; the contaminant pathways including groundwater infiltration to the Buffalo River, erosion of soil to the Buffalo River, human exposure to the Area "D" soils and aquatic toxicity from the Area "D" soils remain. Therefore this alternative is not considered for detailed evaluation.

Alternative 4a - Soil Cover and Grading with Perimeter Groundwater Collection, Pre-Treatment and Disposal to BSA and Shore Stabilization and Containment on East and South Sides

This alternative would provide for soil cover and grading over the entire site, groundwater collection and pre-treatment for discharge to the BSA and sheetpiling for shore stabilization.

This alternative is implementable, however not effective in that the soil cover will not provide thorough protection of human health and also will not reduce infiltration of precipitation to groundwater and ultimately to the Buffalo River. Therefore, this alternative is not considered for detailed evaluation.

Alternative 9 - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Total Excavation, Bioremediation, Backfill with Treated Soil, Soil Cover and Grading, and Shore Stabilization

This alternative would involved the total collection and pre-treatment of groundwater for discharge to the BSA for purposes of dewatering the soil/waste prior to and during excavation. The site would be excavated for treatment of the organics by bioremediation.

Many factors including biodegradability of organics, environmental factors which may affect microbial activity, site hydrogeology, and precipitation, can all have diminishing effects upon the performance of bioremediation. The effectiveness of this alternative is unknown without the performance of a treatability study. Because the implementability is questionable and the effectiveness particular to the site is unknown, this alternative is not considered for detailed evaluation.

Alternative 9a - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Total Excavation, Vitrification, Backfill with Treated Soil, Soil Cover and Grading, and Shore Stabilization

This alternative consists of the same components as Alternative 9 with the substitution of vitrification for bioremediation of the soil/waste.

Vitrification involves a thermal treatment process that converts contaminate soil (primarily inorganics) into a chemically inert and stable glass and crystalline product. The effectiveness of vitrification is unknown without a treatability study; also, the implementability is difficult if not questionable due to the nature of the fill material. Therefore, this alternative is not considered for detailed evaluation.

Alternative 9b - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Total Excavation, Incineration, Backfill with Treated Soil, Soil Cover and Grading, and Shore Stabilization

This alternative consists of the same components as Alternative 9 except with thermal destruction of the soil/waste.

Incineration of the waste could be done with an on-site rotary kiln or on-site fluidized bed. Both processes destroy organic waste by means of combustion. The rotary kiln incinerator would be the most applicable to the Area "D", however, excavation and the size of soil/waste material is questionalbe and therefore may be difficult to implement. The limitations on the effectiveness of rotary kiln incinerators include: suspectibility to thermal shock, necessity for very careful maintenance, need for additional air due to leakage, high particulate loadings, relatively low thermal efficiency, and high capital costs for installation.

Because this treatment technology is difficult to implement and the effectiveness is unknown without a treatability study, this alternative is not considered for detailed evaluation.

Alternative 9c - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Total Excavation, Soil Washing, Backfill with Treated Soil, Soil Cover and Grading, and Shore Stabilization

This alternative consists of the same components as Alternative 9 except with the use of soil washing.

Soil washing is applicable to inorganic and organic waste and can be performed in situ or at an on-site plant. The process involves the infiltration of a solvent or surfactant solution into the contaminated soil to increase the solubility of the contaminants and accelerate leaching of contaminants into the groundwater for recovery via extraction wells or a collection system.

The implementability of this process is difficult due to the nature of the fill material. The effectiveness of soil washing is dependent upon the types of extractants used. A treatability study would be necessary to make this determination. Because of the difficulty in implementation and the questionable effectiveness, this alternative is not considered for detailed evalulation.

Alternative 9d - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Total Excavation, Stabilization/Solidification, Backfill with Treated Soil, Soil Cover and Grading, and Shore Stabilization

This alternative consists of the same components as Alternative 9 except with the implementation of stabilization/solidification for treatment of the soil/waste.

Solidification/stabilization can be performed in situ or at an on-site plant. This process is effective for stabilizing inorganic contaminants and involves in situ mixing of a stabilizing agent with the soil/waste to form a structurally sound matrix.

On-site stabilization requires excavation of the soil/waste for mixing with the reagent at an on-site plant. For both on-site and in situ stabilization, treatability studies would be required. Because of this and the difficulty associated with the mixing for in situ treatment and the need for excavation for on-site stabilization, this alternative is difficult to implement. Consequently, this alternative is not considered for detailed evaluation.

Alternative 9e - Total Groundwater Collection, Pre-Treatment, Discharge to BSA, Chemical Remediation, Soil Cover and Grading, and Shore Stabilization

This alternative consists of the same components as Alternative 9 except with chemical remediation of the soil/waste. Through the placement of chemical oxidizing agents, oxidation of volatile organics and semi-volatile organics would occur. This process does not remove inorganics, however, and the effectiveness is reduced by the presence of subsurface structures which limit the complete distribution of reagents. Because of the question of implementability and effectiveness, this alternative is not considered for detailed evaluation.

The following 13 alternatives were evaluated in detail:

Alternative 1 - No Action with Monitoring

No remedial action would take place under this alternative. This alternative was evaluated to provide a baseline from which to evaluate other alternatives. Under this alternative groundwater monitoring and pumping of NAPL from Well 8 would continue. Under no action alternative the total calculated carcinogenic risk of 1.0E-05 and the hazard index of 200 would not be altered. In addition, potential risks through the inhalation of volatile organics from surface materials would remain. These conditions, which are not adequately protective of human health, may result in unacceptable health risks.

The no action alternative will not ensure compliance with ARARs/SCGs within a reasonable or predictable time frame.

The no action alternative is easy to implement and will not contribute to the reduction of contaminant toxicity, mobility or volume at the site.

Alternative 3 - Cap with Shore Stabilization Using Sheet Piling

This alternative would involve the placement of a flexible membrane liner (FML) cap over the entire site. Also, sheetpiling for shore stabilization would be placed along the east and south sides of the site. Access to and future use of the site would be restricted by fencing and deed restrictions. Groundwater monitoring of the existing on-site wells would occur while pumping of the NAPL from Well 8 would continue.

Alternative 3a - Cap with Shore Stabilization Using Fabriform/Rip-Rap

This alternative would involve the placement of a FML cap over the entire site. Also, Fabriform/Rip-Rap would be placed along the east and south sides for shore stabilization. Site access would be restricted by deed restrictions and fencing. Groundwater monitoring would be performed on the existing on-site wells and pumping of the NAPL from Well 8 would continue.

Alternatives 3 and 3a provide a greater level of protection than Alternative 1 through the implementation of a cap. This eliminates any airborne contaminants and contact with the soil/waste. Erosion control through sheetpiling in Alternative 3 and Fabriform/Rip-Rap in Alternative 3a reduces sediment loading. Sheetpiling in Alternative 3 also affords a reduction in groundwater discharge from the site thereby reducing aquatic toxicity. Cap can be installed easily. Alternatives 3 and 3a do not meet the chemical-specific ARARs/SCGs for migrating groundwater; however, with the implementation of a cap, they do comply with air standards and guidelines for volatile organic emissions from the site. Both alternatives require a long-term O&M program.

Alternative 4 - Cap with Perimeter Groundwater Collection, Pretreatment and Discharge to Buffalo Sewer Authority (BSA) and Shore Stabilization

This alternative would involve the placement of a FML cap over the entire site. Groundwater would be collected along the perimeter of the site for pretreatment and discharge to the BSA. Shore stabilization would be provided by Fabriform/Rip-Rap along the east and south sides. Site access and future use would be restricted by fencing and deed restrictions. The pumping of NAPL from Well 8 would discontinue and a groundwater monitoring program would be implemented.

Alternative 5 - Multi-Media Cap, Perimeter Groundwater Collection, Pretreatment, and Discharge to BSA and Shore Stabilization

This alternative would involve all the same components of Alternative 4, however with the substitution of a multi-media cap for a FML Cap.

Alternatives 4 and 5 provides protection of human health through the elimination of airborne contaminants, contact and incidental ingestion of soils/wastes. Collection of groundwater with pretreatment and discharge to BSA, eliminates discharge of contaminants to the Buffalo River, thereby eliminating aquatic toxicity.

Alternatives 4 and 5 provide reduction of toxicity and mobility of groundwater; however, no reduction in the soil/waste volume is afforded. These alternatives will meet the ARARs/SCGs.

Alternative 6 - Cap, Downgradient Cutoff, Perimeter Groundwater Collection, Pretreatment, Discharge to BSA and Shore Stabilization

This alternative would involve all the components of Alternative 4 along with the placement of a slurry wall downgradient.

Alternative 6a - Cap, Perimeter Groundwater Collection, Treatment, Discharge to Buffalo River, Downgradient Cutoff and Shore Stabilization

This alternative would involve all the components of Alternative 6, however, with treatment of groundwater for discharge to the Buffalo River.

Alternative 6b - Cap, Perimeter Groundwater Collection and Disposal to Treatment, Storage and Disposal Facility (TSDF), Downgradient Cutoff and Shore Stabilization

This alternative would involve the same components as Alternative 6 with the exception of disposal of groundwater to a TSDF.

Alternative 6c - Cap, Complete Cutoff, Perimeter Groundwater Collection and NAPL Collection, Pretreatment and Discharge to BSA, Shoreline Fill Excavation and Complete Shore Stabilization

This alternative would involve the same components as Alternative 6 along with the addition of an upgradient slurry wall for total containment of the site, continuation of the Fabriform/Rip-Rap along the entire length of shore, extension of the groundwater collection trenches into the area of known NAPL and excavation of all fill material outside of the cutoff wall to the point of intersection of the Fabriform/Rip-Rap prepared slope and a line drawn parallel and two feet into the top of the alluvium layer, as a maximum depth. All material will be placed within the slurry wall containment area beneath the cap.

Alternative 6d - Cap, Complete Cutoff, Perimeter Groundwater Collection, Treatment and Discharge to Buffalo River and Shore Stabilization

This alternative would involve the same components as Alternative 6a along with the addition of an upgradient slurry wall for total containment of the site.

Alternative 6e - Cap, Complete Cutoff, Perimeter Groundwater Collection and Disposal to TSDF and Shore Stabilization

This alternative would involve the same components as Alternative 6b along with the addition of an upgradient slurry wall for total containment of the site.

Alternatives 6 through 6e will provide protection of human health through the elimination of airborne contaminants, contact and incidental ingestion of soils/waste and aquatic toxicity by capping.

Alternatives 6 through 6e provide for groundwater collection which will result in an inward flow of groundwater to the site. Consequently, these alternatives will attain the chemical-specific ARARs/SCGs for migrating groundwater. These alternatives do attain the BSA discharge limitations or the effluent standards for discharge to the surface waters of the Buffalo River. These alternatives through shoreline stabilization and through excavation will meet the site-specific SCGs for soils eroding to the Buffalo River. Additionally these alternatives can be designed to meet the action-specific ARARs/SCGs with conventional technologies.

Alternatives 6 through 6e provide a reduction of toxicity and mobility through containment of groundwater and soils/waste via a slurry wall or sheetpiling and treatment of groundwater. These alternatives do not provide a reduction of volume of soil/waste.

All of the Alternatives 6 through 6e utilize proven and reliable technologies with readily available equipment from commercial vendors.

Alternative 7 - Cap, Complete Cutoff, Perimeter Groundwater Collection, Pretreatment and Discharge to BSA and Shore Stabilization

This alternative would involve the same components as Alternative 6e with the exception of utilizing sheetpiling for shore stabilization in place of Fabriform/Rip-Rap. Also, groundwater pretreatment and disposal to the BSA would be used instead of disposal to a TSDF.

Alternative 7 is comparable to Alternatives 4 through 6 with some additional improvment due to sheetpiling providing better erosion control.

Alternative 8 - Total Excavation and Disposal with Soil Cover and Grading, Total Groundwater Collection, Pretreatment and Discharge to BSA and Shore Stabilization

This alternative would involve the excavation and disposal of soil/waste and backfilling with new soil/fill material. Total groundwater collection and pretreatment for discharge to the BSA along with shore stabilization would also occur.

Alternative 8 provides the maximum reduction in residual risk due to complete removal of soil/waste and total collection and pretreatment of contaminated groundwater. However, an O&M program will still be necessary for the pumping and treatment of groundwater and shore stabilization.

Alternative 8 affords the highest degree of reduction of volume of soil/waste and groundwater through excavation of the soil/waste and total collection and pretreatment of the groundwater. This alternative also provides a greater degree of reduction of mobility and toxicity by eliminating the source.

Alternative 8 will attain chemical-specific and site-specific ARARs/ SCGs.

Alternative 8 is by far the most difficult to implement due to problems associated with the excavation of the heterogeneous nature of the soil/waste and the presence of the subsurface structures. Primarily, problems will be encountered with the dewatering and slope stabilization for excavation, materials handling, disposal and placement of backfill. The technologies are proven and reliable, however, and equipment is readily available from multiple vendors.

I) <u>Costs</u>:

Table 5-3 presents a summary of the present value of each of the 13 alternatives evaluated in detail. The no-action alternative has the least present value.

J) <u>Ranking of Alternatives</u>:

All 13 alternatives were evaluated and scored in accordance with the Department's Technical and Administrative Guidance Memorandum (TAGM) No. HWR-90-4030, titled selection of remedial actions at inactive hazardous waste sites prepared by the NYSDEC. Table 5.1 presents a summary of the key evaluation factors and ranking for various alternatives.

SECTION 7: SUMMARY OF THE GOVERNMENT'S DECISION

A) Description of Preferred Alternative:

Based on the evaluations of the various alternatives, the FS Report recommends Alternative 6c as the preferred alternative for this site.

Alternative 6c (Figures 5-6a and b) includes the following components:

- A Flexible Membrane Liner (FML) cap over the entire site.
- Pumping of groundwater and NAPL from perimeter collection drains located along the downgradient sides.
- Pretreatment of groundwater for discharge to BSA.
- Excavation of fill outside of the cutoff wall and replace with clean fill.
- Slurry wall all around the site.
- Geotextile Liner and Fabriform/Rip-Rap for shore stabilization.
- Limited action alternative (fencing, deed restrictions, monitoring).

This alternative would involve the placement of a FML cap over the entire site, groundwater collection and pretreatment for discharge to the BSA and a groundwater cutoff wall completely surrounding the Area "D" site. Complete cutoff will provide containment during the pumping and preatreatment of contaminated groundwater. The cap would decrease the infiltration of water through the site thereby reducing leachate generation. The groundwater will be collected, pretreated and discharged to the BSA for further treatment. The NAPL will be dealt with as part of the overall groundwater contamination. Additional groundwater collection drains will be installed as needed to facilitate the collection and transport of the NAPL to the perimeter groundwater collection system. These additional drains will be located in the areas of Tank park 910, Well W-8 and Well MW-4-88. The exact location and extent of these drains will be determined and properly designed at each location during the design phase. Additionally, this alternative, which incorporates on-site pretreatment, will include an oil/water separator as part of the treatment process. The use of Fabriform/ Rip-Rap for shore stabilization will reduce and control erosion of the banks and the amount of soil entering the Buffalo River. The Fabriform/Rip-Rap will extend around the entire shoreline on all sides of the site.

Excavation of all fill material outside of the cutoff wall along the shoreline (see Figure 1, Alternative 6c, typical section) will virtually eliminate the amount of contaminants from the soil entering the river. The proposed cap would consist of, from the bottom up, six inches of compacted subgrade, a 40 mil High Density Polyethylene (HDPE) or Very Low Density Polyethylene (VLDPE) membrane, and 24 inches of soil cover and six inches of top soil which would support vegetation.

The actual design of the cap that will be installed at the site will be finalized as part of the technical design. This cap design will at least be equivalent to the cap described.

The slurry wall will be keyed a minimum of three feet into the confining layer, which is 20 to 30 feet below surface. The thickness of the wall will be finalized during the design phase.

B) Evaluation of Preferred Alternative:

Overall Protection of Human Health and the Environment

The provision of a FML cap and shore stabilization would remove public health risks associated with contact, incidental ingestion and inhalation pathways. The addition of perimeter groundwater collection would also essentially eliminate further migration of contaminated groundwater from Area "D" into the Buffalo River by reversing the flow gradient through associated pumping. This would eventually assist in the reduction of human health risks associated with consumption of contaminated fish from the Buffalo River; the time frame of this reduction is dependent on the turnover of the local game fish population and the ability of fish to metabolize and/or excrete contaminants. Health impacts potentially associated with erosion loading to the River would be mitigated through the use of Fabriform/ Rip-Rap for shore stabilization, and removal of source contaminants as well as non-source fill material from outside the slurry wall containment.

This alternative would provide significant protection of the environment by preventing migration of contaminated groundwater into the Buffalo River and the erosion of soils/waste from Area "D".

Compliance with ARARs/SCGs

In this alternative, a substantially reduced volume of groundwater will be migrating into the site, thereby obviating the applicability the chemical-specific ARARs/SCGs for migrating groundwater. The collection and pretreatment of groundwater will attain BSA discharge limitations and air standards for treatment discharges to the atmosphere. The NYSDEC guidelines for eroding soils are accommodated through shoreline stabilization.

Long-Term Effectiveness and Permanence

Although not considered as a permanent remedial action, through the implementation of groundwater collection and pretreatment, capping and complete slurry wall, this alternative provides an effective means of reducing the mobility and toxicity of contaminated groundwater and soils from the Area "D" site. This alternative will remain effective provided a long-term O&M program is employed for purposes of cap maintenance and slurry wall upkeep. Likewise, the groundwater pump and treat system will require long-term maintenance. This alternative affords an effective approach to a reduction in the exposure of soil/ waste and the toxicity of aquatic organisms in the adjacent Buffalo River.

Reduction of Toxicity, Mobility or Volume

Pretreatment of groundwater prior to disposal at the BSA would reduce the toxicity of the groundwater collected. The provision of a cap, groundwater collection, a cutoff wall and shore stabilization (Fabriform/Rip-Rap) would almost totally eliminate off-site contaminant migration. Volume would be significantly reduced through the installation of a cap and complete slurry wall. The estimated groundwater flow through the collection system is 84 cfd based on groundwater flow simulation model.

Additionally, the excavation of all fills outside the cutoff wall, as described above, would immediately reduce the toxicity, mobility and volume of the waste in this area.

Short-Term Effectiveness

This alternative will not impact the community or environment during implementation and any worker exposure can be mitigated. The approximate construction period would be three years.

Implementability

This alternative is implementable and utilizes commerically available and reliable technologies. Installation of a complete slurry wall into the heterogeneous fill material may pose some difficulties.

C) **Cost of Preferred Alternative:**

The present value cost of Alternative 6c is estimated to be $9,556,000. The detailed cost analysis which includes capital cost yearly O & M cost and present value is shown in Table C-I.

D) **Monitoring:**

As a part of the long-term monitoring program at this site, water level measurements as well as analyses of groundwater samples will be used to determine if the remedial action is achieving its intended goals. Since one of the key objectives of a containment and groundwater collection option is to maintain an inward hydraulic gradient to ensure no release of contaminants, groundwater elevation become a major monitoring parameter. With this containment system, all wells outside the slurry wall would be considered hydraulically upgradient of contained contamination, while all inside wells would be considered downgradient of the contamination.

With inward gradient conditions, chemical monitoring becomes secondary to groundwater head monitoring, but is still useful for verification of containment performance. The proposed list of chemical parameters will be established during the design phase.

The remedial design will include provisions for the regular O&M of the components of the remedial action once it is in place. This will include regular inspections (and repair when necessary) of the soil cap to monitor for erosion and/or settling Fabriform/Rip-Rap, vegetative cover, fence, slurry wall and drainage system. In addition, the remedial design will include provisions for the O&M of the groundwater pumping and pretreatment system. Since the waste material will be left in place; a five-year review program will be made a part of the remedial design in accordance with Section 121(c) of the Superfund Amendments and Reauthorization Act (SARA) of 1986.

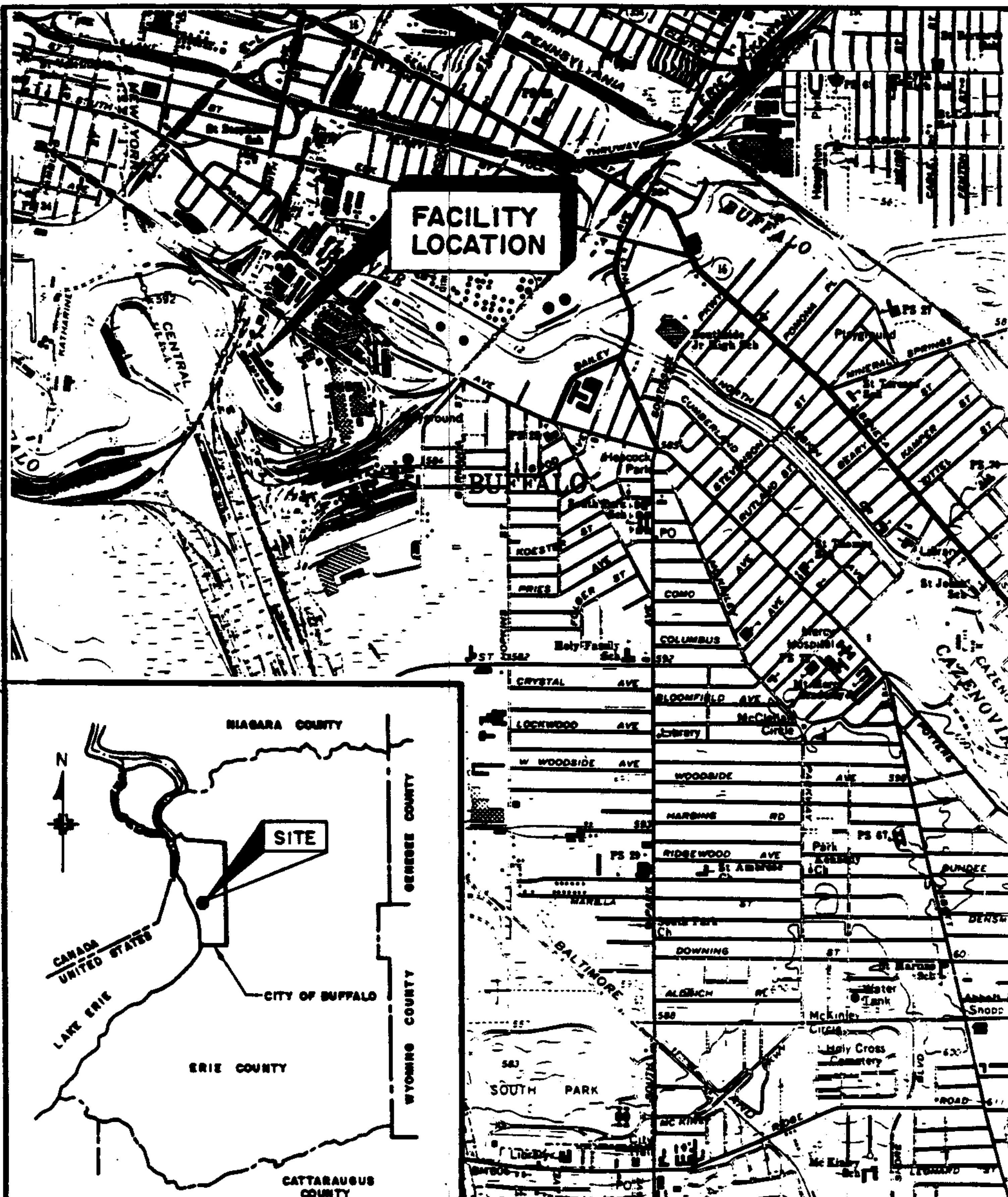
E) <u>**Permanent vs. Non-Permanent Options**</u>:

Alternatives 9 through 9e were developed based on source removal, treatment and disposal, which include bioremediation, vitrification, incineration, soil washing, stabilization/solidification and chemical remediation respectively. These alternatives although considered as permanent, could not pass the initial screening based on effectiveness, implementability and cost (see Table 4-1). Need for multiple technologies involving much uncertainty, need for treatability studies, difficulties in excavation of heterogenous materials; waste below water level; proximity to the Buffalo River; and high costs are some of the factors cited in the FS Report against treatment technologies. Based on detailed evaluation of the alternatives, Alternative 6c which includes treatment of groundwater and containment of waste, is recommended as the preferred alternative for this site. Treatment of groundwater is considered a permanent remedy. Containment of waste although not permanent will satisfy the remedial action alternatives and is cost-effective. Alternative 6c which ranked number two was preferred over Alternative 8 which ranked number one. Extremely high cost, difficulty in implementation due to excavation in heterogeneous material, and availability of disposal capacity are some of the factors against Alternative 8.

Section 8: <u>Figures</u>

Attachment No. 1

Index of Figures	Source
Site Location Map	FS, Figure 1-1
Existing Site Conditions Plan	FS, Figure 1-2
Hydrogeological Cross Section	RI, Figure 4-3
Alternative 6c, Schematic	FS, Figure 5-6a
Alternative 6c, Plan View	FS, Figure 5-6b
Alternative 6c, Typical Section	6/12/91 Letter from Allied Signal



WehranEnviroTech	**BUFFALO COLOR CORPORATION** BUFFALO ERIE COUNTY NEW YORK VICINITY MAP

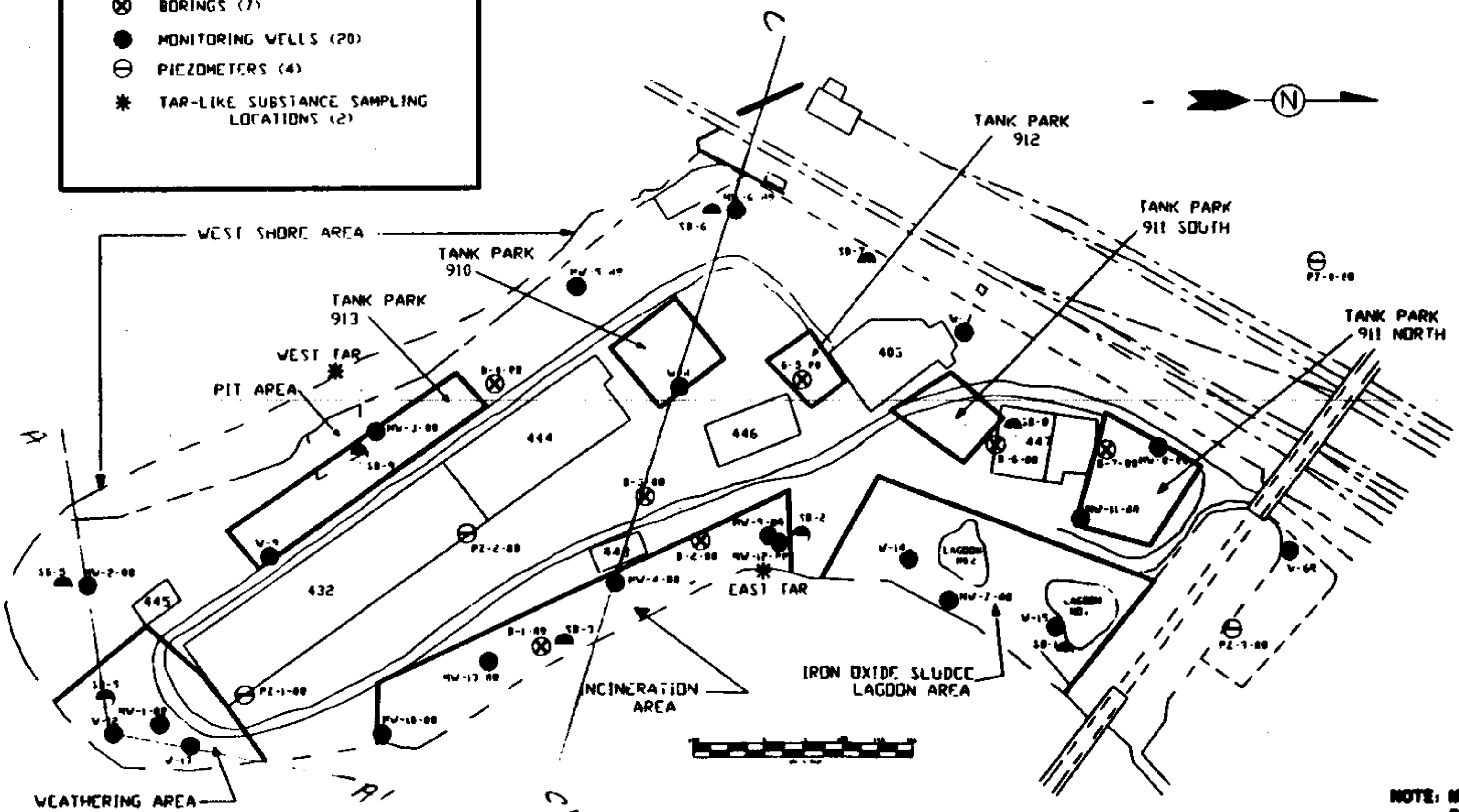
Figure: 1-1
Scale: 1" = 2000'
Date: 12/11/90
Project No: 00257

BUFFALO COLOR CORPORATION

BUFFALO, NEW YORK
AREA D – RI/FS

LEGEND

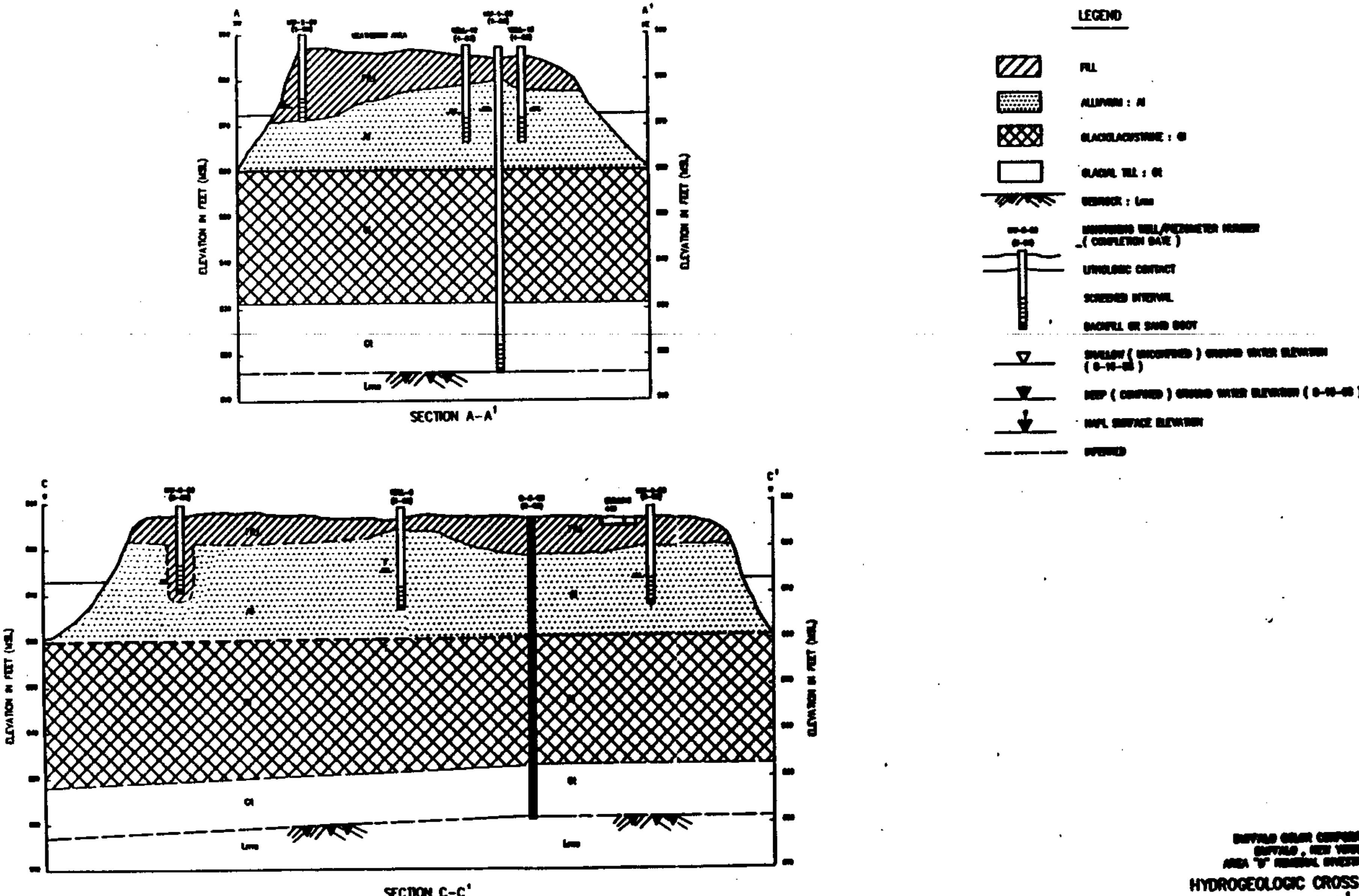
- 2' SURFICIAL SOIL BORING (9)
- BORINGS (7)
- MONITORING WELLS (20)
- PIEZOMETERS (4)
- TAR-LIKE SUBSTANCE SAMPLING LOCATIONS (2)



NOTE: MAP PREPARED BY AUTOMATED COMPLIANCE SYSTEMS, INC

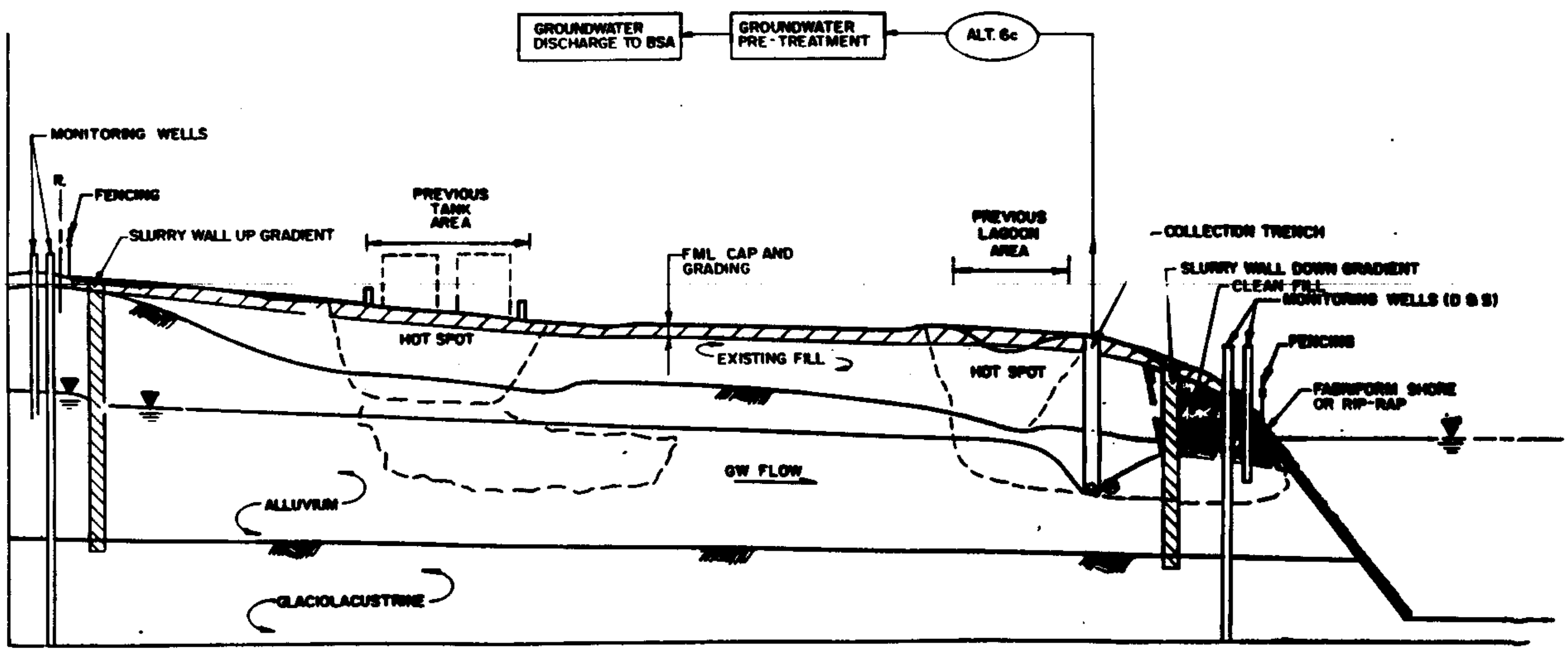
WehranEnviroTech	Drawn By: Checked By: Date:	Scale AS NOTED		BUFFALO COLOR CORPORATION BUFFALO ERIE COUNTY NEW YORK	EXISTING SITE CONDITIONS PLAN	Figure: 1-2 Project No. 002-7

FIGURE 4-3



HYDROGEOLOGIC CROSS SECTION
ALONG LINE A-A', C-C'
SCALE : HORIZ. 1"=200', VERT. 1"=20'

ALTERNATIVE 6c SCHEMATIC

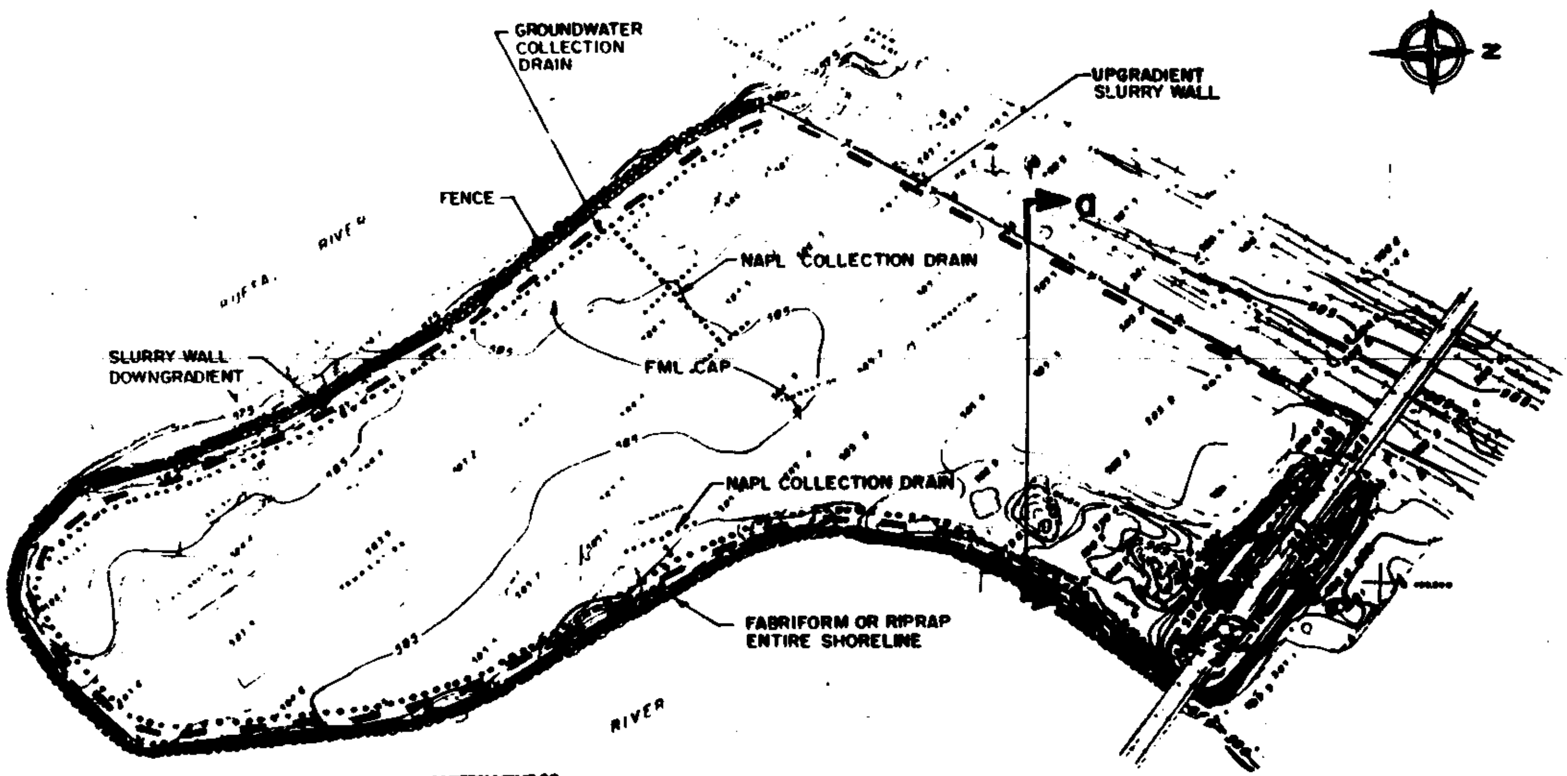


GENERALIZED SECTION a-a

APPROX. SCALE
H - 1"=100'
V - 1"=20'

REVISED 6/25/91

WoodwardEnviroTech	Drawn By: Checked By: Date: 12/10/90	Scale: AS NOTED		BUFFALO COLOR CORPORATION BUFFALO ERIE COUNTY NEW YORK	AREA D FEASIBILITY STUDY	Figure: 5-4g Project No: Q90237



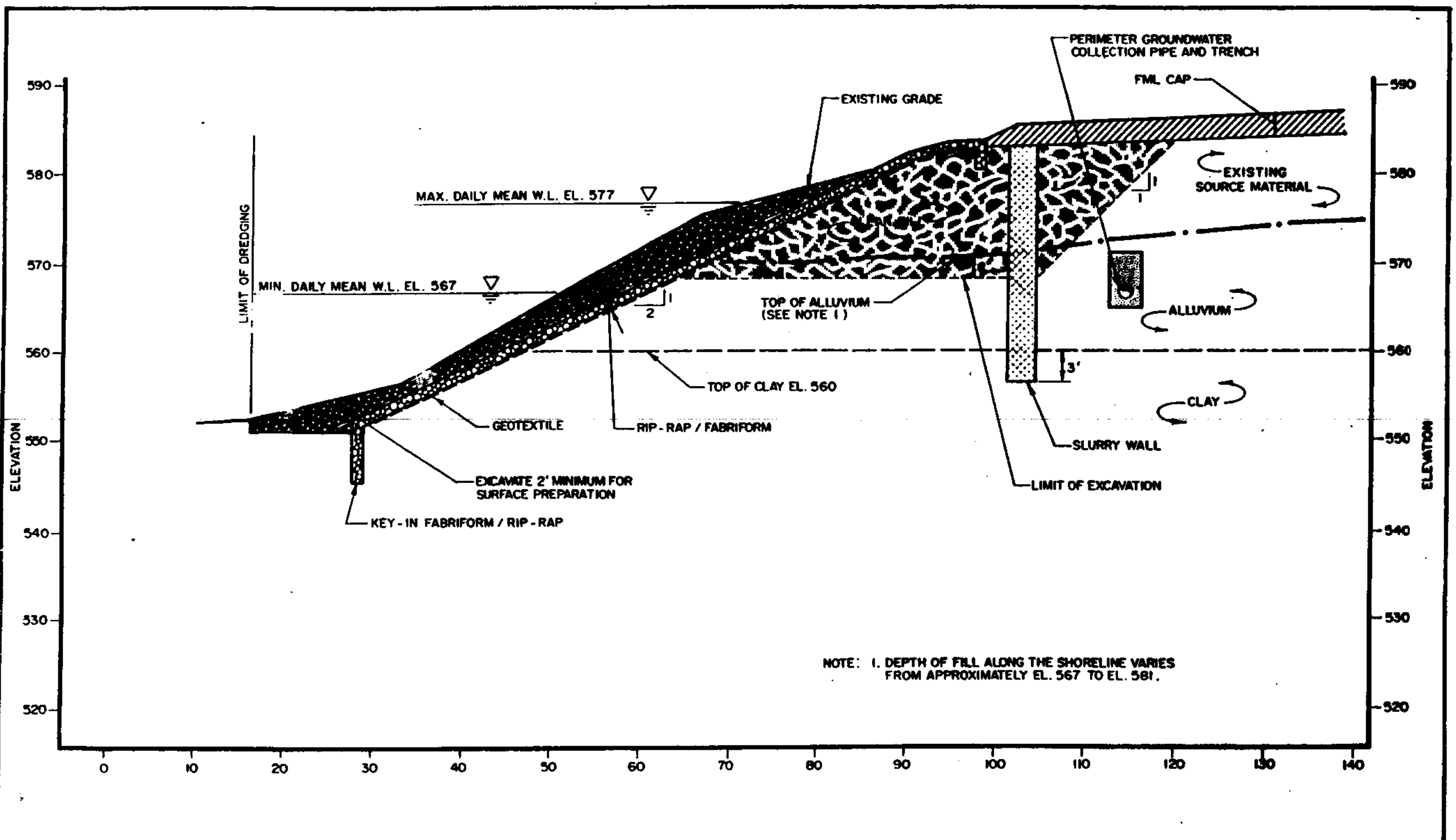
ALTERNATIVE 6C

- GW MONITORING - 30 YEARS
- DEED RESTRICTIONS
- FENCING
- FML CAP
- PERIMETER GW COLLECTION
- GW PRETREATMENT
- GW DISPOSAL TO BUFFALO SEWER AUTHORITY
- SLURRY UPGRADIENT
- SLURRY DOWNGRADIENT

- FABRIFORM OR RIPRAP SHORE STABILIZATION AROUND ENTIRE SHORELINE
- SHORELINE EXCAVATION OF FILL OUTSIDE SLURRY WALL
- NAPL COLLECTION

REVISED 6/25/91

WehranEnviroTech	Drawn By: Checked By: DAP Date: 12/18/90	Scale 1" = 150'		BUFFALO COLOR CORPORATION BUFFALO ERIE COUNTY NEW YORK	AREA D FEASIBILITY STUDY ALTERNATIVE 6C	Figure: 5-6b Project No. 00257



WehranEnviroTech	Drawn By: B. Schmid / Checked By: B. Mil / Date: 6/11/91	Scale: 1" = 10'		BUFFALO COLOR CORPORATION BUFFALO ERIE COUNTY NEW YORK	ALTERNATIVE 6C TYPICAL SECTION	Figure: 1 Project No. 00257

Section 8: Tables

Attachment No. 2

TABLE 6-14: FREQUENCY OF DETECTIONS IN SURFACE SOIL (0-2')

(ssfreq)

PARAMETER	NUMBER OF DETECTIONS	MINIMUM	MAXIMUM	LOCATION OF MAXIMUM	SITE AREA
SEMIVOLATILE ORGANICS (mg/kg)					
NITROBENZENE	2	0.21	580	SB-3	Incineration Area
BENZOIC ACID	1		2.8	SB-4	Weathering Area
NAPHTHALENE	1		470	SB-3	Incineration Area
2-CHLORONAPHTHALENE	1		66	SB-3	Incineration Area
ACENAPHTHYLENE	1		16	SB-4	Weathering Area
FLUORENE	2	0.50	25	SB-4	Weathering Area
PHENANTHRENE	3	4.6	270	SB-4	Weathering Area
FLUORANTHENE	2	4.8	330	SB-4	Weathering Area
PYRENE	2	3.9	310	SB-4	Weathering Area
BENZO(a)ANTHRACENE	2	1.9	180	SB-4	Weathering Area
CHRYSENE	2	2.1	180	SB-4	Weathering Area
BENZO(b)FLUORANTHENE	2	3.1	150	SB-4	Weathering Area
BENZO(k)FLUORANTHENE	1		140	SB-4	Weathering Area
BENZO(a)PYRENE	2	1.7	140	SB-4	Weathering Area
INDENO(1,2,3-cd)PYRENE	2	0.76	77	SB-4	Weathering Area
BENZO(g,h,i)PERYLENE	2	0.78	63	SB-4	Weathering Area
EOX (mg/kg) TOX)	8	11	2780	SB-3	Incineration Area
TOTAL METALS (mg/kg)					
ANTIMONY	3	8	32.2	SB-3	Incineration Area
ARSENIC	9	4.5	77.2	SB-3	Incineration Area
BERYLLIUM	6	0.58	1.3	SB-5	West Shore
CADMIUM	5	0.82	24.8	SB-3	Incineration Area
CHROMIUM	9	44.2	1990	SB-3	Incineration Area
COPPER	9	36.2	3580	SB-3	Incineration Area
IRON	9	15200	537000	SB-1	Iron Oxide Lagoons
LEAD	9	8.9	27300	SB-4	Weathering Area
MERCURY	8	0.07	6.2	SB-3	Incineration Area
NICKEL	9	14.8	363	SB-3	Incineration Area
SELENIUM	1		0.55	SB-6	West Shore
SILVER	9	0.66	4.6	SB-1	Iron Oxide Lagoons
ZINC	9	34.5	3320	SB-3	Incineration Area

	NUMBER OF DETECTIONS	MINIMUM	MAXIMUM	LOCATION OF MAXIMUM	SITE AREA
SEMIVOLATILE ORGANICS (mg/kg) ppm					
1,4-DICHLOROBENZENE	3	1.7	13	B-1-88	Incineration
1,2-DICHLOROBENZENE	4	0.91	110	B-1-88	Incineration
NITROBENZENE	5	0.21	1100	B-1-88	Incineration
1,2,4-TRICHLOROBENZENE	2	1.2	150	B-1-88	Incineration
NAPHTHALENE	7	1.9	8.2	MW-2-88	West Shore
2-CHLORONAPHTHALENE	2	0.55	140	B-1-88	Incineration
2-NITROANILINE	1		1.1	B-5-88	Tank Park 912
ACENAPHTHYLENE	3	0.41	1.7	B-5-88	Tank Park 912
ACENAPHTHENE	1		0.40	MW-9-88	Incineration
2,4-DINITROTOLUENE	2	2.6	3.4	B-5-88	Tank Park 912
FLUORENE	4	0.10	2.5	MW-2-88	West Shore
PHENANTHRENE	9	0.51	11	B-5-88	Tank Park 912
ANTHRACENE	4	1.3	4.8	MW-2-88	West Shore
DI-n-BUTYLPHTHALATE	7	0.29	0.76	MW-9-88	Incineration
FLUORANTHENE	7	0.19	14	MW-2-88	West Shore
PYRENE	8	0.14	13	MW-2-88	West Shore
BENZO(a)ANTHRACENE	4	1.1	6.7	MW-2-88	West Shore
BIS(2-ETHYLHEXYL) PHTHALATE	6	0.23	1.9	MW-8-88	Tank Park 910
CHRYSENE	5	0.35	8.2	MW-2-88	West Shore
DI-N-OCTYL PHTHALATE	1		0.07	B-5-88	Tank Park 912
BENZO(b)FLUORANTHENE	4	1.6	9.7	MW-2-88	West Shore
BENZO(a)PYRENE	7	0.09	5.5	MW-2-88	West Shore
INDENO(1,2,3-cd)PYRENE	4	0.49	2.9	MW-2-88	West Shore
DIBENZO(a,h)ANTHRACENE	3	0.43	0.83	MW-2-88	West Shore
BENZO(g,h,i)PERYLENE	4	0.48	2.6	MW-2-88	West Shore
EOX (mg/kg)	18	11	360	MW-10-88	Incineration
TOTAL METALS (mg/kg) ppm					
ANTIMONY	10	0.63	119	B-5-88	Tank Park 912
ARSENIC	34	4	2860	MW-10-88	Incineration
BERYLLIUM	11	0.7	1.3	B-4-88	West Shore
CADMIUM	12	0.7	7	B-4-88	West Shore
CHROMIUM	34	5.7	440	MW-10-88	Incineration
COPPER	34	6	14500	MW-1-88	Weathering
IRON	34	1750	360000	MW-10-88	Incineration
LEAD	34	8.4	83200	B-5-88	Tank Park 912
MERCURY	14	0.19	14	B-5-88	Tank Park 912
NICKEL	34	3.9	467	MW-7-88	Iron Oxide Lagoons
SELENIUM	14	0.99	21	MW-5-88	West Shore
SILVER	19	0.7	5.9	B-5-88	Tank Park 912
THALLIUM	6	1.4	66	MW-10-88	Incineration
ZINC	34	12	1160	MW-10-88	Incineration

(1) Total Number of Samples: 35	NUMBER OF DETECTIONS	CONCENTRATION MINIMUM	CONCENTRATION MAXIMUM	LOCATION OF MAXIMUM	SITE AREA
SEMIVOLATILE ORGANICS (ug/l)					
PHENOL	3	8	77	MW-3-88	Tank Park 913
2-CHLOROPHENOL	8	0.8	1800	MW-4-88	Incineration
1,3-DICHLOROBENZENE	4	0.7	49	MW-4-88	Incineration
1,4-DICHLOROBENZENE	11	1	4900	MW-4-88	Incineration
1,2-DICHLOROBENZENE	11	2	21000	MW-4-88	Incineration
2-METHYLPHENOL	4	4	47	MW-4-88	Incineration
N-NITROSO-DI-n-PROPYLAMINE	1		24	MW-2-88	West Shore
NITROBENZENE	5	5	15	W-13	Weathering
2,4-DIMETHYLPHENOL	6	4	130	MW-4-88	Incineration
BENZOIC ACID	1		18	MW-3-88	Tank Park 913
BIS(2-CHLOROETHYL)OXYMETHANE	1		20	MW-2-88	West Shore
1,2,4-TRICHLOROBENZENE	4	8	1200	W-15	Iron Oxide Lagoons
NAPHTHALENE	13	0.3	4900	MW-13-88	Incineration
4-CHLOROANILINE	6	8	11000	MW-13-88	Incineration
4-CHLORO-3-METHYLPHENOL	2	4	7	MW-3-88	Tank Park 913
2-METHYLNAPHTHALENE	3	5	16	MW-11-88	Tank Park 911N
2-NITROANILINE	1		4	W-13	Weathering
ACENAPHTHYLENE	1		15	W-6R	Main Plant
ACENAPHTHENE	4	1	26	W-15	Iron Oxide Lagoons
DIBENZOFURAN	2	9	13	W-15	Iron Oxide Lagoons
2,4-DINITROTOLUENE (2)	1		2000	W-13	Weathering
2,6-DINITROTOLUENE	2	1500	1700	W-13	Weathering
DIETHYL PHTHALATE	1		4	MW-4-88	Incineration
FLUORENE	6	2	24	W-15	Iron Oxide Lagoons
N-NITROSODIPHENYLAMINE	5	2	15	MW-2-88	West Shore
PENTACHLOROPHENOL	1		2	MW-4-88	Incineration
PHENANTHRENE	6	3	63	W-15	Iron Oxide Lagoons
ANTHRACENE	5	0.9	14	W-15	Iron Oxide Lagoons
DI-n-BUTYLPHTHALATE	5	0.2	1	MW-12-88	Incineration
FLUORANTHENE	6	1	54	W-8	Tank Park 910
PYRENE	6	4	24	W-15	Iron Oxide Lagoons
BENZO(a)ANTHRACENE	4	1	12	W-15	Iron Oxide Lagoons
BIS(2-ETHYLHEXYL)PHTHALATE	18	2	52	W-12	Weathering
CHRYSENE	4	0.9	11	W-15	Iron Oxide Lagoons
BENZO(b)FLUORANTHENE	1		0.3	W-8	Tank Park 910
BENZO(k)FLUORANTHENE	1		0.6	W-8	Tank Park 910
BENZO(a)PYRENE	2	0.6	7	W-15	Iron Oxide Lagoons
BENZIDINE	2	90	360	W-15	Iron Oxide Lagoons
1-NAPHTHYLAMINE	14	6	42000	W-15	Iron Oxide Lagoons
ANILINE (3)	5	5	660	W-15	Iron Oxide Lagoons

(1) Total Number of Samples: 35	NUMBER OF DETECTIONS	CONCENTRATION MINIMUM	MAXIMUM	LOCATION OF MAXIMUM	SITE AREA
VOLATILE ORGANICS (ug/l)					
VINYL CHLORIDE	1		6	MW-8-88	Tank Park 911N
CARBON DISULFIDE (2)	3	1	43	W-8	Tank Park 910
1,1-DICHLOROETHENE	11	1	8	MW-9-88	Incineration
1,2-DICHLOROETHENE(TOT)	16	1	19	MW-9-88	Incineration
CHLOROFORM	3	0.7	24	MW-9-88	Incineration
2-BUTANONE	1		260	MW-13-88	Incineration
BROMODICHLOROMETHANE	4	1	7	MW-9-88	Incineration
TRICHLOROETHENE	2	1	3	MW-13-88	Incineration
BENZENE	28	0.1	28000	MW-3-88	Tank Park 913
4-METHYL-2-PENTANONE (2)	2	3	24	MW-13-88	Incineration
TOLUENE	25	0.09	4700	MW-13-88	Incineration
CHLOROBENZENE	25	0.6	48000	MW-11-88	Tank Park 911N
ETHYLBENZENE	13	0.2	43000	MW-4-88	Incineration
XYLENE (TOTAL)	21	1	1700	MW-4-88	Incineration
TOTAL METALS (ug/l)					
ALUMINUM (3)	16	1200	67000	W-13	Weathering
ANTIMONY	12	5	124	W-14	Iron Oxide Lagoons
ARSENIC	30	5.7	1820	W-14	Iron Oxide Lagoons
BARIUM (3)	14	30	1020	W-14	Iron Oxide Lagoons
BERYLLIUM	2	6	7	W-13	Weathering
CADMIUM	21	5	127	W-14	Iron Oxide Lagoons
CHROMIUM	30	13	2140	MW-2-88	West Shore
COPPER	33	15	78700	W-13	Weathering
IRON	35	3940	405000	W-14	Iron Oxide Lagoons
LEAD	28	5	3030	W-14	Iron Oxide Lagoons
MAGNESIUM (3)	16	8900	59700	MW-9-88	Incineration
MANGANESE (3)	16	214	21300	MW-9-88	Incineration
MERCURY	12	0.29	50	MW-2/W-12	W. Shore/Weathering
NICKEL	23	30	830	W-13	Weathering
SELENIUM	1		10	W-6R	Main Plant
SILVER	9	5	13	MW-13-88	Incineration
THALLIUM	5	15	94	W-9	Tank Park 913
ZINC	35	23	9950	MW-2-88	West Shore
CYANIDE (ug/l)	11	12	56	W-9	Tank Park 913
HEXAVALENT CHROMIUM (ug/l)	20	6	13	W-12	Weathering
TOC (mg/l)	35	19	2350	MW-13-88	Incineration
TOX (ug/l)	35	15	27200	MW-4-88	Incineration

NOTE: (1) The analysis of NAPL-8 and the aquitard wells (MW-1-88 and MW-7-88) are not included in this table.

(2) 2,4-dinitrotoluene, 4-methyl-2-pentanone and carbon disulfide analyzed in first sample round only (19 samples)

(3) Aniline, Al, Ba, Mg and Mn analyzed in second sample round only (16 samples)

BUFFALO COLOR

TABLE 6-17: FREQUENCY OF DETECTIONS IN STREAM SEDIMENTS

(sedsum2)

	NUMBER OF DETECTIONS	CONCENTRATION MINIMUM	CONCENTRATION MAXIMUM	LOCATION OF MAXIMUM
SEMIVOLATILE ORGANICS (mg/kg)				
1,2-DICHLOROBENZENE	1		1.2	SED-4
NITROBENZENE	1		0.60	SED-5
NAPHTHALENE	3	0.42	0.88	SED-8
ACENAPHTHENE	1		0.24	SED-8
PHENANTHRENE	4	0.79	0.94	SED-5
ANTHRACENE	1		0.61	SED-8
FLUORANTHENE	4	0.81	1.7	SED-8
PYRENE	4	0.54	1.2	SED-8
BENZO(a)ANTHRACENE	3	0.39	0.74	SED-8
CHRYSENE	4	0.26	0.58	SED-8
BENZO(b)FLUORANTHENE	2	0.54	0.59	SED-5
BENZO(a)PYRENE	2	0.31	0.32	SED-5
INDENO(1,2,3-cd)PYRENE	1		0.24	SED-5
BENZO(g,h,i)PERYLENE	1		0.25	SED-5
EOX (mg/kg) (tox)	7	0.02	0.06	SED-6
TOTAL METALS (mg/kg)				
ANTIMONY	5	0.003	0.04	SED-5
ARSENIC	8	0.01	0.14	SED-6
BERYLLIUM	3	0.001	0.001	SED-5
CADMIUM	7	0.001	0.006	SED-6
CHROMIUM	8	0.04	0.95	SED-8
COPPER	8	0.03	5.1	SED-6
IRON	8	24	39	SED-6
LEAD	8	0.05	0.50	SED-6
MERCURY	1		0.005	SED-8
NICKEL	8	0.03	0.1	SED-5
THALLIUM	8	0.002	0.004	SED-6
ZINC	8	0.12	1.1	SED-6

TABLE 7-1

BUFFALO COLOR CORPORATION
AREA "D"

CONTAMINANT LOADINGS TO BUFFALO RIVER VIA GROUND WATER PATHWAY

CONTAMINANT GROUP	NO. OF SAMPLES(1)	AVERAGE CONCENTRATION	LOAD(2) TO RIVER (lbs/day)
Total Volatile Organic Compounds (VOCs) (excluding acetone & methylene chloride)	24	5,758 ug/l	1.2
Poly-Aromatic Hydrocarbons (PAHs) & Phthalates	24	280 ug/l	0.1
~~Other Semi-Volatile Organic Compounds (SVOCs)~~	~~24~~	~~15,982 ug/l~~	~~3.4~~
Total SVOCs	24	16,262 ug/l	3.4
Total Metals (excluding iron)	24	9,417 ug/l	2.0
Total Iron	24	82,285 ug/l	17.4
Total Organic Carbon (TOC)	24	210 mg/l	44.5
Total Organic Halogens (TOX)	24	3,352 ug/l	0.7

NOTES:

(1) Sum of two sample events for 11 monitoring wells (MW-2-88, MW-3-88, MW-4-88, MW-5-88, MW-6-88, MW-9-88, MW-10-88, Well 12, Well 35, Well 14, Well 15, and one sample event for two wells (MW-12-88 and MW-13-88) and one sample event for two wells (MW-12-88 and MW-13-88).

(2) Sample calculation for Total VOCs: 5758 ug/l x 10^{-6}gm/ug x 2.205 x 10^{-3} lbs/gm x 3387 cf/day = 1.2 lb/day.

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MALCOLM PIRNIE

TABLE 7-3

BUFFALO COLOR CORPORATION
AREA "D"

CONTAMINANT LOADINGS TO BUFFALO RIVER
VIA MECHANICAL EROSION PATHWAY

CONTAMINANT GROUP(1)	LOAD TO RIVER(2) lb/day
Poly-Aromatic Hydrocarbons (PAHs & Phthalates	0.029
Other Semi-Volatile Organic Compounds (SVOCs)	0.015
Total SVOCs	0.044
Total Metals (excluding iron)	6.2
Total Iron	270
Total Organic Halogens	0.20

NOTES:

(1) Soil/Fill samples were not analyzed for Volatile Organic Compounds (VOCs) or Total Organic Carbon (TOC).

(2) The samples used for the loading calculation and the calculation methodology is presented in Appendix E.2.

Table 2-1

BUFFALO COLOR CORPORATION
AREA "D" FEASIBILITY STUDY
Potential Groundwater and Surface Water ARARS/SCGS
(Revised 8/91)

Compound	Maximum Groundwater Concentration (ug/l)	Maximum Surface Water Concentration (ug/l)	Chemical-Specific ARARs/SCGs						
			Groundwater (ug/l in water) (1)	Drinking Water (ug/l in water) (2)	Drinking Water (ug/l in water) (3)	Surface Water (ug/l in water) (4b)	Surface Water (ug/l in water) (5)	Surface Water (ug/l in water) (6a)	Surface Water (ug/l in water) (6b)
Aluminum	67,000	1,140	NA	-	-	100	-	-	-
Antimony	124	ND	NA	-	-	-	-	-	45,000
Arsenic	1,820	ND	25	25	50	190	360	-	0.018
Barium	1,020	76	1,000	1,000	1,000	-	-	-	-
Beryllium	7	ND	NA	-	-	11**	-	5.3	0.12
Cadmium	127	ND	10	10	10	-	5.9*	1.1	-
Chromium	2,140	28	50	50	50	-	2,340*	170,000	3,433,000
Copper	78,700	ND	200	200	-	-	25*	12	-
Iron	405,000	2,170	300	300	-	300	300	-	-
Lead	3,030	13	25	25	50	-	131*	3.2	-
Magnesium	59,700	12,800	-	-	-	-	-	-	-
Manganese	21,300	212	300	300	-	-	-	-	-
Mercury	50	ND	2	2	2	0.2	0.2	0.012	0.15
Nickel	830	ND	NA	-	-	-	2433*	160	100
Selenium	10	ND	10	10	10	1.0	-	35	10
Silver	13	ND	50	50	50	0.1	7.6*	0.12	50
Thallium	94	10	NA	-	-	8	20	40	48
Zinc	9,950	138	300	300	-	30	435*	110	-
Cyanide	56	19	100	100	-	5.2	22	5.2	-
Acenaphthene	26	ND	-	50	-	-	20	500	-
Acetone	15,000	22,000	-	50	-	-	-	-	-
Aniline	660	ND	-	5	-	-	-	-	-
Anthracene	14	ND	-	50	-	-	-	-	-
Benzene	28,000	ND	ND	5	5	-	6	5,300	40
Benzidine	360	ND	-	5	-	0.1	0.1	2,500	0.53

(1) 6NYCRR 703.5 (a) (3) Groundwater Standards for Class GA Waters.
(2) 10 NYCRR Subpart 5-1 Standards for Drinking Water Supplies.
(3) 40 CFR 141.11 Standards for Public Drinking Water Systems.
(4b) 6NYCRR 701.19 Fresh Surface Water Standards (Class C)
(5) NYSDEC TOGS 1.1.1 (9/25/90) Ambient Water Quality Standards and Guidelines.
(6a) Clean Water Act 303-304 Water Quality Criteria (Aquatic Life).
(6b) Clean Water Act 303-304 Water Quality Criteria (Fish Consumption).

NA - Not Analyzed
ND - Not Detected
* - Based on Buffalo River hardness of 144mg/liter.
** - When hardness is less than or equal to 75ppm;
1,100 ug/l when hardness is greater than 75ppm

Note: 10 NYCRR Part 170 - Sources of Water Supply Standards are included in the values presented in column #5.

Table 2-1

BUFFALO COLOR CORPORATION
AREA "D" FEASIBILITY STUDY
Potential Groundwater and Surface Water ARARS/SCGS
(Revised 8/91)

Compound	Maximum Groundwater Concentration (ug/l)	Maximum Surface Water Concentration (ug/l)	Chemical-Specific ARARs/SCGs						
			Groundwater (ug/l in water) (1)	Drinking Water (ug/l in water) (2)	Drinking Water (ug/l in water) (3)	Surface Water (ug/l in water) (4b)	Surface Water (ug/l in water) (5)	Surface Water (ug/l in water) (6a)	Surface Water (ug/l in water) (6b)
Benzo(a)anthracene	12	ND	-	50	-	-	-	-	-
Benzo(b)fluoranthene	0.3	ND	-	50	-	-	-	-	-
Benzo(k)fluoranthene	0.6	ND	-	50	-	-	-	-	-
Benzo(a)pyrene	7	ND	ND	50	-	-	0.0012	-	-
Benzoic Acid	18	ND	-	50	-	-	-	-	-
Bis(2-chloroethoxyl)methan	20	ND	-	5	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	52	12	-	50	-	0.6	-	-	-
Bromodichloromethane	7	ND	-	100	100	-	-	-	-
2-Butanone	260	ND	-	50	-	-	-	-	-
Carbon disulfide	43	ND	-	50	-	-	-	-	-
4-Chloroaniline	11,000	ND	-	50	-	-	-	-	-
Chlorobenzene	48,000	ND	-	5	-	5	50	50	-
Chloroform	24	ND	100	50	-	-	-	1,200	18
4-Chloro-3-methylphenol	7	ND	-	50	-	-	-	-	-
2-Chlorophenol	1,800	ND	-	50	-	-	-	2,000	-
Chrysene	11	ND	-	50	-	-	-	-	-
Dibenzofuran	13	ND	-	50	-	-	-	-	-
Di-n-butylphthalate	1	ND	770	50	-	-	-	-	-
1,2-Dichlorobenzene	21,000	ND	4.7	5	-	5	50	760	2.6
1,3-Dichlorobenzene	49	ND	-	5	-	5	50	760	2.6
1,4-Dichlorobenzene	4,900	ND	-	5	75	5	50	760	2.6
1,1-Dichloroethene	8	2	-	5	-	-	-	11,000	-
1,2-Dichloroethene	19	5	-	5	-	-	-	11,000	1.9
Diethylphthalate	4	ND	-	50	-	-	-	-	1,800
2,4-Dimethylphenol	130	ND	-	50	-	-	-	2,100	-

(1) 6NYCRR 703.5 (a) (3) Groundwater Standards for Class GA Waters.
(2) 10 NYCRR Subpart 5-1 Standards for Drinking Water Supplies.
(3) 40 CFR 141.11 Standards for Public Drinking Water Systems.
(4b) 6NYCRR 701.19 Fresh Surface Water Standards (Class C)
(5) NYSDEC TOGS 1.1.1 (9/25/90) Ambient Water Quality Standards and Guidelines.
(6a) Clean Water Act 303-304 Water Quality Criteria (Aquatic Life).
(6b) Clean Water Act 303-304 Water Quality Criteria (Fish Consumption).

NA - Not Analyzed
ND - Not Detected
* - Based on Buffalo River hardness of 144mg/liter.
** - When hardness is less than or equal to 75ppm;

' 1,100 ug/l when hardness is greater than 75ppm

Note: 10 NYCRR Part 170 - Sources of Water Supply Standards are included in the values presented in column #5.

Table 2-1

BUFFALO COLOR CORPORATION
AREA "D" FEASIBILITY STUDY
Potential Groundwater and Surface Water ARARS/SCGS
(Revised 8/91)

Compound	Maximum Groundwater Concentration (ug/l)	Maximum Surface Water Concentration (ug/l)	Chemical-Specific ARARs/SCGs Groundwater (ug/l in water) (1)	Drinking Water (ug/l in water) (2)	Drinking Water (ug/l in water) (3)	Surface Water (ug/l in water) (4b)	Surface Water (ug/l in water) (5)	Surface Water (ug/l in water) (6a)	Surface Water (ug/l in water) (6b)
2,4-Dinitrotoluene	2,000	ND	-	5	-	-	-	-	-
2,6-Dinitrotoluene	1,700	ND	5	5	-	-	-	-	-
Ethylbenzene	43,000	ND	5	5	-	-	-	32,000	3,300
Fluoranthene	54	ND	-	50	-	-	-	3,900	54
Fluorene	24	ND	-	50	-	-	-	-	-
Methylene chloride	15,000	ND	5	5	-	-	-	-	-
2-Methylnaphthalene	16	ND	-	50	-	-	-	-	-
4-Methyl-2-pentanone	24	ND	-	50	-	-	-	-	-
2-Methylphenol	47	ND	-	50	-	-	-	-	-
1-Naphthylamine	42,000	ND	-	50	-	-	-	-	-
Naphthalene	4,900	ND	-	50	-	-	-	-	-
2-Nitroaniline	4	ND	-	50	-	-	-	-	-
Nitrobenzene	15	ND	5	5	-	-	-	27,000	-
N-Nitrosodiphenylamine	15	ND	-	50	-	-	-	-	16
N-Nitrosodipropylamine	24	ND	-	50	-	-	-	-	-
PAH Phenanthrene	63	ND	-	50	-	-	-	-	-
Pentachlorophenol	2	ND	21	50	-	-	1.0	13	-
Phenanthrene	63	ND	-	50	-	-	-	-	-
Phenol,Total chlorinated	77	ND	1.0	50	-	-	1.0	2,500	-
Pyrene	24	ND	-	50	-	-	-	-	-
Toluene	4,700	ND	-	5	-	-	-	17,000	420,000
1,2,4-Trichlorobenzene	1,200	ND	-	5	-	-	50/5	-	-
Trichloroethene	3	ND	5	5	5	-	11	2,100	81
Vinyl chloride	6	ND	2	2	2	-	-	-	530
Xylenes (total)	1,700	6	5	5	5	-	-	-	-

(1) 6NYCRR 703.5 (a) (3) Groundwater Standards for Class GA Waters.
(2) 10 NYCRR Subpart 5-1 Standards for Drinking Water Supplies.
(3) 40 CFR 141.11 Standards for Public Drinking Water Systems.
(4b) 6NYCRR 701.19 Fresh Surface Water Standards (Class C)
(5) NYSDEC TOGS 1.1.1 (9/25/90) Ambient Water Quality Standards and Guidelines.
(6a) Clean Water Act 303-304 Water Quality Criteria (Aquatic Life).
(6b) Clean Water Act 303-304 Water Quality Criteria (Fish Consumption).

NA - Not Analyzed
ND - Not Detected
* - Based on Buffalo River hardness of 144mg/liter.
** - When hardness is less than or equal to 75ppm;
' 1,100 ug/l when hardness is greater than 75ppm

Note: 10 NYCRR Part 170 - Sources of Water Supply Standards are included in the values presented in column #5.

Table 3-1

BUFFALO COLOR CORPORATION

Area "D" Feasibility Study

Screening of Process Options and Technology Types

General Response Action	Technology Type	Process Option	Retention for Detailed Screening
Containment	Capping	Synthetic membrane	Yes
		Single Layer	No
		Multi-Media	Yes
	Barriers	Slurry Walls	Yes
		Vitrified Wall Barrier	No
		Sheet Piles	Yes
		Grout Curtains	No
		Bottom Sealing (Grouting)	No
		Fabriform	Yes
		Rip Rap	Yes
	Backfilling	N/A	Yes
Removal of Soil/Wastes	Complete Removal	Excavation	Yes
	Partial Removal	Excavation	Yes
Treatment - Soil/Waste	Biological	In situ Bio-remediation	No
	Physical/Chemical	In situ stabilization/solidification	No
		On-site stabilization/solidification	No
		In situ Soil Washing	No
		On-site Soil Washing	Yes
		Soil Vacuum Extraction	No
		On-site Composting	No
		On-site Slurry Bioreactor	Yes
		On-site Leach Bed	Yes
		In situ Vitrification	No
		On-site Vitrification	Yes
		On-site Rotary Kiln	Yes
		On-site Fluidized Bed	No
		In situ Chemical Treatment	No
Disposal - Soil/Waste	Containment	On-site Recra vault	No
		Off-site TSD facility	Yes

* If not a RCRA hazardous waste.

** If RCRA hazardous waste.

Table 3-1

BUFFALO COLOR CORPORATION

Area "D" Feasibility Study

Screening of Process Options and Technology Types

General Response Action	Technology Type	Process Option	Retention for Detailed Screening
Groundwater Collection	Pumping	Well point dewatering system Ejector Wells Pumping Wells	No No Yes
	Subsurface Drains	Perimeter Drains Horizontal Drains	Yes Yes
Diversion/Collection of Run-on and Run-off	Grading Surface Water Controls	N/A Dikes and Berms Channels, ditches, trenches Terraces and Benches	Yes Yes Yes No
Treatment - Groundwater	Biological	Suspended growth (activated sludge, SBR) Fixed-film growth (fluidized bed, trickling filter, RBC)	Yes Yes
Treatment - Groundwater	Physical/Chemical	Chemical precipitation (incl.- coagulation, flocculation) Neutralization Chemical Oxidation Granular Activated Carbon Adsorption Steam Stripping Air Stripping Filtration (pretreatment or polishing) Chlorination	Yes Yes No Yes No Yes Yes Yes
	Bio/physical	Powder Activated Carbon Treatment Fluidized Carbon Bed	No No
	Thermal	Incineration	No

* If not a RCRA hazardous waste.

** If RCRA hazardous waste.

Table 3-1

BUFFALO COLOR CORPORATION

Area "D" Feasibility Study

Screening of Process Options and Technology Types

General Response Action	Technology Type	Process Option	Retention for Detailed Screening
Disposal - Groundwater	Off-site	Local POTW (BSA)	Yes
		Off-site TSDF	Yes
	On-site	Discharge to Buffalo River after treatment	Yes
		Reinjection (recharge of treated groundwater)	No
		Reuse on site (feed water for soil/ sludge treatments)	Yes
Disposal - Soil/Waste	Off-site	Landfill	Yes*
		TSDF after treatment	Yes**
	On-site	RCRA Vault after treatment	Yes**
		Landfill	Yes*

* If not a RCRA hazardous waste.

** If RCRA hazardous waste.

Table 4-1
BUFFALO COLOR CORPORATION
Area "D" Feasibility Study
Alternative Development and Screening Summary

ALTERNATIVE	EFFECTIVE	IMPLEMENTABLE	PRELIMINARY PRESENT VALUE COSTS ($000)	CARRY THROUGH DETAILED ANALYSIS
Alternative No. 1 - No Action w/Monitoring - Monitoring Well Program	No	Yes	1,470	Yes
Alternative No. 2 - Limited Action - Monitoring Well Program - Well 8 Pumping (NAPL) - Future Land and GW Use Deed Restrictions - Fencing	Yes for human health, ARARs not met	Yes	1,708	No
Alternative No. 3 - Containment - FML Landfill Cap - Shore Stabilization with Sheetpile - Monitoring Well Program - Well 8 Pumping (NAPL) - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for human health, ARARs potentially met	Yes	6,561	Yes
Alternative No. 3a - Containment - FML Landfill Cap - Shore Stabilization with 'Fabriform®'/Rip-Rap - Monitoring Well Program - Well 8 Pumping (NAPL) - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for human health, ARARs potentially met	Yes	4,825	Yes
Alternative No. 4 - Containment w/GW Treatment - FML Landfill Cap - GW Collection, Pre-treatment, and Disosal to BSA - Fabriform®/Rip-Rap for Shore Stabilization - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, BSA discharge limitations met; ARARs potentially met	Yes	15,404	Yes
Alternative No. 4a - Containment w/GW Treatment - Soil Cover and Grading - GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpile - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, BSA discharge limitations met; ARARs potentially met	Yes	17,668	No
Alternative No. 5 - Containment w/GW Treatment - Multi-Media cap - GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with 'Fabriform®'/Rip-Rap - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, BSA discharge limitations met; ARARs potentially met	Yes	17,598	Yes

* The preliminary cost shown is representative of the cost prior to Alternative 6c revisions shown based on NYSDEC comments. The costs presented in Table 5-3 and Appendix I account for these revisions.

ALTERNATIVE	EFFECTIVE	IMPLEMENTABLE	PRELIMINARY PRESENT VALUE COSTS ($000)	CARRY THROUGH DETAILED ANALYSIS
Alternative No. 6 - Containment w/GW Treatment to BSA - FML Landfill Cap - GW Collection, Pre-treatment, and Disosal to BSA - Fabriform®/Rip-Rap for Shore Stabilization - Slurry Wall at Downgradient - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, BSA discharge limitations met; ARARs potentially met	Yes	9,781	Yes
Alternative No. 6a - Containment w/GW Treatment for Disposal to Buffalo River - FML Landfill Cap - Fabriform®/Rip-Rap for Shore Stabilization - Slurry Wall at Downgradient - GW Treatment and Disposal to Buffalo River - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, ARARs for groundwater met	Yes	9,786	Yes
Alternative No. 6b - Containment w/GW Disposal to TSDF - FML Landfill Cap - Shore Stabilization with 'Fabriform®'/Rip-Rap - GW Collection and Disposal to TSDF - Slurry Wall at Downgradient - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, ARARs potentially met	Yes	32,186	Yes
Alternative No. 6c - Containment w/GW Treatment for Discharge to BSA - FML Landfill Cap - Fabriform®/Rip-Rap for Shore Stabilization (Entire Shoreline)* - GW Collection, Pre-treatment, and Disposal to BSA - NAPL Collection* - Slurry Wall at Upgradient - Slurry Wall at Downgradient - Fill/waste Excavation Outside Slurry Wall* - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, BSA discharge limitations met; ARARs potentially met	Yes	8,692*	Yes
Alternative No. 6d - Containment w/GW Treatment for Discharge to Buffalo River - FML Landfill Cap - Fabriform®/Rip-Rap for Shore Stabilization - GW Treatment and Disposal to Buffalo River - Slurry Wall at Upgradient - Slurry Wall at Downgradient - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, ARARs potentially met	Yes	9,386	Yes
Alternative No. 6e - Containment w/GW Disposal to TSDF - FML Landfill Cap - Shore Stabilization with 'Fabriform®'/Rip-Rap - GW Collection and Disposal to TSDF - Slurry Wall at Downgradient - Slurry Wall at Upgradient - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, ARARs potentially met	Yes	9,946	Yes

* The preliminary cost shown is representative of the cost prior to Alternative 6c revisions shown based on NYSDEC comments. The costs presented in Table 5-3 and Appendix I account for these revisions.

ALTERNATIVE	EFFECTIVE	IMPLEMENTABLE	PRELIMINARY PRESENT VALUE COSTS ($000)	CARRY THROUGH DETAILED ANALYSIS
Alternative No. 7 - Containment w/GW Treatment - FML Landfill Cap - Fabriform®/Rip-Rap for Shore Stabilization - GW Treatment and Disposal to Buffalo River - Slurry Wall at Downgradient - Slurry Wall at Upgradient - Sheetpile at South and East Sides for Shore Stabilization - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes for Human Health, ARARs potentially met	Yes	10,358	Yes
Alternative No. 8 - Containment, GW Treatment, and Soil Excavation - Fencing - Total Excavation of Waste/Fill - Waste/Fill Disposal to TSDF or On-Site - Total Backfill with New Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Yes	Difficult due to materials handling problem; heterogeneous nature of fill material at Area "D" site makes for difficult excavation	336,198	Yes
Alternative No. 9 - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-site Bioremediation - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	64,948	No
Alternative No. 9a - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-Site Vitrification - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	249,748	No
Alternative No. 9b - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-Site Incineration - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	148,948	No

* The preliminary cost shown is representative of the cost prior to Alternative 6c revisions shown based on NYSDEC comments. The costs presented in Table 5-3 and Appendix I account for these revisions.

ALTERNATIVE	EFFECTIVE	IMPLEMENTABLE	PRELIMINARY PRESENT VALUE COSTS ($000)	CARRY THROUGH DETAILED ANALYSIS
Alternative No. 9c - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-Site Soil Washing - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	61,588	No
Alternative No. 9d - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-Site Stabilization/Solidification - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	101,908	No
Alternative No. 9e - Containment, GW Treatment, and Soil Treatment - Total Excavation of Waste/Fill - On-Site Chemical Remediation - Total Backfill with Existing Soil - Total GW Collection, Pre-Treatment, and Disposal to BSA - Shore Stabilization with Sheetpiling - Monitoring Well Program - Future Land Use and GW Use Deed Restrictions - Fencing	Unknown without Treatability Study	Same as Alternative 8	81,748	No

* The preliminary cost shown is representative of the cost prior to Alternative 6c revisions shown based on NYSDEC comments. The costs presented in Table 5-3 and Appendix I account for these revisions.

Table 5-1
BUFFALO COLOR AREA "D"
FEASIBILITY STUDY
NYSDEC TAGM DETAILED ANALYSIS RANKING
SUMMARY TABLE

Analysis Factor	1	2	3	3a	4	4a	5	6	6a	6b	6c	6d	6e	7	8
1. Compliance with chemical-specific ARARs/SCGs	0	0	0	0	0	4	4	0	4	4	4	4	4	4	4
2. Compliance with action-specific ARARs/SCGs	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3
3. Compliance with location-specific ARARs/SCGs	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3
COMPLIANCE WITH ARARs AND SCGs	**0**	**0**	**3**	**3**	**6**	**10**	**10**	**6**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
1. Use of the site after remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Human health and environmental exposure after remediation	0	0	3	3	7	10	10	10	10	10	10	10	10	10	10
3. Magnitude of residual public health risks after remediation	0	0	2	2	2	2	5	5	5	5	5	5	5	5	5
4. Magnitude of residual environmental risks after remediation	0	0	0	0	3	3	3	5	5	5	5	5	5	5	5
PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	**0**	**0**	**5**	**5**	**12**	**15**	**18**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
1. Protection of community during remedial action	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2. Environmental Impacts	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3
3. Time to implement remedy	1	1	1	1	2	2	2	0	0	0	0	0	0	0	0
SHORT-TERM EFFECTIVENESS	**9**	**9**	**8**	**8**	**9**	**9**	**9**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**

Table 5-1

BUFFALO COLOR AREA "D"

FEASIBILITY STUDY

NYSDEC TAGM DETAILED ANALYSIS RANKING

SUMMARY TABLE

Analysis Factor	1	2	3	3a	4	4a	5	6	6a	6b	6c	6d	6e	7	8
1. On-site or off-site treatment or land disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2. Permanence of remedial alternative	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3. Lifetime of remedial actions	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3
4. Quantity and nature of waste or residual remaining	0	0	0	0	2	2	2	2	2	2	2	2	2	2	5
5. Adequacy and reliability of controls	0	0	0	0	2	2	2	2	2	2	2	2	2	2	4
LONG-TERM EFFECTIVENESS	**0**	**0**	**0**	**0**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**16**
1. Volume of hazardous waste reduced	3	3	2	2	4	4	6	4	4	4	4	4	4	4	10
2. Reduction in mobility of hazardous waste	0	0	0	0	2	2	2	2	2	2	2	2	2	2	0
3. Irreversibility	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5
REDUCTION OF TOXICITY, MOBILITY OR VOLUME	**3**	**3**	**2**	**2**	**11**	**11**	**13**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**15**
1. Technical feasibility	6	6	8	8	8	8	7	10	10	10	10	10	10	9	8
2. Administrative feasibility	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
3. Availability of services and materials	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
IMPLEMENTABILITY	**11**	**11**	**13**	**13**	**13**	**13**	**12**	**14**	**14**	**14**	**14**	**14**	**14**	**13**	**12**
TOTAL	**23**	**23**	**31**	**31**	**58**	**65**	**69**	**65**	**69**	**69**	**69**	**69**	**69**	**68**	**80**

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Table 5-3
BUFFALO COLOR CORPORATION
Area "D" Feasibility Study
Summary Of Detailed Cost Estimates

Alternative	Total Cost
8	$308,689,000
6b	$34,927,000
5	$16,297,000
4	$13,693,000
7	$10,713,000
6c	$9,556,000
6a	$9,432,000
6e	$8,834,000
6d	$8,813,000
6	$8,620,000
3	$7,346,000
3a	$5,195,000
1	$1,170,000

FS, APPENDIX I
TABLE C-1

ALTERNATIVE 6c
DETAILED COST ANAYSIS
BUFFALO COLOR AREA "D"

DESCRIPTION		UNITS	COST/UNIT	QUANTITY	CAPITAL COST	YEARLY O/M COST-30 YRS	PRESENT VALUE
Monitoring	Groundwater	EA/YR	$7,800	8		$62,400	$1,079,023
Administration	Deed Restriction	LS			$20,000		$20,000
	Fencing	LF	$18	3,975	$71,550		$71,550
Construction	Mobilization	LS			$100,000		$100,000
	Clearing/Grubbing	AC	$3,625	16.5	$59,813		$59,813
	Grading	CY	$4.00	15,000	$60,000		$60,000
FML Cap	Subbase	CY	$13.09	12,100	$158,389		$158,389
	40 Mil HDPE	SF	$0.40	653,400	$261,360		$261,360
	Soil Fill	CY	$12.58	48,400	$608,872		$608,872
	Top Soil	CY	$20.00	12,100	$242,000		$242,000
	Seeding/Fertilizer	AC	$1,533	15.0	$22,995		$22,995
GW Collection	Perimeter GW Collection	SF	$15.00	49,500	$742,500		$742,500
	NAPL Trenches	SF	$15.00	9,360	$140,400		$140,400
GW Treatment	GW Pre-Treatment	GPY	$0.20	229,000	$135,000	$45,800	$926,975
GW Disposal	Buffalo Sewer Authority	GPY	$0.00075	229,000		$172	$2,970
Containment	Slurry Wall - Upgradient	SF	$7.00	34,100	$238,700		$238,700
	Slurry Wall - Downgradient	SF	$7.00	77,000	$539,000		$539,000
Excavation/Fill	Soil Excavation	CY	$6.00	34,000	$204,000		$204,000
	Fill	CY	$12.58	34,000	$427,720		$427,720
Shoreline	Slope Preparation	CY	$10.00	45,000	$450,000		$450,000
	Fabriform	SF	$4.00	247,500	$990,000		$990,000
	Sediment Control Fencing	SF	$1.00	15,000	$15,000		$15,000
Engineering - 15% of Capital		LS			$823,095		$823,095
Contingency - 25% of Capital		LS			$1,371,825		$1,371,825

TOTAL	$9,556,186

PRESENT VALUE IS BASED ON 10% RETURN ON INVESTMENT AND 6% INFLATION RATE.

Section 9: Administrative Records

Attachment No. 3

Administrative Record

Consent Order No. 947T032682	Order signed between Buffalo Color and NYSDEC on April 13, 1982.
Groundwater Assessment Plant "D" Area Buffalo Color Corporation	Prepared by J.A. Gouck for Buffalo Color on June 25, 1984.
Consent Order No. B9-0014-84-01	Order signed between Buffalo Color, Allied Signal and NYSDEC on December 14, 1987.
Buffalo Color RI/FS Work Plan	Prepared by Malcolm Pirnie, Inc. for Buffalo Color February 1988 (revised April 1988).
Citizens Participation Plan	Prepared by NYSDEC June 1989.
Buffalo Color Area "D" Remedial Investigation Report	Prepared by Malcolm Pirnie for Buffalo Color Corporation and Allied Signal, April 1989, revised August 1989, amended October 30, 1989.
Buffalo River Remedial Action Plan	Prepared by NYSDEC, November 1989.
Risk Assessment for Buffalo Color Area "D"	Prepared by Wehran-New York for Allied Signal and Buffalo Color Corporation (October 1990, revised March 1991).
Project Information Sheets	Prepared by NYSDEC, March 1990, June 1991, September 1991.
Feasibility Study Report Buffalo Color Area "D"	Prepared by Wehran Envirotech for Allied Signal and Buffalo Color Corporation (December 1990, revised June 1991).
Buffalo Color Sites	RI/FS Correspondence file.
Transcript from October 8, 1991 public meeting on the PRAP.	Prepared for NYSDEC October 1991.
Review and response to substantive comments received on the PRAP.	Prepared by NYSDEC, included as a part of ROD.

Attachment No. 4

NOV 18 1991

New York State Department of Environmental Conservation
Responsiveness Summary
for
Proposed Remedial Action Plan
Buffalo Color Sites
Site Nos. 9-15-012 A&B
Buffalo, New York

A public meeting was held by the New York State Department of Environmental Conservation (NYSDEC) on October 8, 1991 at Babcock Street Boys and Girls Club to discuss the Proposed Remedial Action Plan (PRAP) for the Buffalo Color inactive hazardous waste site located on the southwestern portion of the property owned by Buffalo Color Corporation (BCC). The purpose of this letter is to summarize the meeting and provide a response to the questions posed by the public.

The Feasibility Study (FS) Report of the Buffalo Color site was prepared by Wehran-New York, Inc., consultant for BCC and Allied Signal who are Potentially Responsible Parties (PRPs) for this site. At the meeting representatives of the NYSDEC and Wehran-New York, Inc. made a presentation of the activities mentioned below:

1. Discussed the PRAP procedure, public comment period, Record of Decision (ROD) procedure, tentative schedule.

2. Provided a brief description of the site, history of the site, description of past investigations conducted at the site, brief description of the Remedial Investigation (RI) conducted during 1988-90.

3. Discussed the Health Risk Assessment of the site.

4. Discussed the various remedial alternatives evaluated for the remediation of the site.

5. Discussed the recommended remedial action alternative of the site.

No written comments on the PRAP were received during the public comment period which ended on October 31, 1991. The following is a review and further response to the comments received during the October 8, 1991 meeting:

Question: A lot of people do not know where Area "D" is located. It was stated on the information sheet that the site is located at 340 Elk Street, off South Park Avenue, which is not possible.

Answer: The Area "D" is a peninsula adjacent to the Buffalo River located in the southwestern portion of the property owned by the BCC. A map indicating the exact location of the site was mailed with the June 1991 information sheet. The 340 Elk Street address was the original address of BCC. It has been changed to 100 Lee Street with the construction of a new office building on Lee Street.

Question: Recently we had a very large attendance at a similar meeting concerning the PVS Chemical Company. At that meeting, many people did not understand technical terms. Also many people in this neighborhood did not receive notice of the meeting.

Answer: Approximately 300 information sheets were mailed to local citizens and media on our mailing list for the Buffalo Color Area "D" site. In addition there was an article in the October 5, 1991 edition of the Buffalo News about the site and the meeting. Information sheets distributed to the mailing list during March 1990, June 1991 and September 1991 described the site background and the problems at the site. We try to make meetings simple so that the general public can understand the problem and the proposed solutions, however, sometimes the use of complex chemical names and processes are unavoidable. The public is encouraged to ask questions, if anything is not clear.

Question: The following questions were raised with reference to the PRPs. Are they potential? Are they the ones that did it or aren't they? This is all the people want to know.

Answer: When the Department signs a consent order with the PRPs, the first thing in the consent order is no admission of guilt. The Department makes certain allegations that PRPs may be responsible for the disposal of hazardous wastes. The PRPs accepting no responsibility agrees to remediate the site. Unless the Department was to go to court and the PRPs were proven to be guilty of causing the contaminations, the Department considers them potentially responsible.

Question: This plan that you have (Alternative 6c), will need some maintenance through the years; that would mean a continuance of maintenance for years and years and years. We understand that Alternative 8 is very expensive, but would it not be more practical to just excavate all the soil and the groundwater just to clean it up? Considering that the River is practically surrounding it, you would think it would be a better alternative to just clean it up.

Answer: Under the proposed Alternative 6c the waste will be contained onsite and the groundwater will be extracted and treated. The $10 million estimated cost for this alternative includes the cost of containment, treatment of groundwater and operation and maintenance for a period of 30 years. The proposed remedial action will be protective of the human health and the environment. The whole remedial program will be reviewed every five years to evaluate it's effectiveness and performance.

Corrective measures will be taken if the remedial program fails to perform as designed. A five year review program will dictate the need for continuance of the O & M requirement, or implementation of a more permanent type of remedy if technically and economically feasible at the future date.

Alternative 8 would involve the total excavation and off-site disposal of waste, groundwater treatment and shore stabilization. This alternative would cost $309 million to implement. This alternative affords the highest degree of reduction of volume, mobility and toxicity by eliminating the source. However, this alternative will be most difficult to implement due to the presence of subsurface structures, dewatering close to the Buffalo River and shore stabilization. This alternative will involve excavation of approximately 480,000 cy of soil/waste and subsequent backfill with an equal amount of clean fill over a five year period. This will impose 25 to 100 truck trips per day on local roads. Dust generation and accidental release of contaminants during transportation will involve short term risk for the community. Local disposal facilities may not be available which may involve waiting for space to become available in the local Treatment, Storage and Disposal Facilities (TSDF) or look into alternate out-of-State disposal facility. In addition this remedy is also not considered permanent since contaminated material is moved from one location to another without destroying the waste. Reclaiming 19 acres of land at a cost of $309 million is not economically justifiable in the predominantly heavy industrial area.

Question: Who is going to take care of the maintenance? The companies who are responsible? Buffalo Color? We (the citizens) need to know who will maintain it. What if the companies go out of business?

Answer: The work that has been done so far has been done under an Order on Consent with Allied Signal and Buffalo Color. At this point, those companies' commitment ended with the completion of the RI/FS. We are in the process of negotiating with the companies for a new Order on Consent to do the remediation of the site, which will include the design, construction and post-construction operation and maintenance (O&M). There is no commitment from the companies as of yet. We are hopeful we can meet a speedy agreement with the companies for the design, construction, and O&M. The $10 million estimated cost of the proposed alternative includes $2 million for monitoring and groundwater treatment. If at any time during design construction or operation, the companies fail to fulfill their obligation, NYSDEC will continue the program under NYS Superfund and will initiate cost recovery from the responsible parties.

Question: Why can't the site be cleaned up dumptruck by dumptruck? What about long term? What if Buffalo Color moves out and people build houses on it? When regrading the site, what do you mean when you say there will be no significant danger to the community?

Answer: It is not practical to clean the site dumptruck by dumptruck. This will mean moving a half a million cubic yards (close to 25,000 truck loads) of waste out of site and bringing close to 25,000 truckloads of clean fill into the site. Excavation would require dewatering and management of the contaminated water from the site which would pose problems due to proximity of the Buffalo River. Railroads, wood, concrete foundation and miscellaneous construction debris would have to be excavated, segregated and decontaminated. In addition, excavation and transportation will involve short term risk to the community due to hazardous dust generation, increased traffic and accidental spill. The proposed alternative will include institutional controls which will require the site to be fenced and deed restrictions which will prohibit construction of any type of structure which can damage the integrity of the cap. The site topography is generally flat, therefore the regrading required will be minimal. Most of the regrading will be done by bringing clean fill from outside. Dust suppression measures, such as, wetting will be taken to minimize the dust generation and the air quality will be monitored constantly. Therefore, there will be no significant danger to the community during regrading under the proposed remedial action.

Question: The river's location around the site is a major concern. It is the water around it that is affecting a lot more people than just this area.

Answer: The NYSDEC in cooperation with the Buffalo River Citizens' Committee has prepared a Buffalo River Remedial Action Plan (RAP). The RAP is designed to restore and maintain the integrity of the Buffalo River by remediating the bottom sediments and the inactive hazardous waste sites. The proposed alternative for the Buffalo Color site will address the contaminated sediments around the site. A minimum of two feet of sediments will be removed from the river bank and replaced by a rip-rap/fabriform placed on a geotextile membrane. The installation of a low permeability slurry wall will vastly reduce groundwater flow. The installation of a leachate collection system within the slurry wall will reduce the hydraulic head on the interior of the wall and will result in an inward flow direction from the river to the landfill, thus preventing leachate escape. Thus, the proposed alternative will meet the goal of Buffalo River remedial action plan by eliminating the discharge of pollutants to the Buffalo River, as far as the Buffalo Color site is concerned.

Question: How long is the impermeable wall going to last? What will happen when it breaks? How long is a long time? What happens after the 30 or 50 years? What about 90 years from now? What are you going to do then? Is it going to have to be maintained through the years?

Answer: The proposed slurry wall is a soil-bentonite (SB) slurry wall. SB walls have been used for decades for groundwater control in conjunction with large dams and there is ample evidence of their success in this application. However, the ability of these walls to withstand long term permeation by many contaminants and compatability questions have been answered by laboratory permeation tests and not by long term field studies. Although we do not expect any significant effect of the site contaminants on the wall, a thorough compatability testing will be performed during the design phase. In the proposed remedial action the SB wall is installed in the clean fill and native material and therefore will not come in contact with the waste material. The leachate collection system will minimize the contact of leachate with the wall. Slurry walls require no operation and little maintenance. Maintenance of the ancillary measures such as cap and leachate collection system is important to the wall as a part of the entire remedy. Monitoring groundwater levels inside and outside the wall will ensure that design heads are not exceeded. Groundwater quality monitoring will determine the leakage and effectiveness of the entire remedial effort. If the slurry wall breaks down it would be fixed. Therefore with proper monitoring and corrective measures, a properly designed slurry wall can last for an indefinite period.

Question: Why not clean it up a little bit at a time? It takes time, but why spend 30 years maintaining something that is just a band-aid? Is this hazardous material so hazardous that it cannot be neutralized? Why can't you neutralize it right on the site? The impermeable wall would be good to hold all the chemicals to clean it up and neutralize it. Why can't you put in the chemicals to clean it up and neutralize it in there after you put the wall up? Why just put a cap on it?

Answer: Technologies which involves the injection of a specific chemical or chemicals into the subsurface in order to degrade, immobilize, or flush out the contaminants are referred to as in-situ technologies. The Feasibility Study (Section 3.0) looked into various technologies available to treat the waste in-situ. In-situ treatment entails the use of chemicals or biological agents or physical manipulations which degrade, remove, or immobilize contaminants. In-situ stabilization/solidification, in-situ soil washing, in-situ soil vacuum extraction, in-situ bioremediation, in-situ vitrification and in-situ chemical treatment were considered for initial evaluation. Due to the presence of building foundations, concrete slabs, miscellaneous construction debris, pipelines and the railroad, the effectiveness and implementability of these technologies were questionable. Therefore, in-situ waste treatment technologies were dropped for further evaluation. Under the proposed alternative, the extraction and treatment of groundwater from the containment would continue indefinitely. This would remove most of the Non-Aqueous Phase Liquid (NAPL) and some soluble contaminants from the site.

Question: How about if you do this plan (Alternative 6c) but excavate maybe half of the soil? We have a couple of hot spots shown on this map. The tank park area and the lagoon area. Are you going to do anything about those hot spots?

Answer: During remedial investigation, a lighter phase of NAPL was discovered in the trailer park Area 910, and incineration area. The Department considered these two areas to be hot spots and asked the PRPs to recover the NAPL. An attempt was made by the responsible parties to recover the NAPL as an Interim Remedial Measure (IRM), using existing wells. However, the recovery of NAPL was extremely slow. In the proposed perimeter leachate collection system, NAPL will be captured through fan shaped drainage collection system in the two known areas where NAPL exists. An oil/water separator will separate the NAPL and leachate for disposal/treatment. In addition, the iron lagoon area, the weathering area and the incineration area are labelled as hot spots on the map based on the historical use of these areas. Analytical results of the soil samples collected from other areas of the site indicates existence of waste material throughout the site. While some areas contain high levels of heavy metals others contain high levels of Polycyclic Aromatic Hydrocarbons (PAHs) and other organics. Due to the widespread nature of contaminants, it will be difficult to define what constitute hot spots and what is the extent of these hot spots.

Question: Referring to Alternative 6c schematic: In the proposed remedial alternative when you install the slurry wall, the waste/sediment outside the wall (along the river bank) will be taken out and put back on the other side of the wall. Why? If you are going to take it out, get rid of it. Neutralize it completely. Don't throw it back in. Why dump it into a larger area and make the larger area more contaminated?

Answer: Due to construction difficulties the slurry wall cannot be installed right against the water. Installing the slurry wall approximately 20 to 30 feet inward resulted in leaving some contaminated soil outside the containment system which was not acceptable to the Department. Therefore, the original proposal was revised to address this problem. The revised proposal not only addressed the contaminated soil outside the slurry wall, but the sediments on the bank of the river. This offered an additional advantage of installing the slurry wall in clean fill rather than against the waste material. The revised proposal calls for the excavation of the waste/sediments from the proposed location of the slurry wall upto the River bank, placing the excavated waste within the containment and replacing the excavated area with clean fill. The slurry wall then will be installed in the clean fill. The sediments are less contaminated as compared to the waste material. Therefore, placing the sediments in the larger area will not make the larger area more contaminated. We do not see any benefit of treating or neutralizing a small amount of less contaminated sediments as compared to the large volume of more contaminated waste left in place. Additional costs of mobilization/demobilization, transportation, stabilization and disposal cannot be economically justified without deriving any meaningful benefit.

The Department's position regarding hierarchy of remedial technologies for hazardous waste disposal sites, from most desirable to least desirable is destruction; separation/treatment; solidification/chemical fixation; control and isolation technologies; and offsite land disposal. For the Buffalo Color site any in-situ treatment technology will be ineffective and difficult to implement due to the presence of building foundations, concrete slabs and miscellaneous construction debris. Other treatment technologies, destruction, solidification or offsite disposal will require excavation of waste material. Excavation will be most difficult to implement due to the presence of the subsurface structures and location of waste material relative to the Buffalo River. The proposed remedial action (containment of waste and treatment of groundwater) although quite low on the hierarchy scale will be protective of human health and the environment, will meet the remedial action objectives, will be easily implementable and can be economically justified. With proper monitoring, maintenance and periodic review, the effectiveness and performance of the proposed action can be assured. Therefore, the Department will include Alternative 6c in the ROD.

Public concerns about post construction monitoring, operation, maintenance and corrective measures are valid. The design documents and the Order On Consent for remediation with the companies, will address these concerns.

If you have any further questions or comments, please contact:

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