O'BRIEN & GERE ENGINEERS, INC.

Transmittal

To: Mr. Jeffrey Konsella
New York State Department
of Environmental Conservation
Bureau of Western Remedial Action
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, NY 12233-7010

Date: May 23, 1997

File: 3057.032 #2

Re: Site #828005
Former Alcan Aluminum Corp.
Pittsford, New York

We are sending you:

X herewith __ under separate cover: __ drawings X descriptive literature __ letters

If material received is not as listed, please notify us at once.

Quan.	Identifying Number	Title	Action*
3		Feasibility Study Report - Former Alcan Aluminum Corp. Site #828005	Y

*Action letter code: **R**-reviewed **N**-reviewed and noted **I**-for your information
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Remarks:

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Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

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REPORT

Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

Alcan Aluminum Corporation
Cleveland, Ohio

May 1997

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ENGINEERS, INC.

3057.032

REPORT

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Site #828005
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Alcan Aluminum Corporation
Cleveland, Ohio

Thomas K. Pelis, P.E.
Vice President

May 1997

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Executive summary

The risk assessment performed as part of the RI concluded there are no unacceptable risks to human health due to site-related exposure to ground water, surface soils, or surface water/sediments. Certain constituents in ground water were detected above potential chemical-specific ARARS, however, inorganics and VOCs from the impoundment materials would not be expected to significantly contribute to the shallow or deep ground water due to chromium not being detected in the TCLP analyses of impoundment materials, certain detected VOCs being common laboratory chemicals, anomalies, the presence of constituents that are reflective of background conditions detected in upgradient ground water samples, and off-site sources potentially contributing to ground water. Therefore, the remedial action objective developed for the site is:

- Reduce the potential for exposure to constituents within the impoundment materials.

General response actions and representative process options were combined to form alternatives that address the remedial action objective. These alternatives are presented below.

Alternative 1 - No Action would not reduce the potential for exposure to constituents within the impoundment materials.

Alternative 2 - Fencing and Deed Restrictions would reduce the potential for exposure for future on-site workers to constituents within the impoundment materials, and would therefore achieve the remedial action objective.

Alternative 3 - Cover and Deed Restriction would also achieve the remedial action objective. In addition, the silty sand (1×10^{-5} cm/sec) and vegetated cover (Alternative 3a) or the asphalt cover (Alternative 3b) would reduce surface water infiltration, encourage runoff and control erosion. In addition, the asphalt cover would allow for beneficial reuse of the area as a parking lot or other compatible use. Asphalt and macadam covers have been accepted by NYSDEC at various sites (eg. Roth Brothers, Corp., Syracuse, NY and Xerox, Webster, NY) to reduce exposure to constituents and reduce surface water infiltration.

Fencing and deed restrictions are an acceptable alternative that would achieve the remedial objective for this site, however based on the previous discussions and concerns expressed by NYSDEC regarding the reduction of infiltration through the impoundment materials, and the existing owners concern for beneficial reuse of the property as a parking lot, Alternative 3b - Asphalt Cover and Deed Restrictions is the recommended alternative.

1. Introduction

1.1. Objectives and overview

A Remedial Investigation (RI) was conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) at the former Alcan Aluminum Corporation (Alcan) property (site) in Pittsford, New York. The location of the site is presented in Figure 1. The results of the RI were documented in the October, 1996 RI Report (O'Brien & Gere, 1996) which was approved by the New York State Department of Environmental Conservation (NYSDEC) in a letter dated October 10, 1996.

This document presents the Feasibility Study (FS) Report, which sets forth the formulation and evaluation of remedial alternatives for the site. The FS was conducted in accordance with the Consent Order (NYSDEC, 1990), the United States Environmental Protection Agency's (USEPA) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, Interim Final (USEPA, 1988a), the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (40 CFR Part 300; *Federal Register*, March 8, 1990), and NYSDEC's *Technical and Administrative Guidance Memorandum (TAGM) for the Selection of Remedial Actions at Inactive Hazardous Waste Sites* (NYSDEC, 1990b). This FS Report is organized into five sections. A brief overview of these sections follows.

Section 1 summarizes the information contained in the RI Report. It presents information about the site, such as its history and environmental conditions. In addition, summaries of the human health risk assessment (RA) and ecological assessments conducted as part of the RI are included in Section 1.

Section 2 presents the development of remedial alternatives. Included in this section is the presentation of remedial action objectives, general response actions, and the identification of representative process options. In the development of alternatives, remedial technologies, which address the remedial action objectives, were identified and screened, and remedial alternatives were assembled from selected representative remedial technology process options. This section presents the evaluation of these process options, the selection of representative process options and the assembly of those representative process options into remedial alternatives. Since three remedial alternatives were developed a separate alternative screening phase was not necessary to reduce the number of alternatives for purposes of detailed evaluation.

Section 3 presents the detailed analysis of remedial alternatives. In the detailed analysis of alternatives, each alternative was evaluated with respect to the following criteria:

- Overall protection of human health and the environment;
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance.

A relative comparison of the alternatives based on the above criteria is also included in this section.

Section 4 presents the conclusions and recommendations of the FS. In this section, the remedial alternative which represents the best balance of the evaluation criteria is identified. Section 5 presents a conceptual design of the recommended alternative.

Tables and Figures have been prepared to summarize information and present key information and are included in this Report.

1.2. Site background information

1.2.1. Site description

The site, identified as site #828005 on the New York State Registry of Inactive Hazardous Waste Disposal Sites (Registry), is located on Linden Avenue in Pittsford, New York. Figure 1 illustrates the location of the site with respect to nearby physical and cultural features. The site is bordered on the south by Linden Avenue and a railroad yard. Light industrial facilities are located to the west. J.C. Plastics Co. is located on the southwestern corner of the property. Steeply graded wooded lots with a tributary of Irondequoit Creek (Tributary #9) are located to the north, and the Sigismondi Landfill (Registry Site #828011) borders the site to the east. The Sigismondi Landfill consists of fill materials which extend to, and may encroach upon, the Alcan property.

The site is approximately 21 acres (1540 ft long and 600 ft wide) as illustrated in Figure 2. Three larger buildings and two smaller structures currently exist on site (Figure 2). The westernmost building is currently leased from the new owner (Associated Tool & Die Inc.) and is occupied by J.C. Plastics Co. The other two large buildings were former manufacturing buildings. One is vacant and the other is occupied by the new owner. The two small buildings that previously served as pumphouses are both vacant and have been decommissioned.

The surface of the site is generally flat, varying in elevation by less than 4 ft. The area in the northern portion of the site, at the location of the former impoundments, is slightly elevated relative to the rest of the site due to filling and grading activities associated with impoundment closure. Toward the northern edge of the property, eroding gullies create an area with ravines and increased topographic relief. No standing water is visible at the site. Precipitation drains from the site via a drainage swale along Linden Avenue and a second drainage ditch running west to east along the south end of the former impoundments. This swale continues along the east side of the site carrying water off-site to the north. This drainage swale reportedly also receives runoff from a portion of Linden Avenue. Reeds and other marshy vegetation are found along the southern boundary of the former impoundments and within the drainage swale. Based on visual observation, the saturation at this location is believed to be related to surface runoff from the parking lot immediately south of the swale and the main building's roof drainage system. Representatives on-site indicated that water from the facility roof previously drained to a cistern in this area where it was pumped to a drainage ditch just south of the former impoundments. The natural surface gradient carries it off-site from here. Formerly this same swale served as a discharge channel for the J.C. Plastics Co. parking lot.

1.2.2. Site history

The site, formerly known as Jarl Extrusions, Inc., is presently owned and occupied by Associated Tool & Die, Inc. Historical data indicate that Jarl Extrusions began operations in 1953. Information from NYSDEC and the Monroe County Department of Health (MCDOH) indicates that until 1956, wastewater generated from aluminum extrusion operations was discharged into the ravine at the north end of the site, or to a ravine formerly present to the east of the site and now occupied by Sigismondi Landfill. Materials provided by the MCDOH indicate that wastewaters generated from aluminum extrusion operations were pumped into retention impoundments after 1956. Historic aerial photographs obtained from the U.S. Department of Agriculture Soil Conservation Service (1971) and U.S. Geologic Survey (1958, 1963, 1966, 1976 and 1980) suggest that the impoundments were located in areas of natural depressions and were visible between 1963 and 1976. Periodic overflows of the surface impoundments were reported by various state and county agencies between 1956 and 1968.

Since the wastewater was directly discharged into the impoundments, the discharge of settled solids from a wastewater treatment process into the surface impoundments did not occur. Based on available documentation, no listed or characteristic hazardous wastes were discharged to the surface impoundments. Starting in 1975, wastewater was discharged to the public sewer system. In 1976, a pretreatment system was installed to treat the wastewater prior to discharging to the public sewer. Settled solids generated from this pretreatment system were disposed of off-site through local subcontractors. In 1980, the impoundments were backfilled, graded and seeded. The cistern that previously received water from the main facility roof drainage system is located approximately 75 ft northwest of the eastern pumphouse (Figure 2).

1.2.3. Site conditions

<u>Site geology</u>

The site is located within the Erie-Ontario Lowland region of the Central Plains physiographic province (Muller, 1965).

Bedrock within this region consists of Paleozoic age sedimentary rocks of a fine grained nature deposited in shallow seas or deltas during erosion of the eastern lying highlands. These rocks dip gently to the south.

The overburden sediments within the Irondequoit Valley occupy a deep bedrock channel developed prior to and during glaciation (Yager, R.M. et al, 1985). The unconsolidated sediments were deposited by glacial, glacio-fluvial, and glacio-lacustrine processes.

Bedrock was not encountered during drilling operations at the site but available information indicates that the site is located over the Penfield Dolostone near the contact with the resistant Decew Dolostones of the Lockport Formation (Fisher et. al., 1971). The depth to bedrock beneath the site is estimated at 125 feet.

Surficial deposits at the site include massive appearing silty sands. The silty sands may have been reworked by grading operations during impoundment closure in that area. Below the silty sands is laminated clayey silt with occasional fine-grained sand horizons. The clayey silt zones appear as individual clay laminae alternating with silt laminae. Below the clayey silt zone is an unsaturated fine grained sand and silt unit that occasionally contains larger outsized clasts (pebbles). Associated with the lower sampled portion of these deposits are coarse grained sands with heavy mineral crossbedding.

Site hydrogeology

Regionally, the site lies within the Irondequoit Creek drainage basin which includes a buried preglacial valley. Both surface drainage and ground water flow within the region and locally are generally to the north into Lake Ontario. This is consistent with the topography at the surface and the topography of the preglacial bedrock valley within which the aquifer is situated.

Ground water in the area is not utilized for public or private drinking water supplies (Albert, 1996 and Froham, 1996). The Village of East Rochester and the Monroe County Water Authority once operated well fields for public water supplies approximately ½ mile from the site. Each of these well fields have been dismantled and are no longer used. Municipal water in the area is purchased from the Monroe County Water Authority which blends surface water from Lake Ontario with water from Canadice and Hemlock Lakes prior to distribution. Monroe County Water Authority does not utilize ground water.

Two separate water bearing zones are present at the site: a shallow ground water zone and a deep ground water zone that is believed to extend to bedrock. The shallow zone is a perched ground water table that is not in direct hydraulic connection to the deep zone on the site. The deep ground water zone is the Irondequoit Aquifer and is separated from the shallow ground water zone by 30 to 52 feet of unsaturated fine grained sand and silt (Figure 3).

The shallow ground water zone consists of horizontally laminated clayey silt with occasional fine-grained sand horizons. The shallow ground water zone extends from approximately 6 feet below grade to 30 feet below grade (Figure 4). The presence of an unsaturated, fine-grained sand and silt unit immediately below the saturated clayey silt indicates that the shallow zone is a perched ground water zone. Saturation of the sandy silt zone located immediately above the clayey silt zone during periods of high precipitation indicates that water occasionally mounds on top of the lesser permeable materials that comprise the shallow zone. *In situ* hydraulic conductivity tests indicate that the horizontal hydraulic conductivities for the shallow ground water zone average approximately 2.7×10^{-6} cm/sec.

Based on field observation and ground water elevation data, ground water within the shallow saturated zone flows both horizontally and vertically (minimal flow). Horizontal flow rates are controlled by the horizontal hydraulic conductivity of the fine grained sand horizons, while vertical flow potentials are controlled by the hydraulic conductivity of the clayey silts. Ground water levels in shallow wells may not accurately reflect the ground water table or the ground water flow directions due to: the presence of vertical hydraulic gradients; variability in thickness, lateral extent and composition of the materials present at the well site; and anthropogenic effects.

Horizontal hydraulic gradients, as interpreted from the contoured shallow ground water elevation data, range from approximately 0.018 ft/ft during the dry season to approximately 0.039 ft/ft during the wet season.

Ground water elevation contours are presented in Figure 5. Ground water elevation data from the shallow zone indicate that ground water is mounding in the area of the former impoundments, creating a radial flow pattern. Structures on the site, including buildings and parking lots, restrict ground water recharge in certain areas (near B-10 and B-

11), creating a depressed ground water table relative to the impoundment area. Drainage systems such as the drainage swale will tend to increase recharge in certain areas (near B-2S), therefore raising ground water elevations.

The deep ground water zone is contained within the silty sand unit that forms part of the Irondequoit Aquifer. The deep ground water zone is believed to be approximately 60 ft thick, extending from approximately 65 ft below grade to bedrock.

The horizontal hydraulic conductivity of the deep ground water zone ranges from 1.4×10^{-2} cm/sec to 2.3×10^{-3} cm/sec. This range is consistent with the values presented in the literature for materials of similar composition and is about three orders of magnitude higher than hydraulic conductivity values estimated for the shallow ground water zone.

Ground water elevation measurements from the deep wells indicated that ground water is generally flowing towards the north under a hydraulic gradient of approximately 0.035 ft/ft (Figure 6). The ground water elevation measurements and gradients under high and low infiltration periods do not vary significantly, as the ground water elevations in the deep wells remained within 0.5 ft of initial measurement.

A site ground water budget examined and quantified the potential sources of inflow to the site as well as the potential sources of outflow. A site ground water budget was calculated to facilitate interpretation of the site hydrogeology. Results of the water budget data indicate inflow to the shallow ground water zone in the vicinity of the impoundments apparently occurs primarily through recharge from precipitation. Inflow to the shallow ground water zone via percolation was estimated to be approximately 8,200 gallons per day (gpd). Water discharging horizontally from the shallow ground water zone was estimated to be approximately 24 gpd. Vertical outflow from the shallow zone was estimated to be about 205 gpd. Thus, the total quantifiable volume of outflow is approximately 229 gpd.

The volume of outflow from the shallow zone as estimated by the water budget information is approximately 3 percent of the volume of inflow of water to the shallow zone. The excess inflow water probably occurs during periods of increased precipitation. The infiltrating precipitation apparently saturates some of the silty sand unit above the clayey silt and then discharges from the site through the silty sand unit. It is likely that the hydraulic conductivity of the silty sand unit is high enough to allow this volume of water to be transported through this zone.

Calculations for the deep ground water budget indicate that inflow to the deep ground water zone is predominantly from upgradient (153,775 gpd) with a potential addition from vertical percolation from the shallow ground water zone (205 gpd) for a total inflow of approximately 153,980 gpd. However, based on the surface area of the impoundments the volume of vertical ground water flow through the impoundments is significantly less than 205 gpd (75 gpd). The estimated total outflow from the deep ground water zone is approximately 153,775 gpd. Water budget results indicate that the ratio of inflow to outflow for the deep ground water zone balances. The ground water budget suggests that the typical percolation from the shallow ground water zone to the deep ground water zone comprises only 0.13% of the ground water flow in the deep zone. During periods of increased precipitation, if all of the inflow to the shallow zone (8,200 gpd) were to percolate into the deep zone, the 8,200 gpd represents about 5 percent of the ground water volume flowing under the site in the deep ground water zone. Therefore, the ground water budget suggests that constituents in the shallow ground water would not be expected to significantly contribute to the deep ground water zone quality.

1.2.4. Nature and extent of contamination

The October, 1996 RI Report (O'Brien and Gere, 1996) summarized the data collected during the RI and from previous studies conducted at the site. These data established the basis for completing the site Risk Assessments (RAs) and evaluation of remedial options for the site.

As a guideline for interpretation of inorganic parameters in soils, background concentrations and reference materials provided by NYSDEC were used. Ground water analytical results were compared with New York State Class GA water quality standards and guidance values for constituents for which a water quality standard or guidance value exists.

A list of constituents of potential concern at the site was developed during the RI based on a comparison of detected constituents with background levels and NYS Class GA water quality standards and guidance values. Consistent with USEPA methodology, detected site-related constituents were eliminated from further consideration if they did not exceed background or were detected infrequently and at low concentrations. Constituents of concern at the site are presented in the following paragraphs.

Impoundment Boring Samples
Nine Volatile Organic Compounds (VOCs) were detected at concentrations less than 0.85 ppm in the impoundment materials. One semivolatile organic compound was detected in the impoundment materials samples at a concentration less than 0.5 ppm. No pesticides or PCBs were detected in the samples.

The predominant chemical constituents found within the samples collected from the impoundment borings were inorganic parameters. A comparison of the impoundment materials collected from the two former impoundments revealed that the eastern impoundment materials contained a greater number of inorganic parameters with greater concentrations than the western impoundment materials. Based on the results from the RI, the eastern impoundment materials contained calcium, chromium, copper, cyanide, iron, lead, magnesium, nickel, zinc, sulfate, and chloride at concentrations which were elevated with respect to typical background values for NYS soil. Impoundment materials obtained from the western impoundment contained chromium, copper, magnesium, and chloride in excess of typical background values for NYS soil; however the concentrations were not as elevated as the eastern impoundment.

Toxicity Characteristic Leaching Procedure (TCLP) metals analysis of the settled solids were below levels as defined by 40 CFR Part 261. The settled solids would not be considered a characteristic hazardous waste.

Surface Soil Samples
The surface soil samples, with the exception of sample S-1, indicated that organic or inorganic parameter concentrations are not elevated with respect to typical background values for NYS soil. Some inorganic constituents such as aluminum, iron and potassium were elevated with respect to the two site background surface soil samples. Surface soil sample S-1 contained an elevated concentration of total chromium with respect to typical background values for NYS soil.

Shallow Ground Water
The VOC data from the four rounds of sampling demonstrates inconsistent patterns of ground water impacts. Four parameters were detected at concentrations above the NYS Class GA standards (methylene chloride, acetone, total 1,2-dichloroethene, and trichloroethene). Both acetone and

methylene chloride (common laboratory chemicals) are not considered to be constituents of concern since acetone was only detected in one round of sampling and methylene chloride was only detected in a localized area. Total 1,2-dichloroethene and trichloroethene were detected above NYS Class GA standards in monitoring well B-3S during the first round of ground water sampling and were not detected during the second round of ground water sampling.

Turbidity measurements of collected ground water samples were taken. When turbidity values were less than 50 NTU, one ground water sample was collected for total (unfiltered) metals analysis. When turbidity values exceeded 50 NTU, a filtered sample was also collected for soluble metals analyses. Concentrations of inorganic parameters were generally higher and more variable in ground water samples which were turbid (greater than 50 NTU). These higher and more variable concentrations are likely due to the presence of finer grained sediment in the samples.

Inorganic parameters which were detected at soluble concentrations which exceeded NYS Class GA standards or guidance values included chromium, hexavalent chromium, iron, manganese, sodium, fluoride and chloride. TCLP analyses of impoundment materials were conducted and chromium was not detected. Therefore contributions of chromium to the shallow aquifer from the impoundment materials are not expected. In addition, iron, manganese, sodium, fluoride and chloride are reflective of background conditions detected in upgradient ground water samples.

Deep Ground Water

VOCs were detected in each of the deep monitoring wells. Most of the detections occurred during the first ground water sampling event. Acetone and methylene chloride were detected above NYS Class GA standards in the deep ground water. They both were detected during only one round of sampling and are therefore not considered to be constituents of concern at the site. The presence of hexane, which was used for equipment decontamination, is probably due to incomplete rinsing and was only detected in the second round of sampling. The other VOCs detected were 1,1,1-trichloroethane and trichloroethene. 1,1,1-trichloroethane was detected at the NYS Class GA standard in monitoring well B-3D during the first round of ground water sampling and below the NYS Class GA standard during the second round of ground water sampling. Trichloroethene was not detected in the newly installed upgradient monitoring well B-12D, which suggests that the source of the B-1D VOCs is on-site or to the west of the site. However, since trichloroethene was not detected in wells B-4D or B-5D, which are downgradient of B-1D, it is apparent that the presence of trichloroethene at B-1D is a localized occurrence.

The following inorganic parameters were detected in soluble concentrations which exceeded the NYS Class GA ground water standards: chromium, hexavalent chromium, iron, and sodium. Both iron and sodium concentrations exceeded the Class GA standards in the upgradient monitoring wells. Soluble iron concentrations do not show an increase from the upgradient ground water to the downgradient ground water. Therefore, with respect to iron, the deep ground water has not been impacted by the site. Soluble sodium concentrations are higher in some of the downgradient wells; however the higher concentrations may reflect natural variations since the upgradient concentrations exceed the Class GA standards by about six times. Chromium and hexavalent chromium were detected in upgradient monitoring well B-2D and in downgradient wells B-3D and B-5D. Chromium concentrations in B-3D exceeded the Class GA standard, while the B-5D concentrations were equal to or less than the upgradient concentration. The inorganic ground water quality results indicated that ground water in the vicinity upgradient of monitoring well B-3D has been impacted. The ground water at B-3D not only contains elevated chromium and hexavalent chromium, but it also has the highest sulfate and lowest iron concentrations of the deep monitoring wells on the site. None of the shallow monitoring wells at the site contained concentrations of sulfate as high as well B-3D. Furthermore, a deep ground water seep, located near the bottom of the ravine to the north of the site, which issues from the bottom of landfill material, appears to have a sulfur odor and shows evidence of reducing conditions. This information suggests that off-site sources are impacting deep ground water quality at the site. In addition, iron, sodium, chromium and hexavalent chromium are reflective of background conditions detected in upgradient ground water samples.

Based on discussions in Section 1.2.3 percolation from the shallow ground water to the deep ground water is minimal and compounds in the shallow ground water would not be expected to significantly contribute to the deep ground water zone quality. This indicates that the deep ground water constituent concentrations are not a result of infiltration through the impoundment materials.

1.2.5. Risk assessments

Human health risk assessment

A baseline[1] human health risk assessment was performed for the site and was presented in the RI Report (O'Brien & Gere, 1996). This assessment was conducted in accordance with United States Environmental Protection Agency (USEPA) guidelines and procedures, as presented in the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*. The assessment addresses potential risks associated with chemicals detected in site ground water, soil, and air. Populations of concern (on-site workers and off-site child and adult residents) may be exposed to chemicals from several exposure routes. Intakes associated with the following exposure pathways were quantified for the indicated populations:

- **On-site worker (current)** - ingestion and dermal contact with site soil; inhalation of site air
- **On-site worker (future)** - ingestion and dermal contact with site soil; inhalation of site air; ingestion of site ground water
- **Child resident (off-site)** - Ingestion, dermal contact, and inhalation of ground water
- **Adult resident (off-site)** - Ingestion, dermal contact, and inhalation of ground water

Key conclusions of the risk assessment are summarized as follows:

- The total non-carcinogenic hazard index (HI) (0.004) calculated for potential current exposures by on-site workers at the plastics facility (J.C. Plastics) is within the USEPA's range of acceptability (a HI of less than one).

- The total cancer risk calculated for potential future exposures by on-site workers ($2x10^{-7}$) is within the USEPA's range of acceptability. The total non-cancer hazard index calculated for potential future exposures by on-site workers (11.5) exceeds the USEPA's range of acceptability. The exposure pathway posing the greatest potential risk to future on-site workers is air as a result of surficial fugitive

[1] In a baseline exposure assessment, current and future exposures are evaluated assuming no site remediation.

dust emissions. This was evaluated under future conditions if impoundment materials were distributed at the site surface.

- The total cancer risks calculated for potential future ground water exposures by off-site residents using ground water for potable uses (adult: $1x10^{-6}$, child: $8x10^{-7}$) are within the USEPA's range of acceptability. The total non-cancer hazard index calculated for an adult (1.3) marginally exceeds the USEPA's range of acceptability, while the total non-cancer hazard index calculated for a child (0.8) is within the USEPA's range of acceptability.

Ecological risk assessment

This section summarizes the ecological resources and habitat evaluation based on the site reconnaissance and information provided by state agencies.

- Four natural cover types and four cultural cover types exist within the study area (0.5 miles).
- The natural cover types: Successional southern hardwoods, Successional northern hardwoods, Pine-hardwood forest, and Successional old-field provide good quality habitat for a variety of wildlife species.
- Irondequoit Creek and Tributary #9 are significant aquatic habitats within the study area. Although they are capable of supporting life, none was observed at the time of field investigations.
- Cultural cover types do not provide significant habitats which are capable of supporting a diversity of wildlife species.
- Two NYS regulated wetlands are present along Irondequoit Creek within 2 miles of the site, but upstream of site tributaries.
- Five rare plants and one rare community exist within 2 miles of the site.

The Environmental Evaluation was designed to identify potential ecological receptors at or in the vicinity of the site, which could be exposed to site-related compounds during normal life activities. Cover types and aquatic habitats in the vicinity of the site provide quality wildlife habitat for a variety of mammalian, avian, reptilian, and amphibious species. Five rare plants, one rare community, two regulated wetlands, Irondequoit Creek, and an Irondequoit Creek tributary are located within 2 miles of the site.

2. Development of alternatives

2.1. Introduction

The objective of this phase of the FS was to develop a range of remedial options that protect human health and the environment. Remedial alternatives were developed by assembling combinations of technologies, specific to various media, into alternatives that address contamination at the site as a whole. This process consisted of six steps:

1. Development of remedial action objectives
2. Development of general response actions
3. Identification of volumes and/or areas of affected media
4. Identification and screening of remedial technologies and process options
5. Evaluation of process options
6. Assembly of alternatives

These steps are discussed in the following subsections.

2.2. Development of remedial action objectives

Remedial action objectives are specific goals designed to protect human health and the environment. These objectives are based on available information and standards such as potential ARARs and risk based levels established in the risk assessments. ARARs were addressed in this FS instead of the NYS Standards, Criteria, and Guidelines (SCGs), as the Consent Order calls for consistency with CERCLA.

There were no ARARs identified for soil at the site. As summarized in Section 1.2.5, the human health risk assessment performed for the site concluded that no unacceptable excess cancer risk is posed to receptors by site soil. The risk assessment documented a HI of greater than 1 for future on-site workers, indicating that inhalation of site subsurface soil during excavation work poses a potential risk due to chromium in site subsurface soils. The risk assessment also concluded that no unacceptable non-cancer risks are posed to human receptors other than workers involved in disturbance of subsurface soil.

As described in Section 1.2.5, there are currently no off-site or on-site receptors to ground water, therefore no potential adverse health effects are associated with ground water. The NYS Class GA standards were identified as potential ARARs for the site. A comparison of shallow ground water sample concentrations to the NYS Class GA standards indicated that chromium, hexavalent chromium, iron, sodium, fluoride, chloride, methylene chloride, total 1,2-dichloroethene, and trichloroethene were detected at concentrations above the standards. As discussed in Section 1.2.4, TCLP analyses of impoundment materials were conducted and chromium was not detected. Therefore, contributions of chromium to the shallow aquifer from impoundment materials are not expected. Iron, manganese, sodium, fluoride and chloride are reflective of background conditions detected in upgradient ground water samples. In addition, methylene chloride was not considered to be site-related, and the latest round of sampling indicates that 1,2-dichloroethene and trichloroethene were not detected in shallow ground water at the site.

A comparison of deep ground water samples to the NYS Class GA standards showed that deep ground water contains chromium, hexavalent chromium, iron, sodium, acetone and methylene chloride at concentrations above the NYS Class GA water quality standards. As discussed in Section 1.2.4, acetone and methylene chloride were detected above NYS Class GA standards in the first round of sampling but were not detected in more recent sampling rounds. In addition, the presence of iron, sodium, chromium and hexavalent chromium are reflective of background conditions detected in upgradient ground water samples. This is consistent with discussions regarding site hydrogeology in Section 1.2.3, indicating that percolation from the shallow ground water zone contributes only 0.13% to the ground water flow in the deep zone, and suggests that deep zone constituents concentrations are not a result of infiltration through impoundment materials. In addition, off-site sources could also be impacting deep ground water.

Given the potential risks to human receptors related to site subsurface soil the following remedial action objective has been established for this FS:

- Reduce the potential for exposure to constituents within the impoundment materials.

2.3. Development of general response actions

General response actions are medium-specific actions which may be combined into alternatives to satisfy the remedial action objective. General response actions which may be combined into alternatives that satisfy the remedial action objective for the site include institutional actions, containment actions, removal actions, and treatment actions.

2.4. Identification of volumes or areas of media

Site conditions, the nature and extent of contamination, and preliminary remediation goals were taken into consideration to define the areas and/or volumes of media to be addressed by general response actions.

Surface soil and impoundment sample data were used to estimate the areas and volumes of the site which would be associated with the soil and impoundment material remedial objective. The eastern impoundment covers approximately 48,200 ft^2 with an estimated volume of 25,000 yd^3. The western impoundment covers approximately 60,260 ft^2 with an estimated volume of 28,800 yd^3. The total volume of impoundment materials is estimated to be about 53,800 yd^3.

2.5. Identification and screening of remedial technologies and process options

Alternatives were developed by identifying and screening potentially applicable remedial technology types and process options for each general response action. Process options were screened on the basis of technical implementability. The technical implementability of each identified process option was evaluated with respect to site contaminant information, physical characteristics and volumes of affected media, and potential exposure levels. Process options which were viewed as not being technically implementable were not considered further.

Technologies and process options identified for the impoundment materials are described and screened for technical implementability in Table 1.

These include No Action, Institutional Actions, Containment Actions, Removal Actions and Treatment Actions. The results of the screening and a description of the process options which passed the technology screening phase follows.

Each of the remedial technologies associated with the institutional general response actions passed the preliminary screening. These technologies included access restrictions (deed restrictions and fencing) and visual inspections of a cover.

The technology associated with the site containment general response actions (covering) passed the preliminary screening. Process options for covering included a silty sand ($1x10^{-5}$ cm/sec) and vegetated soil cover or an asphalt cover.

The remedial technology associated with the removal general response action was excavation. Excavation was considered to be not applicable for the site due to the excessive volume, nature of the waste, and the potential excavation, transportation and off-site disposal costs which would be incurred following excavation. The volume of material to be excavated would be approximately 53,800 yd^3. The total present worth cost of excavating, transporting, and disposing of such a large volume of material is estimated to be in excess of $4.3 million.

The remedial technologies associated with the general response action for treatment of the impoundment materials included thermal treatment, chemical/physical treatment, *ex situ* biological treatment and *in situ* biological treatment. Examination of the various process options available for the treatment of the site material concluded that *in situ* vitrification, stabilization, and an acid wash were not applicable due to the large volume of material at the site. The remaining process options were also considered infeasible because those technologies did not address inorganics, the main constituent of concern in the impoundment materials at the site. In addition, these remedial technologies would not reduce the potential for exposure to constituents within the impoundment materials.

A more detailed discussion of the remedial technology process options which passed the screening phase follows.

Deed Restrictions: Deed restrictions incorporated into a property deed might include land use restrictions that would preclude the conduct of activities which would expose impoundment materials or impair the integrity of a cover.

Fencing: Fencing would consist of the placement of a fence around the impoundments to limit access to the impoundment material.

Visual Inspections: Visual inspections involve periodic on-site inspections to monitor the condition of a cover.

Covering: Covering techniques are used to isolate and contain materials. Covering would reduce the potential for exposure to constituents within the impoundment materials. Covers were selected that reduce surface water infiltration, encourage runoff, and control erosion. Covers would consist of a silty sand ($1x10^{-5}$ cm/sec) and vegetated cover or an asphalt cover. Asphalt or macadam covers have been accepted by NYSDEC at various sites (eg. Roth Brothers Corp., Syracuse, NY and Xerox, Webster, NY) to reduce exposure to constituents, reduce surface water infiltration and provide beneficial reuse of the area. The construction of a cover at the site would include proper grading of the surface and side slopes.

2.6. Evaluation of process options

The process options remaining after the initial screening were evaluated further according to the criteria of effectiveness, implementability, and cost. The effectiveness criterion includes the evaluation of: potential effectiveness of the process options in meeting remediation goals and handling the estimated volumes or areas of media; potential effects on human health and the environment during construction and implementation; and experience and reliability of the process options for site contaminants and conditions. The technical and institutional aspects of implementing the process options were assessed for the implementability criterion. The capital and operation and maintenance (O&M) costs of each process option were evaluated as to whether they were high, medium, or low relative to the other process options of the same technology type.

Based on the evaluation, the most favorable process options for each technology type were chosen as a representative process option. Selecting representative process options simplifies the assembly of alternatives, but does not eliminate other process options. The process option actually used to implement remedial action may not be selected until the remedial design phase. A summary of the evaluation of process options and selected representative process options for the site is presented as Table 2.

Representative process options selected for the site were: deed restrictions, fencing, cover and periodic visual inspections of a cover.

Based on our evaluation, both covers discussed in Section 2.5 would address the remedial objective by reducing the potential for exposure to constituents within the impoundment materials. The silty sand (1×10^{-5} cm/sec) and vegetated cover is less expensive as compared to the asphalt cover, however, the asphalt cover would allow for beneficial reuse of the area.

2.7. Assembly of remedial alternatives

General response actions and representative process options were combined to form alternatives that address the remedial action objective. Three alternatives were developed for the site. These included a no action alternative, an institutional alternative, and an institutional/containment alternative. The no-action alternative was included in the range of alternatives in accordance with USEPA guidelines (USEPA, 1988a) and the NCP (*Federal Register*, March 8, 1990) for comparison purposes only. A summary of the alternatives and their components is presented in Table 3. A description of each alternative follows:

2.7.1. Alternative 1 - No-Action

Alternative 1 is the no-action alternative. The no-action alternative serves as the benchmark for the evaluation of action alternatives. This alternative would provide for an assessment of the environmental conditions if no remedial actions are implemented.

2.7.2. Alternative 2 - Fencing and Deed Restrictions

Alternative 2 is an institutional alternative which incorporates access restrictions that include fencing and deed restrictions. The objective of these components is to restrict site access, and land use.

2.7.3. Alternative 3 - Cover and Deed Restrictions

Alternative 3 is an institutional/containment alternative which incorporates access restrictions, placement of a cover over the impoundment materials and periodic on-site visual inspections to monitor the condition of the cover. A one-time evaluation/review regarding whether adequate protection of human health and the environment is maintained would be conducted three years after completion of the remedial alternative.

Access restriction would include deed restrictions. The objective of this component is to restrict human activity which may be detrimental to the integrity of the cover placed over the impoundment materials.

The cover would consist of a silty sandy (1×10^{-5} cm/sec) and vegetated cover (Alternative 3a) or an asphalt cover (Alternative 3b). The construction of a cover at the site would include proper grading of the surface and side slopes to encourage runoff and control erosion. The vegetated layer in Alternative 3a would prevent erosion and encourage evapotranspiration. The asphalt cover in Alternative 3b would allow for beneficial reuse of the area as a parking lot or other compatible use.

O&M activities for Alternative 3, would include periodic on-site inspections of the cover, and repairs as necessary.

3. Detailed analysis of alternatives

3.1. Introduction

The objective of the detailed analysis of alternatives was to analyze and present sufficient information to allow the alternatives to be compared and a remedy selected. The analysis consisted of an assessment of the alternatives with respect to nine evaluation criteria that encompass statutory requirements and include other gauges of the overall feasibility and acceptability of remedial alternatives. The detailed analysis of alternatives also included a comparative evaluation designed to assess the relative performance of the alternatives and identify major trade-offs among them. The nine evaluation criteria were:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance.

The preamble to the NCP (*Federal Register*, March 8, 1990) indicates that, during remedy selection, these nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The two threshold criteria, overall protection of human health and the environment and compliance with ARARs, must be satisfied in order for an alternative to be eligible for selection. Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost are primary balancing criteria which are used to balance the trade-offs between alternatives. The modifying criteria are state and community acceptance, which are formally considered after public comment is received on the RI/FS report and the Preliminary Remedial Action Plan (PRAP).

3.5. Reduction of toxicity, mobility, or volume through treatment

The evaluation of reduction of toxicity, mobility, or volume through treatment addresses the expected performance of treatment technologies employed in each alternative. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

3.6. Short-term effectiveness

The short-term effectiveness criterion addresses the protection of workers and the community during construction and implementation of each alternative, environmental effects resulting from implementation of each alternative, and the time required to achieve remedial objectives. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

3.7. Implementability

The analysis of implementability involves the assessment of the following factors: the ability to construct and operate technologies, the reliability of technologies, the ease of undertaking additional remedial action, the ability to monitor the effectiveness of each remedy, the ability to obtain necessary approvals from other agencies, and the availability of services, capacities, equipment, materials, and specialists. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

3.8. Cost

The objective of evaluating costs during the detailed analysis of alternatives is to make comparative analyses among alternatives based on cost. Cost estimates were prepared based on readily available vendor information and quotations, cost estimating guides, and experience. Capital costs are those required to implement a remedy and include both direct and indirect capital costs. Annual O&M costs are costs which are expected to be incurred yearly. The estimated capital and O&M costs are presented for each alternative along with a present worth cost, which represents the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action. Present worth costs were calculated for a three year period at a 7% discount rate. The costs presented were prepared on the same basis for each alternative to facilitate the comparative analysis.

Total capital costs, annual O&M, and present worth are presented in Table 4 for each Alternative. Preliminary cost estimates for Alternatives 2, 3a and 3b are presented in Tables 5, 6 and 7, respectively.

3.9. State acceptance

State acceptance will be addressed in the Record of Decision (ROD) following the public comment period.

3.10. Community acceptance

Community acceptance will be addressed in the ROD following the public comment period.

3.11. Comparative analysis of alternatives

3.11.1. Overall protection of human health and the environment

Alternative 1 would not reduce the potential for exposure to constituents within the impoundment materials. Alternative 2 would reduce exposure to constituents within the impoundment materials by discouraging trespassers through fencing and preclude the conduct of activities which would expose impoundment materials through deed restrictions. Alternative 3 would also reduce exposure to constituents within the impoundment materials with a cover and preclude the conduct of activities which would expose impoundment materials through deed restrictions.

3.11.2. Compliance with ARARs

No chemical, location or action specific ARAR's were identified for Alternatives 1 and 2. For Alternative 3 the NYS air quality standards were

4. Conclusions and recommendations

The risk assessment performed as part of the RI concluded there are no unacceptable risks to human health due to site-related exposure to ground water, surface soils, or surface water/sediments. Certain constituents in ground water were detected above potential chemical-specific ARARS, however, inorganics and VOCs from the impoundment materials would not be expected to significantly contribute to the shallow or deep ground water due to chromium not being detected in the TCLP analyses of impoundment materials, certain detected VOCs being common laboratory chemicals, anomalies, the presence of constituents that are reflective of background conditions detected in upgradient ground water samples, and off-site sources potentially contributing to ground water. Therefore, the remedial action objective developed for the site is:

- Reduce the potential for exposure to constituents within the impoundment materials.

General response actions and representative process options were combined to form alternatives that address the remedial action objective. These alternatives are presented below.

Alternative 1 - No Action would not reduce the potential for exposure to constituents within the impoundment materials.

Alternative 2 - Fencing and Deed Restrictions would reduce the potential for exposure for future on-site workers to constituents within the impoundment materials, and would therefore achieve the remedial action objective.

Alternative 3 - Cover and Deed Restriction would also achieve the remedial action objective. In addition, the silty sand (1×10^{-5} cm/sec) and vegetated cover (Alternative 3a) or the asphalt cover (Alternative 3b) would reduce surface water infiltration, encourage runoff and control erosion. In addition, the asphalt cover would allow for beneficial reuse of the area as a parking lot or other compatible use. Asphalt and macadam covers have been accepted by NYSDEC at various sites (eg. Roth Brothers, Corp., Syracuse, NY and Xerox, Webster, NY) to reduce exposure to constituents and reduce surface water infiltration.

Fencing and deed restrictions are an acceptable alternative that would achieve the remedial objective for this site, however based on the previous discussions and concerns expressed by NYSDEC regarding the reduction of infiltration through the impoundment materials, and the existing owners concern for beneficial reuse of the property as a parking lot, Alternative 3b - Asphalt Cover and Deed Restrictions is the recommended alternative.

5. Conceptual design of the recommended alternative

The recommended alternative (Alternative 3b - Asphalt Cover and Deed Restrictions) includes deed restrictions, an asphalt cover, periodic visual on-site inspections of the cover and a one-time evaluation/review three years after completion of the cover.

The cover would consist of approximately 3 inches of asphalt and 6 inches of gravel subbase. Prior to installing the cover, the site would be graded to allow for proper storm water drainage.

The existing cistern located northwest of the eastern pumphouse (Figure 2) would be removed along with the impacted soil around the cistern. The impacted soil would be placed in the former impoundments and thereby incorporated into the cover remedy. Additionally, impacted soil near the drainage ditch (S-1) will be placed in the area of the former impoundments and incorporated into the cover remedy.

Deed restrictions would include measures to restrict land use that would preclude the conduct of activities which would expose impoundment materials or impair the integrity of the cover.

Standard construction methods would be used to implement this alternative. Level D protection would be expected to be adequate to protect on-site workers during construction.

The estimated total capital cost is $325,150 with an annual O&M cost of $4,000 and a total present worth of $330,150.

Table 1
Former Alcan Aluminum Corporation Site #828005
Screening of Technologies and Process Options

General Response Action	Remedial Technology	Process Options	Description	Screening Comments *
No Action	None	Not Applicable	No action.	Required for consideration by NCP.
Institutional Actions	Access Restrictions	Deed Restrictions	Land and ground water use restrictions for site.	Potentially applicable.
		Fencing	Installation of a fence surrounding site.	Potentially applicable.
	Monitoring	Visual Inspections	Periodic visual inspections of a cover.	Potentially applicable.
Containment Actions	Cover	Asphalt Cover	Asphalt cover over impoundment materials.	Potentially applicable.
		Silty Sand (1x10-5 cm/sec) & Vegetated Soil Cover	Compacted silty sand & vegetated soil cover over impoundment materials.	Potentially applicable.
Removal Actions	Excavation	Excavation	Removal of material using appropriate construction equipment (ie. backhoes, front-end loaders).	Not applicable due to the high capital cost associated with the excavation and disposal.

Table 3

REMEDIAL ALTERNATIVES

Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

General Response Actions	Technology	Alt 1	Alt 2	Alt 3
No Action		✓		
Institutional Actions	Fencing		✓	
	Deed Restrictions		✓	✓
	Periodic Visual Inspections of a Cover			✓
Containment Actions	Silty Sand ($1x10^{-5}$ cm/sec) and Vegetated Soil Cover or Asphalt Cover			✓

Table 4
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES
Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

	Alternative I No action.	Alternative 2 - Fencing and Deed Restrictions	Alternative 3 - Cover and Deed Restrictions
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT			
Protection of Human Health and Environment	Would not reduce the potential for human inhalation of, ingestion of, or contact with the impoundment materials.	Fencing and deed restrictions would reduce the potential for human inhalation of, ingestion of, or contact with the impoundment materials.	The cover system in conjunction with the deed restrictions would reduce the potential for human inhalation of, ingestion of, or contact with the impoundment materials. Deed restrictions would help to maintain the integrity of the cover by prohibiting activities which could disturb the cover.
COMPLIANCE WITH ARARs			
Chemical Specific ARARs	None	None	None
Location Specific ARARs	None	None	None
Action Specific ARARs	None	None	Potential action-specific ARARs are the NYS air quality standards (6 NYCRR Part 257-3). Construction activities involving earth moving would be conducted using appropriate dust control measures to control particulate emissions.
LONG-TERM EFFECTIVENESS AND PERMANENCE			
Magnitude of Residual Risk	Would not reduce the potential for human inhalation of, ingestion of, or contact with the impoundment materials.	Fencing and deed restrictions would minimize excavation activities therefore reducing the potential for ingestion of, inhalation of, or contact with the affected media.	The cover system would reduce the potential for ingestion of, inhalation of, or contact with the impoundment materials. Deed restrictions would help to maintain the integrity of the cover by prohibiting activities which could disturb the cover.

Table 4
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES
Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

	Alternative 1 No action.	Alternative 2 - Fencing and Deed Restrictions	Alternative 3 - Cover and Deed Restrictions
LONG-TERM EFFECTIVENESS AND PERMANENCE (Continued)			
Adequacy and Reliability of Controls	None.	Fencing and deed restrictions are adequate and reliable methods of reducing the potential for human infiltration of, ingestion of, or contact with the impoundment materials.	The cover system is an adequate and reliable measure for reducing the potential for human infiltration of, ingestion of, or contact with the impoundment materials. Deed restrictions would help to maintain the integrity of the cover by prohibiting activities which could disturb the cover.
REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT			
Degree of Expected Reduction of Toxicity, Mobility or Volume	None.	None.	None
SHORT-TERM EFFECTIVENESS			
Protection of Community During Remedial Actions	No remedial action, therefore there is no protection.	No protection required as a result of fence installation.	No protection likely required during cover construction.
Protection of Workers During Remedial Actions	No remedial action, therefore no protection is required.	No protection required during fence installation.	Appropriate protective equipment would be used during remedial activities.
Environmental Impacts	No remedial action. Therefore, there is no environmental impact.	No remedial action. Therefore, there is no environmental impact.	Contaminant transport during construction would be minimized through appropriate methods such as off-site drainage control and dust control.

Table 4
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES
Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

	Alternative 1 No action.	Alternative 2 - Fencing and Deed Restrictions	Alternative 3 - Cover and Deed Restrictions
SHORT-TERM EFFECTIVENESS (Continued)			
Time Until Remedial Action Objectives are Achieved	No remedial action. Remedial action objective would not be achieved.	Reducing the potential for human inhalation of ingestion of or contact with the impoundment materials would be expected to occur immediately after the fence and deed restrictions are implemented.	Reducing the potential for human inhalation of, ingestion of or contact with the impoundment materials would be expected to occur immediately after the cover system and deed restrictions are implemented.
IMPLEMENTABILITY			
Ability to Construct and Operate the Technology	No construction or operation.	Fence readily constructed.	Cover system readily constructed.
Reliability of Technology	No technology.	Fence would be highly reliable.	The cover system is reliable for reducing exposure to constituents within the impoundment materials.
Ease of Undertaking Additional Remedial Actions, If Necessary	Additional remedial actions would be easily implementable.	Additional remedial actions would be easily implementable.	The cover system will not impede future remedial actions, if necessary.
Ability to Monitor Effectiveness of Remedy	No monitoring included.	No monitoring included.	Periodic on-site visual inspection would monitor the condition of the cover.
Coordination with Other Agencies	None required.	Coordination with local government and present property owner necessary to implement deed restrictions.	Coordination with local government and present property owner necessary to implement deed restrictions.
Availability of Offsite Storage and Disposal Services	None required.	None required.	None required.

Table 4
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES
Feasibility Study
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

	Alternative 1 No action.	Alternative 2 - Fencing and Deed Restrictions	Alternative 3 - Cover and Deed Restrictions
IMPLEMENTABILITY (Continued)			
Availability of Necessary Equipment, Specialists and Materials	None required.	None required.	Cover materials expected to be readily available.
Availability of Technologies	None required.	None required.	Cover materials readily available.
COST			
Total Capital Costs	None.	$50,000	Alt. 3a - Silty sand and vegetated cover and deed restriction - $297,000 Alt. 3b - Asphalt cover and deed restrictions - $325,150
Annual Operation & Maintenance	None.	None	Alt. 3a - $1,000 Alt. 3b - $1,000
Total Present Worth Costs (3 years, 7%)	None.	$50,000	Alt. 3a - $302,000 Alt. 3b - $330,150
STATE ACCEPTANCE	To be assessed following the public comment period and documented in the ROD.		
COMMUNITY ACCEPTANCE	To be assessed following the public comment period and documented in the ROD.		

Table 5

Preliminary Cost Estimate
Alternative 2- Fencing and Deed Restrictions
Former Alcan Aluminum Corporation
Site #828005
Pittsford, New York

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Cost				
Fencing	2000	Linear Feet	$15	$30,000
Deed Restrictions			Lump Sum	$5,000
Total Capital Cost				$35,000
Engineering Fees				
Remedial Design				$10,000
Construction Phase				$5,000
Total Engineering Fees				$15,000
Total Capital Cost and Engineering Fees				$50,000
Annual O&M Cost				$0
Total Present Worth				$50,000

Assumptions:

Remedial design includes limits of fill investigation, design drawing and bid evaluation.
Construction phase includes 1 week on site inspection and shop drawing review.

Table 6
Preliminary Cost Estimate
Alternative 3a - Silty Sand and Vegetated Cover and Deed Restrictions
Former Alcan Aluminum Corporation
Site # 828005
Pittsford, New York

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Cost				
Silty Sand Layer (6 inch)	2500	Cubic Yard	$15	$37,500
Grading of Site	10000	Cubic Yard	$5	$50,000
Topsoil (4 inch)	1700	Cubic Yard	$35	$59,500
Stormwater Drainage			Lump Sum	$31,000
Mobilization/demobilization			Lump Sum	$9,000
Seed	3.1	Acre	$1,775	$5,500
Deed Restrictions			Lump Sum	$5,000
Subtotal				$197,500
Contingency (20% of Capital Cost)				$39,500
Total Capital Cost				$237,000
Engineering Fees				
Remedial Design				$35,000
Construction Phase				$25,000
Total Engineering Fees				$60,000
Total Capital Cost and Engineering Fees (incl. Contingency)				$297,000
Annual O&M Cost				
Site Mowing, Inspection and Maintenance			Lump Sum	$1,000
Three Year Review (one event)				$3,000
Subtotal				$4,000
Total Present Worth of Annual O&M (3 years, 7%)				$5,000
Total Present Worth				$302,000

Assumptions:

Capital Cost Estimate:

Cover includes: 6 inch silty sand layer (1x10-5 cm/sec), and 4 inch topsoil layer.

Assumes site surface soil contain no stones larger than 1/4-inch.

Grading assumes: average depth of 2 ft of grading material, using existing soil on-site, over 3.1 acres (min. 4% slope for surface drainage).

Stormwater drainage includes 1600 ft of grass ditch and 200 ft of rip-rap ditch.

Engineering Fee Estimate:

Remedial Design includes: pre-design (topo survey, materials investigation, limits of fill investigation), design (remedial design report, design drawings, specifications), construction cost estimate, pre bid meeting and bid evaluation.

Construction phase includes: 2 weeks on site inspection, shop drawing review, engineering certification, O&M Plan, and record drawings.

Table 7
Preliminary Cost Estimate
Alternative 3b - Asphalt Cover and Deed Restrictions

Former Alcan Aluminum Corporation
Site # 828005
Pittsford, New York

Item	Quantity	Unit	Unit Cost	Total Cost
Capital Cost				
Grading of Site	6250	Cubic Yard	$5	$31,250
Asphalt Cover	3.1	Acre	$49,000	$151,900
Stormwater Drainage			Lump Sum	$31,000
Mobilization/demobilization			Lump Sum	$6,000
Deed Restrictions			Lump Sum	$5,000
Subtotal				$225,150
Contingency (20% of Capital Cost)				$45,000
Total Capital Cost				$270,150
Engineering Fees				
Remedial Design				$35,000
Construction Phase				$20,000
Total Engineering Fees				$55,000
Total Capital Cost and Engineering Fees (incl. Contingency)				$325,150
Annual O&M Cost				
Inspection and Maintenance			Lump Sum	$1,000
Three Year Review (one event)				$3,000
Subtotal				$4,000
Total Present Worth of Annual O&M (3 years, 7%)				$5,000
Total Present Worth				$330,150

Assumptions:

Capital Cost Estimate:

Asphalt cover includes: 3" asphalt and 6" gravel base.

Grading assumes: average depth of 1.25 ft of grading material using existing soil on-site, over 3.1 acres

Stormwater drainage includes 1600 ft of grass ditch and 200 ft of rip-rap ditch.

Engineering Fee Estimate:

Remedial Design includes: pre-design (topo survey, materials investigation, limits of fill investigation), design (remedial design report, design drawings, specifications), construction cost estimate, pre bid meeting and bid evaluation.

Construction phase includes: 2 weeks on site inspection, shop drawing review, engineering certification, O&M Plan, and record drawings.

FIGURE 1

FORMER ALCAN ALUMINUM
CORP. SITE #828005
PITTSFORD, NEW YORK

SITE LOCATION MAP

0 2000 4000

SCALE IN FEET

CONTOUR INTERVAL = 5 FEET

ADAPTED FROM ROCHESTER EAST N.Y., WEBSTER N.Y., FAIRPORT N.Y.
AND PITTSFORD N.Y. 7.5 MIN. QUAD. MAPS

8/1/92

3057.032.130

8.5X11

O'BRIEN & GERE ENGINEERS, INC.

I:\DIV58\PROJECTS\3057032\DWG\FIG2.DWG 1=1

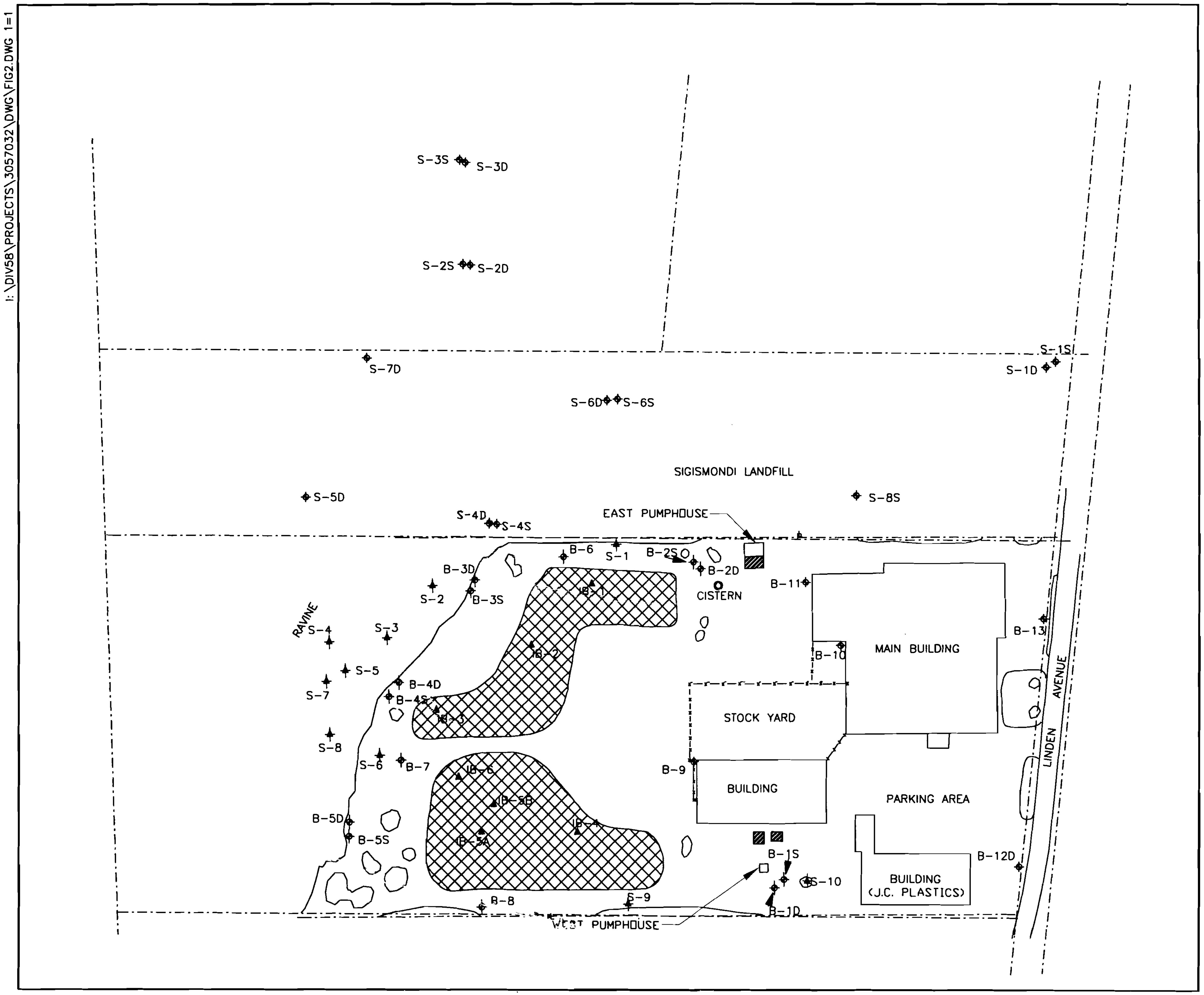


FIGURE 2

LEGEND

PROPERTY BOUNDARY

MONITORING WELL LOCATION

IMPOUNDMENT BORING LOCATION

SURFACE SOIL SAMPLE LOCATION

FORMER WATER IMPOUNDMENTS AS LOCATED BY AERIAL PHOTOS AND SOIL BORINGS

CEMENT FOUNDATION

CISTERN

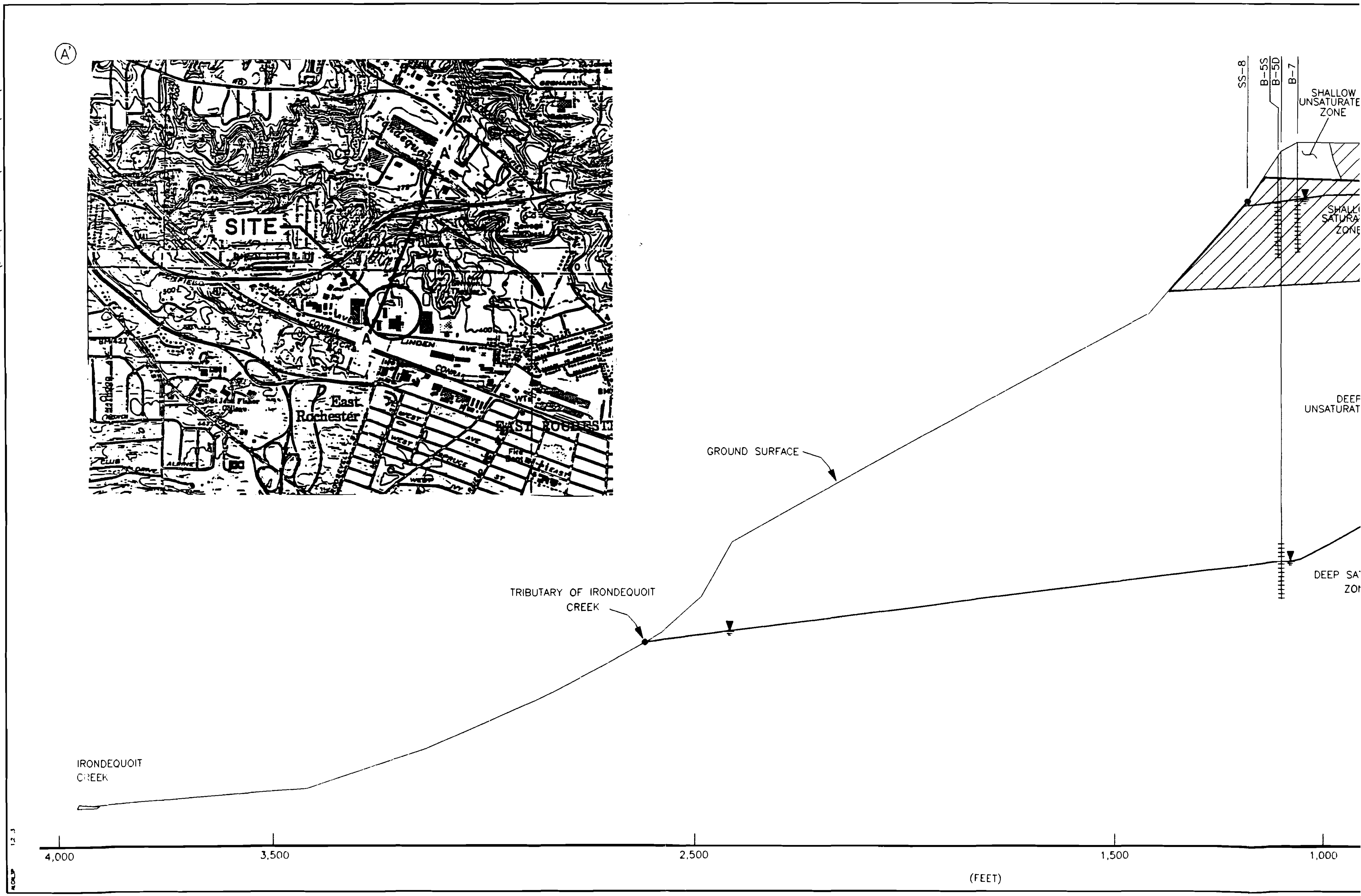
FORMER ALCAN ALUMINUM CORP., SITE #828005
PITTSFORD, NEW YORK

LOCATION OF SHALLOW AND DEEP GROUND WATER MONITOR WELLS SURFACE SOIL SAMPLE & IMPOUNDMENT BORING

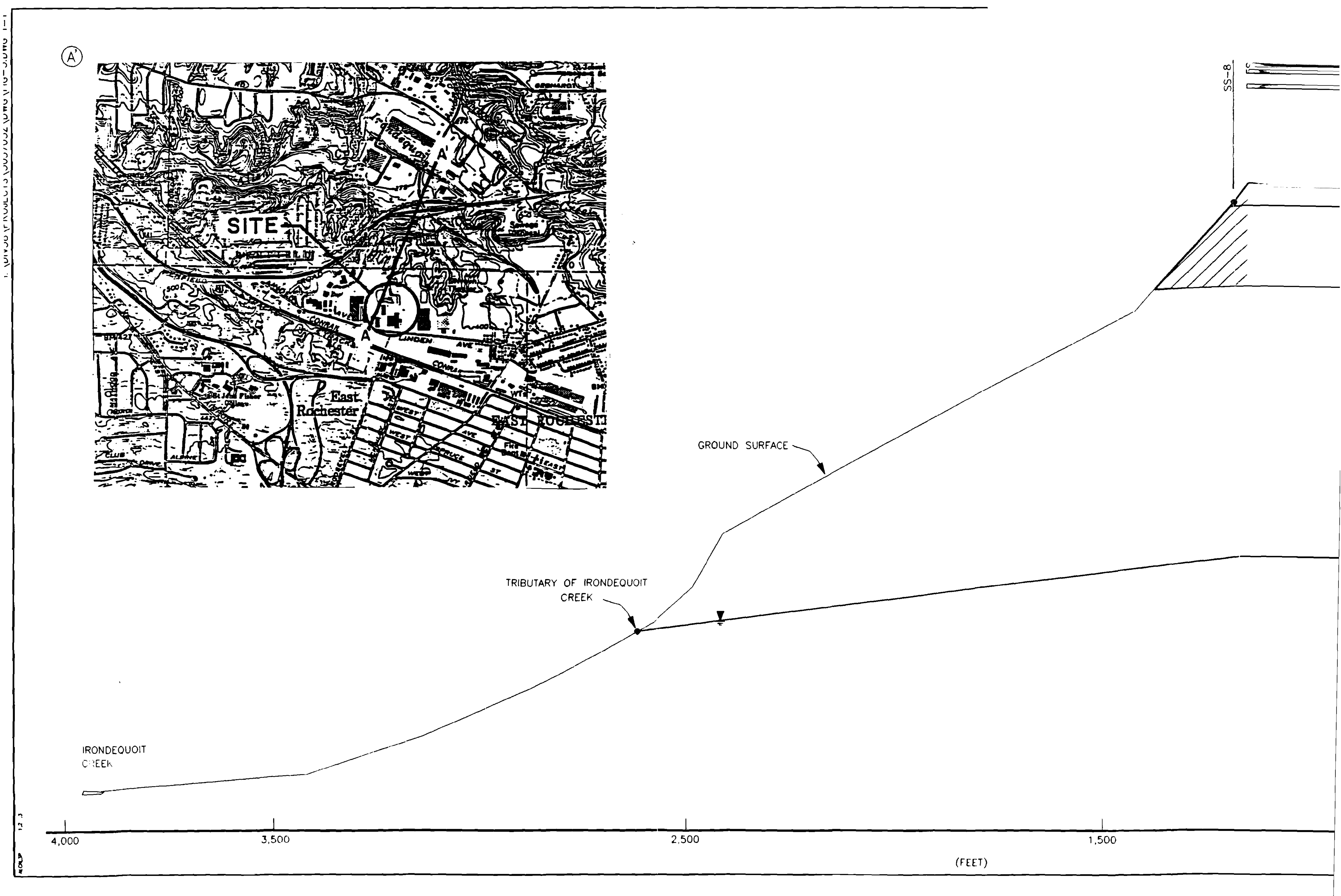
0 150 300
APPROX. SCALE

FILE NO. 3057.032-131

O'BRIEN & GERE ENGINEERS INC.



A'
SITE
A
A
East Rochester
EAST ROCHESTER
LINDEN AVE
CONRAIL
SS-8
B-5S
B-5D
B-7
SHALLOW UNSATURATED ZONE
SHALLOW SATURATED ZONE
DEEP UNSATURATED
DEEP SATURATED ZONE
GROUND SURFACE
TRIBUTARY OF IRONDEQUOIT CREEK
IRONDEQUOIT CREEK
4,000
3,500
2,500
1,500
1,000
(FEET)


A'
SITE
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A'
East Rochester
EAST ROCHESTER
LINDEN AVE
GROUND SURFACE
TRIBUTARY OF IRONDEQUOIT CREEK
IRONDEQUOIT CREEK
SS-8
4,000
3,500
2,500
1,500
(FEET)

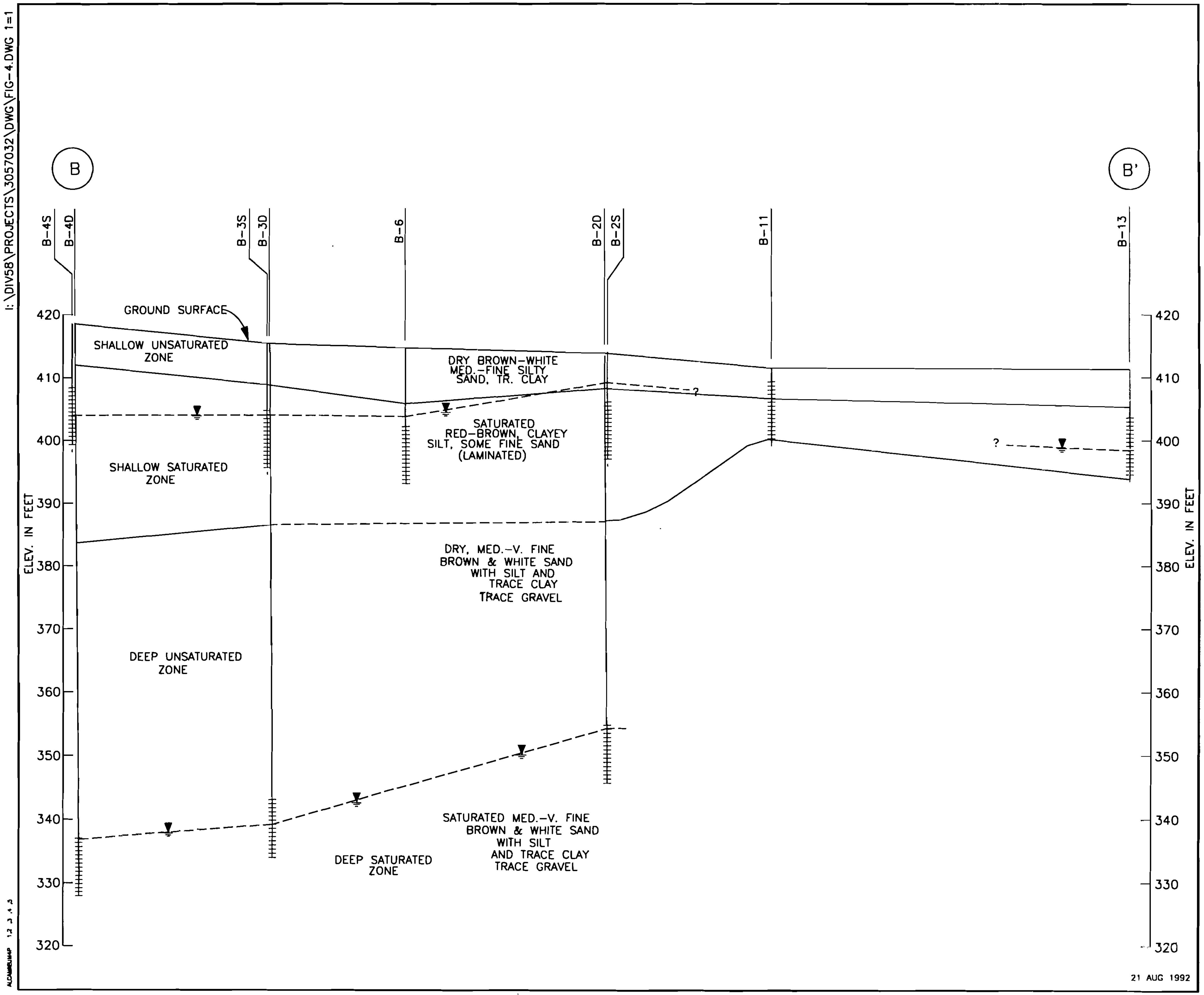


FIGURE 4

LEGEND

WELL SCREEN INTERVAL

GROUND WATER ELEVATION (6/3/92)

B-4S SHALLOW MONITORING WELL

B-4D DEEP MONITORING WELL

FORMER ALCAN ALUMINUM CORP., SITE #828005
PITTSFORD, NEW YORK

MEASUREMENT IN FEET (USGS DATUM)

CROSS SECTION B – B'

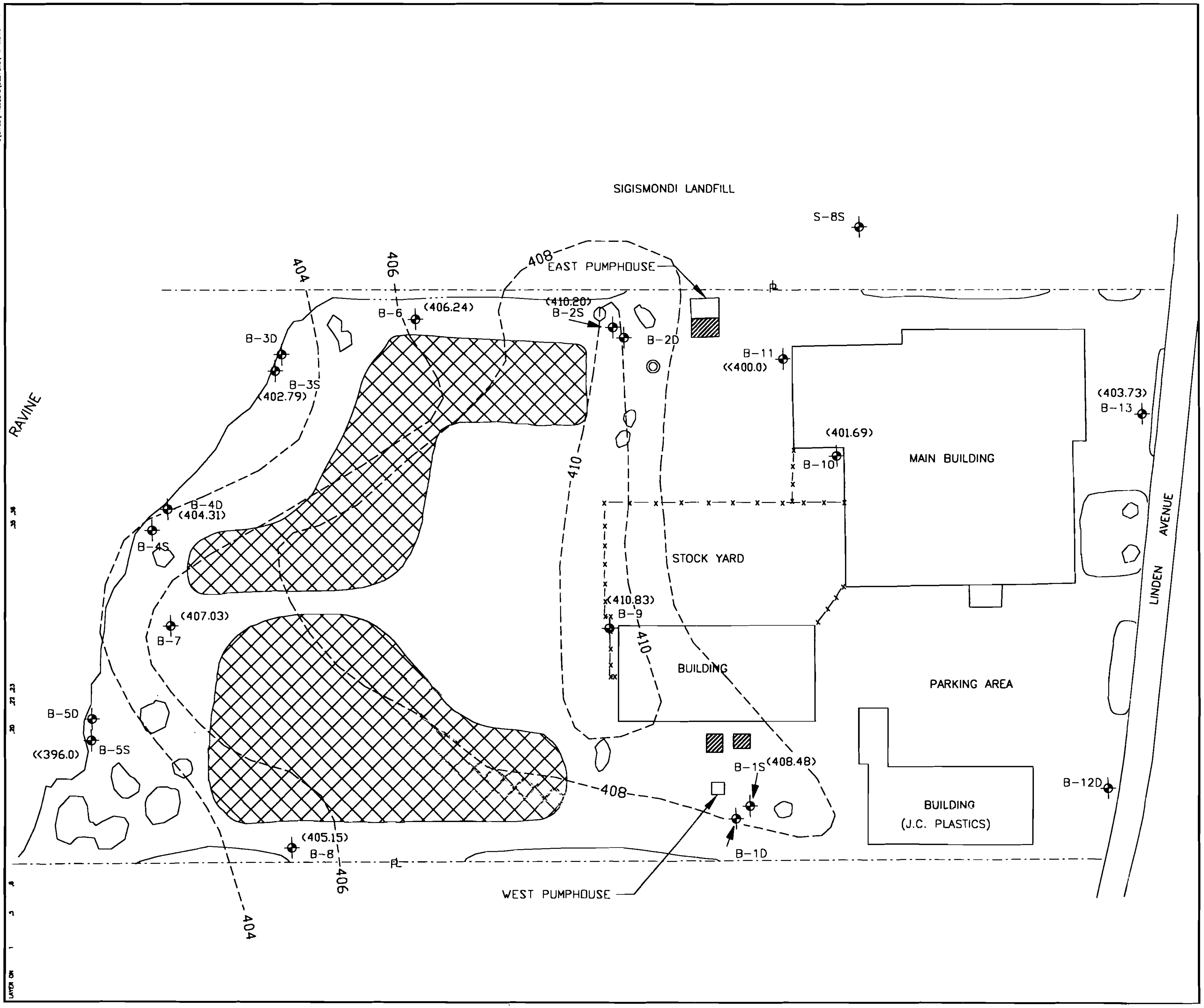
0 15 30
VERT. SCALE IN FEET

0 100 200
HORIZ. SCALE IN FEET

FILE NO. 3057.032-133

O'BRIEN & GERE ENGINEERS INC.

FIGURE 5



LEGEND

- PROPERTY BOUNDARY
- FORMER WATER IMPOUNDMENT AS LOCATED BY AERIAL PHOTOS AND SOIL BORINGS
- MONITORING WELL LOCATION
- CEMENT FOUNDATION
- CISTERN
- 408 GROUND WATER ELEVATION CONTOUR
- (<400.0) GROUND WATER ELEVATION

FORMER ALCAN ALUMINUM CORP., SITE #828005
PITTSFORD, NEW YORK

SHALLOW GROUND WATER ELEVATIONS 8/10/92

0 100 200
SCALE IN FEET

FILE NO. 3057.032-131

O'BRIEN & GERE ENGINEERS INC.

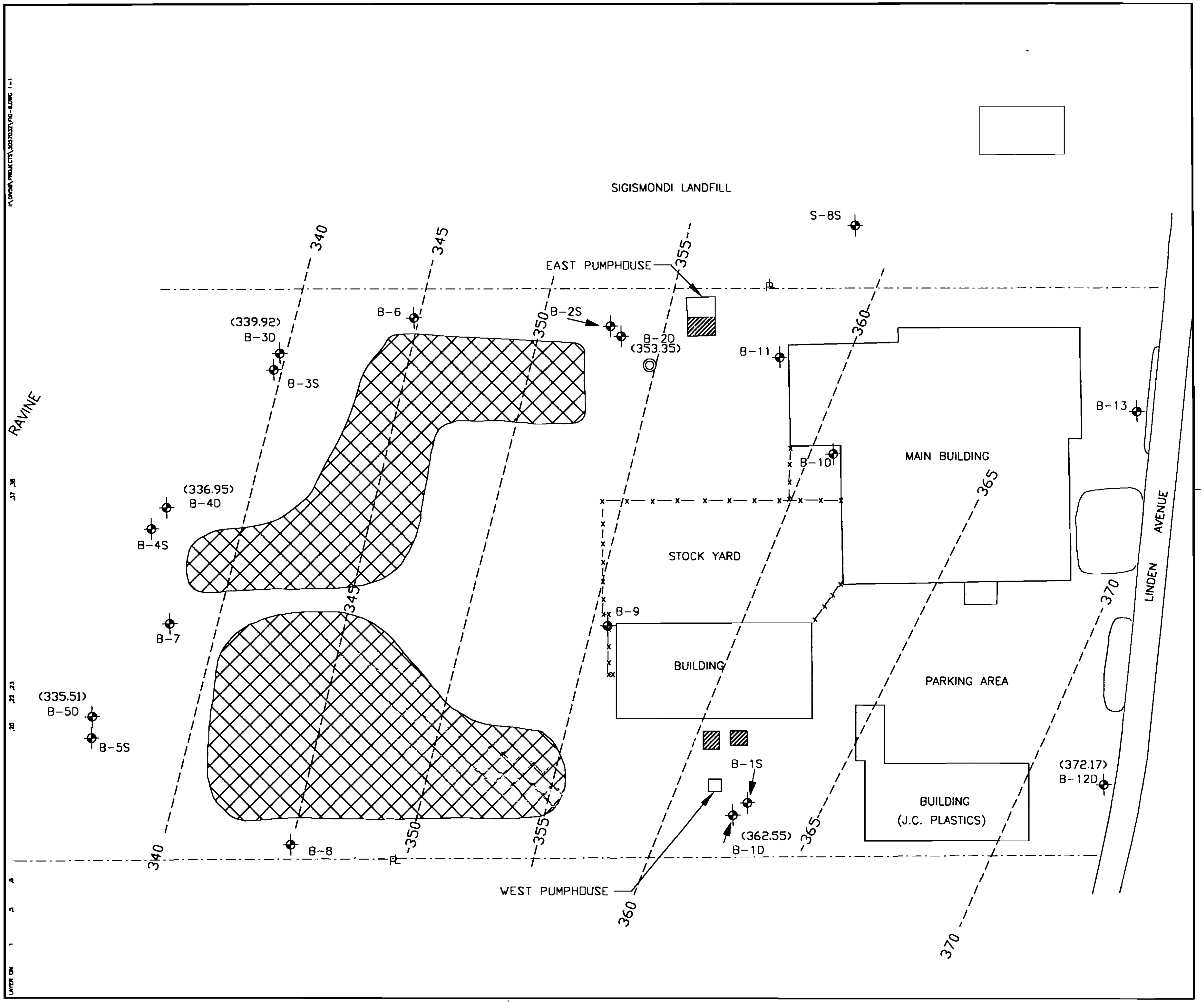


FIGURE 6

LEGEND

PROPERTY BOUNDARY

FORMER WATER IMPOUNDMENTS AS LOCATED BY AERIAL PHOTOS AND SOIL BORINGS

MONITORING WELL LOCATION

CEMENT FOUNDATION

CISTERN

-360- GROUND WATER ELEVATION CONTOUR

(353.35) GROUND WATER ELEVATION

FORMER ALCAN ALUMINUM CORP., SITE #828005
PITTSFORD, NEW YORK

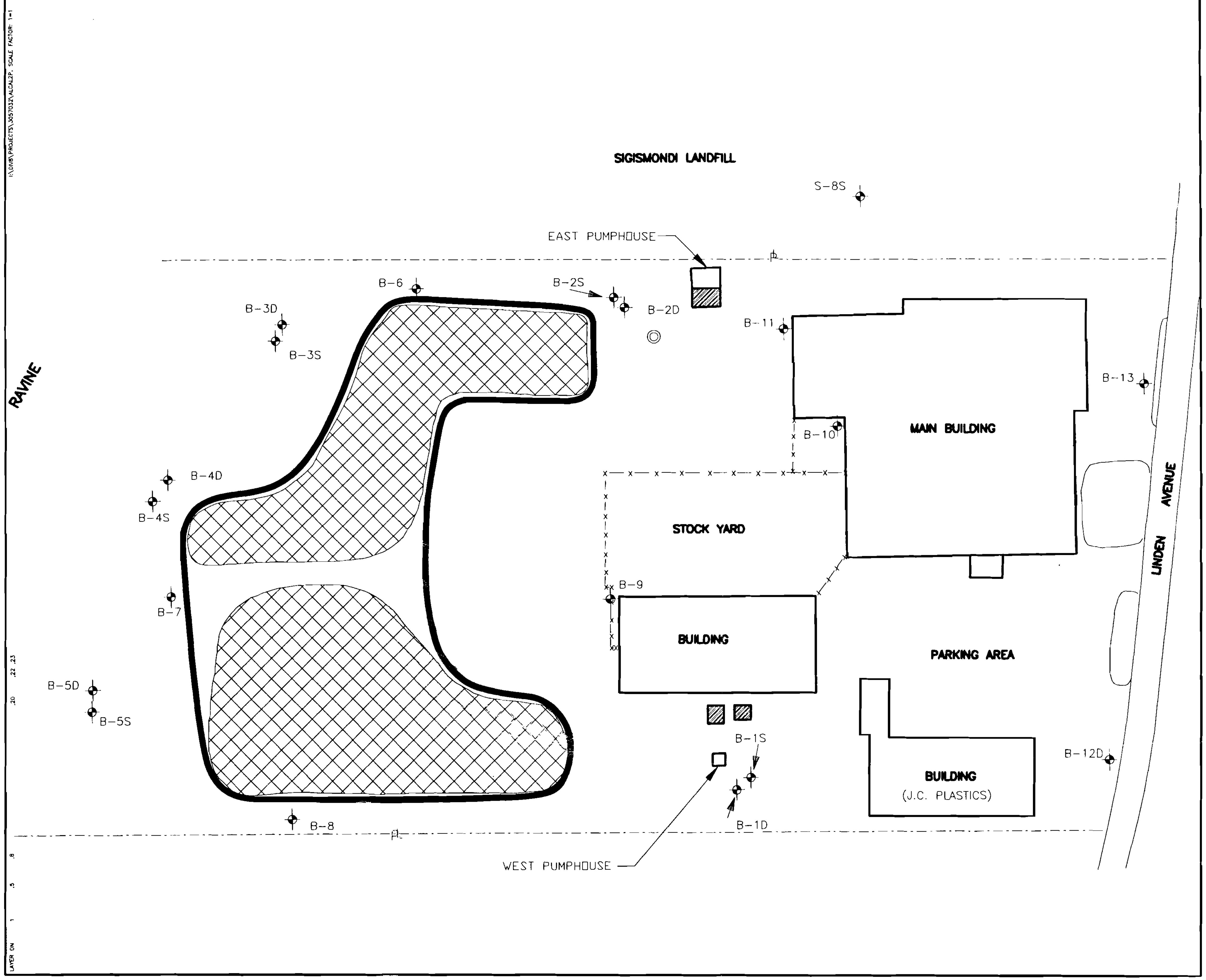
DEEP GROUND WATER ELEVATIONS 8/10/92

0 100 200
SCALE IN FEET

FILE NO. 3057.032-131

O'BRIEN & GERE ENGINEERS INC.

FIGURE 7



LEGEND

- PROPERTY BOUNDARY
- FORMER WATER IMPOUNDMENTS AS LOCATED BY AERIAL PHOTOS AND SOIL BORINGS
- MONITORING WELL LOCATION
- CEMENT FOUNDATION
- CISTERN
- LIMITS OF PROPOSED FENCE OR COVER

FORMER ALCAN ALUMINUM CORP.
SITE #828005
PITTSFORD, NEW YORK

LIMITS OF PROPOSED FENCE OR COVER

0 100 200
SCALE IN FEET

FILE NO. 3057.032-1??

O'BRIEN & GERE ENGINEERS INC.