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FINAL WORK PLAN
GILL CREEK REMEDIATION PROJECT
POST REMEDIATION MONITORING PLAN

Prepared for:
E.I. du Pont de Nemours and Company Inc.
26th Street and Buffalo Avenue
Niagara Falls, New York 14302
and
Olin Corporation
Lower River Road
Charleston, Tennessee 37310
July 1993

Woodward-Clyde

Woodward-Clyde Consultants
3571 Niagara Falls Boulevard
North Tonawanda, New York 14120
Project Number 22915 T104

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Project Number 92C2255-6

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Woodward-Clyde Consultants

July 9, 1993
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Dr. Ann Masse
E.I. du Pont de Nemours and Company, Inc.
26th Street and Buffalo Avenue
Niagara Falls, New York 14302

Mr. James Brown
Olin Corporation
Lower River Road
Charleston, Tennessee 37310

Re: Gill Creek Remediation Project
Post Remediation Monitoring Plan

Dear Dr. Masse and Mr. Brown:

Woodward-Clyde Consultants (WCC) is pleased to present the Final Work Plan for the Gill Creek Post Remediation Monitoring Program. The Work Plan has been revised based on comments in the letter from Dr. Ann Masse to Mr. Michael Hinton (NYSDEC), dated April 14, 1993.

Please advise if you have any additional comments regarding this Work Plan.

Very truly yours,

Martin S. Leonard, P.E.
Senior Project Engineer

James F. Roetzer, Ph.D.
Senior Associate

MSL/JFR:jee

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1.0
INTRODUCTION

1.1 PURPOSE AND SCOPE

E.I. du Pont de Nemours and Company (DuPont) and Olin Corporation (Olin) have jointly undertaken a remediation program involving removal of contaminated sediment along a portion of Gill Creek near its confluence with the Niagara River. This document presents a Work Plan for post remediation monitoring, outlining specific technical objectives, sample collection techniques, data analyses, and report deliverables.

Gill Creek flows in a generally southerly direction, traversing the Olin property between Buffalo and Adams Avenues, and passing through the DuPont property between Adams Avenue and the Niagara Mohawk Right-of-Way. The creek then passes under the Robert Moses Parkway Bridge and discharges to the Niagara River. During periods of low flow, the daily cycling of Niagara River levels, due to hydropower operations, causes reversal of flow direction in the southern reach of Gill Creek. The primary area of investigation for this study encompasses the reach of Gill Creek from Adams Avenue to its confluence with the Niagara River (see Figure 1-1). Background sampling will be conducted immediately south of Buffalo Avenue.

1.2 INVESTIGATION OBJECTIVES

Sediments accumulating in the subject reach of Gill Creek will be monitored over a period of 5 years. Utilizing the data collected from the monitoring program, an evaluation will be performed to identify if any potential recontamination of Gill Creek sediments is occurring. In addition, water column samples will be taken to monitor trends in Gill Creek water quality.

1.3 BACKGROUND

In 1981 and 1992, DuPont and Olin undertook programs to remediate contaminated sediments in the southern portion of Gill Creek. Contaminated sediments were

excavated from the creekbed and adjacent banks and removed. Areas addressed in these two remediation efforts are illustrated on Figure 1-2.

2.0
SITE DESCRIPTION

Gill Creek is a minor tributary to the Niagara River, flowing south from Hyde Park into the Niagara River approximately one half mile downstream of the Robert Moses Power Project water intakes. The section of Gill Creek south of DuPont Road crosses what was, in the past, a low marshy area bordering the Niagara River. This area was subsequently filled in, extending the creek and shoreline to the south.

Area 1

The creekbed from north of Staub Road to the Niagara River was designated as "Area 1". Sediments in this area were excavated to bedrock during the 1992 remediation because this area was not addressed in 1981. The post-remediation creekbed consists of crushed stone placed directly on the bedrock surface.

Area 2d

The creekbed between Adams Avenue and just north of Staub Road was designated "Area 2d" during the 1992 remediation. The creekbed in this area consists of compacted clay, from which surficial sediment deposited since the first remedial action (in 1981) was removed during the 1992 remediation. Some groundwater seepage was observed during the 1992 remediation in an area of the creekbed north of the railroad bridge, and as a result this area was covered with a layer of gravel over a flexible membrane liner (FML).

Area 3

The creekbed under the Adams Avenue Bridge, and extending about 50 feet downstream from the bridge, was designated "Area 3" during the 1992 remediation. This area was apparently not completely addressed during the 1981 remedial work, and as a result sediments were removed to bedrock during the 1992 remediation. Due to seepage observed in the area downstream from the bridge, an FML was placed across the creekbed and up the west side bank. This liner was covered with concrete on the bank,

and with clayey fill across the bed of the creek. The exposed bedrock under the bridge was covered with concrete, due to the difficulty of placing and compacting soil fill.

It is expected that, in future years, sediment will gradually accumulate on the compacted clay, concrete, and crushed stone surfaces of these remediated areas. These newly deposited sediments will be the primary target of this post-remediation monitoring program. In addition, water column samples will be taken to monitor trends in Gill Creek water quality.

3.0
SCOPE-OF-WORK

3.1 SAMPLING PROGRAM

3.1.1 Sampling Locations

Accumulated sediment will be sampled at five locations in Gill Creek. Sampling locations have been numbered 1 through 5, starting just south of Buffalo Avenue and ending at the Robert Moses Parkway (see Figure 3-1). Sampling locations are as follows:

Location	Description
1	Gill Creek - near mid-channel, just south of Buffalo Avenue - background location, upstream from the 1992 remediation area
2	Gill Creek - near west bank, approximately 50 feet south of Adams Avenue
3	Gill Creek - near mid-channel, south of the Railroad Bridge
4	Gill Creek - near west bank, south of Staub Road
5	Gill Creek - near west bank, just south of the Robert Moses Parkway eastbound lanes

The Gill Creek post-remediation sediment sampling program will address the five designated sampling locations based upon potential contamination sources, and physical (sampling) constraints. Three of the locations (number 2, 3, and 4) are targeted to be in the vicinity (downgradient) of observed areas of groundwater seepage. The purpose of these locations is to collect sediment which settles in the vicinity of these seepage areas. These sediments could be susceptible to contamination through sorption of

contaminants present in groundwater seepage (if it occurs).

Location 1 is a background location, south of Buffalo Avenue. One sediment sample will be collected at this location in order to characterize that portion of the creek which is affected by water and sediments from upstream sources, outside the influence of Olin and DuPont operations.

Location 2, downstream from Adams Avenue has been selected to monitor potential recontamination of sediments caused by groundwater seeps observed just downstream from Adams Avenue during the remediation activities. Special provisions (including placement of a flexible membrane liner) were incorporated into the remedial program to control these potential sources. This sampling location has been selected to evaluate the efficacy of these provisions.

Similarly, Location 3, downstream from the railroad bridge, has been selected to monitor potential recontamination of creek sediments by seeps located in the creek channel, just upstream from the railroad bridge.

Location 4, downstream from Staub Road, near the west bank of the creek, has been selected to monitor potential recontamination of sediment by seeps observed along the west bank, just upstream from the Staub Road crossing.

Location 5, downstream from the Robert Moses Parkway was selected near the downstream limit of the remediation (sediment removal) project. At this location, sediments may be deposited from upstream sources in Gill Creek, as well as from the Niagara River during period of reverse flow. Quantifying the relative amounts of sediment from each source will not be possible.

In addition to the sediment samples taken at these five locations, water column samples will be taken at Locations No. 1 and No. 4. Location No. 1 will reflect water quality in the creek as it enters the remediated area. Location No. 4 will provide information on potential impacts on water quality as the creek flows through the remediated area.

3.1.2 Sampling Methodology and Analysis

The proposed sediment sampling technique will be similar at each location, and will consist of the use of sediment traps. The purpose of the sediment traps is to collect settling suspended matter, and to maintain a clear separation between the newly deposited sediments and the current creekbed materials.

Sediment traps will be constructed of approximately 8-inch diameter stainless-steel cylinders with open tops and closed bottoms. The traps will be approximately 6 inches in height, and will be placed so that the open tops are approximately 6 inches above the creekbed. This placement will allow the traps to collect settling suspended matter, while minimizing the collection of bed load, debris and the current materials making up the creekbed (compacted clay and crushed stone). In the event that excessive quantities of debris collect in the traps, coarse screens will be placed over the open tops.

The sediment traps will be designed and installed to resist movement due to hydraulic forces. Initially, two traps will be placed at each sampling location. Traps will be checked quarterly to verify that they have not been lost, and that sediment is accumulating at acceptable rates. If inadequate sediment volume is accumulating, additional traps may be installed to increase the volume of sediment collected.

One year after initial placement, the traps will be removed from the creek to extract collected sediment. Water from the upper portion of the cylinders will be decanted, and sediments will be transferred to pre-cleaned laboratory containers for subsequent analyses. Depending on the amount of sediment collected, this process will be repeated annually, or every other year, for a period of 5 years after initial placement of the sediment traps.

Water column grab samples will be taken just prior to removal of the sediment traps, to avoid the potential for influence by disturbed sediment.

All samples will be analyzed for the compounds listed in Table 3-1. It should be noted that the seepage identified in Area 3 exhibited high concentrations of chlorobenzenes. The chlorobenzenes may have originated at the Solvent Chemical Site.

In the event that insufficient sample volume is obtained at any location, the priority for analyses will be:

- % Solids determination
- PCBs, BHCs, and QA/QC samples
- Volatiles and QA/QC samples
- Base/neutrals and QA/QC samples
- Mercury and QA/QC samples

All samples to be analyzed, all QA/QC samples, and the proper chain-of-custody forms will be shipped to a NYSDOH-approved CLP analytical laboratory. Analytical methods and QA/QC requirements will be in accordance with SW-846 protocols. Table 3-2 summarizes analytical procedures to be used for all samples. Table 3-3 summarizes required deliverables to be included in the laboratory reports.

Sampling events will occur either annually, or every other year, after completion of the remediation program, depending on the rate of sediment deposition in the traps.

3.2 REPORT PREPARATION

Upon receipt of laboratory data from each of the sediment sampling events, comparisons with background data and prior sampling events will be performed. These comparisons will be in graphical form, to portray variations of contaminant concentrations over time at each location, and spatially for each sampling event. Following completion of these comparisons, interim reports will be prepared describing all analytical results obtained to date, and identifying any trends (spatial or over time) which might indicate potential recontamination of the subject reach of Gill Creek.

In addition, each interim report will include an evaluation of groundwater flow in the vicinity of the Gill Creek remediation area, to determine if there is a significant flow of contaminated groundwater into the creek. This evaluation will include groundwater level data from the two groundwater monitoring wells installed north of Adams Avenue during the remediation project, and groundwater level data collected from other on-site wells while the DuPont groundwater treatment system is in operation.

At the end of the 5 year monitoring period, a final report will be prepared which will document and summarize the post-remediation data, and present conclusions regarding the status of creek sediment contamination.

4.0
PROJECT SCHEDULE

Assuming NYSDEC approval of this Work Plan, it is expected that field activities will be performed during the 1993 (initial trap placement), and 1994 field seasons, and annually or bi-annually thereafter through 1998. Interim and Final Reports will be submitted to the NYSDEC within 60 days of receipt of laboratory analytical results.

Tables

TABLE 3-1

INDICATOR PARAMETER LIST
GILL CREEK POST-REMEDIATION MONITORING PROGRAM

Volatiles

Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Chloromethane
1,1-Dichloroethane
1,1-Dichloroethylene
trans-1,2-Dichloroethylene
cis-1,2-Dichloroethylene
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Tetrahydrothiophene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Vinyl chloride

Inorganics

Mercury

Base/Neutrals

1,4-Dichlorobutane
bis(2-Ethylhexyl)phthalate
1,2-Dichlorobenzene
1,4-Dichlorobenzene
Hexachlorobutadiene
Hexachloroethane
Naphthalene

Pesticides/PCBs

alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Total PCBs

TABLE 3-2

SUMMARY OF QC SAMPLING AND ANALYSIS PLAN
POST-REMEDIATION MONITORING
DUPONT - GILL CREEK PROJECT
NIAGARA FALLS, NEW YORK

Sample Matrix	Laboratory Parameter	Method	Investigative Samples[1]	QC Samples		
				Field Duplicates[2]	Trip Blanks	MS/MSD[3]
Sediment	PCBs and BHCs	8080	5	1		1/1
	Volatiles	8010	5	1		1/1
	Mercury	7471	5	1		1/1
	Base/neutrals	8270	5	1		1/1
Water	PCBs and BHCs	8080	2	10%		10%/10%
	Volatiles	8010	2	10%	1	10%/10%
	Mercury	7471	2	10%		10%/10%
	Base/neutrals	8270	2	10%		10%/10%

Notes:

1. Per round of sampling.
2. A sediment field duplicate will be taken at a predetermined location, at which two additional sediment traps will be deployed. For water samples, 10 percent (or one for the entire program assuming five annual events) field duplicates will be collected.
3. MS/MSD - Matrix spike/matrix spike duplicate for organics and a matrix spike/laboratory duplicate sample for inorganics. For water samples, 10 percent (or one each for the entire program, assuming five annual events) MS/MSD will be collected.

TABLE 3-3

REQUIRED DELIVERABLES FOR THE GILL CREEK POST-REMEDIATION MONITORING PROGRAM

- Case narratives
- Date of sample collection
- Date of sample receipt
- Date of sample extraction/digestion
- Identification of method(s) used for preparation
- Identification of method(s) used for analysis
- Identification of method(s) used for cleanup (if required)
- Method detection limits or practical quantitation limits (PQLs)
- Sample dilution factor
- Dates of analyses
- Definition of surrogates
- Recovery of surrogates
- Matrix spike/matrix spike duplicate and MS/laboratory duplicate recoveries
- Instrument blanks
- Method blanks
- QC check sample data
- A table comparing all QC data to QC acceptance criteria

The case narrative will describe any and all QA/QC problems encountered during analysis of the samples. For each sample for which QA/QC problems are encountered, the following specific information will be reported in the case narrative:

- Sample identification number
- Data with outlying quality control
- Specific analytical problems that occurred
- The corrective action that was taken or attempted to resolve the problem

Figures

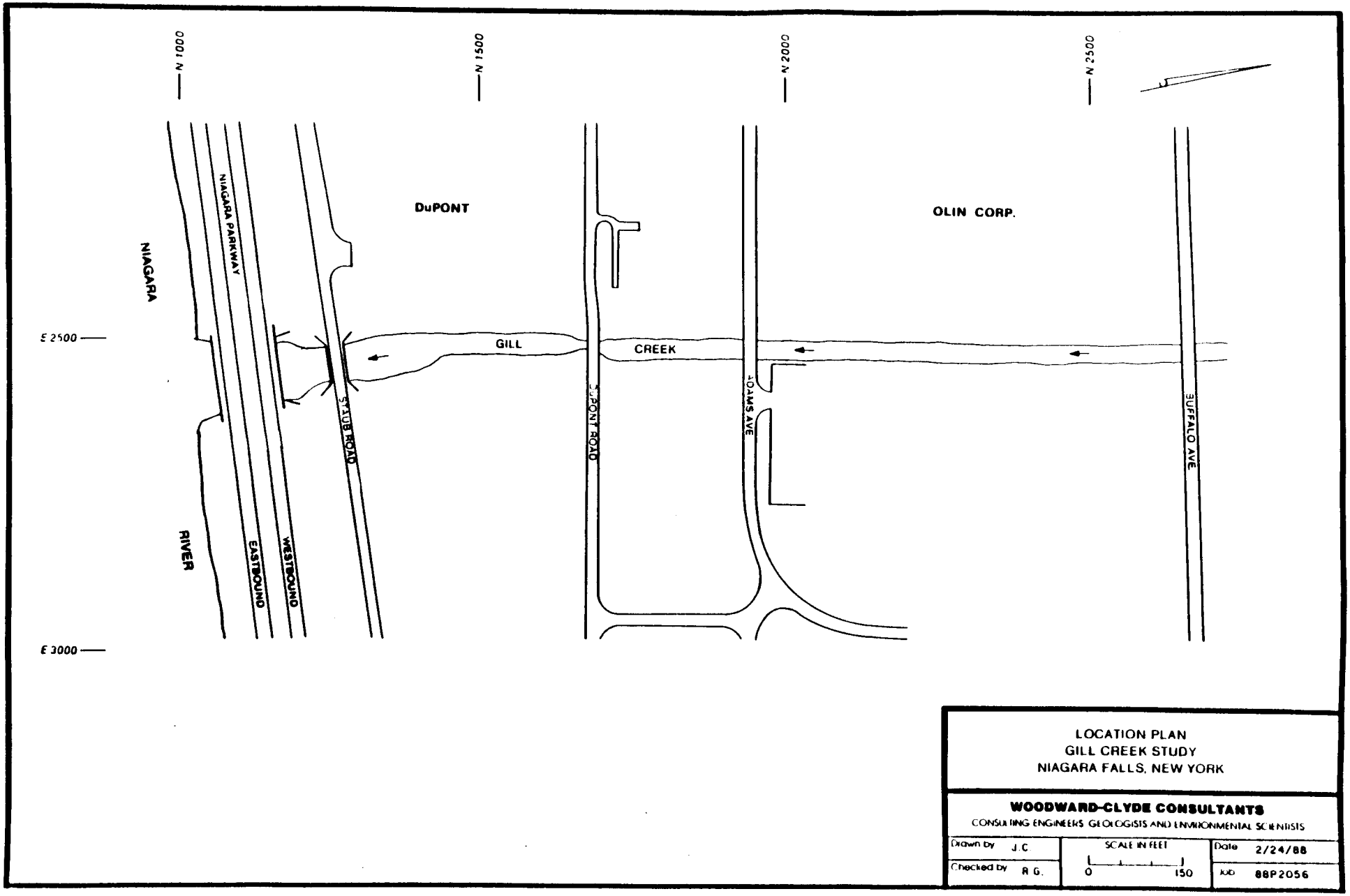
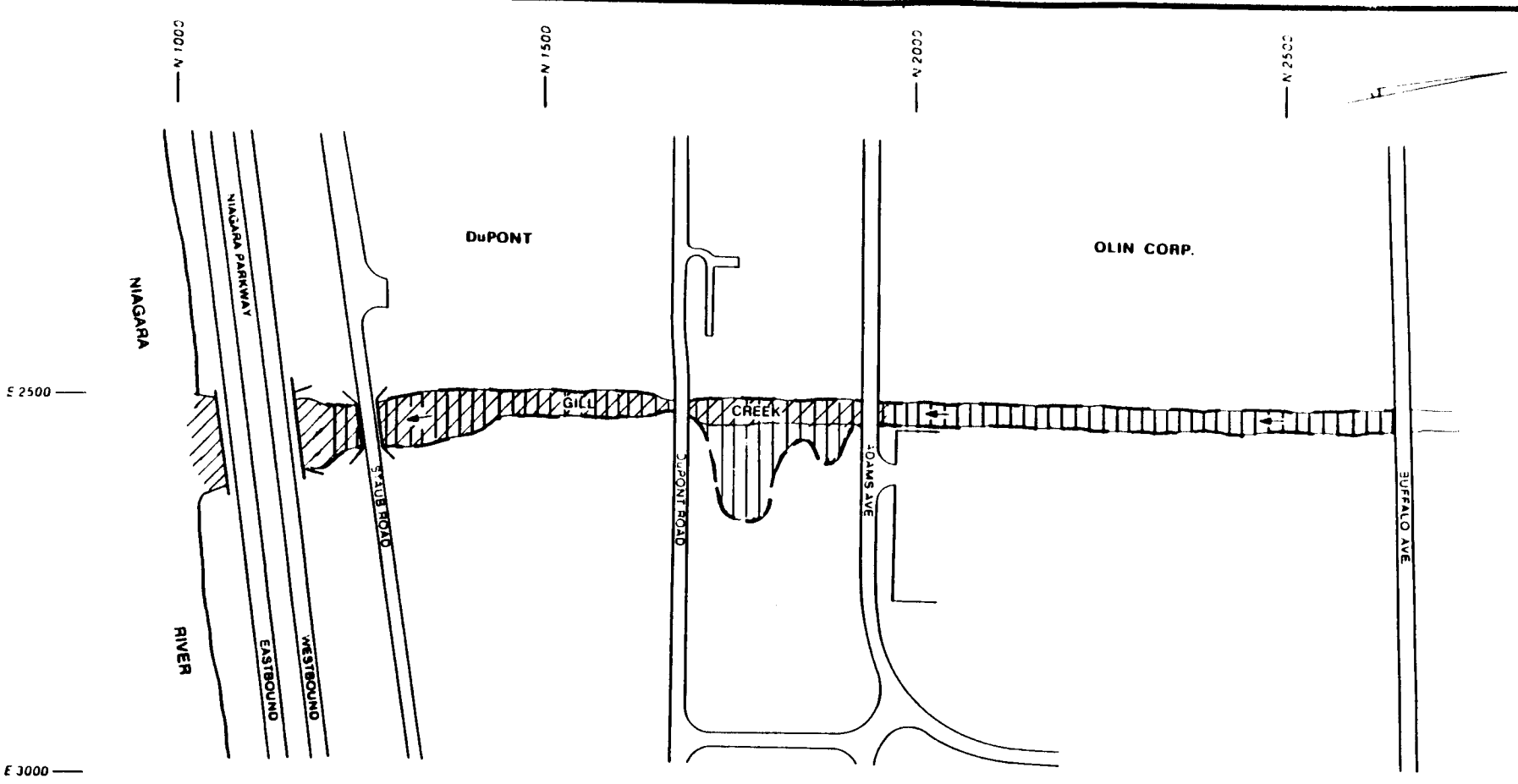

N 1000
N 1500
N 2000
N 2500
E 2500
E 3000
NIAGARA
RIVER
NIAGARA PARKWAY
EASTBOUND
WESTBOUND
STAUB ROAD
DuPONT
GILL
CREEK
DuPONT ROAD
JOHNS AVE
OLIN CORP.
BUFFALO AVE
LOCATION PLAN
GILL CREEK STUDY
NIAGARA FALLS, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
Drawn By J.C
Checked By R.G.
SCALE IN FEET
0
150
Date 2/24/88
Job 88P2056

FIGURE 1-1



GILL CREEK REMEDIATION SUMMARY
NIAGARA FALLS, NEW YORK

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

Drawn By J.C.	SCALE IN FEET 0 150	Date	2/24/88
Checked by R.G.		W.O.	88P2056

FIGURE 1-2

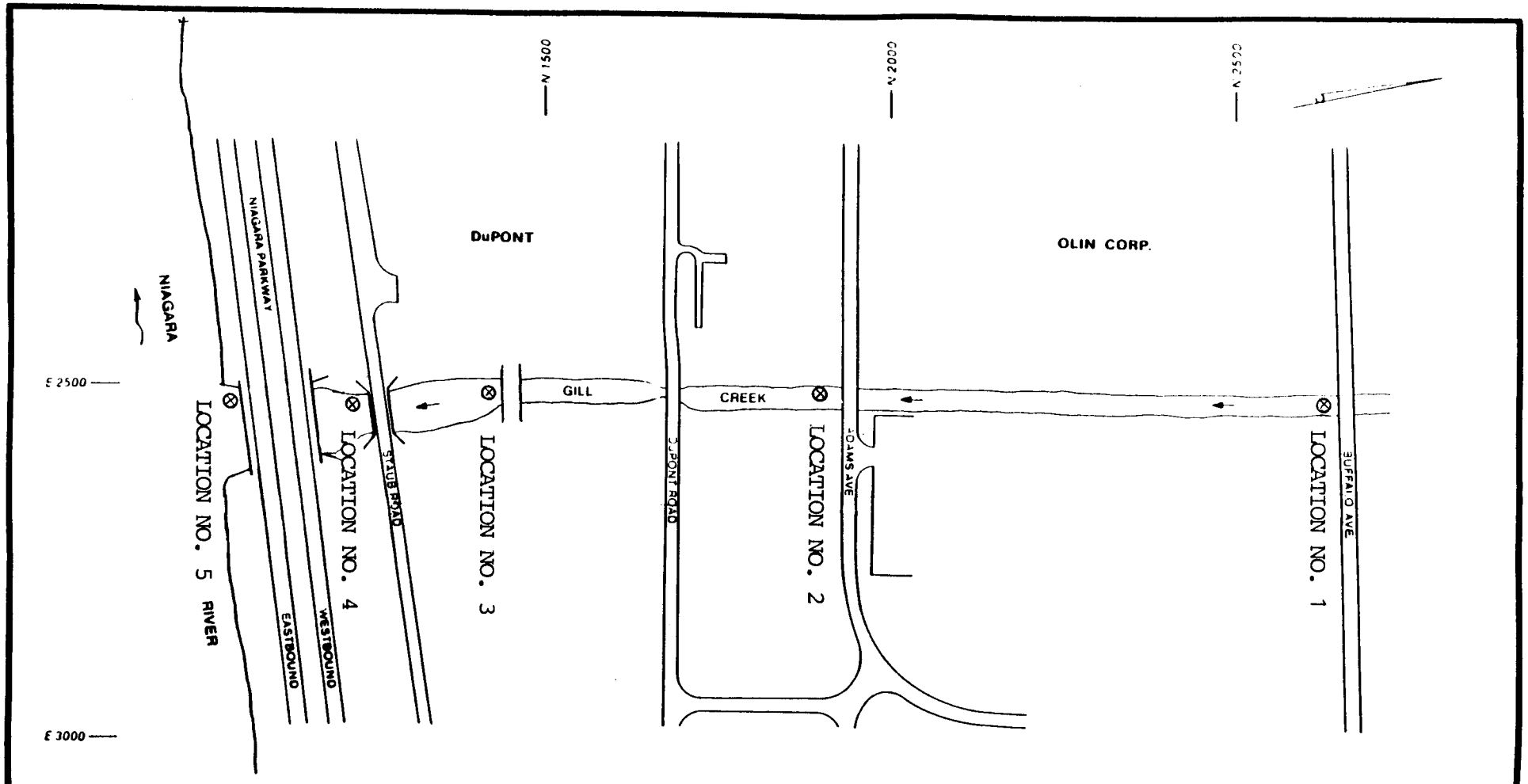

N 1500
N 2000
N 2500
DuPONT
OLIN CORP.
NIAGARA
E 2500
E 3000
NIAGARA PARKWAY
EASTBOUND
WESTBOUND
STAUB ROAD
GILL
CREEK
DUPONT ROAD
ADAMS AVE
BUFFALO AVE
LOCATION NO. 5
RIVER
LOCATION NO. 4
LOCATION NO. 3
LOCATION NO. 2
LOCATION NO. 1
LEGEND:
SAMPLING LOCATIONS
SAMPLE LOCATION PLAN
GILL CREEK STUDY
NIAGARA FALLS, NEW YORK
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
Drawn By J C
Checked by R G
SCALE IN FEET
0
150
Date 2/24/88
88P2056

FIGURE 3-1