Bill

Olin CHEMICALS

P.O. BOX 248, 1186 LOWER RIVER ROAD NW, CHARLESTON, TN 37310
Phone: (615) 336-4000

July 28, 1995

Mr. Andrew Bellina
UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY
Emergency & Remedial Response Division
26 Federal Plaza
New York, New York 10278

Mr. Paul R. Counterman, P.E.
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
Division of Solid Waste Management
50 Wolf Road
Albany, New York 12233

Dear Messrs. Bellina and Counterman:

Re: CMS Addendum
Phase II Corrective Measures Study
Olin Buffalo Avenue Plant

This is in reference to the Olin Chemicals Phase II Corrective Measures Study (CMS) for its Buffalo Avenue Plant, submitted to the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) on March 29, 1995. The Agencies presented comments on the CMS to Olin in a letter dated June 5, 1995. These comments have been addressed in discussions between Olin and the agencies in a teleconference of June 19, 1995, and are described below. In accordance with these discussions, the CMS itself will not be revised, but an Addendum will be attached to the CMS. This letter and its attachments comprises the CMS Addendum.

Resolution of each comment is described below, numbered in accordance with the USEPA/NYSDEC June 5, 1995 letter. The June 5, 1995 letter is attached for reference (Attachment I).

1. Olin agrees to assess contaminant loading from the Buffalo Avenue Plant to the Buffalo Avenue sewers and the sewer along the east side of Gill Creek. Based on our information, the Buffalo Avenue diversion sewer discharges to the Niagara River without treatment and the Buffalo Avenue sanitary sewer and the sewer along the east side of Gill Creek discharge to the Niagara Falls Wastewater Treatment Plant. The results of this assessment are included as Attachment II.

2. Figure 3.2 does not require revision given the dewatered conditions in the A-Zone near Buffalo Avenue.

3. The bedrock completion data for monitoring wells OBA-18A and OBA-19A were presented in the CMS on a separate page from the overburden data. The bedrock data for the wells is attached for your information (Attachment III).

4. One year of quarterly sampling of the Olin production wells (prior to treatment) for total mercury was conducted as part of the RCRA Facility Investigation (RFI). Results of these analyses are listed below:

	Total Mercury Concentration (mg/L)
Third Quarter 1991	0.3
First Quarter 1992	ND (0.2)
Second Quarter 1992	0.3
Third Quarter 1992	ND (0.2)

Note:
ND ( ) Not Detected (Detection Limit)

This suggests that the data reported by Harza Engineering in 1979 may have been anomalous, or that mercury concentrations in groundwater have been reduced by remedial pumping which has been ongoing since that initial reporting of data.

5. Olin agrees to evaluate the impacts of the Olin production wells on B-Zone groundwater flow in conjunction with performance monitoring of the proposed B-Zone recovery system. As noted in the Corrective Measures Study, additional B-Zone wells are planned for the performance monitoring program.

6. The historic potentiometric surface data documenting the presence of upward hydraulic gradients are included as Attachment IV.

7. The source of contamination in the area east of Gill Creek remains a point of some disagreement. However, as noted in the Corrective Measures Study, and as noted in response to item #15, below, Olin will monitor wells located in this area as part of the remedial performance monitoring.

8. Olin agrees that any potential need for expanded Plant 2 coverage in the B-Zone will be based upon data developed as part of the remedial performance monitoring. The remedial performance monitoring has been enhanced, per Olin's response to comment #15 below and will be fully presented in the Remedial Plan.

9. Olin agrees to the general goals for corrective action as presented in the Agencies June 5, 1995 letter if it is understood that the objectives apply solely to Olin-derived hazardous waste constituents.

10. The requested evaluation (evaluation of need for remedial measures to address the soil fill which was placed into basements of several buildings in Plant 1) is included as Attachment V.

11. The Remedial Plan will include a long-term cap maintenance program.

12. Olin agrees to include the bottom-of-well depth specification in the Remedial Plan.

13. Olin agrees that additional active A-Zone capture might be necessary, and, as stated in the CMS, the passive relief wells may be converted to pumping wells if necessary.

14. Olin acknowledges the Agencies' statement that any treatment plan will be in compliance with all necessary permits. The system capacity will allow for expansion if necessary.

15. Olin agrees with the suggested enhancements to the hydraulic and chemical monitoring performance program. The full program will be presented in the Remedial Plan,

16. Olin agrees to submit quarterly reports for the first two years of system operation, and acknowledges that the reporting schedule may revert to semiannual thereafter.

17. Per discussions with the Agencies, Olin agrees to the Termination of Recovery language insofar as the termination criteria provided apply solely to Olin-derived hazardous waste constituents.

18. The U qualifier on Figures 3.3 and 3.4 indicate the chemical was not detected. The number preceding the U qualifier is the detection limit for the analysis.

19. Olin agrees that the Groundwater Standard is 2 ppb for total mercury.

20. Five recovery wells are shown on Figure 4.1. RW-1 is located along Alundum Road in the central portion of the Plant. RW-2 is at the location of OBA-20AB and RW-3 is at the location of OBA-17AB. RW-4 and RW-5 are located along Gill Creek south of RW-3. However, only four passive relief wells are shown. The passive relief well (PR-3) to be located midway between RW-2 and RW-3 and was inadvertently omitted from Figure 4.1.A corrected figure will be included in the Remedial Plan.

21. The new monitoring wells (OBA-22A and 22B) were located to:

    i) provide data on the extent of hydraulic containment northwest of the ARGC Area; and

    ii) to monitor groundwater chemistry northwest of the ARGC Area.

    Addition of these wells will improve the monitoring well network in this area of the Plant.

22. The Gill Creek stage elevation shown on Figure 3.6 should be 562.47.

23. Conventional parameter monitoring will be considered if determined to be appropriate based on the system performance monitoring.

Further Issues:

At the teleconference meeting of June 19, 1995, the Agencies requested that Olin proceed with remedial plans on a fast-track, so that the remedial system may be started up by the end of 1996. Olin agrees to make a good faith effort to meet that timetable goal. To this end, Olin has initiated our Treatability Study for the pumped groundwater. However, as the Agencies are aware, there are technical and regulatory issues relating to treatment and discharge of pumped groundwater which must be resolved before Olin commits to any schedule. Olin currently is working on the resolution of those issues by pursuing several treatment / discharge options as part of the Treatability Study.

Regarding the implementation of remediation at the Olin Niagara Falls Plant Site, the Agencies are aware that Olin already has initiated paving activities as part of the site Soil Management strategy. In fact, all of the Plant 1 area and most (approximately 75%) of the Plant 2 area has been paved. Paving of the remainder of Plant 2 is planned and will be completed per remedial objectives.

Please direct any questions to me at 615\ 336-4587.

Sincerely,

Michael J. Bellotti

Michael J. Bellotti
Senior Associate Hydrogeologist

cc:
J C Brown - Olin
L E Murray -Olin
J Frye - Olin
A Houston - Olin
M L Fries Esq.- Husch & Eppenberger
William Wertz - NYSDEC Albany
Stanley Radon - NYSDEC Buffalo
Michael Hinton -NYSDEC Buffalo
Philip Masters: USEPA Region II
Kelly McIntosh: Connestoga-Rovers, Inc.
Annette Sansone, Esq.: NYSDEC:Region 9, Buffalo, NY
James Reidy: USEPA Region II: New York, NY
Matt Forcucci: NYSDOH : Buffalo, NY

ATTACHMENT I

NYSDEC AND USEPA COMMENTS ON THE PHASE II CORRECTIVE MEASURES STUDY (LETTER DATED JUNE 5, 1995)

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7251
518-457-9236 FAX 518-457-9240

Michael D. Zagata
Commissoner

June 5, 1995

Mr. Michael J. Bellotti, P.G.
Senior Associate Hydrogeologist
Olin Chemicals
P.O. Box 248
Lower River Road
Charleston, TN 37310

Re: Phase II Corrective Measures Study
Olin Buffalo Avenue Plant

Dear Mr. Bellotti:

The New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) have reviewed Olin's Phase II Corrective Measures Study (CMS) which was submitted on March 31, 1995. Although the Agencies believe that the recommended measures could form a major part of the long-term remedial program for the facility, we disagree with some of the conclusions of the report. Additional evaluation of site conditions is needed before the Agencies can approve the CMS. We have the following comments on the Report:

Site Investigations

Groundwater Flow - Sewers

1. The Agencies agree with Olin's conclusions that the sewers along Buffalo Avenue and the East side of Gill Creek appear to be intercepting groundwater flow in the A and B Zones. As part of the CMS, Olin must evaluate the environmental impacts associated with groundwater infiltration into the Buffalo Avenue Sewers. (What is the contaminant loading to the sewer and where do the sewers discharge?)

2. Figure 3.2 should be revised to reflect the assumed discharge of groundwater into the sewers.

3. If OBA-11A was dry, as stated on page 12 of the report and if OBA-18A was dry, as stated on page 15 of the report, why does Figure 3.2 include groundwater elevation data, 561.07 ft and 560.66 ft, respectively, from the wells? Furthermore, the stated water level elevation for OBA-18A is more than two feet beneath the base of the well (562.95) as described in the well log in Appendix A.

   Why were wells OBA-18A and OBA-19A terminated at the bedrock surface (562.95 feet, and 561.64 feet, respectively)? Well OBA-11A, which is in the same vicinity, was installed to a depth of 559 feet(3.2 ft beneath the bedrock surface), and had a water level elevation of 561.07 feet. It should have been obvious to the engineer or geologist performing oversight of the well installation that OBA-18 would in all likelihood be dry. Both wells must be deepened to at least 559 feet and resampled so that a more meaningful understanding of groundwater flows and groundwater quality can be developed for Plant 1.

4. At the October 11, 1994 meeting between Olin and the Agencies, we expressed our concern regarding historical Mercury groundwater contamination which had been observed at Plant 1 and which was described in the "Ground Water Quality Investigation at Olin Corporation's Plant Number 1, Niagara Falls, New York" (Harza Engineering, November 1979). Historical data indicate the presence of up to 223 ppb of Mercury in samples from the Olin production well, and average mercury concentrations of 13,000 ppb of Mercury in samples(20) obtained from water which was collected from an abandoned Plant 1 sewer (2CW). We believe that the information is pertinent. We assumed that Olin would evaluate and discuss the significance of that data in the CMS; however, there is no mention of the information in the CMS.

B-Zone Hydraulics

5. As we have stated in the past, we disagree with Olin's conclusion regarding the effect of the Olin Pumping well on

the B-Zone groundwater flows. The conclusion that B-Zone capture extends to the central portion of Plant 2 is based upon an analysis of groundwater level measurements obtained only from the Olin Plant Site. Based upon the more comprehensive groundwater level measurements which were obtained from the Olin site and surrounding facilities (7/28/94), the Olin production well appears to have very little effect on groundwater flow in the B-zone (see Figure 4.65 of the RCRA Facility Investigation Report (RFI)).

The effectiveness monitoring program must include sufficient data to unambiguously demonstrate the extent of the capture zones associated with the existing pumping wells and with the additional pumping wells which have been proposed as part of the site remedy.

Deep Bedrock Hydraulics

6. Olin should present the historical potentiometric surface data from which it was concluded that CD Zone pumping created upward gradients in the deeper bedrock zones(page 21).

Extent of Olin Related Contamination

7. The Agencies agree with the statement on page 12 of the CMS that links the following groups of compounds with past Olin activities: methanol, benzene, chlorinated benzenes, chlorinated phenols, mercury and BHCs. We disagree, however, with the characterization of the extent of groundwater contamination attributable to Olin. As indicated by Figures 7-1 through 7-21 of the RFI, Olin related compounds have been observed over broad areas of Plant 1 and Plant 2.

The benzene ratios presented in Figures 8-4 through 8-6 of the CMS suggest that the contamination which has been observed in Olin monitoring wells east of Gill Creek may be associated with the neighboring Solvent Chemical site, but the Agencies remain convinced that some of the contamination is attributable to Olin. The A-Zone and B-Zone potentiometric surface maps presented in the RFI (Figures 4-64, and 4-65) clearly indicate that groundwater flows from the ARGC Area toward the northeast corner of the site. Also, the presence of substantial concentrations of BHCs in areas east of Gill Creek is difficult to attribute to a source

other than the Olin facility.

We also question the current usefulness of benzene ratios as a mechanism for determining the source(s) of the observed contamination. As can be seen by comparing the attached Figure 4-6 and Figure 4-7 (Significant Volatiles and Semivolatiles in Composite Soil Samples)[1] , with the Solvent Chemical groundwater data which Olin used in Figures 8-1 through 8-6 of the CMS, there appears to a significant disparity between the abundance of 1,2,4-trichlorobenzene in the Solvent Chemical soils and its concentration in the groundwater. It is possible that differences in the solubility and the degree of transport retardation among the various chlorinated benzenes may affect the ratios of the compounds as they migrate from their respective sources. A more detailed analysis of these issues, including the collection of additional data would be needed to support decisions based upon the use of benzene ratios.

In the future, the Department will initiate a meeting with representatives from Olin, Solvent Chemical and DuPont to discuss these issues in the context of developing a remedy for the groundwater contamination in the northeast corner of Plant 2.

Corrective Measures Components

Areas Requiring Remediation

8. As stated in our letter of November 4, 1994, the CMS should address Olin-related contamination throughout Plant 1 and the part of Plant 2 which is west of Gill Creek. Unfortunately, the "Groundwater Remediation Area" depicted on Figure 2.2 of the CMS does not include all of those areas. Olin may need to expand the geographic extent of the proposed B-Zone recovery well network to address the Olin-related B-Zone contamination which has been observed to the west of Alundum Road. The need for expanded Plant 2 coverage

---

[1]*November 1990 "Remedial Investigation Report for the 3163 Buffalo Avenue Site, Niagara Falls, New York" which was prepared by ecology and environment, inc.*

will be based upon data developed as part of the remedial effectiveness monitoring program. The need for Plant 1 coverage cannot be assessed until the tasks discussed in comments 3 and 4 above have been satisfactorily addressed.

Corrective Measures Objectives

9. As the Agencies stated in our April 4, 1994 letter to Olin:

In the future, when Olin revises the CMS workplan, the Goals for Corrective Action should include:

"To reduce the concentration of hazardous waste constituents within the groundwater at the Buffalo Avenue Plant over time to acceptable State and Federal levels consistent with the use of the property and adjacent property".

"To restrict off-site migration of Olin-derived hazardous waste constituents in Bedrock and Overburden groundwater"

"To restrict unpermitted discharge of Olin derived hazardous waste constituents from the groundwater to the sanitary sewers and SPDES outfalls.

<u>Goals for corrective action</u> - An acceptable definition of the word "restrict" as used in the CMS is "to eliminate significant off-site discharge or migration of Olin-derived hazardous waste constituents that pose threats to human health and the environment to the maximum extent possible or technically feasible.

Based upon our understanding of the discussion which took place at the meeting of October 11, 1994, Olin has made a verbal commitment to develop a comprehensive remedial program to address soil and groundwater contamination associated with Olin's past activities throughout Plant 1, and for that part of Plant 2 which is west of Gill Creek.

In light of those previous comments, the groundwater remedial objectives specified on page 31 of the CMS report are unacceptable.

Soils Remediation

10. On October 13, 1994, the NYSDEC permitted Olin to use the stockpile of previously excavated soils to fill in the foundations of former buildings 137, 138, and 139. As a condition of that approval the NYSDEC explicitly stated that:

> *When performing the RCRA Corrective Measures Study for the Niagara Falls Plant, Olin must also perform a specific evaluation of the need for remedial measures to address the materials which were placed into buildings 137, 138 and 139. As part of that study, Olin may have to perform additional characterization of the fill. Depending upon the results of the Study, Olin may be required to perform additional remedial measures to mitigate any unacceptable risks posed by the presence of the fill.*

Olin has failed to incorporate the required evaluation into the CMS. It must be included in the revised CMS.

11. Olin must develop a long-term "cap" maintenance program as part of any soil remedy which relies on pavement or soil covers.

Groundwater Remediation

12. Because the elevation of the presumed position of the B-Zone fracture varies substantially across the site and is not entirely consistent with respect to its separation from the uppermost zone of 100% water loss, (compare OBA-16B with OBA-17AB), we believe that the screened interval of the recovery wells should extend to at least an elevation of 550 ft. to create adequate capture of B-Zone groundwater.

13. Based upon the results of the pump test, the Agencies question whether the spacing of the pumping and "passive relief wells" will be sufficient to effectuate A-Zone containment to the necessary extent. The need for additional recovery wells will be based upon the performance monitoring data.

Groundwater Treatment

14. From the Agencies perspective, any of the treatment technologies described in the CMS are acceptable as long as Olin can treat the groundwater in compliance with any

necessary SPDES, POTW and NYSDEC Air Permit. Olin should proceed with selection of a treatment system and should expedite the implementation of any treatability studies which may be needed to select the most appropriate treatment option.

Because the proposed recovery well network may not be sufficient to achieve the remedial objectives, the treatment plant should be designed to allow for future capacity expansion in the event that the planned excess treatment capacity is insufficient.

Performance Monitoring

15. The performance monitoring program is not sufficiently comprehensive. At a minimum, the performance monitoring program must include the following components:

Hydraulic Monitoring - The following monitoring wells shall be used to monitor the hydraulic effectiveness of the Interim Corrective Measures for the first two years of remedial system operation: All Olin A-Zone, B-Zone, and C-Zone Wells, plus DuPont Well clusters 20 and 22.

In addition, Olin should, to the extent practicable, coordinate the hydraulic monitoring program with the monitoring programs at the DuPont and Solvent Chemical facilities.

Hydraulic containment will be evaluated by use of potentiometric surface maps derived from "point in time" data. The hydraulic monitoring program will involve both instantaneous and continuous water level monitoring. Instantaneous water level monitoring will be obtained manually by measuring the extraction and monitoring wells. The instantaneous monitoring will be conducted on a monthly basis during the first 24 months of system operation. Thereafter, the frequency of monitoring will be modified as appropriate; however, the frequency of hydraulic monitoring shall be no less than quarterly.

Continuous hydraulic monitoring using automated recorders will be performed on the extraction and selected monitoring wells. Continuous monitoring will be performed over a 24

hour period on each operational extraction well and on selected monitoring wells during the initial extraction well evaluation program. Thereafter, continuous monitoring will be performed as necessary to more clearly determine whether hydraulic containment has been achieved.

If, as discussed on page 44 of the CMS, the response to pumping results in an anisotropic distribution of the potentiometric surface, additional monitoring wells may be needed to demonstrate that the capture zone is sufficiently extensive.

Chemical Monitoring - The following monitoring wells shall be used to monitor the groundwater quality for the first two years of remedial system operation: All Olin A-Zone, B-Zone, and C-Zone Wells, plus DuPont Well clusters 20 and 22.

Each of these shall be sampled twice during the first year of system operation (6 months apart) for the list of parameters specified on page 47 and 48 of the CMS. These results will be retained as a historical data base.

For the second year of system operation, Olin may, with the approval of the Department, reduce the list of analytes and monitoring wells. Each of the wells shall be sampled twice during the second year (6 months apart) for the Reduced Parameter List. Thereafter, the chemical monitoring program will follow the recommendations of the approved Olin Performance Report.

Reporting

16. For the first two years, Olin should submit quarterly reports which describe the results of the system operation, including pertinent monitoring data. Thereafter, semi-annual reports may be permissible.

Termination of Groundwater Recovery

17. The structure of the termination criteria which Olin has proposed (page 51) is unacceptable.

Olin must petition the Department for approval to shut down a groundwater recovery system and/or well. Termination of pumping at any one or more of the recovery wells will be

permissible when "Termination Criteria" (a) and (b) described in **Attachment B** herein are met in the area and aquifer(s) associated with the well(s).

Minor Comments

18. Section 3.1.1.3: The units shown in Figures 3.3 and 3.4 are confusing, and seem to be a combination of two separate units as described in the legends for these figures. The figures depict soluble mercury concentrations in wells, yet each value is followed by a "U", which in the legend means not detected.
19. The New York State Groundwater Standard for Mercury is 2 ppb total Hg, not soluble Hg.

20. Page 33: Reference to Figure 4.1 notes it contains the location of 5 recovery wells. Only four are actually shown.

21. Section 6.0 - Performance Monitoring: two new monitoring wells (OBA-22A and 22B) are listed and are shown on Figure 6.1. Rationale for the proposed location of these wells should be given in the report so their effectiveness can be maximized relative to the other monitoring wells Olin proposes to use for monitoring hydraulic containment.

22. Is the elevation of Gill Creek depicted on Figure 3.6 correct? Should it be 562.47 ft?

23. The data suggest that the head in OBA-17AB may be influenced by Gill Creek as well as the sewers. Olin should consider monitoring for some conventional parameters to help determine whether Gill Creek influences B-Zone groundwater chemistry in its vicinity.

The Agencies will soon be contacting you to set up a meeting to discuss these comments. Should you have any questions regarding these issues, please call William Wertz, Ph.D. of the NYSDEC at (518) 457-9255 or Philip Masters of the USEPA Region II at (212) 637-4180.

Sincerely,

Roger D. Murphy
for Paul R. Counterman, P.E.
Chief
Bureau of Western Haz. Waste Programs
Division of Haz. Substances Regulation

Roger D. Murphy
for Andrew Bellina, P.E.
Chief
Hazardous Waste Facilities Branch
U.S.E.P.A. - Region II

attachments

cc: S. Radon, Reg. 9
J. Reidy, USEPA Region II
L. Murray, Olin
W. Wertz
P. Masters, USEPA Region II
J. Konsella
A. Sansone, Reg. 9
M. Fries, Husch & Eppenberger

Attachment A

Solvent Chemical Soil Data

Draft

JD-1900 D3048

REMEDIAL INVESTIGATION REPORT FOR THE 3163 BUFFALO AVENUE SITE NIAGARA FALLS, NEW YORK

Volume I

November 1990

WITH JUNE 6, 1991 REVISIONS

Prepared for:

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233

ecology and environment, inc.
BUFFALO CORPORATE CENTER
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

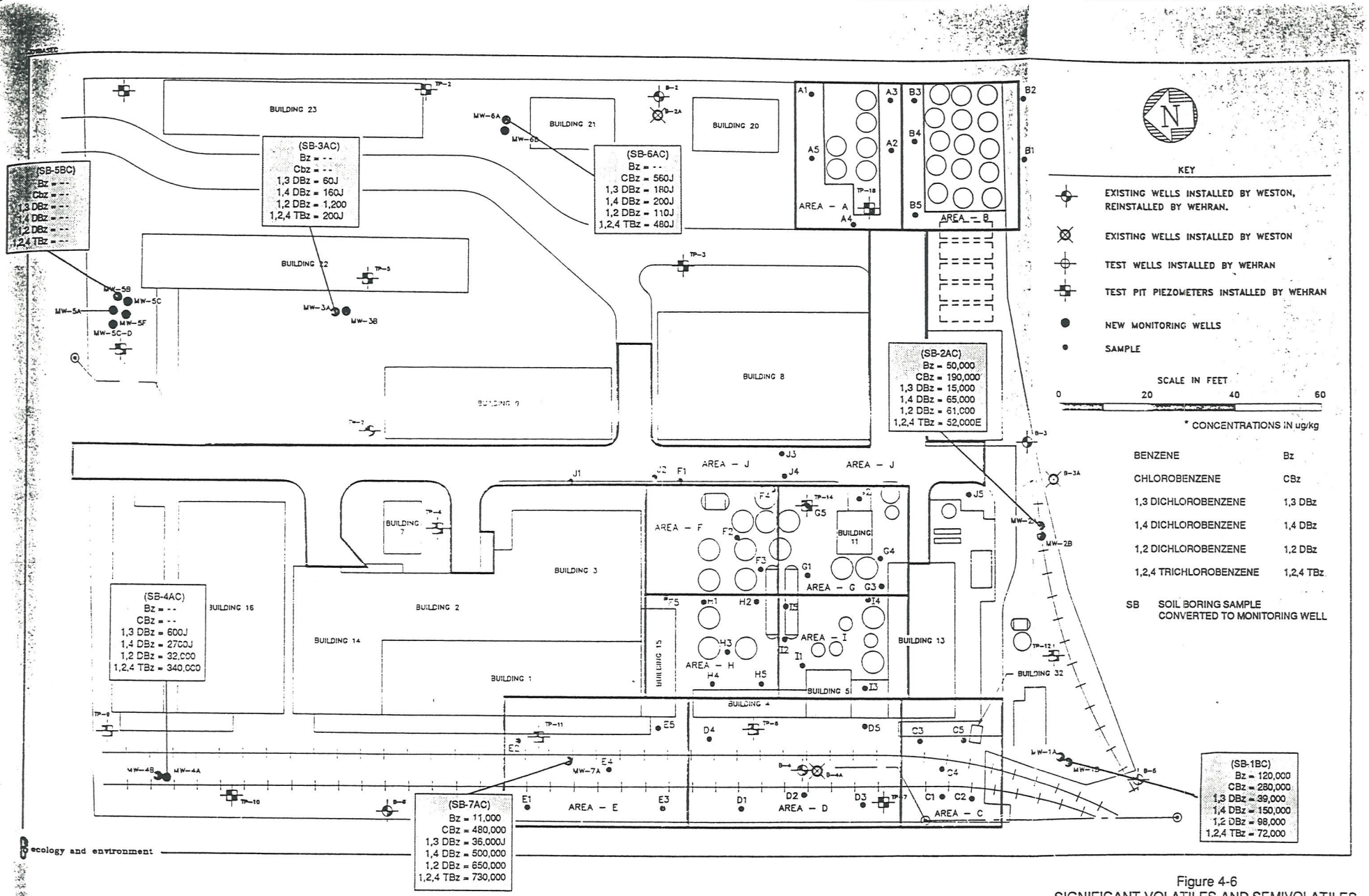
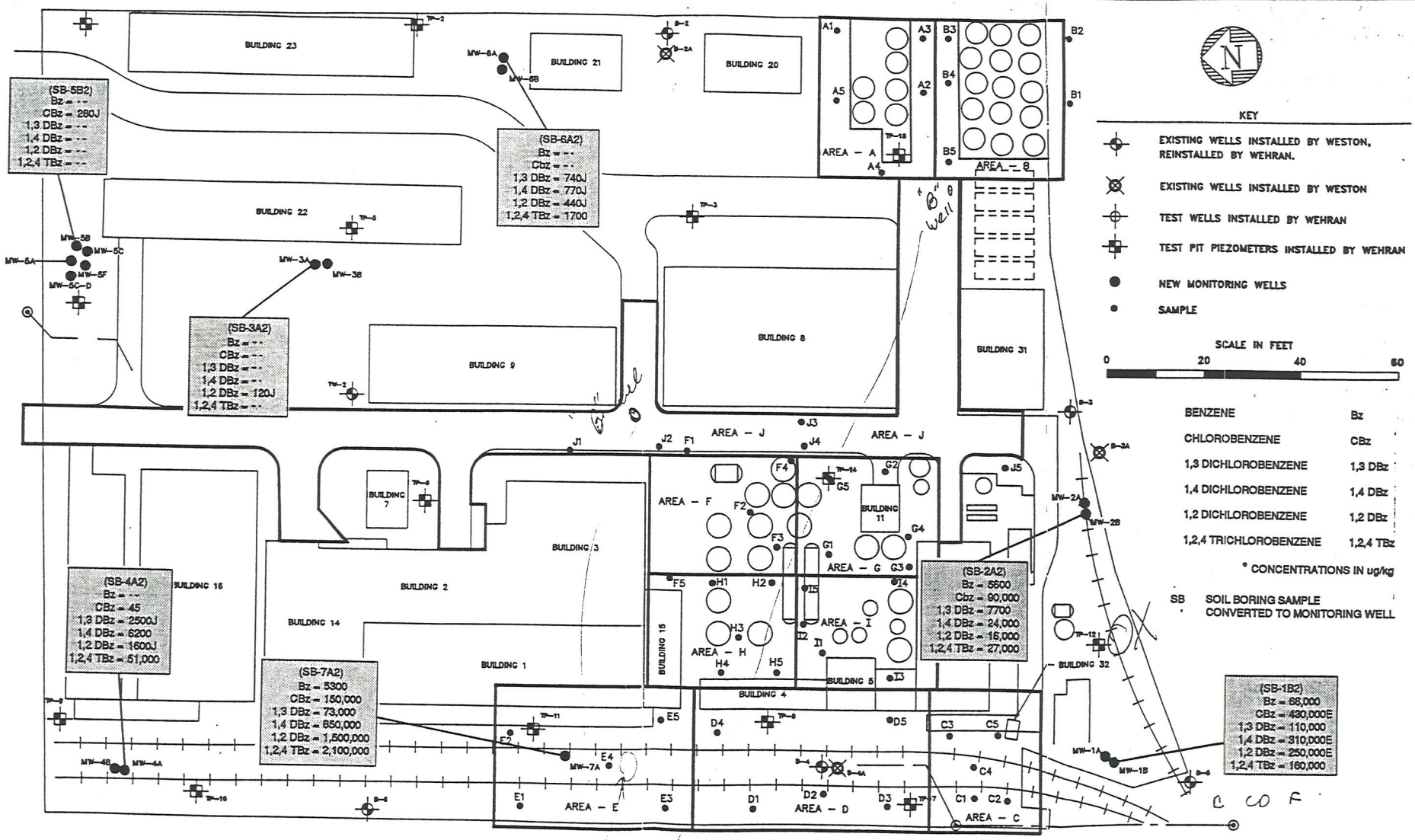


Figure 4-6
SIGNIFICANT VOLATILES AND SEMIVOLATILES
IN COMPOSITE SOIL SAMPLES (6.0' TO BEDROCK)



ecology and environment

Figure 4-5
SIGNIFICANT VOLATILES AND SEMIVOLATILES IN SUBSURFACE SOIL (2.0' TO 4.0')

Attachment B

Termination Criteria

ATTACHMENT B

Termination Criteria

(a) All Groundwater Protection Standards have been achieved.

(b) The total concentration of all Olin Related organic compounds is no greater than 100 parts per billion (ppb), and no single organic compound concentration exceeds 50 ppb.

Termination of the entire system may not take place until Olin submits, and the Department approves, an assessment which indicates that the residual groundwater contamination does not pose an unacceptable risk to human health and the environment.

Alternative Termination Criteria

In the event that the groundwater protection standards cannot be practicably attained, the only other basis for the termination of a groundwater recovery system and/or well is by meeting Alternative Termination Criteria. Once the alternative criteria are met, Olin may petition the Department to begin Termination Monitoring to shut down a groundwater recovery system and/or well as provided below:

A groundwater recovery system and/or well may be shut down if:

(a) The Point of Exposure (property boundary) Wells associated with that system and/or well meet the On-Site Termination Criteria in (a) and (b) above;

and

(b) The chemical concentration of hazardous waste constituents in all the Internal Monitoring Wells associated with that system and/or recovery well indicate that the "Zero Slope Condition" defined

below can be attained during Termination Monitoring.

and

(c) The chemical concentration of hazardous waste constituents in all the Internal Monitoring Wells associated with that system and/or recovery well are such that after shutdown of the recovery system and/or well, the concentration of hazardous waste constituents in the Point of Exposure Wells downgradient of the recovery system and/or well will remain below the groundwater protection standard;

or in lieu of (c) above,

(d) Olin submits, and the Department approves, an analysis which indicates that the residual groundwater contamination would not result in an unacceptable risk to human health and the environment.

"Zero Slope Condition" - The zero slope condition is defined as follows: when the slope of the plot of the sum of the concentration of hazardous waste constituents in a well versus time is deemed zero according to the procedures described herein. The determination of said condition shall be made on a well-by-well basis at all specified groundwater monitoring wells associated with a given groundwater recovery well. The determination of whether there is a zero slope shall be made as follows.

(1) The sum of the concentration of hazardous waste constituents resulting from eight consecutive quarterly sampling events will be plotted versus time.

(2) If the curve which best fits these data points is linear, then a straight line using a

least squares regression model will be fitted to the data and the slope of the fitted curve will be computed and designated as the estimated slope.

(3) If the data points fit a non-linear form, then an exponential curve using a least squares regression model will be fitted to the data. The estimated slope will be the first derivative of the curve at a value of time half way between the last two sampling points.

(4) The estimated slope shall be deemed zero if:

That slope is less than or equal to zero, (i.e. the concentration is stable) or the yearly decrease of the total concentration of hazardous waste constituents is less than the average overall precision of analytical methods used. (Olin and the Department will develop a methodology for calculating the average overall precision prior to implementation of Termination Monitoring.)

(5) In addition, the spatial and temporal distributions of the concentrations of compounds will be assessed to provide additional information regarding trends.

Constituents that can be **demonstrated** as not attributable to releases from the Olin site may be excluded from the data evaluation used to determine whether the termination criteria have been met. Olin shall notify and have the burden to demonstrate to the Department the justification for excluding data on that basis.

ATTACHMENT II

ESTIMATED CHEMICAL LOADING RATES TO SEWERS FOR OLIN NIAGARA FALLS PLANT

ATTACHMENT II
ESTIMATED CHEMICAL LOADING RATES TO SEWERS FOR OLIN NIAGARA FALLS PLANT

INTRODUCTION

Chemical loading rates associated with groundwater seepage to the Buffalo Avenue Sanitary and/or Diversion Sewers and the DuPont Sanitary Sewer (located along the east side of Gill Creek) were estimated as a followup to the Olin Chemicals Niagara Falls Plant Corrective Measures Study (CMS). This Attachment presents the methods and the resulting loading rate estimates.

METHODS

Groundwater

Groundwater flow in the A-Zone and B-Zone (see the CMS for descriptions of waterbearing zones) occurs primarily in weathered bedrock (A-Zone) or in near-horizontal fracture zones associated with bedding planes (B-Zone). For this loading rate assessment, groundwater flow was estimated based on the assumption that the hydraulic characteristics of the fracture network can be approximated as an equivalent porous media. Aquifer transmissivities were developed (using porous media theory) from slug test data taken during the RFI and CMS.

Groundwater flow was estimated using Darcy's Law for fluid flow in porous media. Darcy's Law can be expressed as follows:

$$Q = (T)(dh/dx)(W)$$

Where:
Q = Groundwater Flow Rate (L^3/T)
T = Transmissivity (L^2/T)
dh/dx = hydraulic gradient
W = width of the section through which groundwater flow is being estimated (flow section) (L)

Flow Sections

DuPont Sanitary Sewer:

Based on the depth of the DuPont Sanitary Sewer and consideration of groundwater potentiometric surface maps, seepage to the sewer potentially occurs from the A-Zone. B-Zone groundwater from the plant is migrating primarily to the north and does not discharge to the DuPont sanitary sewer. A-

Zone groundwater flow toward the DuPont Sanitary Sewer occurs between Adams Avenue and Buffalo Avenue. For purposes of flow estimation, this was divided into two flow sections (designated A-1 and A-2) as shown on Figure 1, a typical A-Zone piezometric gradient map, which has been adapted from the RFI.

Buffalo Avenue Sanitary and/or Diversion Sewers:

The A-Zone is dewatered in the vicinity of the Buffalo Avenue Sewers. Therefore groundwater discharge to the sewers occurs through the B-Zone. The B-Zone potentiometric surface map presented on Figure 2 indicates groundwater flow toward the Buffalo Avenue sewers occurs along Buffalo Avenue between Gill Creek and Chemical Road (Plant 2) and across the northwest portion of Plant 1. For purposes of flow estimation, these areas were divided into three flow sections (designated B-1, B-2 and B-3) as shown on Figure 2, a typical B-Zone piezometric map, which has been adapted from the RFI.

Representative Wells

Each flow section contains a monitoring well located near the sewer. This well was used to represent the transmissivity and chemical concentration in the flow section at the discharge boundary. The selected representative wells are as follows:

Flow Section	*Representative Well*
A-1	OBA-16A
A-2	OBA-9A
B-1	OBA-11B (1)
B-2 B-3	OBA-1B OBA-2B

Notes:
(1) No transmissivity data available for this well. Transmissivity data from OBA-1B was used for flow section B-1.

Transmissivity

Transmissivity was estimated for each flow section based on tests conducted at the representative wells during the RFI and CMS. Transmissivity values were as follows:

Flow Section	*Representative Well*	*Transmissivity (ft^2/day)*	*Type of Test*	*Test Date*
A-1	OBA-16A	5.5	Rising Head Slug	1/19/95
A-2	OBA-9A	1.4	Rising Head Slug	1/20/95
B-1 & B-2	OBA-1B	1195	Rising Head Slug	1/22/91
B-3	OBA-2B	76.6	Rising Head Slug	1/20/95

LOADING RATES

For each flow section, the loading rate to the sewer was estimated as follows:

$$L = (Q)(Crw)$$

Where:
L = Loading Rate (M/T)
Q = Groundwater Flow Rate (L^3/T)
Crw = Chemical concentration in the representative well (M/L^3)

In several instances, the chemical parameter was not detected in the representative well. The ND values in representative wells were estimated as follows:

1) if the parameter was detected in another well located in the same plant area (i.e. Plant 1 or Plant 2) as the flow section, a value of one-half the detection limit was assumed for the representative well.

2) If the parameter was not detected in another well located within the same plant area (i.e. Plant 1 or Plant 2) as the flow section, a value of 1 µg/L was assumed for the representative well.

The chemical concentrations used were the most recent data available for each well is presented in the RCRA Facility Investigation Report (August 1994) Figures 7.1 through 7.21.

RESULTS

The calculation sheets for the loading rate estimates are presented in Table 1. The loading rates are summarized as follows:

	Estimated Loading Rates (lbs/day)	
Chemical	***DuPont Sanitary Sewer***	***Buffalo Avenue Sewer***
Mercury	4.7×10^{-7}	4.8×10^{-2}
Total Chlorinated Aliphatic VOCs	5.7×10^{-4}	4.0×10^{-1}
Benzene	1.5×10^{-5}	1.4×10^{-3}
Total Chlorinated Benzenes	3.4×10^{-4}	2.1×10^{-2}
Total Chlorinated Phenols	9.6×10^{-6}	2.7×10^{-3}
Total BHCs	1.0×10^{-5}	3.0×10^{-4}
Methanol	9.6×10^{-4}	2.5×10^{-1}

TABLE 1
OLIN CHEMICALS BUFFALO AVENUE PLANT
ESTIMATED CHEMICAL LOADING RATES: SEEPAGE TO SEWERS

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Mercury Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	0.195	2.97E-07
A-2	9A	370	0.012	1.40	6.2	0.44	1.71E-07
				Subtotal	30.6		4.68E-07
B-1	11B	330	0.004	1195	1577.4	1.40	1.38E-04
B-2	1B	840	0.008	1195	8030.4	95.60	4.79E-02
B-3	2B	400	0.002	77	61.6	5.20	2.00E-05
				Subtotal	9669.4		4.81E-02
				Total	9700.0		4.81E-02

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Volatile Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	71.0	1.08E-04
A-2	9A	370	0.012	1.40	6.2	1179.8	4.58E-04
				Subtotal	30.6		5.66E-04
B-1	11B	330	0.004	1195	1577.4	1610.0	1.58E-01
B-2	1B	840	0.008	1195	8030.4	483.0	2.42E-01
B-3	2B	400	0.002	77	61.6	744.0	2.86E-03
				Subtotal	9669.4		4.03E-01
				Total	9700.0		4.04E-01

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Benzene Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	5.00	7.62E-06
A-2	9A	370	0.012	1.40	6.2	19.00	7.37E-06
				Subtotal	30.6		1.50E-05
B-1	11B	330	0.004	1195	1577.4	1.00	9.84E-05
B-2	1B	840	0.008	1195	8030.4	2.50	1.25E-03
B-3	2B	400	0.002	77	61.6	5.00	1.92E-05
				Subtotal	9669.4		1.37E-03
				Total	9700.0		1.39E-03

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Chlorinated Benzene Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	5.00	7.62E-06
A-2	9A	370	0.012	1.40	6.2	855.00	3.32E-04
				Subtotal	30.6		3.39E-04
B-1	11B	330	0.004	1195	1577.4	53.00	5.22E-03
B-2	1B	840	0.008	1195	8030.4	32.00	1.60E-02
B-3	2B	400	0.002	77	61.6	16.00	6.15E-05
				Subtotal	9669.4		2.13E-02
				Total	9700.0		2.17E-02

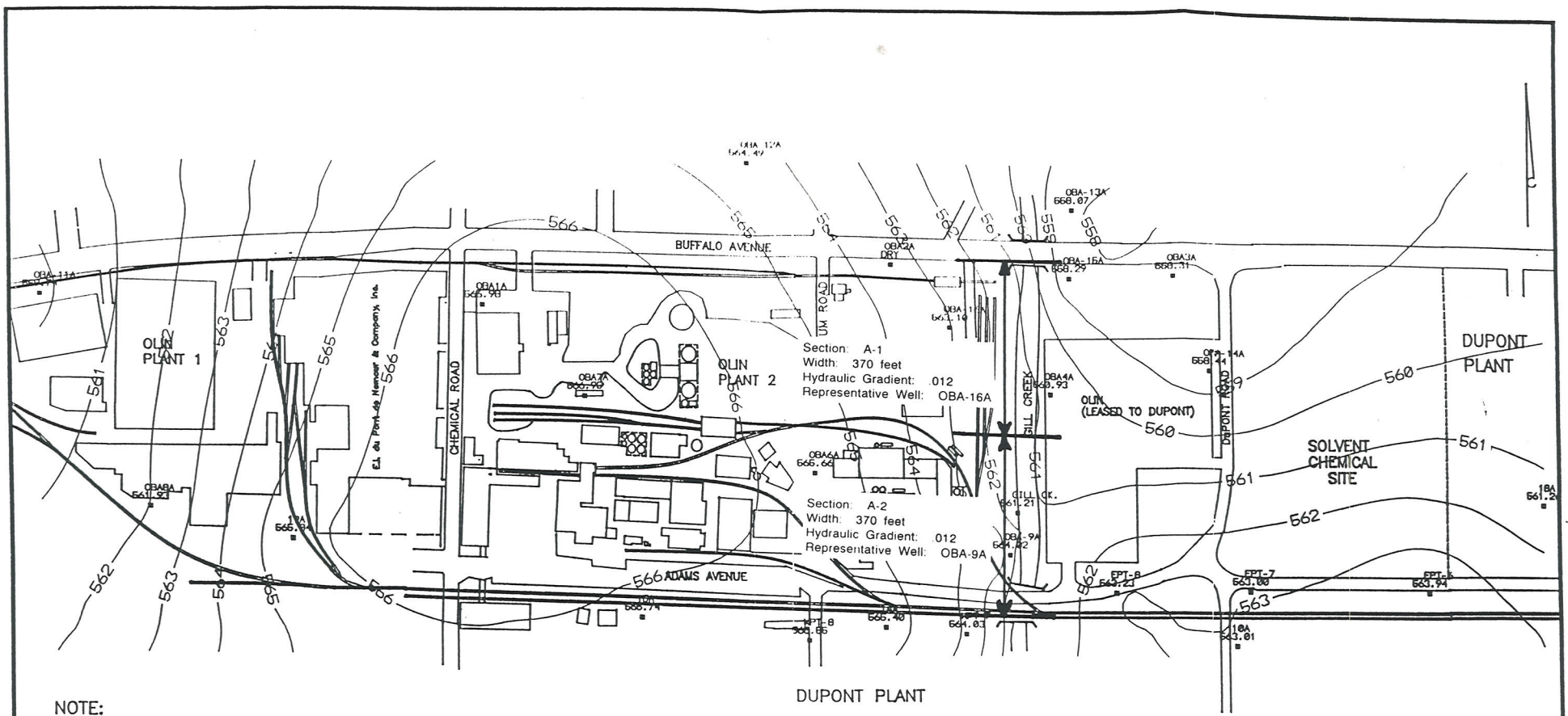
TABLE 1 (concluded)
OLIN CHEMICALS BUFFALO AVENUE PLANT
ESTIMATED CHEMICAL LOADING RATES: SEEPAGE TO SEWERS

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Chlorinated Phenol Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	5.00	7.62E-06
A-2	9A	370	0.012	1.40	6.2	5.00	1.94E-06
				Subtotal	30.6		9.56E-06
B-1	11B	330	0.004	1195	1577.4	1.00	9.84E-05
B-2	1B	840	0.008	1195	8030.4	5.00	2.51E-03
B-3	2B	400	0.002	77	61.6	15.00	5.77E-05
				Subtotal	9669.4		2.66E-03
				Total	9700.0		2.67E-03

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Total BHC Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	2.67	4.07E-06
A-2	9A	370	0.012	1.40	6.2	16.00	6.21E-06
				Subtotal	30.6		1.03E-05
B-1	11B	330	0.004	1195	1577.4	0.86	8.46E-05
B-2	1B	840	0.008	1195	8030.4	0.12	6.01E-05
B-3	2B	400	0.002	77	61.6	39.80	1.53E-04
				Subtotal	9669.4		2.98E-04
				Total	9700.0		3.08E-04

Flow Section	*Representative Well*	*Flow Section Width (ft)*	*Hydraulic Gradient*	*Transmissivity (ft^2/day)*	*Groundwater flow (ft^3/day)*	*Methanol Concentration (µg/L)*	*Estimated Loading (lbs/day)*
A-1	16A	370	0.012	5.50	24.4	500.00	7.62E-04
A-2	9A	370	0.012	1.40	6.2	500.00	1.94E-04
				Subtotal	30.6		9.56E-04
B-1	11B	330	0.004	1195	1577.4	1.00	9.84E-05
B-2	1B	840	0.008	1195	8030.4	500.00	2.51E-01
B-3	2B	400	0.002	77	61.6	500.00	1.92E-03
				Subtotal	9669.4		2.53E-01
				Total	9700.0		2.54E-01

Notes:
Flow Sections A-1 and A-2 discharge to the DuPont sanitary sewer located on the east side of Gill Creek.
Flow Sections B-1, B-2, and B-3 discharge to the Buffalo Ave. sanitary and/or diversion sewer
(flow proportions between the two sewers cannot be distinguished)
Chemical concentrations used are presented in the RCRA Facility Investigation Report Figures 7-1 through 7-21



NOTE:
ALL GROUNDWATER ELEVATIONS DERIVED FROM WATER LEVEL MEASUREMENTS OBTAINED ON JUNE 10, 1994 DURING THE COORDINATED HYDRAULIC HEAD MONITORING EVENT.

LEGEND:

OBA–8A ← WELL ID

561.93 ← GROUNDWATER ELEVATION (IN FEET)

— 561 — POTENTIOMETRIC SURFACE CONTOUR LINE (IN FEET)

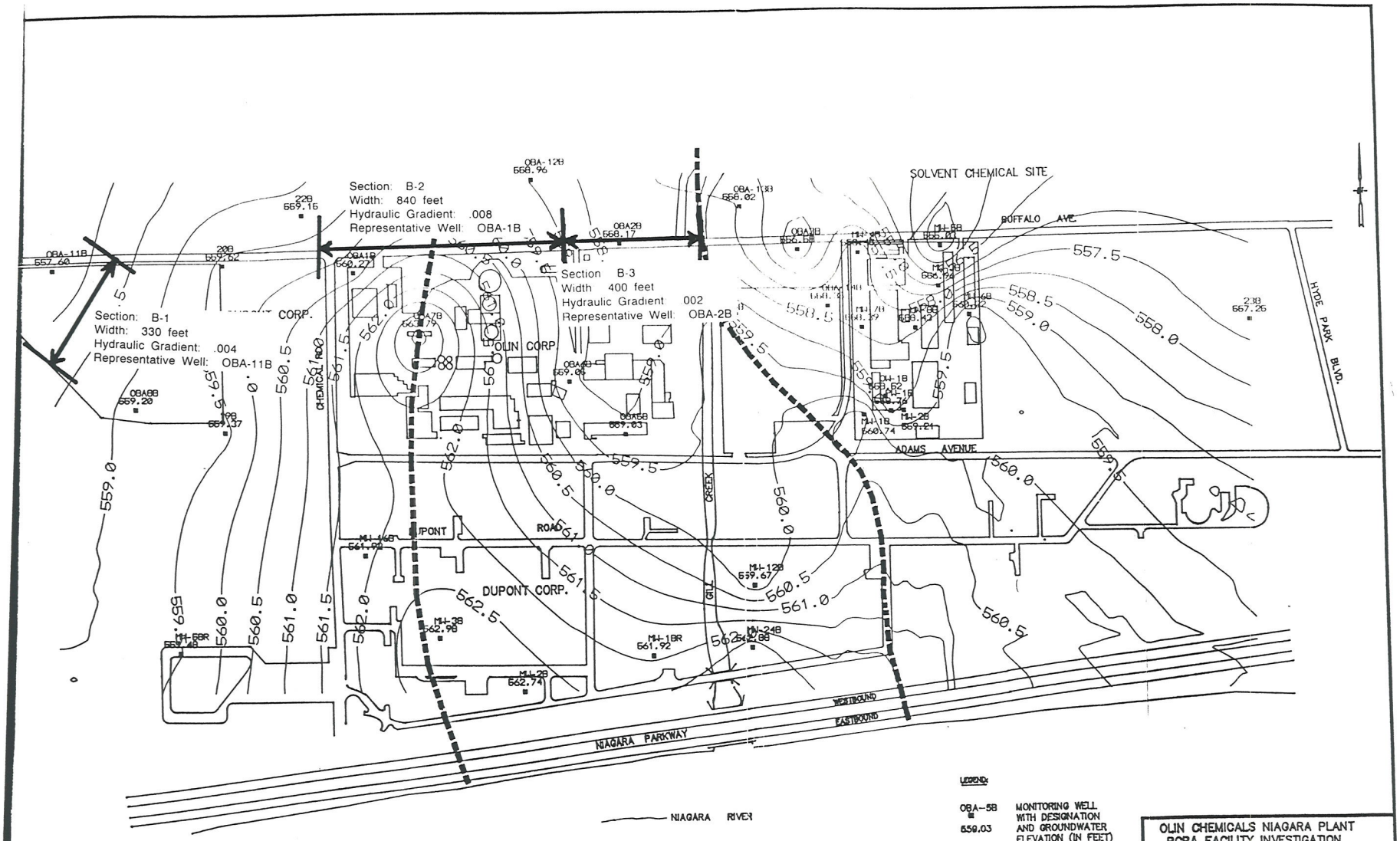
FLOW SECTION

OLIN CHEMICALS NIAGARA PLANT
RCRA FACILITY INVESTIGATION

WOODWARD–CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

A-ZONE FLOW SECTIONS FOR ESTIMATION OF GROUNDWATER INFILTRATION TO SEWERS

Job No.: 4E02704	Drawing No.: AZFINAL	Date: 07-27-94
Checked by: KRM	Rev. No.:	FIGURE 1
Scale: 0 200 Feet		



NOTE: ALL GROUNDWATER ELEVATIONS DERIVED FROM WATER LEVEL MEASUREMENTS OBTAINED ON JUNE 10, 1994 DURING THE COORDINATED HYDRAULIC HEAD MONITORING EVENT.

OLIN CHEMICALS NIAGARA PLANT
RCRA FACILITY INVESTIGATION

WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

B-ZONE FLOW SECTIONS FOR ESTIMATION OF GROUNDWATER INFILTRATION TO SEWERS

Job No: 48D2704 | Drawing No: B2FINAL | Date: 7/25/94
Drawn by: FRG | Checked by: KRM

FIGURE 2

ATTACHMENT III

BEDROCK STRATIGRAPHIC AND INSTRUMENTATION LOGS (OBA-18A AND OBA-19A)

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

PROJECT NAME: OLIN CHEMICALS CMS
PROJECT NUMBER: 6548
CLIENT: OLIN CHEMICALS
LOCATION: BUFFALO AVE. NIAGARA FALLS

HOLE DESIGNATION: OBA-19A
DATE COMPLETED: DECEMBER 27, 1994
DRILLING METHOD: 6 ¼" ID HSA / WR
CRA SUPERVISOR: A. KISIEL

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. AMSL	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	Overburden							
-10.6	DOLOSTONE: gray, saccharoidal, moderately weathered with solution pits, vugs, weathered fossils, trace gypsum, sphalerite, highly fractured horizontal to vertical fractures	561.64	WELL SCREEN 12" Ø BOREHOLE SAND PACK 8" Ø BOREHOLE CUTTINGS		1	100	25	100
-13.1	- some horizontal and near horizontal fractures	558.14						
	END OF HOLE @ 13.6ft BGS							
-15.6								
-18.1								
-20.6								
-23.1								
-25.6								
-28.1								
-30.6								
-33.1								
-35.6								
-38.1								
-40.6								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

(L-02)
Page 1 of 1

PROJECT NAME: OLIN CHEMICALS CMS
PROJECT NUMBER: 6548
CLIENT: OLIN CHEMICALS
LOCATION: BUFFALO AVE. NIAGARA FALLS

HOLE DESIGNATION: OBA-18A
DATE COMPLETED: DECEMBER 22, 1994
DRILLING METHOD: 6 ¼" ID HSA / WR
CRA SUPERVISOR: A. KISIEL

DEPTH ft. BGS	DESCRIPTION OF STRATA	ELEV. ft. AMSL	MONITOR INSTALLATION	BEDROCK INTERVAL	RUN NUMBER	CORE RECOVERY %	RQD %	WATER RETURN %
	Overburden							
8.9	DOLOSTONE: gray, saccharoidal, fossiliferous, slightly to moderately weathered, solution pits and vugs, occasional stylolites, trace gypsum and sphalerite - broken rock fragments - some weathered horizontal and vertical fractures (7" length) - occasional horizontal to slightly inclined, slightly to moderately weathered fractures	562.95	WELL SCREEN 12" Ø BOREHOLE SAND PACK 8" Ø BOREHOLE		1	100	47	100
11.4		560.05						
13.9								
16.4	END OF HOLE @ 11.3ft BGS							
18.9								
21.4								
23.9								
26.4								
28.9								
31.4								
33.9								
36.4								
38.9								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▼ STATIC WATER LEVEL ▼

ATTACHMENT IV

HYDRAULIC DATA PROVIDED BY DUPONT
OLIN NIAGARA FALLS PLANT
CORRECTIVE MEASURES STUDY

ATTACHMENT IV

HYDRAULIC DATA PROVIDED BY DUPONT

OLIN NIAGARA FALLS PLANT CMS

Well	1T95	Head Difference	4Q94	Head Difference	3Q94	Head Difference	2Q94	Head Difference	1Q94	Head Difference
15CD	553.93	-2.73	554.21	-2.74	554.32	-2.84	552.99	-3.59	554.38	-6.91
15D	556.66		556.95		557.16		556.58		561.29	
19CD1	—	NC	553.79	-3.01	554.04	-3.01	552.30	NC	553.07	-3.13
19D	556.16		556.80		557.05		—		556.20	
22C	553.67	-2.71	553.97	-2.73	554.28	-2.84	552.94	-3.31	553.07	-3.13
22D	556.38		556.70		557.12		556.25		556.20	

NC - not calculable

Note: a negative head difference indicates an upward vertical gradient

ATTACHMENT V

EVALUATION OF PLACEMENT OF EXCAVATED SOILS INTO BUILDINGS 137, 138, AND 139 OLIN CHEMICALS NIAGARA FALLS PLANT CORRECTIVE MEASURES STUDY

ATTACHMENT V
EVALUATION OF PLACEMENT OF EXCAVATED SOILS INTO BUILDINGS 137, 138, AND 139 OLIN CHEMICALS NIAGARA FALLS PLANT CORRECTIVE MEASURES STUDY

Per the letter of October 13, 1994 from Paul R. Counterman to Carl D. Nelson (attached), the New York State Department of Environmental Conservation (NYSDEC) granted Olin permission to use the coarse fraction of a stockpile of previously excavated soils to fill in the foundations of former Buildings 137, 138, and 139. These soils had been excavated from several areas of the plant property during prior construction activities. Olin has completed the foundation fill operation in accordance with the provisions ot the October 13, 1994 letter. Prior to use as fill, and as part of the approval requirements, the soils were sampled and chemically analyzed. These results show the soil to be non-hazardous.

These soils are now contained within the former building basements and covered with asphalt pavement which prevents the soils from exposure to any water infiltration. The building basements in question are relatively shallow and do not extend below the water table. Thus, the soils are effectively isolated from both infiltration and groundwater. Therefore, the potential for leaching of residual contaminants (if present) is minimal.

Monitoring wells located throughout the Plant 1 area will continue to be monitored in accordance with the performance monitoring program presented in the Phase II Corrective Measures Study (CMS) and its Addendum. Unforeseen impacts of these soils on groundwater quality would be evident in the results of future groundwater monitoring.

Management of these soils in this manner is consistent with (and is covered under) the Soil Management Program as presented in the Phase II CMS prepared for the facility.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-7251

Langdon Marsh
Commissioner

October 13, 1994

RECEIVED
OCT 24 1994
C. D. Nelson

Mr. Carl D. Nelson, P.E.
Associate Environmental Specialist
Olin Chemicals
P.O. Box 248
Lower River Road
Charleston, Tn 37310

Re: Soil Management

Dear Mr. Nelson:

The New York State Department of Environmental Conservation (NYSDEC) has reviewed Olin's October 6, 1994 plan for handling the stockpile of excavated soils and fill at the Niagara Falls Plant. The purpose of the Plan was to develop a strategy for managing materials which were excavated in conjunction with recent construction and demolition activities at the facility.

Based upon the analytical test results of the coarse and fine-grained portions of the stockpiled materials, the NYSDEC has determined that Olin may use the coarse-grained material (> 1cm) as fill to bring the foundation/basements of former buildings 137, 138, and 139 up to the surrounding grade. Olin must cover the fill with a minimum of 6 inches of clean soil, or two inches of crushed stone or asphalt.

Olin must segregate the fine-grained material (<1cm) from the coarse, and must dispose of the material in accordance with all applicable regulations.

When performing the RCRA Corrective Measures Study for the Niagara Falls Plant, Olin must also perform a specific evaluation of the need for remedial measures to address the materials which were placed into buildings 137, 138 and 139. As part of that study, Olin may have to perform additional characterization of the fill. Depending upon the results of the Study, Olin may be required to perform additional remedial measures to mitigate any unacceptable risks posed by the presence of the fill.

This approval applies only to the existing stockpile of materials. Soils management protocols for future construction or remedial programs should be developed and reviewed by the Department as part of those programs.

Should you have any questions regarding this issue, please call William E. Wertz, Ph. D. at (518) 457-9255 or Ms. Cheryl Webster at (716) 851-7220.

Sincerely,

Paul R. Counterman

Paul R. Counterman
Chief
Bureau of Western Haz. Waste Programs
Division of Haz. Substances Regulation

cc: M. Hans
F. Shattuck
P. Buechi
A. Bellina, USEPA-Region 2