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**SUPERFUND FINAL CLOSE OUT REPORT
LOVE CANAL SITE
NIAGARA COUNTY
NIAGARA FALLS, NEW YORK**

September 2000

Prepared by

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**SUPERFUND FINAL CLOSE OUT REPORT
LOVE CANAL SITE**

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LIST OF IMPORTANT ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COR	Close Out Report
DHHS	U.S. Department of Health and Human Services
EDA	Emergency Declaration Area
EMS	Environmental Monitoring at Love Canal Study
ESD	Explanation of Significant Differences
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
LCARA	Love Canal Area Revitalization Agency
LCHS	Love Canal EDA Habitability Study
LCL	Love Canal Landfill
MATA	Maintenance and Technical Assistance Cooperative Agreement
NFBE	Niagara Falls Board of Education
NPL	National Priorities List
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
OCC	Occidental Chemical Corporation
PACA	Property Acquisition Cooperative Agreement
PCD	Partial Consent Decree
RAR	Remedial Action Report
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TRC	Love Canal Technical Review Committee

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I. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has determined that all remedial activities at the Love Canal Superfund site (Site) have been completed in accordance with Close Out Procedures for National Priorities List Sites (OSWER Directive 9320.2-09 A-P). In addition, EPA has determined that all activities covered by Section 312 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the 1978 and 1980 Presidential Emergency Declarations have been completed.

The Site has been undergoing remediation for more than 20 years. Given the extent of the contamination, and the fact that the Site was discovered prior to, and was, in fact, a key factor in, the enactment of CERCLA, numerous Federal, State and local agencies have been involved in the comprehensive cleanup program.

Prior to the enactment of CERCLA, initial remedial measures were conducted at the Site by the State of New York, the City of Niagara Falls and the Federal government. Also prior to CERCLA, two Presidential Declarations of Emergency (1978 and 1980) were issued, which provided Federal funding and designated the Federal Emergency Management Agency (FEMA) as the lead Federal agency in the home purchase and residential relocation activities.

Under CERCLA, the various remedial actions, completed at the Site, were implemented according to the selected remedies in the following documents: 1) the July 1982 Decision Memorandum, 2) the 1985 Record of Decision (ROD), 3) the 1987 ROD, 4) the 1988 ROD for the 93rd Street School, 5) the 1991 ROD Amendment for the 93rd Street School, 7) the 1989 Partial Consent Decree (PCD) with Occidental Chemical Corporation (OCC), a potentially responsible party (PRP) and subsequent modifications (PCD), 8) the three Explanations of Significant Differences (ESDs) to the 1985 and 1987 RODS, 9) the 1987 Property Acquisition Cooperative Agreement (PACA) with the Love Canal Area Revitalization Agency (LCARA) and 10) the 1989 Maintenance and Technical Assistance Cooperative Agreement (MATA) with LCARA.

The Site was addressed in seven phases, *i.e.*, initial actions and six remedial action phases, focusing on 1) landfill containment with leachate collection, treatment, and disposal; 2) excavation and interim storage of the sewer and creek sediments; 3) final treatment and disposal of the sewer and creek sediments and other Love Canal wastes; 4) remediation of the 93rd Street School soils; 5) Emergency Declaration Area (EDA) home maintenance and technical assistance

to LCARA; and, 6) buyout of homes and other properties in the EDA through LCARA. Three other remedial actions: a) the Frontier Avenue Sewer remediation, b) the EDA 4 soil removal, and c) the repair of a portion of the Love Canal cap, were completed in 1993.

EPA and the New York State Department of Environmental Conservation (NYSDEC) have determined that all selected remedies and other associated remedial actions have been implemented in accordance with the decision documents identified above.

II. SUMMARY OF SITE CONDITIONS

Site Background

The Site is in an urban area in the southeast corner of the City of Niagara Falls, approximately 1/4 mile north of the Niagara River in Niagara County, New York. Approximately 10,000 people are located within a mile of the Site, and 70,000 people live within three miles. The area is served by a public water supply system, which serves approximately 77,000 people.

The Site includes the original segment of the canal [3200 feet by 80 feet] built by William T. Love in the late 1800s for a proposed hydroelectric power project which was subsequently abandoned. Between 1942 and 1952, the Hooker Chemicals & Plastics Corporation (now OCC) disposed of approximately 22,000 tons of drummed and liquid chemical wastes, including polycyclic aromatic hydrocarbons, halogenated organics, pesticides, chlorobenzenes and dioxin in the abandoned canal, which thereby became the Love Canal Landfill (LCL). In 1953, the LCL was covered with soil and deeded by Hooker Chemicals to the City of Niagara Falls Board of Education (NFBE).

Subsequently, the surrounding area near the covered LCL was extensively developed with the construction of numerous homes and an elementary school (99th Street School). Problems with odors and residues in the basements and backyards of the affected properties were first reported in the 1970's. Also, during the 1970's, unusually high precipitation in the region caused the water table within the LCL to rise. The high water table carried contaminants laterally in surficial soils and along utility bedding into the basements of homes abutting the LCL. Various studies, conducted at this time, verified that numerous toxic chemicals had migrated into the surrounding area directly adjacent to the original disposal site. Dioxin and other contaminants also migrated from the LCL to the sanitary and storm sewers which carried the contaminants outside the LCL boundaries into nearby creeks, which are tributaries to the Niagara River. In 1978, the New York State Department of Health (NYSDOH) identified more than 80 chemicals in the LCL and adjacent soils.

In August 1978, further sampling prompted the New York State (NYS) Commissioner of Health to order the closure of the 99th Street School and to recommend that pregnant women and children under two years of age who lived in the homes (239 properties), which abutted or were across the street from the LCL, to evacuate the area immediately and that residents avoid the use of their basements as much as possible and avoid consuming home-grown produce. These properties were subsequently identified as Ring I and Ring II homes.

Also, in August 1978, President Carter issued the first of two Emergency Declarations at the Site. The first emergency declaration provided Federal funding for remedial work to contain the chemical wastes at the Site and for the relocation of the Ring I and Ring II residents. During this time, an eight-foot-high chain-link fence was installed around the LCL and the Rings I and II homes

In May 1980, President Carter issued the second Declaration of Emergency at the Site. This emergency declaration specifically established the EDA, the approximately 350-acre neighborhood surrounding the LCL, and authorized \$20 million of Federal funds for the purchase of homes. The Federal Emergency Management Agency (FEMA) disbursed these funds and, together with NYSDEC, relocated hundreds of the affected families. As a result, approximately 950 families, of the more than 1,050 families affected, were relocated from a 10-square-block area surrounding the LCL. Those families that were not relocated remained in their homes.

In 1981, EPA proposed the addition of the Site to the National Priorities List (NPL), making it eligible for funding under the Superfund legislation. The Site was added to the NPL in 1983.

In 1982, the U.S. Department of Health and Human Services (DHHS) and NYSDOH determined that the homes in the EDA outside Ring I and Ring II could be reoccupied. This decision was based on data presented in the May 1982 Environmental Monitoring at Love Canal study (EMS), prepared by EPA's Office of Research and Development (ORD). However, because the ORD study was heavily criticized, EPA initiated additional study activities in 1983 to determine the habitability of the EDA. This effort represented the early work of what became known as the Love Canal EDA Habitability Study (LCHS), which is described below.

Site Investigations

Early in 1978, NYSDOH and NYSDEC contacted EPA for technical assistance. EPA and NYSDOH sampled indoor air and stream sediments, biota and water. NYSDOH also sampled residential sumps, and EPA evaluated ambient air and storm sewers around the LCL. This additional sampling showed significant chemical contamination in private homes adjacent to the LCL.

In addition to these early investigations which lead to the Presidential Declarations of Emergency at Love Canal, there were other field investigations and studies conducted at the Site, including the following:

- EPA-ORD - Environmental Monitoring at Love Canal [May 1982] (evaluated the nature and extent of contamination throughout the EDA, including air, soils, surface water, sediments and biota sampling).
- Malcolm Pirnie - Environmental Information Document - Site Investigations and Remedial Action Alternatives - Love Canal [October 1983] (evaluated contamination in creeks and sewers and alternatives for remediation).
- CH2M Hill - Love Canal Sewer and Creek Remedial Alternative Evaluation and Risk Assessment [March 1985] (evaluated risks posed by contamination in creeks and sewers, further evaluated alternatives for remediating the creeks and presented

a proposed remedial action plan). This report represented the Feasibility Study for the May 1985 ROD.

- E.C. Jordan - Long-Term Monitoring Program Design for the Love Canal Remedial Project [August 1985] (evaluated contamination in the groundwater and effectiveness of the barrier drain and cap system). Hundreds of monitoring wells were installed between 1985 and 1987.
- Alternatives for Destruction/Disposal of Love Canal Creek and Sewer Sediments [June 1987] (evaluated alternatives for the final treatment and disposal of the sediments).
- Love Canal EDA Habitability Study [May-July 1988] (evaluated air and soil contamination in the EDA and comparison neighborhoods, using habitability criteria).
- 93rd St. School Remedial Investigation and Feasibility Study [March 1988] (evaluated the nature and extent of contamination at the 93rd St. School and alternatives for remediating this contamination).

1986 Superfund Amendments and Reauthorization Act (SARA) Provisions for Love Canal: Habitability Study, Property Acquisition, Maintenance and Technical Assistance

The 1986 amendments to CERCLA included specific provisions in Section 312, to address the significant program aspects of the Site. These included:

- Completion of a study of the habitability of the EDA, *i.e.*, the LCHS.
- Acquisition of those properties which were not eligible for government acquisition under the FEMA acquisition program.
- Maintenance of property acquired under the FEMA and SARA acquisition programs.
- Provision of technical assistance to the Love Canal Area Revitalization Agency¹ (LCARA) to facilitate its efforts to revitalize the EDA.

In August 1983, EPA, in order to address concerns raised by the 1982 EMS, established the multi-agency Love Canal Technical Review Committee (TRC) to act as a management group to provide interagency coordination and oversight for further remedial and habitability activities for the Site. The TRC was comprised of senior-level representatives from EPA, DHHS/Centers for Disease Control, NYSDOH and NYSDEC. The principal task of the TRC was to determine the habitability of the EDA surrounding the Site.

In order to ensure that the criteria for habitability were technically sound and to assist in the actual development of the criteria, the TRC convened a group of scientists, consisting of experts in various fields. For the habitability criteria, the experts reviewed environmental data, executed and planned remedial measures and reviewed both published and unpublished health studies. Various EPA contractors were involved in the preparation of this study, including CH2M Hill for

¹ The Love Canal Area Revitalization Agency is a New York State Agency which was designated as the lead agency in the rehabilitation effort of the Love Canal EDA.

sampling analysis, management and preparation of the study report and PRC, Life Systems and ACER for peer review of the study design and final report. There were two peer review groups which reviewed the habitability criteria and, subsequently, a pilot study was completed. The pilot study results and the design for the full scale LCHS were also peer reviewed.

The LCHS sampling and evaluation was performed from 1987 until 1988. Volume I-Final Report of the LCHS, Introduction and Decision-Making Documentation was issued in May 1988. Volumes II (issued in February 1988) and III (issued in May 1988) presented the results of the assessment for the Love Canal indicator chemicals for air and soil. Volume IV (issued in March 1988) presented the assessment of the dioxin soil assessment. Volume V (issued in July 1988) summarizes the subsequent peer review of Volumes II-IV and the response to that peer review.

In September 1988, using the results of the LCHS, the NYS Commissioner of Health issued a Decision on Habitability, which identified appropriate land uses for the seven designated areas of the EDA. Areas 1-3 were declared not suitable for residential use, *i.e.*, nonhabitable, but were suitable for commercial/industrial use. Areas 4-7 were deemed habitable, *i.e.*, suitable for residential use.

In 1987, EPA entered into the first of two cooperative agreements with LCARA to implement the mandates from Section 312 of CERCLA with respect to the EDA. This first agreement covered EDA property acquisition. EPA's September 1996 RAR for the Site under the PACA covers the EPA property acquisition program; LCARA purchased approximately 100 properties under this program. LCARA purchased approximately 600 properties under all acquisition programs.

In 1989, EPA entered into a second cooperative Agreement with LCARA to implement the maintenance and technical assistance (MATA) mandates of Section 312 of CERCLA. Under this MATA agreement, EPA provided LCARA with funding to maintain improved and unimproved properties in the EDA. EPA's funding for this program has terminated. While the majority of these funds were used to maintain those EDA homes slated for rehabilitation, a portion of the funds were also used to demolish EDA homes that had deteriorated to the extent that they presented safety concerns or were a net loss to the overall value of the property. Over 250 homes were demolished under the MATA program.

EPA's technical assistance has supported LCARA's efforts to revitalize the EDA. LCARA sold approximately 260 homes in the areas slated for residential use and prepared a master plan for the areas slated for commercial/industrial use.

Records of Decision Findings

In July 1982, the EPA Region 2 Administrator issued a Decision Memorandum: Cooperative Agreement with the State of New York for Love Canal; this document was a precursor to the Superfund ROD. This memorandum approved Federal funding for various remedial measures, including:

- construction of an extension to and improvement of the existing barrier drain/leachate collection system;
- construction of a new leachate treatment facility;
- covering the temporary clay cap with a synthetic material to prevent rain from coming into contact with the buried wastes;
- demolition of houses directly adjacent to the LCL;
- demolition of the 99th Street School;
- plugging and abandonment of existing on-site water, gas and storm sewer facilities;
- conducting studies to determine the best way to proceed with cleanup of the EDA creeks and sewers; and,
- monitoring to ensure that the effectiveness of the cleanup activities.

In May 1985, EPA issued a ROD with a selected remedy to remediate the sewers and the creeks in the EDA. This ROD called for:

- hydraulically cleaning the sewers;
- dredging and hydraulically cleaning the Black Creek culverts;
- removing Black and Bergholtz creek sediments with dioxin concentrations exceeding one part per billion (ppb);
- construction of an on-site interim storage facility for the creek and sewer sediments; and,
- remediation of the 102nd Street outfall area (which was subsequently addressed under the remedial action for the 102nd Street Landfill Superfund site).

In October 1987, EPA issued a second ROD and selected a remedy to address the destruction and disposal of the dioxin-contaminated sediments from the sewers and creeks. The ROD called for:

- construction of an on-site facility to dewater the sewer and creek sediments and to contain the dewatered sediments;
- construction of a separate on-site facility to treat the dewatered sediments through high temperature thermal destruction;
- on-site thermal treatment of the residuals stored at the Site from the leachate treatment facility and other associated Love Canal waste materials; and,
- on-site disposal of any nonhazardous residuals from the thermal treatment or incineration process.

In 1988, EPA published an ESD to the 1985 and 1987 RODs, which specified that creek sediments were to be dewatered at a facility constructed at the 93rd Street School adjacent to Bergholtz Creek, placed in polyethylene bags and then transported and stored at OCC's RCRA-permitted storage buildings at its Niagara Falls Main Plant, pending high temperature thermal destruction at OCC's Niagara Falls Main Plant. In addition, other Love Canal wastes, including the sewer sediments and other remedial wastes originally targeted for thermal treatment at the Site, were also to be thermally treated at OCC's Niagara Falls Main Plant rather than at the Site. In May 1989, OCC, the United States and the State of New York entered into an agreement, *i.e.*,

a partial consent decree (PCD), filed in U.S. District Court, to implement this modification to the 1985 and 1987 RODs.

In November 1996, EPA issued a second ESD for the 1987 ROD. This ESD authorized thermal treatment and/or land disposal of the stored Love Canal waste materials at an off-site commercial incinerator and landfill rather than at OCC's Niagara Falls Main Plant. In December 1998, EPA issued a third ESD which provided notice that EPA was granting a treatability variance to OCC to eliminate the requirement that the stored Love Canal waste materials containing dioxin at concentrations between 1 and 10 ppb be incinerated. As a result of this variance, these materials could be disposed at a commercial hazardous waste landfill without treatment.

In September 1988, EPA issued a third ROD which selected a remedy for contaminated soils at the 93rd Street School. The selected remedy included the following actions:

- excavation of approximately 7500 cubic yards of contaminated soil adjacent to the school;
- on-site solidification and stabilization of the contaminated soils; and,
- return of the stabilized soils to the excavated area.

After the issuance of the 1988 ROD, the NFBE raised concerns that leaving the treated soils on-site would limit its options for reuse of the property. In May 1991, EPA issued an amendment to the 1988 ROD, which modified the remedy and called for excavation and off-site disposal of the contaminated soils.

Cleanup and Other Activities Performed

All remedial activities which were conducted at the Site between 1978 and 1982 are documented in EPA's 1982 Decision Memorandum.

Improvements to the Containment System

The remedial actions specified in the July 1982 Decision Memorandum were all completed by 1985. By June 1983, the Rings I and II homes, adjacent to the LCL, had been demolished, as well as the 99th Street School. In 1985, NYSDEC installed the 40-acre cap consisting of high-density polyethylene liner which was then covered by 18 inches of clean soil and seeded for grass. In addition, the leachate collection system was improved, and a new leachate treatment facility was constructed. These actions are documented in the Final Report Love Canal Remedial Action Project - Northern and Central Sectors, November 1985.

Removal of Contaminated Creek and Sewer Sediments

The remediation of the contaminated sewers was performed during 1986 and 1987. A total of 68,000 linear feet of storm and sanitary sewers were cleaned. An on-site facility was constructed to dewater sewer contaminants. From 1987 until 1989, Black and Bergholtz creeks were dredged of approximately 14,000 cubic yards of sediments. Clean riprap was placed in the creek beds,

and the banks were replanted with grass. These two remedial actions conformed with the portions of the 1985 ROD, requiring the removal of dioxin-contaminated sediments from the creeks and sewers. The majority of sewer remediation work is documented in the 1987 ROD, with some additional sewer cleanup in 1987. The creek work is documented in the Final Engineering Report - Love Canal Black and Bergholtz Creeks Remediation, October 1990.

In addition, a small section of the Frontier Avenue sewer which ran along the outskirts of the containment system was rerouted in 1992. This action was documented in the September 1993 Remedial Action Report for the Love Canal Site: EDA 4, Frontier Avenue/100th Street and the Love Canal Cap Repair.

Interim Storage and Treatment/Disposal of Creek and Sewer Sediments and Other Love Canal Waste Materials

The treatment and disposal of the sewer and creek sediments represents the last remedial action completed for the Site. In 1988, concurrent with the excavation of the creek sediments by Stevenson Environmental, Inc., contractor to NYSDEC, OCC's contractor, Conestoga-Rovers & Associates Limited, received the sediments at a staging area near the 93rd St. School. At this staging area, the creek sediments were dewatered, bagged and transported to OCC's Niagara Falls Main Plant for temporary storage in its RCRA-permitted storage buildings, awaiting thermal treatment and/or land disposal at facilities outside of New York State. The sewer sediments and other Love Canal wastes targeted for treatment under the 1987 ROD were also bagged and transported for storage to OCC's Niagara Falls Main Plant. A total of 15,496 bags, representing approximately 39,000 cubic yards of Love Canal waste materials, were stored at OCC's Niagara Falls Main Plant. In February 1998, OCC began shipping the bagged Love Canal wastes for disposal from its storage facilities. In August 1999, the last remaining bags of wastes were shipped for ultimate disposal, either for thermal destruction or for landfilling. Of these, 10,262 bags were directly land disposed in a Subtitle C facility at the Grassy Mountain Landfill, Utah. The remaining 5,234 bags were incinerated at Deer Park, Texas and Originate, Utah, prior to land disposal of the ash residue in Subtitle C facilities at Deer Park, Texas and Grassy Mountain, Utah, respectively. This Remedial Action was completed in August 1999 and is documented in the March 2000 Remedial Action Report (RAR): Final Treatment/Disposal of Love Canal Sewer and Creek Sediments and Other Remedial Wastes.

Excavation and Off-site Disposal of Contaminated Soils at the 93rd Street School

In 1992, the contaminated soils at the 93rd Street School were excavated; these materials were used for alternate grading material for the 102nd Street Landfill Superfund site Remedial Action. This Remedial Action was completed in September 1992 and is documented in the September 1992 Final Report for the Remediation of the 93rd Street School Site.

Community Relation Activities Performed

In March 1983, NYSDEC opened a Public Information Office in the EDA to handle the growing public concerns. Until 1994, the NYSDEC office remained opened on a daily basis, interacting with the local community on an as needed basis.

In 1982, EPA established a satellite office in downtown Niagara Falls to handle the Site, as well as other EPA Superfund sites in the Niagara Falls and Buffalo, New York area. All decisions made about the Site were completed within a public forum, especially during the development of the LCHS, which included the monthly TRC meetings, as well as expert panel meetings, which were all open to the public. All residents of the EDA were informed of each meeting and were encouraged to attend. All associated minutes, reports and other documents generated during the more than 70 TRC meetings, as well as each expert panel meeting, et al., were made available to the public for review at the EPA offices in Niagara Falls. The final TRC meeting was held in a public forum in 1991.

The offices of LCARA were located in the EDA, and LCARA's Board of Directors conducted monthly meetings on the progress of the revitalization of the EDA in a public forum. The final meeting of the LCARA Board was held in May 2000.

III. DEMONSTRATION OF QUALITY ASSURANCE/QUALITY CONTROL

The Quality Assurance/Quality Control program used throughout the performance of the various Remedial Actions was rigorous and in conformance with EPA and State standards; therefore, EPA and New York State determined that all analytical results are accurate to the degree needed to assure satisfactory execution of the Remedial Actions, consistent with the 1982 Decision Memorandum, the 1986 Superfund Amendments and Reauthorization Act (SARA), the 1985, 1987 RODs and the associated ESDs, the 1988 ROD and the associated 1991 ROD Amendment, the PCD and subsequent modifications and all Remedial Design plans and specifications.

IV. MONITORING RESULTS

The effectiveness of the containment system at Love Canal has been monitored for more than 15 years. An extensive array of nearly 200 monitoring wells currently exists around the containment area. In the past, the monitoring data have undergone significant scrutiny, especially during the LCHS. Effective containment of the disposal area was a requirement for residential use of any part of the EDA.

In June 1987, the final report from the first year's monitoring data showed that concentrations of various contaminants in groundwater and surface water outside of the perimeter of the containment system were at low levels or below detection.

In 1988, the NYS Commissioner of Health's Habitability Decision acknowledged that the system was working effectively. Currently, the leachate collected in the barrier drainage system is treated in an on-site activated carbon leachate treatment facility. The treated wastewater is discharged to the City of Niagara Falls Wastewater Facilities according to specific discharge limitations. Dense nonaqueous phase liquids are stored on-site with eventual incineration at OCC's liquid incinerator at OCC's Niagara Falls Main Plant. Spent carbon is shipped off-site for disposal on a regular basis. Extensive monitoring data from the various perimeter monitoring wells, which ring the capped LCL, indicate that the containment system is working effectively. Monitoring will continue to be conducted indefinitely.

V. SUMMARY OF OPERATION AND MAINTENANCE

OCC has taken over the day-to-day Operation and Maintenance (O&M) activities at the Site. NYSDEC oversees OCC's O&M activities and provides direction to OCC on the scope and extent of the annual monitoring tasks. Included in the O&M is the requirement for annual monitoring and reporting. The O&M activities, performed on an annual basis, include the following: groundwater monitoring at various wells on or around the Site; groundwater elevation measurement at piezometers located around the Site; and, a performance assessment of the Love Canal leachate treatment facility and the barrier drain system.

The 1999 data results show that there has been no significant change in chemical conditions and that the barrier drain system is successfully capturing leachate from the Site and preventing off-site migration of chemicals. Hence, monitoring results continue to confirm that the remediation and containment system, *i.e.*, the leachate collection and treatment system, is functioning properly.

VI. SUMMARY OF REMEDIATION COSTS

The original 1982 Decision Memorandum identified \$6,995,000 in Federal funds for the completion of the original remedial actions. The 1985 ROD selected remedy identified \$8.16 million for the completion of the remedial action. The 1987 ROD selected remedy identified between \$26.4 and \$31.4 million for the completion of the remedial action. The 1988 ROD selected remedy identified between \$2.3 and \$3.7 million. The 1991 ROD amendment selected remedy identified \$2.25 million for the completion of the remedial action.

With respect to overall costs for all the remedial activities which have been completed at the Site, EPA has expended approximately \$100 million in capital costs, which included over \$40 million given to NYSDEC under a cooperative agreement to perform remedial activities. These include costs expended for remedial investigation and feasibility studies, remedial design and remedial action. FEMA expended approximately \$20 million for the relocation activities. OCC, the PRP,

expended approximately \$35 million under the PCD for its part of the remedial actions, which included the pretreatment, thermal destruction and final disposal of the sewer and creek sediments.

In its 1995 consent decree settlement with OCC, EPA and FEMA recovered \$129 million plus interest. Also, in its 1995 consent decree settlement with the U.S Army, EPA recovered \$8 million in contributory costs.

VII. PROTECTIVENESS

NYSDEC has a permanent easement on the fenced portion of the Site. Under the direction of NYSDEC, OCC continues to maintain the operations at the Site and to ensure the protectiveness of the remedy. The containment area and the areas of the EDA are served by a public water supply system. At the present time, groundwater usage in the residential areas of the EDA is not restricted.

Outside of the containment area, four (Areas 4-7) of the seven areas of the EDA are suitable for residential use. Many of the existing homes in these areas were rehabilitated and reoccupied. Currently, there is ongoing development of new residential properties in some of these areas. The other three areas (Areas 1-3) are suitable for commercial/industrial use or development; it is currently anticipated that any future development in these areas will be handled by the City of Niagara Falls.

Extensive monitoring results from nearly 200 wells which ring the capped LCL indicate that the containment system is working effectively and that no evidence of groundwater contamination outside the containment area has occurred. The 70-acre containment area, encompassing the original 16-acre hazardous waste LCL and the 40-acre clay/synthetic liner cap, is fenced and monitored. The barrier drainage system and leachate collection and treatment system continues to remain operational and functional.

The Site meets all the site completion requirements as specified in OSWER Directive 9320-09-A-P, Close Out Procedures for National Priorities List Sites. Specifically, all cleanup actions specified in the RODs and the ESDs have been implemented. Continued monitoring shows that the Site no longer poses any threats to human health and the environment. The only continued activity remaining is the ongoing O&M activities. A bibliography of all reports relevant to the completion of the Site under the Superfund program is attached.

VIII. FIVE YEAR REVIEW

The containment of the LCL was a pre-SARA decision. None of the post-SARA remedial decisions that were implemented at the Site resulted in hazardous substances remaining on-site. It is the policy of EPA to conduct five-year reviews of pre-SARA remedies which result in hazardous substances remaining on-site. Consequently, EPA will conduct a five-year review of the Site before September 2004.

Approved by:

Jeanne M. Fox
Regional Administrator

Date

BIBLIOGRAPHY

SUPERFUND FINAL CLOSE OUT REPORT LOVE CANAL SITE

I. SITE BACKGROUND

Field Investigations of Uncontrolled Hazardous Waste Sites - FIT Project - Mitre Model Scoring of Love Canal, New York, Ecology and Environment, Inc. and USEPA, October 23, 1981.

II. SITE INVESTIGATIONS

Environmental Monitoring at Love Canal, USEPA, May 1982 (three volumes).

Habitability of the Love Canal Area - A Technical Memorandum, USEPA-Office of Technology Assessment, June 1983.

Environmental Information Document - Site Investigations and Remedial Action Alternatives - Love Canal, Malcolm Pirnie, Inc. and NYSDEC, October 1983.

Love Canal Sewer and Creek Remedial Alternatives Evaluation and Risk Assessment, CH2M Hill, Inc., USEPA, March 1985.

Love Canal EDA: Proposed Habitability Criteria, NYSDOH and DHHS, December 1986.

Pilot Study for Love Canal EDA Habitability Study, Volume I, CH2M HILL and the Technical Review Committee (TRC): USEPA-Region II, US Department of Health and Human Services/Centers for Disease Control, NYSDOH and NYSDEC, February 1987.

Pilot Study for Love Canal EDA Habitability Study, Volume II, CH2M Hill and the TRC, March 1987.

Alternatives for Destruction/Disposal of Love Canal Creek and Sewer Sediments, Draft Addendum Feasibility Study, CH2M HILL and USEPA, June 1987.

Black and Bergholtz Creeks Remediation Conceptual Design Report, TAMS and USEPA, August 1987.

Love Canal Emergency Declaration Area Habitability Study Final Report - Volume I - Introduction and Decision-Making Documentation, USEPA and the TRC, May 1988.

Love Canal Emergency Declaration Area Habitability Study Final Report - Volume II - Air Assessment-Indicator Chemicals, USEPA and the TRC, February 1988

Love Canal Emergency Declaration Area Habitability Study Final Report - Volume III - Soil Assessment-Indicator Chemicals, USEPA and the TRC, May 1988.

Love Canal Emergency Declaration Area Habitability Study Final Report - Volume IV - Soil Assessment-2,3,7,8-TCDD (Dioxin), USEPA and the TRC, March 1988.

Love Canal Emergency Declaration Area Habitability Study Final Report - Volume V - Peer Review Summary-TRC Responses, USEPA and the TRC, July 1988.

Love Canal Emergency Declaration Area - Decision on Habitability, NYS Commissioner of Health, September 1988.

Remedial Investigation Summary-Remedial Investigation/Feasibility Study (RI/FS) Report for the 93rd Street School Site - Volume I, LEA and NYSDEC, March 1988.

Feasibility Study - RI/FS Report - Volume II, LEA and NYSDEC, March 1988.

Supplemental Laboratory Data - RI/FS Report - Volumes III and IV, December 1987.

III. DECISION DOCUMENTS

Decision Memorandum: Cooperative Agreement with the State of New York for Love Canal, USEPA, July 1982.

Record of Decision - Love Canal, USEPA, May 1985.

Record of Decision - Love Canal, USEPA, October 1987.

Record of Decision - Love Canal - 93rd Street School, USEPA, September 1988.

Explanation of Significant Differences (I) for the 1987 Record of Decision, USEPA, June 1989.

Love Canal Area Master Plan, The Saratoga Associates and LCARA, June 1990 (five volumes).

Record of Decision Amendment - Love Canal - 93rd Street School, USEPA, May 1991.

Explanation of Significant Differences (II) for the 1987 Record of Decision, USEPA, November 1996.

Petition for Site Specific Treatability Variance, OCC, May 1998.

Explanation of Significant Differences (III) for the 1987 Record of Decision, USEPA, December 1998.

Site-Specific Treatment Variance [40 CFR § 268.449(h)], USEPA, December 1998.

IV. CLEANUP AND OTHER ACTIVITIES

Long-Term Monitoring Program Design for the Love Canal Remedial Project, E.C. Jordan and NYSDEC, August 1985.

Final Report: Love Canal Remedial Action - Northern and Central Sectors, Conestoga-Rovers & Associates Limited and NYSDEC, November 1985.

Final Engineering Report - Love Canal Black and Bergholtz Creeks Remediation, TAMS and NYSDEC, October 1990.

Final Report for the Remediation of 93rd Street School Site, Niagara Falls, New York, Loureiro Engineering Associates and NYSDEC, September 18, 1992.

Final Report - Love Canal Units B9 and 18 - Remediation of Frontier Avenue Sewer, 110th Street and EDA 4, A.B. Environmental Services and NYSDEC, September 1993.

Remedial Action Report for the Love Canal Area Revitalization Agency-Property Acquisition Cooperative Agreement, USEPA, September 30, 1996.

Final Construction Report, Dewatering Containment Facility and Clay/Soil Stockpile Area Remediation, OCC and Treatek-CRA Company, May 1997.

Phase I Report, Love Canal Bagged Wastes, OCC and Treatek-CRA Company, February 1998.

Phase II Report, Love Canal Bagged Wastes, OCC and Treatek-CRA Company, June 1998.

Remedial Action Report, Final Treatment/Disposal of Love Canal Sewer and Creek Sediments and Other Remedial Wastes, GlennSprings Holdings, Inc. and OCC, March 2000.

V. MONITORING

Love Canal Remedial Project - Task V-C, Long-Term Monitoring Program, First Year Monitoring Data Report, Final Report, E.C Jordan and NYSDEC, June 1987.

1995-99 Operation and Monitoring Report - Five Years - Love Canal - Occidental Chemical Corporation, Niagara Falls, New York, Glenn Springs Holdings, Inc, Miller Springs Remediation Management, Inc. and OCC.