



**DRAFT FOR PUBLIC COMMENT
EXPLANATION OF SIGNIFICANT DIFFERENCES
PINE STREET CANAL SUPERFUND SITE
BURLINGTON, VERMONT
December 2008**

Superfund Records Center
SITE: FE LAWSON RIVER
BREAK: 5.4
SERIAL: 299164

Site Name: Pine Street Canal Superfund Site
Site Location: Burlington, Vermont
Lead Agency: United States Environmental Protection Agency (EPA)
Support Agency: Vermont Department of Environmental Conservation (VT DEC)

I. INTRODUCTION

This draft Explanation of Significant Differences (ESD) is being issued for the Pine Street Canal Superfund Site to address differences between the remedial action being undertaken there and the remedy that was set forth in the Record of Decision (ROD) for the Site on September 29, 1998. EPA is required to publish a final ESD by Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9617(c), and the rule at 40 C.F.R. § 300.435(c)(2)(i).

The remedy selected by the 1998 ROD included placing a sand and silt cap over contaminated sediments in the canal and turning basin that posed an unacceptable ecological risk. Construction of the cap was completed in March 2003. In the summer of 2004, the cap was extended over a portion of the western bank of the canal, after it was discovered that coal tar and oil (collectively referred to as nonaqueous phase liquid or NAPL) was migrating along historic cribbing and the root systems of dead trees, accumulating in pools on the ground surface and the surface of the underwater cap.

Oily sheens and globules of coal tar were once again observed floating on the surface water at the southern end of the canal in the spring of 2005. Studies conducted by defendants responsible for the implementation of the clean up, under the supervision of EPA and VT DEC, determined that NAPL is migrating upwards through the existing cap, into the water column.

This draft ESD calls for a modification of the cap to address the ongoing migration of NAPL. In areas where NAPL is seeping (between transects T9 and T13 approximately, as shown on figure 1), the cap will be partially replaced and/or augmented with a new cap system that will capture NAPL before it is released into the canal. The NAPL that accumulates will periodically be removed and shipped off site for treatment or disposal in an approved facility.

In accordance with CERCLA §117(d), 42 U.S.C. § 9617(d), and the rules at 40 C.F.R. §§ 300.435(c)(2)(i)(A) and 300.825(a)(2), this draft ESD and its supporting documents have been added to the Administrative Record for the Site and are available for public inspection. In

addition, EPA is seeking public comment on this draft ESD between December 22, 2008 and January 27, 2009. The Administrative Record is available for public review at the following locations:

EPA New England Records Center
One Congress Street, Suite 1100
Boston, Massachusetts 02114-2023
By appointment only: 617-918-1440

Fletcher Free Public Library
Reference Desk
235 College Street
Burlington, Vermont 05401
802-865-7217
Hours: Mon, Tues, Thurs, Fri – 8:30 am to 6:00 pm
Wed – 8:30 am to 9:00 pm
Sat – 9:00 am to 5:30 pm
Sun – 12:00 to 6:00 pm

Bailey-Howe Library
Special Collections
University of Vermont
Burlington, Vermont 05405
802-656-2138
Hours: Mon thru Fri – 9:00 am to 5:00 pm
Sat and Sun – 1:00 to 5:00 pm

II. SITE HISTORY, CONTAMINATION, AND THE SELECTED REMEDY

The Pine Street Canal Superfund Site is located between Pine Street and the eastern shore of Lake Champlain, about half a mile south of downtown Burlington, Vermont. The Site consists of an abandoned barge canal and turning basin, stormwater management areas, vegetated wetlands and uplands. The canal is hydraulically connected to Lake Champlain and, as such, is subject to flooding when lake levels are high. The upland areas along Pine Street and Lake Street are zoned for enterprise (light manufacturing); however, the majority of the 38-acre Site is vacant and is used occasionally by trespassers. The wetlands and open water along the lakefront are zoned recreation/greenspace and conservation. Groundwater beneath the Site has been classified by the State of Vermont as Class IV, making it unpotable and suitable for agricultural or commercial uses only.

The Site has been used for various industrial/commercial purposes since the mid-1800's when the railroad on the western edge of the canal was built. The barge canal and turning basin were first dredged in 1868 to provide access to Lake Champlain for several lumber companies, a coal company, and a boat builder. By 1879, two slips for barges, one running north from the turning basin, the second running east towards Pine Street from the middle of the canal, had also been constructed.

Around 1895, Burlington Gas Works, a manufactured gas plant (MGP), was constructed on Pine Street, just north of what is now the Burlington Electric Department. The plant used a coal gasification process to manufacture gas for the city. Burlington Gas Works reportedly disposed of large quantities of coal gasification wastes, such as coal tar, fuel oil, contaminated wood chips, iron oxide, cinders, and associated contaminants such as cyanide and metals, on site and in the wetlands behind the plant. These waste materials are the primary source of contamination at the Site.

Disposal practices at the MGP, as well as the operations of other industries at the Site, have resulted in the infilling of wetlands and peaty soils at much of the Site. The gas plant ceased operations in 1966 and was dismantled in 1967. By 1977, both barge slips had been filled in. Naturally occurring processes, such as deposition, eutrophication, and sediment trapping in large root mats, continued to fill in the canal and turning basin.

The first observation of visible contamination on surface water was documented in 1926, when a daily log book for the MGP noted that light tar from the plant's tar well was running into the lake. A series of oily releases to the canal occurred in the late 1960s and early 1970s. In 1977 and 1978, the State of Vermont took exploratory borings for the Southern Connector highway that was proposed to be constructed on the Site. The borings revealed extensive subsurface contamination.

The Site was proposed for the Superfund National Priorities List (NPL) on October 23, 1981 and was listed on September 8, 1983. In 1985, EPA undertook an emergency removal action at the former Maltex Pond (figure 1). VT DEC provided field oversight. Six to eighteen inches of soil contaminated with coal tar were removed from the surface, mixed with limestone, solidified, and shipped off site for disposal at an approved facility. A permeable geotextile membrane was placed over the excavated area, and topped with clean topsoil. Contaminated soil was left in place below the geotextile membrane.

The Vermont Agency of Transportation continued their investigations of the proposed Southern Connector right-of-way until 1988 when EPA took the lead for site investigations. In November 1992, EPA proposed a cleanup plan for the Site. The plan included dredging contaminated sediments and placing them in a containment/disposal facility (CDF) built on site, and, collecting mobile coal tar and oil. Public comment on the 1992 proposed plan was negative. Commenters were critical of certain aspects of EPA's remedial investigation, including the nature and extent of ecological risk at the Site, the migration of contaminated groundwater, and air quality. Commenters were also concerned about the short-term health effects of excavation and the construction of a large CDF on the shores of Lake Champlain. After a six-month comment period, EPA withdrew the proposed cleanup plan.

In 1993, environmental regulators, the potentially responsible parties (PRPs), and other citizens and groups who had been active in commenting on the 1992 proposed plan formed the Pine Street Barge Canal Coordinating Council (PSBCCC). The PSBCCC's mission was to design and oversee the implementation of additional studies to fill in data gaps in the remedial investigation, and to recommend a proposed remedy for the Site to EPA. Under the oversight of EPA and the

State of Vermont, and with involvement of the PSBCCC, additional studies of the Site were performed by the PRPs in 1994 through 1998. In 1993, the State of Vermont reclassified the groundwater from drinking water to commercial and agricultural uses only. This action removed a significant pathway for human exposure and the primary focus of the Site shifted from human-health to ecological risk. In late 1997, the PSBCCC recommended a remedy for the Site. EPA adopted the recommendations of the PSBCCC, and in May 1998, released a second proposed cleanup plan for public comment. In September 1998, EPA issued the ROD for the Site, selecting the remedy recommended by the PSBCCC.

The remedy set forth in the 1998 ROD for the Pine Street Canal Site included the following:

- capping contaminated sediments in the canal and turning basin with sand and silt;
- capping contaminated sediments in emergent wetlands with sand and top soil;
- construction of a weir at the mouth of the turning basin where it enters Lake Champlain
- improving on-site stormwater managements features;
- habitat restoration;
- mitigating adverse effects from the remedy, if any, on historically-significant structures;
- establishing and monitoring compliance with deed restrictions that prohibit potable use of groundwater, prevent unsafe contact with contaminated soil below five feet, and prevent certain land uses that could result in unacceptable human-health risk (e.g., residential, children's day care);
- long-term compliance monitoring of groundwater, surface water, stormwater, sediment and performance monitoring of the cap; and
- performing five-year reviews of the remedy to ensure that it remains protective.

On February 11, 2000, a Consent Decree was entered in United States District Court for the State of Vermont between EPA, VT DEC and the PRPs. In it, three Performing Defendants agreed to implement the remedy selected in the 1998 ROD. Groundwater monitoring, pre-design studies and pilot tests began in the fall of 2000. Construction began in October 2001 with the concrete weir built at the outlet to Lake Champlain. The reconfiguration of on-site stormwater features and capping emergent wetlands took place over the summer and fall of 2002.

Experience and information gathered during construction of a waterway between wetlands and the canal indicated that it would be feasible and advantageous to apply the sand directly over the sediments in a dewatered canal rather than from a hopper on a barge, as originally planned. Further, it was determined that construction during the winter season would take advantage of increased sediment strength due to freezing, as well as accelerate the overall remedial action schedule. Construction of the cap was completed in March 2003 and the canal and turning basin were slowly inundated with water, in advance of spring flooding.

In June 2003, oily sheens and globules of coal tar were observed floating on the water surface in one area of the canal. Pools of coal tar were also found on the cap in the canal and in an uncapped area immediately adjacent to the canal. Absorbent booms (which still remain) were placed across the canal to prevent the contamination from migrating to Lake Champlain. In the summer of 2004, the cap was extended over a portion of the west bank of the canal where historic cribbing and the root systems of dead trees were pathways for NAPL migration. The

expanded cap seemed to be working to control the release of NAPL until oily sheens and globules of coal tar were once again observed floating on the surface water at the southern end of the canal in the spring of 2005.

In 2006, a five-year review of the protectiveness of the remedy was conducted, as required by the ROD. EPA determined that with the exception of the performance of the subaqueous cap in the southern portion of the Site, the remedial actions are functioning as intended by the ROD. The cap performance standard that is not being met is for the isolation of contaminants. The five-year review report can be found in the public repositories mentioned above and as a link from EPA's Pine Street website at www.epa.gov/ne/superfund/sites/pinestreet.

The Performing Defendants conducted field investigations under the supervision of EPA and the VTDEC in 2006 and 2007 to evaluate the rate at which NAPL is being released from the southern portion of the canal, its distribution, and the mechanisms of release. In 2008, the Performing Defendants evaluated options that could be implemented as partial replacement for, augmentation of, or addition to the existing cap to prevent NAPL from seeping into the canal. The results of the investigation and evaluation of remedial options can be found in two reports entitled *Final NAPL Investigation Report (February 1, 2008)* and *Final NAPL Controls Report (June 20, 2008)*. These reports are included in the Administrative Record for the Site, and are available as links from EPA's Pine Street website and in the public repositories.

III. BASIS FOR THIS ESD

Performance standards for the subaqueous cap in the southern portion of the canal (between transects T9 and T13, approximately) are not being met. In these areas, the cap has not effectively isolated the contamination. NAPL that lies beneath the canal is migrating upwards, through the cap and into the water column, where benthic organisms, fish and other wildlife can come into contact with it. The rate of NAPL seepage is significant and is estimated to be at least 111 kg/year. If the absorbent booms were not in place, contamination could migrate to Lake Champlain, which is a source of drinking water for Burlington, at levels of concern.

Studies conducted in 2006 and 2007 indicate that the primary mechanism for the release of NAPL is gas ebullition. The organic-rich canal sediments beneath the installed cap are generating gas, presumed to be methane. As the gas passes through the contaminated sediments, it can become coated with NAPL. Coated bubbles pass through the sand cap and when they hit the surface of the water and burst, an oily sheen is left behind (figure 2). The path that the gas takes through the sand can act as a pore through which droplets of coal tar can migrate. Depending on the density of the coal tar, it either accumulates with the sheens on the water surface, or drops and accumulates on the cap surface.

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES

The capping materials specified in the ROD for the subaqueous cap were sand and silt. During remedial design, a geotextile layer was added to the bottom of the cap to prevent the sand and silt from slumping into and mixing with the very soft, contaminated sediments at the bottom of the canal. A layer of geogrid was also added to support the weight of construction equipment.

In those areas where the seepage of contaminants is occurring (between transects T9 and T13, approximately), this ESD provides that the existing cap will be redesigned and reconfigured to intercept and sequester the NAPL, preventing its release into the canal. The specifications for the new cap profile and the selection of materials for the cap will be finalized during design. It is expected that the new cap will include a high-permeability layer that will reduce the gas gradient and will facilitate passive collection and removal of NAPL. In addition to the performance standards for the isolation of contaminants set forth in the 2000 Consent Decree¹, the new cap will be evaluated against the following design criteria:

- ability to control the release of NAPL into the canal;
- ability to reduce contaminant loading to and through cap materials in the biologically-active zone;
- ability to limit the replacement of the layer(s) in which NAPL is sequestered;
- ease of removal of NAPL and change-out of materials in which NAPL is sequestered; and
- 30-year minimum design life.

One possible design for the reconfigured cap is described as “Alternative 2” in the June 2008 *Final NAPL Controls Report*. Alternative 2 would modify the existing cap between T9 and T13, approximately, with the addition of two new layers. The first would be a comprised of high-permeability, lightweight material (e.g., pumice, expanded perlite, recycled glass) in which slotted pipes would be laid to facilitate NAPL capture and removal. This layer would be covered with a reactive cap in which an absorbent material (e.g., organoclay) at the core of the cap binds with the contaminant and prevents its release. When the capacity of the absorbent material is reached, the reactive cap must be replaced. However, it is expected that most of the migrating NAPL would accumulate in the underlying high-permeability layer before it reached the reactive cap, thereby minimizing the need for change-out. The new cap with its NAPL capture layer would require a more complex operation and maintenance program than did the original sand cap.

Some microdredging of the existing sand cap is expected during installation of the new cap to minimize changes to the canal profile and to maintain, to the extent practicable, the original elevation of the bottom of the canal.

EPA expects that other possible designs, in addition to Alternative 2, will be considered during the design of the reconfigured cap. Regardless of the final design of the reconfigured portion of

¹ The subaqueous cap shall prevent contact between the contaminated sediments and benthic organisms and fish in the biologically-active portion of the benthic habitat (1-10 cm) at ecologically harmful levels. It shall be a barrier to the effects of bioturbation. It shall prevent or minimize the migration of contaminants from the contaminated sediments through the cap.

Cap materials shall be selected and applied so as to isolate ecological receptors from the contaminated soils and sediments that will remain in place below the cap. Cap thickness, after settling and compaction, shall be sufficient to prevent exposure of benthic organisms that recolonize the cap to underlying contaminants. Increases in the elevation of the bottom of the canal shall be minimized. The water column shall be maintained at sufficient depth to minimize the potential for cap erosion.

the cap, the monitoring program will also be more comprehensive than that required under the 1998 ROD. Operation, maintenance and monitoring programs will be developed during remedial design.

The remaining components of the original remedy remain unchanged.

Change in Expected Outcomes

It is expected that the new cap will meet the performance standard for isolation of contamination. Consistent with EPA's February 2, 2002 guidance entitled *Principles for Managing Contaminated Sediments at Hazardous Waste Sites*, OSWER directive 9285.6-08, which was issued after the Pine Street ROD, this ESD is a part of an iterative approach. If new information indicates that site assumptions should be re-evaluated, EPA may require additional measures to address the isolation of contamination performance standard in the future.

All other expected outcomes remain unchanged.

V. Support Agency Comments

VT DEC participated with EPA in developing the changes to the selected remedy described herein.

VI. Statutory Determinations

EPA believes that the remedy as adjusted herein remains protective of human health and the environment and satisfies the requirements in Section 121 of CERCLA. The changes made in this ESD have not changed the remedial action objectives for the Site. Rather, the modifications to the remedy described herein will allow the remedy to continue to perform in the most cost-effective manner practicable while meeting all of the statutory requirements of CERCLA.

VII. Public Participation Compliance

In accordance with Section 117(d) with CERCLA and Section 300.825(a) of the NCP, this ESD will become part of the Site's Administrative Record which is available for public review at the locations identified in the introduction to this document.

Although a formal comment period is not required when issuing an ESD, in this instance, given the considerable public involvement in the remedy selected in 1998, EPA is issuing the ESD in draft to allow for public review and comment. EPA will collect written comments from December 22, 2008 to January 27, 2009. Comments on the draft ESD should be mailed to:

Karen Lumino
EPA New England
1 Congress Street
Suite 1100 (HBT)
Boston, MA 02114

Comments may also be submitted via email to lumino.karen@epa.gov

As required by NCP section 300.435(c)(2)(i)(B), EPA will also publish a notice of availability and a brief description of this ESD in a major local newspaper of general circulation following the signing of this ESD. EPA will consider comments received during the comment period in issuing a final ESD.

Attachment A – Figures

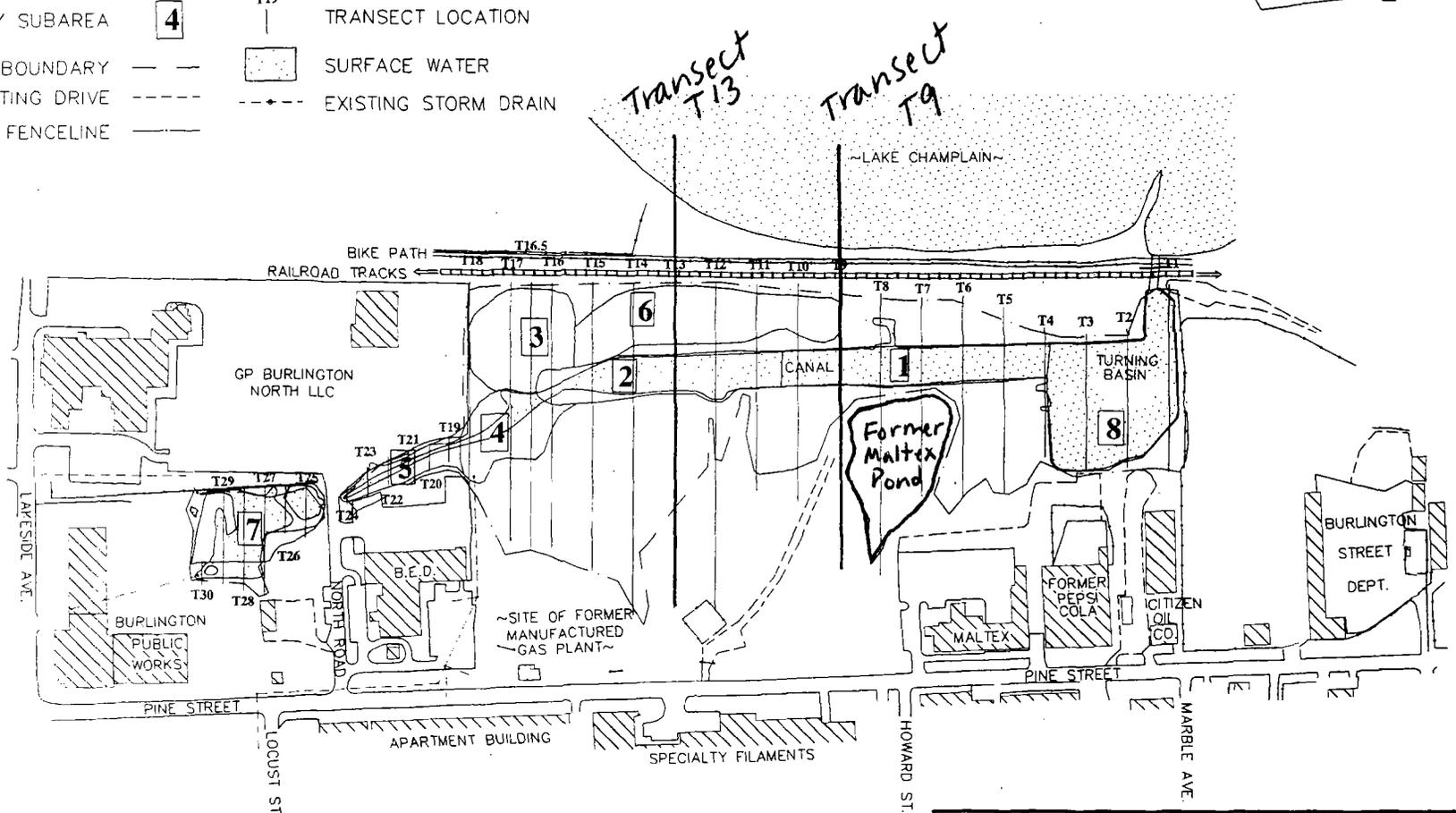
Attachment B – Draft ESD Administrative Record Index

Pine Street Canal Draft ESD
Attachment A

Figures

LEGEND

- STUDY SUBAREA 4
- WETLAND BOUNDARY
- EXISTING DRIVE
- EXISTING FENCELINE
- T19
- TRANSECT LOCATION
-
- SURFACE WATER
-
- EXISTING STORM DRAIN



BURLINGTON, VERMONT
 PINE STREET CANAL SUPERFUND SITE
 FINAL NAPL CONTROLS REPORT

GENERAL SITE PLAN



FIGURE
 1-2

Note: Map provided by The Johnson Company.



Figure 2

1 inch

**Pine Street Canal Draft ESD
Attachment B**

Administrative Record Index

05: RECORD OF DECISION (ROD)

File Break: 05.04

216973 RECORD OF DECISION (ROD)

Author: US EPA REGION 1
Addressee:
Doc Type: REPORT
RECORD OF DECISION (ROD)

Doc Date: 09/29/1998 # of Pages: 322

Bates Number:
Weston Number:

299164 DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD)

Author: US EPA REGION 1
Addressee:
Doc Type: REPORT

Doc Date: 12/01/2008 # of Pages: 17

Bates Number:
Weston Number:

07: REMEDIAL ACTION (RA)

File Break: 07.05

263768 DRAFT REMEDIAL ACTION CONSTRUCTION COMPLETION REPORT VOLUME 1 OF 2 12/27/2006 TRANSMITTAL NUMBER 2006043189

Author: JOHNSON COMPANY INC
Addressee: US EPA REGION 1
VERMONT STATE OF
Doc Type: REPORT

Doc Date: 12/30/2006 # of Pages: 1592

Bates Number:
Weston Number:

07: REMEDIAL ACTION (RA)

File Break: 07.05

299115 DRAFT, PHASE I REMEDIAL ACTION CONSTRUCTION COMPLETION REPORT OPERABLE UNIT 01

Author: JOHNSON COMPANY INC

Doc Date: 01/29/2002 # of Pages: 225

Addressee: US EPA REGION 1

Bates Number:

Doc Type: REPORT

Weston Number:

08: POST REMEDIAL ACTION

File Break: 08.03

256970 FIVE-YEAR REVIEW REPORT

Author: SUSAN STUDLIEN US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION

Doc Date: 10/03/2006 # of Pages: 96

Addressee:

Bates Number:

Doc Type: FIVE YR REVIEW RPT & APPROVAL

Weston Number:

08: POST REMEDIAL ACTION

File Break: 08.05

299105 FINAL NAPE CONTROLS REPORT

Author: GARRY E HORVITZ ARCADIS
Addressee: BARRY L KELLEMS ARCADIS
PHILIP A SPADARO ARCADIS
GREEN MOUNTAIN POWER CORP

Doc Date: 06/30/2008 # of Pages: 135

Bates Number:

Weston Number:

Doc Type: REPORT

10: ENFORCEMENT/NEGOTIATION

File Break: 10.08

25918 CONSENT DECREE: UNITED STATES DISTRICT COURT OF VERMONT, CIVIL ACTION NO 1:99-CV-366

Doc Date: 02/11/2000

of Pages: 82

Author: MARGERY L ADAMS US EPA REGION 1
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CANUTE DALMASSE VT DEPT OF ENVIRONMENTAL CONSERVATION
DERRICK DAVIS BCV CORP
DERRICK DAVIS DAVIS DEVELOPMENT CORPORATION
DERRICK DAVIS MALTEX PARTNERSHIP
JOHN P DEVILLARS US EPA REGION 1
C L DUTTON GREEN MOUNTAIN POWER CORP
A DONALD JR GILBERT VERMONT GAS SYSTEMS INC
LINDA HUDSON GENERAL DYNAMICS ARMAMENT SYSTEMS INC
MICHAEL E JANETT CITIZENS PROPERTIES INC
CHERYL A LAFLEUR NEW ENGLAND ELECTRIC SYSTEMS
LINDA D LYNESS SPECIALTY FILAMENTS INC
L GAUREN MEUTTIA UNITED STATES DISTRICT JUDGE
DENNIS K MORGAN SOUTHERN UNION CO
BRIAN R SEARLES VERMONT AGENCY OF TRANSPORTATION
ERICK TITRUD VT OFFICE OF THE ATTORNEY GENERAL
NORMAN A JR VARNEY LOCKHEED MARTIN CORP
DAVID WALTSON VERMONT RAILWAY
L KEITH WIMBUSH UDV NORTH AMERICA INC
STEVEN H WOOD MAYTAG CORP

Bates Number:

Weston Number:

Doc Type: ENFORCEMENT SETTLEMENT

13: COMMUNITY RELATIONS

File Break: 13.05

260733 FIVE-YEAR REVIEW COMPLETE; FOLLOW-UP ACTION PLANNED

Author: US EPA REGION 1

Doc Date: 01/01/2007

of Pages: 4

Addressee:

Bates Number:

Doc Type: FACT SHEET

Weston Number:

Number of Documents in Collection: 8