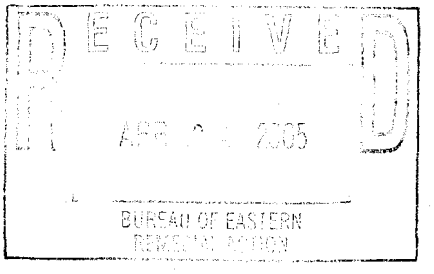
Five-Year Review Report
Colesville Landfill Superfund Site
Broome County
Town of Colesville, New York



Prepared by:

United States Environmental Protection Agency
Region 2
New York, New York

April 2005

EXECUTIVE SUMMARY

A second five-year review for the Colesville Landfill Superfund site, located in the Town of Colesville, Broome County, New York, was completed. Currently the landfill remedy is functioning as intended by the decision documents protecting human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name *(from WasteLAN)*: Colesville Landfill

EPA ID *(from WasteLAN)*: NYD980768691

Region: 2	**State:** NY	**City/County:** Town of Colesville/Broome County

SITE STATUS

NPL Status: ■ Final ☐ Deleted ☐ Other (specify)

Remediation Status (choose all that apply): ☐ Under Construction ☐ Operating ■ Complete

Multiple OUs? ☐ YES ■ NO	**Construction completion date:** September 30, 2004

Are portions of the site in use or suitable for reuse? ■ YES ☐ NO ☐ N/A

REVIEW STATUS

Lead agency: ☐ EPA ■ State ☐ Tribe ☐ Other Federal Agency

Author name: George Jacob

Author title: Remedial Project Manager	**Author affiliation:** EPA

Review period:** 4/2000 to 4/2005

Date(s) of site inspection: 4/7/05

Type of review:

☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion ☐ Policy ■ Statutory

Review number: ☐ 1 (first) ■ 2 (second) ☐ 3 (third) ☐ Other (specify)

Triggering action:

☐ Actual RA Onsite Construction at OU # _ ☐ Actual RA Start at OU#___
■ Construction Completion ■ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: 4/19/2000

Due date ***(five years after triggering action date)***: 4/19/2005

Does the report include recommendation(s) and follow-up action(s)? ☐ yes ■ no
Is human exposure under control? ■ yes ☐ no
Is migration of contaminated groundwater stabilized? ■ yes ☐ no ☐ not yet determined
Is the remedy protective of the environment? ■ yes ☐ no ☐ not yet determined
Acres in use or suitable for use: **restricted:** 35 acres **unrestricted:** ___

Five-Year Review Summary Form (continued)

Issues, Recommendations, and Follow-Up Actions

The selected remedy has not been fully implemented. Institutional controls to protect the integrity of the cap, monitoring wells, and extraction wells and to prevent the installation of potable water wells in the vicinity of the landfill need to be implemented. The County is expected to implement these institutional controls. This site cannot be deleted from the National Priorities List until the institutional controls are in place and the remedial action objectives are achieved.

This site has ongoing operation, maintenance and monitoring activities as part of the selected remedy. As was anticipated by the decision documents, these activities are subject to routine modification and adjustment. This report includes suggestions for improving, modifying and/or adjusting these activities.

This report did not identify any issue or make any recommendation for the protection of public health and/or the environment which was not included or anticipated by the site decision documents.

Protectiveness Statement

The implemented actions at the site protect human health and the environment in the short-term; however, in order for the site to be protective in the long-term, institutional controls need to be implemented. Currently, there are no exposure pathways that could result in unacceptable risks and none are expected, as long as the site use does not change and the engineered and access controls that are currently in place continue to be properly operated, monitored, and maintained.

I. Introduction

This second five-year review for the Colesville Landfill site, located in the Town of Colesville, Broome County, New York, was conducted by United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM) George Jacob. The review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §9601 *et seq.* and 40 CFR 300.430(f)(4)(ii) and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). The purpose of five-year reviews is to ensure that implemented remedies protect public health and the environment and that they function as intended by the site decision documents. This report will become part of the site file.

A five-year review is required at this site due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

In accordance with Section 1.3.3 of the five-year review guidance, a subsequent statutory five-year review is triggered by the signing date of the previous five-year review report. The first five-year review was signed on April 19, 2000.

This five-year review found that the implemented remedy is functioning as intended and continues to protect human health and the environment.

II. Site Chronology

Table 1 (attached) summarize the site-related events from discovery to construction completion.

III. Background

Site Location

The Colesville Landfill site is located in the Town of Colesville, Broome County, New York. The property on which the landfill is situated is bounded by East Windsor Road to the south and by unnamed tributaries of the Susquehanna River to the west-northwest (North Stream) and to the east (South Stream) (see Figure 1). The nearest residential development is Doraville, located approximately a mile to the southeast of the site.

Physical Characteristics

The Colesville Landfill Superfund site is characterized as rural and includes large tracts of undeveloped woodlands, as well as agricultural tracts and scattered residential parcels. Of the 113 acres on which the property is situated, the landfill occupies approximately 35 acres. The property's topography ranges from approximately 1,400 feet above mean sea level in the east to about 970 feet above mean sea level in the west.

Surface water drainage at the site is via two tributaries of the Susquehanna River—the North Stream and the South Stream. The North Stream, located to the north and west of the landfill, flows southwesterly to the Susquehanna River. To the east and south of the landfill is the South Stream, which flows to the south-southwest into a low-lying wet area. Both tributaries join the Susquehanna River approximately 0.5 miles above Doraville.

The Susquehanna River is classified as Class B surface water in the vicinity of the site. Class B waters are suitable for both primary[1] and secondary[2] contact recreation, as well as for fish propagation. The North Stream and South Stream are Class C and D waters, respectively. These waters are suitable for secondary contact recreation and fish propagation only.

Existing flood insurance maps (Federal Emergency Management Agency, 1983) indicate that no portions of the site are located in either the 100- or 500-year flood zone.

Vegetation patterns at the site are a mixture of herbaceous field, weed, and grass species. Both open-field and forested habitats characterize the surrounding area. These habitats support a large variety of avian and mammalian species. No New York State Department of Environmental Conservation (NYSDEC) Significant Habitat Areas are found on-site, although the site is located within the range of several migratory endangered or threatened species. The predominant aquatic species found in the Susquehanna River include small mouth bass, rock bass, and white suckers.

The nearest homes to the landfill are located to the south and southeast along East Windsor Road. The home closest to the landfill, which was at a distance of approximately 380 feet, was purchased by Broome County and was demolished. Another home, located approximately 500 feet from the landfill, is now vacant. Two other homes are located approximately 640 feet from the landfill.

Site Geology/Hydrogeology

Glacial outwash deposits at the site consist of a heterogeneous mixture of gravel, sand, clay and silt. The average hydraulic conductivity of these materials is approximately 0.3 ft/day. Water moving within the glacial outwash aquifer beneath the landfill is part of a shallow groundwater subsystem that discharges into nearby surface-water bodies. In this type of hydrogeologic setting, essentially all of the areal recharge to the glacial outwash aquifer moves horizontally because of the dense glaciolacustrine clay confining unit that underlies the glacial outwash aquifer. The direction of groundwater flow at the Colesville Landfill site is toward the west and southwest, discharging to the North Stream and Susquehanna River. Although groundwater is present in the till and

---

[1] Primary Contact Recreation—recreational activities where the human body may come in direct contact with water to the point of complete body submergence (i.e., swimming, diving, water sports, and surfing).

[2] Secondary Contact Recreation—recreational activities where contact with water is minimum and where ingestion of water is not probable (*i.e.*, fishing and boating).

glaciolacustrine clay, the low permeabilities of these units limit their potential for groundwater flow. A very small portion of the base flow to the Susquehanna River is derived from groundwater flow moving upward from the bedrock aquifer, through the glaciolacustrine clay into the overlying glacial outwash aquifer, where it ultimately seeps into the Susquehanna River.

Land and Resource Use

The area surrounding the site includes large tracts of undeveloped woodlands, as well as agricultural tracts and scattered residential parcels.

Many of the residents of the Town of Colesville use private water supply wells. These wells utilize groundwater from both shallow and deep aquifers. Other homes utilize groundwater obtained from springs.

The home closest to the landfill is located approximately 500 feet from the landfill; the home is currently vacant. Two other homes are located approximately 640 feet from the landfill. Since the Susquehanna River is downgradient of these properties, no other properties are potentially impacted by the site.

History of Contamination

Waste disposal operations at the landfill commenced in 1969. The landfill was owned and operated by the Town of Colesville between 1969 and 1971. Broome County purchased the landfill in 1971, and operated it until 1984 when it closed.

The landfill was primarily used for the disposal of municipal solid waste, although drummed industrial wastes from various sources were also disposed of between 1973 and 1975. Operational records indicate that these drummed wastes consisted of aqueous dye waste and organic solvent waste. Known waste constituents included benzene, cyclohexane, acetone, isopropyl alcohol, methanol, ethanol, n-hexane, toluene, xylene, dimethyl ether, zinc, aluminum, iron, tin sulfate, and chloride. In practice, drummed wastes were randomly co-disposed with the municipal solid wastes and disposed of in segregated areas. The drums were either buried intactly, or were punctured and crushed prior to burial.

The landfill contains approximately 468,000 cubic yards of co-disposed waste.

Initial Response

The site was proposed for inclusion on the Superfund National Priorities List (NPL) in October 1984; it was listed on the NPL in June 1986. NYSDEC was designated the lead agency for this site. In 1983, samples collected by the Broome County Health Department from residential wells in the vicinity of the site indicated that the Colesville Landfill was contaminating the groundwater beneath and in the immediate vicinity of the site. The sample results prompted the Broome County Department of Public Works to install carbon filters on the affected residences, to conduct a quarterly residential well monitoring program, and to perform two investigative studies of the

Colesville Landfill. These studies were performed by Wehran-New York, Inc. (Wehran) in 1983 and 1984.

Wehran's 1983 study indicated that the groundwater quality in the vicinity of the Colesville Landfill demonstrated a strong indication of contamination by landfill leachate. Volatile organic levels, measured as total volatile organics, ranged from 48 to 2,800 micrograms per liter (µg/l) within and around the landfill. Residential wells ranged from 32 µg/l to 415 µg/l, expressed as total volatile priority pollutants.

Wehran's 1984 investigation confirmed the findings of the 1983 study with respect to the immediate landfill vicinity. Total volatile priority pollutant concentrations ranged from "not detected" in upgradient monitoring wells to 7,795 µg/l immediately downgradient. Contamination was confined, primarily, to the upper portions of the glacial outwash aquifer that underlies the site.

Basis for Taking Action

In 1988, Wehran completed a remedial investigation (RI) at the site on behalf of the Broome County Department of Public Works and GAF Corporation, the Potentially Responsible Parties (PRPs), pursuant to an Order on Consent (Index No. T010687) issued by NYSDEC.

The RI found that the landfill was releasing low levels of VOCS into the groundwater. In general, five VOCS, 1,1-dichloroethane, 1,1,1-trichloroethane, trichloroethene, trans-1,2-dichloroethene and benzene, were the major contaminants in the contaminant plume. The risk assessment concluded that exposure to the chemicals identified at the site could result from the consumption of contaminated well water or the inhalation of VOCs present in the water.

In 1990, Wehran completed a confirmatory sampling program which confirmed the findings of the 1988 RI.

In December 1990, Wehran completed a feasibility study (FS) report, which presented an analysis of the potential alternatives for the remediation of contamination observed at the site.

IV. Remedial Actions

Remedy Selection

Based upon the results of the RI/FS, in 1991, EPA signed a ROD for the site, calling for, among other things:

- Installation of a multimedia cap on the landfill;
- Installation of a leachate collection system;
- Installation of groundwater extraction wells to contain the groundwater

contamination;

- Collection and treatment of contaminated groundwater from beneath and downgradient of the landfill;

- Conveyance of the collected leachate and contaminated groundwater via the sewer system to a local wastewater treatment facility;

- Imposition of property deed restrictions, if necessary, to prevent the installation of drinking water wells at the site and to restrict activities which could affect the integrity of the cap, monitoring wells, and extraction wells; and

- Provision of new wells for affected residents located in the vicinity of the site.

Remedy Implementation

Pursuant to the above-referenced Order on Consent with NYSDEC, Weharn, on behalf of the PRPs, began the engineering design for the selected remedy in the spring of 1991. During the initial stages of the design, the PRPs' consultant performed extensive field work to collect additional data for the groundwater portion of the remedial design. By June 1993, it was apparent that there were technical issues related to the groundwater extraction and treatment system that would not be easily or promptly resolved. It was, therefore, decided that the landfill cap design and the alternate water supply (double-cased deep wells) design should be completed separately from the groundwater extraction and treatment system design to allow the capping of the landfill and alternate water supply components of the remedy to proceed. In 1994, Wehran, on behalf of the PRPs, completed the engineering design for the capping of the landfill and wetland restoration (creation of a new wetland to replace the three small wetland areas on the landfill's surface); the capping of the landfill and wetland restoration, performed by Tug Hill Construction Inc., was completed in October 1995.

An alternate water supply well design (deep wells), which was prepared by Wehran, was approved by the State in 1995. The implementation of the design was delayed, however, while Broome County attempted to purchase the five affected properties and to place deed restrictions preventing the installation and use of groundwater wells on the properties so that there would be no drinking water receptors. The County purchased three of the five properties. Two of the purchased properties are vacant and their wells have been decommissioned. One of the purchased properties is currently occupied by the former property owner, who has a life tenancy on the property. She is currently receiving bottled water from the County[3]. Of the two remaining properties that the County has not purchased, one of them is vacant and the other one contains two occupied structures. On the occupied property, the County decommissioned an old well and a surface water supply system and installed two new bedrock wells—one for each structure.

---

[3] Since the resident's well was found to be contaminated in the early 1980s, the County provided her with bottled water. She installed a deep well in the early 1990s. Although VOCs have not been detected in her new well, she continues to receive bottled water from the County.

Based upon design-related aquifer tests conducted at the site, it was determined that extracting contaminated groundwater at the landfill, as called for in the ROD, would not likely be an effective means of remediating the groundwater at the source in a reasonable time frame. Specifically, the aquifer tests determined that the aquifer near the landfill has a low permeability, which would severely limit the area of influence of the extraction wells and would allow the groundwater to be pumped at only a very low rate (0.25 to 0.5 gallon per minute). Such conditions would necessitate the installation of an inordinate number of extraction wells. This conclusion led to an evaluation of alternative groundwater technologies and the performance of a pilot-scale study to evaluate the effectiveness of one of the more promising technologies, enhanced reductive dechlorination. This process involves injecting the contaminated groundwater with an easily degradable carbohydrate solution (*i.e.*, molasses), which provides excess organic carbon that promotes microbial activity in the aquifer, enhancing the breakdown of chlorinated VOCs. Based upon the results of the pilot study, which showed a significant decline in VOC concentrations, it was concluded that this technology, in combination with the installation of downgradient extraction wells (as called for in the ROD), offered the most technically feasible approach to restoring groundwater quality in a reasonable time frame[4].

In January 2001, while the groundwater remedy was under construction, GAF Corporation declared bankruptcy. Subsequently, NYSDEC and Broome County negotiated a new State Order under which the remaining work was completed.

The groundwater management system, constructed by Clean Earth Technologies, Inc., as a subcontractor to ARCADIS, became operational in September 2002. It consists of 17 automated reagent injection wells, three groundwater recovery wells, and an on-site groundwater treatment system. Molasses injections are performed automatically once every four weeks.

In April 2000, during an inspection of the site performed as part of the five-year review process, in the vicinity of the landfill, EPA inspected a spring and a low-lying wet area that were contaminated with site-related pollutants that exceeded NYSDEC's Ambient Water Quality Values. The source of the low-lying wet area is groundwater discharging upward through a vertical, three-foot diameter concrete structure that extends approximately 2.5 feet below the ground surface. The concrete structure appears to have been placed there to enhance the spring as a source of water. Until the contamination was detected, the opening of this structure was partially buried and obscured by dense vegetation. Since contaminated water from the spring and the low-lying wet area could potentially discharge to nearby streams, remedial measures to address these areas were undertaken in September 2003 and July 2004, respectively. The remedy for the low-lying wet area consists of a sand filter and a granular activated carbon unit that were placed in the concrete structure (a cover was placed over the top of the structure). The water then flows through a horizontal 4-inch diameter drainage pipe running through the side of the concrete structure. A riprap-lined outlet structure to prevent erosion was installed at the discharge point of the drainage pipe. The remedy for the contaminated spring along the North Stream consists of the installation of a subsurface stone collection trench and

---

[4] The change to the remedy was documented in a September 2000 Explanation of Significant Differences (ESD).

drainage layer in the area of the spring to prevent the contaminated spring water from exfiltrating above the land surface. Riprap was placed between the stream and the collection trench to protect the integrity of the trench and infiltration bed during high water conditions. The contaminated groundwater that is the source of the spring is being treated with upgradient molasses injections near the landfill. These actions, which were performed by ARCADIS, were documented in a July 2004 ESD.

Institutional Controls Implementation

The County is currently seeking to place deed restrictions on all five of the affected properties to prevent the installation of groundwater wells. The County is also seeking to place restrictions on the landfill property to protect the integrity of the cap, monitoring wells, and extraction wells.

System Operations/Operation and Maintenance/Monitoring

To maintain the integrity and effectiveness of the cap, routine operation and maintenance (O&M) activities are necessary. The inspection/maintenance plan for the cap calls for regular inspection and evaluation of the cap, mowing the vegetation during the growing season, and fence maintenance. Repairs are to be made to the cap, as necessary, to control the effects of settling, subsidence, erosion or other events, and to prevent run-on from eroding or otherwise damaging the final cover. The inspection/maintenance plan has been modified to incorporate long-term groundwater monitoring, the molasses injections, the O&M of the groundwater extraction and treatment facility, and the maintenance of the passive treatment system placed in the concrete structure (granular activated carbon replacement) based upon post-treatment sampling results.

The site is inspected on a quarterly basis as follows:

- The site is inspected for debris, litter and/or waste.
- The landfill cap is inspected for vegetation loss due to erosion or poor grass growth. Annual ground inspections at the beginning of each summer also note the status of woody plant species on the landfill surface and side slopes.
- The landfill cap is inspected for settlement, ponding, and animal borrows.
- The gas venting pipes are inspected for damage.
- The site access gate and fence are inspected for operational locks and vandalism.
- The culverts, drainage ditches, and level spreaders are inspected for sediment buildup or erosion.
- The groundwater monitoring wells are inspected for operational locks, damage, and vandalism.

The groundwater extraction and treatment system O&M, injections of molasses, inspections, landfill maintenance, sampling, monitoring, data evaluation, and reporting costs are approximately $180,000 on an annual basis; these costs are broken down in Table 2 (attached).

During the five-year review site inspection, a seep was observed on the south side of the landfill near the concrete structure, which could potentially overflow to the South Stream. Since a seep at this location has not been observed previously, it is possible that it was attributable to heavy rains prior to the site inspection. No information exists on the chemistry of this leachate. In addition, the lid to the carbon container was loose.

V. Progress Since the Last Five-Year Report

The first five-year review for this site was approved on April 19, 2000. This five-year review found that while capping the waste material, erecting a security fence, posting warning signs, placing carbon filters on two private wells, providing bottled water to other residents, and purchasing one adjacent property had significantly reduced the potential for exposure to hazardous materials at the site, all of the remedial actions called for in the ROD, in particular the treatment of the contaminated groundwater, had not been implemented. In addition, a site inspection had identified the presence of a spring and a low-lying wet area contaminated with site-related pollutants. Therefore, concluded, the first five-year review, the contamination in the groundwater and the surface water releases continued to pose a threat to public health and the environment.

Since the first five-year review, the County purchased three of the five properties. Two of the purchased properties are vacant and their wells have been decommissioned. One of the purchased properties is currently occupied by the former property owner, who has a life tenancy on the property. As was noted above, although VOCs have not been detected in her well, she receives bottled water from the County. Of the two remaining properties that the County has not purchased, one of them is vacant and the other one contains two occupied structures. On the occupied property, the County decommissioned an old well and a surface water supply system and installed two new bedrock wells (one for each structure).

In addition, the groundwater extraction and treatment system is operating and the spring and a low-lying wet area contaminated with site-related pollutants have been addressed.

VI. Five-Year Review Process

Administrative Components

The five-year review team consisted of George Jacob (RPM), Grant Anderson (hydrogeologist), Chloe Metz (human health risk assessor), and Mindy Pensak (ecological risk assessor, Biological Technical Assistance Group).

Community Involvement

The EPA Community Involvement Coordinator for the Colesville Landfill site, Michael Basile, published a notice in the *Press & Sun Bulletin,* a local newspaper, on January 27, 2005, notifying the community of the initiation of the five-year review process. The notice indicated that EPA would be conducting a five-year review of the site to ensure that the site is protective of public health and the environment and that the implemented components of the remedy are functioning as designed. It was also indicated that once the five-year review is completed, the results will be made available in the local site repository. In addition, the notice included the RPM's address and telephone number for questions related to the five-year review process or the Colesville Landfill site. A similar notice will be published when the review is completed.

Document Review

The documents, data, and information which were reviewed in completing the five-year review are summarized in Table 3 (attached).

Data Review

Groundwater monitoring data during this five-year review period exceeded NYSDEC Water Quality Standards and Guidance Values (T.O.G.S. 1.1.1) (WQSGV) and/or EPA Maximum Contaminant Levels (MCLs)[5] for a number of contaminants in on-site groundwater monitoring wells (see Table 4). Especially high are the levels of 1,2,3-trichloropropane, chloroethane, chloroform, cis-1,2-dichloroethylene, tetrachloroethylene, trichloroethylene, and vinyl chloride. These concentrations are primarily found in on-site monitoring well GMMW-6, which is located in the area of greatest contamination. Downgradient contaminant levels drop off sharply.

The automated reagent injection system was installed in September 2002. Because of the short operation time, comprehensive data on its effectiveness are not currently available. However, 2 of the three downgradient extraction wells showed an increase in vinyl chloride (a VOC breakdown product) concentrations beginning in February 2003. The most recent data show that concentrations in these wells are now falling. Downgradient monitoring wells have consistently shown lower levels of vinyl chloride. More long-term monitoring data illustrating the downward trends in the concentrations of VOCs and the consequent rise in degradation products in downgradient wells will be of interest for the next five-year review.

The two drinking water wells which were installed in the deep bedrock aquifer are tested regularly by the County and the results do not show contamination.

In April 2000, a spring and a low-lying wet area were found to be contaminated with site-related pollutants. Contaminated water from the spring and the low-lying wet area could discharge to the

---

[5] WQSGVs and MCLs are the highest levels of a contaminant that is allowed in drinking water. They are promulgated standards that apply to public water systems and are intended to protect human health by limiting the levels of contaminants in drinking water.

nearby streams. VOCs were not, however, detected in the streams, probably due to volatilization and dilution. Maximum concentrations for some of the contaminants in these areas included 1,1-dichloroethane at 280 micrograms per liter (µg/l), chlorobenzene at 81 µg/l and cis-1,2-dichloroethylene at 400 µg/l. Although these levels were not above the human health-based New York State Surface Water Standards for Class C water bodies, the maximum concentration of vinyl chloride at 230 µg/l exceeded EPA's National Recommended Water Quality Criteria of 2.4 µg/l (which is designed to be protective of human health from consumption of freshwater fish) by two orders of magnitude. Following the remediation of the spring and a low-lying wet area in September 2003 and July 2004, respectively, VOCs have not been detected.

Interviews

Interviews were conducted on April 7, 2005 with John Kowalchyk and David Donoghue of Broome County and Steven M. Feldman of ARCADIS for this review.

Site Inspection

On April 7, 2005, a 5-year review-related site inspection was conducted by EPA Personnel, George Jacob, Grant Anderson and Chloe Metz and NYSDEC Project managers, Joseph Yavonditte and Gerard Burke. Also present at the site inspection were John Kowalchyk and David Donoghue of Broome County and Steven M. Feldman of ARCADIS.

Institutional Controls Verification

The County is currently seeking to place deed restrictions on all five of the affected properties to prevent the installation of groundwater wells. The County is also seeking to place restrictions on the landfill property to protect the integrity of the cap, monitoring wells, and extraction wells.

New York State now requires annual certifications that institutional controls that are required by RODs are in place and that remedy-related O&M is being performed. To comply with this requirement, on an annual basis, the site will need to be inspected to determine whether any intrusive activities have been performed at the site and the building and property records will need to be reviewed to ascertain whether or not any filings had been made for such activities. The annual O&M report that is currently submitted by the County should include a summary of the findings of the above-noted activities, along with certifications that remedy-related O&M is being performed.

Other Comments on Operation, Maintenance, Monitoring, and Institutional Controls

Table 5 (attached) summarizes several observations and offers suggestions to resolve the issues.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The ROD, as modified by the ESDs, called for, among other things, the installation of a cap,

molasses injections, and contaminated groundwater collection and treatment. The purpose of the response action was to reduce the risk to human health and the environment due to contaminants leaching from the landfill mound. The capping of the landfill was to minimize the infiltration of rainfall and snowmelt into the landfill, thereby reducing the potential for contaminants leaching from the landfill and negatively impacting the wetlands habitat and groundwater quality. Capping was to also prevent direct contact exposure to contaminated soils. Injecting molasses and pumping and treating the contaminated groundwater was to control the migration of contaminated groundwater within the site boundary to ensure that groundwater beyond the site boundary meets Applicable or Relevant and Appropriate Requirements (ARARs) for groundwater.

Sample data from the passive treatment system placed in the concrete structure indicate that the VOCs are below NYSDEC Ambient Water Quality Values.

While it appears that the remedy is functioning as intended by the decision documents, the remedy has not yet resulted in restoration of groundwater to meet ARARs. The success of the groundwater extraction system in remediating the contaminant plume as intended by the decision documents is difficult to determine at this time. Typically, the success of a groundwater remedy is measured by analysis of groundwater elevations demonstrating consistent plume capture over time, decreasing concentrations in groundwater over time, and data from groundwater extraction wells demonstrating that the wells are consistently operational and are extracting contaminated groundwater. Also, it is difficult to determine how the groundwater management system is performing hydraulically, since there are no maps that show the steady-state potentiometric surface. In addition, analysis of the influent to the extraction wells show an increase in degradation compounds immediately after the molasses injections began, with fluctuating contaminant levels observed in subsequent sampling events. There are no graphs of well performance or trend analyses, so it is difficult to assess the performance of the groundwater management system.

The ROD called for deed restrictions which prohibit the future drilling of wells on those properties that may be negatively affected by the VOC-contaminated groundwater plume. The ROD also called for deed restrictions to protect the integrity of the cap, monitoring wells, and extraction wells. The County is currently seeking to place deed restrictions on all five of the affected properties to prevent the installation of groundwater wells. The County is also seeking to place restrictions on the landfill property to protect the integrity of the cap, monitoring wells, and extraction wells.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

There are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedy. The Colesville Landfill has been capped and the cap is being maintained, removing direct contact (*i.e.*, ingestion or dermal contact with soil) exposures to the public as well as ecological receptors. A fence is in place to further prevent potential exposures to trespassers. Additionally, an extraction and treatment system and an automated reagent injection system are working to control and treat contaminated groundwater that may be moving off-site. Potential exposure to contaminated groundwater has been eliminated. The County has purchased three of the five potentially affected properties. Two of the purchased properties are vacant and their

wells have been decommissioned. One of the purchased properties is currently occupied by the former property owner, who has a life tenancy on the property. Since the resident's well was found to be contaminated in the early 1980s, the County provided her with bottled water. She installed a deep well in the early 1990s. Although VOCs have not been detected in her new well, she continues to receive bottled water from the County. Of the two remaining properties that the County has not purchased, one of them is vacant and the other one contains two occupied structures. On the occupied property, the County decommissioned an old well and a surface water supply system and installed a new bedrock well for each structure.

There are no significant changes in site use expected over the next five years. An exposure pathway that was not considered in the original assessment is vapor intrusion into indoor air. This pathway is discussed below in Question C.

The methodology for conducting a risk assessment under CERCLA has changed considerably since the original risk assessment for the Colesville site was performed in 1988. As a result, many of the contaminants present on-site were not quantitatively assessed. The toxicity values that were used to evaluate the indicator chemicals in the original risk assessment (benzene, chlorobenzene, 1,1-dichloroethane, 1,1-dichloroethylene, and trichloroethylene) have not, however, changed such that the remedy is rendered unprotective.

Because many chemicals were not assessed quantitatively, groundwater and stream monitoring data from the last three years (2002-2004) were compared to health-based screening levels developed by EPA, Region 9, called preliminary remediation goals (PRGs), as well as state and federal ARARs. The PRGs are values that are equivalent to a cancer value of one in one million (10^{-6}) or a noncancer hazard quotient of 0.1. Both National Primary Drinking Water Regulations and New York State Groundwater Quality Standards are legally enforceable standards designed to protect human health by establishing maximum allowable concentrations of contaminants in drinking water. Table 4 shows a comparison of the maximum detected groundwater concentrations to these values.

Groundwater concentrations for several compounds exceed the state and federal values, as well as EPA health-based standards. The levels of 1,2,3-trichloropropane, chloroethane, chloroform, cis-1,2-dichloroethylene, tetrachloroethylene, trichloroethylene, and vinyl chloride exceed the PRGs at a cancer risk of one in ten thousand and a noncancer hazard quotient of 1.0. However, these concentrations are, primarily, found in on-site monitoring well GMMW-6, which is located in the area of greatest contamination. Downgradient contaminant levels drop off sharply.

In the original risk assessment from 1988, surface water in the adjacent streams did not show contamination and, therefore, exposure to this medium was not evaluated. During the previous five-year review inspection, a spring and a low-lying wet area were found to be contaminated with site-related pollutants. The levels of vinyl chloride that were detected exceeded EPA's National Recommended Water Quality Criteria, which is designed to be protective of human health from consumption of freshwater fish. Since the contaminated spring and a low-lying wet area are located outside the fenced boundary of the site, the potential for human contact was possible; however, since they were situated along the side of a steep ravine, human contact with them was difficult. Remedial measures to address these areas were undertaken in September 2003 and July 2004, respectively.

A comparison of maximum concentrations to risk-based screening numbers indicates that consumption of groundwater would present unacceptable cancer risks and noncancer hazards to humans. However, the remedy has effectively prevented residents from drinking contaminated groundwater. Therefore, exceeding groundwater standards does not affect the protectiveness of the remedy. The remedial action objectives of reaching state and federal groundwater standards have not been achieved, but it is anticipated that they will be reached in the future.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Soil vapor intrusion was evaluated based on the health-protective assumption that residences are located above the maximum detected chemical concentrations in off-site, downgradient monitoring wells. Only the off-site wells were used in the vapor intrusion evaluation since on-site wells exhibit concentrations that do not realistically represent what is beneath the residences downgradient.

Maximum concentrations in the downgradient wells from sampling data collected between 2002 and 2004 were compared with the health-based screening criteria provided in the "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (EPA, 2002)." This guidance provides concentrations of chemicals in groundwater associated with indoor air concentrations at a cancer risk ranging from one in a million to one in ten thousand and a noncancer hazard quotient (HQ) of 1.0.

At 19 µg/l, the maximum concentration of trichloroethylene found in a downgradient well, was above the vapor intrusion screening value of 5.3 µg/l, which represents a cancer risk of one in ten thousand (10^{-4}). This concentration, seen in monitoring well W-18 (located on a property where there is currently an abandoned house) in both the 2002 and 2003 sampling events, indicates that vapor intrusion could potentially be an issue for residents living downgradient. At this well, the groundwater ranges from seven to 10 feet below the ground surface. It is, however, unlikely that contamination at levels seen in W-18 could be reaching occupied residences, some of which are hundreds of feet away and on the other side of the North Stream (which may be, though has not been conclusively shown to, intercepting the plume). Since the property is not owned by the County, future habitation or development could occur.

Future groundwater monitoring will be necessary to ensure that contaminated groundwater, at the concentrations seen on-site, is not reaching the residences. The County owns the property upon which the landfill is located and has purchased some of the immediately adjacent properties. Deed restrictions on the County's properties will prohibit future development there.

Recently, EPA has learned that 1,4-dioxane is present at many sites where 1,1,1-trichloroethane is also detected. This chemical has not typically been in the Target Compound List of analytes, but has recently been added. 1,4-dioxane is very soluble in water and is not usually removed by air stripping. The presence of this chemical at the Colesville landfill has not been evaluated, since EPA was not aware of it at the time of the RI. The concentrations of 1,1,1-trichloroethane at the site indicate that the presence of 1,4-dioxane at the site will need to be evaluated in the future.

There is no information that calls into question the protectiveness of the selected remedy.

Technical Assessment Summary

Based upon the results of the five-year review, it has been concluded that:

- Although two small, low-lying areas of the cap where standing water was observed need to be filled and regraded, overall, there has been very little apparent settling of the cap;
- The cap and vegetative cover are intact and in good condition;
- The fence around the cap within the site is intact and in good repair;
- The monitoring wells are functional;
- There is no evidence of trespassing or vandalism;
- The remedy has prevented residents from drinking contaminated groundwater; and
- No additional measures are needed to protect public health.

VIII. Issues, Recommendations, and Follow-Up Actions

The selected remedy has not been fully implemented. Institutional controls to protect the integrity of the cap, monitoring wells, and extraction wells and to prevent the installation of potable water wells in the vicinity of the landfill need to be implemented. The County is expected to implement these institutional controls. This site cannot be deleted from the National Priorities List until the institutional controls are in place and the remedial action objectives are achieved.

This site has ongoing operation, maintenance and monitoring activities as part of the selected remedy. As was anticipated by the decision documents, these activities are subject to routine modification and adjustment. This report includes suggestions for improving, modifying and/or adjusting these activities (see Table 5).

This report did not identify any issue or make any recommendation for the protection of public health and/or the environment which was not included or anticipated by the site decision documents.

IX. Protectiveness Statement

The implemented actions at the site protect human health and the environment in the short-term; however, in order for the site to be protective in the long-term, institutional controls need to be implemented. Currently, there are no exposure pathways that could result in unacceptable risks and

none are expected, as long as the site use does not change and the engineered and access controls that are currently in place continue to be properly operated, monitored, and maintained.

X. Next Review

Since hazardous substances, pollutants or contaminants remain at the Colesville Landfill site which do not allow for unlimited use or unrestricted exposure, in accordance with 40 CFR 300.430 (f) (4) (ii), the remedial action for the site shall be reviewed no less often than every five years. EPA will conduct another five-year review on or before April 2010.

Approved:

William J. McCabe, Acting Director
Emergency and Remedial Response Division

4-19-05
Date

Table 1: Chronology of Site Events	
Event	**Date(s)**
Operation of landfill	1969-1984
Samples collected by Broome County Health Department from residential wells in vicinity of site indicate that landfill contaminating groundwater	1983
Site placed on National Priorities List	1986
Record of Decision	1991
Cap Remedial Design	1991-1994
Cap Remedial Action	1995
Alternate Water Supply Well Remedial Design	1995
Explanation of Significant Differences	2000
Groundwater Remedial Design	2000-2004
First Five-Year Review Conducted	2000
Alternate Water Supply Well Remedial Action	2002
Groundwater Remedial Action	2002-2004
Explanation of Significant Differences	2004
Preliminary Site Close-Out Report	2004

Table 2: Annual Operation, Maintenance, and Monitoring Costs	
Activity	**Cost per Year**
Groundwater Remediation OM&M, Injection of Molasses	$60,000
Groundwater Monitoring, Sampling and Analysis	$65,000
Data Management and Reporting	$30,000
Site Inspection/Maintenance	$25,000
Total Estimated Cost	*$180,000*

Table 3: Documents, Data, and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
Remedial Investigation/Feasibility Study, Wehran Engineering	1990
Record of Decision, EPA	1991
Operation and Maintenance Monitoring Manual, ARCADIS	1994
Groundwater Remediation System Engineering Report, ARCADIS G&M, Inc.	2000
Five-Year Review Report, EPA	2000
Explanation of Significant Differences, EPA	2000
2002 Annual Report, ARCADIS G & M Inc.	2002
Spring Remedy, ARCADIS G & M Inc.	2003
Explanation of Significant Differences, EPA	2004
Preliminary Close-Out Report, EPA	2004
Interim Remedial Action Report, ARCADIS G & M Inc.	2004
2003 Monitoring Report, Quarter 3, ARCADIS G & M Inc.	2004
2003 Monitoring Report, Quarter 4, ARCADIS G & M Inc.	2004
Operational Year 2, Quarter Number 1, Monitoring Report, ARCADIS G & M Inc.	2004
Operational Year 2, Quarter Number 2, Monitoring Report, ARCADIS G & M Inc.	2004
Operational Year 2, Quarter Number 3, Monitoring Report, ARCADIS G & M Inc.	2004
Operational Year 2, Quarter Number 4, Monitoring Report, ARCADIS G & M Inc.	2004
Annual Monitoring Report, Operational Year 2 ARCADIS G & M Inc.	2005
Monitoring Report, Operational Year 3, Quarter 1, ARCADIS G & M Inc.	2005
Opearational Year 2, Annual Monitoring Report, ARCADIS G & M Inc.	2005
EPA guidance for conducting five-year reviews and other guidance and regulations to determine if any new Applicable or Relevant and Appropriate Requirements relating to the protectiveness of the remedy have been developed since EPA issued the ROD.	

Table 4 - Comparison of Maximum Detected Concentrations of Contaminants Detected in Monitoring Wells to Their Respective Water Quality Standards and Guidance Values, Human Health Risk Based Screening Criteria (Preliminary Remediation Goal), and/or Primary Drinking Water Standard (Maximum Contaminant Level)

Chemical	Maximum Concentration (µg/l)	Location and Date of Maximum Concentration	New York State Water Quality Standards and Guidance Values (µg/l)	Primary Drinking Water Standard (µg/l)	Region 9 Preliminary Remediation Goal (µg/l)
1,1,1-Trichloroethane	88	GMMW-2 (7/02)	**5**	200	320
1,1,2-Trichloroethane	5.1	GMMW-6 (4/03)	**1**	**5**	**0.2**
1,1-Dichloroethane	1,100	GMMW-6 (6/04)	**5**	NA	**81**
1,1-Dichloroethylene	8.3	GMMW-6 (7/02)	**5**	**7**	340
1,2,3-Trichloropropane	21	GMMW-5 (6/03)	**0.04**	NA	**0.0056**
1,2,4-Trimethylbenzene	1.3	W-5 (7/02)	5	NA	**1.2**
1,2-Dichloroethane	8.3	GMMW-6 (4/03)	**0.6**	**5**	**0.1**
1,2-Dichloropropane	2.3	GMMW-6 (7/02)	**1**	5	**0.016**
Benzene	7.4	GMMW-6 (7/02)	**1**	**5**	**0.4**
Chlorobenzene	66	GMMW-6 (4/03)	**5**	100	110
Chloroethane	420	GMMW-6 (6/04)	**5**	NA	**0.5**
Chloroform	6	GMMW-6 (4/03)	7	NA	**0.017**
cis-1,2-Dichloroethylene	1,500	GMMW-6 (4/03)	**5**	**70**	**6.1**
Dichlorodifluoromethane	10	GMMW-6 (7/02)	**5**	NA	390
Methylene chloride	31	GMMW-6 (9/04)	**5**	**5**	**4.3**
Tetrachloroethylene	13	GMMW-6 (12/04)	**5**	**5**	**0.1**
Toluene	6.3	W-5 (7/02)	**5**	1,000	72
Trichloroethylene	180	GMMW-2 (4/03)	**5**	**5**	**0.028**
Vinyl chloride	520	GMMW-6 (6/04)	**2**	**2**	**0.02**

Legend

Values in **bold** exceed applicable water quality standards, guidance values, and/or Preliminary Remediation Goals. PRGs represent a cancer risk of one in one million (10^{-6}) and a noncancer hazard quotient of 0.1 (to account for possible exposure to multiple chemicals).

NA=Not available

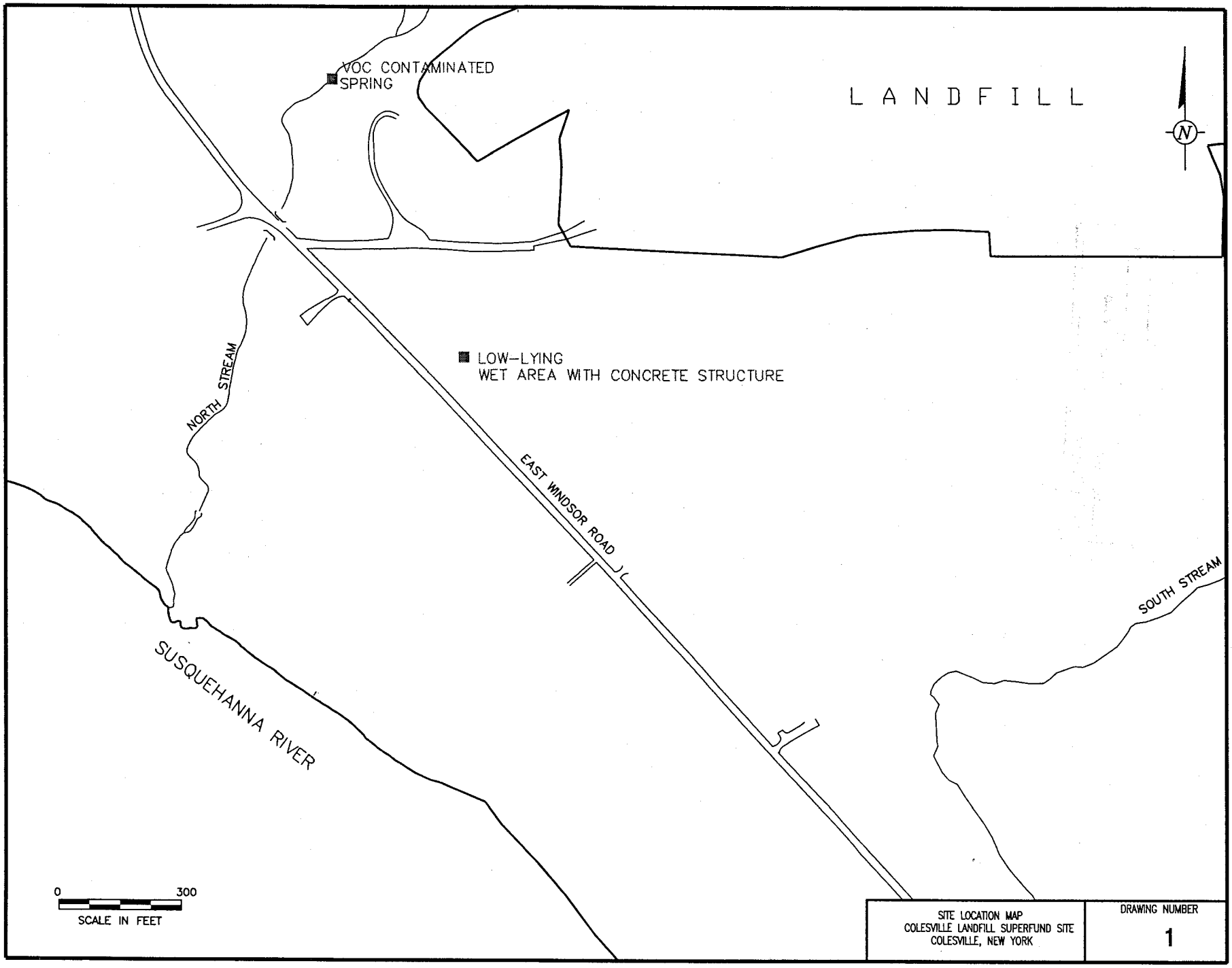
Sources: Preliminary Remediation Goal: http://www.epa.gov/region09/waste/sfund/prg/index.htm
Maximum Contaminant Levels: http://www.epa.gov/safewater/mcl.html
Water Quality Standards and Guidance Values: http://www.dec.state.ny.us/website/regs/ch10.htm

Table 5: Other Comments on Operation, Maintenance, Monitoring, and Institutional Controls	
Comment	**Suggestion**
A seep was observed on the south side of the landfill, which could potentially overflow to the South Stream. Since a seep at this location has not been observed previously, it is possible that it was attributable to heavy rains prior to the site inspection.	If the seep still exists, it should be sampled. If it is contaminated, it will need to be remediated.
The carbon container from the passive treatment system placed in the concrete structure is loose.	The lid to the carbon container should be secured.
Standing water was observed at two locations on the cap.	These areas need to be filled and regraded.
Two of the 3 downgradient extraction wells showed an increase in vinyl chloride (a VOC breakdown product) concentrations beginning in February 2003. The most recent data show that concentrations in these wells are now falling. Downgradient monitoring wells have consistently shown lower levels of vinyl chloride. More long-term monitoring data illustrating the downward trends in the concentrations of VOCs and the consequent rise in degradation products in downgradient wells will be of interest for the next five-year review.	Continued monitoring for vinyl chloride and its biodegradation products in wells downgradient of the injection wells is necessary to ensure that the chemicals transformed into more toxic compounds by the injection system are not moving off-site.
The maximum concentration of trichloroethylene found in a downgradient well was above the vapor intrusion screening value during two sampling events. Therefore, vapor intrusion could potentially be an issue for residents living downgradient.	Sub-slab soil gas samples should be collected from downgradient homes to evaluate the potential for vapor intrusion.
Recently, EPA has learned that 1,4-dioxane is present at many sites where 1,1,1-trichloroethane is detected. This chemical has been recently added to the Target Compound List of analytes. 1,4-dioxane is very soluble in water and is not usually removed by air stripping. The presence of this chemical at the site has not been evaluated, since EPA was not aware of it at the time of the RI. The concentrations of 1,1,1-trichloroethane at the site indicate that the presence of 1,4-dioxane at the site should be evaluated in the future.	Future groundwater samples should be analyzed for 1,4-dioxane.

Table 5: Other Comments on Operation, Maintenance, Monitoring, and Institutional Controls

Comment	Suggestion
The installation of groundwater wells is not restricted on the five affected properties and there are no restrictions on the landfill property to protect the integrity of the cap, monitoring wells, and extraction wells.	Deed restrictions need to be placed on all five of the affected properties to prevent the installation of groundwater wells. Restrictions need to be placed on the landfill property to protect the integrity of the cap, monitoring wells, and extraction wells.
It is difficult to determine how the groundwater management system is performing hydraulically.	Maps that show the steady-state potentiometric surface, graphs of well performance, and trend analyses (or alternative measures) should be prepared. If a capture zone analysis is performed, it may require the installation of additional wells and/or tracer tests.
New York State now requires annual certifications that institutional controls that are required by RODs are in place and that remedy-related O&M is being performed.	On an annual basis, the site will need to be inspected to determine whether any intrusive activities have been performed at the site and the building and property records will need to be reviewed to ascertain whether or not any filings had been made for such activities. The annual O&M report that is currently submitted by the County should include a summary of the findings of the above-noted activities, along with certifications that the institutional controls are in place and that remedy-related O&M is being performed.

Table 6: Acronyms Used in this Document	
ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
MCLs	Maximum Contaminant Levels
µg/l	Micrograms per Liter
NYSDEC	New York State Department of Environmental Protection
PRGs	Preliminary Remediation Goals
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
VOCs	Volatile Organic Compounds


VOC CONTAMINATED
SPRING
LANDFILL
N
LOW-LYING
WET AREA WITH CONCRETE STRUCTURE
NORTH STREAM
EAST WINDSOR ROAD
SOUTH STREAM
SUSQUEHANNA RIVER
0
300
SCALE IN FEET
SITE LOCATION MAP
COLESVILLE LANDFILL SUPERFUND SITE
COLESVILLE, NEW YORK
DRAWING NUMBER
1