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Infrastructure, buildings, environment, communications

ARCADIS G&M, Inc.
88 Duryea Road
Melville
New York 11747
Tel 631 249 7600
Fax 631 249 7610
www.arcadis-us.com

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BUREAU OF
CONSTRUCTION SERVICES

Mr. Joe Yavonditte
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7013

ENVIRONMENTAL

Subject:
SP-4 Spring Remedy Conceptual Site Plan,
Colesville Landfill,
Broome County, New York.
(Site No. 704010)

Date:
7 March 2003

Contact:
Steven M. Feldman

Phone:
(631) 391-5244

Email:
sfeldman@arcadis-us.com

Our ref:
NY000949.0012.0006A

Dear Mr. Yavonditte:

On behalf of Broome County, ARCADIS is providing two copies of the SP-4 Spring Remedy Conceptual Site Plan (Figure 1) for the Colesville Landfill site, Broome County, New York. As requested by the NYSDEC during our conference call on February 5, 2003, Figure 1 provides a worst-case estimate of the distance the North Stream would be relocated for installation of a spring remedy at the SP-4 location.

ARCADIS has evaluated two scenarios for the installation of the spring remedy. These scenarios include a preferred scenario (Scenario 1), and a worst-case scenario (Scenario 2). Under Scenario 1, collected spring water would be routed via subsurface piping beneath the North Stream to a 30-foot by 80-foot treatment zone located on the northwest side of the North Stream, which is property owned by Broome County. Scenario 1 would require temporary rerouting of water in the North Stream to allow for installation of the subsurface piping, but will require minimal, if any, permanent modification to the North Stream.

Under Scenario 2, collected spring water would be routed via subsurface piping to a 30-foot by 80-foot treatment zone located within the existing North Stream channel. Scenario 2 would require approximately 200-feet of the North Stream to be relocated a maximum distance of 40-feet northwest (see Figure 1).

The installation of a spring remedy at the SP-4 location under either scenario will require temporary modifications to the North Stream during construction, and would require a permanent modification under the worst-case scenario. ARCADIS is providing this information so that you can advise us regarding the regulatory and permitting requirements for conducting construction activities within the North

Stream channel under both scenarios. Although Scenario 1 is preferable and preliminary evaluation indicates that it is constructible, assessing the permit requirements for Scenario 2 up front will assist in ensuring timely implementation if, for unforeseen reasons, the North Stream needs to be relocated.

Please feel free to contact me if you have any questions or comments.

Sincerely,

ARCADIS G&M, Inc.

Steven M. Feldman
Project Manager

Copies:
George Jacob, USEPA
Ray Standish, Broome County

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88 Duryea Road
Melville
New York 11747
Tel 631 249 7600
Fax 631 249 7610
www.arcadis-us.com

ENVIRONMENTAL

Mr. George Jacob
United Stated Environmental Protection Agency – Region 2
290 Broadway, 20th Floor
New York, New York 10007-1866

Subject:
Spring Remedy Comparative Analysis and Preferred Remedy Conceptual Design, Colesville Landfill, Broome County, New York.
(Site No. 704010).

Date:
3 March 2003

Contact:
Steven M. Feldman

Phone:
(631) 391-5244

Email:
sfeldman@arcadis-us.com

Our ref:
NY000949.0012.0006A

Dear Mr. Jacob:

On behalf of Broome County, ARCADIS is providing two copies of the Spring Remedy Comparative Analysis and Preferred Remedy Conceptual Design for the Colesville Landfill site, Broome County, New York. The attached proposed spring remedy design and construction schedule (Figure 3) indicates that spring remedies can be designed and constructed by late July 2003 pending USEPA approval. Accordingly, we request your review and comment on or before March 17th, 2003.

Please feel free to contact me if you have any questions or comments.

Sincerely,

ARCADIS G&M, Inc.

Steven Feldman

Steven M. Feldman
Project Manager

Copies:
Joe Yavonditte, NYSDEC
Ray Standish, Broome County

Part of a bigger picture

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Disclosure Statement

The laws of New York State require that the corporations which render engineering services in New York be owned by individuals licensed to practice engineering in the State. ARCADIS cannot meet that requirement. Therefore, all engineering services rendered to Broome County in New York are being performed by ARCADIS Engineers and Architects of New York, P.C., a New York Professional corporation qualified to render professional engineering in New York. There is no surcharge or extra expense associated with the rendering of professional services by ARCADIS Engineers and Architects of New York, P.C.

ARCADIS is performing all those services that do not constitute professional engineering, and is providing administrative and personnel support to ARCADIS Engineers and Architects of New York, P.C. All matters relating to the administration of the contract with Broome County are being performed by ARCADIS pursuant to its Amended and Restated Services Agreement with ARCADIS Engineers and Architects of New York, P.C.

Introduction

The following report has been prepared to provide a comparison of the potential spring water remedies downgradient of the Colesville Landfill in Broome County, New York. Spring areas evaluated include the springs located adjacent to the North Stream (currently designated as spring sampling locations SP-2, SP-3 and SP-4), and the spring located to the south approximately 375-feet downgradient of the southern landfill boundary (designated as spring sampling location SP-5). Included in the evaluation are a brief description of historical spring and surface water quality, comparative analysis of potential spring remedies, development of preferred remedies, and a conceptual design of the preferred remedial approach for the SP-4 Spring location.

Background

Capping of the landfill as prescribed in the Record of Decision (ROD) was completed in November of 1995. Water levels in the vicinity of the landfill have been relatively stable since completion of the cap. Since the springs are a surface expression of the water table intersecting land surface, the stable water levels have had the effect of maintaining a relatively consistent flow from the identified springs. The consistent flow from the springs, despite the fact that the landfill cap prevents the infiltration of precipitation, indicates that the springs are probably a natural occurrence at the site. Although the spring flow has been relatively stable, the quality of the spring water has shown a general improvement since completion of the landfill cap.

One conclusion of the U.S. Environmental Protection Agency (USEPA) five-year review in April 2000 of the remedial action was that there was insufficient post-capping data to determine whether contaminant concentrations in the spring water were an ongoing problem. Because the landfill cap and groundwater remedy are not directly remediating the discharge of impacted spring water, the USEPA requested an evaluation of spring water corrective actions. Based on historic spring water quality, spring data collected since the five-year review, and post-capping water level data, there is now sufficient information to evaluate remedial actions that are necessary to be protective of human health and the environment.

Existing Spring and Surface Water Quality

Table 1 summarizes the analytical results for all spring and surface water samples collected from September 26, 1995 to December 9, 2002. As shown in Table 1, individual constituents of concern (COCs) vary from location to location, but generally consist of 1,1-dichloroethane (1,1-DCA), chlorobenzene (CB), chloroethane (CA), cis-1,2-dichloroethane (c-1,2-DCE), vinyl chloride (VC), and BTEX compounds (benzene, toluene, ethyl benzene, and xylenes). Since the sampling program began, total volatile organic compound (TVOC) concentrations in springs located in the most upstream reach of the North Stream (sampling locations SP-1, SP-2, and SP-3) have decreased significantly. Specifically, TVOC concentrations in SP-1 have ranged from 646.3 ppb parts per billion (ppb) to below the limits of detection for spring water samples collected on September 26, 1995 and February 9, 2000, respectively. TVOC concentrations in SP-2 have ranged from 279.7 ppb to 15.1 ppb for spring water samples collected on September 26, 1995 and December 9, 2002, respectively; and, TVOC concentrations in SP-3 have ranged from 153.3 parts per billion (ppb) to 26.6 ppb for spring water samples collected on September 26, 1995 and December 9, 2002, respectively. Spring water quality in areas located further downgradient of the former landfill have varied from location to location. Specifically, TVOC concentrations at sampling location SP-4 have increased, and range from below the limits of detection to 909.5 ppb for spring water samples collected on February 9, 2000 and December 9, 2002, respectively. Spring water samples have only been collected a the SP-5 location in 2002, during which time TVOC concentrations have remained relatively consistent and range from 154.1 ppb to 115 ppb for spring water samples collected on July 25, 2002 and August 9, 2002, respectively.

In addition to spring water sampling, surface water samples have been collected from mid-stream locations (designated as sampling locations F-5 through F-7) along the North Stream located downgradient of the springs. Surface water quality that is most representative of chronic exposure to VOCs is found in areas of the stream where attenuation and mixing have occurred, and concentrations are representative of long-term average conditions. Therefore, mid-stream surface water quality is the appropriate measure of compliance. Surface water sample analytical results are summarized in Table 1.

Spring and Surface Water Compliance Criteria

According to the New York State Department of Environmental Conversation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.2.1, one of the purposes of the Model Technology Best Professional Judgment (BPJ) limits is to provide guidance to NYSDEC staff responsible for writing requirements equivalent to SPDES permits for discharges from remediation sites. As such, these values have been selected as the effluent design criteria of the proposed spring remedies discussed herein. Carbon treatment was selected as the BPJ limit because it contained the most conservative BPJ limits. BPJ limits for carbon treatment based on NYSDEC TOGs Section 1.2.1 are provided in Table 1. Spring water analytical results shown in bold on Table 1 exceed the BPJ limits.

As outlined in 6 NYCRR Part 931.4, the North Stream has been designated as a Class C surface water by the NYSDEC. Ambient Water Quality Standards and Guidance Values (AWQSGVs) for Class C streams based on NYSDEC TOGs Section 1.1.1 are presented in Table 1. As shown on Table 1, VOC concentrations in surface water have not exceeded the AWQSGV.

Comparative Analysis of Spring Water Remedies

Based on the historical spring water quality described above, spring locations SP-4 and SP-5 have been included in the evaluation of remedial alternatives. Spring locations SP-1, SP-2, and SP-3 have not been evaluated due to the significant decrease of COCs within these springs. As shown in Table 1, individual COC concentrations at these spring locations are currently below, or just above their respective BPJ limits. ARCADIS believes this decreasing trend is a direct result of the landfill cap completed in November 1995 as part of the Record of Decision (ROD) remedy for the Site. Therefore, natural attenuation will effectively remediate groundwater concentrations and thereby maintain VOC concentrations in spring water below BPJ limits over time. Further, springs SP-2 and SP-3 will continue to be monitored as described in the Long-Term Monitoring (LTM) Plan, and a confirmatory sample from location SP-1 will be collected to demonstrate compliance with BPJ limits. If COC concentrations were to increase, a spring remedy could be applied in a timely and effective manner to the respective spring.

Identification of Potential Spring Water Remedies

The spring remedies discussed below were identified based on our discussion with the USEPA and NYSDEC on February 5, 2003, and meeting their ability to meet the following primary objectives:

- Eliminate the risk associated with the potential for direct exposure to COCs by humans and ecological receptors.

- For spring location SP-4, reduce COC concentrations in spring water discharges to the North Stream to below BPJ limits in order to maintain compliance with AWQSGVs in the North Stream.

- For spring location SP-5, reduce COC concentrations in spring water to below BPJ limits.

- Minimize negative impacts to the environment caused by construction activities.

In addition to the primary objectives listed above, the following secondary objectives were evaluated:

- Remedy must be able to withstand a 25-year flood.

- Remedy must be operational regardless of seasonal environmental conditions.

- Remedy should be cost-effective in terms of both capital and operation and maintenance (O&M) expenses.

Based on the primary and secondary objectives described above and per the request of the USEPA and NYSDEC, four remedial alternatives have been evaluated including two remedial alternatives for the SP-4 spring location and two remedial alternative for the SP-5 location. The evaluated remedial alternatives are as follows:

<u>Spring Location SP-4:</u>

- Alternative 1a - Install a spring collection trench and treat spring water in-situ via air sparging; and,

- Alternative 2a - Install a spring collection trench and treat spring water with an engineered wetland/peat and zero-valent iron/sand reactive system.

<u>Spring Location SP-5:</u>

- Alternative 1b - Replace spring collection sump and treat spring water via air sparging; and,

- Alternative 2b - Replace spring collection sump and treat spring water with liquid phase granular activated carbon (LPGAC).

The addition of an activated carbon component to the SP-4 spring remedy was evaluated based on the request of the USEPA. However, activated carbon was determined to be an ineffective treatment alternative due to the concentrations of cis-1,2-DCE and VC.

Each remedial alternative discussed below also includes long-term spring water monitoring as outlined in the Long-Term Monitoring Plan (ARCADIS 2002).

Detailed Description of Potential Spring Water Remedies

The following section provides a detailed description of each potential spring remedy and the relative advantages and disadvantages of each alternative. Included in each description is an estimate of capital and present-worth O&M costs over a five-year period. All capital cost estimates include design, system construction, construction oversight, and administrative costs.

Spring Location SP-4

Alternative 1a - Install a spring collection trench and treat spring water in-situ via air sparging.

Alternative 1a consists of installing a spring collection trench and treating the spring water with an in-situ air sparging system. Under this alternative, a subsurface interceptor trench would be installed perpendicular to spring water flow to capture the spring prior to reaching land surface. Spring water would then be conveyed to a subsurface air sparging vessel where it would be treated and discharged to the North Stream. Implementation of Alternative 1a would require the installation of an additional air compressor and associated electrical and piping components within the existing treatment building. In addition, implementation of Alternative 1a will require subsurface compressed air piping to be installed from the existing treatment building to the spring location. It is anticipated that installation of this remedy at the SP-4 sampling location will require a streambed modification to the North Stream in order to create sufficient room for installation of the remedy.

Because of the present-day concentrations of VC at the SP-4 sampling location, emissions from the air sparging vessel will have to be collected and treated prior to discharge. Vapor phase activated carbon and/or potassium permanganate impregnated zeolite units would be installed within the existing treatment building.

The estimated capital cost of Alternative 1a is between $250,000 and $325,000. The estimated present-worth O&M cost over five-year period is between $125,000 and $150,000.

The following provides a comparison of the advantages and disadvantages of Alternative 1a:

Advantages:

- Spring water is collected and treated.
- Eliminates the direct exposure risk to humans and ecological receptors.
- Eliminates COCs from spring water discharging to the North Stream (at the SP-4 sampling location).

Disadvantages:

- Installation at the SP-4 sampling location will require substantial site clearing/grading to allow access for subsurface piping installation.
- In addition, installation of subsurface piping at this location will be hazardous to on-site employees.
- High O&M costs.
- Will require streambed modifications.
- Will require collection and treatment of emissions.

Alternative 2a - Install a spring collection trench and treat spring water with an engineered wetland/peat and zero-valent iron/sand reactive system.

Alternative 2a consists of installing a spring collection trench and treating the spring water with an engineered anaerobic wetland/peat and zero-valent iron/sand reactive system. Under this alternative, a subsurface interceptor trench would be installed perpendicular to spring water flow to capture the spring prior to reaching land surface. Spring water would then be conveyed to an initial engineered anaerobic wetland containing a peat substrate base, then through a zero-valent iron/sand zone, and then through a final treatment zone (if necessary) prior to discharge to the North Stream. COCs within the spring water will primarily be degraded by the zero-valent iron/sand vessel zone. Under normal operating conditions (i.e., after successful establishment of the anaerobic engineered wetland), the initial anaerobic engineered wetland will provide initial treatment of the COCs and will reduce dissolved oxygen within the spring water. A final treatment zone may be installed to provide additional removal of COCs, pH adjustment, removal of iron, and oxygenation of the spring water. The necessity of the final treatment zone would be established following the implementation of a bench-scale treatability test. It is anticipated that the installation of this remedy at the SP-4 sampling location will require a streambed modification to the North Stream in order to create sufficient room for installation of the remedy.

The estimated capital cost of Alternative 2a is between $230,000 and $280,000. The estimated present-worth O&M cost over a five-year period is between $30,000 and $50,000.

The following provides a comparison of the advantages and disadvantages of Alternative 2a:

Advantages:

- Spring water is collected and treated.
- Eliminates the direct exposure risk to human health and the environment.
- Eliminates discharge of COCs from spring water to the North Stream.
- Installed remedy restores environmental quality.
- Requires minimal O&M.

Disadvantages:

- Will require streambed modifications at the SP-4 sampling location.

Spring Location SP-5

Alternative 1b – Replace spring collection sump and treat spring water via air sparging.

Alternative 1b consists of replacing the existing spring collection sump and treating the spring water with an in-situ air sparging system. Implementation of Alternative 1b would require the installation of an additional air compressor and associated electrical and piping components within the existing treatment building. In addition, implementation of Alternative 1b will require subsurface compressed air piping to be installed from the existing treatment building to the spring location.

Based on a preliminary DAR-1 analysis, emissions from the system will not require treatment prior to discharge to the atmosphere.

The estimated capital cost of Alternative 1b is between $150,000 and $180,000. The estimated present-worth O&M cost over a five-year period is between $30,000 and $45,000.

The following provides a comparison of the advantages and disadvantages of Alternative 1b:

Advantages:

- Spring water is collected and treated.
- Eliminates the direct exposure risk to humans and ecological receptors.

Disadvantages:

- High capital cost due to installation of substantial trenching and piping for delivery of the compressed air to the spring location.
- Installation of additional mechanical components may result in higher O&M requirements.

Alternative 2b – Replace spring collection Sump and treat spring water via liquid phase granular activated carbon.

Alternative 2b consists of replacing the existing spring collection sump and treating the spring water with LPGAC. The estimated capital cost of Alternative 2b is between

$45,000 and $60,000. The estimated present-worth O&M cost over a five-year period is between $35,000 and $50,000.

The following provides a comparison of the advantages and disadvantages of Alternative 2b:

Advantages:

- Spring water is collected and treated.
- Eliminates the direct exposure risk to humans and ecological receptors.
- Low capital cost.

Disadvantages:

- Will require O&M associated with the LPGAC.

Conclusions and Recommended Remedial Alternatives

Based on the historical spring and surface water quality data and comparative analysis of potential spring water remedies, the following conclusions have been made:

- TVOC concentrations in springs located adjacent to the former landfill (SP-1, SP-2, and SP-3) have substantially decreased since the installation of the ROD landfill cap and stormwater management system. The most recent spring water quality sampling event indicates that COC concentrations at these spring locations are below, or just above their respective BPJ limits.
- Spring water quality has not adversely affected surface water quality. Surface water sample analytical results for samples collected from the North Stream are below the AWQSGVs.
- For the SP-4 spring location, Alternative 2a meets all of the remedial action objectives and requires substantially less O&M costs then Alternative 1a. Further, Alternative 2a does not require substantial subsurface pipe installation along a steep slope making the alternative implementable and less hazardous for on-site workers.

- For the SP-5 spring location, Alternative 2b meets all of the remedial action objectives and has a minimal capital cost.

Based on the above conclusions, ARCADIS recommends the following remedial alternatives:

Springs Located Adjacent to the Existing Landfill (SP-1, SP-2 and SP-3)

No further action. Continue to monitor spring water quality at the SP-2 and SP-3 sampling locations as described in the LTM Plan. Collect a confirmatory sample from the SP-1 sampling location to demonstrate that COC concentrations are below BPJ limits. If spring water quality declines (i.e., COC concentrations increase substantially above the BPJ limits), install an appropriate remedial action at the respective location.

Spring Location SP-4

Implementation of Alternative 2a. Install a spring collection trench and treat spring water with an engineered wetland and zero-valent iron/sand reactive vessel. The installation of Alternative 2a provides active, effective treatment with minimal O&M requirements. Further, implementation of an engineered wetland will enhance the modified environment.

Spring Location SP-5

Implementation of Alternative 2b. Replace the existing spring collection sump and treat spring water with LPGAC. The installation of Alternative 2b provides active, effective treatment with a minimal capital cost.

Remedial Action Approach

The following section describes the proposed remedial action approach for the SP-4 spring location. Because of the proven reliability and the technical simplicity of the preferred SP-5 remedial action, a detailed description of the conceptual design has not been provided in this report.

The remedial action approach for SP-4 spring water includes a combination of in-situ reductive dechlorination technologies. Specifically, COCs will be degraded via anaerobic reductive dechlorination through the establishment of an initial engineered anaerobic wetland and via reductive dechlorination through the installation of an in-situ zero-valent iron reactive area. If deemed necessary, additional spring water treatment will be achieved through the installation of a final treatment zone. The necessity for the final treatment zone will determined based on the results of a bench-scale treatability test to be completed prior to and during the final system design.

The following section provides a review of the proposed remedial technologies to be utilized in the remedial action approach and the proposed conceptual design.

Description of Remedial Technologies

The following section provides a brief technical review of the remedial technologies proposed to remediate SP-4 spring water at the Site.

Engineered Anaerobic Wetland

Engineered wetlands have successfully been used to treat contaminants in water using natural microbial processes in a wetland ecosystem. An engineered wetland typically has three primary components; an impermeable layer, a soil or gravel layer providing a substrate for nutrients and support for the root zone and a vegetation zone.

Rapid attenuation of chlorinated ethanes and ethenes has been observed in marsh wetlands and studies have documented order-of-magnitude decreases in VOC concentrations as groundwater discharges relatively short distances upward through these wetlands. Within a wetland system, microbial processes are mostly responsible for this rapid contaminant attenuation through high activities of dehalogenating bacteria coupled with methanotrophic bacteria. These biological degradation processes are similar in nature to the biological processes utilized for the approved Groundwater Remediation System currently installed at the Site. Wetlands are capable of creating anaerobic conditions (below the root zone) for biodegradation of highly oxidized chlorinated VOCs (CVOCs) such as PCE and TCE, and aerobic conditions (within the root zone) for degradation of less oxidized CVOCs such as 1,2-DCE, and VC). The extremely high organic carbon content within the wetland bed also plays a key role by increasing the residence time of compounds and allowing the biodegradation processes time to go to completion (Pardue et al., 2000).

Zero Valent Iron

The use of elemental metals for in-situ reductive dehalogenation has been developed over the past 11 years. Although several metals (such as zinc or tin) have been proven to be effective in this application, metallic iron has been chosen due to its dehalogenation efficacy, cost and benign environmental impact. The dehalogenation process can be best described as anaerobic corrosion of the metal by the chlorinated hydrocarbon which is adsorbed directly to the metal surface where the dehalogenation reactions occur. Research on elemental iron systems indicates three mechanisms are at work in the reductive process:

- First, the Fe^{o} acts as a reductant by supplying electrons directly from the metal surface to the adsorbed halogenated compound.

- Secondly, solubilized ferrous iron can also act as a reductant, albeit at a rate at least an order of magnitude slower.

- Thirdly, metallic iron may act as a catalyst for the reaction of hydrogen with the halogenated hydrocarbon. In this process the hydrogen is produced on the surface of the iron metal as the result of anaerobic corrosion with water.

The primary reaction facilitated by the iron particles (listed as the first bullet above), which can be described as an abiotic oxidative corrosion of iron by the CVOC, results in the complete mineralization of CVOCs to the innocuous end products ethane and ethene. Assuming TCE is the COC and ethene is the primary end product, the reaction proceeds as follows:

$$Fe^{o} \rightarrow Fe^{+2} + 2e^{-}$$

$$C_2HCl_3 + 3H^{+} + 6e^{-} \rightarrow C_2H_4 + 3Cl^{-}$$

Zero-valent iron reactive barriers have already been shown to offer a more cost effective alternative to pump and treat systems; their operational costs are 70 - 90% less because no provision must be made for the disposal of recovered water, and the system is mechanically passive. The EPA (USEPA 1998) has published a reactive wall technology review in which they list 10 full scale field sites at which elemental iron dehalogenation was used, including many instances of successful full-scale treatment of CVOC's (Vance 2002).

Conceptual Design

The following section provides a brief overview of the proposed conceptual design for spring water at the SP-4 sampling location. Figure 1 shows a process flow diagram of the proposed conceptual design and Figure 2 shows typical details of the proposed conceptual design. A detailed topographic/stream survey is currently being developed. This survey will provide a more accurate depiction of the spring locations and will include an estimate of the maximum required distance the stream channel will be modified in the vicinity of SP-4 spring location. ARCADIS will provide this estimate to the USEPA and NYSDEC following receipt of the survey and evaluation of design criteria.

As discussed previously, the recommended remedial alternative includes the installation of a spring collection trench and an engineered anaerobic wetland and zero-valent iron/sand reactive system. The proposed system may consist of three components as follows:

- An initial anaerobic engineered wetland; followed by,

- An in-situ zero-valent iron/sand reactive zone; followed by,

- A final treatment zone, to be determined based on the results of the bench-scale treatability test.

Prior to and during the final system design, bench scale treatability testing will be conducted to provide data for the final system design and to demonstrate the effectiveness of the proposed remedy prior to system construction. A description of the bench scale treatability testing and primary function of each the conceptual design components is provided below.

Bench-Scale Treatability Testing

Prior to and during the final system design, bench-scale treatability testing will be conducted at the ARCADIS treatability laboratory to provide data for the final system design and to demonstrate the effectiveness of the proposed remedy prior to system construction. Bench-scale treatability testing will include:

- Batch tests of potential zero-valent iron medias; and,

- Column tests comprised of wetland (peat) and iron substrates.

Batch tests will consist of testing the ability of several commercially available iron medias to degrade SP-4 spring water COCs. Batch tests will be conducted by mixing

SP-4 spring water with the iron medias in individual glass jars. Samples of the respective jars will be collected over time to determine the degradation rate constants for each of the iron medias. The batch tests will be performed to demonstrate the effectiveness of zero-valent iron in remediating site spring water, to determine site-specific half-life degradation constants for the full-scale design; and, to determine the most effective, cost beneficial zero-valent iron media.

Upon completion of the batch tests, column tests will be conducted utilizing the most effective (based on treatment efficiency and cost) iron media from the batch tests and utilizing a peat/sand mixture to create a simulated remediation system (i.e., will contain each component of the proposed remedy). During the column test, SP-4 spring water will be introduced into each column at a flowrate similar to the estimated design flowrate of the SP-4 spring. The main purpose of the column tests will be to demonstrate the effectiveness of the treatment system as a whole, and to obtain data to design the final treatment zone.

Initial Engineered Anaerobic Wetland

Spring water collected within the spring collection trench will be routed via gravity flow to the initial anaerobic engineered wetland. It is anticipated that this wetland will be constructed as a horizontal subsurface flow anaerobic wetland consisting of a peat/sand mixture and indigenous wetland vegetation. The primary function of the initial anaerobic wetland will be to reduce dissolved oxygen concentrations in preparation for the in-situ zero-valent iron/sand zone and to provide initial treatment of CVOCs through reductive dechlorination. ARCADIS is currently proposing to construct this zone as a horizontal subsurface flow system with indigenous wetland vegetation; however, the exact flow regime (i.e., horizontal flow or vertical flow) and type of wetland vegetation may be altered during the detailed design based on space constraints, additional field data obtained prior to design, and the results of the bench-scale treatability testing. For example, if space constraints limit the available system installation area, an upflow design approach may be warranted. This would result in this zone consisting of a peat/sand mixture only (i.e., no wetland vegetation).

Zero-Valent Iron/Sand Zone

Following pre-treatment and oxygen depletion within the initial wetland zone, spring water will be routed through a zero-valent iron/sand vessel. It is anticipated that this zone will be constructed as a horizontal subsurface flow system consisting of a mixture of zero-valent iron and sand. Because of the numerous types of zero-valent iron (i.e., iron pellets, iron filings, iron powder, etc...) and their respective effectiveness in reductive dechlorination, the type and quantity of iron required will be determined during the bench-scale laboratory treatability testing. The primary function of the zero-valent iron/sand zone will be to reduce COC concentrations to at or just above their respective discharge limits prior to entering the final treatment zone. As discussed above, it is anticipated that this zone will operate as a horizontal flow system; however, the flow regime may be altered to a vertical flow system, if deemed necessary.

Final Treatment Zone

A final treatment zone may be required to treat effluent spring water emanating from the zero-valent iron/sand zone. As discussed previously, the type of treatment will be determined following the laboratory treatability testing. Potential treatment requirements include final COC degradation, pH adjustment, oxygenation, and iron removal. The final treatment zone will be designed (if necessary) during the full-scale design. If a final treatment zone is required, ARCADIS will prepare a brief conceptual design letter for USEPA approval prior to continuing with the full-scale design.

Schedule

A proposed schedule for implementation of spring remedies is provided on Figure 3. As shown on Figure 3, pending USEPA approval of the proposed conceptual design, the full-scale remedy can be operational by August 1, 2003.

References

New York State Department of Environmental Conservation, Division of Water Technical and Operational Guidance Series (1.1.1), "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", June 1998.

New York State Department of Environmental Conservation, Division of Water Technical and Operational Guidance Series (1.2.1), "Industrial Permit Writing", February 1998.

Pardue, J.H., G. R. Kassenga, and W.S. Shin. 2000. Design Approaches for Chlorinated VOC Treatment Wetlands. In: J.L. Means and R.E. Hinchee (eds.), Wetlands and Remediation, An International Conference, Battelle Press

USEPA, "Permeable Reactive Barrier Technologies for Contaminant Remediation," USEPA, EPA/600/R-98/125, 102 pp., 1998.

Vance, David B., "2 to the 4 Technology Solutions; Treatment of Chlorinated Hydrocarbon Contaminated Groundwater with the Injection of Nanoscale Reactive Particles," 2002.

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Table 1. Volatile Organic Compounds Detected in Spring and Surface Water Samples, Colesville Landfill, Broome County, New York.

Constituent[6] (ug/L)	Ambient Water Quality Standards/Guidance Values: Class C Standard[3] (ug/L)	Ambient Water Quality Standards/Guidance Values: Class C Guidance Value[3] (ug/L)	Model Technology BPJ Limits[4,5] (ug/L)	Site ID: SP-1 Date: 9/26/1995	SP-1 3/11/1996	SP-1 2/9/2000	SP-2 9/26/1995	SP-2 12/12/1995	SP-2 2/9/2000	SP-2 7/25/2002
1,1,1-Trichloroethane	--	--	10	< 1	< 1	< 5	< 1	< 1	< 5	< 1
1,1-Dichloroethane	--	--	10	**42.9**	3.8	< 5	6.2	**33.8**	**57**	**36** J
1,1-Dichloroethene	--	--	10-100	--	--	< 5	--	--	< 5	< 1
1,2-Dichloroethane	--	--	10-100	< 1	< 1	< 5	< 1	0.2 J	< 5	< 1
Benzene	10 H(FC)	210 A(C), 760 A(A)	5	**4.9**	< 1	< 5	2	**7.5**	< 5	< 1
Chlorobenzene	5 A(C), 400 H(FC)	--	10-25	**37**	0.8 J	< 5	**27.3**	**13.3**	**24**	**9.9** J
Chloroethane	--	--	10	3.8	< 1	< 5	4.6	8.2	**15**	**15** J
Chloroform	--	--	100	< 1	< 1	< 5	< 1	< 1	< 5	< 1
cis-1,2-Dichloroethene	--	--	10	--	--	< 5	--	--	< 5	1.5 J
Ethylbenzene	--	17 A(C)	5	**99**	< 1	< 5	**38**	**27.5**	< 5	2.2 J
m,p-Xylene	--	65 A(C), 590 A(A)	5	**273**	< 1	< 5	**126**	2	< 5	< 1
Naphthalene	--	110 A(A)	10-50	--	--	--	--	--	--	--
o-Xylene	--	65 A(C), 590 A(A)	5	**182**	< 1	< 5	**71.1**	1	< 5	< 1
Toluene	6000 H(FC)	100 A(C), 480 A(A)	5	3.7	< 1	< 5	3.5	1.1	< 5	< 1
trans-1,2-Dichloroethene	--	--	10-100	--	--	< 5	--	--	< 5	< 1
Trichloroethene	40 H(FC)	--	10	--	--	< 5	--	--	< 5	2.7 J
Vinyl chloride	--	--	10	< 1	< 1	< 5	--	3.3	< 5	< 1
Total VOCs				646.3	4.6	0	279.7	96.9	96	67.3

J	Value estimated.
ug/L	Micrograms per liter.
--	Not designated as a Water Class of C; no associated value has been developed for the compound.
--	Not analyzed.
BPJ	Best professional judgement.
H(FC)	Denotes values for protection of fresh surface water that are designated for human consumption of fish.
A(A)	Denotes values for protection of fresh surface water that are designated for fish propagation.
A(C)	Denotes values for protection of fresh surface water that are designated for fish survival.
Class C	Waters are fresh surface waters whose best usage is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit their use for these purposes.
1.	Sample collected in marsh area between SP-5 and road.
2.	Sample collected downgradient of SP-5 in stormwater culvert adjacent to road.
3.	Water quality standards based on Ambient Water Quality Standards and Guidance Values for Class C surface published in NYSDEC Technical and Oprational Guidance Series (TOGS) 1.1.1.
4.	Model technology BPJ daily maxium limits recommended for carbon adsorption with appropriate pretreatment from Attachment C of TOGS 1.2.1.
5.	When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
6.	Values in bold exceed the Ambitent Water Quality Standards/Guidance Values and/or Model Technology BPJ Limits.

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Table 1. Volatile Organic Compounds Detected in Spring and Surface Water Samples, Colesville Landfill, Broome County, New York.

Constituent[6] (ug/L)	Ambient Water Quality Standards/Guidance Values Class C Standard[3] (ug/L)	Class C Guidance Value[3] (ug/L)	Model Technology BPJ Limits[4,5] (ug/L)	Site ID: SP-2 Date: 12/9/2002	SP-3 9/26/1995	SP-3 12/12/1995	SP-3 3/11/1996	SP-3 2/9/2000	SP-3 7/25/2002	SP-3 12/9/2002
1,1,1-Trichloroethane	--	--	10	< 1	3	< 1	< 1	< 5	2.9 J	< 5
1,1-Dichloroethane	--	--	10	**12**	**68.1**	< 1	1.7	< 5	**46** J	**23**
1,1-Dichloroethene	--	--	10-100	< 1	--	--	--	< 5	< 1	< 5
1,2-Dichloroethane	--	--	10-100	< 1	< 1	< 1	< 1	< 5	< 1	< 5
Benzene	10 H(FC)	210 A(C), 760 A(A)	5	< 1	2.8	2.2	< 1	< 5	< 1	< 5
Chlorobenzene	5 A(C), 400 H(FC)	--	10-25	< 1	**49.1**	**12.2**	2	< 5	**7.9** J	< 5
Chloroethane	--	--	10	< 1	**25.4**	7.7	< 1	< 5	8.3 J	< 5
Chloroform	--	--	100	< 5	< 1	< 1	< 1	< 5	< 1	< 5
cis-1,2-Dichloroethene	--	--	10	1.3				< 5	2.3 J	1.3
Ethylbenzene	--	17 A(C)	5	< 1	< 1	**18.4**	0.2 J	< 5	< 1	< 5
m,p-Xylene	--	65 A(C), 590 A(A)	5	< 1	1.6	**51.3**	0.7 J	< 5	< 1	< 5
Naphthalene	--	110 A(A)	10-50	--	--	--	--	--	--	--
o-Xylene	--	65 A(C), 590 A(A)	5	< 1	2.1	**25.8**	0.3 J	< 5	< 1	< 5
Toluene	6000 H(FC)	100 A(C), 480 A(A)	5	< 1	< 1	0.5 J	0.4 J	< 5	< 1	< 5
trans-1,2-Dichloroethene	--	--	10-100	< 1	--	--	--	< 5	< 1	< 5
Trichloroethene	40 H(FC)	--	10	1.8	--	--	--	< 5	3 J	2.3
Vinyl chloride	--	--	10	< 1	1.2	0.4 J	< 1	< 5	< 1	< 5
Total VOCs				15.1	153.3	150.3	5.3	0	70.4	26.6

J	Value estimated.
ug/L	Micrograms per liter.
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--	Not analyzed.
BPJ	Best professional judgement.
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A(C)	Denotes values for protection of fresh surface water that are designated for fish survival.
Class C	Waters are fresh surface waters whose best usage is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit their use for these purposes.
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2.	Sample collected downgradient of SP-5 in stormwater culvert adjacent to road.
3.	Water quality standards based on Ambient Water Quality Standards and Guidance Values for Class C surface published in NYSDEC Technical and Oprational Guidance Series (TOGS) 1.1.1.
4.	Model technology BPJ daily maxium limits recommended for carbon adsorption with appropriate pretreatment from Attachment C of TOGS 1.2.1.
5.	When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
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Table 1. Volatile Organic Compounds Detected in Spring and Surface Water Samples, Colesville Landfill, Broome County, New York.

Constituent[6] (ug/L)	Ambient Water Quality Standards/Guidance Values: Class C Standard[3] (ug/L)	Ambient Water Quality Standards/Guidance Values: Class C Guidance Value[3] (ug/L)	Model Technology BPJ Limits[4,5] (ug/L)	Site ID: SP-4 Date: 2/9/2000	SP-4 7/25/2002	SP-4 12/9/2002	SP-5 7/25/2002	SP-5 (Marsh[1]) 8/22/2002	SP-5 (Culvert[2]) 8/29/2002	SP-5 12/9/2002
1,1,1-Trichloroethane	--	--	10	< 5	9.2 J	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	--	--	10	< 5	**200** J	**240**	**45**	< 1	< 1	**31**
1,1-Dichloroethene	--	--	10-100	< 5	< 1	< 5	< 1	< 1	< 1	< 1
1,2-Dichloroethane	--	--	10-100	< 5	2.6 J	4.3	< 1	< 1	< 1	< 1
Benzene	10 H(FC)	210 A(C), 760 A(A)	5	< 5	2.7 J	2	**5.5**	< 1	< 1	3.9
Chlorobenzene	5 A(C), 400 H(FC)	--	10-25	< 5	**18** J	**14**	**81**	< 1	< 1	**52**
Chloroethane	--	--	10	< 5	< 1	**30**	**17**	< 1	< 1	**23**
Chloroform	--	--	100	< 5	< 1	< 5	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	--	--	10	< 5	**73** J	**400**	1.4	< 1	< 1	< 1
Ethylbenzene	--	17 A(C)	5	< 5	< 1	< 5	2.8	**5.6** J	< 1	< 1
m,p-Xylene	--	65 A(C), 590 A(A)	5	< 5	< 1	< 5	< 1	**28** J	< 2	< 1
Naphthalene	--	110 A(A)	10-50	--	--	--	--	--	--	--
o-Xylene	--	65 A(C), 590 A(A)	5	< 5	< 1	< 5	< 1	< 1	< 1	< 1
Toluene	6000 H(FC)	100 A(C), 480 A(A)	5	< 5	< 1	< 5	< 1	**210** J	< 1	3.6
trans-1,2-Dichloroethene	--	--	10-100	< 5	< 1	8.2	< 1	< 1	< 1	< 1
Trichloroethene	40 H(FC)	--	10	< 5	< 1	**21**	1.4	< 1	< 1	< 1
Vinyl chloride	--	--	10	< 5	**230** J	**190**	< 1	< 1	< 1	< 1
Total VOCs				0	535.5	909.5	154.1	257.7	0	115.5

J	Value estimated.
ug/L	Micrograms per liter.
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--	Not analyzed.
BPJ	Best professional judgement.
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1.	Sample collected in marsh area between SP-5 and road.
2.	Sample collected downgradient of SP-5 in stormwater culvert adjacent to road.
3.	Water quality standards based on Ambient Water Quality Standards and Guidance Values for Class C surface published in NYSDEC Technical and Oprational Guidance Series (TOGS) 1.1.1.
4.	Model technology BPJ daily maxium limits recommended for carbon adsorption with appropriate pretreatment from Attachment C of TOGS 1.2.1.
5.	When a range is listed for the BPJ limit, a variation in available references was found. Recommended daily maximum limits should be in this range.
6.	Values in bold exceed the Ambitent Water Quality Standards/Guidance Values and/or Model Technology BPJ Limits.

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Table 1. Volatile Organic Compounds Detected in Spring and Surface Water Samples, Colesville Landfill, Broome County, New York.

Constituent[6] (ug/L)	Ambient Water Quality Standards/Guidance Values Class C Standard[3] (ug/L)	Class C Guidance Value[3] (ug/L)	Model Technology BPJ Limits[4,5] (ug/L)	Site ID: F-5 Date: 6/13/1995	F-5 9/13/1995	F-5 12/12/1995	F-5 3/11/1996	F-6 6/13/1995	F-6 9/13/1995	F-6 12/12/1995
1,1,1-Trichloroethane	–	--	10	< 1	< 1	< 1	< 1	0.1 J	< 1	0.2 J
1,1-Dichloroethane	–	--	10	< 1	< 1	1.2	1.2	1.1	0.7 J	2.9
1,1-Dichloroethene	--	--	10-100	< 1	2	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	--	--	10-100	2.6	< 1	< 1	< 1	< 1	< 1	< 1
Benzene	10 H(FC)	210 A(C), 760 A(A)	5	< 1	0.2 J	0.3 J	< 1	< 1	< 1	< 1
Chlorobenzene	5 A(C), 400 H(FC)	--	10-25	3.8	< 1	2.3	1.6	< 1	< 1	3.8
Chloroethane	--	--	10	1.3	< 1	1.5	< 1	< 1	< 1	0.8 J
Chloroform	--	--	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	–	--	10	< 1	< 1	< 1	< 1	1.3	1.1	3.3
Ethylbenzene	–	17 A(C)	5	< 1	0.5 J	0.6 J	< 1	< 1	< 1	0.3 J
m,p-Xylene	–	65 A(C), 590 A(A)	5	1.1	1.4	1.8	0.6 J	< 1	< 1	0.7 J
Naphthalene	–	110 A(A)	10-50	–	1.4	2.2	0.5 J	< 1	< 1	0.6 J
o-Xylene	–	65 A(C), 590 A(A)	5	0.8 J	0.9 J	< 1	0.3 J	< 1	< 1	0.6 J
Toluene	6000 H(FC)	100 A(C), 480 A(A)	5	0.8 J	0.6 J	0.7 J	0.3 J	< 1	< 1	0.4 J
trans-1,2-Dichloroethene	–	–	10-100	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	40 H(FC)	--	10	< 1	< 1	0.3 J	< 1	0.8 J	0.8 J	2.2
Vinyl chloride	--	--	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total VOCs				10.4	7.1	11.2	4.5	3.3	2.6	15.8

J — Value estimated.
ug/L — Micrograms per liter.
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Table 1. Volatile Organic Compounds Detected in Spring and Surface Water Samples, Colesville Landfill, Broome County, New York.

				Site ID:	F-6	F-6	F-7	F-7	F-7	F-7
				Date:	3/11/1996	7/25/2002	6/13/1995	9/13/1995	12/12/1995	3/11/1996
	Ambient Water Quality Standards/Guidance Values		Model Technology							
Constituent[6] (ug/L)	Class C Standard[3] (ug/L)	Class C Guidance Value[3] (ug/L)	BPJ Limits[4,5] (ug/L)							
1,1,1-Trichloroethane	--	--	10		< 1	< 1.0 J	0.2 J	< 1	0.4 J	< 1
1,1-Dichloroethane	--	--	10		1.3	< 1.0 J	0.7 J	0.3 J	2	1.6
1,1-Dichloroethene	--	--	10-100		< 1	< 1.0 J	< 1	< 1	< 1	< 1
1,2-Dichloroethane	--	--	10-100		< 1	< 1.0 J	< 1	< 1	< 1	< 1
Benzene	10 H(FC)	210 A(C), 760 A(A)	5		< 1	< 1.0 J	< 1	< 1	< 1	< 1
Chlorobenzene	5 A(C), 400 H(FC)	--	10-25		0.5 J	< 1.0 J	< 1	< 1	0.4 J	< 1
Chloroethane	--	--	10		< 1	< 1.0 J	< 1	< 1	< 1	< 1
Chloroform	--	--	100		< 1	< 1.0 J	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	--	--	10		1.3	< 1.0 J	0.7 J	< 1	2.2	2.1
Ethylbenzene	--	17 A(C)	5		0.1 J	< 1.0 J	< 1	< 1	< 1	< 1
m,p-Xylene	--	65 A(C), 590 A(A)	5		0.2 J	< 1.0 J	< 1	< 1	< 1	1 J
Naphthalene	--	110 A(A)	10-50		0.3 J	< 1.0 J	< 1	< 1	< 1	< 1
o-Xylene	--	65 A(C), 590 A(A)	5		0.1 J	< 1.0 J	< 1	< 1	< 1	< 1
Toluene	6000 H(FC)	100 A(C), 480 A(A)	5		< 1	< 1.0 J	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	--	--	10-100		< 1	< 1.0 J	< 1	< 1	< 1	< 1
Trichloroethene	40 H(FC)	--	10		0.4 J	< 1.0 J	0.4 J	< 1	< 1	0.9 J
Vinyl chloride	--	--	10		< 1	< 1.0 J	< 1	< 1	< 1	< 1
Total VOCs					4.2	0	2	0.3	3	4.6

J	Value estimated.
ug/L	Micrograms per liter.
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--	Not analyzed.
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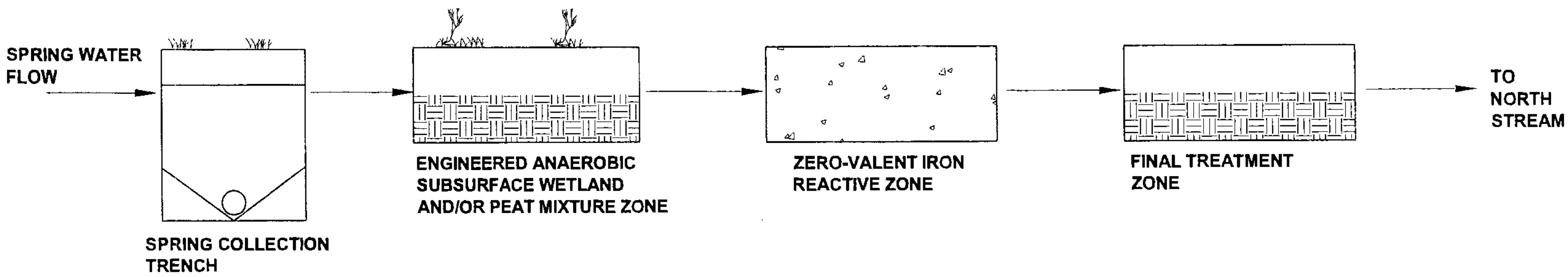
6.	Values in bold exceed the Ambitent Water Quality Standards/Guidance Values and/or Model Technology BPJ Limits.



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SCALE IN FEET

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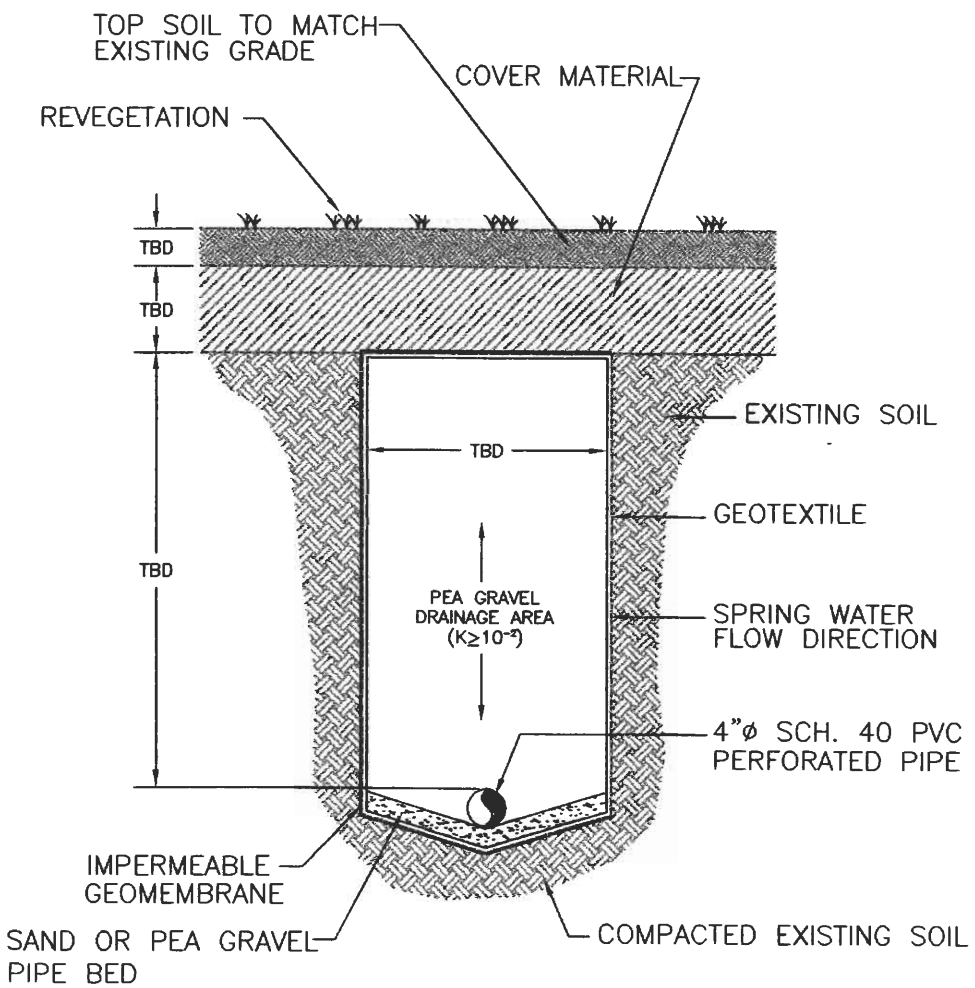
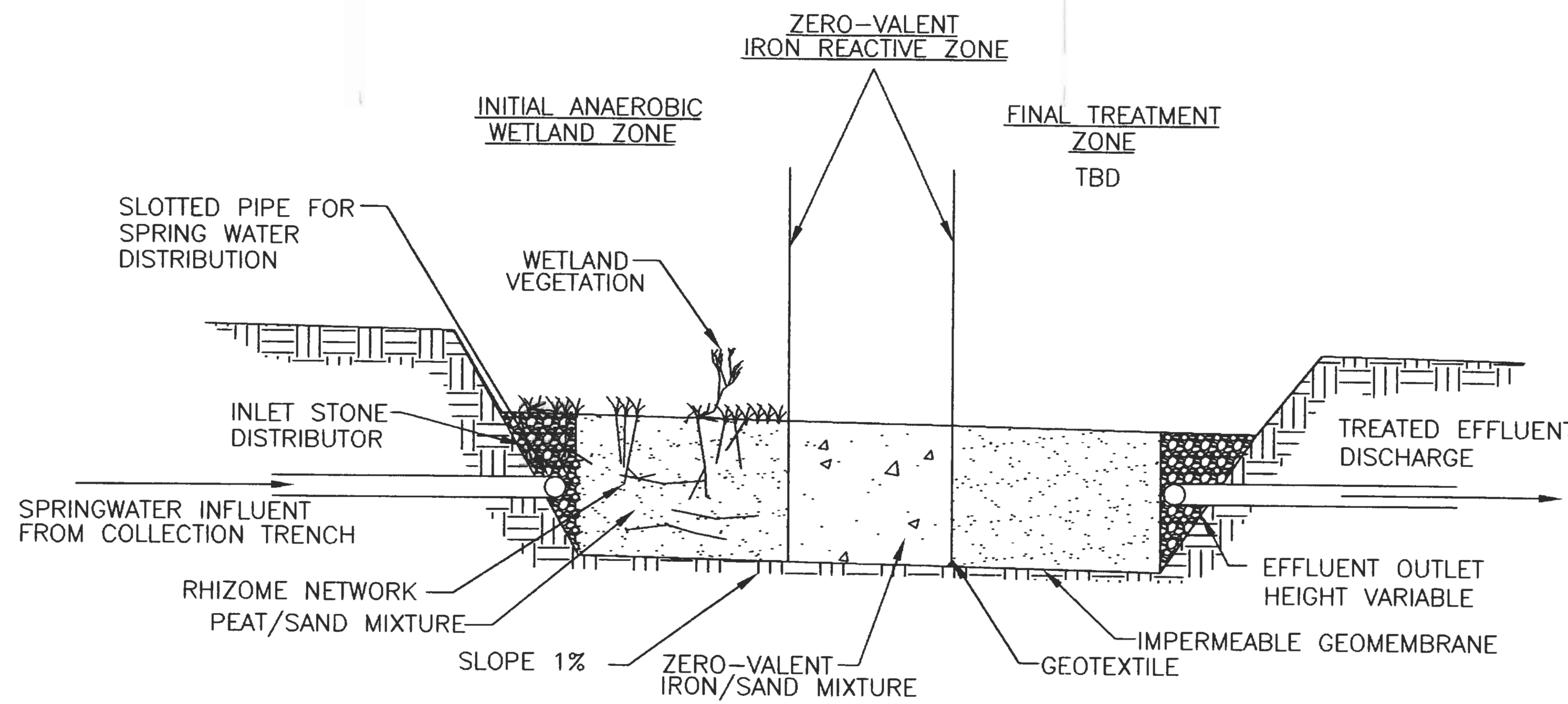
DRAWN MG	DATE 3/21/03	PROJECT MANAGER ST	DEPARTMENT MANAGER NV
SP-4 REMEDY PROCESS FLOW DIAGRAM COLESVILLE LANDFILL BROOME COUNTY, NY		LEAD DESIGN PROF. CT	CHECKED KZ
		PROJECT NUMBER	DRAWING NUMBER 1



TYPICAL COLLECTION TRENCH DETAIL

N.T.S.



CONCEPTUAL CROSS-SECTION OF SUBSURFACE HORIZONTAL FLOW SPRING TREATMENT SYSTEM

N.T.S.

ENGINEERING DESIGN:
ALL PROFESSIONAL ENGINEERING SERVICES DEPICTED ON THIS DRAWING HAVE BEEN PERFORMED FOR ARCADIS G&M INC. BY ARCADIS ENGINEERS & ARCHITECTS OF NEW YORK, P.C. A PROFESSIONAL CORPORATION QUALIFIED TO PERFORM SUCH SERVICES IN THE STATE OF NEW YORK

NO.	DATE	REVISION DESCRIPTION	BY / CKD

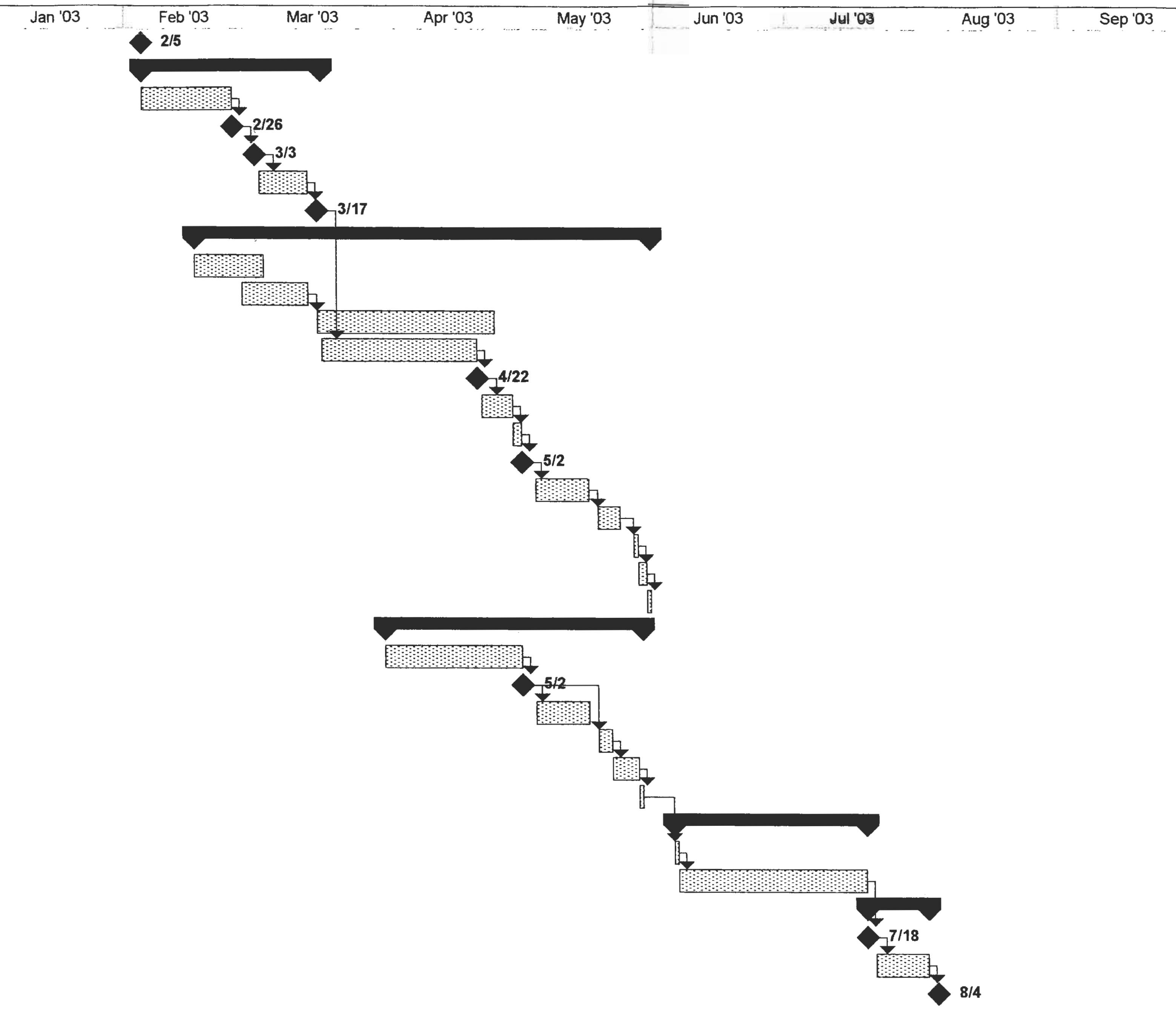
ARCADIS
88 Duryea Road
Melville, New York 11747
Tel: 516/249-7600 Fax: 516/249-7610

COLESVILLE LANDFILL
BROOME COUNTY, NEW YORK

DRAWN M.G.	DATE 3/21/03	PROJECT MANAGER M.V.	DEPARTMENT MANAGER MV
SP-4 REMEDY CONCEPTUAL DESIGN DETAILS FOR SPRING WATER		LEAD DESIGN PROF. CT	CHECKED KZ
		PROJECT NUMBER	DRAWING NUMBER 2

Figure 3. Proposed Colesville Landfill Spring Remedy Design and Construction Schedule.

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Telephone Conference Call with USEPA**	1 day	Wed 2/5/03	Wed 2/5/03	
2	**Conceptual Design Report**	**29 days**	**Wed 2/5/03**	**Mon 3/17/03**	
3	Prepare Conceptual Design Report	15 days	Wed 2/5/03	Tue 2/25/03	
4	Submit to Broome County	2 days	Wed 2/26/03	Thu 2/27/03	3
5	Submit to USEPA	1 day	Mon 3/3/03	Mon 3/3/03	4
6	USEPA Review	9 days	Tue 3/4/03	Fri 3/14/03	5
7	USEPA Approval	1 day	Mon 3/17/03	Mon 3/17/03	6
8	**Full-Scale Design**	**74 days**	**Mon 2/17/03**	**Fri 5/30/03**	
9	Survey and Obtain Site Information	12 days	Mon 2/17/03	Tue 3/4/03	
10	Prepare Treatability Study Design	11 days	Fri 2/28/03	Fri 3/14/03	
11	Conduct Treatability Study	30 days	Mon 3/17/03	Fri 4/25/03	10
12	Prepare Full-Scale Design	5 wks	Tue 3/18/03	Mon 4/21/03	7
13	Submit to Broome County	1 day	Tue 4/22/03	Tue 4/22/03	12
14	Broome County Review	5 days	Wed 4/23/03	Tue 4/29/03	13
15	Address Broome County Comments	2 days	Wed 4/30/03	Thu 5/1/03	14
16	Submit to USEPA	1 day	Fri 5/2/03	Fri 5/2/03	15
17	USEPA Review	10 days	Mon 5/5/03	Fri 5/16/03	16
18	Address USEPA Comments	5 days	Mon 5/19/03	Fri 5/23/03	17
19	Resubmit to USEPA	1 day	Tue 5/27/03	Tue 5/27/03	18
20	USEPA Review	2 days	Wed 5/28/03	Thu 5/29/03	19
21	USEPA Approval	1 day	Fri 5/30/03	Fri 5/30/03	20
22	**Bid Package Preparation and Bid Procurement**	**41 days**	**Tue 4/1/03**	**Wed 5/28/03**	
23	Bid Package Preparation/Identify Bidders	23 days	Tue 4/1/03	Thu 5/1/03	
24	Send Bid Packages to Bidders	1 day	Fri 5/2/03	Fri 5/2/03	23
25	Receive Bids	10 days	Mon 5/5/03	Fri 5/16/03	24
26	Evaluate Bids	3 days	Mon 5/19/03	Wed 5/21/03	24FS+2 wks
27	Negotiate Contract	3 days	Thu 5/22/03	Tue 5/27/03	26
28	Award Contract	1 day	Wed 5/28/03	Wed 5/28/03	27
29	**Spring Remedy Construction**	**31 days**	**Thu 6/5/03**	**Fri 7/18/03**	
30	Mobilization	1 day	Thu 6/5/03	Thu 6/5/03	28FS+1 wk
31	Construction	6 wks	Fri 6/6/03	Fri 7/18/03	30
32	**Spring Remedy Startup**	**10 days**	**Fri 7/18/03**	**Fri 8/1/03**	
33	Construction Complete	0 days	Fri 7/18/03	Fri 7/18/03	31
34	Testing and Startup	2 wks	Mon 7/21/03	Fri 8/1/03	33
35	**Final Site Walkover**	1 day	Mon 8/4/03	Mon 8/4/03	34



Project: Colesville Landfill Spring Reme
Date: Mon 3/3/03

Task	Progress	Summary	External Tasks
Split	Milestone	Project Summary	External Milestone
			Deadline

ARCADIS

Kenneth P. Zegel
Staff Engineer

Steven M. Feldman
Project Manager

ARCADIS ENGINEERS & ARCHITECTS OF NEW YORK, P.C.

Christina Tuohy

Christina Tuohy, P.E.
Vice President

Spring Remedy Comparative Analysis and Preferred Remedy Conceptual Design

Colesville Landfill, Broome County, New York

Prepared for:
Broome County

Prepared by:
ARCADIS G&M, Inc.
88 Duryea Road
Melville
New York 11747
Tel 631 249 7600
Fax 631 249 7610

Our Ref.:
NY000949.0012.0006A

Date:
3 March 2003

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