Technical Review of the Feasibility Study Report for the Batavia Landfill Site
Batavia, New York

Prepared for

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Work Assignment No.: C02040
EPA Region: II
EPA Site/Facility ID. No.: NYD980507693
Contract No.: 68-W9-0003 (TES-6)
TRC Document No.: NY-040-RP4
TRC Project No.: 1-635-134-2-2P22-0
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Date Prepared: December 15, 1993

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1.0 INTRODUCTION

This deliverable presents the results of TRC Environmental Corporation’s (TRC - formerly Alliance Technologies Inc.) review of the Batavia Landfill Site Operable Unit One Draft Feasibility Study (BLS FS), Batavia, New York completed by GZA Geoenvironmental of New York for NL Industries, Incorporated, Highstown, New Jersey (October 1993). The report represents the complete development, evaluation and comparative analysis for the remedial alternatives of the Batavia Landfill Site. This review is being conducted under the U.S. Environmental Protection Agency (EPA) Contract No. 68-W9-0003 (TES-6) Work Assignment No. C02040. TRC’s methodology for completing the technical review is presented in Section 2.0 of this report, followed by a brief discussion of TRC’s major conclusion and recommendations in Section 3.0. Subsequently, as directed by EPA, specific issues pertaining to the FS raised by EPA are addressed in Section 4.0 of TRC’s report. This is followed by a presentation of major technical issues (General Comments) in Section 5.0 of the report and by TRC’s page-specific comments in Section 6.0.

2.0 REVIEW METHODOLOGY

TRC’s review was developed in accordance with compliance with the requirements of the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This review has focused on the quantity and quality of presented information with respect to its value in determining viable remedial action alternatives, necessary for proper selection of the remedial design for the Batavia Landfill Site. The Batavia Landfill Site (BLS) FS was reviewed for compliance with the requirements outlined in the following documents:

- Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final; October 1988, EPA/540/G-89/004;
- Conducting Remedial Investigations and Feasibility Studies for CERCLA Municipal Landfill Sites; February 1991, EPA/540/P-91/001;
In conducting this review of the BLS FS, TRC has reviewed all relevant and available documents including:

- Batavia Landfill Site, Draft Remedial Investigation Report, Volumes 1-5; April 1989, Goldberg-Zoino Associates of New York, Buffalo New York;
- Focused Feasibility Study, Batavia Landfill, Batavia, New York; Work Assignment C02040, prepared for U.S. Environmental Protection Agency by TRC Environmental Co., August 28, 1992;
- Interim Ground Water Risk Assessment, Draft Final, Batavia Landfill, Batavia, New York; Work Assignment C02061; prepared for U.S. Environmental Protection Agency by Alliance Technologies, March 27, 1992;

The review of the BLS FS, including general and page specific comments, is provided in Sections 5.0 and 6.0. Specific activities conducted by TRC in reviewing each section of the BLS FS are discussed below.

Section 2.0 Summary of Site Conditions

- TRC compared presented information with information presented in the Remedial Investigation Report; and
- TRC compared presented information with information presented in the Risk Assessment prepared by Alliance.

Section 3.0 Wetland Delineation and Functional Assessment

As directed by EPA, TRC did not review this section.

Section 4.0 Cultural Resources Evaluation

As directed by EPA, TRC did not review this section.
Section 5.0 Applicable or Relevant and Appropriate Requirements and To Be Considered Criteria

- TRC compared GZA's presentation of Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs) with information and procedures set forth in EPA's guidance document CERCLA Compliance With Other Laws Manual and Guidance on Conducting Remedial Investigations and Feasibility Studies, Interim Final; and
- evaluated the development of GZA's ARARs and TBCs selection process based on provided EPA guidance documents.

Section 6.0 Remedial Action Objectives

- TRC compared GZA's development of remedial action objectives (RAOs) in accordance with EPA guidelines, Alliance's risk assessment, and information gathered during the Remedial Investigation (RI).

Section 7.0 General Response Actions

- TRC evaluated GZA's development of general response actions in accordance with EPA guidelines, GZA's defined remedial action objectives, and TRC's risk assessment; and
- reviewed GZA's determination of volumes of contamination against applicable information gathered during the RI to confirm the estimated volumes of contaminated material.

Section 8.0 Identification and Screening of Technologies and Process Options

- TRC evaluated GZA's methodology for evaluating possibly applicable technologies and process options through the development and screening stages for compliance with EPA guidance; and
- determined the applicability of selected technologies and process options to conform with developed RAOs and general response actions.

Section 9.0 Assembling of Alternatives

- TRC evaluated the assembling of alternatives with specific guidelines developed by EPA.
Section 10.0 Detailed Evaluation of Alternatives

- TRC evaluated the selected alternatives with respect to EPA guidance, including long term effectiveness, short term effectiveness, reduction of toxicity, mobility, and volume, compliance with ARARs, overall protection of human health, and implementability;

- evaluated the selected alternatives against information obtained in the RI for accuracy and effectiveness;

- evaluated alternative implementability against site specific physical and chemical details including waste material, waste characterization, site accessibility, size, and location.;

- compared alternative clean-up goals with those established in the risk assessment and remedial action objectives and general response actions developed earlier; and

- Costs presented in Appendix E were checked against Means Site Work Cost Data manuals to determine the representativeness of the estimated cost.

3.0 CONCLUSION AND RECOMMENDATIONS

Based on TRC's comprehensive review of the Feasibility Report for the Batavia Landfill Site, TRC has determined that there appears to be one major deficiency in the formulation of the report which necessitates that the remedial alternative evaluation rankings for several of the alternatives be fully reassessed. As they stand, it appears that several alternatives have been ranked higher or lower than warranted. This gives an impression to TRC that the evaluation process may be biased. In particular, it appears that the evaluation is unjustifiably weighted towards Alternative 4. TRC recommends that the alternatives be reevaluated following the incorporation of TRC's general and page-specific comments (by GZA) into the FS report for the site.

4.0 EVALUATION OF TECHNICAL ISSUES EXPRESSED BY EPA

Issue #1

EPA is concerned that contaminated sediment volumes will be accurately determined by GZA for evaluation of treatment options.

It is TRC's opinion that GZA has underestimated the volumes of contaminated sediments in Pond 2, Pond 3, Pond 4, Pond 5, Galloway Swamp, Southeast Drainage Ditch, and the Ditch South of Harloff Road. TRC's conclusion is further explained during the review of Section 7.0 (see General Comments, Section 5.0).
Issue #2

EPA is concerned that the chromium and magnesium pits are not accurately located.

TRC reviewed the soil borings completed during RI activities within the waste pit area. Based on available information, the areal extent and volume of contaminated material contained within the chromium and magnesium pit area, cannot be determined. Further details are provided in General Comments, Section 5.0.

Issue #3

EPA is concerned, as suggested by GZA, that capping of the sanitary landfill resulted in an easterly ground water gradient.

After a thorough review of the BLS FS, TRC concludes that GZA makes no such statement, suggestion, or intimation that implies that an easterly ground water flow gradient is the result of capping of the sanitary landfill.

Issue #4

EPA is concerned, as stated by GZA, that the upper aquifer has a horizontal flow component only.

After a thorough review of the BLS FS, TRC concludes that GZA makes no such statement or conclusion within the FS.

Issue #5

EPA is concerned that associated costs with each alternative are representative and realistic costs, and that GZA documents each presented cost.

Due to lack of specific cost information and documentation as presented by GZA, many alternative specific costs could not be verified. TRC provides more detail in the review of Section 10.0 (see General Comments, Section 5.0).

Issue #6

EPA is concerned that the discussions related to Alliance’s risk assessment were accurate.

It is TRC’s opinion that GZA’s discussions relating to Alliance’s risk assessment are accurate.
5.0 GENERAL COMMENTS

TRC's general comments on the FS Report appear below, presented by section.

5.1 Section 2.0 Summary of Site Conditions

No general comments were generated for Section 2.0.

5.2 Section 5.0 Applicable and Relevant and Appropriate Requirements

Several ARARs and other TBCs have not been identified and/or considered by GZA in the FS Report. While it is not certain that these additional ARARs/TBC will have a major impact on the remedial action effort (and thus require extensive consideration in the remedial alternative evaluations), it is essential that they be identified for proper evaluation (e.g., compliance with ARARs) in Section 5.0 of the FS Report. Refer to TRC Section 6.0, Page-Specific Comments, for Section 5.0 for an evaluation of omitted ARARs and TBCs.

5.3 Section 6.0 Remedial Action Objectives

The current presentation of RAOs (as presented in Tables 6.1 and 6.2) does not enable TRC to determine whether the formulated RAOs are adequate to achieve protection of public health and the environment. Note that RAOs must identify all media and exposure routes, contaminants of concern, and target levels for each contaminant to assure all pathways of exposure are eliminated by the selected remedial action. As presented, TRC was unable to cross-reference each clean-up (target) level with the specific RAO. Two different risk assessment columns are present, one is considered under ARAR/TBC criteria and is termed Risked Based Cleanup Level, and one is listed under the Risk Assessment heading. Both concentrations were obtained from the Batavia Landfill Site (BLS) Risk Assessment conducted by Alliance. Clarification of the RAO formulation process is critical to this FS report.

Two ARAR/TBC columns are also presented in the Tables 6.1 and 6.2. An ARAR/TBC is used as a major heading and also as a subheading under the RAO major heading. It is unclear what is being presented in this table. The main goals of RAOs are to provide protection from carcinogens within a risk range of $10^4$ to $10^6$; to provide sufficient protection from all non-carcinogens of concern including those set at the chemical-specific ARAR level; to address environmental effects; and to accurately address each significant pathway of human exposure. Clean-up levels should be clearly established based on ARAR/TBC criteria and the risk assessment. Based on Table 6.1 it appears that sediment criteria for New York was the only ARAR/TBC criteria considered. Table 6.2 lists several background ranges in the eastern and western United States. It is unclear from the table what other ARARs and/or TBCs were considered. The tables should be revised and simplified to indicate appropriate RAO levels for
comparison with other criteria.

A discussion of the possible human or environmental receptors to contaminated ground water and leachate should be included under Section 6.3, Protection of Ground Water. As stated on page 6-1, the EPA requested GZA to define RAOs to adequately address the human health risks associated with the potential effect of the materials at the site on ground water (i.e., protection of ground water). The installation of the water line extension to area residents does not remove the GZA's responsibility to adhere to all ARARs and/or TBCs associated with ground water. Several alternatives require leaving the waste in place; therefore, the probability of interaction between ground water and waste remains.

5.4 Section 7.0 General Response Actions

GZA lists the general response actions (GRAs) applicable to the specific medium of concern throughout Section 7.0. A brief discussion of each GRA should be included to describe the action and how it will meet the remedial action objective previously set forth in Section 6.0. Also, a discussion should be included of why the No Action alternative is included in Section 7.0.

Evaluation of Volume Determination

The determination of volumes of contaminated material is important during the screening of remedial alternatives as it effects the cost and implementability of each alternative in a variety of ways. Incorrect volume estimates may make some alternatives or technologies attractive while others are eliminated. Therefore, careful volume determination is necessary to accurately develop and screen alternatives. Based on a review of the methodology used by GZA to formulate volume estimates, TRC does not feel these estimates are sufficiently accurate to fully support accurate FS development. General comments relating to GZA's volume estimates for the suspected magnesium fines area, the waste pit area, and sediment areas appear below.

Suspected Magnesium Fines Area

The inability to define the area or volume of contaminated material within the Suspected Magnesium Fines area poses a significant problem since the volume of the waste is directly proportional to the cost of selected alternatives. High inorganic content of waste and soil could also have a direct bearing on the implementation of several remedial alternatives including thermal and stabilization treatment. GZA should use existing RI data in an attempt to estimate possible horizontal and vertical extent of the magnesium fines area. Considering the substantial concentrations of inorganics found in Soil Borings BL-7S and WP-30, to depths of approximately 13 feet, additional information is necessary to define the area.
Waste Pit Area

The inability to define the area or volume of contaminated material within the chromium and magnesium pits is also a significant problem. GZA advanced 31 soil borings within the waste pit area. The majority of the borings were located in a 100 foot by 450 foot area. The southern most soil boring, WP-27, contained waste as described in the boring logs. No other borings were completed farther south, therefore the southern boundary of the area remains unknown. The eastern most soil borings, WP-4, WP-24, and WP-16, all contained waste as described in the boring logs. No additional borings were completed farther east; therefore, the eastern boundary of the waste pit area is unknown. As this area contains elevated concentrations of metals which hinder certain types of process options and technologies, a better estimation of the areal extent and volume of the area is required.

Sediment Volumes

It appears that GZA has not utilized information obtained during the BLS RI (e.g., soil gas survey results, surface water sampling, boring logs from the installation of monitoring wells, and interviews with the former Town of Batavia Landfill Superintendent) in formulating volume estimates for remediation of sediments. No rationale is provided for some of the chosen depths of waste when determining the volume of waste present in several of the areas. TRC notes that the RI report states that sediment samples were collected at the surface and at a depth of one foot below grade; however, based on a review of the RI appendices, it is not possible to determine what the actual sample depths were. It can be observed from Table 7.1 that substantial concentrations of metals and organics exist in several of the sediment areas. It would be incorrect to assume that concentrations of these compounds cease at one foot below grade when the sample was obtained at that depth. More than likely, these concentrations exist deeper than the one foot depth assumed in six out of seven sediment areas. Several boring logs indicate that loose sand is present to depths below one foot. Using the assumption provided by GZA that contaminated sediments are the result of runoff, runoff water would likely be transported deeper than one foot due to the drainage capacities of loose sand. GZA should review sediment sample locations to determine which samples were collected at one foot depths and re-estimate volumes based on depth and concentrations present.

5.5 Section 8.0 Identification and Screening of Technologies and Process Options

The identification and screening of technologies and process options are the third and fourth steps in the alternative development process. As stated in EPA's Guidance for Conducting Remedial Investigations/Feasibility Studies (EPA, 1988), technologies and process options are reduced by evaluating the options with respect to technical
implementability. Technical implementability should be evaluated on a site-specific basis considering information gained during the RI. Based on a review of Section 8.0, TRC believes that a more detailed analysis of site-specific information is warranted to verify the effectiveness of the technology or the process option being considered. At a minimum, a clearer discussion of the process options and how they relate to BLS is needed. At this stage, information relative to the site could eliminate several technologies or process options before further consideration and time is expanded.

Site-specific criteria that should be evaluated during the identification and evaluation of technologies and process options includes: site geology, hydrology, climatology, surface water patterns, ground water patterns, waste types, and site-specific interaction and/or inter-relationships with sensitive environments (wildlife habitats, wetlands, rivers, etc.). At this stage of the development process, all applicable site information should be gathered to properly screen technologies and process options.

Surface water drainage patterns, infiltration, evapotranspiration, and leachate production should be evaluated for all different remedial process options relating to the protection of ground water such as capping, stabilization, or thermal treatment. To achieve the RAO for the protection of ground water, the process option must limit the infiltration contacting the contained waste deposits. As an example, the Hydrologic Evaluation of Landfill Performance (HELP) model should be used to determine water balance through drainage, infiltration, and evapotranspiration. In addition, the estimated volumes of runoff are essential in evaluating the size of retention basins, grading and vegetation plans, and leachate collection systems.

GZA states that several of the technologies are "readily implementable" without supplying the reasoning for this conclusion. Also, consideration should be given to the administrative/legal implementability of the options, such as the ability to obtain the necessary permits for construction activities or the feasibility of working on Batavia Town Landfill property.

TRC also recommends that a discussion be provided for each process option comparing the RAOs presented in Section 6.0 to the process option objectives. The objective should be similar. GZA adequately describes in general terms what each option consists of, without describing the option objectives and how they relate (on a site-specific basis) to those objectives outlined in Section 6.0.

TRC understands that the costs presented at the identification stage are only roughly estimated by GZA. However, a brief discussion should be provided explaining how these costs were estimated and what constitutes a high, moderate, and low cost estimate. The discussion should include whether cost is based on a comparable technology or on the no-action alternative cost.
5.6 Section 9.0 Assembling of Alternatives

The major component of this section should be the development of technologies and process options into alternatives. What is presented in Section 9.0 does not explain the development process that GZA followed to arrive at the chosen alternatives. As stated in EPA's Guidance on Conducting Remedial Investigations/Feasibility Studies, the target number of alternatives to be carried through screening should be set by the project manager and the lead agency on a site-specific basis. Information is not provided to determine the stages of the screening process. Section 9.0 should be expanded to provide the rational used by GZA in selecting their chosen alternatives. As the alternatives address the site as a whole, specific advantages of utilizing chosen options (in combination with other options) should be documented. General response actions developed in Section 7.0 should be considered when assembling alternatives. A limited description of each alternative should be included, especially when interaction among waste and ground water is a concern.

5.7 Section 10.0 Detailed Evaluation of Alternatives

A major problem with this section appears to be a bias towards one alternative. While all alternatives presented in Section 10.0 have advantages and disadvantages, it is evident that GZA favors Alternative 4. Great detail is taken to illustrate the advantages of this alternative while the remaining alternatives receive general discussions and conclusions. All alternatives should be presented equally in detail, objectively and unbiased. GZA should reexamine the other alternatives and evaluate them in this manner so that a focused and detailed analysis of alternatives can be made.

Site Specific Information

Another problem that appears in this section is the lack of alternative evaluations based upon site-specific conditions. The detailed evaluation of alternatives is the sixth step in the feasibility process and should be the most site specific. As stated in the EPA Guidance on Conducting Remedial Investigations/Feasibility Studies, implementability is a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete, it also includes operation, maintenance, replacement, and monitoring of technical components of an alternative, if required, into the future after the remedial action is complete.

Additionally, the EPA publication Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites states that the technical implementability of a technology, including the ability to construct and/or operate the technology, and the reliability of the technology, largely depends on the treatability of the contaminated material. The technical implementability will also depend on such site-specific variables...
such as the availability of sufficient space for materials handling and equipment handling, the source of the material and the accessibility of the site.

The above considerations including site-specific logistics are not mentioned in the BLS FS. As an example, Alternative 7 which utilizes in-situ stabilization as treatment should consider access to the site. As stated in the FS, stabilization equipment is very large and heavy. Consideration is not given to transporting the equipment to the site along rural roads and bridges that may contain weight limits. Transporting this type of equipment across the site might require the movement of waste. GZA does not consider general site-specific and location-specific logistics such as these throughout Section 10.0. As stated earlier, this step is the most site-specific. GZA should revise Section 10.0 to reflect the impacts of technical implementability on each alternative. To avoid repetition, page-specific comments will not deal with this issue since it pertains to Section 10.0 as a whole and its occurrence throughout the section is numerous.

Cost Evaluation

The cost section of each alternative provides no documentation for estimated associated costs. Therefore, verification of total costs is not possible. It is also unclear what factors were considered in determining costs such as the implementation of wells, or the installation of a liner. Some costs that are specified in Appendix E receive no mention in the text. These are important factors that affect the decision making process, and as such should be included in the appropriate alternative discussions.

Long Term Effectiveness

In Alternatives 1, 2, 3, 4, 5, 6, and 7, GZA concludes that due to natural attenuation, contaminants found in ground water will decrease with time and eventually eliminate the risks to possible receptors. The long-term effectiveness of the alternative is therefore considered by GZA to be adequate. While this conclusion is logical based on the chemical characteristics of the compounds, other factors influencing contaminant levels are not considered by GZA. For natural degradation of compounds to occur, the source area of the compounds must be removed. Several of the alternatives require capping with the waste in place. Thus, the source areas will be left in place, particularly the magnesium fines area and the waste pit area, and the potential for contamination remains. Although the potential rate of leachate generation may be reduced due to capping, it will not be eliminated except in Alternative 6.

As stated in FS, the site has not been completely characterized and additional source areas may be present. No documentation or site wide contaminant degradation patterns are presented by GZA to confirm the assumption that natural attenuation of contaminants is occurring at the site. Instead, in Alternative 4, one compound from one well is used to illustrate the attenuation process. Also, in Alternative 4, GZA explains
the attenuation processes that causes the degradation of organic compounds at the site. GZA fails to discuss the inorganic contamination present at the site. Inorganic compounds are less prone to natural attenuation. Therefore, the risks associated with these compounds remains at the site.

Given the size of the site and varied waste deposits and ground water flows and surface water patterns, this information is inconclusive. Additionally, for the two capping alternatives, no quantitative evaluation of reduced infiltration is presented such as through use of the HELP model. The long-term effectiveness should be reevaluated for each alternative as infiltration and/or seasonal fluctuations of ground water are likely to interact with waste thereby generating leachate contaminants. TRC recommends that conclusions pertaining to the natural attenuation process be limited and should not be the sole mechanism to correct potential ground water problems at the BLS.

**ARARs/TBCs Evaluation**

ARARs and TBCs are consistently unaddressed throughout the evaluation of alternatives. ARARs and TBCs should be considered as they have a direct bearing on implementability of the selected alternative. GZA should incorporate specific discussions of chemical, action and location specific ARARs and TBCs for each alternative. What is presented throughout Section 10.0 is a general discussion with few specific ARARs and TBCs cited.

As stated in several sections of the FS, but particularly Section 10.0, the construction of a water line to nearby residents of the site does not relieve GZA of the burden to comply with ground water ARARs or TBCs. Potentially applicable ground water ARARs/TBCs include Federal and State Maximum Contaminant Levels (MCLs), Secondary Maximum Contaminant Levels (SMCLs), Drinking Water Limits, and Health and Safety Advisors. GZA should conduct a thorough review to locate all potentially applicable ARARs and TBCs.

The Compliance with ARARs in Alternative 4 includes an emission control plan and filing of an Air Pollution Emission Notice under 40 CFR 52 and also OSHA regulations including 29 CFR 1926 and 29 CFR 1904 which pertain to the excavation associated with grading and worker safety. These ARARs should be included in all applicable alternatives of Section 10.0.

**Alternative 1: No-Action**

According to EPA Guidance on Conducting Remedial Investigations/Feasibility Studies Section 4.1.3.1, Source Control Actions, the No Action alternative should not include fencing to control site access. GZA should revise this alternative to reflect this and re-estimate costs associated with the alternative.
**Alternative 2 - Sediment Cover**

EPA's *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*, Section 4.2.2.1, Surface Controls lists several factors that must be considered for implementation and operation and maintenance of adequate grading plans. Some of these factors include:

- A grading plan that results in runoff from the site being controlled;
- A grading plan that will reduce the contact time of runoff water;
- A grading plan that will control erosion; and
- Ongoing maintenance will be required.

Many other considerations are listed in the guidance document and should be considered for proper evaluation of the alternative. In the discussion of Alternative 2, GZA does not discuss any issues.

**Alternative 3 - Sediment Cover, In-Situ Treatment of Hot Spots**

When developing stabilization alternatives, the EPA guidance document *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites* lists several criteria that should be considered concerning stabilization. The concerns include:

- Identifying the reagents that are available;
- Identifying the waste that is applicable to this technology;
- Identifying the advantages or disadvantages of having the waste remain on site;
- The increase in volume that may result from the expansion of the cement mixture;
- Verifying sufficient mixing of waste and reagents;
- The concentration of organics within the waste and the effects to the waste/cement mixture;
- Waste containing drums may require pretreatment;
- Long-term monitoring may be required; and
- Evaluating the long-term effectiveness during the five-year review.

These considerations are important to determine the implementability of the alternative. Many of these factors should be included while developing this alternative to give a clearer indication of possible advantages or disadvantages to this alternative.

As an example, stabilization reagents consist typically of lime and other alkaline materials. No consideration appears to have been given to the effect this may have on the surrounding wetlands. A potential problem, for instance, is that as the stabilization process begins and material is first introduced to the ground and waste, leachate from the uncured mixture could enter ground water, changing the pH. Ground water could
ultimately discharge to the wetlands. As wetlands are fragile in nature, any change in pH could have adverse effects.

**Alternative 4 - Sediment and Landfill Cover**

As stated previously, more site specific information should be considered in the text of this alternative. The HELP model should be used to estimate the effect of this cover option on reducing infiltration for comparative evaluation with Alternative 6. The New York State (New York 6 NYCRR Part 360) landfill requirements pertain to this site but are not considered or discussed by GZA in this alternative. These requirements should be included as they will have a direct impact on the implementability, long term effectiveness, and costs associated with the alternative.

**Alternative 5 - Sediment Cover, Excavation/Treatment of Hot Spots**

The source of the cited components for the landfill soil cover should be referenced. New York State requires (New York 6NYCRR Part 360) that composite-barrier caps be utilized in the closure of municipal solid waste landfills. Therefore, the landfill soil cover included in Alternative 4 and 5 would not meet this ARAR.

**Alternative 6 - Sediment and Waste Consolidation, Landfill Cap With Leachate Collection**

Leachate volumes should be estimated based on an analysis using a procedure such as the HELP model. Costs associated with the disposal of leachate could be significantly more or less than what is represented here. Depending on the volume of leachate generated, different technologies may warrant further consideration for the disposal or treatment of leachate.

**Alternative 7 - Sediment and Landfill Cover, With Excavation and Treatment of Buried Drum Area Soils and In-Situ Stabilization Waste Pit Area Soils**

Alternative 7 includes several aspects of Alternative 5 and Alternative 6, such as a greater detailed discussion of the implementability of the alternative, a greater detailed discussion of the ARARs, and documentation of the cost of the alternative for verification. Therefore, most general comments as stated above apply to Alternative 7.

**Alternative 8 - Sediment and Waste Consolidation, Landfill Cap With Excavation And Treatment of Buried Drum Area Soils and In-Situ Stabilization of Waste Pit Area Soils**

Alternative 8 contains many aspects presented in Alternative 6 and Alternative 7. As such details and the associated issues have been discussed in the reviews of those sections.
Appendix E - Estimated Cost of Remedial Alternatives

GZA should provide documentation to verify most costs associated with each alternative. The cost of various technologies, such as stabilization, should be verified through contact with qualified vendors or current literature.

It appears throughout the appendix that the cost of excavation is overpriced. It is unknown if this an error or that health and safety (i.e., level B or C personal protection equipment) is included in the listed price. This should be documented.

The units of volume should be consistent throughout the cost tables. Stabilization is quoted at $50 per cubic yard in Alternative 3 and at $60 per ton in Alternative 7.

6.0 PAGE-SPECIFIC COMMENTS

p. 2-11, ¶3 It should be noted that the chemicals which drive the carcinogenic risk for ground water are: arsenic, beryllium, 1,1-dichloroethylene, bis(2-ethylhexyl)phthalate, and vinyl chloride. The chemicals which drive the noncarcinogenic risk are: antimony, arsenic, iron, and zinc.

p. 5-2, ¶3 It is suggested that, in addition to those Federal chemical-specific ARARs/TBC listed in Table 5-1 of the FS, GZA also consider the following potential ARARs/TBC for ground water at the site:


p. 5-2, ¶4 It is recommended that, in addition to those State chemical specific ARARs/TBC listed in Table 5-1 of the FS, GZA also consider the following potential State ARARs/TBC for ground water at the site:

- Regulations for Drinking Water Supplies, Public Health Law Section 225 (NYSDOH, Part 5), Maximum Contaminant Levels (MCLs): Maximum permissible limit of contaminant in water delivered to the free flowing outlet of the ultimate user of a public water system.

p. 5-4, ¶1 Based on an evaluation of Table 5-3 of the FS, GZA does not appear to have considered several Federal location-specific requirements which may
be ARARs/TBC. The potential ARARs/TBC which have been omitted from consideration are:

- Scenic Rivers Act (16 U.S.C. 1271 et seq. Section 7(a); 40 CFR 6.302(c)): Regulates actions which may have an adverse effect on wild, scenic, or recreational rivers as specified in Sec. 1276(a). This may be pertinent to Tonawanda Creek.

- Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), Protection of Endangered Species (50 CFR Part 200, 402), which restricts all activities in areas inhabited by endangered species: Although endangered species have not yet been identified in Galloway Swamp, this wetland area may support Federal or State-regulated species and thus the Endangered Species Act of 1973, which restricts all activities in areas inhabited by endangered species.

- Wilderness Act (16 U.S.C. 1131), Protection of Wilderness (50 CFR 35.1 et seq.): Requires designated wilderness areas be administered such that they remain unimpaired (This could pertain to Galloway Swamp).


It is recommended that GZA also include these Federal regulations in the list of potential location-specific ARARs/TBC for the site. The detailed analysis of remedial alternatives should include an evaluation as to whether these ARARs/TBC will be met by or applicable to each alternative.

Based on an evaluation of Table 5-4 of the FS, GZA does not appear to have considered several State location-specific requirements which may be ARARs/TBC. The potential State ARARs/TBC which have been omitted from consideration are:

- New York Wetlands Laws Article 24, Title 7 - Freshwater Wetland Regulations, Permit Requirements (Section 24-701): Permit/approval required for any form of draining, dredging,
excavation, or removal, dumping, or filling, erecting of roads or structures or obstructions which alter flow, effluent discharge, or activity which disrupts wetland system.

- New York Wetlands Laws, Title 9 - Freshwater Wetlands Preservation Program, Land Use Regulations (Section 24-0903): Minimum land use regulations which permit only compatible uses of wetlands which are designated on state wetlands maps.

- New York Water Pollution Control Regulations, NYSDEC, Title 6, Part 608, Use and Protection of Waters (608.2, .04): Permits/approvals required for disturbance of protected streams, excavation, or placement of fill in navigable waterways. This ARAR is pertinent to the Tonawanda Creek and any tributaries interconnected within the Galloway Swamp.

It is recommended that GZA also include these State regulations in the list of potential location-specific ARARs/TBC for the site. The detailed analysis of remedial alternatives should include an evaluation as to whether these potential ARARs/TBC will be met by each or are applicable to alternative.

p. 7-2

Pond 2 - Harloff Road is not included in Figure 3. It should be included for clarity and consistency between text and figures.

p. 7-3

Pond 3 - From an inspection of available RI data, soil gas surveys were conducted at six locations (1, 2, 3, 4, 5, and 8) on the southwestern edge of Pond 3. It is not known if the results of the survey were used to determine the area of the contaminated sediments within the pond.

p. 7-4

Pond 4 - Rationale should be provided for assuming two feet of sediment contamination instead of the previously used one foot.

According to Table 7.1 bis(2-ethylhexyl)phthalate, pentachlorophenol, cadmium, and mercury also exceeded the RAOs. These should be included in the text or corrected in the table for accuracy and consistency.

Sediment sample SSL-2 is missing from Table 7.1.

p. 7-6

Ditch Along Harloff Road - Text states that based on the understanding of surface flow conditions, runoff from the BLS does not lead to this area. This area may, however, receive runoff from the area due to the culvert leading from the southeastern corner of the landfill to the ditch.
The culvert location should be included in Figure 3.

p. 7-8 General Waste Deposit - It should be stated whether aerial photography was used in determining volumes or areas of waste present at various locations within the landfill.

p. 7-9 Southern Waste Deposit - This area is listed as the Southern Area in Figure 4. GZA should use consistency in area names to avoid confusion.

From the depth of waste values listed in Table 7-2, it is unclear how a waste thickness of 17 feet was obtained.

Soil boring locations BL-18R, BL-18SD, BL-17, BL-14, BL-14R, and MW-4 are shown on Figure 4 but are not included in Table 7-2. The soil borings locations should be included for completeness.

p. 7-10 Suspected Magnesium Fines - This area is not represented on any figures within the FS. It should be included for clarity.

p. 7-11 Waste Pit Area - The volume of contaminated material needs further definition (see Section 5.0, General Comments).

p. 8-3 Fencing - Signs should be included at regular intervals to warn potential trespassers of the risks associated with the landfill.

p. 8-5 Sediment Controls - Surface water patterns, climatology, ground water patterns, seasonal water table are several concerns that should also be considered.

It is not stated if the retention ponds will be lined or unlined, and the possible maintenance that will be required.

p. 8-6, ¶1 Possible treatment options should be discussed, and how they relate to BLS waste characteristics.

Staging and handling of waste material, soil fill and construction equipment should be discussed.

p. 8-6 Off-Site Disposal - This option should be retained at least for "Hot Spots" and evaluated as it would result in a reduction of contaminants at the site and greatly reduce the exposure risk to receptors. This option should not be deleted based on EPA guidance. Further consideration is warranted.

p. 8-9, ¶1 Deficiencies listed in Table 8.3 are not discussed in the text, instead other
reasons are given for excluding certain options. For consistency, deficiencies should be listed in the table and discussed in the text.

p. 8-9  
In-Situ Treatment - This technology was excluded due to its inability to reduce the potential for exposure. Several other options, such as consolidation, that also do not reduce the potential for exposure are retained. It is unclear what specific factors were considered when evaluating options and what factors limit combining several options. A more complete discussion should be included.

p. 8-11, ¶2  
Surface drainage, evapotranspiration, and infiltration calculations from each type of cap should be estimated. As stated in Section 7.20, the general response action for ground water "Containment such as capping to reduce the potential of infiltration and thus leaching of contaminants from the soil/waste." GZA does not consider the different amounts of surface drainage, evapotranspiration, and infiltration that each type of cap will produce. The HELP model would be useful in appraising the effectiveness of each cap (see Section 5.0, General Comments).

p. 8-14  
Leachate Collection - As stated above, site specific information should be used to evaluate the implementability of this option. An estimate of the volume of leachate produced by each type of cap should be made to evaluate the each type of collection system for each type of cap under consideration (see comment for page 8-11, ¶2).

p. 8-16, ¶1  
It is unclear how the cost-effective volume of off-site disposal of wastewater was determined to be between 5,000 and 10,000 gallons. The amount of leachate produced for each type of cap should be evaluated (see comments for page 8-11, ¶2 and page 8-14).

p. 10-2, ¶4  
The number of sediment samples should be stated in the text. Six samples are shown on Figure 5.

p. 10-4, ¶2  
The time frame for implementation of the alternative should be discussed in this section.

p. 10-4, ¶3  
Costs should be documented throughout Section 10.0. See General Comments section.

p. 10-5, ¶1  
Geotextiles and geofabrics represent approximately 12% of the total cost as listed in Appendix E. GZA should include a discussion of the use of geotextiles and geofabrics in Alternative 2.

Some states do not allow deed restrictions to be placed on properties due
to inherent problems associated with enforcement, as stated in EPA landfill guidance. Deed restrictions and how they relate to state and local laws should be included in the discussion.

p. 10-7, ¶3 Chemical specific ARARs need to be discussed in this section (refer to the General Comments section).

p. 10-8, ¶2 Volumes of fill, and areas to covered should be included in this section (refer to the General Comments section).

p. 10-9, ¶3 The variety of reagents that may be used should be considered in this section and in the implementability section.

p. 10-10, ¶3 The implications of the waste remaining on site should be discussed with an emphasis on the potential exposure to receptors.

p. 10-10, ¶6 It is not stated to what depth stabilization will proceed. This could have a direct impact on cost and long term effectiveness. (Possible problems may arise associated with the leaching of compounds if the stabilized mass is located below the ground water table.)

p. 10-11, ¶4 The applicability of the stabilization technology to the waste present at the landfill needs further evaluation.

p. 10-11, ¶5 A conceptual final grading plan should be included.

Clearing and grading to construct access roads and staging of equipment and soil is not considered. Consideration should be given to the weight of the equipment and the practicality of conducting stabilization at this time.

The effect of stabilization on site hydrology, surface water runoff, and wetlands impacts due to reagent mixtures should be discussed. Typically the reagents are alkaline. The close proximity to the wetlands could cause leaching of the reagents to ground water and ultimately to the wetlands. This does not appear to have been considered.

p. 10-13, ¶4 The source of the components for the landfill soil cover should be referenced. New York State requires (New York 6NYCRR Part 360) that composite-barrier caps be utilized in the closure of municipal solid waste landfills. Therefore, the landfill soil cover included in Alternative 4 would not meet this ARAR.

p. 10-15, ¶2 It is stated on page 10-14, ¶ 1 that natural attenuation processes to be discussed for inorganic species would include precipitation, sorption, ion-
exchange, and oxidation-reduction. However, discussions regarding the processes of precipitation and oxidation-reduction have been omitted. It is suggested that the discussion of natural attenuation processes also include the discussion of these processes.

p. 10-18, §1 The example provided by GZA to demonstrate that contaminant concentrations in ground water have decreased over the course of the study is rather limited. It considers analytical data from only one monitoring well. To best demonstrate a general decrease of contaminant levels in ground water, a number of monitoring wells in which contaminants have been detected should be considered along with the sampling results for several seasons and years. Seasonal sampling results should be considered to account for any seasonal fluctuations in ground water quality that may occur. Since limited ground water monitoring data is currently available for the BLS (in terms of the number of monitoring wells and samples) it would be difficult to conclude that contaminant levels have decreased over the course of the study.

p. 10-20, §3 GZA does not discuss any of the New York State landfill cap requirements for municipal solid waste landfills. Composite-barrier caps are required by New York State (6NYCRR Part 360) for closure of municipal solid waste landfills. Therefore, the cap design for Alternative 4 does not meet this ARAR.

p. 10-29, §2 The handling and staging of equipment should be considered with regards site logistics. Access roads, etc. should also be considered.

p. 10-29, §5 Leachate volumes should be estimated using the HELP model to size appropriate tanks and estimate volumes of leachate to be disposed of at the local Publically Owned Treatment Works (POTW).

Calculations/modelling results have not been provided to support the leachate generation rate (6,000 gallons per day) which is presented. It is recommended that GZA present the calculations/model results which support this value for evaluation. This information is important because it is also the basis for determining the costs associated with treatment of leachate from the landfill.

p. 10-30, §1 Run-on and run-off calculations need should be completed for estimating the size of the retention pond and for supplying necessary water to sustain the mitigated wetlands.

p. 10-31, §5 See above comments pertaining to the natural attenuation process at the site.
See above comments pertaining to the discussion of ARARs throughout Section 10.0.

GZA must consider site-specific information gathered historically and from the RI in evaluating the implementability of this alternative.

Documentation must be included in a discussion of the cost of the alternative. This information is necessary to verify the cost as presented by GZA.

The natural attenuation conclusions should be revised to reflect recommendations made earlier.

The discussion of ARARs should be revised to eliminate the conclusion made regarding the natural attenuation process. There is no substantial information to conclude that natural attenuation will achieve similar results as treatment.

The discussion of implementability should be expanded to include site specific information that would impair or improve this alternative for proper evaluation of all alternatives.

All associated costs should be documented to permit verification.

Regarding the costs associated with the treatment of leachate, see comments for page 10-29, ¶5.

GZA has not provided an adequate comparative analysis of the alternative with regards to the short-term effectiveness. GZA has mainly considered the risks to workers during any excavation and/or consolidation of wastes. Other factors which should be considered in the comparative analysis of the short-term effectiveness of the alternative include: impacts (e.g., noise, dust, increased risk of vehicular accidents) due to the increased traffic associated with each alternative (e.g., truck traffic required to import cap materials), air emissions generated by treatment units and/or during excavation activities, and potential for injuries during implementation/construction of remedies. The analysis which is performed should be comparative. For example, the amount of traffic that would be generated by each alternative should be determined and compared. The alternative which produces the least amount of increased traffic volume would have the least potential for adverse impacts to roads and the surrounding community and, therefore, would be the most favorable in terms of traffic volume for short-term effectiveness. Each of the factors influencing the short-term effectiveness of each alternative should then be considered
together when rating an alternative on short-term effectiveness.

p. 10-45, ¶4 The inclusion of a study of natural attenuation with Alternative 4 should not affect the comparative analysis of the potential for the alternative to reduce toxicity, mobility, and volume. The natural attenuation study would not result in any decrease in the toxicity, mobility, or volume of contaminants. Also, since the cap proposed under Alternative 4 is minimal in comparison to New York State standards for closure of municipal landfills and will still allow significant infiltration, Alternative 4 should receive a low rating with regards to reduction of toxicity, mobility, and volume.

p. 10-45, ¶6 The comparative analysis of each alternative with respect to the potential for each alternative to protect human health does not consider all potential threats to human health and the environment resulting from the BLS. Evaluation of alternatives in terms of overall protection of human health and the environment should consider the manner in which site risks identified in the conceptual site model are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. Potential threats to human health and the environment resulting from municipal landfills may include:

- Leachate generation and ground water contamination;
- Soil contamination (including hot spots);
- The landfill contents themselves;
- Landfill gas;
- Wetlands contamination; and
- Contamination of surface waters and sediments.

The overall assessment of protection of human health and the environment is based on evaluating how each of the potential threats has been addressed in terms of the composite of factors assessed under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Each alternative should be evaluated and compared on the same set of criteria. It is recommended that GZA reevaluate each alternative for overall protection of human health based on these criteria.

p. 10-45, ¶7 Risks associated with workers involved in future excavation activities at the site which were identified in the risk assessment were determined under the assumption that the workers would not utilize the proper level of personnel protective equipment (PPE). Risks associated with excavation activities may be mitigated by using the proper PPE. Therefore, it is not appropriate to conclude that "unacceptable risks" to workers are associated
with excavation in the waste pit area without qualifying it by stating that these "unacceptable risks" are to workers who do not utilize PPE appropriate to the activities. Risks to workers during excavation activities and other work performed at the BLS can be minimized by utilization of the proper level of PPE.

p. 10-46, ¶5 In general, the evaluation and discussion of the ability of each alternative to meet ARARs/TBC appears limited to Federal and State requirements regarding landfill cap requirements. However, as discussed by GZA in Section 5.0 of the FS, there are a number of chemical, location, and action-specific ARARs/TBC which have been identified for the BLS and potential remedial technologies. Additional ARARs/TBC not identified by GZA are discussed by TRC in page-specific comments for Section 5.0 of the FS. The comparative analysis of compliance with ARARs/TBC should consider each of the ARARs/TBC identified by GZA and TRC.

p. 10-47, ¶1 Data has not been obtained which would verify that the natural silt and clay layer encountered beneath the BLS is continuous in all areas where waste has been disposed and/or is of adequate thickness to impede vertical migration of leachate. Also, given that the landfill cover proposed for Alternatives 4 and 7 is minimal, significant infiltration would likely occur. This, combined with the low permeability layer underlying the BLS, could result in ground water mounding within the landfill and leachate outbreaks occurring in the future along the perimeter of the landfill. Also, see page 8-11, ¶2 with regards to the volume of leachate generation.


p. 10-48, ¶4 The comparative analysis of the implementability of each of the alternatives is lacking in that it appears to consider only a limited number of factors. Factors which should be considered in the implementability of each alternative include:

• Administrative implementability (e.g., the relative difficulty of coordinating and obtaining permits to perform activities, off-site deed restrictions, etc.);

• Difficulties in gaining permission to treat leachate and/or ground water at a local POTW;

• The technical implementability of a technology, including the ability to construct and/or operate the technology and the reliability of the technology;
• The ability to monitor the effectiveness of a remedy (particularly for a technology like in-situ stabilization);

• The ability to provide adequate protection to workers during implementation of potential remedies;

• Areal requirements for equipment and stockpiling of equipment, soil, etc.;

• The availability of goods and services; and

• The accessibility of the site and the adequacy of roadways to support increased traffic volume and the weight of required equipment.

It is recommended that the evaluation of the implementability of each alternative take into consideration each of these factors and any others which may affect the implementability of a particular technology at the BLS. The overall assessment of implementability should be based on the composite of these factors.

p. 10-48, ¶6 GZA acknowledges that Alternative 6 utilizes conventional construction practices. However, GZA gives this alternative a medium ranking under implementability because excavation into waste may require additional worker protection and monitoring of working conditions. TRC is of the opinion that Alternative 6 should be given a high ranking under implementability because it does utilize conventional construction practices and the technology required to protect workers during invasive activities and to monitor working conditions is easily obtained and implemented. It is acknowledged that alternatives which include excavation of wastes may increase the risk to workers and/or the community, this risk should be considered in the evaluation of the short-term effectiveness of the alternative.


p. 10-50, ¶4 Alternatives 6 and 8 should be given a high ranking in terms of overall protectiveness of human health. Each of these alternatives, due to landfill cap design, will provide the highest protection against infiltration of surface water and, therefore, provide the greatest protection against future ground water contamination. Alternative 4, due to the minimal design of the landfill cover, will still allow significant infiltration of surface water into the waste material and, therefore, should be given a medium ranking in terms of overall protection of human health and the environment. Also,
risks to workers and residents associated with construction activities should be evaluated under the short-term effectiveness of the alternative, not overall protection of human health and the environment.

p. 10-50, ¶5 It should be noted that alternatives other than Alternative 4 utilize conventional construction technologies and, therefore, rank high in implementability. As currently worded, this paragraph suggests that Alternative 4 is the only alternative which utilizes conventional technologies.

p. 10-50, ¶6 The mechanism which is provided in Alternative 4 to identify potential future health risks associated with ground water contamination is not unique to the technology proposed for Alternative 4 and can easily be included in the other alternatives. Therefore, Alternative 4 should not be given a higher ranking for long-term effectiveness because of this provision.

p. 10-50, ¶7 GZA has not justified medium ranking in terms of the potential for Alternative 4 to reduce toxicity, mobility, and volume. The landfill cap design proposed for Alternative 4 is below standards with respect to New York State requirements (6NYCRR 360) for closure of a municipal solid waste landfill. The rate of infiltration (and leachate production) has not been estimated by GZA for this cap design and, therefore, it is difficult to evaluate whether this design will significantly reduce infiltration and leachate production. Unless leachate production by the landfill is significantly controlled by the alternative, it is difficult to predict future impacts to ground water. Also, Alternative 4 does not include any treatment of "hot spots". The combination of these factors suggest that Alternative 4 should be given a low ranking in terms of reduction of toxicity, mobility, and volume.

p. 10-51, ¶1 It appears that the evaluation of Alternative 4 in terms of compliance with ARARs is limited to landfill closure requirements under 40 CFR 258. However, even under 40 CFR 258, the low permeability layer is 18 inches with 6 inches of topsoil (as opposed to the 12 inches proposed). It is recommended that GZA reevaluate and discuss the ability of Alternative 4 to meet other location and action-specific ARARs, particularly New York State requirements (6NYCRR 360) for closure of municipal solid waste landfills.
Alternative Specific Comments

Alternative 1

Fencing should not be included in the cost of this alternative as it is not allowed by EPA guidance.

Alternative 2

The cost of seed seems elevated. Means Site Work Cost Data lists blue grass seed spread by a push spreader at $23.83 per 1000 square feet. If 9.9 acres are to be seeded, the total cost is approximately $10,000. Appendix E lists the total seed cost for swale construction at almost $30,000. The total cost of seed for Alternative 2 is $67,200. Using Means cost estimates, the total cost is $23,325, a difference of $64,000.

Alternative 3

The maintenance of the swales is not included in the cost.

Lump sum values should be documented, such as treatability studies, mobilization, and stabilization.

Seeding is overpriced in this alternative.

Alternative 4

As volumes are not discussed in the associated Alternative 4 text (Section 10.0), it is unclear how the volume of fill was determined. As the cost of the fill represents approximately one half of the capital required, it warrants detailed explanation.

It is unclear how a value of $100,000 was chosen for the cost of the research and interpretation portion of the attenuation study.

Alternative 5

Documentation should be provided for the cost of the acid scrubbers. At $650,000 per scrubber, specific information should be provided (vendor quote, reference text, etc.).

Documentation should also be provided for the cost associated with the LTTS treatment process. Costs associated with this technology are substantial.
Rationale should be provided for the cost of repairing the existing Batavia Town Landfill cap.

**Alternative 6**

The cost of excavation under the leachate collection system heading is given as $5.00 per cubic yard. Elsewhere in the appendix the price is listed at $6.00 per cubic yard. Since the volumes are almost 70,000 cubic yards, this is a substantial cost that should be reflected in the alternative.

The cost of off-site leachate treatment should be documented as it represents a substantial cost.

**Alternative 7**

It is unclear why stabilization costs differ between alternatives. The cost of stabilization is listed as $50 per cubic yard in Alternative 3. The cost listed in Alternative 7 in the waste pit area is listed at $150 per cubic yard. Factors causing a three fold increase in unit price should be documented.

**Alternative 8**

It is unclear why the stabilization unit price in Alternative 3 differs from the unit price in Alternative 8 (see comment above for Alternative 7).