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July 15, 2015

Illinois Pollution Control Board, Clerk's Office
James R. Thompson Center
Suite 11-500
100 W. Randolph St.
Chicago, IL 60601

RE: Petition of Saline County Landfill for Adjusted Standards

Dear Sir or Ma'am,

Per 35 Illinois Administrative Code 101.302(h), enclosed please find a hard copy and four electronic copies on CD-ROM, of the petition for adjusted standard, submitted on behalf of Saline County Landfill, Inc. The filing fee check for $75, payable to the Illinois Pollution Control Board, is enclosed, pursuant to 35 Illinois Administrative Code 101.302(e)(1). Certificate of service and a notice of filing are attached, per 35 Illinois Administrative Code 101.304(d).

Yours very truly,

Brian Konzen

BEK:km
encl.
84071

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of the Petition of Saline County	)	No.
	)	
Landfill, Inc., for an Adjusted Standard	)	

NOTICE OF FILING

Please take notice that today I have filed with the Office of the Clerk of the Pollution Control Board the Petition for Adjusted Standard on behalf of Saline County Landfill, Inc., a copy of which is herewith served upon you.

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276
Attn: James Kropid

BY: _____ DATE: July 17, 2015

Brian Konzen
Lueders, Robertson & Konzen
1939 Delmar Avenue
Granite City, IL 62040
618-876-8500
ARDC# 06187626

84072

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of the Petition of Saline County	)	No.
	)	
Landfill, Inc., for an Adjusted Standard	)	

CERTIFICATE OF SERVICE

I, the undersigned, certify a copy of the foregoing Petition for Adjusted Standards was served by first class mailing upon the following persons by depositing same in United States Post Office Box before 5:00 PM in Granite City, Illinois, with first class postage fully prepaid, and addressed to the following on July 17th, 2015.

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276
Attn: James Kropid

BY: Brian Konzen

Brian Konzen
Lueders, Robertson & Konzen
1939 Delmar Avenue
Granite City, IL 62040
618-876-8500
ARDC# 06187626

84071

00000 2

Illinois Environmental Protection Agency

Bureau of Land • 1021 N. Grand Avenue E. • Box 19276 • Springfield • Illinois • 62794-9276

Notice of Application for Permit to Manage Waste (LPC-PA16)

Date: July 2, 2015

To Elected Officials and Concerned Citizens:

The purpose of this notice is to inform you that a permit application has been submitted to the Illinois EPA, Bureau of Land, for a solid waste project described below. You are not obligated to respond to this notice, however, if you have any comments, please submit them in writing to the Bureau of Land, Attn: Permit Section, at the above address, or contact the Permit Section at 217/524-3300 within 21 days.

NOTE: Please complete this form online, save a copy locally, print and submit it to the Permit Section #33, at the above.

The permit application, which is identified below, is for a project described at the bottom of this page.

Site Identification:

Site Name: Saline County Landfill IEPA ID Number: 1658080001

Street Address: 5000 Whitesville Rd. P.O. Box:

City: Harrisburg State: IL Zip Code: 62946 County: Saline

TYPE OF PERMIT SUBMISSIONS:

- ☐ New Landfill
- ☐ Landfill Expansion
- ☐ First Significant Modification
- ☐ Significant Modification to Operate
- ☑ Other Significant Modification
- ☐ Renewal of Landfill
- ☐ Development
- ☐ Operating
- ☐ Supplemental
- ☐ Transfer
- ☐ Name Change
- ☐ Generic

TYPE OF FACILITY:

- ☑ Landfill
- ☐ Land Treatment
- ☐ Transfer Station
- ☐ Treatment Facility
- ☐ Storage
- ☐ Incinerator
- ☐ Composting
- ☐ Recycling/Reclamation
- ☐ Other (Specify)

TYPE OF WASTE:

- ☑ General Municipal Refuse
- ☐ Hazardous
- ☑ Special (Non-Hazardous)
- ☐ Chemical Only (exec. putrescible)
- ☐ Inert Only (exec. chem. & putrescible)
- ☐ Used Oil
- ☐ Solvents
- ☐ Landscape/Yard Waste
- ☐ Other (Specify)

Description of Project:

Petition to the Illinois Pollution Control Board for an Adjusted Standard to allow site specific regulatory changes and permit modifications to 1) modify the permit groundwater detection and assessment monitoring parameter lists in order to minimize the influence of strip mine water quality impacts, and 2) Approve Groundwater Protection Standards that act as potential triggers for corrective action. A copy of the petition is available at the Harrisburg Public Library.

Saline Co. Landfill
List of PA-16 Notifications

The Honorable Mr. Gary Forby
Senator State District 59
903 W. Washington St., Suite 5
Benton, IL 62812

Mr. Brandon W. Phelps
Representative State District 118
607 South Commercial St.
Harrisburg, IL. 62946

Mr. Mike Henshaw
States Attorney, Saline County
Saline County Courthouse
10 E. Poplar St., Suite 24
Harrisburg, IL 62946

Mr. Carey Harbison
Chairman, Saline County Board
Saline County Courthouse
10 E. Poplar St., Suite 26
Harrisburg, IL 62946

Ms. Sarah Wolford
Harrisburg City Clerk
110 East Locust Street
Harrisburg IL. 62946

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Total Postage & Fees	$0.49 $

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Sent To: Mr. Carey Harbison Saline Co. Board Chair
Street, Apt. No.; or PO Box No.: Saline Co. Courthouse, 10E Poplar St Suite 26
City, State, ZIP+4: Harrisburg IL 62946

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Sent To: Mr. Gary Forby Sen. State Dist 59
Street, Apt. No.; or PO Box No.: 903 W. Washington St. Suite 5
City, State, ZIP+4: Benton, IL 62812

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07/15/2015

Sent To: Mr. Mike Hanshaw State's Atty Saline Co.
Street, Apt. No.; or PO Box No.: Saline Co. Courthouse 10E Poplar Suite 24
City, State, ZIP+4: Harrisburg IL 62946

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Restricted Delivery Fee (Endorsement Required)	$0.00 $0.00
Total Postage & Fees	$0.49 $

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Sent To: Mr. Brandon Phelps Rep. Dist. 118
Street, Apt. No.; or PO Box No.: 607 South Commercial St
City, State, ZIP+4: Harrisburg IL 62946

PS Form 3800, August 2006 — See Reverse for Instructions

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of the Petition of Saline County	)	No.
	)	
Landfill, Inc., for an Adjusted Standard	)	

PETITION FOR ADJUSTED STANDARD

COMES NOW Saline County Landfill, Inc., per 415 ILCS5/28.1, and petitions the Illinois Pollution Control Board for adjusted standards.

1. The relevant site, commonly known as the Saline County Landfill, is located approximately 5 miles southeast of Harrisburg, in Saline County, Illinois.

2. Saline County Landfill initiated closure in 2006. Two primary adjusted standards are requested: 1.) modification of monitoring parameter lists, and 2.) implementation of groundwater protection standards.

3. 415 ILCS 5/28.1(c), provides as follows:

> (c) If a regulation of general applicability does not specify a level of justification required of a petitioner to qualify for an adjusted standard, the Board may grant individual adjusted standards whenever the Board determines, upon adequate proof by petitioner, that:
>
> > (1) factors relating to that petitioner are substantially and significantly different from the factors relied upon by the Board in adopting the general regulation applicable to that petitioner;
> >
> > (2) the existence of those factors justifies an adjusted standard;
> >
> > (3) the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability; and
> >
> > (4) the adjusted standard is consistent with any applicable federal law.

4. Per 35 Illinois Administrative Code 104.406, the following information must be contained in a petition for adjusted standards:

a) A statement describing the standard from which an adjusted standard is sought. This must include the Illinois Administrative Code citation to the regulation of general applicability imposing the standard as well as the effective date of that regulation;

b) A statement that indicates whether the regulation of general applicability was promulgated to implement, in whole or in part, the requirements of the CWA (33 USC 1251 et seq.), Safe Drinking Water Act (42 USC 300(f) et seq.), Comprehensive Environmental Response, Compensation and Liability Act (42 USC 9601 et seq.), CAA (42 USC 7401 et seq.), or the State programs concerning RCRA, UIC, or NPDES [415 ILCS 5/28.1];

c) The level of justification as well as other information or requirements necessary for an adjusted standard as specified by the regulation of general applicability or a statement that the regulation of general applicability does not specify a level of justification or other requirements [415 ILCS 5/28.1] (See Section 104.426);

d) A description of the nature of the petitioner's activity that is the subject of the proposed adjusted standard. The description must include the location of, and area affected by, the petitioner's activity. This description must also include the number of persons employed by the petitioner's facility at issue, age of that facility, relevant pollution control equipment already in use, and the qualitative and quantitative description of the nature of emissions, discharges or releases currently generated by the petitioner's activity;

e) A description of the efforts that would be necessary if the petitioner was to comply with the regulation of general applicability. All compliance alternatives, with the corresponding costs for each alternative, must be discussed. The discussion of costs must include the overall capital costs as well as the annualized capital and operating costs;

f) A narrative description of the proposed adjusted standard as well as proposed language for a Board order that would impose the standard. Efforts necessary to achieve this proposed standard and the corresponding costs must also be presented;

g) The quantitative and qualitative description of the impact of the petitioner's activity on the environment if the petitioner were to comply with the regulation of general applicability as compared to the quantitative and qualitative impact on the environment if the petitioner were to comply only with the proposed adjusted standard. To the extent applicable, cross-media impacts must be discussed. Also, the petitioner must compare the qualitative and quantitative nature of emissions, discharges or releases that would be expected from compliance with the regulation of general applicability as opposed to that which would be expected from compliance with the proposed adjusted standard;

h) A statement which explains how the petitioner seeks to justify, pursuant to the applicable level of justification, the proposed adjusted standard;

i) A statement with supporting reasons that the Board may grant the proposed adjusted standard consistent with federal law. The petitioner must also inform the Board of all

procedural requirements applicable to the Board's decision on the petition that are imposed by federal law and not required by this Subpart. Relevant regulatory and statutory authorities must be cited;

j) A statement requesting or waiving a hearing on the petition (pursuant to Section 104.422(a)(4) of this Part a hearing will be held on all petitions for adjusted standards filed pursuant to 35 Ill. Adm. Code 212.126 (CAA));

5. Per 415 ILCS 5/28.1(c)(1), the factors relating to Petitioner are substantially and significantly different from the factors relied upon by the Board in adopting general regulations otherwise applicable to the Petitioner. These factors include the effect of pre-landfill strip mining, and upwelling of a deep-seated brine source of salinity. See sec. II.1.(c) and II.2.(c).

6. Per 415 ILCS 5/28.1(c)(2), the existence of these factors justified an adjusted standard. See sec. II. 1 and II. 2 of the adjusted standard petition document.

7. Per 415 ILCS 5/28.1(c)(3), the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability. See sec. II.1.(g) and Sec. II.2.(g) of the adjusted standard petition document. In fact, adoption of the adjusted standard will confer an overall environmental benefit. Compliance with the regulations of general applicability is constrained by inability to develop representative background standards due to: acid mine drainage, proximity of upgradient monitoring wells to the mine high wall, and upward vertical movement of mineralized water. Further, monitoring under regulations of general applicability is less effective than under the adjusted standard. See Sec. II.1.(e) and Sec. II. 2.(e.)of the adjusted standard petition document.

8. The adjusted standard is consistent with any applicable federal law. Per 415 ILCS 5/28.1(c)(4), the intent of the adjusted standard is to implement standards analogous to the ground water protection standards described by 40 CFR 258.55 (h) and (i). See Sec. II.1.(i) and

II.2.(i) of the petition document.

9. **The standard from which the adjusted standard is sought** is 35 Illinois Administrative Code 811.319(a)(2), which identify the "criteria for choosing constituents to be monitored" under a detection monitoring program. Further, relief is sought from the standard described in 35 Illinois Administrative Code 811.319(b), and 35 Illinois Administrative Code 811.320, in order to modify the detection and assessment monitoring parameter lists to improve monitoring program functionality within the strip mine environment. Lesser modification is sought to 35 Illinois Administrative Code 811.324, 811.325, and 811.326, in order to implement the use of groundwater protection standards as a trigger for potential corrective action. The proposed adjusted standard language necessary to implement these changes are presented in Appendix B.

10. **The regulation of general applicability was promulgated to implement, in whole or in part, the Illinois state programs concerning RCRA Subtitle D**, the federal regulations promulgated by the USEPA pursuant to sections 4004 and 4010 of the RCRA Municipal Solid Waste Landfill Program. Specific correlation of the Illinois state statutes to the Federal Subtitle D regulations are found in Appendix Table 35 Illinois Administrative Code 811, Appendix B.

11. **The regulation of general applicability does not specify a level of justification necessary for an adjusted standard.** However, 35 Illinois Administrative Code 811.320 (b), provides levels of adjusted standard justification for developing background standards. See Article II.1.(c), and II. 2.(c) of the attached adjusted standard petition document.

12. **The nature of the Petitioner's activity that is the subject of the proposed adjusted standard** is a municipal solid waste landfill that closed in 2006. See Article II.1.(d) of the adjusted standard petition document, for the facts further described in 35 Illinois Administrative Code 104.406(d).

13. **The efforts that would be necessary if the Petitioner were to attempt to comply with the regulation of general applicability** include, but are not limited to, remediation of ground water influences caused by strip mining many years before the site was used as a landfill. Further, site specific conditions constrain the ability of Petitioner to develop representative background standards which successfully characterize the natural temporal and spatial variations in background ground water quality. See Article II.1.(e) and Article II.2.(e), of the adjusted standard petition document.

14. **A narrative description of the proposed adjusted standard:** a modification of the detection monitoring list of constituents, and adopting 35 IL Admin. Code Class I potable ground water standards as the ground water protection standards for selected constituents, instead of maintaining a non-degradation standard at the zone of attenuation. See Article II.1.(f) and Article II.2.(f), of the adjusted standard petition document.

15. **A quantitative and qualitative description of the impact of Petitioner's activity on the environment if Petitioner were to comply with the regulation of general applicability** is as follows: under the general applicability regulation, the ability of Petitioner to respond to ground water quality exceedances is constrained, as is the ability to clearly determine impacts associated with the Landfill. See Article II.1.(g) and Article II.2.(g), of the adjusted standard petition document.

16. **How Petitioner justifies the proposed adjusted standard** on the basis of environmental considerations. Specifically, the standard of general applicability cannot be implemented due to site specific considerations, the presence of acid mine drainage, and the presence of regionally documented upwelling of saline formation brine. Further, adjusted ground water protection standards are justified because the influence of previous strip mining, the fractured bedrock

geologic conditions, and the proximity of the landfill to the strip mine high wall, render it impossible to develop representative interwell ground water background standards under the rule of general applicability.

17. **The Board may grant the proposed adjusted standard consistent with federal law.** The constituents listed in permit Lists L1, which includes the vast majority of the 40 CFR 258 Appendix II assessment monitoring constituents will continue to be monitored in the facility leachate. One or more of these constituents may be added to the groundwater monitoring parameter lists, should future data suggest that the parameter is indicative of a leachate release from the landfill. Further, the proposed adjusted standard will meld applicable state and federal regulations to develop site specific requirements for the trigger concentrations that would call for ground water corrective action. These trigger concentrations are analogous to the ground water protection standards described by 40 CFR 258.55(h) and (i).

18. The Petitioner waives its right to an oral hearing pursuant to 35 Illinois Administrative Code 104.422(a)(4).

19. Therefore, Saline County Landfill, Inc., prays the Illinois Pollution Control Board adopt the adjusted standards detailed in Appendix B of the attached, concerning:

A. 35 Illinois Administrative Code 811.319(a)(2), which identify the criteria for choosing constituents to be monitored under a detection monitoring program.

B. 35 Illinois Administrative Code 811.319(b), and 35 Illinois Administrative Code 811.320.

C. 35 Illinois Administrative Code 811.324, 811.325, and 811.326.

Brian E. Konzen, ARDC #06187626
Lueders, Robertson & Konzen
P. O. Box 735, Granite City, IL 62040
618-876-8500

83742

Saline County Landfill
Petition for Adjusted Standards

Executive Summary

Site specific and regional groundwater flow conditions have resulted in circumstances which make it difficult if not impossible to develop representative background groundwater quality standards using the upgradient monitoring well data. The Saline County Landfill (SCL) Unit 1 Fill area is situated such that the upgradient side of the landfill nearly abuts the former strip mine high wall. Thus, the groundwater flow paths to the upgradient wells do not allow sufficient contact time between the groundwater and the mine spoil deposits to allow representative groundwater quality characterization. Similarly, the site is located in an area where the upward movement of highly mineralized groundwater has been reported by several investigators. This hydrodynamic groundwater flow pattern results in potential for extreme spatial variations in groundwater concentrations because the upward flow of groundwater does not occur at a uniform rate. Rather discontinuities such as joints, fissures, fractures or faults in the bedrock may result in preferential flow pathways which allow the mineralized water to reach shallower depths.

Two adjusted standards are proposed to provide relief from these conditions. First, the facility proposes the modification of the detection and assessment monitoring parameter lists to eliminate inorganic parameters which are not suitable leachate indicator constituents either because the constituent does not occur in the leachate at significant concentrations, or because the groundwater concentrations of the constituent are so variable due to the acid mine drainage impacts that the constituent provides no utility to either the detection or assessment monitoring programs. The facility also seeks an adjusted standard pursuant to 35 IAC 811.320(a)(1)(B) to modify the total and dissolved chloride applicable groundwater quality standard (AGQS) to 200 mg/L based on the Illinois Class I Groundwater Quality Standard (35 IAC 620.410). This adjusted standard modification is proposed in lieu of deleting the constituent since chloride provides a useful indication of landfill related changes in groundwater quality. However, due to the hydrostratigraphic unit discontinuity and regionally documented upwelling of formation brine, the ability to characterize relatively minor fluctuations in chloride background concentrations is limited. As such, the use of the Class I Groundwater Standard is believed to provide a means to account for the background concentration limitations without deleting the parameter from the detection monitoring list.

Similarly, the petition proposes that the Illinois General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212) be approved as an adjusted standard modified background concentration for total and dissolved ammonia. The adjusted standard is necessary for this parameter since the ammonia concentrations have been shown to vary in response to acid mine drainage. The adjusted standard to modifying the total and dissolved chloride and total and dissolved ammonia background concentrations has been combined with the request to modify the detection and assessment monitoring parameter lists since the technical justification and the other 35 IAC 104.406 "Petition Content Requirements" are nearly identical for both requested adjusted standards.

Secondly, Groundwater protection Standards (GPS) are proposed to act as trigger concentrations to identify potential landfill related groundwater impacts which require source control or corrective action. The GPS values are necessary since the groundwater is impacted by anthropogenic strip mine effects which have degraded the groundwater such that the 35 IAC 811.325(e) and (f) regulations require that corrective action be based on public health and environmental considerations. Both of the requested adjusted standards are deemed imperative to resolving the groundwater monitoring issues which exist at the site.

As discussed in subsection (e) of Section 1.0 (Petition for Modification of Monitoring Parameter Lists and Background Concentration), the SCL has attempted to resolve inorganic background groundwater quality standard issues associated with the requirements of 35 IAC 811.320. However, these efforts have been constrained by the difficulties characterizing background groundwater quality and the difficulties discriminating landfill related impacts in groundwater quality from the groundwater quality changes associated with acid mine drainage or naturally occurring hydrodynamic geochemical conditions in the central portion of the Illinois Basin. SCL requests an adjusted standard to allow the modification of parameters which are monitored as part of the routine landfill detection monitoring program as well as the assessment monitoring program. This request seeks to substitute the monitoring of constituents which are better indicators of landfill impacts in place of constituents which are heavily influenced by concentration changes associated with the strip mine drainage. The adjusted standard described in Section 1.0 will improve the ability to detect and respond to landfill related changes in groundwater quality.

It is anticipated that certain leachate indicator parameters will likely remain within the detection monitoring program despite the potential to exhibit concentration fluctuations which are associated with sources other than the landfill. Chloride, for instance has been shown to provide a good indicator parameter for landfill leachate. The constituent is very mobile and as such provides an early warning of a potential release. Also, as discussed in the technical demonstration provided in Attachment A, the leachate concentrations are typically 10 times higher than the chloride concentrations exhibited in the groundwater. However, background chloride concentrations are affected by natural processes (i.e., shale and minespoil clay mineral disassociation (i.e., breakdown) and/or upwelling of deep seated formation waters) which have been discussed by previous investigators. In addition, the physical limitations at the site (i.e., discontinuous nature of hydrostratigraphic units at the site) make it impossible to develop representative interwell background (i.e., background concentrations based on statistical evaluation of upgradient monitoring well data) concentrations for this constituent.

As discussed in Section (d) of Petition No. 1, the Saline County Landfill is located in close proximity to the former coal strip mine high wall which borders the southeast and south sides of the landfill (Refer to Figure 1). This high wall is located immediately upgradient (southeast) of the landfill. Thus, as shown in Figure 1 the background groundwater quality monitored upgradient of the landfill is representative of groundwater that has flowed through very little mine spoil (less than 100 ft.). Thus, it is not likely that the background groundwater quality at these wells can be representative of groundwater downgradient of the landfill, since the downgradient groundwater has been in contact with the mine spoil deposits within the strip mine basin for a much greater time period, allowing a greater opportunity for dissolution of minerals present in the minespoil. The applicant has previously sought to overcome these physical constraints by developing background standards from wells located within the Unit 2 portion of the landfill far from the existing Unit 1 landfill (i.e., more than 600 ft. from the existing landfill). However, this proposed resolution has proved unacceptable to the Illinois EPA because the Unit 2 facility is located downgradient of Unit 1 and thus the groundwater quality at these alternate wells could potentially be affected by releases from the Unit 1 Landfill.

Additionally, as discussed in the Section (d) of Petition No. 1, the saturated lacustrine unit located along the west side of the landfill which is monitored by wells G11S, G12S and G13S is not present at the site upgradient (southeast) of the landfill. Due to these conditions, it is not possible to locate upgradient monitoring wells which would allow development of interwell statistical background concentrations to represent this unit. As such, intrawell standards have been developed using historical data from each of the lacustrine wells. However, due to the aforementioned landfill related impacts, it is not possible to revise the intrawell background

levels should temporal concentration variations occur. For these reasons, an adjusted standard is requested to modify the way the facility is required to respond to statistically significant increases (SSIs) in concentration. Currently, SSIs encountered during the detection monitoring program require that the facility undertake one of the following actions:

a. Complete verification re-sampling to corroborate the potential SSI, or determine whether it was a false positive (a concentration fluctuation associated with analytical variability, cross contamination during sampling or analysis, etc.);

b. If the SSI is confirmed, the facility may complete an Alternate Source Demonstration (ASD) to show that the SSI is associated with a source other than a release from the landfill (i.e., analytical variability, natural temporal or spatial variation in background concentration etc.); or

c. Complete assessment monitoring to identify the nature and extent of the release (what constituents are present in the plume, what are the concentrations of these constituents, what is the area of the release, etc.).

If assessment monitoring determines that landfill related groundwater quality impacts have affected the groundwater resulting in concentrations which exceed background levels beyond the facilities zone of attenuation (ZOA), or resulted in concentrations within the ZOA which exceed the maximum allowable predicted concentrations anticipated by the Groundwater Impact Assessment GIA (35 IAC 811.317), then the facility is required to take corrective action to stop the release such that no significant increases in concentrations occur at or beyond the facility's ZOA. This standard differs from the Federal 40 CFR 258 (Subtitle D) requirements applied throughout the majority of the United States, since the Illinois standard sets background concentrations as the sole water quality corrective action trigger (at or beyond the ZOA) rather than Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs), or other alternate compliance levels (ACLs) based on risk based health or environmental exposure considerations. Under the current rule of general applicability, maximum allowable predicted concentrations (MAPCs) have been established based on the contaminant transport model predicted concentrations. These MAPCs form the relevant groundwater compliance standard within the zone of attenuation. The MAPCs are used to identify instances where the groundwater concentrations are not adhering to the transport model predicted concentration in order to identify potential releases which might cause a background exceedance at or beyond the ZOA. Under the proposed Groundwater Protection Standard approach, either the Class I Groundwater Standard (refer to 35 IAC 620.410), the Federal SDWA MCL or the existing permitted background or Applicable Groundwater Quality Standard (AGQS) would form the relevant compliance standard for wells located within the ZOA.

Due to fact that the landfill is located in a former coal strip mined area which is subject to acid mine drainage related groundwater quality changes which frequently cause SSIs for inorganic and heavy metal parameters, it is often difficult if not impossible to separate groundwater impacts associated with the landfill from the acid mine drainage influences caused by the anthropogenic use of the property to extract coal. Additionally, the physical limitations on the installation of upgradient monitoring wells which are capable of providing representative background groundwater quality data make it difficult if not impossible to statistically develop background groundwater quality standards which are representative of these site conditions. Due to these limitations, groundwater impacts identified at the site which are clearly associated with anthropogenic sources unrelated to the landfill (i.e., constituents such as sulfate, iron, manganese, heavy metals, etc.) are frequently attributed to landfill related releases.

Based on this discussion, the facility requests permission to develop site specific groundwater protection standards (GPS) values which would serve as a trigger for determining when groundwater quality changes warrant corrective action. Where possible, the proposed adjusted standard seeks the approval of Groundwater Protection Standards based on 35 IAC 620.410 Class I "Potable Resource" Groundwater Standards which are deemed protective of Public Health and the Environment. However, in instances where the background concentrations exceed the Class I Groundwater Standard, the petition either proposes that the background standard or AGQS define the GPS or that the constituent be deleted from the detection and/or assessment monitoring parameter lists. Deletion of constituents with background groundwater concentrations that are greater than the leachate concentrations is justified since the leachate is unlikely to act as a potential source of groundwater contamination. In these instances the constituent will not provide a useful indication of potential landfill influences on groundwater quality.

In instances where no Class I Groundwater Standard or Federal SDWA MCL is available, the petition seeks to maintain the non-degradation aspects of the State regulations while providing relief from the site specific conditions which confound the implementation of these regulations. For instance, the groundwater protection standards for the vast majority of the organic constituents (constituents whose concentrations are not influenced by the acid mine drainage) would remain the same as the Applicable Groundwater Quality Standards (AGQS) or background levels which have been set equal to the practical quantitation limits (PQLs) for the analytical method used to analyze the samples. Thus, other than background levels or AGQSs, only State (Class I Groundwater) or Federal (MCLs) promulgated groundwater quality standards have been proposed as GPS values. Based on this discussion, it is apparent that the proposed GPS values are consistent with the requirements of 40 CFR 258.55(i). Furthermore, because the approach utilizes only promulgated drinking water standards (either State or Federal) and not alternate compliance levels (ACLs) based on risk based analyses, the proposed GPS values have already undergone risk evaluation and have been determined to be protective of public health and the environment. As such, the proposed GPS values may be adopted without conducting a health based risk assessment.

Due to laboratory issues consistently achieving the Landfill Unit 1 AGQS values, it is anticipated that the organic constituent PQLs which form the basis of the Unit 2 SCL Landfill permit will be proposed to the IEPA to define background concentrations for the permit listed organic constituents, rather than the presently permitted Unit 1 values. The use of the Unit 2 PQLs allows the monitored constituent concentrations to be quantified relevant to Class I Groundwater Standards and/or MCLs but avoids quantitation issues associated with matrix interferences etc. which preclude achieving the PQLs based on ideal conditions (25 ml sample volume, no interferences, etc.). It is anticipated that an application for significant permit modification to modify the organic constituent PQL's will be submitted to IEPA at a later date. As such, no action on the PQLs is requested from the Illinois Pollution Control Board.

The proposed adjusted standard would provide relief from potential assessment monitoring and corrective action implemented to address constituents which are the result of anthropogenic groundwater quality influences caused by previous coal strip mine operations. However, due to the Groundwater Impact Assessment (GIA) Requirements of 35 IAC 811.317, the facility would continue to implement post closure care leachate management system operation and maintenance as detailed in the facility's permit. Additionally, the SCL facility would continue to implement source control measures including improvements to the leachate management system which are designed to eliminate or minimize further releases to the groundwater as required by 35 IAC 811.324(e) and (f).

Submitted to:

Illinois Pollution Control Board

Petition for Adjusted Standards
Saline County Landfill
IEPA Permit No. 1658080001

CS Geologic Project No. 15010903

June 29, 2015

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Adjusted Standard Petition
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I. Introduction

A. Relevant Background

The Saline County Landfill site is located approximately five miles southeast of Harrisburg in Saline County, Illinois. The landfill received developmental and operating permits (1983-9-DE/OP) on March 30, 1983, and September 15, 1983, respectively. The landfill which was originally owned by Bert and Gladys Driskell and operated by Milo and Braden Lambert (as the Lambert #3 Landfill) operated within the abandoned coal strip mine area for approximately 27 years before initiating closure in 2006. The landfill operating and developmental permits were transferred to Saline County Landfill in 1987 and the landfill was later acquired by Allied Waste Inc. in 1999. The landfill consists of the original existing landfill Unit No. 1 authorized by operating permit 1983-9-DE/OP and two lateral expansion areas (Cell 1 North and Cell 1 South) where operations were authorized on October 6, 2000 by permit modification No. 11.

Coal strip mining operations previously occurred at the site between 1959 and 1965. These mining operations resulted in the removal of the soils and bedrock overburden to access the Herrin No. 6 and Springfield No. 5 coal seam. The overburden soil and bedrock materials were left in 10 to 50 ft. high spoil banks which are evident in an aerial photographs of the site dated 1970 (refer to Figure 1). The mixture of soil and rock left in the spoil banks are referred to as "mine spoil". Because the mining operations required the removal of substantial thicknesses of shale deposits, the mine spoil banks contain appreciable shale which has become disaggregated and weathered over time. This weathering process has exposed fine grained iron sulfide minerals (i.e., pyrite and marcasite) which were deposited in the shale. Upon aerial exposure these microcrystalline pyrite minerals have been subject to a process referred to as oxidation. Sulfuric acid (H_2SO_4) has been formed as a consequence of the natural weathering and oxidation of the iron sulfide minerals present in the mine spoil. This byproduct of the mining operations is commonly referred to as acid mine drainage.

The acidic drainage conditions discussed in the previous paragraph result in the pH of the shallow groundwater ranging from slightly alkaline conditions (pH of approximately 7.5 SU) to very acidic (pH of approximately 4.0 SU). Each pH unit represents a 10 fold increase in the concentration of the H_3O^+ hydronium ion. Thus, the 3 pH unit variations frequently observed between monitoring wells represent a 1000 fold increase in the acidity of the groundwater. Due to the localized nature of the pyrite oxidation and the iron metabolizing bacteria which help to promote the process, it is not uncommon for pH levels to vary by several pH units over relatively short lateral distances between monitoring wells (Refer to Figures 6 and 7). Similarly, because the oxidation and bacteriologic processes are subject to a wide range of environmental influences (temperature, moisture, etc.) it is not unusual for large variations in pH levels to occur over relatively short periods of time (i.e., between quarterly monitoring rounds).

The acidity of the groundwater also plays a direct influence on the concentrations of other constituents in the groundwater. For instance limestone and dolomite are highly soluble under acidic conditions. These minerals are common in the glacial soil deposits and also within the Pennsylvanian cyclothem bedrock. As such, increases in acidity result in the dissolution of these minerals. Trace metals contained within these minerals are also released when the mineral is dissolved resulting in increased aqueous metal concentrations, total dissolved solid concentrations, specific conductance levels etc. Most heavy metals (cadmium, lead, zinc,

copper, manganese, nickel, etc.) which occur naturally in the soil and shale bedrock are also more mobile under acidic conditions. Thus, the concentrations of these metals in solution tend to increase as the pH decreases (i.e., as the groundwater becomes more acidic).

The influences of acidic mine drainage has confounded efforts to develop representative groundwater background concentrations for some constituents. As such, for these constituents, the acid mine drainage hinders the ability to develop groundwater monitoring programs capable of detecting potential contaminants releases from regulated landfill units. The Illinois Pollution Control Board (IPCB) has recognized that these site specific acidic drainage conditions exist and regulations have been promulgated to help account for these conditions. For instance 35 IAC 620.440 provides the groundwater quality standards which are applicable to Class IV Groundwater, which includes groundwater within areas which have been previously mined. 35 IAC 620.440(c) exempts certain mine spoil related parameters (TDS, chloride, iron, manganese, sulfate and pH) from the groundwater quality standards set forth in 35 IAC 620.420 (Class II Groundwater Quality Standards). However, as previously discussed, the influences of acid mine drainage may extend beyond these parameters and include other constituents (i.e., ammonia, boron, chemical oxygen demand, magnesium, antimony, etc.) which are frequently monitored as part of landfill groundwater monitoring programs.

In addition to the strip mine related acid drainage impacts on groundwater quality, pervasive regional influences have also been identified which affect the regional groundwater quality. Regional hydrodynamic groundwater flow conditions exist within Southern Illinois which give rise to upward movement of highly mineralized groundwater from deeper stratigraphic units. The regional flow conditions and their influence on groundwater quality have been discussed by numerous previous investigators. Davis (1973); Meents et al (1952); Bredehoeft et al (1963), Clayton and others (1966), Graf and others (1965 and 1966); and Hensel and McKenna (1989) document extensive areas of Southern Illinois where the shallow water quality is considered to be brackish or non-potable. The groundwater and the surface water in these areas are reported to possess elevated salinity levels which are often attributed to degradation caused by upward movement of brine and/or improper brine disposal practices (Davis, 1973; Graf and others 1966; and Bredehoeft 1963). Based on evaluation of 4000 chemical analyses taken from wells completed at depths less than 250 ft., Davis (1973) determined that the Wabash Valley Fault Zone (same as the Shawneetown Fault and Cottage Grove Fault System) which is located less than 2 miles southeast of the Saline County Landfill (Refer to Figure 2), corresponds to the southern boundary of this highly mineralized groundwater area.

Similarly, Graf and others 1966 also determined that the Wabash Valley Fault zone area or the Rough Creek or Shawneetown Fault Zones (Refer to Figure 2) was characterized by a high geochemical gradient which was attributed to the upwelling of brines. Graff and Others (1966), documented Total Dissolved Solids (TDS) concentrations ranging between 60,000 mg/L and 130,000 mg/L in South Central Saline County at depths less than 2000 ft. below ground surface). Cartwright (1970) identified temperature gradient trends which coincided with the Rough Creek Fault Zone (Same as the Wabash Valley or Shawneetown Fault Zones). The isothermal high zone identified along the Rough Creek Fault Zone (Refer to Figure 2) was attributed to upward movement of deep brines. As shown by Figure 2, the Saline County Landfill is located north of

the Shawneetown Fault and thus is within the brine upwelling area discussed by these previous investigators. As previously stated, these brines tend to be characterized by high concentrations of TDS, chloride and specific conductance.

The regionally identified upward movement of brines has been attributed to the hydrodynamic groundwater flow conditions within the central portions of the Illinois Basin. Groundwater flow into the basin displaces some of the mineralized water vertically upward. Figure 9 shows the approximate location of the Saline County Landfill relative to a Structure Contour Map depicting the Top of the Mount Simon Formation. As shown by the map the site is located extremely close to the center of the Illinois Basin (a geologic structural feature shaped similarly to a bowl). The area is also associated with numerous faults and seismic activity. Numerous investigators (including several from the Illinois State Geologic Survey) have discussed brine upwelling in this area being the result of regional hydrodynamic flow conditions resulting from upward displacement of saline water due to the flow of groundwater from the updip flanks of the basin (Davis, 1973; Bredehoeft and Others, 1963; Graf and Others, 1966; Cartwright, 1970). As shown by Figure 9, the central portion of the Illinois Basin and the highly faulted area encompasses many square miles.

The upward flow of mineralized groundwater may affect the groundwater quality within the shale bedrock and hydraulically interconnected minespoil in the vicinity of the site. As noted by Davis (1973), these influences are anticipated to be greatest in the vicinity of vertical joints or cracks in the bedrock which provide a conduit for vertical upward migration of mineralized groundwater. Flushing and dilution of highly mineralized groundwater is anticipated to occur at differing rates which depend on local recharge conditions and the hydraulic conductivity of the materials. As such, it is not unusual that localized areas of higher chloride concentration have been detected at the site. In fact, based on interpolation of the isoconcentration contours presented by Figure 6 from Davis, 1973(Refer to Appendix E2), the regional chloride concentrations in the shale bedrock in the vicinity of the Saline County landfill is expected to average approximately 80 mg/L, rather than the 16.4 mg/L interwell background which was developed for the Shale Unit at Landfill 1.

Based on these preceding discussions, it is apparent that the groundwater quality in the vicinity of the landfill are influenced by a combination of regional hydrogeologic conditions (i.e., the upwelling of a deep seated brine source of salinity) as well as pre-existing anthropogenic sources of groundwater quality impact (effects of strip mining). The inorganic groundwater quality influences of these regional and outside anthropogenic sources complicate the interpretation of the groundwater quality data and limit the ability to develop representative background concentrations.

B. Overview of Requested Relief

In order to improve the groundwater monitoring program at the Saline County Landfill Facility, two principal adjusted standards are requested so that the monitoring system might be better designed to detect potential releases from the regulated landfill unit while minimizing the

number of false positive exceedances resulting from the influences of the acidic drainage within the mine spoil which forms the uppermost monitored unit at the site. The proposed adjusted standards include the modification of the monitoring parameter list to eliminate constituents that are affected by acid mine drainage and/or the elimination of constituents that are unlikely to act as potential sources of contamination, since the leachate concentrations are considerably less than the groundwater concentrations. Based on the comparative analysis of leachate and groundwater concentrations, eleven (11) constituents have been selected as proposed permit List G1 constituents that would undergo statistical groundwater quality evaluation in order to provide potential indication of potential releases of leachate. However, pursuant to discussions with the Illinois EPA, it is proposed that an additional eight (8) current List G1 constituents (pH, specific conductance, dissolved ammonia, dissolved chloride, dissolved magnesium, dissolved sulfate, TDS, and dissolved zinc) be retained in the permit G1 parameter list for trend analysis. For the most part, these 8 constituents are sensitive to changes in minespoil geochemistry and thus provide a geochemical means to contrast acid drainage related changes in groundwater quality from potential landfill leachate related changes in groundwater quality. No changes to the required List of G2 organic constituents are proposed since these constituents are not significantly affected by the acid mine drainage conditions in the shallow groundwater.

An adjusted standard to modify the total and dissolved chloride applicable groundwater quality standard (AGQS and MAPC) to 200 mg/L is also requested as part of the 1st adjusted standard petition. The technical justification for this adjusted standard is the same as the request to delete detection and assessment monitoring parameters (i.e., inability to characterize background concentrations due to site specific and regional factors). The requested alternate standard of 200 mg/L is based on the Illinois Class I Groundwater Quality Standard (35 IAC 620.410). The adjusted standard modification is proposed in lieu of deleting the constituent since it is believed that chloride may still provide a useful indication of landfill related changes in groundwater quality, if the background standard is modified. Based on discussions with the Illinois EPA, it is proposed that total and dissolved chloride be exempted from statistical evaluations of permit condition VIII.A.13(a). The request for exemption recognizes that the site hydrogeologic conditions result in spatial and temporal concentration variations which make implementation of the currently permitted intrawell statistical standards impracticable. Instead the requested IPCB adjusted standard of 200 mg/L implemented pursuant to 35 IAC 811.320(a)(1)(B) would serve as an interwell background limit (and Groundwater Protection Standard) which would be applicable to all (i.e., bedrock, lacustrine and minespoil) wells.

Similarly, pursuant to discussions with the Illinois EPA it is also proposed that dissolved and total ammonia be exempted from the statistical trend analysis program. Data analysis has shown that changes in the concentrations of ammonia occur in response to acid mine drainage conditions. This is attributed to the fact that process forming the acid mine drainage is mediated by iron metabolizing bacteria that secrete ammonia. These conditions make it difficult if not impossible to implement the currently permitted system of intrawell statistical standards. Instead it is proposed that pursuant to 35 IAC 811.320(a)(1)(B), that the IPCB approve the implementation of an adjusted standard based on the General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212). This adjusted standard would provide relief from temporal and spatial variations in concentrations associated with the acid drainage conditions but would

require further analysis (alternate source demonstrations, assessment monitoring, etc.) in instances where more pronounced concentration variations are observed. In this manner, it is believed that the usefulness of one of the more pronounced leachate indicator constituents can be maintained to identify potential major changes in groundwater quality while recognizing the background variability associated with the acid mine drainage conditions which exist at the site.

The second adjusted standard seeks to establish Groundwater Protection Standards (GPS) which will act as trigger concentrations to determine the need to initiate corrective measures or additional source control measures. Groundwater Protection Standards are deemed necessary since the anthropogenic influence of previous strip mining combined with the regional hydrodynamic groundwater flow and geologic conditions (fracturing, faulting etc.) render it impossible to develop representative interwell groundwater background standards. The GPS values are necessary pursuant to 35 IAC 811.325(e) and (f) to establish numerical standards to assess when changes in groundwater concentrations associated with the landfill constitute a risk to potential receptors or the environment. Current regulatory guidance requires that the Illinois EPA utilize background groundwater quality determined pursuant to 35 IAC 811.320 as the trigger concentration to assess the need for corrective action. Thus, despite the regulatory directive of 35 IAC 811.325(e) which reads:

> *"The Agency shall determine that remediation of a release of one or more constituents monitored in accordance with 811.319 from a MSWLF Unit is not necessary if the owner demonstrates to the Agency that:*
>
> *1) The groundwater is additionally contaminated by substances that have originated from a source other than the MSWLF unit and those substances are present in such concentrations that cleanup of the release from the MSWLF unit would provide no significant reduction in risk to actual or potential receptors*; or
>
> *2) The constituents are present in groundwater that:*
>
> *A) Is not currently or reasonably expected to be a source of drinking water; and*
>
> *B) Is not hydraulically connected with waters to which the hazardous constituents are migrating or are likely to migrate in concentrations that would exceed the groundwater quality standards established under Section 811.320; or*
>
> *3) The remediation of the release is technically impracticable; or*
>
> *4) The remediation results in unacceptable cross-media impacts.... "*

The Illinois EPA is also bound pursuant to 35 IAC 811.319(a)(1)(A) and 35 IAC 811.319(a)(4)(A)(iv) to uphold the groundwater non-degradation standards that background concentrations not be exceeded at or beyond the facility's zone of attenuation (ZOA). As such,

there is a conflict between the requirements of 35 IAC 811.325 (e) and (f) which indicate that risk based considerations dictate the need for corrective action and 35 IAC 811.319(a)(1)(A) and 35 IAC 811.319(a)(4)(A)(iv) which define threat as an exceedance of the background standard. In order to address this conflict, numerical standards referred to as "Groundwater Protection Standards" are required to define concentrations which if exceeded as a result of MSWLF activities would constitute a public health or environmental risk thus requiring corrective action. For this reason, the applicant has proposed that the GPS requirements of 40 CFR 258.55(4) be made applicable to this facility.

Both of the above described adjusted standard requests are required to provide relief from the site specific hydrogeologic conditions which limit the compliance monitoring and corrective action programs. Discontinuities in hydrostratigraphic units at the site make it impossible to adequately characterize the acid mine drainage conditions which are common in the shallow strip mine spoil and interconnected shale bedrock at the site. Similarly, regional groundwater flow conditions exist that promote the upward movement of highly mineralized groundwater or brine. Fractures and faulting have created vertical pathways for flow through the Pennsylvanian shale bedrock. These fractures result in non-uniform concentration conditions which preclude the development of representative interwell background (background groundwater quality based on statistical evaluation of pooled upgradient monitoring well data) for many constituents especially chloride. Both adjusted standard petitions are required to provide relief from site specific conditions which limit the ability to discern increases in concentrations of certain constituents whose concentrations are highly affected by acid mine drainage and/or the regional hydrodynamic movement of deep seated highly mineralized formation waters.

The proposed GPS values are necessary so that a practical numerical standard can be applied to the corrective action regulatory guidance provided in 811.325(e) and (f). Specifically, the GPS values are necessary to define numerical limits or trigger concentrations which would necessitate corrective action or additional source control measures to mitigate potential health or environmental risks. These numerical standards or GPS values must be protective of public health and the environment while taking into consideration the degraded background groundwater quality which is attributed to mining operations which predate the landfill operations.

The proposed adjusted standards will provide relief from site specific groundwater quality conditions which hamper monitoring and corrective action/source control efforts at the site. The proposed adjusted standards have been carefully developed to improve the groundwater monitoring system at the landfill. The adjusted standard to implement GPS values are necessary to establish corrective action objectives that remain protective of human health and the environment while recognizing limitations associated with the background groundwater quality associated with the previous strip mine operations at the site. The proposed adjusted standards are discussed in greater detail in the subsequent sections of this petition.

The adjusted standard petition has been organized into two parts: the first section provides the request to modify the detection and assessment monitoring parameter lists (i.e., Petition No. 1), the 2nd section (i.e., Petition No. 2) provides the technical and legal justification for the request

for Groundwater Protection Standards. Both adjusted standard petitions have been organized in accordance with the requirements of Subpart D of 35 IAC 104.406. Additional supporting technical justification for the requested adjusted standards is provided in Appendix A. Appendix B presents the editorial changes to the State Subtitle G Municipal Solid Waste Regulations which would be necessary to implement the proposed adjusted standards on a site specific basis. Appendices C through H provide supporting information provided to document compliance with the 35 IAC 104.406 statutory requirements. Appendix I presents the responses to the Illinois EPA comments on the initial (December 2011) petition and provides additional supporting information that was submitted in response to the Agency comments.

II. Requested Relief

As discussed in the preceding introduction section, two principal adjusted standards are requested to provide relief from the above mentioned quality issues. These primary adjusted standards include 1) the modification of the detection and assessment monitoring parameter lists to provide a monitoring system that is more indicative of potential landfill related changes in groundwater quality and 2) the creation of Groundwater Protection Standards or GPS that allow the requirements of 35 IAC 811.325(e) and (f) to be implemented in a manner that is protective of human health and the environment. In addition, the 1st adjusted standard petition also includes a request to implement Pollution Control Board adjusted background standards pursuant to 35 IAC 811.320(a)(1)(B) to modify the total and dissolved chloride and the total and dissolved ammonia background levels. The request for these Board adjusted background standards has been grouped with the 1st petition, since the statutory and technical demonstrations for the 1st petition is directly applicable to the request for Board adjusted background concentrations for these parameters. Each of the requested adjusted standards is identified in the subsequent sections along with a discussion of the board required statutory justification for granting the requested relief. Refer to 35 IAC104 Subpart D for a description of the requirements for requesting adjusted standard relief.

1.0 Petition for Modification of Monitoring Parameter Lists and Adoption of an Adjusted Standard Modified Chloride and Ammonia Background Concentration.

a) Statement of Standard from which an Adjusted Standard is Sought.

Modification of the required detection groundwater monitoring parameter list.
An adjusted standard is requested to allow the modification of the required detection groundwater monitoring parameter list. Specifically, an adjusted standard is requested to provide relief from 35 IAC 811.319(a)(2) which identifies the "Criteria for Choosing Constituents to be Monitored" under a detection monitoring program. 35 IAC 811.319(a)(2)(i) requires that detection monitoring include constituents which appear in, or are expected to be present in the leachate to be monitored. Pursuant to the current requirements of 35 IAC 811.319(a)(2)(ii), at a minimum this list shall include the following constituents:

Ammonia – Nitrogen (dissolved)
Arsenic (dissolved)
Boron (dissolved)
Cadmium (dissolved)
Chloride (dissolved)
Chromium (dissolved)
Cyanide (total)
Lead (dissolved)
Magnesium (dissolved)
Mercury (dissolved)
Nitrate (dissolved)

Sulfate (dissolved)
Total Dissolved Solids (TDS)
Zinc (dissolved)

Modification of the required assessment groundwater monitoring parameter list.
Should assessment monitoring be required due to the detection of statistically significant increases (SSIs) in concentrations of detection monitoring constituents, an adjusted standard from 35 IAC 811.319(b)(5)(A) (i.e., requirement that assessment monitoring include 40 CFR 258 Appendix II and 35 IAC 620.410 constituents) is also requested such that the assessment monitoring list may be modified to remove inorganic heavy metal constituents whose concentrations are significantly affected by acidic drainage conditions present in the mine spoil unit and the hydraulically connected portions of the upper shale bedrock. Specifically, several of the inorganic constituents listed in CFR 258.Appendix II, incorporated by reference at 35 Ill. Adm. Code 810.104, and several of the inorganic constituents from 35 Ill. Adm. Code 620.410, would be exempted from the assessment monitoring program. An alternate monitoring list which is not as sensitive to acidic drainage as the aforementioned assessment monitoring list is proposed for trend and statistical analysis purposes in lieu of the exempted inorganic constituents (Refer to Section F for a Narrative Description of the Proposed adjusted standard and a description of the proposed alternate groundwater monitoring list). Pursuant to discussions with the Illinois EPA, it is proposed that some of the acid drainage affected constituents be retained to help document potential changes in the anthropogenic concentrations of these constituents. However, it is proposed that these acid drainage affected constituents be utilized primarily for trend analyses and that they be exempted from statistical comparisons to background concentrations.

As previously mentioned, an adjusted standard to modify the total and dissolved chloride applicable groundwater quality standard (AGQS and MAPC) to 200 mg/L is also requested as part of the 1st adjusted standard petition. Pursuant to 35 IAC 811.320(a), the applicable groundwater quality standard shall be based on either background groundwater quality or a Board established adjusted standard developed in accordance with the justification procedure provided in 35 IAC 811.320(b). The proposed adjusted standard alternate dissolved and total chloride standard of 200 mg/L is based on the Illinois Class I Groundwater Quality Standard (35 IAC 620.410). As such, the proposed adjusted standard background concentration for dissolved and total chloride (i.e., 200 mg/L) is consistent with the Class I Groundwater requirements of 35 IAC 811.320(b)(2) despite the fact that site groundwater contains naturally occurring constituents which do not meet the standards of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440. The proposed adjusted standard for total and dissolved chloride is more protective of public health and the environment than might be required if the applicant sought to pursue the adjusted standard pursuant to the non-potable, non-resource groundwater requirements specified by 35 IAC 811.320(b)(4).

Similarly, the petition also proposes that the Illinois General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212) be approved as an adjusted standard modified background concentration for total and dissolved ammonia. The adjusted standard is necessary for this

parameter since the ammonia concentrations have been shown to vary in response to acid mine drainage (refer to Figure 8). The proposed implementation of a Board adjusted standard approved pursuant to the requirements of 35 IAC 811.320(b) and the request to exempt the constituent from statistical analyses would provide relief from discerning whether the acid drainage related fluctuations in ammonia concentrations constitute an SSI relative to the intrawell background concentrations. The propose background standard of 15 mg/L based on the General Use Water Standard would provide an interwell background standard that is protective of public health and the environment while recognizing the anthropogenic effects that previous strip mine operations have had on groundwater quality. Groundwater concentrations below 15 mg/L would be exempted from comparison to the currently permitted intrawell background standards. The use of the General Use Water Standard of 15 mg/L as a background concentration/GPS may still require that occasional Alternate Source Demonstrations be submitted to IEPA to demonstrate that the interwell ammonia background exceedance is not associated with a leachate release from the landfill (i.e., well G17S). The ASDs are deemed an appropriate evaluation mechanism to maintain this relatively sensitive leachate indicator parameter as part of the monitoring program.

b) Statement of Regulation of General Applicability from which Relief is Sought

The regulation of general applicability from which the adjusted standard is requested was adopted as part of 35 IAC 811 Subpart C. These regulations apply to all landfills in which chemical and putrescible wastes are to be placed, except as otherwise provided in 35 Ill. Adm. Code 817. The rules were adopted pursuant to the federal standards for the new municipal solid waste landfills (MSWLF) units and are identical-in-substance to the federal regulations promulgated by the U.S. Environmental Protection Agency pursuant Sections 4004 and 4010 of the RCRA MSWLF program (i.e., RCRA Subtitle D). The Illinois standards presented in 35 IAC 811 Subpart C are in many ways more stringent than the Corresponding RCRA Subtitle D requirements presented in 40 CFR 258. The proposed adjusted standards seek to implement requirements (i.e., Groundwater Protection Standards) and/or flexibilities (i.e., ability to modify monitoring parameter lists) of the federal regulations which are not specifically enumerated by the Illinois Subpart C requirements.

An adjusted standard to modify the total and dissolved chloride applicable groundwater quality standard (AGQS and MAPC) to 200 mg/L and the total and dissolved ammonia standard to 15 mg/L is also requested as part of the 1st adjusted standard petition. This request is made pursuant to the procedures outlined in 35 IAC 811.320(b). The technical justification for this adjusted standard is the same as the request to delete detection and assessment monitoring parameters (i.e., inability to characterize background concentrations due to site specific and regional factors). The requested total and dissolved chloride adjusted standard background value of 200 mg/L is based on the Illinois Class I Groundwater Quality Standard (refer to 35 IAC 620.410). The total and dissolved ammonia background is proposed based on the Illinois General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212). As such, while the proposed dissolved and total chloride and total and dissolve ammonia standards are not based on the statistical background calculation procedures of 35 IAC 811.320(d), the proposed chloride adjusted standard background concentration (i.e., 200 mg/L) and the ammonia standard of 15 mg/L would

still be deemed consistent with the regulatory requirements since pending Board approval, the standard would comply with the requirements of 35 IAC 811.320(b)(2).

The specific correlation of the state statutes to the Federal Subtitle D regulations may be found tabulated in Appendix B to the 35 IAC 811 (Illinois Solid Waste Disposal Regulations). This table provides a Section-by-Section correlation between the requirements of the federal MSWLF regulations at 40 CFR 258 (1992) and the requirements of the Illinois Subtitle G solid waste regulations.

The rule of general applicability was implemented pursuant to Sections 7.2, 21, 21.1, 22, 22.17, 22.40 and 27 of the Environmental Protection Act [415 ILCS 5/7.2, 21, 21.1, 22, 22.17, 22.40, and 27]. The rule of general applicability was Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990; amended in R92-19 at 17 Ill. Reg. 12413, effective July 19, 1993; amended in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994; expedited correction at 18 Ill. Reg. 7504, effective July 19, 1993; amended in R90-26 at 18 Ill. Reg. 12481, effective August 1, 1994; amended in R95-13 at 19 Ill. Reg. 12257, effective August 15, 1995; amended in R96-1 at 20 Ill. Reg. 12000, effective August 15, 1996; amended in R97-20 at 21 Ill. Reg.15831, effective November 25, 1997; amended in R98-9 at 22 Ill. Reg.11491, effective June 23, 1998; amended in R99-1 at 23 Ill. Reg. 2794, effective February 17, 1999; amended in R98-29 at 23 Ill. Reg.6880, effective July 1, 1999; amended in R04-5/R04-15 at 28 Ill. Reg. 9107, effective June 18, 2004; amended in R05-1 at 29 Ill. Reg. 5044, effective March 22, 2005; amended in R06-5/R06-6/R06-7 at 30 Ill. Reg. 4136, effective February 23, 2006; amended in R06-16/R06-17/R06-18 at 31 Ill. Reg. 1435, effective December 20, 2006; amended in R07-8 at 31 Ill. Reg. 16172, effective November 27, 2007.

The regulations of general applicability that are the subject of the proposed adjusted standard include the request to modify the detection monitoring parameter lists presented in 35 IAC 811.319(a)(2) and the assessment monitoring parameter requirements of 35 IAC 811.319(b)(5)(A), as well as the federal assessment monitoring requirements in 40 CFR 258.55 and Appendix II which are incorporated by reference at 35 IAC 811.319(b)(5)(A) and at 35 Ill. Adm. Code 810.104. 40 CFR 258.54 provides the federal detection monitoring requirements for municipal solid waste landfills (MSWLF). 40 CFR 258.54(a)(2) allows the Director of an Approved State the authority to establish an alternate list of inorganic indicator parameters for a MSWLF unit, in lieu of a some or all of the heavy metals (constituents 1-15 in 40CFR 258 Appendix I). The state has already adopted such a list of alternative constituents which has been incorporated into the regulations at 35 IAC 811.319(a)(2) which is the subject of this adjusted standard request. As such, the detection monitoring parameter selection flexibility provided by 40 CFR 258.54(a)(2) does not appear necessary for the proposed adjusted standard, since the federally mandated parameter list has already been modified.

Similarly, the assessment monitoring requirements presented in 40 CFR 258.55(b) provides that:

> *"the Director of an Approved State may delete any of the Appendix II monitoring parameters for a MSWLF unit if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the unit".*

While some of the Appendix II inorganic constituents that are proposed to be deleted are present in the leachate from the MSWLF unit, these inorganic and heavy metal constituents cannot be quantified in the groundwater, unless the concentrations in the leachate are significantly greater than those in the groundwater. The MSWLF Unit leachate cannot reasonably act as a source of contamination to the groundwater unless the leachate concentrations are significantly elevated relative to the groundwater. As such, the background groundwater concentrations act as a surrogate detection limit benchmark when determining whether the leachate concentrations are sufficiently elevated that leakage derived from the waste contained in the MSWLF unit would constitute a threat to groundwater. A detailed comparison of leachate and groundwater concentrations for each hydrostratigraphic unit is presented in Appendix A.

The Director of an Approved State may choose to delete or replace any Appendix II assessment monitoring constituents, if it is determined that the constituent cannot reasonably be expected to be derived from the waste unit at sufficient concentrations which could be detected in the groundwater. The adjusted standard presented above in Section a, proposes that constituents that occur in the leachate at concentrations which are not significantly elevated relative to the groundwater be deleted, since the monitoring of these constituents provides little or no utility in detecting releases from the landfill. The 35 IAC 811.319(a)(2) and the 40 CFR 258 Appendix II constituents will continue to be monitored in the leachate, such that the groundwater monitoring for these constituents could be resumed if it was determined that the leachate concentrations of these constituents had increased relative to the background groundwater concentrations.

c) Statement of Level of Justification

The regulation from which the adjusted standard is sought does not contain specific levels of justification, so factors set forth in section 28.1(c) of the Act apply to this petition. As will be described in more detail below, the Saline County Landfill (SCL) has established that:

- *The factors relating to the landfill are substantially different from the factors relied upon by the Board in adopting the regulations of general applicability;*
- *The existence of these different factors justifies an adjusted standard;*
- *The requested standard will not result in environmental health effects more adverse than the effects considered by the Board in adopting the rules of general applicability.*

Furthermore, based on the authority granted to the Director of an Approved State to modify detection and assessment monitoring parameter lists, it is believed that the adjusted standard is consistent with applicable federal law.

Pursuant to Section 28.1(c) of the Act, the justification for the adjusted standard to modify the detection and assessment monitoring parameter lists is provided in subsequent discussions provided below.

(1) The factors relating to the petitioner are substantially and significantly different from the factors relied upon by the board in adopting the general regulation applicable to that practitioner.

35 IAC 811.319(a)(2) identifies the "*Criteria for Choosing Constituents to be Monitored*". Subparagraph A of this regulation clearly identifies the Board rationale for adopting the detection monitoring list and states that the constituents monitored should:

"*provide a means of detecting groundwater contamination*".

As shown by the groundwater quality demonstration submitted in Appendix A and summarized in Figures 6 and 7, the range of background pH concentrations vary by more than 3 full pH units within the strip mine spoils and the hydraulically connected bedrock which comprise the monitored zones at the landfill. This represents over a 1000 fold increase in the concentration of H_3O^+ ions or the acidity of the solution which occurs over relatively small distances between monitoring wells and during relatively short time intervals between quarterly monitoring rounds.

As previously mentioned, the abrupt changes in pH occur as a result of acidic drainage conditions within the mine spoil. Regulatory guidance provided in the State's Tiered Approach to Clean Up Objectives or TACO (35 IAC 742 Appendix B – Table C) recognizes that the remedial standards for various heavy metal constituents often vary as a function of pH (Refer to Attachment 2 of Appendix I for copy of table). Lower or more stringent remedial standards are required for environments characterized by low pH or acidic conditions since the solubility and hence the mobility of these metals is much greater under acidic conditions. Table J of the same TACO Appendix lists the soil partitioning coefficients (Kd) for 13 heavy metal constituents. As shown by Table J, the majority of the heavy metal constituents exhibit significant variations in sorption behavior as a function of pH levels and increased acidity. While the sorption behavior tends to be ion specific and certain metals are more mobile within defined pH ranges, all 13 heavy metal constituents have lower Kd (i.e., sorption) values at a pH of 4.9 than at neutral pH 7.0 conditions. The relatively lower Kd values associated with the lower pH (i.e., more acidic environment) infers that heavy metal constituents are less likely to be absorbed onto soil as the acidity of the soil and/or groundwater increases. As such, the solubility of these metals increase under these acidic conditions. Hence, the aqueous concentrations of these metals are much higher than would occur under neutral pH conditions.

The Illinois EPA presents data on the anticipated leachate concentrations in Appendix C of their LPC-PA2 and PA19 guidance documents. It is believed that the Agency relied on this data in determining representative ranges of leachate constituent concentrations. The references for the leachate concentration data in LPC-PA 2 and PA19 are listed as follows:

Gasper, James A. and Jeff M. Harris (1989), Management of Leachate from Sanitary Landfills (Browning-Ferris Industries).

Dolan, David; Keoughl, Helen; R.L. O'Hara and O'Leary, Kevin (1991) A Comparison of Chemical Constituents in Industrial Hazardous Waste and Municipal Waste Landfill Leachate (Waste Management North America Inc.).

While the Waste Management reference could not be located, the BFI reference was published in the Proceedings of the 1989 Environmental Engineering Specialty Conference. The Gasper and Harris paper indicates that the source of the leachate data is derived from 24 Browning Ferris Industries landfills. The paper provides no mention of how many of the landfills were located within areas which were previously strip mined for coal removal. The Gasper and Harris paper does indicate that the "the average leachate heavy metal concentrations are on the same order of magnitude as the drinking water standards". This suggests that the groundwater surrounding the landfills that were studied by Gasper and Harris might be considered a potential source of drinking water. Whereas, the groundwater surrounding the Saline County Landfill is clearly non-potable as recognized by the Class IV groundwater designation pursuant to 35 IAC 620.240. The paper also recognizes that the leachate concentrations varied appreciably from site to site. Specifically Gasper and Harris (1989) indicate that the "standard deviation in constituent concentrations were generally as large, or larger than the averages." Thus, it is apparent that the identification of monitoring parameters which are representative of the leachate composition while remaining sufficiently sensitive to potential changes to background groundwater quality is very much a site specific endeavor. While scientific efforts have been made to represent the broadest number of landfills, site specific conditions such as the leachate character and the presence of acidic drainage in the mine spoil render many of the 35 IAC 811.319(a)(2)(A) indicator parameters incompatible with site hydrogeologic conditions.

Page 2-42 of the R-88-7 Economic Impact Study of the Landfill Regulations "ECIS" states that groundwater monitoring constituents should be selected that:

> "*...cause or contribute to groundwater contamination, and ones for which collection and analytical procedures exist to determine statistically significant changes in concentration...*"

Due to the wide range in temporal and spatial variations in background groundwater quality for many inorganic constituents, it is often not possible to determine statistically significant changes in groundwater quality for these minespoil related constituents. The board regulations presented in 35 IAC 811.320(d)(3) provide some relief by allowing background to be determined using data derived from wells which are not hydraulically upgradient of the landfill. However, due to the geometry of the strip mined area relative to the landfill boundary (Refer to Figure 1) and the impacts associated with the landfill (i.e. elevated cis 1,2 DCE concentrations at monitoring well G17S), IEPA no longer allows intrawell statistical procedures based on data collected from wells which are not located hydraulically upgradient of the landfill. Similarly, IEPA does not support the use of the Unit 2 monitoring wells (i.e., wells located north of the Unit 1 Landfill) for developing revised interwell background values due to the same concerns that the Unit 1 landfill may have influenced groundwater quality at these wells. As such, no acceptable alternate network of non-upgradient monitoring wells has been agreed upon to develop revised background standards.

As previously mentioned, an adjusted standard is also requested from the Board to modify the groundwater quality standards required pursuant to 35 IAC 811.320 to allow the Board to approve an alternate background standard (AGQS) of 200 mg/L for total and dissolved chloride. The Board approved adjusted standard for total and dissolved chloride concentrations is necessary since the current monitoring well network is incapable of characterizing spatial

variations in the concentrations of this parameter due to the discontinuous nature of the hydrostratigraphic units and due to the regional conditions which promote the upwelling of deep formation brines along bedrock fractures and discontinuities. The presence of these bedrock discontinuity features cannot be predicted in a manner which would allow representative background concentrations to be developed.

Unlike the acid mine drainage related parameters where the groundwater concentrations exceed or are equal to the leachate concentrations, the chloride concentrations in the leachate tend to be much greater than the concentrations observed in the groundwater (refer to Box Plot comparisons presented in Appendix A). As such, this petition proposes that the constituent dissolved chloride be retained as part of the permit designated G1 monitoring list. However, it is proposed that the adjusted standard background total and dissolved chloride concentration of 200 mg/L be approved for each hydrostratigraphic unit in order to address the background concentration uncertainties. These uncertainties are associated with the discontinuous hydrostratigraphic units (refer to Figure 1 for Arial photo), and the potential for chloride to be released by acid mine drainage dissolution of the clay minerals contained in the shale and minespoil. The total and dissolved chloride background concentration adjusted standard is also warranted due to the brine upwelling conditions which have been documented throughout the region. The upwelling brine results in steep vertical concentration gradients (i.e., variations in chloride concentrations with depth). Bedrock fractures which allow relatively unimpeded upward movement of the brine combined with varying rates of intermixing with the shallow water (i.e., dilution of the upwelling brine) make it difficult to characterize representative background concentrations for this constituent.

The proposed adjusted standard background total and dissolved chloride concentration of 200 mg/L is necessary to account for the geologic and hydrogeologic uncertainties discussed in the previous paragraph. Similarly, the petition proposes that the Illinois General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212) be approved as an adjusted standard modified background concentration for total and dissolved ammonia. The adjusted standard is necessary for this parameter since the ammonia concentrations have been shown to vary in response to acid mine drainage (refer to Figure 8 for ammonia vs sulfate scatter plot).

The adjusted standard (refer to adjusted standard petition No. 2) also requests approval to use groundwater protection standards to act as trigger concentrations to identify the need for corrective action. The GPS values are necessary since the site has been additionally contaminated by bi-products from the previous coal strip mining operations which make it difficult to discern landfill related increases in concentration.

35 IAC 811.320(b) identifies two different levels of justification: 35 IAC 811.320(b)(2) provides the justification requirements for groundwater that presently serves or may serve as a source of drinking water in the foreseeable future; and 35 IAC 811.320(b)(4) presents the requirements for groundwater which contains naturally occurring constituents which do not meet the standards of 35 IAC 620.410, 620.420 and 620.430. Because the groundwater within the saturated mine spoil deposits is classified as Class IV pursuant to 35 IAC 620.240, the justification summarized by 35 IAC 811.320(b)(4) is deemed applicable to this petition. Many of the justification points

required pursuant to 35 IAC 811.320(b)(4) for modifying the background groundwater quality standards are also believed applicable to the technical demonstration for an adjusted standard to modify the Detection and Assessment Monitoring parameter lists. The discussion provided in Section 2(c) should be referenced for additional supporting information (refer to criteria C for Adjusted Standard Petition Item 2).

(2) The existence of those factors justifies an adjusted standard;

The groundwater quality obstacles described in the preceding paragraphs have created an impediment to permitting revised groundwater quality standards at the site. During previous permit applications, the IEPA has indicated that the uncertainties associated with the potential for overlapping impacts associated with the acid mine drainage and landfill impacts have prompted the Agency take a very conservative interpretation of the monitoring results (i.e., the assumption that any exceedances of permitted background levels is associated with the landfill). This has resulted in the IEPA requesting that corrective action be extended to constituents such as iron, manganese and sulfate which commonly occur within the strip mine deposits at concentrations which are much greater than the concentrations observed in the leachate (refer to Appendix A comparison of leachate and groundwater concentrations). These conditions warrant the approval of the proposed adjusted standard in order to allow the corrective action efforts to be focused on constituents that are indicative of impacts caused by the landfill and not the anthropogenic influences of previous strip mining operations at the site.

(3) The requested adjusted standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability;

Because the saturated strip mine spoils at the site are classified as Class IV groundwater, which by definition restricts the groundwater from being utilized as a public water supply or a resource groundwater (refer to 35 IAC 620.230), the adjusted standard will not result in any health effects which are significantly more adverse than the effects considered by the Board in developing the rule of general applicability. The parameters which are proposed to be deleted from the detection and assessment monitoring programs are demonstrated to provide a poor indication of potential leachate impacts (refer to Appendix A for technical demonstration). As shown by Appendix A, the proposed replacement parameters provide a much better indication of potential leachate impacts than the existing permitted constituents.

The proposed total and dissolved chloride adjusted standard background concentration of 200 mg/L is also protective of the environment since it applies the Class I potable groundwater standard to saturated minespoil deposits and the hydraulically interconnected bedrock which are deemed Class IV groundwater. Similarly, the petition proposes that the Illinois General Use Water Standard of 15 mg/L (refer to 35 IAC 302.212) be approved as the background standard for total and dissolved ammonia. This proposed standard is also deemed protective given the highly acidic groundwater conditions observed at the site. Furthermore, groundwater protection standards are proposed (refer to Adjusted Standard Petition No. 2) such that the groundwater quality associated with the landfill will be maintained at levels which are deemed protective of

public health and the environment. A more thorough discussion of health evaluation is provided in the response to the 35 IAC 811.320(b) adjusted standard requirement discussion presented in Section 2(c) of this petition (i.e., refer to criteria C for Adjusted Standard Petition Item 2).

(4) The adjusted standard is consistent with any applicable federal law,

As discussed in Section 1(i), the Director of an Approved State is granted authority to approve alternate groundwater monitoring parameter lists. As such, pending the IEPA approval of the alternate monitoring approach (i.e., alternate parameter list), the proposed adjusted standard would be deemed to be consistent with federal law. Similarly, the Illinois Subtitle G Municipal Solid Waste regulations underwent review by the US Environmental Protection Agency and received a determination of adequacy indicating that the State's Municipal Solid Waste regulations were deemed consistent with and/or more protective than the Federal Subtitle D regulations. The procedures specified in 35 IAC 811.320(b) "Justification for Adjusted Groundwater Quality Standards" have been reviewed by USEPA and received federal approval. Therefore, the adjusted standard approach to developing alternate background levels is deemed consistent with applicable federal requirements.

d) Description of the nature of the petitioner's activity that is subject of the proposed adjusted standard.

A brief narrative extracted from previous permit applications is provided below to provide an overview of the nature of the petitioners activity.

Landfill Location

The Saline County Landfill site is located approximately five miles southeast of Harrisburg in Saline County, Illinois. The landfill is located primarily in the West ½ of the Southwest ¼ of Section 5, and the East ½ of the Southeast ¼ of Section 6, and a part of the Northeast ½ of the Northwest ¼ of the Northwest ¼ of Section 8, Township 10 South, Range 7 East of the Third Principal Meridian. The existing landfill footprint area occupies approximately 20.5 acres within an approximately 166 acre parcel located along the west side of Saline County Highway 5.

Historical Background

Coal strip mining operations previously occurred at the site between 1959 and 1965. These mining operations resulted in the removal of the soils and bedrock overburden to access the Herrin No. 6 and Springfield No. 5 coal seam. The overburden soil and bedrock materials were left in 10 to 50 ft. high spoil banks which are evident in aerial photographs of the site dated 1970.

The SCL Landfill received developmental and operating permits (1983-9-DE/OP) on March 30, 1983, and September 15, 1983, respectively. The IEPA site identification number for the

Landfill is No. 1658080001. The landfill was originally owned by Bert and Gladys Driskell and operated by Milo and Braden Lambert as the Lambert #3 Landfill. The original Unit 1 portion of the landfill was constructed as a trench landfill which was later converted to an area landfill in which waste was placed above the trenches.

The landfill operating and developmental permits were transferred to Saline County Landfill, (SCL) Inc. by Supplemental Permit No. 1987-183-SP dated October 23, 1987. The permitted landfill was constructed and initiated filling operations in 1988, although based on the IEPA database review it appears that landfilling activities may have existed at the site dating back to 1973. SCL Inc. was acquired by Allied Waste Industries in 2000. Significant Modification Permit No. 1996-147-LFM superseded the previously cited permits and approved the facility for operation in accordance with the applicable regulations contained in 35 Ill. Admin. Code (35 IAC) Part 814, Subpart C. Landfill Unit 1 consists of the original existing landfill unit (approximately 15.8 acres) authorized by operating permit 1983-9-DE/OP and two roughly 2.4 acre lateral expansion areas (Cell 1 North and Cell 1 South totaling 4.8 acres) where operations were authorized on October 6, 2000 by permit modification No. 11. Cells 1N and 1S were constructed with composite liner and granular drainage blanket leachate collection systems. Cells 1N and 1S were operated by Allied approximately 5 years until the landfill ceased accepting waste in 2005 and initiated closure. Initially, the original Unit 1 landfill was not equipped with a leachate removal system, however, a retrofit system consisting of 5 vertical leachate extraction wells was later installed by Allied Waste in 2005 to help reduce leachate head and minimize potential leachate releases within the pre-existing Unit I landfill area. This system has since been expanded to include approximately 15 wells which may be used for combination leachate and landfill gas extraction.

Summary of Site Geologic Conditions

The surficial deposits at the site consist primarily of mine spoil, with Pleistocene lacustrine deposits around the western periphery of the mined area. The strip mine spoil deposits are underlain and in some areas laterally bounded by Pennsylvanian cyclothem bedrock units (alternating sequence of shale, siltstone, coal etc.). The mine spoil ranges in thickness from approximately 37.1 to 134.8 feet at the site, where present, with a surface elevation ranging from approximately 360 to 425 feet above mean sea level (MSL). The lacustrine (lake) deposits are located along the western side of the landfill, and range in thickness from approximately 31.8 to 42.7 feet. The surface elevation along the western portion of the landfill, where the lacustrine deposits are encountered, is approximately 358 feet MSL. The uppermost bedrock at the site consists of a shale unit which ranges in thickness from approximately 3.3 to 30.5 feet. The top of the shale unit ranges in elevation from approximately 345 feet MSL in the southeast corner of the landfill to below 290 feet MSL on the northern end of the landfill property where substantial thicknesses of bedrock were removed to access the coal seams.

Regional Structural Geology

The Saline County Landfill is situated along the north flank of the Shawneetown Fault system which is also referred to as the Rough Creek, Cottage Grove or Wabash Valley Fault Zone (Treworgy 1981). The Hicks Dome impact structure is located approximately 12 miles south of the landfill. The landfill is bounded to the south by the Shawneetown Fault System and to the

North by the McCormick Fault (refer to Figure 2 for a local structural geology map). Review of several regional references (i.e., Davis 1973; Graf and others 1966; and Cartwright 1970), indicates that these structural features are believed to play a significant role in the upward movement of saline groundwater within the southern portion of the Illinois Basin.

Site Hydrogeologic Conditions

The Unit 1 Landfill is located in a former coal strip mine. The South Branch of the Saline River flows along the west side of the site. The site hydrogeologic conditions have been evaluated based on investigations of the Unit 1 and the Unit 2 landfill sites

Groundwater within the mine spoil and lacustrine deposits occurs under water table conditions (phreatic surface). During late 2009 and early 2010, the groundwater elevations within the minespoil deposits typically ranged between 367 and 357. During 2009 and early 2010 the groundwater elevations within the shale monitoring unit ranged between 366 ft. MSL and 356 ft. MSL. The maximum water levels are typically observed at monitoring well G22D located near the southeast corner of the landfill, whereas the minimum groundwater elevation generally occurred at well G23D, located on the northern side of the landfill. Bedrock wells completed within the upper portion of the shale typically indicate potentiometric surface levels above the top surface of the shale.

Horizontal hydraulic gradients were calculated from the potentiometric surface data for the annual flow assessment. Within the minespoil Unit, the groundwater flow direction in the vicinity of the landfill has historically been toward the north and northwest. However, historical groundwater level monitoring data indicate that the groundwater flow directions fluctuate in response to variable recharge conditions and groundwater pumping or discharge conditions. The groundwater levels and flow patterns also depend on the mine spoil backfill fabric which results in anisotropic hydraulic conductivity which is typically aligned with the spoil banks.

The shallow monitoring zone potentiometric surface maps for the 2nd, 3rd and 4th quarter 2010 and 1st quarter 2011 indicate a predominantly northward component of groundwater flow. During the 2010 and 2011 monitoring period, the mine spoil had horizontal hydraulic gradients ranged from a low of 0.00009 feet per feet (ft./ft.) during the 4th Qtr 2010 to a high of 0.00033 ft./ft. during the 2nd Qtr of 2010 (Refer to Table 1).

Regional Hydrogeologic Conditions

Pryor (1956) prepared an evaluation of the groundwater geology of Southern Illinois. The reference described the surficial deposits throughout most of Southern Saline County as providing poor groundwater yields. Alluvial deposits adjacent to rivers were deemed capable of providing fair to good yield. Pennsylvanian age bedrock comprises the uppermost bedrock unit throughout the majority of the County. These bedrock deposits consisted of shale dominated cyclothem deposits which were considered a poor potential groundwater source. Despite the relatively poor groundwater yield properties and poor groundwater quality, approximately a dozen wells have been drilled within a 1 mile radius of the landfill (refer to Figure 5). However, as indicated by the driller logs presented in Appendix C, many of the wells do not appear to have been utilized for potable water supply. This is indicated by the fact that the wells were in some

cases backfilled and abandoned, or in other cases no pitless adaptor or pump are reported to have been installed.

The shallow regional hydrologic conditions (groundwater flow and groundwater quality) have been heavily influenced by land usage (strip mining, etc.) and by the regional hydrodynamic groundwater flow conditions within the Southern Illinois Basin. Davis (1973); Graf and others (1966); and Hensel and McKenna (1989) document extensive areas of Southern Illinois where the shallow water quality is considered to be brackish or non-potable. The groundwater and the surface water in these areas have been degraded by upward movement of brine and/or improper brine disposal practices. Based on evaluation of 4000 chemical analyses taken from wells completed at depths less than 250 ft., Davis (1973) determined that the Wabash Valley Fault Zone (same as the Shawneetown Fault and Cottage Grove Fault System) which encompasses the Saline County Landfill, corresponds to the southern boundary of this highly mineralized groundwater area. Davis (page 17) attributes the poor shallow water quality to the following:

> *"the high concentrations of dissolved minerals in shallow waters of the Illinois Basin would seem an unusual occurrence … one factor in southern Illinois is probably the thin veneer of nearly impermeable Quaternary tills and clayey silts which blanket the bedrock aquifers. This layer possibly hinders appreciable recharge of the underlying Paleozoic aquifers and thus prevents dilution and flushing of the upwelling brines"*

Similarly, Graf and others 1966 also determined that the Wabash Valley Fault zone area or the Rough Creek or Shawneetown Fault Zones (Refer to Figure 2) was characterized by a high geochemical gradient which was believed to be associated with upwelling of brines. Graff and Others (1966), documented Total Dissolved Solids (TDS) concentrations ranging between 60,000 mg/L and 130,000 mg/L in South Central Saline County at depths less than 2000 ft. below ground surface).

Cartwright (1970) identified temperature gradient trends which coincided with the northeast trend of the Rough Creek Fault Zone (Same as the Wabash Valley or Shawneetown Fault Zones). The isothermal high zone identified along the Rough Creek Fault Zone was attributed to upward movement of deep brines. As previously stated, these brines tend to be characterized by high concentrations of TDS, chloride and specific conductance. The Shawneetown or Rough Creek Fault zone is located approximately 1.5 miles east to southeast of the landfill site (Refer to Figure 2). Thus, the landfill site is situated in relatively close proximity to the fault zone where upward movement of deep seated formation brines have been documented for nearly 50 years.

In addition, to these deep seated sources of potential salinity impacts, previous investigations in the vicinity of the site have identified shallow groundwater quality influences which have been attributed to previous strip mining activities at the site. Dennis (1989) completed a Master's of Science thesis describing the groundwater quality at several strip mined locations in southern Saline County. The strip mine groundwater quality was characterized by high concentrations of TDS, sulfate, dissolved and total metals. These degraded groundwater quality conditions were

often accompanied by strongly acidic conditions (pH less than 5.0 S.U.) suggesting that acid mine drainage conditions had developed.

Based on these preceding discussions, it is apparent that the groundwater quality in the vicinity of the landfill are likely to be influenced by a combination of regional hydrogeologic conditions (i.e., the upwelling of a deep seated brine source of salinity) as well as pre-existing anthropogenic sources of groundwater quality impact (effects of strip mining). The inorganic groundwater quality influences of these regional and outside anthropogenic sources complicate the interpretation of the groundwater quality data. For this reasons, it is believed that organic parameters, especially volatile organic compounds often provide a more reliable indication of landfill related impacts.

Strip Mine Geochemistry Discussion

Coal strip mines have long been noted as exerting a profound influence on groundwater quality. Concentrations of metals and non-metal constituents including boron, cadmium, lead, zinc, boron, iron, manganese, arsenic, antimony, selenium, aluminum and magnesium frequently occur at elevated concentrations within previously strip mined areas. In a study of streams located in a coal-mining region of southwest Indiana, concentrations of aluminum, iron, manganese, nickel and zinc increased as pH decreased below 6.0. Oxidation of sulfide minerals (i.e., predominantly pyrite) forms a sulfuric acid and releases dissolved ferrous iron as well as other metals. The formation of the sulfuric acid was observed to greatly increase the acidity of the groundwater (Wilber et al., 1985). These acidic (i.e., low pH) waters can leach trace metals from other minerals and\or soils with which they come in contact. In another study, elevated concentrations for several metals were reported from stream sampling sites impacted by coal mining in the Saline River Basin in 1993 (IEPA, 1996). In addition, because the sulfide mineral oxidation reactions are mediated by biochemical activity of bacteria, the BOD and COD values also tend to increase.

Data from EPA (1996) indicate that metals such as arsenic, antimony, cadmium, copper, lead, selenium, and zinc are found in varying concentrations in coal indicating that these constituents are likely to be found in the groundwater associated with Pennsylvanian age coal and shale deposits or within mined areas where these bedrock formations have been disturbed.

Description of the Unit 1 Landfill Design

The Saline County landfill was constructed in a manner which reflects the evolution of the solid waste disposal regulations over the past 25 years. The pre-existing portion of the Unit 1 landfill was permitted in 1983 and construction was initiated that same year. The initial landfill was designed as a trench fill, and an area landfill operation was later constructed over the initial landfill trenches. The trench fill operation consisted of excavating trenches to an elevation just above the water table. Waste was then placed into the unlined trench. No leachate collection system was installed in the trenches. The waste was covered by available mine spoil materials before the next lift of waste was placed. The landfill operations were continued for approximately 13 years by vertically filling on the nearly 16 acre footprint established by permit No.1983-9-DE/OP.

In 1996, Permit application Log 1996-147 was submitted to the IEPA. This permit application represented the first significant permit modification application for the SCL. This application provided the plans and specifications detailing how the landfill demonstrated compliance with the applicable 35 IAC 814 Subpart C regulations and included a groundwater impact assessment demonstrating that both the existing landfill unit as well as the lateral expansion areas (designated Cell 1North and Cell 1 South) would meet the Groundwater Impact Assessment (GIA) requirements of 35 IAC 811.317.

The Cell 1 North and South lateral expansion areas were designed and constructed with a 3 foot thick composite liner system which was overlain by a leachate drainage layer. Leachate collected from the base of the expansion area portions of the landfill is removed from two sumps (L301 and L302) located along the landfill perimeter. The landfill achieved the design grades and final cover was placed on the landfill during 2006 and 2007. The final cover barrier consisted of a composite liner system consisting of 1.5 foot of re-compacted clay liner overlain by a 40 mil linear low density polyethylene (LLDPE) flexible membrane liner. 30 inches of vegetative or rooting zone soil was placed above the liner. Finally 6 inches of topsoil were placed above the vegetative zone soil layer.

The design attributes (composite liner, leachate collection system etc.) of the expansion area portions of the landfill enabled these cells to meet the GIA requirements. Leachate analysis results from samples collected from vertical wells constructed in the pre-existing portion of the landfill were provided in permit application Log 1996-147. These data indicated a relatively dilute leachate (chloride concentration 300 mg/L, ammonia 1.7 mg/L, and TDS concentration of 1,244 mg/L). The existing landfill unit data was utilized for contaminant transport model input of the leachate source concentrations. Based on this analysis the operator demonstrated that the predicted concentrations from the pre-existing Unit 1 Landfill area would be less than background concentrations at the zone of attenuation, 100 years after the closure of the landfill unit. Additional leachate extraction wells have been installed into the pre-existing Unit 1 landfill area. These wells provide a more comprehensive depiction of the leachate geochemistry that has been utilized for the source characterization analyses provided in Appendix A.

Description of Groundwater Monitoring Network

The existing permitted groundwater monitoring network for Unit 1 of the Saline County Landfill consists of 24 groundwater monitoring wells and 12 piezometers which are shown on Figure 3. The shallow groundwater monitoring wells are screened in the mine spoil, except for wells G11S, G12S, and G13S which are down gradient wells screened in the lacustrine deposits along the west side of the landfill. Because the lacustrine unit does not exist at the site upgradient of the landfill, it is not possible to develop interwell background groundwater quality standards which are representative of the lacustrine monitoring unit. The down gradient monitoring wells screened in the mine spoil are primarily located along the northwest and north sides of the landfill include G14S, G15S (R15S), G16S, G17S, G18S and G19S. In addition, four temporary wells (T24S, T25S, T26S, and T27S) were also installed in 2004 along the north side of the landfill as part of an assessment monitoring network. Wells G20S, and G21S are located along the east side of the landfill and are also designated as downgradient wells by the permit. Monitoring well G22S, located upgradient near the southeast corner of the landfill is also

screened in mine spoil. However, as shown by Figure 1, upgradient well G22S is located close to the former strip mine highwall along the upgradient side of the landfill.

Nine downgradient monitoring wells (G12D, G13D, R14D, G15D, G16D, G17D, G18D, G19D, and G23D), and 2 upgradient wells (G11D and G22D) are screened in the upper portion of the shale which underlies the minespoil. These bedrock wells have exhibited varying degrees hydraulic interconnection to the overlying mine spoil deposits. The variability of the bedrock geochemistry is likely a function of the well construction (well screen interval depth below the mine spoil interface) and/or the degree of fracturing present in the shale.

Permit Modification No. 20 was issued on May 26, 2005 (Permit Application Log Nos. 2003-313 and 2004-423). This permit approved the assessment monitoring results and the implementation of a corrective action plan for Unit 1. The corrective action plan was required due to statistically significant increases in chloride concentrations at monitoring wells G14S, G15S and G18S; and elevated concentrations of cis 1,2-dichloroethene (average concentration of approximately 7.5 ug/L) at monitoring well G17S. The inconsistent detection of acetone at well G19S was also included in the corrective action permit condition IX.3. However, no confirmed acetone concentrations have been reported at monitoring well G19S in the past seven years (i.e., not detected during any of the past 27 monitoring rounds).

Summary of Corrective Action Efforts

The Saline County Landfill is undergoing corrective action to address groundwater and landfill gas related exceedances. Methane concentrations in excess of regulatory requirements of 50% LEL have historically been detected at several of the perimeter monitoring probes (i.e., Probes GP-1, GP-2, GP-3, GP-4, GP-7, GP-8 and GP-9). The gas management system installed within the interior of the landfill combined with additional system balancing efforts have eliminated the gas exceedances along the west and north sides of the landfill. However, persistent methane exceedances continue to be observed along the east and south sides of the landfill (i.e., probes GP-1 and GP-4). Dewatering pumps were installed during early 2010 in several of the gas extraction wells located in these areas in order to address the elevated methane levels at the probes. The pumps are intended to reduce liquid levels to improve the efficiency of the gas extraction wells. An additional five combination landfill gas and liquid extraction wells were installed along the east side of the pre-existing Unit 1 Landfill area during late September and Early October 2011. The additional 5 extraction wells were installed pursuant to Permit Application Log 2011-035 (approved by permit Modification No. 36) in an effort to mitigate the landfill gas migration along the southeast side of the landfill. The extraction wells were also designed to remove free liquids which might have accumulated in the eastern portion of the landfill.

Tables and graphs summarizing the groundwater and landfill gas monitoring data were provided in the 2011 Evaluation of Remedial Activities report which was submitted by CS Geologic on May 31, 2011. The corrective action plan to address the groundwater exceedances included the final closure of the Unit 1 Landfill (completed in August 2006), the implementation of the landfill gas management plan (part of the Facility's Post Closure Care Plan), the installation of

leachate extraction pumps at wells EW1 thru EW5; and the installation of gradient control wells along the east side of the landfill.

The Saline County Landfill Unit 1 achieved final grades and ceased receiving waste in 2005. Final cover was placed on the existing Saline County Landfill during 2006 and the facility is no longer being operated. A second approximately 58 acre landfill Unit (referred to as Landfill Unit 2) was permitted in the area north of Landfill Unit 1 (Refer to Figure 3), however the Unit 2 landfill was not constructed or operated. Due to economic considerations, the operator decided to close the Unit 2 Facility. A significant permit modification application to certify the closure and postclosure of the Landfill 2 permit was submitted in July 2012. The affidavit documenting the completion of closure and postclosure of the Unit 2 Facility was approved by the IEPA in January 2014.

The Unit 1 Facility is currently conducting activities which are typically associated with post closure care (mowing, leachate removal, landfill gas management, environmental monitoring, etc.). These activities are conducted by contractors hired by SCL therefore, no full time staff are currently employed at the facility. Republic Services Inc. has established contracts with several environmental services firms to implement the post closure care plan (i.e., operate the gas and leachate management systems, perform required environmental monitoring and prepare compliance reports and permit applications).

e) Statement summarizing the efforts necessary to comply with the regulation of general applicability.

The facility has been monitoring the 14 listed inorganic/indicator detection monitoring parameters listed in 35 IAC 811.319(a)(2) since the regulations were amended in 2007 and the monitoring changes were incorporated into the facilities permit in 2008. Prior to this monitoring list modification, the facility monitored a G1 list of constituents which contained many of the same parameters. Years of experience has shown that the data from these monitoring programs are often extremely difficult, if not impossible to interpret. The background concentrations of the many of the parameters are sensitive to acid mine drainage and exhibit significant spatial and temporal concentration variations.

Since the approval of the facilities first significant permit modification in 1996, the facility has developed and permitted both interwell (statistics based on a pooled upgradient background monitoring network) and intrawell (background concentration calculation statistics based on historical data from an individual well) background concentrations for each monitored constituent. The revisions in groundwater background concentrations have been proposed to better characterize the range of variability resulting from the acidic drainage conditions in the mine spoil and hydraulically connected portions of the bedrock which are monitored by deep or permit "d" designated monitoring wells.

Revisions to the background groundwater quality standards were proposed to the IEPA in July 2008 (Permit Application Log 2008-274). This application is under review by IEPA. Additional

information will be submitted in the near future to respond to questions and comments raised during the Agency's initial review. However, because some constituent releases from the landfill have been documented (i.e., 1,1-dichloroethane and cis1,2-dichloroethene at well G17S), the IEPA's ability to approve revisions to the intrawell prediction intervals to account for variations in the concentrations of acid drainage related parameters is constrained by concerns over the development of revised background standards at wells which exhibit landfill related influences. Because 1,1-dichloroethane and cis 1,2-dichloroethene are synthetic volatile organic compounds or degradation products of synthetic organic compounds that are commonly found in landfill leachates and/or landfill gas and its condensates, these constituents tend to provide an indication of landfill impact which is not in any way attributed to acid mine drainage or other natural sources. As such, the detection of these constituents at downgradient well G17S is considered to provide evidence of landfill related releases to the groundwater.

Without the relief provided by the adjusted standard requested herein, the need for assessment monitoring and corrective action would be extended to several permit required (or former) detection monitoring parameters (i.e., sulfate, iron, manganese, zinc, pH, total dissolved solids (TDS), and specific conductance) which are directly influenced by acid mine drainage. Similarly, these constituents or other acid mine drainage affected assessment monitoring parameters could determine the scope of the corrective action program at the landfill.

These issues would not be so profound if it were possible to develop representative interwell (background developed using upgradient data) background groundwater quality standards. However, due to the physical geometry of the landfill boundary within the previously strip mined area, it is impossible to characterize groundwater quality through the use of interwell statistical methods (i.e., using pooled up-gradient monitoring data). As shown by Figure 1, the landfill is located in close proximity to the previous strip mined excavation's high wall. As shown by Figure 4, the groundwater flow direction has consistently been from the southeast towards the west and northwest. Thus, wells installed upgradient of the landfill (i.e., G22S) are situated in close proximity to the former strip mine highwall. Groundwater composition tends to achieve a chemical equilibrium as a function of the groundwater flow path distance through the saturated media (Refer to Freeze and Cherry, 1979, Chapter 7 for a discussion of the geochemical evolution of natural groundwater quality). In this case, it is apparent that the saturated mine spoil deposits act as a basin bounded by the relatively impermeable Pennsylvanian Age bedrock and or lacustrine deposits.

The regional groundwater flow conditions also limit the ability to develop representative interwell background concentrations. Regionally prevailing hydrogeologic conditions exists in the Southern Illinois (i.e., south central portion of the Illinois Basin geologic structure) which results in upward flow of highly mineralized groundwater or brine (refer to Davis (1973), Meents et al (1952), Bredehoeft et al (1963), Clayton and others (1966), Graf and others (1965 and 1966), and Cartwright (1970)). The upwelling of brines tends to be concentrated in areas where fractures or faults provide a vertical pathway for the brine to move upward. The State Department of Natural Resources Web site http://www.dnr.state.il.us/lands/landmgt/parks/r5/saline.htm notes that the Saline County area has long been associated with salt works developed from brine springs.

> *"Salt is the theme of the early history in the area around Equality in Gallatin County. One of several counties which were originally part of Gallatin, Saline County takes its name from the salt works. The American Indians made salt here long before the first settlers appeared. In 1803 the Indians ceded their "Great Salt Springs" to the United States by treaty. Congress refused to sell the salt lands in the public domain but it did authorize the Secretary of the Treasury to lease them to individuals for a royalty. The leases required the holder to produce a certain quantity of salt each year or pay a penalty."*

The City of Equality mentioned in the preceding paragraph is located approximately 10 miles east of the landfill. However, as discussed by Davis (1973), Cartwright (1970) and Graf and others (1966), the upwelling phenomenon encompasses a much larger area extending from the Salem-Woodward Structural block (Washington County area) to the north to the Wabash Valley Fault Zone in the southeast (Gallatin County area). Local springs in the Saline and Gallatin County area have provided a relatively prolific shallow source of salt. As shown in Figure 9, the salinity upwelling conditions are attributed to the hydrodynamic groundwater flow conditions in the central portion of the Illinois Basin. The landfill is located very close to the central portion of the bowl shaped depression in the bedrock strata. Groundwater following the dip of the bedrock formations flows into this depression or basin from the flank areas which possess higher groundwater elevation. The flow into the basin displaces the more mineralized groundwater or brine located in the central portion of the basin. Bedrock fractures and faulting associated with the Wabash Valley Fault Zone has created cracks and crevices in the bedrock that allow the brine to move upward toward the ground surface. This gives rise to the Saline Springs from which the County takes its name.

As discussed by Davis (1973), the upward movement of the brine is believed to be highly localized in areas where fractures allow relatively unimpeded upward flow of the mineralized groundwater. Often the upwelling brine intermixes with shallower groundwater before reaching the ground surface. Due to the localized nature of the fracture systems, it is impossible to characterize the upwelling groundwater through the background monitoring program. Furthermore, site dewatering activities (such as during construction activities) may have steepened the vertical upward hydraulic gradients thus increasing the rate of upward groundwater flow of the mineralized groundwater. As discussed in Appendix A, deep well P10LS (located in the former Landfill Unit 2 footprint) has indicated chloride concentrations in excess of 140 mg/L, more than 800% greater than the Unit 1 shale dissolved chloride background concentration (refer to Appendix A). Well P10LS is completed in the shale underlying the minespoil and is located approximately1500 ft. north of the Unit 1 Landfill (Refer to Figure 1). The presence of such elevated chloride concentrations in relatively impermeable bedrock located so far from the existing Landfill Unit 1 supports the existence of localized brine upwelling influences at the site.

Based on the discussions provided in the preceding paragraphs, it is apparent that statistical comparisons of downgradient and upgradient monitoring data are constrained by the landfills geographical position within the strip mined basin (refer to Figure 1 air photo depicting the

relative absence of strip mine spoils along the upgradient side (southeast corner) of the landfill). Specifically, pooled data derived from the sole upgradient monitoring well G22S (southeast of the landfill) has exhibited acid mine drainage characteristics which are not as developed as some downgradient monitoring locations. For these reasons, the permit was modified based on intrawell background calculated from the historical data from each monitoring well. However, the ability to calculate revised intrawell AGQS values was curtailed in 2004 by evidence of landfill related changes in groundwater quality, as evidenced by the detection of cis 1,2 dichloroethene at monitoring well G17S. The detection of this constituent suggested that the groundwater had been impacted by either leachate and/or landfill gas such that intrawell statistical procedures were inappropriate.

Similarly, the lacustrine unit located along the western boundary of the landfill at monitoring wells G11S, G12S and G13S is discontinuous and is not present at the site along the east or southeast (upgradient) side of the landfill (Refer to Figure 3 for well locations). Thus, as in the case of the minespoil unit, it is not possible to characterize the background groundwater quality for this stratigraphic unit using interwell statistical methods since no upgradient wells exist within the saturated lacustrine unit. Fortunately, the groundwater quality within the lacustrine unit has remained relatively stable over time since it is not heavily influenced by acid mine drainage. With very few exceptions, the intrawell lacustrine unit background concentrations calculated prior to the development of Landfill Cells 1 North and 1 South have remained representative of historical groundwater quality conditions.

The acidic drainage which has developed within the mine spoil and hydraulically connected bedrock has resulted in the strip mine groundwater developing higher concentrations of iron, manganese, zinc, sulfate and TDS than were observed within the landfill leachate (Refer to Appendix A for box plots comparing groundwater and leachate concentrations). Furthermore, due to the previously discussed flow path and groundwater contact time considerations, the downgradient concentrations of these acid mine drainage related constituents are often greater than the currently permitted AGQSs which are based on the background concentrations calculated from data collected from a single monitoring well located in close proximity to the upgradient edge of the strip mined area. As such, a corrective action program which might be implemented to address acid drainage related constituents such as antimony, iron, manganese, sulfate, TDS, zinc, etc. would have to be performed indefinitely since it is unlikely that the concentrations of these constituents would decrease to levels observed at the upgradient margin of the strip mined area. Because groundwater concentrations within the minespoil exceed the leachate concentrations, the facility would be forced to remediate the anthropogenic groundwater influences caused by strip mining. In Gallatin (refer to page 4 of PCB docket 1991-156, January, 1992) the Board found that forcing an operator to remediate strip mine groundwater quality influences would place an unfair burden on the landfill operator.

35 IAC 104.406(e) requires that the petitioner estimate the costs required to comply with the rule of general applicability. However, the proposed adjusted standard seeks to modify the parameter lists to better reflect the landfill leachate, as such, environmental and implementation considerations rather than economic considerations provide the primary impetus for seeking approval of the proposed adjusted standards. Nevertheless, there are economic considerations

associated with maintaining a groundwater monitoring system where the landfill related changes in groundwater quality are poorly differentiated from acid mine drainage and/or regional salinity issues.

To date, the costs associated with complying with the rule of general applicability have encompassed the installation and operation of the gradient control system along the east side of the landfill, the installation and operation of the retrofit leachate collection system in the pre-existing Unit 1 Landfill area. In addition, the operator has implemented the final closure plan which has included the placement of a composite cover system to reduce the rate of water percolation and leachate generation. Finally, numerous permit modifications have been prepared in an attempt to address revision of background groundwater quality, alternate source demonstrations, assessment monitoring, and evaluation of remedial activities (ERA). Many of these permit applications arise from difficulties discriminating minespoil related changes in groundwater quality from landfill related changes.

Groundwater related permit modification applications completed since the initial significant permit modification (Application Log 1996-147) are summarized below in Table 2. As shown by Table 2, seven permit applications have been submitted during the past 12 years attempting to address groundwater exceedances, many of which are the result of natural variability in background concentrations due to the previously discussed acid mine drainage conditions. Permit application Logs: 2003-020, 2003-313, 2004-051, 2004-423, 2006-197, 2008-274, and 2009-200 present either requests for revisions of AGQS/MAPCs, Alternate Source Demonstrations (ASD's) to show that exceedances were not the result of a release from the landfill, and/or Assessment monitoring reports necessitated by exceedances of background levels (AGQS/MAPCs). In some of the instances, the exceedances which were reported were acknowledged as being attributed to the landfill. However, in many instances no such determination could be made since representative strip mine background groundwater concentrations could either not be adequately defined or because the background concentrations (AGQS values) exhibited higher concentrations and more variability than the leachate concentrations. As such, the costs of complying with the rule of general applicability has also included numerous permit applications (refer to Table 2) to adjust the permit AGQS and MAPCs to better reflect the background groundwater quality, complete ASDs or assessment investigations. The combined cost of these permit applications is estimated to have exceeded $150,000.

As discussed in the previous paragraphs, it is difficult to estimate the full costs associated with continuing to monitor a list of parameters which does not reflect the constituents likely to be released from the landfill, should a release occur. The monitoring of constituents that are not representative of the leachate could result in false negative error, where contaminants are released from the facility but are not detected because the parameters which are monitored most frequently are insensitive to these groundwater quality changes. Similarly, false positive errors might also occur in which significant changes in groundwater quality are attributed to landfill impacts when in fact the groundwater quality changes are the result of other influences which are not associated with the landfill. Representative detection and assessment monitoring parameters are necessary to reduce the potential of both false positive and false negative errors.

Pursuant to the economic analysis requirements of 35 IAC 104.406(e), the costs associated with the current permit approved List G1 monitoring program (i.e., monitoring conducted in accordance with the rule of general applicability) are contrasted against the costs associated with monitoring the adjusted standard proposed List G1 parameters (Refer to Table 3). As shown in Table 3, the total costs for monitoring the 17 proposed List G1 constituents is $113 relative to $102 for the 14 existing permit List G1 parameters. Based on the 23 permitted monitoring wells present at the site, the routine detection analytical costs would be $2,599 for the proposed parameters compared to $2,346 for the existing permit List G1 list. Thus, the annual cost of monitoring the proposed amended G1 parameter list would actually be slightly greater (approximately $506/yr) than the currently permitted List G1. Thus, it is apparent that no economic incentive exists for modifying the G1 parameter list. . Similarly, the List G2 organic parameters are the same under both the existing and the proposed monitoring program as such the costs are identical.

Finally, should assessment monitoring (i.e., 40 CFR 258. Appendix II constituents and 35 IAC 620.410 constituents), the bulk of the analytical costs are associated with analyzing organic constituents (i.e., herbicides, pesticides, PCB's, semi-volatile constituents, VOCs, etc.) and not the inorganic constituents. First Environmental Inc. of Naperville, Illinois has provided cost estimates of $1,449 per sample for the combined assessment monitoring required pursuant to 40 CFR 258.Appendix II and 35 IAC 620.410. The 8 total metal constituents which are proposed to be deleted from the program (Refer to Table 6) would result in a net cost reduction of approximately $50 per sample. This equates to approximately 3.5% of the total assessment monitoring analytical costs. Five monitoring wells are currently undergoing assessment monitoring. These wells are monitored for the 40 CFR 258 Appendix II and 35 IAC 620.410 parameter lists twice a year. Therefore, based on the 5 wells being monitored twice a year at $50 per sample, the decrease in assessment monitoring costs would equate to $500 per year. Thus, the magnitude of the assessment monitoring decrease is nearly the same as the increase for the proposed adjusted standard detection monitoring program. As such, it is apparent that no significant change in costs occurs as a result of the proposed parameter list changes.

The proposed parameter list changes are intended to improve the sensitivity of the monitoring program to landfill related impacts. The selection of parameters which are more representative of landfill related impacts will help result in a reduction of the Type 1 (false positive error) and Type 2 (false negative error) rates. As previously mentioned, it is anticipated that the parameter list changes will also result in an increased ability to respond to exceedances in an expeditious manner. As such, the proposed parameter list changes are anticipated to provide more accurate indication of potential impacts as well as an improved response rate.

35 IAC 620.440 (Class IV Groundwater Quality) exempts the majority of the acid mine drainage related parameters from the Class I or Class II groundwater standards because these constituents are likely attributed to the chemical reactions in the mine spoil. The applicant maintains that similar considerations must also be given to the selection of detection and assessment monitoring parameters which define the target levels for the corrective action restoration program.

f) Narrative Description of the Proposed Adjusted Standard and Proposed Language

35 IAC 811.319(d)(3)(B) requires that the operator shall implement the plan for remedial action program within 90 days of establishing that a violation of an applicable groundwater quality standard of Section 811.320 has occurred which is attributable to the solid waste disposal facility. However, as discussed in the preceding sections, the acidic drainage conditions in the saturated mine spoil and the upward movement of highly mineralized groundwater or brine result in wide variations in background groundwater quality. These temporal and spatial fluctuations in background groundwater quality make it difficult, if not impossible to establish potential landfill related increases in concentrations for many of the naturally occurring inorganic indicator and heavy metal constituents which comprise the permitted detection monitoring parameter lists (refer to constituents listed in Petition 1, Section (a)). Specifically the concentrations of pH, specific conductance, cadmium, magnesium, sulfate, TDS, zinc and many of the heavy metal assessment monitoring parameters are all significantly influenced by the acid drainage (low pH) conditions typically associated with groundwater within the mine spoil and/or hydraulically interconnected bedrock. Furthermore, the regionally observed upward movement of highly mineralized groundwater has created chloride concentration variations for which it is difficult if not impossible to characterize background concentrations statistically.

Due to the mine spoil acidic drainage related temporal and spatial variations in background concentrations, it is proposed that an adjusted standard be granted to enable the modification of the detection monitoring list of constituents required pursuant to 35 IAC 811.319(a)(2)(A) (refer to petition Section (a) for the required list of detection monitoring parameters). Specifically, it is proposed that dissolved cadmium be deleted from the required List G1 detection monitoring parameter list. Pursuant to IEPA recommendations, it is proposed that several constituents which are heavily influenced by acidic drainage and/or brine upwelling related changes in groundwater quality (i.e., pH, specific conductance, dissolved ammonia, dissolved chloride, dissolved magnesium, dissolved sulfate, TDS and dissolved zinc) continue to be monitored but be exempt from statistical analysis requirements of permit conditions VIII.13(b, d, and e). Where possible, both the deleted parameters and the parameters exempted from statistical analyses have been replaced by constituents which are more representative of the SCL landfill leachate and/or constituents which are less likely to be influenced by acid mine drainage (refer to Table 4 for the proposed G1 detection monitoring list). Based on the proposed detection monitoring parameter list presented in Table 4, seventeen List G1 detection monitoring constituents would be monitored in lieu of the fourteen parameters currently required by 35 IAC 811.319(a)(2)(A). In addition, pH and specific conductance would also continue to be monitored as field parameters.

Additionally, should assessment monitoring be required due to the detection of a SSI, it is proposed that heavy metal constituents whose solubility's and sorption coefficients are affected by acid mine drainage be exempted from the 35 IAC 811.319(b)(5)(A) assessment monitoring requirements (which is incorporated by reference at 35 IAC 810.104). The requested exemption would result in the following constituents being removed from the assessment monitoring list:

Total Antimony;

Total Cadmium;
Total Cobalt;
Total Copper;
Total Nickel;
Total Selenium;
Total Silver; and
Total Thallium.

Pursuant to comments from the Illinois EPA, the following heavy metals would be retained in the assessment monitoring parameter list, but would be exempt from the statistical analysis requirements of permit conditions VIII.13 (b, d and e):

Total iron;
Total manganese;
Total zinc;

These constituents were originally incorporated into the rule of general applicability by reference in 35 IAC 811.319(b)(5). These constituents have been included in the assessment monitoring requirements since they are included in 40 CFR 258 Appendix II and/or 35 IAC 620.410 parameter lists. However, as previously mentioned in Section (c), the federal regulations presented in 40 CFR 258.55 provides the Director of an Approved State the authority to modify the list of assessment monitoring parameters.

As mentioned in previous sections, the adjusted standard application also proposes that the Board approve an applicable groundwater quality standard background concentration of 200 mg/L for dissolved and total chloride and 15 mg/L for dissolved and total ammonia (Refer to Table 4). The chloride AGQS of 200 mg/L is based on the Class I Groundwater Standard (refer to 35 IAC 620.410) and the ammonia standard of 15 mg/L is based on the Illinois General Use Water Standard (refer to 35 IAC 302.212).

Proposed Alternate Detection Monitoring Parameters

In lieu of the detection monitoring constituents listed in 35 IAC 811.319(a)(2), the leachate and background groundwater concentrations have been statistically and graphically evaluated to develop a site specific detection monitoring parameter list which is capable of detecting potential concentration increases associated with releases from the landfill. This list of proposed detection monitoring parameters also seeks to minimize false positive exceedances associated with the variability in temporal and spatial background concentrations caused by the acidic drainage which is pervasive at the site. The proposed monitoring program focuses on organic constituents which serve as good leachate indicator constituents since they are not indicative of acid mine drainage. Secondly, the proposed site specific regulation seeks to include inorganic background monitoring constituents which are believed indicative of the landfill derived releases with minimal influence or masking interferences caused by the acid mine drainage.

Based on the approach discussed in the preceding paragraph, the following constituents are proposed to be monitored in lieu of the *35 IAC 811.319(a)(2)* parameter list.

Organic Constituents

The applicable groundwater quality standard (AGQS) for each of the volatile organic compounds (VOCs) listed in 35 IAC 811.319(a)(3)(A) shall be determined based on the practical quantitation limit (PQL) for the SW846 analysis method 8260. Thus in the case of the 51 organic chemicals listed under the Safe Drinking Water Act (40 CFR 141.40) and the Subtitle D required detection monitoring organic constituent list (40 CFR 258.Appendix I), the AGQS values shall be based on the permit approved PQL or the laboratory reporting limit. This list of organic detection monitoring constituents (i.e., Permit List G2) is presented below.

Constituent
Acetone
Acrylonitrile
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform; Tribromomethane
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform; Trichloromethane
o-Chlorotoluene
p-Chlorotoluene
Dibromochloromethane
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
trans-1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
cis-1,2-Dichloroethylene
trans-1,2-Dicloroethylene
1,2-Dichloropropane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
1,3-Dichloropropene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
Hexachlorobutadiene
2-Hexanone; Methyl butyl ketone

Isopropylbenzene
p-Isopropyltoluene
Methyl bromide; Bromomethane
Methyl chloride; Chloromethane
Methylene bromide; Dibromomethane
Dichloromethane
Methyl ethyl ketone
Methyl iodide; Iodomethane
4-Methyl-2-pentanone
Naphthalene
Oil and Grease (hexane soluble)*
n-Propylbenzene
Styrene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Tetrahydrofuran
Toluene
Total Phenolics
1,2,3-Trichlorobenzene
1,2,4-Trichlorbenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Trichlorofluoromethane
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl acetate
Vinyl chloride
Xylenes

Based on this approach, the organic constituent background standards will remain consistent with the practical quantitation limit approach used to define the historical AGQS values required by the permit. However, it is anticipated that the Unit 2 Landfill organic constituent PQL's will be proposed to the Illinois EPA as a significant permit modification application since the PQL values are consistent with First Environmental Inc. reporting limits (Refer to Appendix F for Reporting Limits) and are more readily achieved given matrix conditions which exist within the saturated strip mine deposits. The PQLs presented in Appendix F are sufficient to identify potential MCL and/or Class I Groundwater exceedances, however, the PQLs are set at levels which are more uniformly achieved given the matrix conditions and analytical procedures used to analyze the groundwater quality samples from the site.

Indicator Constituents

Based on comparisons of leachate and groundwater concentrations, the following indicator constituents are also proposed as part of the routine detection monitoring program. The proposed background concentration and the rationale for the development of this background are also summarized below:

Constituent	Proposed AGQS (Background)	Rationale
Bicarbonate Alkalinity	To be developed based on combination interwell and intrawell statistics	Alkalinity is relatively low within the mine spoil but occurs at relatively higher concentrations in the leachate.
Dissolved Chloride	200 mg/L all Hydrostratigraphic Units (pending approval of adjusted standard). Parameter exempted from intrawell statistical analyses.	35 IAC 620.410 (Class I GW) due to documented regional and site specific spatial variability
Total Cyanide	0.005 mg/L (Shale & Minespoil AGQS) 0.010 mg/L (Lacustrine AGQS)	Currently permitted background level.
Ammonia – Nitrogen (dissolved)	Proposed Minespoil AGQS/MAPC = 15 mg/L all hydrostratigraphic Units. Parameter exempted from intrawell statistical analyses.	Based on the General Use Water Standard (refer to 35 IAC 302.212). Alternate Source Demonstration will likely be required for well G17S.
Dissolved Arsenic	Currently permitted interwell and intrawell AGQS background levels.	Currently permitted background levels.
Total Barium	Based on currently permitted interwell and intrawell AGQS background levels.	Currently permitted background levels.
Dissolved Boron	Based on currently permitted interwell and intrawell AGQS background levels.	Based on currently permitted background levels.
Dissolved Nitrate	Minespoil Interwell AGQS/MAPC =1.44 mg/L; Shale interwell AGQS/MAPC = 1.59 mg/L; Refer to Permit Attachment 3 for intrawell AGQS/MAPCs for Lacustrine Unit, Minespoil and Shale	Currently Permitted interwell and intrawell AGQS/MAPCs
Dissolved Chromium	Develop interwell background for minespoil and bedrock unit using recent data. Develop intrawell AGQS for lacustrine unit and shale wells beneath the lacustrine unit. GPS = 100 ug/L, based on Class I Groundwater,	Majority of wells are constructed of #304 Stainless Steel (a nickel-chromium alloy). Variations in Cr concentrations may be the result of water yield differences between hydrostratigraphic units. This will likely necessitate ASDs and revised background.
Total Sodium	Refer to currently permitted interwell and intrawell values for each hydrostratigraphic unit.	Currently permitted interwell and intrawell AGQS and MAPC
Total Potassium	Interwell minespoil and lacustrine AGQS = 438 mg/L, MAPC =455.5, Bedrock AGQS/MAPC=55.7mg/L	Currently permitted interwell AGQS and MAPC
Dissolved Mercury	Dissolved Mercury Minespoil AGQS/MAPC = 0.2 ug/L Shale AGQS/MAPC = 0.2 ug/L Lacustrine AGQS = 0.2 ug/L	Existing Permit Background levels
Dissolved Lead	Currently permitted interwell and intrawell AGQS background levels	Lead appears to be subject to iron related interferences. ASDs and intrawell statistics may be required.
Dissolved Magnesium	Exempt from statistical analysis, Monitor for trend analysis.	Acid drainage indicator.
Dissolved Sulfate	Exempt from statistical analysis, Monitor for trend analysis.	Acid drainage indicator.
TDS	Exempt from statistical analysis, Monitor for trend analysis.	Acid drainage indicator.
Dissolved Zinc	Exempt from statistical analysis, Monitor for trend analysis.	Acid drainage indicator.

Note:
Both interwell and intrawell AGQS and MAPC values are currently permitted, making it difficult to provide a tabulated summary. Refer to Permit presented in Appendix G for List of interwell and intrawell AGQS/MAPCs.

As noted in the discussion provided in Section 1.0 (i), the Director of an Approved State has the authority to approve modifications to the parameter list. The proposed monitoring list modifications presented above, are necessary to overcome the site specific geochemical (acid mine drainage) and hydrogeologic constraints (discontinuous hydrostratigraphic units, upwelling brine) posed by the site. Based on recent monitoring data, it is evident that some of the recent groundwater concentrations exceed the proposed background concentrations. For example, dissolved ammonia concentrations at wells G17S exceed the proposed AGQS/MAPC of 15 mg/L. As shown by the scatter plot of dissolved ammonia vs dissolved sulfate (Figure 8), it is apparent that the increased concentrations of dissolved ammonia are positively correlated to increasing sulfate concentrations. This suggests that the ammonia concentration increases are related to the increases in acidity that give rise to the sulfate concentration increases. The ammonia exceedances are attributed to concentration fluctuations caused by proliferation of iron metabolizing bacteria which have contributed to the acidic drainage.

Because ammonia is a good indicator of leachate, as indicated by the box plots comparisons presented in Appendix A, it has not been proposed that ammonia be deleted from the monitoring parameter list. Instead, it is proposed that an alternate source demonstration (ASD) be completed to show that the elevated ammonia concentrations at well G17S are not associated with releases from the landfill. If this ASD cannot be completed in a manner acceptable to the Illinois EPA then the dissolved ammonia exceedances would be added to the assessment monitoring and corrective action program described by Permit Condition IX.3.

The costs associated with the proposed alternate monitoring list is approximately the same as the costs associated with the existing detection monitoring list specified by 35 IAC 811.319(a)(2) and by Permit condition VIII.A.(12). Thus, the landfill facility does not seek to gain a reduced monitoring cost benefit as a result of the proposed detection and assessment monitoring parameter revisions. However, the parameter list modifications should bring significant relief from unending attempts to modify background standards to better reflect pH fluctuations in the minespoil and hydraulically connected shale. Similarly, it is anticipated that the number of Alternate Source Demonstrations and assessment monitoring investigations will also be reduced if the proposed adjusted standard is approved. As discussed in Section (e) it is estimated that approximately $150,000 of applicant funds have been spent in the past 10 years or so on efforts to revise AGQS/MAPCs, conducting ASDs and assessment monitoring evaluations. Similarly, IEPA resources (review staff time, senior management time etc.) have also been utilized to review the numerous permit applications and preparing responses and issuing permits. The proposed adjusted standard should also help preserve the Agency's time and effort by focusing reviews on monitoring parameters which are more indicative of the constituents present in the waste unit.

The proposed modifications to the Illinois Subtitle G Solid waste regulations (i.e., 35 IAC 811.319 through 811.320) which are necessary to implement the proposed adjusted standard are presented in Appendix B. The proposed adjusted standard regulatory changes have been color coded so that the Petition No. 1 "*Modification of Detection and Assessment Monitoring Parameter List*" related changes are presented in brown whereas the proposed regulatory

changes related to Petition No. 2 "*Request for Groundwater Protection Standards*" are shown in red.

g) Statement of Impact on the Petitioners Activity on the Environment

The approval of the proposed adjusted standard to revise the detection monitoring and assessment monitoring parameter lists is anticipated to result in a net benefit to the environment. Currently, compliance with the regulation of general applicability is constrained by the inability to clearly determine impacts which are associated with the landfill facility from the masking effect caused by the acid drainage present in the mine spoil and in the hydraulically connected bedrock. Thus, under the general applicability regulation the ability to respond to groundwater quality exceedances is negatively influenced.

Typically, inorganic constituent exceedances result in the submittal of alternate source demonstrations. Often additional monitoring data is collected to support these demonstrations. This process results in the passage of considerable time before the exceedances can be confirmed as being related to the landfill. Often no consensus can be reached on the nature of the impact (i.e., which constituents which wells are the result of landfill related impacts). Not only does this affect the relative timing for the implementation of assessment monitoring and corrective action, it also influences the determination of which constituents are the result of landfill related releases and thus it affects the type of corrective action treatment which is required. Therefore, the approval of the adjusted standard to revise the detection monitoring and assessment monitoring parameter lists will result in the ability to respond to landfill related releases and if necessary implement corrective action in a more expedited manner.

Similarly, the proposed adjusted standard to adopt the chloride Class I drinking water standard (200 mg/L) as background for the minespoil, lacustrine and shale monitoring units will also simplify the efforts to discern regional upwelling salinity sources from landfill related increases in chloride concentrations. This will help speed the response to significant concentration increases by reducing the number of chloride related alternate source demonstrations. The proposed background concentration is also sufficiently protective of public health, welfare and the environment since it applies the Class I potable groundwater standard to groundwater which has been heavily degraded by historic mining operations.

Similarly, the proposed adjusted standard to establish the dissolved and total ammonia standard of 15 mg/L based on the Illinois General Use Water Standard (refer to 35 IAC 302.212) is also deemed protective given that the groundwater in the previously strip mined acres would be classified as Class IV groundwater under 35 IAC 620.240. As discussed throughout this document, the groundwater strip mined within the strip mined area is characterized by acidic drainage conditions which result in depressed groundwater pH levels. The ammonia may occur in either in the ionized (ammonium ion) form NH_4^+ where it is typically bound in the soil as a salt, or may occur in the unionized form NH_3^+ which is more mobile and more toxic to aquatic life. The more toxic unionized NH_3^+ form tends to predominate under higher pH or alkaline conditions. As shown in Figures 6 and 7, the groundwater in the minespoil which surrounds the downgradient side of the Unit 1 Landfill is very acidic. Thus, the ammonia would be present in

the ionized less toxic form. NH_4^+ is highly sorbed onto soils and would be anticipated to form relatively immobile ammonium sulfate salts (a common fertilizer component) in this environment. Similarly, the lacustrine and bedrock pH is generally fairly neutral and would also favor the less toxic ionized ammonium state. Thus, the requested adjusted standard to utilize the ammonia General Use Water Standard (refer to 35 IAC 302.212) of 15 mg/L as background is deemed protective of public health and the environment.

Landfill leachate tends to consist of a complex mixture of organic and inorganic constituents. Acid mine drainage tends to be characterized by low pH, high concentrations of sulfate and dissolved metal concentrations. Frequently, landfill corrective action is implemented to address relatively diffuse concentrations of organic constituents which exceed drinking water standards (i.e., Safe Drinking Water Act 40 CFR 141 or the 35 IAC 620 Groundwater Protection Standards). This occurs because many of the volatile organic constituents are relatively mobile in the environment and/or are subject to comparison to relatively low drinking water standards since several of these VOC constituents have been identified as probable human carcinogens. As such, VOCs present at even relatively low concentrations may represent a significant health risk.

Due to the presence of high concentrations of sulfate and heavy metals, corrective action within strip mined areas becomes significantly more difficult. Methods typically used for treating VOC constituents in groundwater such as air stripping or carbon absorption become less viable or more maintenance intensive due to the extremely high anion (primarily sulfate) and metals concentrations in the groundwater. As such, the most viable means of addressing the wide assemblage of constituents detected from a landfill release is to transport the water to the local Publically Owned Treatment Works (POTW) for treatment. However, in most cases the POTW is no better equipped to treat the complex stream of constituents present in mixed landfill/acid mine drainage impacted groundwater. As such, the POTW treats constituents mandated by its permit prior to discharging the "treated effluent". However, constituents such as chloride, sulfate, etc. are often not effectively treated by the POTW. These constituents are discharged in the treated effluent into the receiving stream resulting in cross-media impacts. The proposed adjusted standards minimize these cross media impacts by focusing the detection and assessment monitoring lists on constituents which are better indicators of landfill impact. While corrective action or enhanced source controls may still be necessary, it is believed that the volume of effluent sent to the POTW can be better managed if monitoring parameters are selected which are better indicative of landfill related releases.

h) Justification of the Proposed Adjusted Standard

The proposed adjusted standard is justified on the basis of implementability and environmental considerations. The rule of general applicability cannot be implemented due to site specific considerations (i.e., presence of acid mine drainage which results in large fluctuations in the pH of the groundwater (i.e., 3 pH units) and the presence of regionally documented upwelling of saline formation brines. The site specific and regional groundwater quality factors also constrain the ability to develop representative interwell background standards (background developed from pooled upgradient monitoring data). This limitation arises from the close proximity of the

landfill to the southeastern or upgradient high wall, the general absence of saturated lacustrine deposits upgradient of the landfill and from the inherent difficulty locating background monitoring wells in fractures capable of characterizing the upward movement of formation brines.

Due to these limitations, it is not possible to develop background values which are representative of the lacustrine, minespoil and shale monitoring units. Attempts to utilize the down gradient data, both from down gradient Unit 1 Landfill wells and from more distal Unit 2 wells have been denied due to the potential for impacts derived from the existing landfill.

The proposed adjusted standard is also warranted based on environmental considerations. As previously mentioned, the masking influence of the acid mine drainage results in significant ASD analysis and evaluations which slow down the implementation of assessment monitoring and corrective action. Collection and treatment of the acid mine drainage water may also result in cross-media impacts when the water is sent to the El Dorado Publically Owned Treatment Works (POTW). Acidic drainage water containing elevated concentrations of heavy metals and sulfate are not easily treated, potentially resulting in the treatment effluent passing these constituents into the receiving stream. The proposed parameter list revision will help enable the corrective action to be focused in areas which present evidence of landfill release impacts rather than expanding the area to include appreciable volumes of water derived from the strip mined areas which have not been influenced by the landfill.

Similarly, the proposed adjusted standard request to revise the total and dissolved chloride background level is also justified for many of the same reasons stated in the preceding paragraph. However, 35 IAC 811.320(b) also requires that the petitioner provide statutorily required demonstration of the justification for the adjusted standard. As mentioned in Section (c), the regulations identify two tiers of demonstration which may be required depending on the resource value of the groundwater. While the proposed adjusted standard seeks to approve a background level based on the highest possible level of groundwater (i.e., Class I Groundwater), it is clear that the previous coal strip mining at the site have degraded the groundwater such that the demonstration requirements listed in 35 IAC 811.320(b)(4) are most appropriate. These requirements are restated below in italics along with the petitions demonstration.

4) *For groundwater which contains naturally occurring constituents which do not meet the standards of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440, the Board will specify adjusted groundwater quality standards, upon a demonstration by the operator that:*

A) The groundwater does not presently serve as a source of drinking water;

Demonstration
Neither the lacustrine, minespoil nor the hydraulically connected bedrock are utilized as a source of potable water supply. Figure 5 depicts the location of private water supply wells located in the vicinity of the landfill. The water well construction records for each of these wells is presented in Appendix C. As shown by the water supply well drilling record locations shown on Figure 5, the closest potable well (Record 21) is located approximately 0.5 miles upgradient (southeast) of the landfill. However, this well was installed in 1900 and thus may no longer be in service.

The drilling record No. 11 which is shown approximately 0.5 miles downgradient of the existing landfill area was abandoned and was never completed as a potable water supply well (Refer to Appendix C). Similarly, Well No. 10 located approximately 4700 ft. northwest (downgradient) of the existing landfill does not appear to have been completed as a potable water supply since no pump was installed in the well or pitless adaptor. As such, given the degraded nature of the strip mine groundwater quality and the lack of any potable wells in the vicinity of the site, the proposed adjusted standard requesting a total and dissolved chloride background level of 200 mg/L will not adversely affect any drinking water sources. Similarly, as previously mentioned the requested dissolved and total ammonia standard of 15 mg/L would not adversely affect any drinking water sources since the ammonia would be anticipated to be absorbed to soils and/or form relatively immobile salts.

B) The change in standards will not interfere with, or become injurious to, any present or potential beneficial uses for such waters;

Demonstration
The water within the strip mine spoils and the hydraulically connected bedrock is highly degraded due to the previous coal strip mine operations which existed at the site. Because these mine activities existed prior to the landfill, the site groundwater is classified as Class IV or "Other Groundwater" pursuant to 35 IAC 620.240. The request to approve the dissolved and total chloride Class I groundwater standard of 200 mg/L will not interfere or become injurious to, any present or potential beneficial uses of the groundwater since it seeks to maintain chloride concentrations consistent with the potable groundwater standard presented in 35 IAC 620.410. Similarly, the total and dissolved ammonia standard of 15 mg/L is based on the General Use Water Standard (refer to 35 IAC 302.212) which is deemed protective of human health. As presented in prior discussions, the ammonia will not be mobile under the acidic conditions which exist at the site. As such the proposed standard of 15 mg/L will not adversely affect aquatic life in area streams.

C) The change in standards is necessary for economic or social development, by providing information including, but not limited to, the impacts of the standards on the regional economy, social disbenefits such as loss of jobs or closing of landfills, and economic analysis contrasting the health and environmental benefits with costs likely to be incurred in meeting the standards; and

Demonstration
The proposed adjusted standard to modify the total and dissolved chloride background standard to 200 mg/L and the total and dissolved ammonia background to 15 mg/L will not affect social or economic development or the regional economy in either a positive or a negative manner. As discussed in Sections (e) and (g), it is anticipated that the requested adjusted standard will help speed the response to groundwater exceedances by reducing ASD evaluations necessitated by the limitations in developing representative AGQS values. The cost ramification of the adjusted standards is discussed in Section (e).

D) The groundwater cannot presently, and will not in the future, serve as a source of drinking water because:

i) It is impossible to remove water in usable quantities;

ii) The groundwater is situated at a depth or location such that recovery of water for drinking purposes is not technologically feasible or economically reasonable;

iii) The groundwater is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption;

iv) The total dissolved solids content of the groundwater is more than 3,000 mg/l and that water will not be used to serve a public water supply system; or

v) The total dissolved solids content of the groundwater exceeds 10,000 mg/l.

Demonstration
As shown by the SCL permit presented in Appendix G, the permitted interwell Total Dissolved Solid (TDS) background concentration within the minespoil unit is 8,579 mg/L. The intrawell TDS background concentrations in the minespoil unit are often greater than the interwell background concentration and in some cases range in excess of 24,000 mg/L (i.e., well G20S). Similarly, the shale bedrock intrawell TDS background levels range up to 10,800 mg/L at well G19D (refer to permit Attachment 3 presented in Appendix G). Eight of the 11 shale monitoring wells have intrawell TDS background concentrations which exceed the 3,000 mg/L referenced above in criterion (iv). Furthermore, every one of the minespoil monitoring wells has a sulfate concentration which greatly exceeds the Class I Groundwater Standard of 400 mg/L. Similarly, the upper portion of the bedrock is hydraulically connected to the minespoil unit such that 10 of the 11 bedrock monitoring wells also exceed the sulfate Class I Groundwater Standard. Sulfate at elevated concentrations acts as a laxative. Due to the elevated sulfate and heavy metal concentrations, it is highly unlikely that the water from either the minespoil or the hydraulically interconnected bedrock will ever be utilized as a public water supply system. Even if such future use could occur, the requested dissolved and total chloride adjusted standard of 200 mg/L or the dissolved and total ammonia standard of 15 mg/L would in no way impair such a use.

i) Proposed Adjusted Standard Consistency with Federal Law

The regulations of general applicability that are the subject of the adjusted standard to modify the monitoring parameter lists include both the State of Illinois 35 IAC 811.319(a)(2) detection monitoring requirements and the 35 IAC 811.319(b)(5) assessment monitoring requirements. The federal detection and assessment monitoring requirements of 40 CFR 258.54 and 40 CFR 258.55 and Appendices I and II which are incorporated by reference at 35 IAC 811.319(b)(5)(A) and at 35 Ill. Adm. Code 810.104 are also affected by the proposed permit monitoring list changes.

40 CFR 258.54 provides the federal detection monitoring requirements for municipal solid waste landfills (MSWLF). 40 CFR 258.54(a)(2) allows the Director of an Approved State authority to establish an alternate list of inorganic indicator parameters for a MSWLF unit, in lieu of some or all of the heavy metals (constituents 1-15 in 40 CFR 258 Appendix I). Similarly, 40 CFR 258.54(a)(2) provides that the director shall consider the following factors in determining the alternative monitoring parameters: the types, quantities, and concentrations of constituents in the waste managed at the MSWLF unit; the mobility stability and persistence of the waste constituents or their reaction products in the unsaturated zone beneath the MSWLF unit; the detectability of indicator parameters, waste constituents, and reaction products, waste constituents in the groundwater; and the concentration or values and coefficients of variation of monitoring parameters or constituents in the groundwater background.

Because the state of Illinois has adopted such a list at 35 IAC 811.319(a)(2), which is the subject of this adjusted standard request, it is apparent that the Director has already modified the detection monitoring list using the authority provided by 40 CFR 258.54. As such, the federal requirements are consistent with the proposed adjusted standard so long as the Director (Illinois EPA) is in agreement with the proposed parameter list modifications.

The assessment monitoring requirements presented at 40 CFR 258.55(b) provides that:

> *"the Director of an Approved State may delete any of the Appendix II monitoring parameters for a MSWLF unit if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the Unit".*

While some of the Appendix II inorganic constituents which are proposed to be deleted are present in the leachate from the MSWLF unit, these inorganic and heavy metal constituents cannot be reasonably be quantified in the groundwater, unless the concentrations in the leachate are significantly greater than those in the groundwater. Furthermore, 40 CFR 258.55(d)(2) enables the Director of an Approved State the authority to modify the Assessment monitoring list pursuant to the requirements of 40 CFR 258.54(a)(2). As such, the types of constituents likely to be present in the waste; the persistence of the waste constituents or their reaction products in the unsaturated zone beneath the MSWLF unit; the detectability of indicator parameters, waste constituents, and reaction products in the groundwater; and the concentration or values and coefficients of variation of monitoring parameters or constituents in the groundwater background may be considered when developing an alternate assessment monitoring list.

The MSWLF Unit leachate cannot reasonably act as a source of contamination to the groundwater unless the leachate concentrations are significantly elevated relative to the groundwater. As such, the background groundwater concentrations act as a surrogate detection limit benchmark when determining whether the groundwater quality has been affected by leakage derived from the waste contained in the MSWLF unit.

The Director of an Approved State may choose to delete or replace any Appendix II assessment monitoring constituents, if it is determined that the constituent cannot reasonably be expected to be derived from the waste unit at sufficient concentrations which could be detected in the groundwater. The adjusted standard summarized in Section (f) and presented in Appendix B proposes that constituents that occur in the leachate at concentrations which are not significantly elevated relative to the groundwater be deleted or exempted from permit required statistical analysis program since the monitoring of these constituents provides little or no utility in detecting releases from the landfill. The 35 IAC 811.319(a)(2) and the 40 CFR 258 Appendix II constituents will continue to be monitored in the leachate, such that the groundwater monitoring for these constituents could be resumed if it was determined that the leachate concentrations of these constituents had increased sufficiently that these parameters might provide useful indication of potential landfill impacts.

As discussed in Section 1(c), the Illinois Subtitle G Municipal Solid Waste regulations underwent review by the US Environmental Protection Agency and received a determination of adequacy indicating that the State's Municipal Solid Waste regulations were deemed consistent with and/or more protective than the Federal Subtitle D regulations. The procedures specified in 35 IAC 811.320(b) "Justification for Adjusted Groundwater Quality Standards" have been reviewed by USEPA and received federal approval. As such, the adjusted standard approach to developing alternate background levels is deemed consistent with applicable federal requirements. Furthermore, because the chloride Class I Groundwater Standard of 200 mg/L (refer to 35 IAC 620.410) is less than the Federal MCL of 250 mg/L, it is deemed protective relative to both the State and Federal regulations. Therefore, if the adjusted standard is granted the proposed total and dissolved chloride adjusted standard background level of 200 mg/L will be consistent with federal requirements.

j) Statement Regarding Hearing

The petitioner waives its right to a hearing pursuant to Section 104.422.

k) Citation of Legal Authorities and Supporting Documents

As noted in the preceding petition sections, the basis for requesting the modification of the detection and assessment monitoring parameter lists is founded primarily on the State and federal regulatory requirements. Specifically, Sections 28.1 of the Illinois Environmental Protection Act and 35 IAC 104.400 (Subpart D) discusses the requirements for demonstrating that the proposed adjusted standard adheres to State of Illinois regulatory requirements. The State regulations from which relief is sought include 35 IAC 811.319 and 811.320. Pursuant to the requirements of 35 IAC 104.406(K), copies of these regulations are provided in Appendix E.

Section 35 IAC 811.320(b) provides the regulatory process for justifying Adjusted Groundwater Quality Standards. While the proposed petition primarily seeks to delete constituents which are not useful in identifying landfill related changes in groundwater quality or exempt these constituents from permit required statistical analyses, the petition also requests Board approval of an adjusted groundwater quality standard for total and dissolved chloride and total and dissolved ammonia. The adjusted standard is requested pursuant to the requirements of 35 IAC 811.320(b)(4). Section 35 IAC 811.320(b)(4) describes the requirements for petitioning for an adjusted groundwater quality standard for groundwater which contains naturally occurring constituents which do not meet the standards of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440. These requirements are believed appropriate for both the approval of the total and dissolved chloride and the ammonia adjusted standard as well as the request to delete constituents from the detection and or assessment monitoring lists.

Federal Subtitle D regulations presented at 40 CFR 258.54 is also relevant since they indicate that the Director of approved State may establish alternative detection monitoring list. Similarly, 40 CFR 258.55 indicates that Director of an Approved State may delete any of the Appendix II assessment monitoring parameters if the constituent are not reasonably expected to be derived from the waste contained in the Unit. Pursuant to the requirements of 35 IAC 104.406(K), copies of 40 CFR 258.54 and 258.55 are provided in Appendix E-1.

Finally, the preceding demonstration has also included references to the Gallatin National Permit appeal presented in (PCB Docket No. 1991-156, January, 1992) since this permit appeal raised many points which are applicable to the requested adjusted standard. For instance in the Gallatin decision, the Board found that "there were inherent enforceability problems in requiring an entity who had nothing to do with the pre-existing background exceedance to clean it up". The Board also found that rigorous application of the State's Groundwater Quality Standards could encourage landfill operators to seek to build in high quality groundwater areas, rather than in areas where the pre-existing groundwater quality is substandard. A copy of the Board's decision on the Gallatin National appeal (PCB Docket No. 1991-156) is provided in Appendix E-1.

It should be noted that there are a few notable differences in the Gallatin Appeal which do not apply to this proposed adjusted standard application. For example, Gallatin National sought to develop a landfill at a site where no Municipal Solid Waste landfill operations had previously occurred. As such, the operator of Gallatin had the ability to develop background groundwater quality using either interwell or intrawell statistical approaches. As discussed in the previous sections, these statistical approaches are either not available to the SCL operator due to discontinuities in hydrostratigraphic units (inability to characterize minespoil and lacustrine background groundwater quality using upgradient monitoring data), or are no longer appropriate due to limitations on intrawell statistical procedures resulting from landfill related groundwater quality changes. Also, the Gallatin appeal sought to set aside the General Groundwater Quality Standards (i.e., 35 IAC 620.420) due to the elevated background concentrations present in the strip mined areas, whereas the preceding adjusted standard petition seeks to either:

1) Delete and replace constituents which are not representative of site leachate, or constituents where background groundwater quality variations are so great due to acid

mine drainage that further monitoring of these constituents provides no utility in identifying impacts derived from the landfill; or

2) Adopt a Board approved adjusted standard of 200 mg/L (Refer to 35 IAC 620.410) for dissolved and total chloride in each of the three site's hydrostratigraphic units (i.e., Minespoil, Lacustrine, and Bedrock). This adjusted standard is requested due to site specific and regional hydrogeologic conditions which preclude the development of representative background concentrations (i.e., discontinuous hydrostratigraphic units and/or the presence of regional upwelling conditions).

3) Adopt a Board approved adjusted standard of 15 mg/L (Refer to the General Use Water Standard of 35 IAC 302.212) for dissolved and total ammonia. This adjusted standard is requested since the strip mine acidic drainage conditions are mediated by micro bacteria which have been shown to affect the groundwater ammonia concentrations.

In addition to the above referenced regulatory statutes and legal authorities which are applicable to this petition, the petitioner has also identified several technical references which help support the existence of the regional hydrogeologic conditions (i.e., brine upwelling) referenced in this petition. The applicable portions of these references are also presented in Appendix E-2 in order to document how these conditions confound the development of representative background standards.

l) Additional Information Required in the Regulation of General Applicability

Technical demonstrations have been completed to support the proposed list of detection and assessment monitoring parameters. These technical demonstrations are provided in Appendix A. The technical demonstrations have been submitted to the Illinois EPA for their consideration.

2.0 Adjusted Standard to Allow Development of Groundwater Protection Standards

Requested Relief

Petition Section 2 proposes that an adjusted standard be approved to implement "Groundwater Protection Standards" in a manner consistent with federal regulations presented in 40 CFR 258.55. The technical and legal justification for the requested relief is provided in the subsequent sections. This request has been organized pursuant to the Board required statutory justification procedures outlined in 35 IAC104 Subpart D.

a) Statement of Standard from which an Adjusted Standard is Sought.

Modification of the Corrective Action Trigger Concentration

As described in the introduction provided in Section I, site specific conditions including the previous site history of coal strip mining activity, presence of acid mine drainage influences, as well as unique hydrogeologic conditions (discontinuous hydrostratigraphic units, regional upward movement of mineralized groundwater etc.) result in circumstances which confound the development of representative background groundwater quality standards. As such, the petitioner requests an adjusted standard to allow the development of Groundwater Protection Standards (GPS) which would form the trigger to determine when groundwater quality variations require the implementation of corrective action.

Federal regulations 40 CFR 258.54 and 258.55 require that the facility develop background groundwater quality standards and statistically compare the down gradient monitoring data against these statistical limits to determine whether a statistically significant increase (SSI) in concentration has occurred. The federal regulations require that assessment monitoring be initiated if a landfill related SSI is identified in the detection monitoring program. Background standards are developed for each of the assessment monitoring (40 CFR 258.Appendix II and 35 IAC 620.410 – Class I Groundwater) constituents. Pursuant to 40 CFR 258.55, the facility is required to develop Groundwater Protection Standards (GPS) if exceedances are identified which are associated with releases from the landfill. These GPS values act as the numeric standard by which the groundwater monitoring data is evaluated to determine the potential need for corrective action. Under the federal program, the GPS values are typically based on one of the following three criteria:

1) federal maximum contaminant levels or MCL's (refer to Safe Drinking Water Act 40 CFR 141);

2) site background levels, if background is greater than the MCL; or

3) if no MCL exists; alternate compliance levels (ACLs) have been developed by some states so that the corrective action trigger concentration is based on a compound specific risk assessment or health/environmental exposure evaluation.

As previously mentioned, Illinois differs from the federal requirements by specifying that landfill related impacts must be remediated such that no exceedances of background groundwater quality levels occur at or beyond the zone of attenuation (ZOA), a point 100 ft. from the waste boundary. The current Illinois Subtitle G waste disposal regulations result in a non-degradation standard being applied to groundwater at the Saline County Landfill (SCL) site, an environment where the pre-existing groundwater quality has been severely degraded due to previous coal strip mining. Due to potential overlapping groundwater quality influences from the landfill and/or the anthropogenic surface mining related groundwater degradation, the facility is requesting adjusted standard modification of the detection and assessment monitoring parameter lists and the chloride and ammonia background concentrations (Refer to Section 1). The facility also requests that an adjusted standard be granted to approve the use of Groundwater Protection Standards in order to better enable the corrective action programs to be implemented in a manner that is protective of public health and welfare, as well as protective of the environment.

Specifically, if the detection monitoring program determines that an exceedance of an applicable groundwater quality standard (AGQS or a PCB granted adjusted standard) has occurred at or beyond the ZOA or an exceedance of a maximum allowable predicted concentration (MAPC) has occurred within the ZOA as a result of a release from the landfill, then the facility shall implement an assessment monitoring program in accordance with 35 IAC 811.319(b). In addition to characterizing the nature and extent of the release, including monitoring for the 40 CFR 258 Appendix II and 35 IAC 620.410 constituents, the operator shall develop groundwater protection standards which will designate the numerical standards for each of the monitored constituents which would necessitate corrective action and/or source control improvements. The proposed GPS values are summarized in the tables tab of Attachment B. The GPS values may require periodic modification due to changes in regulations (i.e., Safe Drinking Water Act, Illinois 35 IAC 620.410 Class I Groundwater Protection Standards), and/or changes in the analytical testing program or changes in permitted background concentrations.

As shown in Appendix B, which provides the proposed adjusted standard language, the proposed statutes affected by this revision consist primarily of 35 IAC 811.319(b) (Amended at 31 Ill. Reg. 16172, effective November 27, 2007) and 35 IAC 811.320 (Amended at 31 Ill. Reg. 16172, effective November 27, 2007). Although, less extensive modifications have also been made to Sections 811.324 (Added in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994), Section 811.325 (Added in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994) and 811.326 (Amended at 31 Ill. Reg. 1435, effective December 20, 2006) to reference that Groundwater Protection Standards rather than concentration variations relative to AGQS background concentrations would be utilized as the trigger for implementing corrective action.

b) Statement of General Applicability

The regulations of general applicability from which the adjusted standard is requested were adopted as part of 35 IAC 811 Subpart C. These regulations apply to landfills in the State of Illinois in which chemical and putrescible wastes were placed after the effective date of the regulations, except as otherwise provided in 35 Ill. Adm. Code 817. The rules were adopted pursuant to the federal standards for the new Municipal Solid Waste Landfill (MSWLF) units and are identical in substance to the federal regulations promulgated by the U.S. Environmental Protection Agency pursuant Sections 4004 and 4010 of the RCRA relating to MSWLF program. The specific correlation of the state statutes to the Federal Subtitle D regulations may be found in the Appendix Table 35 IAC 811.Appendix B, This table provides a Section-by-Section correlation between the requirements of the federal MSWLF regulations at 40 CFR 258 (1992) and the requirements of this Part.

The rule of general applicability was implemented pursuant to Sections 7.2, 21, 21.1, 22, 22.17, and 22.40 and authorized by Section 27 of the Environmental Protection Act [415 ILCS 5/7.2, 21, 21.1, 22, 22.17, 22.40, and 27].

The rule of general applicability was Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990; amended in R92-19 at 17 Ill. Reg. 12413, effective July 19, 1993; amended in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994; expedited correction at 18 Ill. Reg. 7504, effective July 19, 1993; amended in R90-26 at 18 Ill. Reg. 12481, effective August 1, 1994; amended in R95-13 at 19 Ill. Reg. 12257, effective August 15, 1995; amended in R96-1 at 20 Ill. Reg. 12000, effective August 15, 1996; amended in R97-20 at 21 Ill. Reg.15831, effective November 25, 1997; amended in R98-9 at 22 Ill. Reg.11491, effective June 23, 1998; amended in R99-1 at 23 Ill. Reg. 2794, effective February 17, 1999; amended in R98-29 at 23 Ill. Reg.6880, effective July 1, 1999; amended in R04-5/R04-15 at 28 Ill. Reg. 9107, effective June 18, 2004; amended in R05-1 at 29 Ill. Reg. 5044, effective March 22, 2005; amended in R06-5/R06-6/R06-7 at 30 Ill. Reg. 4136, effective February 23, 2006; amended in R06-16/R06-17/R06-18 at 31 Ill. Reg. 1435, effective December 20, 2006; amended in R07-8 at 31 Ill. Reg. 16172, effective November 27, 2007.

c) Level of Justification

The proposed adjusted standard influences several regulations contained in Sections 35 IAC 811.319(b), 811.320, with minor modifications to 35 IAC 811.324, 811.325 and 811.326. In general, the regulation of general applicability does not specifically address the level of justification required for each of these sections, however 35 IAC 811.320 (b) provides two levels of adjusted standard justification for developing background standards. The level of justification discussed by this section considers the quality of the groundwater in developing the level of justification requirements for adjusted standards. Because these requirements touch on many of the issues faced by the proposed adjusted standard, they are believed applicable to this request.

35 IAC 811.320(b)(2) provides for groundwater that presently serves as or may in the foreseeable future served as a source of drinking water. This includes groundwater and that contains naturally occurring constituents which meet the applicable requirements of 35 Ill. Adm. Code 620.410, 620.420, 620.430, or 620.440 the Board will specify adjusted groundwater quality standards no greater than those of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440, respectively, upon a demonstration by the operator that:

A) The change in standards will not interfere with, or become injurious to, any present or potential beneficial uses for such groundwater;

B) The change in standards is necessary for economic or social development, by providing information including, but not limited to, the impacts of the standards on regional economy, social disbenefits such as loss of jobs or closing of landfills, and economic analysis contrasting the health and environmental benefits with costs likely to be incurred in meeting the standards.

C) All technically feasible and economically reasonable methods are being used to prevent the degradation of the groundwater quality.

35 IAC 811.320(b)(4) provides the adjusted standard requirements for groundwater which cannot be deemed potable. For groundwater which contains naturally occurring constituents which do not meet the standards of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440, the Board will specify adjusted groundwater quality standards, upon a demonstration by the operator that:

A) The groundwater does not presently serve as a source of drinking water;

B) The change in standards will not interfere with, or become injurious to any potential beneficial uses for such waters;

C) The change in standards is necessary for economic or social development by providing information including, but not limited to, the impacts of these standards on the regional economy, social disbenefits such as loss of jobs or closing of landfills, and economic analysis contrasting the environmental benefits with costs likely to be incurred in meeting the standards; and

D) The groundwater cannot presently and will not in the future, serve as a source of drinking water because

i) It is impossible to remove water in usable quantities;

ii) The groundwater is situated at a depth or locations such that recovery of water for drinking purposes is not technologically feasible or economically reasonable;

iii) the groundwater is so contaminated that it would be economically or technologically impractical to render the water fit for human consumption;

iv) The total dissolved solids content of the water is more than 3000 mg/L and that the water will not be used to serve a public water supply system; or

v) The total dissolved solids content of the groundwater exceeds 10,000 mg/L.

As discussed in the preceding section, 35 IAC 811.320(b)(4) provides a description of the criterion to justify the approval of adjusted standards in previously mined areas which do not meet the groundwater standards of 35 Ill. Adm. Code 620.410, 620.420, 620.430 or 620.440. The Saline County Landfill is located within a former coal strip mined area. Evidence of the previous mining activity is apparent from the Department of Agriculture aerial photograph (Dated 1970) presented in Figure 1. This photograph depicts the ridge and furrow topography, spoil banks and end cut lakes which clearly indicate that the vast majority of the SCL site was previously mined for its coal resources. Similarly, the geologic map for the Rudement Quadrangle, Illinois clearly indicates that the landfill site encompasses large areas which were previously strip mined (Refer to Geologic Map provided in Appendix E-2). As such, the site is afforded the Class IV groundwater quality considerations described by 35 IAC 620.440. Additionally, the background groundwater quality standards requirements of 35 IAC 811.320(b)(4) are also believed applicable due to the previous history of mining activity at the site. A discussion is provided below detailing the adherence to the considerations listed by 35 IAC 811.320(b)(4).

A) The groundwater does not presently serve as a source of drinking water;

The groundwater within the saturated mine spoil deposits and the hydraulically interconnected bedrock formations does not presently function as a source of potable water, nor is it likely to function as such a resource in the future. Based on review of the Illinois State Water Survey and the Illinois State Geologic Survey files, the closest potable well is located outside of the previously strip mined area, approximately 1500 ft. from the landfill's boundary and approximately 2400 feet from the existing waste boundary (Refer to Figure 5). Copies of the available water supply well construction records are presented in Appendix C. Furthermore, due to the groundwater quality associated with the previous strip mining operations, the concentrations of several constituents which are considered indicative of mining related impacts that exceed the drinking and general use groundwater standards are summarized in Table 7. As shown by Table 7, the concentrations of the constituents identified by 35 IAC 620.440 as indicative of mine impacts exceed the vast majority of the potable Class I Groundwater (35 IAC 620.410) and the General Use Groundwater criteria (Refer to 35 IAC 620.420).

The interwell background standards presented in Table 7 were developed from pooled upgradient groundwater monitoring well data. As discussed in Section 1(e), the groundwater tends to become more mineralized further downgradient along the flow path since the water has been in contact with the soil for a greater length of time. Therefore, the concentrations of these constituents tend to increase further downgradient due to the natural interaction/dissolution which occurs along the groundwater flow path. Based on the Table 7 comparison of background groundwater concentrations to the drinking water and general use standards, it is apparent that the majority of the mine spoil and hydraulically connected bedrock exceeded the drinking water and general use groundwater standards.

In addition to these indicator parameters, past monitoring at the facility has demonstrated that the concentrations of heavy metal constituents also tend to be elevated due to the acid mine drainage (Refer to Appendix A for Box plot evaluation of groundwater v. leachate concentrations). Because the list of constituents occurring at elevated concentrations include both metals (i.e.,

iron, manganese, antimony, nickel, zinc etc.) as well as anionic constituents such as sulfate, it is technically difficult and extremely expensive to treat the groundwater to achieve potable or general use standards. Constituents such as the dissolved metals can be removed using activated carbon. However, due to the high TDS levels, the treatment carbon would quickly be expended after treating a small volume of water. Anionic constituents such as sulfate and chloride cannot be effectively, treated by carbon filtration. While reverse osmosis could technically be used to remove sulfate and/or chloride from the groundwater, this process is extremely expensive and would not be practical given the volume of water and the prevalence of these constituents in the regional groundwater found in the area. Other sources of water (surface water, cisterns, groundwater from other areas, etc.) would provide a more viable source of potable water than the treatment of the contaminated water from the former strip mined area. As such, it is apparent that the poor background groundwater quality associated with the previous coal strip mining operations conducted at the site greatly limits the potential use of the groundwater. Similarly, the potential future use of the groundwater from the strip mined area is also likely to be limited by the mine related groundwater degradation.

B) The change in standards will not interfere with, or become injurious to any potential beneficial uses for such waters;

The proposed adjusted standards providing relief from 35 IAC 811.319(a)(2) and from 35 IAC 811.320 will not interfere with, or become injurious to any potential beneficial uses for the groundwater. The proposed adjusted standards still require the facility to meet the non–degradation requirements at the point of compliance /zone of attenuation boundary (100 ft. from the landfill boundary) for the vast majority of the detection and assessment monitoring parameters. The GPS values that are not developed based on background concentrations will be based on the 35 IAC 620.410 Class I Potable Groundwater Standards. These Class I Groundwater standards have already been deemed to be protective for public health, welfare and the environment in instances where the exposure scenario is infinitely greater (i.e., the constituents in a potable water supply) compared to the conditions at the SCL Landfill where the water is not used and will not be used for human consumption.

The proposed changes in the background groundwater monitoring requirements are effective within the strip mined areas and interconnected bedrock or lacustrine units where the groundwater quality has already been shown to be degraded to the point where beneficial uses are not possible. As such, the proposed adjusted standards will not interfere or become injurious to potential uses for the groundwater. Rather it is intended that the adjusted standard to modify the detection monitoring list and to institute Groundwater Protection Standards for selected constituents will provide a benefit by enabling more expedited response to exceedances which are landfill related. As previously discussed, the masking influence of the acid mine drainage has made it difficult to characterize and respond to changes in groundwater quality. Often, alternate source demonstrations are performed to evaluate whether the exceedances are associated with the acid mine drainage or the landfill. It is anticipated that the selection of representative detection monitoring constituents and the setting of representative background concentrations and/or Groundwater Protection Standards will enable quicker response to changes in groundwater quality which are related to the landfill. Therefore the proposed adjusted

standards should help protect potential for beneficial uses of the groundwater by promoting faster response to potential landfill releases.

C) *The change in standards is necessary for economic or social development by providing information including, but not limited to, the impacts of these standards on the regional economy, social disbenefits such as loss of jobs or closing a landfills, and economic analysis contrasting the health and of environmental benefits with costs likely to be incurred in meeting the standards;*

The proposed adjusted standards are not anticipated to have an appreciable economic impact (positive or negative) on the site or the surrounding area (regional economy). The landfill has implemented final closure and is currently preparing to enter post closure care (PCC). The landfill is currently implementing a contingent remedial action system designed to mitigate groundwater impacts associated with the previously existing portion of the landfill. This plan requires (or required) the placement of a final cover consisting of a composite liner system in order to minimize surface water percolation into the landfill. The plan also required that leachate be collected from five vertical extraction wells installed within the pre-existing portions of the Unit 1 fill area. This plan is being and will be implemented regardless of the outcome of this adjusted standard petition.

The facility continues to institute site improvements designed to control leachate and landfill gas releases. In the spring of 2010, leachate extraction pumps were installed in 5 pre-existing landfill gas extraction wells located in the eastern portion of the Unit 1 Landfill. The pumps were intended to further enhance the leachate extraction capabilities in the eastern part of the landfill. Similarly, pursuant to permit application Log 2011-035 (Permit Modification No. 36), an additional 5 combination leachate and landfill gas extraction wells were installed in the pre-existing portion of Landfill Unit 1 during late September and early October 2011. Thus, the number of leachate extraction points in the 15 acre pre-existing Unit 1 fill area has been increased to 15. As such, no economic benefit is sought through the avoidance of corrective action or source control.

The primary economic benefits arise out of eliminating the unnecessary response to groundwater exceedances which are associated with acid mine drainage. It is anticipated that the frequency of assessment monitoring, and alternate source demonstrations (ASDs) will be reduced if this adjusted standard petition is approved. However, the economic impacts of the decrease in assessment monitoring and ASDs are confined to contractors hired by Republic and will not influence the surrounding community.

D) *The groundwater cannot presently and will not in the future, serve as a source of drinking water because*:

The groundwater is so contaminated due to the effects of acid mine drainage that it would be economically or technologically impractical to render the water fit for human consumption. As discussed in Section 1 (*petition to modify the detection and assessment monitoring parameter lists*), the groundwater contains concentrations of dissolved metals, TDS and sulfate which render it unfit for human consumption. As shown in Table 7, the current interwell Total Dissolved Solids (TDS) AGQS or background concentration for the mine spoil unit is 8,579

mg/L. The majority of the shallow site monitoring wells have intrawell TDS applicable groundwater quality standards or background concentrations that exceed the 3,000 mg/L, threshold discussed in 35 IAC 811.320(b)(4)(D)(vi). As such, due to the Class IV groundwater designation and the poor background groundwater quality, the water within the previously mined area will not be used to serve a public water supply system. Monitoring wells G20S (24,668 mg/L) and G19D (10,900 mg/L) have TDS intrawell background levels in excess of 10,000 mg/L.

Similarly, the shallow shale bedrock unit tends to demonstrate hydraulic connection with the strip mine spoils and the vast majority of the deep monitoring wells are characterized by background TDS levels in excess of 3000 mg/L. As such, the shale bedrock groundwater quality in the vicinity of the strip mine would be characterized brackish and unfit for human consumption. The private water supply well construction logs presented in Appendix C suggest that the groundwater quality in the wells completed off-site may not be significantly better. It is apparent from the driller logs that in many instances no pump or pitless adaptor was installed which would indicate that the water was being conveyed to a local dwelling. Furthermore, several of the logs indicate that the water was "corrosive to metal containers" or "left deposits in the tea kettle". This suggests the existence of highly mineralized groundwater within the bedrock. As previously discussed in Section (e) of the first adjusted standard petition, it is believed that the upwelling of highly mineralized groundwater is a regional phenomenon associated with the hydrodynamic flow conditions within the central portion of the Illinois Geologic Basin.

Due to the low pH, the groundwater actively dissolves minerals present in the shale bedrock and minespoil. Similarly, as shown in Table 7 the average sulfate concentrations in the shale bedrock wells are approximately 8 times (800%) higher than the Class I (35 IAC 620.410) potable groundwater standard of 400 mg/L. Similarly, the mine spoil well sulfate levels are approximately 17 times (1700%) higher than the Class I (35 IAC 620.410) potable groundwater standards. Elevated levels of sulfate are associated with a laxative effect. As such, based on these background concentrations, the site groundwater (mine spoil or shale) could not be used for human consumption. The acidic mine drainage caused by the oxidation of pyrite (iron sulfide minerals) is not a readily reversible process. Therefore, the groundwater quality is not anticipated to improve to levels which might meet potable or general use standards. As a result, the groundwater from the minespoil and interconnected bedrock is not currently fit for human or livestock consumption, nor is it anticipated that the groundwater quality will significantly improve without elimination of the processes that give rise to the acidic drainage (i.e., elimination of oxygenated water percolation coming into contact with the microcrystalline iron sulfide present in the minespoil and/or shale).

The requested adjusted standard to create groundwater protection standards is justified based on the lack of potential for beneficial use as described above, but also due to the physical limitations (discontinuous aquifer unit geometry) in developing statistical background values using the methods summarized in 35IAC 811.320(d). Pursuant to 35 IAC 811.320(b)(4) the background levels need not meet the requirements of 35 IAC 620.410 or 620.420 since the facility is located within an area where previous site activity has degraded the groundwater such that it is not

possible to utilize the groundwater for beneficial purposes. However, the more rigorous standards of 35 IAC 620.410 have been selected in order to provide proposed GPS values which are demonstrably protective of public health, welfare and the environment.

Finally, the approval of GPS as a trigger for implementing corrective action within areas where the groundwater is highly mineralized due to anthropogenic coal strip mining operations is mandated by 35 IAC 811.325 (e) and (f). These statutes require that:

"The Agency shall determine that remediation of a release of one or more constituents monitored in accordance with Section 35 IAC 811.319 from a MSWLF unit is not necessary if the owner or demonstrates to the Agency that:

> *The groundwater is additionally contaminated by substances that have originated from a source other than the MSWLF unit and those substances are present in such concentrations that cleanup of the release from the MSWLF unit would provide no significant reduction in risk to actual or potential receptors."*

Furthermore, 35 IAC 811.325 (f) indicates that:

> *"source control measures may be necessary to eliminate or minimize further releases to the groundwater, to prevent exposure to the groundwater, or to remediate the groundwater to concentrations that are technically practicable and which reduce threats to human health and the environment"*

Groundwater protection standards are proposed which can be utilized by the landfill operator and the regulators to identify when groundwater quality changes have occurred as a result of the landfill operations which may represent a risk to potential receptors and/or a possible threat to human health or the environment. The proposed use of GPS as a trigger concentration for corrective action is consistent with the Federal Subtitle D regulations 40 CFR 258.55(d)(4). The GPS values are necessary in this instance to establish specific corrective action trigger levels which recognize the inherent remedial limitations associated with the previous strip mine related influences on groundwater quality. Furthermore, the GPS values enable a means to define corrective action trigger levels which are "technically practicable and which reduce threats to human health and the environment", as required by 35 IAC 811.325(f).

d) Description of the Nature of the Petitioner's Activity

Refer to Nature of Petitioners activity discussion presented in Section 1(d).

e) Statement summarizing the efforts necessary to comply with the regulation of general applicability.

As discussed in Section 1, since the approval of the facility's first significant permit modification in 1996, the operator has developed and permitted both interwell (statistics based on a pooled upgradient background monitoring network) and intrawell (background concentration calculation statistics based on historical data from each individual well) background concentrations for each

monitored constituent. The revisions in groundwater background concentrations have been proposed to better characterize the range of variability resulting from the acidic drainage conditions in the mine spoil and hydraulically connected portions of the bedrock which are monitored by deep or permit "d" designated monitoring wells (Refer to permit condition VIII.A.9 presented in Attachment G). However, these attempts to revise the permit to better reflect the pronounced effects of the acid mine drainage have been largely ineffective.

The shallow groundwater (i.e., mine spoil unit) pH levels routinely vary by 3 pH units or more indicating a 1000 fold change in the acidity of the groundwater over relatively short distances and time periods (Refer to Figure 6). .The pH fluctuations shown in Figures 6 and 7 often accompany changes in groundwater elevation (i.e., dewatering) which subject the iron minerals in the minespoil and shale to subaerial (i.e., above the water table) weathering and oxidation. As such, it is apparent that localized mine drainage conditions exists which cause changes in groundwater quality that cannot be characterized based on available upgradient monitoring data. Iron metabolizing bacteria act as a catalyst for the development of acid mine drainage conditions. These bacteria colonies tend to become established where conditions are conducive (adequate substrate, moisture content temperature etc.), resulting in extremely localized areas where pronounced acid drainage develops. Because the reactions are catalyzed microbiologically, the effects may exhibit considerable spatial variability. Based on these factors, it is not possible to develop background concentrations in a manner capable of reflecting the abrupt changes in groundwater quality associated with these acidic drainage chemical reactions.

35 IAC 620.440 exempts the groundwater from the Class I or Class II groundwater standards of 35 IAC 620.410 and 620.420. The chemical reactions in the mine spoil result in dissolution of minerals which make it impossible to comply with many of the Class I and Class II groundwater Quality Standards. These factors have prompted the development of Class IV groundwater (refer to 35 IAC 620.240) which is applicable to areas where groundwater quality has been degraded. The regulations allow Class IV groundwater quality standards (refer to 35 IAC 620.440) to be applicable in such areas where land use has resulted in anthropogenic degradation of the groundwater quality. The applicant maintains that similar considerations must also be given to the selection of detection and assessment monitoring parameters and Groundwater Protection Standards which define the target levels for the corrective action restoration program in such areas where groundwater quality has been previously degraded.

As discussed in Section 1.0(e) of the first adjusted standard petition, under the current permit and regulatory framework, constituents that are heavily influenced by acid mine drainage such as iron, manganese and sulfate could be included in the corrective action plan (i.e., require remediation). Because these constituents are indicative of the geochemical effects of acid mine drainage (refer to 35 IAC 620.440), and typically exhibit higher concentrations in the groundwater than in the leachate, it would be impossible to achieve the corrective action objectives for these mine spoil related parameters. As such, the corrective action activities would have to be performed indefinitely to address concentrations of constituents not related to the landfill operations.

These issues might not be so profound if it were possible to develop representative interwell (background developed using upgradient data) background groundwater quality standards. However, due to the physical geometry of the landfill boundary relative to the upgradient boundary of the previously strip mined area, it is impossible to characterize groundwater quality through the use of interwell statistical methods (i.e., using pooled up-gradient monitoring data). As shown by the Figure 1, the landfill is located in close proximity to the previous strip mined excavation high wall (edge of the strip mine). As shown by Figure 4, the groundwater flow direction has consistently been from the southeast towards the west and northwest. Thus, wells installed upgradient of the landfill (i.e., G22S) are situated in close proximity to the upgradient boundary of the former strip mine highwall.

As previously mentioned, groundwater composition achieves chemical equilibrium as a function of the groundwater flow length and travel time through the saturated media (Refer to Freeze and Cherry "*Groundwater*" 1979) Chapter 7 for a discussion of the geochemical evolution of natural groundwater quality). Because upgradient well G22S is situated so close to the upgradient boundary of the strip mined area, the groundwater along the southeast side of the landfill (i.e., area) has flowed through as little as 100 to 200 ft. of strip mine spoil deposits before reaching the well. As such, it is not reasonable to assume that background groundwater quality determined from wells which are situated so close to the upgradient strip mine area boundary are representative of the downgradient wells where the groundwater has been in contact with minespoil over a much longer flow path. The increased flow path length allows greater contact time thus increasing the potential for mineral matter to dissolve and go into solution.

In the case of the Saline County Landfill, it is apparent that the saturated minespoil deposits act as a basin bounded by the relatively impermeable, undisturbed (i.e., unmined) Pennsylvanian Age bedrock and/or lacustrine deposits. Due to the presence of the high walls along the eastern and southern boundaries of the landfill, it is not possible to locate other upgradient monitoring wells at the site which provide more representative indications of background groundwater quality (Refer to Figure 1). Even if representative background monitoring wells could be located upgradient of the landfill, the iron bacteria catalyzed reactions tend to be localized such that significant variations in groundwater quality would be a certain occurrence.

Similarly, as discussed by numerous regional references (Davis, 1973; Graf and others (1966, Bredehoeft 1963, and Cartwright 1970), upward movement of highly mineralized formation waters have been reported in the area north of the Rough Creek or Shawneetown Fault Zones (Refer to references provided in Appendix E-2). Several of these investigators have surmised that the upward movement of the formation brines is occurring along cracks, fissures, joints and faults in the bedrock. The fracture dominated, non-uniform nature of this type of upwelling makes it impossible to develop a representative background chloride concentration characterization.

The upwelling of saline brines is pervasive condition in this area of the Illinois basin. As mentioned in Section 1(e), during the early 1800's saline springs in the Equality area (approximately 10 miles east of the landfill site) were utilized to process salt which is reported to have accounted for a significant portion of the State's revenue between 1818 and 1828.

Furthermore, many of the potable water supply driller logs presented in Appendix C indicate that the water from bedrock wells drilled in the area was corrosive to metal suggesting appreciable dissolved salt content. Site specific evidence of the non-uniform or localized chloride concentrations attributed to brine upwelling is apparent from shale well P10LS which is located approximately 1500 ft. north of the Unit 1 landfill (Refer to Figure 3). Well P10LS has exhibited chloride concentrations of up to 141 mg/L, approximately 800% higher than the 16.4 mg/L interwell dissolved chloride AGQS for the Shale Bedrock Unit (Refer to Table 1 of Appendix A,). These localized areas of high chloride concentrations are likely to correspond to faults or fissures in the bedrock. Because the upwelling brines intermix and become diluted with the shallow groundwater, as discussed by Davis, 1973 (Refer to Appendix E-2), the upwelling brine may also influence chloride concentrations in the Minespoil and Lacustrine units. For this reason, adjusted standard petition No. 1 has proposed that the Class I Groundwater total and dissolved chloride groundwater standard of 200 mg/L be applied to all three hydrostratigraphic units at the site.

The hydrogeologic conditions described in the proceeding paragraphs have confounded the use of interwell statistical analyses (groundwater background calculations based on pooled upgradient groundwater monitoring data). As such, the permit was modified based on intrawell background calculated from the historical data from each monitoring well. However, the ability to calculate revised intrawell AGQS values was curtailed in 2004 due to evidence of landfill related changes in groundwater quality. Specifically, cis 1,2 DCE detected at monitoring well G17S provided evidence of landfill related impacts which thus precluded statistical analyses to development background concentrations using data from monitoring wells located downgradient of the landfill (i.e., precluded the use of intrawell statistical procedures).

It is apparent that the site specific conditions constrain the ability to develop representative background standards in a manner which characterizes the natural temporal and spatial variations in background groundwater quality. Therefore, the petitioner seeks to address these limitations in the following ways:

- First by adjusting the required detection and assessment monitoring lists, to eliminate constituents which do not provide useful landfill impact related indicator constituents due to either low concentrations in the landfill leachate and/or elevated background groundwater concentrations due to either the acid drainage induced variability in concentrations or regional upwelling of mineralized groundwater and/or brine;

- Secondly, as discussed, in this section, an adjusted standard is also requested to allow Groundwater Protection Standards to be established using a combination of site specific background as well as the Board established Class I groundwater standards of 35 IAC 620.410.

The use of site specific background standards in combination with Class I groundwater standards will enable the majority of the detection and assessment monitoring parameter GPS values to continue to be based on background concentrations. The use of recognized public health and welfare based standards (i.e., Class I Groundwater Standards) will help resolve the dichotomy by

which the facility might be required to treat one monitoring constituent to background concentrations well below the potable groundwater standard while the overall groundwater quality would remain heavily degraded due to the anthropogenic influences of previous strip mine operations (i.e. non potable concentrations of iron, manganese, sulfate, TDS, zinc, etc.). The GPS values are presented in Table 4 for routine permit List G1 detection monitoring parameters and Table 5 for the List G2 organic constituents. The GPS values for assessment monitoring constituents, including 40 CFR 258 Appendix II and 35 IAC 620.410 Class I Groundwater inorganic and organic constituents) are presented in Table 6. As shown by Tables 5 and 6, the majority of the organic parameter GPS values would be established at the instrument practical quantitation limits, thus the non-degradation requirements of 35 IAC 811.319 and 320 would be maintained for most constituents. However, the Class I groundwater based GPS values would provide relief from some of the site specific groundwater quality variations. The groundwater protection standards and the revisions to the detection/assessment monitoring parameter lists will minimize potential cross media impacts by allowing the corrective action efforts to be focused in areas of identified landfill related impacts, rather than including strip mine related acid drainage impacts.

35 IAC 104.406(e) requires that the petitioner estimate the costs required to comply with the rule of general applicability. As summarized in the preceding paragraphs, the permit related options for resolving the site specific issue conflicts with the rule of general applicability are largely exhausted. To date, the costs associated with complying with the rule of general applicability have encompassed the following actions:

- the installation and operation of the gradient control system along the east side of the landfill. The operation of this system has since been terminated with IEPA approval, due to unintended worsening of the acid drainage related impacts on groundwater quality (refer to Appendix A for additional discussion);

- the installation and operation of the retrofit leachate collection system in the pre-existing Unit 1 Landfill area;

- implementation of the final closure plan which has included the placement of a composite cover system to reduce the rate of water percolation and leachate generation; and

- submittal of numerous permit modification applications which have been prepared in an attempt to revise background groundwater quality, provide alternate source demonstrations that explain the variation in background groundwater quality and provide assessment monitoring results. The operator has also completed numerous evaluation of remedial activities (ERA) reports have evaluated the effectiveness of the remedial efforts. Many of these permit applications have arisen from difficulties discriminating minespoil related changes in groundwater quality from landfill related changes.

Groundwater related permit modification applications completed since the initial significant permit modification (Application Log 1996-147) are summarized in Table 2. As shown by Table 2, Thirteen permit applications have been submitted during the past 10 years attempting to

address groundwater exceedances, many of which are the result of natural variability in background concentrations due to the previously discussed acid mine drainage conditions. Permit application Logs: 2003-020, 2003-313, 2004-051, 2004-423, 2006-197, 2008-274, 2009-200 and 2011-419 present either requests for revisions of AGQS/MAPCs, Alternate Source Demonstrations (ASD's) to show that exceedances were not the result of a release from the landfill, and/or Assessment monitoring reports necessitated by exceedances of background levels (AGQS/MAPCs). In some of the instances, the exceedances which were reported were acknowledged as being attributed to the landfill. However, in many instances no such determination could be made since representative strip mine background groundwater concentrations could either not be adequately defined or because the background concentrations (AGQS values) exhibited higher concentrations and more variability than the leachate concentrations. As such, the costs of complying with the rule of general applicability has also included numerous permit applications (refer to Table 2) to adjust the permit AGQS and MAPCs to better reflect the background groundwater quality, complete ASDs or assessment investigations. The combined cost of these permit applications is estimated to have exceeded $150,000.

While the Site Evaluation of Remedial Activity (ERA) reports (Refer to Application Log 2011-251, 2012-252, 2013-266 and 2014-261) suggest improvement in statistical groundwater quality concentration trends (i.e., decreasing concentrations of chloride at temporary assessment wells (T24S, T25S, T26S and T27S) and at detection monitoring wells G14S, R15S, G17S and G18S; and decreasing cis-1,2-dichloroethene concentrations at well G17S). Decreasing concentrations of dissolved ammonia have also been observed at the majority of the wells since the gradient control system operations were terminated in 2012. However, elevated concentrations of several acid mine drainage related parameters (i.e., cadmium, iron, manganese, sulfate, selenium, antimony, zinc etc.) remain. Based on persistent groundwater AGQS/MAPC exceedances, and failure to gain approval of ASDs, the Illinois EPA has indicated that they believe more extensive corrective action efforts are needed to restore the groundwater to background conditions. As such, the following discussion provides an evaluation of costs which could likely be incurred to comply with the rule of general applicability assuming that the detection and assessment monitoring parameter lists are not adjusted and the GPS values are not approved.

Many of the AGQS/MAPC constituent exceedances occur for constituents with average groundwater concentrations in the strip mine spoils which exceed the leachate concentrations (Refer to Box plots provided in Appendix A). Because the concentrations of many of the constituents are widespread throughout the strip mined areas, it is anticipated that at a minimum, the corrective action program would have to demonstrate hydraulic containment of all groundwater flowing beneath the landfill. Based on an analytic element groundwater flow model (Refer to Appendix D) it is estimated that groundwater flow beneath the pre-existing Unit 1 Landfill area could be intercepted by four extraction wells pumping at an average combined discharge rate of 12 gallons per minute (17,280 gals/day). The costs associated with this scenario are presented in Table 8.

The corrective action estimate summarized above assumes the operation of four extraction wells along the North (downgradient) side of the landfill. The estimate assumes that the water

collected by the extraction wells is hauled to the El Dorado POTW. The 10 year operational time frame is provided for cost estimate illustration purposes. As shown in Table 8, the design, construction and operation cost for a 10 year period would be approximately $5.6 million dollars. Pursuant to 35 IAC 811.326(e), the corrective action program would be required to operate until the groundwater quality at all wells have achieved the applicable groundwater quality standard for three years. Due to the limitations developing representative background concentrations (refer to discussion in Introduction Section), it is apparent that the conditions necessary to terminate system operations are unlikely to be achieved for the existing detection and/or assessment monitoring parameters, regardless of the time frame that the corrective action system is operated. Under this scenario, the remedial system would be operated indefinitely. Furthermore, the corrective action efforts would not restore the groundwater quality such that it could be used for potable water supply or as a groundwater resource. The concentrations or anthropogenic strip mine related parameters including sulfate, manganese, iron, heavy metals, TDS, etc. would still render the groundwater unfit for public use.

Conversely, numerous studies have shown that groundwater dewatering, such as would occur through the operation of a pump and treat system, would actually exacerbate or worsen the acid mine drainage by exposing more minespoil to oxidation reactions which generate acidity (Cravotta and others, 1999; Duaime, Sandau and Smith, 2011). These authors indicate that the acid drainage forming chemical reactions are expedited by the variably saturated or moist conditions caused by lowering of the water table.

Physical barrier systems such as slurry trench bentonite cut off walls have also been considered as a means to isolate the landfill from the surrounding strip mine deposits (Refer to Application Log 1999-381). However, the depth to the underlying shale exceeds 100 feet along the northeast corner of the landfill and averages approximately 75 ft. As such, specialized construction techniques (i.e., crane and clam bucket) would be necessary to excavate to such great depths. Furthermore, if the slurry trench was constructed, the facility would still be required to implement gradient control (groundwater pumping) within the interior of the isolated area. Assuming approximately 245,000 ft^2 of cut off wall and a unit cost of $\$20/ft^2$, the barrier wall around the north and east sides of the landfill would cost approximately $4.9 million dollars not including inboard gradient control system operations. Permit application log 1999-381 rejected this approach since the costs to construct the cut off wall and operate the gradient control system would not be commensurate with any benefit to human health or the environment. Furthermore, even if the barrier wall was constructed, the groundwater immediately outside of the cut off wall would remain Class IV groundwater (refer to 35 IAC 620.240) and the elevated concentrations of strip mine related parameters (i.e., sulfate, iron, TDS, iron, manganese and zinc) would still render the groundwater non-potable and would restrict any resource value of the groundwater. Based on these conditions, the efforts to isolate the landfill would provide no net benefit to the environment.

The strip mined area in which the landfill is located is surrounded by relatively impermeable Pennsylvanian bedrock and/or lacustrine deposits (Refer to aerial photograph presented in Figure 1). These geologic materials act to isolate the landfill and the strip mine impacts from the surrounding groundwater. Furthermore, downgradient groundwater quality data from the

temporary assessment monitoring wells T24S, T25S, T26S and T27S installed along the north and northwest sides of the landfill (Refer to Figure 4) indicate that any landfill related groundwater quality related impacts tend to be quickly attenuated within a short distance from the landfill. Concentration trend analyses provided in the 2011 Evaluation of Remedial Activities (ERA) Report, permit application log 2011-251 indicate that the dissolved chloride concentrations were essentially stable at concentrations ranging between 15 mg/L (T24S) and 40 mg/L (at wells T26S and T27S). Because these temporary wells are located approximately 100 ft. from the downgradient boundary of the landfill, it does not appear that the landfill is resulting in any significantly elevated concentrations of this indicator constituent. Similarly, the trace concentrations of cis 1,2-dichloroethene and 1,1 dichloroethane reported at well G17S have not been reported at any of the T series wells located at or beyond the landfill's ZOA. Based on the two constituents that are believed to provide the best indication of potential landfill impact (i.e., constituents which are minimally affected by acid mine drainage), there is no discernible change in groundwater quality at or beyond the landfill's downgradient zone of attenuation. Therefore, the petitioner maintains that no evidence exists that the landfill constitutes an environmental or public health risk which would warrant the installation of either physical barriers (i.e., slurry trench cut-off walls) or hydraulic barriers such as groundwater capture wells. To date, the corrective action efforts have focused on source control measures including improved final cover, additional landfill gas and leachate extraction wells, etc.

Based on the preceding discussion, it is believed that the logical approach to addressing the groundwater quality issues associated with the site is to:

1. focus the groundwater monitoring list to constituents which provide a reasonable indication of landfill related releases (refer to Adjusted Standard Petition No. 1);

2. to implement groundwater protection standards which provide health and/or risk based trigger concentrations to determine when corrective action is necessary (refer to petition No. 2); and

3. to continue to implement source controls (final cover, leachate and landfill gas extraction system improvements) to mitigate potential future releases to the maximum extent possible (currently being implemented in response to permit Section IX).

f) Narrative Description of the Proposed Adjusted Standard and Proposed Language

The current 35 IAC 811-814 (State of Illinois Landfill Regulations) require that the SCL facility meet a non-degradation standard at or beyond the zone of attenuation. This rule of general applicability is required despite the fact that the landfill facility is located within a former coal strip mine area where the groundwater quality is highly degraded due to the previous mine activity, as well as regionally prevailing salinity conditions. The site specific conditions (landfill position relative to the upgradient mine highwall and potential for high salinity water to upwell through fractures) often make it difficult, if not impossible to develop a representative characterization of background groundwater quality.

With the exception of 35 IAC 811.325(e) and (f), the Illinois Subtitle G waste disposal regulations require the facility to remediate any constituent related to a landfill release at or beyond the ZOA to achieve a non-degradation standard based on background concentrations. This results in a dichotomy where some constituents such as dissolved chloride in the bedrock wells may need to be restored to the interwell background level of 16.4 mg/L (approximately 1/12 of the Class I drinking water standard) despite the fact that the groundwater is clearly non-potable as evidenced by the fact that the intrawell background sulfate concentration is 3,111 mg/L, nearly 800% higher than the Class I potable groundwater standard of 400 mg/L. Similarly, the Shale Unit interwell background total iron concentration of 196.8 mg/L is nearly 40 times greater than the potable Class I groundwater standard. Thus, given these background groundwater quality conditions, there is no environmental, beneficial use, and/or economic consideration which warrants the remediation of one constituent (in this example chloride) to an ultra low (and most likely non-representative) background standard when the groundwater will remain non-potable due to the anthropogenic influences of the previous coal strip mine operations which occurred at the site.

The SCL facility does not claim that there are no landfill related impacts to the groundwater. There clearly are landfill related groundwater impacts (i.e., the cis-1,2-dichloroethene at well G17S), which the petitioner believes are insignificant relative to the highly degraded nature of acid mine influenced strip mine groundwater quality. The recent cis-1,2-dichloroethene concentrations at well G17S average approximately 5 ug/L, less than 1/10 of the 35 IAC 620.410 Class I potable groundwater standard of 70 ug/L. Furthermore, the SCL facility has implemented source control measures (i.e., composite final cover to minimize generation of leachate, installation of additional landfill gas and leachate management system improvements) to mitigate these releases to the extent possible. These corrective actions are being undertaken in manner consistent with the "source control" intent described by 35 IAC 811.325(e) and (f). The facility is committed to continuing to work with the Illinois EPA to address landfill related releases through source control measures which are technically and environmentally warranted. However, corrective actions which exacerbate or worsen the groundwater quality by increasing acid mine drainage (i.e., capture wells or dewatering outside of the landfill boundary) must be avoided. Similarly, physical cut-off wall barriers which have no potential of achieving a commensurate level of groundwater quality improvement must also be considered unviable.

The petitioner requests that the Board approve the Groundwater Protection Standards (GPS) described in Tables 4, 5 and 6 in order to help resolve the inherent conflict in the regulations between the remedial objectives based on non-degradation standards and the health or environmental risk based objectives which are allowed by 35 IAC 811.325(e) and (f). By proposing Class I potable groundwater standards as GPS, the petitioner has utilized published groundwater standards which are recognized by the State of Illinois as being deemed protective of public health and the environment.

Appendix B provides the proposed redline markup changes to the rule of general applicability to incorporate the proposed use of groundwater protection standards.

g) Statement of Impact on the Petitioner's Activity on the Environment

The approval of the proposed adjusted standard to create groundwater protection standards which would act as the compliance limits for determining the need for corrective action would create an overall environmental benefit. Currently, compliance with the regulation of general applicability is constrained by two factors: 1) the inability to develop representative background standards for some constituents with concentrations that are influenced by either acid mine drainage or the upward vertical movement of mineralized water; and 2) the inability to clearly determine impacts which are associated with the landfill facility from the masking effect caused by the acid drainage present in the mine spoil and in the hydraulically connected bedrock. Thus, under the general applicability regulation the ability to respond to groundwater quality exceedances is negatively influenced.

Typically, inorganic constituent exceedances result in the submittal of alternate source demonstrations (ASDs). Often additional monitoring data is collected to support these demonstrations. This process results in the passage of considerable time before the exceedances can be confirmed as being related to the landfill. Often no consensus can be reached on the nature of the impact (i.e., the IEPA concedes that strip mine influences exist for a parameter but cannot discount the possibility that landfill related releases of the constituent have also occurred). Not only do these disagreements affect the relative timing for the implementation of assessment monitoring and corrective action but they also influence the determination of which constituents are the result of landfill related releases and thus require treatment.

Due to uncertainty associated with the potential for overlapping impacts (minespoil acid drainage and landfill related changes in groundwater quality), the Agency has felt compelled to take the most conservative approach (assuming all groundwater quality changes are the result of landfill impact) in addressing areas where the landfill related impacts overlap with the impacts associated with acid mine drainage or in addressing areas where the background concentrations/influences of acid mine drainage cannot be adequately defined to allow discrimination of the impacts. While this level of conservatism is understandable, it runs counter to the Boards previous decision that efforts should be made to discriminate impacts in areas where overlapping influences exist. Specifically, in Gallatin National v. IEPA (PCB Docket 91-156, January 1992, page 129-42) the Board found that:

> *"there are inherent enforceability problems in requiring an entity who had nothing to do with the pre-existing background exceedances to clean it up, and certainly not as a condition of the permit."*

Similarly, 35 IAC.325(e) indicates that:

> *The Agency shall determine that remediation of a release of one or more constituents monitored in accordance with Section 811.319 from a MSWLF unit is not necessary, if the owner or operator demonstrates to the Agency that:*
>
> *1) The groundwater is additionally contaminated by substances that have originated from a source other than the MSWLF unit and those substances are present in such concentrations*

that cleanup of the release from the MSWLF unit would provide no significant reduction in risk to actual or potential receptors; or

2) *The constituents are present in groundwater that:*
   A) Is not currently or reasonably expected to be a source of drinking water; and

   B) is not hydraulically connected with waters to which the hazardous constituents are migrating or are likely to migrate in concentrations that would exceed the groundwater quality standards established under section 811.320; or

3) *The remediation of the release is technically impractical; or*

4) *The remediation results in an unacceptable cross media impacts.*

35 IAC 811.325(f) indicates that:

"A determination by the Agency pursuant to subsection (e) shall not affect the Agency's authority to require of the owner or operator to undertake source control measures or other measures that may be necessary to eliminate or minimize further releases to the groundwater, to prevent exposure to the groundwater, or to remediate the groundwater to concentrations that are technically practical and which reduce threats to human health or the environment."

Therefore, the approval of the proposed adjusted standard(s) to revise the detection monitoring and assessment monitoring parameter lists and to develop groundwater protection standards will result in the ability to provide more timely response to landfill related releases and if necessary allow implementation of corrective action in a more expedited manner. It is anticipated that the number of ASDs and/or assessment monitoring investigations will be reduced by providing monitoring system indicator parameters and corrective action trigger (groundwater protection standards) levels which are better suited to filter out acid drainage related impacts. The proposed adjusted standards should also help to reduce the review burden placed on the Agency.

Landfill leachate consists of a complex mixture of organic and inorganic constituents. Acid mine drainage tends to be characterized by low pH, high concentrations of sulfate and total and dissolved metal concentrations. Frequently, landfill corrective action is implemented to address relative diffuse concentrations of organic constituents which exceed drinking water standards (i.e., Safe Drinking Water Act 40 CFR 141 or IL Groundwater Protection Standards 35 IAC 620.410 or 620.420). This occurs because many of the volatile organic compounds (VOCs) are relatively mobile in the environment and/or are subject to comparison to relatively low drinking water standards since several of these VOC constituents have been identified as known or probable human carcinogens. As such, VOCs present at even relatively low concentrations may potentially represent a significant health risks. Due to the presence of high concentrations of sulfate and heavy metals, corrective action within strip mined areas becomes significantly more difficult. Methods typically used for treating VOC constituents in groundwater such as air stripping, or carbon absorption become less viable due to the extremely high anion (primarily sulfate) and metal concentrations in the groundwater. Furthermore, groundwater extraction conducted outside of the limits of waste (such as might be conducted for a groundwater pump and treat corrective action) can dewater the minespoil deposits subjecting them to subaerial (i.e.,

above water table) exposure and oxidation which results in exacerbation of the acid mine drainage related pH decreases.

Due to the wide assemblage of constituents detected and the concentrations of these constituents, the most viable means to treat a release is often to transport the water to a Publically Owned Treatment Works (POTW) for treatment, as was done with water derived from the site's gradient control system which was operated until mid 2012 along the east side of the landfill. However, in many cases the POTW is no better equipped to treat the complex stream of constituents present in mixed landfill/acid mine drainage impacted groundwater. As such, the POTW treats constituents mandated by its permit prior to discharging the "treated effluent". However, constituents such as chloride, sulfate, etc. are not effectively treated by the POTW nor are specific discharge standards required for these constituents within the effluent. Due to these limitations, the treated effluent containing these constituents may be discharged into the receiving stream resulting in potential cross-media impacts. The petitioners maintain that to the extent possible, it is preferable that the strip mine related impacts be maintained to the area of the previous mine rather than transported to the POTW where many of the constituents would be released into the stream at elevated concentrations in the form of the POTW system effluent.

Finally, 35 IAC 811.104.406(g) requires that the petitioner compare the qualitative and quantitative nature of emissions under the rule of general applicability compared to the proposed adjusted standard. This comparison is somewhat complicated due to the aforementioned difficulties discriminating acid mine drainage and upwelling impacts from landfill related changes in groundwater concentrations. However, as previously mentioned the dissolved chloride concentrations at the temporary assessment monitoring wells located along the downgradient boundary of the landfill (i.e., T24S, T25S, T26S, T27S) are stable at concentrations which are believed to be consistent with site background conditions. Refer to chloride trend analysis presented in Appendix H. Similarly, no confirmed concentrations of any VOC (cis 1,2-dichloroethene, 1,1 dichloroethane etc.) constituents have been detected at the temporary assessment monitoring wells. As such, it appears that the chloride and the VOC constituents detected at the detection monitoring wells are attenuated within a short distance of the landfill (approximately 100 ft.).

Similarly, as shown by the box plots presented in Appendix A, the concentrations of other constituents which are deemed to provide a good potential indication of leachate influence (i.e., bicarbonate alkalinity, barium, boron, potassium, sodium, etc.) all provide substantial evidence that the concentrations of these constituents are rapidly attenuated within the strip mine spoils which underlie the landfill. As such, the source control strategy which is presently being implemented at the site is deemed effective and protective of public health, welfare and the environment. As mentioned in the preceding paragraphs, groundwater pump and treat is likely to result in two potentially negative attributes. 1) The potential for cross media impacts increase due to the increased volume of water sent to the POTW for treatment; and 2) groundwater pumping is likely to exacerbate the acid mine drainage by exposing pyrite in the minespoil to the effects of oxidation. As shown by page 4 of the US Department of Interior, Office of Mine Reclamation and Enforcement Status of Research of Acid Mine Drainage (2009) provided in Appendix E-2, it is apparent that dewatering such as would occur with a pump and treat system

could be expected to worsen groundwater quality by exposing minespoil to oxidation reactions which create acid mine drainage.

h) Justification of the Proposed Adjusted Standard

This adjusted standard seeks to establish Groundwater Protection Standards (GPS) which will act as trigger concentrations to determine the need to initiate corrective measures or additional source control measures. Groundwater protection standards are deemed necessary since the anthropogenic influence of previous strip mining combined with the regional hydrodynamic groundwater flow and geologic conditions (fracturing, faulting etc.) render it impossible to develop representative interwell groundwater background standards. The GPS values are necessary pursuant to 35 IAC 811.325(e) and (f) to establish numerical standards to assess when changes in groundwater concentrations associated with the landfill constitute a risk to potential receptors or the environment. Current regulatory guidance requires that the Illinois EPA utilize background groundwater quality determined pursuant to 35 IAC 811.320 as the trigger concentration to assess the need for corrective action, whereas 35 IAC 811.325(e) requires that the risk to actual or potential receptors be considered to establish the need for corrective action.

The Illinois EPA is bound pursuant to 35 IAC 811.319(a)(1)(A) and 35 IAC 811.319(a)(4)(A)(iv) to uphold the groundwater non-degradation standards that background concentrations not be exceeded at or beyond the facility's zone of attenuation (ZOA). Therefore, the risk based standard presented in 35 IAC 811.325(e) presents a conflict. The conflict between the requirements of 35 IAC 811.325 (e) and (f) which indicate that risk based considerations dictate the need for corrective action and 35 IAC 811.319(a)(1)(A) and 35 IAC 811.319(a)(4)(A)(iv) which define threat as an exceedance of the background standard at or beyond the ZOA, can best be resolved by the adjusted standard approval of numeric standards which define risks to public health and the environment. In order to address this conflict, "Groundwater Protection Standards" are required to define concentrations which if exceeded as a result of MSWLF activities would constitute a public health or environmental risk thus requiring corrective action. For this reason, the applicant has proposed that the GPS requirements of 40 CFR 258.55(4) be made applicable to this facility.

Specifically, the GPS values are necessary to define numerical limits or trigger concentrations which would necessitate corrective action or additional source control measures to mitigate potential health or environmental risks. The proposed numerical standards or GPS values are based on a combination of background levels (the existing standard under the rule of general applicability) and 35 IAC 620.410 Class I potable groundwater standards. As such, the proposed GPS values are protective of public health and the environment while taking into consideration the degraded background groundwater quality which is attributed to mining operations which predate the landfill operations. The adjusted standard to implement GPS values are necessary to establish corrective action objectives that remain protective of human health and the environment while recognizing limitations associated with the background groundwater quality associated with the previous strip mine operations at the site.

The proposed adjusted standard to develop groundwater protection standards is also justified on the basis of implementability and environmental considerations. The rule of general applicability cannot be effectively implemented due to site specific considerations (i.e., presence of acid mine drainage which results in large fluctuations in the pH of the groundwater (i.e., 3 pH units). The site specific factors (discontinuities in hydrostratigraphic units, regional upward flow of mineralized water etc.) also constrain the ability to develop representative interwell background standards (background developed from pooled upgradient monitoring data). The hydrostratigraphic discontinuity limitation reflects the close proximity of the landfill to the southeastern (upgradient) high wall of the mine and the lack of saturated lacustrine deposits upgradient of the landfill (Refer to Figure 1). Due to these limitations, it is often not possible to develop interwell background values which are representative of the lacustrine and minespoil monitoring units. Similarly, the regional hydrodynamic conditions which give rise to upward flow of mineralized water, especially within fractures, joints and fault zones further confounds the ability to develop representative interwell background standards for the shale bedrock and the hydraulically connected portions of the minespoil. Due to these limitations on development of representative background concentrations, it is believed that the proposed use of the GPS values will eliminate ambiguity associated with applying non-degradation standards which may not be statistically representative of the highly degraded acid mine drainage affected groundwater which exists at the site.

The proposed adjusted standard seeks to approve groundwater protection standards to act as remedial trigger concentrations. The proposed GPS values for the listed inorganic constituents (Refer to Table 4) are based on either background standards (where they can be defined) or based on the Class I Groundwater Standards that the Board has deemed applicable to 35 IAC 620.410 Class I "Potable Resource Groundwater". Similarly, the proposed GPS values for the organic List G2 constituents are also based on Class I potable groundwater standards, where available. If no Class I groundwater standard has been promulgated by 35 IAC 620.410 the proposed GPS values have been based on the practical quantitation limit (i.e., the laboratory reporting limit for the constituent). As shown by Table 5, the proposed GPS values for the majority of the organic constituents for which no Class I standard has been promulgated shall be based on the laboratory reported practical quantitation limits for the SW 846 method 8260 analyses. The GPS values for organic constituents at wells located within the zone of attenuation shall be the Class I Groundwater Standard if one exists, or if no Class I Groundwater Standard exists the existing permit specified AGQS values presented in Table 5 shall constitute the effective compliance standard. As such, the proposed GPS values for the majority of the volatile organic constituents (i.e., constituents whose concentrations are not associated with acid mine drainage) shall continue to be based on maintaining the non-degradation standard at the zone of attenuation (i.e., 100 ft. from the landfill boundary).

The proposed adjusted standard is also warranted based on environmental considerations. As previously mentioned, the masking influence of the acid mine drainage results in significant ASD analysis and evaluations which slow down the implementation of corrective action. Collection and treatment of the acid mine drainage water may also result in cross-media impacts

when the water is sent to the El Dorado Publically Owned treatment Works (POTW). Acidic drainage water containing elevated concentrations of heavy metals and sulfate are not easily treated, potentially resulting in the treatment effluent passing some of these constituents (sulfate etc.) into the receiving stream. The proposed adjusted standard will seek to contain the acid mine drainage related impacts to the previously strip mined areas. As previously mentioned, it is proposed that the GPS values for constituents for which no 35 IAC 620.410 Class I standard has been promulgated be based on the existing landfill permit AGQS values.

Because the majority of the List G2 and the 40 CFR 258 Appendix II Assessment monitoring organic constituents (Refer to Table 6) have no promulgated Class I Groundwater standards, the groundwater non-degradation requirements of 35 IAC 811.319(a)(4)(A)(iv) and 35 IAC 811.320(a)(2) are maintained for the majority of the potential organic monitoring constituents. In these instances, the background concentrations will conservatively be based on the laboratory reporting limits or the practical quantitation limit for the SW 846 analysis method utilized by the laboratory. However, it is likely that the facility will submit a Significant Modification of Permit Application to IEPA to proposes that the background levels and GPS for the organic constituents be based on the Unit 2 Landfill permitted AGQS values which more closely reflect the practical quantitation limits which can consistently be achieved given the analytical methods and the matrix interferences which exist within the strip mine groundwater. However, until such a permit application is approved to modify the PQLs, the existing Unit 1 Landfill AGQS values shall remain in effect.

The proposed monitoring list contains the selected inorganic constituents listed in Section 1(f) of this petition which are indicative of potential leachate impacts while minimizing the masking effect caused by the acidic mine drainage (Refer to Section 1(f)). As discussed in the preceding paragraph, the background standards for the organic constituents for which no 35 IAC 620.410 Class I Groundwater Standard has been promulgated will remain the currently permitted laboratory reporting limits or PQL's for the specific SW 846-8260 analysis method. As such, the non-degradation standard will remain for most constituents at wells located at or beyond the zone of attenuation. For these organic constituents, the non-degradation standard is based on the instrument ability to decipher potential significant increases in concentration given the matrix conditions which exist in the site groundwater.

The proposed modification to the background parameter list and the development of Groundwater Protection Standards will help enable the corrective action to be focused in areas which present evidence of landfill release impacts rather than expanding the area to include appreciable volumes of water derived from the strip mined areas which have not been influenced by the landfill. This will also minimize cross media impacts associated with treating water derived from the strip mine areas outside of the zone influenced by the landfill release. Finally, the proposed GPS values presented in Tables 4, 5 and 6 seek to define numerical standards which will be used to assess potential risks to actual or potential receptors (refer to 35 IAC 811.325(e)) and to define remedial trigger concentrations that are technical practicable and reduce threats to human health or the environment (35 IAC 811.325(f)). The GPS values, effective within the zone of attenuation will enable corrective action to be implemented in a

manner which is commensurate with the potential risks and benefits to public health and the environment. For instance, the cis 1,2-dichloroethene concentrations observed at G17S which are less than $1/10^{th}$ of the drinking water standard of 70 ug/L would necessitate continued assessment monitoring since it provides an indication of landfill related impacts which warrant closer scrutiny. The cis-1,2-dichloroethene might also necessitate additional source control measures within the landfill (i.e., additional landfill gas and leachate extraction wells), if deemed appropriate by the Illinois EPA. However, because neither the groundwater usage potential nor the potential risks to public health and environmental would be significantly improved, groundwater hydraulic and/or physical barriers outside of the landfill would not be necessary unless the concentrations indicated an exceedance of the GPS values.

The approach described in the preceding paragraph would balance the reality that the anthropogenic strip mine related concentrations of iron, manganese, TDS , sulfate etc. render the groundwater at the site non-potable such that no environmental benefit is gained by treating one constituent to background concentrations when the overall value of the groundwater resource will not be altered.

While site specific issues give rise to proposed modifications to the Landfill's permit which are different than the majority of the landfills within the state, the proposed modifications are consistent with applicable State and Federal laws. The petitioner believes that an innovative alternative is required since the site specific conditions (acidic drainage, regional upwelling of mineralized groundwater and hydrostratigraphic unit continuity) result in limitations in developing representative interwell background standards. These factors restrict the ability to implement the rule of general applicability. Under current permit conditions and regulatory requirements, the facility would be required to remediate the groundwater to remove constituents such as, iron, manganese, sulfate, etc. which are clearly associated with the influences of the acid mine drainage which would exist even in the absence of the landfilling operations. As noted by the IPCB in Gallatin National Company v. IEPA (PCB 91-156):

> *"there are inherent enforceability problems in requiring an entity who had nothing to do with the pre-existing background exceedances to clean it up, and certainly not as a condition of a permit".*

As noted by the Board in Gallatin v. IEPA (PCB Docket 91-156), failure to resolve these issues could result in conditions that would be at odds with good public policy. For example the Board found that the requirement that the corrective action address concentrations of acid drainage related parameters such as sulfate, iron, manganese etc. could encourage landfill owners and operators to site and construct landfills in areas where the groundwater quality has not been previously degraded in order to establish the facility in an environment where the general applicability standards could be met. This would potentially result in the use of land that might be better suited for other purposes.

The Saline County Landfill Inc. acknowledges that the landfill has experienced releases of certain constituents which have required corrective action. The landfill is in the process of implementing source control measures which are designed to minimize releases from the landfill,

prevent exposure to potential landfill affected groundwater, and/or remediate the groundwater to concentrations which are technically practicable. The source control measures which are being implemented include the following:

- Placement of the final cover consisting of a composite liner system on the landfill. This cover is designed to greatly minimize the percolation of precipitation into the landfill and thus minimizes the generation of leachate;

- Installation and operation of 4 vertical leachate extraction wells located within the Unit 1 Landfill Area (i.e., wells L33R (Agency Designation L303), L34R (L304), L35R (L305), L36R (L306)). These wells remove leachate from the pre-existing portion of the Unit 1 landfill so that it can be treated, thus minimizing exfiltration through the base of the landfill. Additionally, recent groundwater and leachate elevation data indicate that portions of the landfill and the leachate collection wells extend below the mean groundwater elevation. Leachate extraction pumping being conducted at these locations has acted to create locally convergent groundwater flow, which helps to minimize the flow of landfill impacted groundwater away from the landfill;

- Installation of extraction pumps in an additional 5 gas extraction wells along the east side of the landfill. As described by application Log 2010-091, the pumps are intended to assist in the removal of leachate and condensate from the landfill. The pumps which were installed in the Spring of 2010 are intended to improve the efficiency of the gas extraction system along the east side of the landfill, and are also intended to reduce leachate head and the potential for leakage from the landfill; and

- Pursuant to Permit application log 2011-035, an additional 5 combination landfill gas and leachate extraction wells were installed in the eastern portion of the landfill during September and early October 2011. These wells are intended to improve the landfill gas extraction capability and to remove leachate from the eastern portion of the landfill.

These source control actions are deemed consistent with the requirements of 35 IAC 811.325(e) and (f) since the actions seek to minimize potential leakage from the landfill unit from entering the groundwater. Due to the acid mine drainage influence of previous coal mining activities on the groundwater quality (refer to Appendix A for a discussion of background groundwater quality), it is believed that the above described source control measures are commensurate with the regulatory guidance of 35 IAC 811.325(f) that source control measures may be required by IEPA to minimize or eliminate landfill related influences on the groundwater.

Due to the highly mineralized nature of the acid mine drainage affected groundwater at the site, it is difficult to discern landfill related groundwater quality influences for some constituents from the anthropogenic influences caused by prior coal strip mine operations. As such, the source control measures should continue to be implemented and improved, where possible, so as to minimize the potential release of landfill affected groundwater into the strip mine acid drainage affected environment. By implementing the source control measures described above, it is anticipated that the need to distinguish potential overlapping influences from acidic mine

drainage and landfill related changes in groundwater quality can be reduced or eliminated. Furthermore, source control measures applied within the waste limits help to reduce the cross media impacts caused by capturing large volumes of acid mine drainage impacted groundwater outside of the limits of waste.

As documented in several Evaluation of Remedial Activity reports which were recently submitted to IEPA (refer to application Log 2011-251, 2012-252, 2013-266 and 2014-261), the source control measures appear to be demonstrating a positive influence on groundwater quality as evidenced by the fact that overall decreasing concentrations of dissolved chloride have been observed at the Permit Condition IX.3 wells (G14S, R15S, G17S and G18S) and the temporary assessment monitoring wells (T24S, T25S, T26S and T27S) since the landfill final cover and leachate extraction system improvements were installed. Similarly, no confirmed concentrations of acetone have been reported at well G19S in over 5 years. Because multiple sources of chloride exist (i.e., landfill leachate, upwelling of mineralized groundwater, and chloride released from clay minerals during acid mine drainage related breakdown of the clay mineral structure), the decreasing chloride concentration trends at the assessment wells may reflect other factors such as termination of construction related groundwater dewatering and rebound of the water table. Regardless of the source of the chloride concentration decreases, the concentration trends suggest that conditions are stable or improving in such a manner that source controls provide a prudent response.

i) Proposed Adjusted Standard Consistency with Federal Law

The proposed adjusted standard seeks to meld applicable State and Federal regulations to develop a site specific requirement for the trigger concentrations which would necessitate groundwater corrective action. These trigger concentrations are analogous to the Groundwater Protection Standards (GPS) described by 40 CFR 258.55(h and i). The Federal regulations in 40 CFR 258.55(h) require that the GPS values be set based on the following criteria:

- For constituents that have a promulgated maximum contaminant level (MCL), the MCL shall be utilized as the GPS;
- For constituents where no MCL has been promulgated, the background concentration shall be used to define the GPS; and
- If the background level is higher than the MCL, the background level shall be utilized in lieu of the MCL.

Pursuant to 40 CFR 258.55(h)(3)(i), the Director of an Approved State may establish alternative Compliance Levels (ACLs) based on health based or exposure considerations. The adjusted standard proposed in the preceding sections seeks the approval of GPS values based on a combination of Class I Groundwater Standards and site specific background levels. The Class I Groundwater Standards of 35 IAC 620.410 are equal to or lower than the Federal MCLs. As

such, these Class I groundwater Standards have been adopted as an ACL in lieu of the MCLs. The proposed GPS values for the List G1, List G2 and Appendix II Assessment Monitoring parameters are presented in Tables 4, 5 and 6.

The GPS values for inorganic constituents which are present in the landfill leachate but also exhibit significant background concentration variations would be based on either the background concentration (to the extent that background concentrations can be defined) or in instances where the background levels cannot be readily defined due to the aforementioned site specific limitations, the GPS value would be set equal to the relevant 35 IAC 620.410 standard. In some instances, the background groundwater concentrations are higher than the leachate concentrations. In these instances, the inorganic constituents are believed to provide a poor indication of potential leachate impact. As discussed in the adjusted standard Section 1(f), it is proposed that the inorganic constituents that are believed to serve as poor indicators of potential leachate impact either be removed from the detection and assessment monitoring parameter lists or be exempted from the statistical analysis requirements of permit condition VIII.A.13. A proposed alternate monitoring list is specified in Section 1(f).

j) Statement Regarding Hearing

The petitioner waives its right to a hearing pursuant to Section 104.422.

k) Citation of Legal Authorities and Supporting Documents

As previously mentioned, the primary support for the use of groundwater protection standards is 35 IAC 811.325(e) which discusses the use of public health and environmental risk criteria to establish the criteria for remediation at facilities where the groundwater quality is degraded due to activities which occurred prior to the landfill operations. This petition proposes that the Illinois Class I Groundwater Standards (Refer to 35 IAC 620.410) be utilized to define Groundwater Protection Standards that are protective of public health and welfare.

As in the case of Petition No. 1, the appropriate regulatory guidance has been utilized in preparing this petition. Specifically, Sections 28.1 of the Illinois Environmental Protection Act and 35 IAC 104.400 (Subpart D) discusses the requirements for demonstrating that the proposed adjusted standard adherence to State of Illinois regulatory requirements.

The State regulations from which relief is sought include 35 IAC 811.319 and 811.320. Pursuant to the requirements of 35 IAC 104.406(K), copies of these regulations are provided in Appendix E. Section 35 IAC 811.320(b) provides the regulatory process for justifying Adjusted Groundwater Quality Standards. These procedures are deemed applicable because the groundwater use or potential future use considerations are an important factor in why the adjusted standards are being sought.

Federal Subtitle D regulations at 40 CFR 258.55(h and i) describes the process for developing Groundwater Protection Standards to assist in interpreting potential risks to human health and the environment. Pursuant to the requirements of 35 IAC 104.406(K), a copy of 40 CFR 258.55 is provided in Appendix E-1.

Finally, as in the case of Petition No. 1, the preceding demonstration has also included references to the Gallatin National Permit appeal presented in PCB Docket No. 1991-156 (January, 1992) since this permit appeal raised many points which are applicable to the requested adjusted standard. For instance in the Gallatin decision, the Board found that "there were inherent enforceability problems in requiring an entity who had nothing to do with the pre-existing background exceedance to clean it up". The Board also found that rigorous application of the State's Groundwater Quality Standards could encourage landfill operators to seek to build in high quality groundwater areas, rather than in areas where the pre-existing groundwater quality is substandard. A copy of the Board's decision on the Gallatin National appeal (PCB Docket No. 1991-156) is provided in Appendix E-1.

As noted in Petition No. 1, there are a few notable differences in the Gallatin Appeal which do not apply to this proposed adjusted standard application. For example, Gallatin National sought to develop a landfill at a site where no Municipal Solid Waste landfill operations had previously occurred as such the operator of Gallatin had the ability to analyze background groundwater quality using either interwell or intrawell statistical approaches. As discussed in the previous sections, these statistical approaches are either not technically viable due to interwell statistical limitations associated with the following: discontinuities in hydrostratigraphic units, upwelling of mineralized groundwater from deeper bedrock, inability to characterize minespoil and lacustrine background groundwater quality using upgradient monitoring data, or due to intrawell statistical procedure limitations resulting from landfill related groundwater quality changes. Also, the Gallatin appeal sought to set aside the General Groundwater Quality Standards (i.e., 35 IAC 620.420) due to the elevated background concentrations present in the strip mined areas, whereas the preceding adjusted standard petition seeks to adopt many of the Class I Groundwater Standards of 35 IAC 620.410 as Groundwater Protection Standards to help alleviate compliance issues associated with the inability to statistically characterize background groundwater concentrations.

The GPS values also help resolve technical limitations associated with achieving non-degradation remedial goals within a highly degraded groundwater environment. The GPS provide remedial objectives which are protective of public health, welfare and the environment while recognizing the limitations associated with the anthropogenic groundwater quality degradation caused by previous mining operations and/or the natural upwelling conditions associated with the hydrodynamic groundwater flow within the central portion of the Illinois Basin. These conditions affect the site groundwater quality resulting in highly variable background concentrations. As such, the goal of maintaining non-degradation standards or requiring the restoration of groundwater quality to background concentrations which are variable and/or difficult to characterize is unrealistic.

l) Additional Information Required in the Regulation of General Applicability

Technical demonstrations have been completed to support the proposed list of detection and assessment monitoring parameters. These technical demonstrations are provided in Appendix A submitted under separate cover and have been submitted to the Illinois EPA for their consideration.