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May 5, 2011

Regarding: Request for Reconsideration of Oct. 2010 Approval of NV Energy Landfill Application

Dear Southern Nevada Health District Board of Health Chairwoman Strickland, All Members of the Board, and Dr. Sands:

Thank you for the opportunity last week to address the Board of Health on behalf of the Sierra Club. Our April 28, 2011 testimony was with respect to the NV Energy application to expand its coal ash landfill at its Reid Gardner site in Moapa. At the meeting Sierra Club requested that you reconsider the Board's October 28, 2010 decision where you approved the application but did not approve new permit conditions and of necessity did not authorize issuance of a permit.

Several Board Members noted during last week's meeting that Sierra Club's request could not be acted upon because the relevant agenda item for the April 28, 2011 meeting did not provide for Board action. Board members also expressed confusion about the nature of the proposed expansion, not realizing that the proposal would allow up to an additional 35 years of disposal of coal ash onto the existing, entirely unlined landfill, and also did not realize that the application failed to comply with core regulatory requirements that preclude Board of Health assessment of risk to the environment and public health.

Accordingly, Sierra Club hereby requests that the Board take action at its next meeting to reconsider its Oct. 28, 2010 decision approving NV Energy's application.

Despite the passage of 493 days from the date of its initial application through last Thursday's meeting, NV Energy still had not complied with the core state protective rules, including to "demonstrate that the design is sufficient to protect the waters of the State from degradation by pollutants or contaminants" and to ensure that the landfill "will not cause or contribute to pollution."¹ The application is therefore not merely technically incomplete; it is substantively incomplete; for both reasons, then, it is legally inadequate. Indeed, it offers very little relevant information to you about the risks that the Board is being asked to impose on the environment and public health.

The Board's action on Oct. 28, 2010 was predicated on NV Energy's unsupported assertion that leachate generation would be "insignificant." Notwithstanding NV Energy's claims to the contrary last Thursday, NV Energy's own submissions to the SNHD illustrate that leachate generation will be massive – indeed, in the range of millions of gallons per year in the active portion of the landfill – and so, "significant" by any reasonable definition.ⁱⁱ

Accordingly, NV Energy has no basis for its refusal to demonstrate that the design of the proposed landfill expansion "is sufficient to protect the waters of the State from degradation by pollutants or contaminants," and for its refusal to provide "[t]he volume and physical and chemical characteristics of predicted leachate generation." NAC 444.739 (5). **The Board must not approve a landfill application that entirely fails to meet state requirements that are central to the Board's mission to protect public health and the environment.**

Moreover, several aspects of the presentation by SNHD staff and NV Energy at your meeting of April 28, 2011 amplify the importance of decisive action by the Board, including the discussion of leachate generation, a newly-proffered definition of the term "significant" used to justify the failure to comply with NAC 444.739,ⁱⁱⁱ inadequate assurances about compliance with state law and with pending federal rules, unclear commitments on a sampling plan, and questions about the record in this matter.

(1) NV Energy's Submissions on How Much Leachate will be Generated

At the April 28, 2011 Board meeting, NV Energy and its expert urged you to dismiss the results of its Oct. 2010 submissions to SNHD staff that are based on NV Energy's use of the industry standard Hydrologic Evaluation of Landfill Performance (HELP) program. In particular, they urged you to ignore the results of the NV Energy seventh run of the HELP program, one that was expressly undertaken at the request of SNHD staff.ⁱⁱⁱ NV Energy and its contractor noted that the "scenario" selected by SNHD staff for this run required NV Energy to put "255 inches of rain on the landfill." They proceeded to disparage district staff's requested "unrealistic scenario," offering "for perspective" that "Seattle gets about 40-inches per year," that SNHD's precipitation choice was "way further than any conditions that we would see here," and that this was "a little bit more [rain] than we get here in Southern Nevada."^{iv} NV Energy's engineering contractor Nathan Betts, who headed the consulting team that prepared the application, further testified that SNHD staff's purpose in requesting use of this "unrealistic" and "extreme in nature" scenario was to "examine the sensitivity of the [HELP] model."^v Regrettably, according to Betts, this "caused some problems in the model."^{vi} In essence, NV Energy implored you at your April 28 meeting to dismiss NV Energy's own submission because the results obtained were a function of bizarre SNHD staff requests.

The Board of Health must reject NV Energy's importuning. SNHD staff's request on precipitation values for HELP run #7 was not outlandish. Instead, staff aimed to account for water placed on the landfill for dust suppression, which NV Energy maintains will approach the equivalent of 255 inches of rain per year. Accounting for that water when considering the permit application and permit conditions is therefore appropriate, as Vinny Spotleson of the Sierra Club noted in a public comment at the termination of the April 28, 2011 meeting. Indeed, based on testimony and evidence adduced by the Moapa Band of Paiutes to the Board, present levels of

watering of the landfill may be insufficient to fully suppress harmful coal ash dust infiltration into the Tribe's community.^{vii} If the submitted HELP results are in error, then, it is that they underestimate the water that should be added to the landfill and so underestimate the amount of leachate generated by the landfill.

(2) NV Energy's New Definition of "Insignificant"

At the April 28, 2011 Board meeting, NV Energy adhered to the assertion of its application that leachate formation will be "insignificant." Under questioning, however, consultant Nathan Betts stated that there is "no numerical value" behind NV Energy's use of the term^{viii} and that he couldn't presume what any other expert in the industry outside his own team of consultants "would have thought when looking at it." NV Energy's Tony Garcia then interjected to offer, for the first time, a numerical definition of "insignificant" – namely 100 gallons per acre per day.^{ix}

NV Energy accordingly now asks the Board to believe that anything less than 5 million gallons a year of leachate contamination from this landfill is "insignificant."^x The postulate is absurd on its face and sharply conflicts with state standards.^{xi} See NAC 444.644. Further, the quantification is provided without respect to contaminant load or other features of a proper physical and chemical characterization of the leachate.^{xii} See NAC 444.739. The Board must reject NV Energy's definition and affirm, by reconsidering and disapproving the application, that NV Energy was never relieved of its obligation to "demonstrate" that its landfill design would "protect the waters of the State from degradation by pollutants or contaminants." *Id.*

(3) Compliance with State Law

Draft Permit Condition #2, as presented to you by District staff on April 28, would require the landfill to be "at all times in compliance with the latest version of the Solid Waste Management Authority Regulations Governing Class III Landfills and NAC 444.570 through 444.7499 as applicable." Sierra Club has already demonstrated, based on the available evidence, that the existing landfill is polluting groundwater.^{xiii} That evidence was examined by expert hydrogeologist Elliott Lips and reported to you in testimony and letters. In addition, the NV Energy submissions establish that more than a million gallons of leachate per year are contaminating the environment. Accordingly, NV Energy's existing waste disposal operation on its coal ash landfill is already violating the aforementioned regulations, and the proposed expansion will exacerbate and prolong the contamination. **The Board simply must not approve a permit whose standards it knows will be violated from day one of issuance.**^{xiv}

(4) Pending EPA Rule on Coal Ash

Draft Permit Condition #5, as presented by SNHD staff, provides assurance that NV Energy will be required to modify its permit and conform its operations to changes in statutes or regulations, including when a new EPA rule is adopted governing coal ash disposal.

However, any new EPA coal ash rule will likely "grandfather in" existing facilities. Condition 5 as written is therefore meaningless. It will remain meaningless unless revised to establish that all protective standards and requirements for new coal ash landfills, including those in a final EPA

rule, will apply to the existing NV Energy coal ash landfill at Reid Gardner without respect to exemptions or exceptions for existing facilities that might otherwise be available. **Nevada law protecting public health and the environment cannot be ignored simply because federal EPA regulation is lax, pending, or ridden with loopholes.**

(5) The Mesa Landfill Sampling Plan

The Board cannot approve the permit, including Condition 8, without public access and comment on the proposed sampling plan since that plan is supposed to contain exceedance levels and enforcement triggers. SNHD staff memorandum #10-11 to the Board of April 28, 2011 established that NV Energy would provide to the SNHD a final sampling plan within 30 days of the issuance of the permit. Sierra Club objected to this arrangement. SNHD staff on April 28, 2011 stated that a final sampling plan must be finalized before a permit issues. If this change holds and NV Energy submits its plan for review *prior* to permit issuance, then the Board could ensure adequate public participation with respect to that plan.

In anticipation of that, Sierra Club requests, in electronic form, an up-to-date plan, an up-to-date draft permit, an up-to-date application, and any other supportive materials related to the permit or application generated since April 15, 2011. We request this material at least two weeks prior to the meeting at which you will reconsider your decision to approve the application, as Sierra Club has requested.

As before we stress that potentially well-considered permit terms, including a fully considered sampling plan, cannot substitute for an adequate application in the first instance. In the present application, NV Energy studiously avoids providing sufficient information for the Board to evaluate the risks it may, by granting the permit, impose on public health and the environment.

(6) Sierra Club's Participation in the Administrative Process

Board of Health Chairwoman Strickland questioned why the Sierra Club's expert failed to raise the need for an adequate study of leachate forming from the landfill prior to the Board's Oct. 4, 2010 workshop in Moapa.

In fact, Sierra Club previously raised this issue:

(1) In our June 4, 2010 letter to Glenn Savage, in which we alleged that groundwater contamination from the landfill "is in no doubt attributable to the fact that the present landfill lacks adequate protections to prevent leachate from contaminating the environment."

(2) In our Sept. 9, 2010 email to Walter Ross, with copies to Glenn Savage, Dennis Campbell and Eddie Ridenour;^{xv}

(3) In our Oct. 1, 2010 email to the Board, as well as in Mr. Norris's memorandum to me of Sept. 22, 2010 to which we referred and attached to our Oct. 1, 2010 transmission to the Board.^{xvi}

Far from hiding the ball, and notwithstanding that our formulation sharpened with added expertise, Sierra Club made exceptionally vigorous efforts to convey to the District and the Board throughout the summer of 2010 its concern that operations under the NV Energy coal ash landfill will fail to protect public health and the environment, and that far greater scrutiny was warranted.

In sum, we urge you to schedule for your next Board of Health meeting a reconsideration of the Board's earlier, Oct. 28, 2010, approval of NV Energy's application to expand its coal ash landfill at Reid Gardner.^{xvii}

Please do not hesitate to contact me if you have any question about these points and authorities.

Sincerely yours,



Dan Galpern
For the Sierra Club

[Endnotes follow on subsequent pages.]

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ⁱ NAC 444.739 provides, in relevant part:

Report for design. (NRS 444.560) A report for the design of a Class III site must:

....
5. Demonstrate the design is sufficient to protect the waters of the State from degradation by pollutants or contaminants. The demonstration must consider, without limitation:

- (a) The hydrogeologic characteristics of the site and surrounding area;
- (b) The climatic factors of the area; and
- (c) The volume and physical and chemical characteristics of predicted leachate generation.

....

ⁱⁱ As Sierra Club previously has explained, the Board presumed, but did not verify, that submissions by NV Energy in October 2010 supported its central assertion. District staff permitted Sierra Club access to those submissions only after the Oct. 28, 2010 Board hearing. Those submissions strongly support the analysis of Sierra Club’s experts that the landfill presents a significant risk to the environment, including the region’s groundwater – “waters of the State” under Nevada law. See NRS 445A.415 (2) (definition includes “[a]ll bodies or accumulations of water, surface and underground...”).

ⁱⁱⁱ Audiotape of SNHD Board of Health Meeting of April 28, 2011, available at <http://www.southernnevadahealthdistrict.org/boh-minutes.php>

^{iv} *Ibid.*

^v *Ibid.*

^{vi} *Ibid.*

^{vii} When the landfill ceases accepting wastes for disposal and is capped, then – presuming that those caps are effective – there may then be less need for such dust suppression watering. Until that time, NV Energy will not be able to comply even minimally with its requirement to minimize coal ash dust pollution without continuous watering.

^{viii} Consultant Betts added, however, that “the only real regulatory standard for leachate is how the depth of the water that is sitting on top of the liner. And in this case, the depth of the water is going to be about like 5 hundredths of an inch. And the regulatory requirement is that it has to be less than 12 inches.” Audiotape of SNHD Board of Health Meeting of April 28, 2011, available at <http://www.southernnevadahealthdistrict.org/boh-minutes.php>.

Expert hydrogeologist Charles Norris dealt thoroughly with the depth of water issue in his letter to you of April 22, 2011, at 13-16. In sum, as Norris noted, “[t]he depth-of-leachate computation is not a measurement of, and is not a surrogate for, the rate or volume of leachate generation. It provides no relevant information for, nor method for developing, the demonstration that the landfill will not degrade waters of the State, as required by NAC 444.739.” *Norris letter* at 14. Although Norris’s letter was previously submitted to the Board, for the convenience of Members and staff we have appended it here as well as Attachment A.

^{ix} Betts had earlier stated that an unspecified EPA guidance document “suggests an allowable leakage rate through the landfill liner of 100 gallons per acre per day.”

^x 100 gpd/acre , over 131 acres, for 365 d/year = 4.8 million gpy (approximately). Betts also stated that HELP model runs #1-6 established that actual leachate for acres not being watered for dust suppression would be less than 20 gpd per acre. This still approaches 1 million gallons per year for the 131-acre footprint of the landfill, excluding acres in need of watering for dust suppression. Although the regulations do not provide for any *de minimis* exemption from the requirements of NAC 444.739, even if they did the quantity of 1 million gallons of leachate contamination could not reasonably be deemed *de minimis*.

^{xi} NAC 444.644 provides, in relevant part:

Systems for solid waste. ([NRS 444.560](#))

1. All solid wastes must be:

(a) Stored, collected, utilized, treated, processed and disposed of by means that do not create a health hazard, public nuisance or impairment of the environment.

....

2. All solid waste systems **must be operated in a manner that will not cause or contribute to pollution of:**

(a) The atmosphere; or

(b) Surface or groundwaters of the State.

....

[Emphasis added.]

^{xii} A small amount of leachate of high toxicity may be as hazardous to public health and the environment as a larger amount of leachate with lower levels of toxicity.

^{xiii} The representation by NVE at the April 28, 2011, Board meeting that contamination of groundwater under the existing landfill predates the date of the landfill is a red herring . The contamination does NOT predate NVE’s disposal of CCB wastes on the mesa in areas now covered by the present landfill. We know of no record of any industrial activity prior to NVE placement of wastes on the mesa that could suggest predecessor contamination in that location. NV Energy must not be allowed to grandfather in all of its existing contamination of the environment under this proposal landfill permit.

^{xiv} Instead of authorizing additional contamination stretching over decades, the Board should order the closure of the Reid Gardner landfill.

^{xv} In response to our receipt of a bare bones set of “waste characterization” spreadsheets, we asked, *inter alia*:

....

“What is the bulk composition of these wastes?”

(5) What is the expected concentration of ALL constituents (not just the RCRA 8 and pH) that can impact human health and the environment in leachates that will form from these wastes?

(6) If NV Energy provides you with an answer to (5), please find out (and share with us) what leachate characterization protocol has it used to address the inadequacies of the TCLP test — so as to provide the necessary information for the Health District to meet its obligation to protect public health?”

^{xvi} These materials were previously submitted to the Board; we will retransmit them – and will forward the materials referred to in the next two emails as well – upon the request of any member of the Board of Health or SNHD staff.

^{xvii} In addition, in light of the contamination that all available evidence demonstrates will be generated not only by the landfill expansion but also from existing operations, the Board should act both to reconsider its prior approval of the expansion proposal and also to direct district staff to consider revoking NV Energy’s existing permit and to compel the company to undertake environmental remediation at the Reid Gardner site.

Attachment A

Charles Norris, Geo-Hydro Inc., letter to the Board of Health, April 22, 2011

April 22, 2011

By USPS mail to:

Chairwoman Linda Strickland
Southern Nevada District Board of Health
P. O. Box 3901
Las Vegas NV 89106

(Also sent by email or fax Ch. Strickland and Board Members)

Dear Chairwoman Strickland and Members of the Board:

I testified at a public comment meeting conducted by the Southern Nevada Health District (SNHD) on October 4, 2010, in Moapa, regarding deficiencies in the application by NV Energy (NVE) for a proposed expansion of the Reid Gardner Station (RGS) ash landfill. Subsequent to that testimony, I reviewed additional materials made available by NVE and/or SNHD of Health to Western Environmental Law Center (WELC) that, in part, pertain to issues that I raised or discussed at that meeting. At the request of WELC, I am writing to you to discuss my review of those additional materials and to present my assessment of them as they relate to the concerns I initially expressed.

As I will describe in more detail below, the concerns I expressed in my October 4, 2010, testimony in Moapa have not been assuaged by my review of the new materials. Quite to the contrary, the new materials in the application reinforce many of my original concerns and confirm the deficiencies of the application. The application remains deficient in failing to demonstrate that the proposed facility will not degrade Nevada's ground- and surface waters. But, it is now clear from the new materials available to the Board and the public, that extant degradation of Nevada's

GEO-HYDRO, INC

groundwater by the existing facility is virtually certain and will be exacerbated by the proposed expansion. It is equally clear that the application still lacks the necessary characterizations of waste, waste leachate, geology, and hydrogeology to allow the company to demonstrate, or the Board to find, that the proposed expansion will not itself degrade waters of the State.

Since the October 4, 2010, meeting I have been provided with new documents relating to the proposed expansion of the RGS ash landfill from three sources. The first source is the modifications to the application for the proposed landfill expansion, provided to SNHD by NVE (Mod). The second source is Memorandum 15-10, with attachments, dated October 28, 2010, from the SNHD staff to the Board (Memo 15-10). The third source I reviewed is the minutes of the Board's meeting on October 28, 2010 (Minutes). These are the primary materials I have reviewed since my testimony on October 4, 2010, in Moapa. It is my understanding that all of these sources are before the Board. Where my review of these sources caused me to review other sources or documents, I will reference those for the Board's convenience.

Leachate Generation at the Proposed Expansion

The revised (*i.e.*, subsequent to October 15, 2010) application persists in asserting that the quantity of leachate that will be produced by the proposed expansion will be "insignificant."¹ The revised application, unlike the previous (December 22, 2009) version, now lists, as its first reason for this assertion, "Computer modeling using the Hydrologic Evaluation of Landfill Performance (HELP)."² The SNHD staff, in Memo 15-10, accepts the "insignificant" leachate assertion in NVE's

¹ Mod, Tab 4, p. 15-2, "The quantity of leachate generated in the Landfill is expected to be insignificant ..."

² *Ibid.*

application in the staff's response to public comments, also calling upon the newly produced HELP modeling as the underlying rationale.³

The program HELP is an appropriate tool to assess the potential for leachate generation from a landfill, and it is good that this modeling was done. In fact, I strongly criticized the application at the October, 4, 2010, hearing for failure to have performed such an evaluation, citing HELP as an example of tools available, to quantify likely leachate generation rates, in compliance with NAC 444.739 5. (c). I used the term *unconscionable* for the absence of such modeling.

Although the application then before the public and, presumably, before the SNHD did not include any such modeling⁴, a later submittal to your staff establishes that some HELP modeling was done in June 2009; it just wasn't part of the application before the Board. That submittal also establishes that an additional model run was October 15, 2010, after the Moapa hearing.⁵ The 2009 modeling investigated landfill performance under six scenarios with water solely from precipitation. The seventh simulation, performed after the Moapa hearing, investigated landfill performance under a single scenario that included both precipitation and water added for dust suppression. This was a scenario I specifically identified in my Moapa testimony as an important element for evaluating leachate generation from the proposed expansion.

³ Memo 15-10, p. 86, response to ASI # 73; "NV Energy used computer modeling to predict that the potential for leachate generation is insignificant. The modeling program used was Version 3 of Hydrologic Evaluation of Landfill Performance (HELP)."

⁴ Contrary to some of the discussions in Minutes from which one might infer HELP modeling results were part of the application before the public prior to the October 4, 2010 hearing, neither HELP results nor even reference to HELP use are part of that application. Any interpretations from the statements in Minutes by Mr. Campbell, at page 62, that HELP reference or information was included in emails to me from Carol Clarke on September 23 (and 24), 2010, are totally in error. No HELP information was provided in that Tab 11 transfer.

⁵ There is a technical memorandum from Nathan K Betts of CH2M HILL, NVE's landfill consultant, to Walter Ross of SNHD staff, dated October 15, 2010, entitled "Explanation of HELP Model Results." Attachments to that technical memorandum included the input and output data from six model runs performed in June 2009 and a run performed on October 15, 2010.

The seven HELP simulations purportedly were run, in part, to determine the volume of leachate produced by the landfill expansion.^{6 7} Such determination would have partially provided the information required for compliance with Nevada regulations prohibiting degradation of waters of the state.⁸ HELP provides output that allows one to calculate the projected rate of leachate generation. But, neither NVE nor its consultant provided in the application or in the technical memorandum to the Board's staff a computation of the leachate generation rates. The revised application simply re-asserts the leachate generation will be "insignificant."

How HELP Works

The HELP program allows a detailed analysis of leachate production and how it is distributed within and moves through a landfill. But, before I discuss the results of these HELP runs with respect to leachate generation, it is worth discussing what HELP does and how it does it.

HELP primarily considers a column of material defined by the user as representative of some part of the landfill at some point in time. One scenario might be to evaluate the landfill performance before any waste is placed. Another scenario might be to evaluate the performance with a full thickness of waste and all final covers. Another might be to evaluate the condition of partial waste thickness and no cover. Leachate is one type of water that comes in contact with waste.

⁶ *Ibid*, page 1, "HELP modeling was performed on the South Lateral Landfill Expansion (SLLEP[*sic*]) to (1) determine the estimated contact water generation rates for the contact water balance modeling, (2) determine estimated peak head build-up (seepage height) along an interior side slope of the landfill for stability evaluations, and (3) estimate the peak head buildup on the bottom liner system."

⁷ Memo 15-10, p. 83, attachment M, SNHD Response to ASI #69, repeated at p. 85, attachment M, SNHD Response to ASI #71, "A 'HELP' or Hydrogeologic [*sic*] Evaluation of Landfill Performance computer model was submitted to aid the design of the Leachate (contact water) Collection and Management System and to predict the amount of leachate (contact water) which will be generated 'computer modeling.'"

⁸ NAC 444.739 states, "A report for the design of a Class III site must: 5. Demonstrate the design is sufficient to protect the waters of the State from degradation by pollutants or contaminants. The demonstration must consider, without limitation: (c) the volume and physical and chemical characteristics of the predicted leachate generation."

HELP evaluates landfill performance under a choice of water inputs. Most commonly, the water input to a model run, or simulation, is precipitation (rain and snow). Another option is to use a combination of precipitation and artificial water, as one might get from spreading water for dust suppression. Regardless of the nature of water introduction, HELP combines them all into the input term *precipitation*.

HELP evaluates the performance of the landfill by determining what happens to the precipitation that is input to the simulation in response to the material characteristics that are input.⁹ The potential choices for the fate of the water are that it can infiltrate into the landfill or it can be lost as *run-off* without infiltrating. HELP can compute how much of the introduced water does either.

A number of things can happen with water that infiltrates. For water near the surface of the landfill, if the conditions are right, it can evaporate from the surface under drier conditions. It can be taken up by plants and transpired to the air as part of cooling or photosynthesis. In HELP, these two processes are combined into a single process called *evapotranspiration*. Since variables that control evapotranspiration are strongly controlled by weather and climate, weather and climate variables are also inputs to HELP.

Water that infiltrates but is not lost to evapotranspiration becomes part of the water stored in the landfill, at least temporarily. The HELP term for this water is *storage*. The analogy of a sponge

⁹ One inconsistency of note is that the input properties of the waste materials in HELP are sometimes inconsistent with values ascribed to them elsewhere in the application. One example is the hydraulic conductivity of the ash. In Mod, Tab 4, p. 15-2, among the list of reasons contributing to the assertion of “insignificant” leachate production, the application states, “Relatively low permeability of compacted ash (1×10^{-5} cm/sec).” In the HELP model the value used, the default value provided by the Corps of Engineers with the program, for high-density fly ash compacted to optimum dry density is 5 times as high as that in the text. As pointed out in my September 2010 memorandum, even the lower of these values is *not* characteristic of a low permeability material.

is often used; water dripping on a dry sponge will dampen the sponge initially and be stored in it. Eventually, if the dripping continues, the sponge becomes “full” and any new water will find a way out of the sponge. The same is true of a HELP simulation of a landfill. Once the storage capacity of the landfill material is exceeded, water will flow through and discharge from a landfill.

HELP computes the discharge water beyond that in storage. There are two generally used mechanisms in HELP to discharge from the landfill. One is water migration out of the bottom of the landfill. The HELP term for this water loss is *percolation* or *leakage*. The second form of water loss from the landfill, if it is designed into the engineering of the landfill, is water extracted from the landfill by a leachate collection system. The loss of water from the landfill in HELP is *drainage*.

Since HELP can evaluate changes of precipitation with time, each of the other factors will change with time. For that reason HELP simulations are usually run over periods of many years to account for variability within and among years and develop good average values.

A HELP simulation works from the principle of conservation of mass, *i.e.*, all of the water being put into the model must be accounted for. HELP cannot create water and HELP cannot destroy water. The basic balances for a HELP evaluation of a landfill are (1) infiltration to the landfill is precipitation minus run-off,¹⁰ (2) leachate¹¹ moving into storage or through the landfill is

¹⁰ All of the HELP simulations presented by CH2M Hill to date defined run-off as zero. Thus, for purposes of these scenarios, precipitation is infiltration.

¹¹ Leachate is a term typically restricted to water that infiltrates into waste too deeply to be lost to evapotranspiration, as opposed to run-off, water that simply runs along the surface of the waste, without infiltrating it. Both leachate and run-off are contact water.

infiltration minus evapotranspiration, and (3) once storage capacity of the landfill has been reached, leachate is equal to leakage plus drainage.¹²

Simulated Rates of Leachate Generation from NVE's HELP Modeling

The HELP simulation performed by CH2M HILL used one of two precipitation scenarios. The six June 2009 simulations modeled precipitation to duplicate the averages and variations of the weather patterns at Las Vegas. These six simulations were each run for a period of 20 years. The October 2010 simulation also uses Las Vegas weather data for variations in natural precipitation but added substantial precipitation to represent water added by typical operations, including dust suppression. This simulation was run for a period of five years.

The October 2010 simulation, HELP run 7, is configured as a full landfill, with 85 feet of ash atop the leachate collection system and the liner. Since the simulation is run with run-off equal to zero, the leachate production is equal to precipitation minus evapotranspiration. A review of the output over the five-year period of the simulation establishes that it took two years for the landfill to reach equilibrium with storage, *i.e.*, much of the leachate during the first two years did not drain through but was retained within the landfill. For the final three years, storage varied slightly from year to year, but no longer showed systematic increase, and the combined discharge from drainage and leakage approximately equaled the leachate generation rate. The averages for the last three years were, therefore used to estimate the landfill performance under operating conditions of water addition on the active portion of the landfill.

¹² Each time period will show minor additions to storage or reductions from storage depending on immediate and recent weather variations that will be inversely reflected in the discharge from the landfill. Over a long period of simulation, these changes will sum to zero and average leachate will equal average discharge (drainage plus leakage).

The average leachate generation rate projected by HELP run 7, *i.e.*, the difference between average precipitation (including water for dust suppression) and average evapotranspiration over the three-year period of interest is approximately 604,000 cubic feet of leachate per acre per year (cf/ac/yr), or about 4.5¹³ million gallons of leachate per acre per year (Mgal/ac/yr). By no stretch of the imagination can 4.5 Mgal/ac/yr be considered an insignificant annual per-acre volume of leachate. But, that rate of leachate generation applies to the entire active area, not just one acre. There is nothing in the application that indicates how many acres of the landfill are typically being actively watered. In the Minutes of the Board meeting on October 28, 2010 (p. 34), Walter Ross suggested such active area might be 10 acres.¹⁴ Using Ross' 10-acre suggestion as a guide, the annual leachate generated under the active areas is about 45 Mgal/yr.

Most of the proposed expansion will not be active at any given time and will not be subject to artificial watering. These areas will have leachate generated from naturally occurring precipitation. The CH2M HILL technical memorandum included six HELP simulations for this precipitation condition, using weather records available directly in HELP from Las Vegas. The Las Vegas data, while convenient to use, appear to underestimate rainfall at the landfill and, therefore, will

¹³ I will report leachate values to only two significant digits, to reflect the uncertainties of the input value to HELP.

¹⁴ The discussion of surplus water from the CH2M HILL technical memorandum can be interpreted to suggest an active operating face of only 3 acres.

underestimate the generation rate of leachate.¹⁵ The HELP simulation with Las Vegas weather and with the same landfill configuration as HELP run 7 will be referred to as HELP run 3.¹⁶

A review of the output from HELP run 3 shows that for the first 5 years of the 20-year simulation, most of the infiltrating leachate being generated was consumed by increasing the leachate storage in the landfill. Thereafter, the landfill approached an equilibrium condition and discharge from the landfill approximately equaled infiltrating leachate.

The average leachate generation rate projected by HELP run 3, *i.e.*, the difference between average precipitation and average evapotranspiration over the 15-year period of interest, is approximately 1,600 cf/ac/yr, or about 12,000 gal/ac/yr. That rate of production is significantly less than the per-acre rate where ash is watered, but this rate of leachate generation applies to the entire landfill area outside the actively watered area. The lined and unlined areas of the proposed expansion total 130 acres. If 10 acres is actively water, then the unwatered 120 acres will produce 1.4 Mgal/yr. Again, this is not an insignificant volume of leachate. The combined leachate generation for the proposed expanded facility is the sum of these two leachate generation rates, about 46 Mgal/yr.

The Fate of the Generated Leachate

Leachate generated in the landfill impacts groundwater only where it is allowed to migrate to groundwater. There are no barriers to leachate migration to underlying groundwater in the 90 acres

¹⁵ Weather data from Las Vegas and several stations closer to RGS show Las Vegas has significantly lower precipitation. The weather data compiled by Western Regional Climate Center, on line at <http://www.wrcc.dri.edu/coopmap/> show Las Vegas to have an annual, long-term precipitation rate of 4.16 in/yr. In comparison, Logandale has an average of 5.14 in/yr (124% of that at Las Vegas); Mesquite, 5.85 in/yr (141%); Bunkerville, 6.23 in/yr (150%); and Valley of Fire State Park, 6.56 (158%).

¹⁶ It is the CH2M HILL run entitled "Nevada Energy Pond South Lateral Bottom 85'Waste" and was run on June 25, 2009.

of the proposed expansion facility that remain unlined. In the 40 acres of the proposed expansion facility on BLM land, where BLM requires a liner system, the liner and leachate collection system will intercept part of the leachate, reducing the portion that will migrate directly to underlying groundwater. The HELP modeling that was done by CH2M HILL allows an assessment of the portion of leachate that is intercepted (HELP drainage) and the portion that continues to move through the bottom of the landfill and directly toward underlying groundwater (HELP leakage).

HELP run 7 computes the distribution of leachate discharge between drainage to the leachate collection system and leakage through the bottom of the landfill for areas being actively watered. Considering, as above, the last three (equilibrium) years of the five-year simulation, HELP run 7 shows that when active watering is occurring over a lined portion of the expansion, the volume of leachate leakage through the bottom of the liner to groundwater is 240,000 gal/ac/yr. HELP predicts the volume of leachate that will drain to the leachate collection system from watered areas underlain by the collection system is 4.3 Mgal/ac/yr, i.e., total generated leachate (4.5 Mgal/ac/yr) minus leachate that leaks through the liner (0.2 Mgal/ac/yr). Most of the generated leachate over lined areas is intercepted by the collection system. However, if the 10-acre watering area is again postulated, the lined area of the landfill under the watered area will leak 2.4 Mgal/yr of leachate to groundwater.

HELP run 3 computes the distribution of leachate discharge between drainage to the leachate collection system and leakage through the bottom of the landfill for areas without watering. Considering, as above, the last 15 (equilibrium) years of the 20-year simulation, HELP run 3 shows that with no active watering over a lined portion of the expansion, the volume of leachate leakage through the bottom of the liner to groundwater is 5,400 gal/ac/yr. HELP predicts the volume of

leachate that will drain to the leachate collection system from unwatered areas underlain by the collection system is 3,500 gal/ac/yr.¹⁷ It is noteworthy that for the unwatered scenario, HELP predicts that more of the generated leachate over lined areas leaks through the bottom of the liner than is intercepted by the collection system. Using the HELP run 3 per-acre leakage rates for the bottom of the lined portion of the proposed expansion, the total leakage to groundwater from the lined area will be 130,000 gal/yr¹⁸ if there is no watering.

HELP run 3 provides a non-conservative¹⁹ estimate of leachate volumes and fates that will exist in perpetuity once the landfill is closed. HELP run 3 computes the leachate generation rate without watering as 12,000 gal/ac/yr. Over the 90 unlined acres, the leachate generation rate is 1.1 Mgal/year, and all of that leachate can migrate downward to the underlying groundwater. If the leachate collection system continues to operate after closure, the bottom of the lined area of the landfill will leak at least 5,400 gal/acre/yr, and the total leachate leakage from the 24 acres of lined bottom is at least 130,000 gal/yr. The total, perpetual migration of leachate to groundwater, based upon HELP run 3, is 1.2 Mgal/yr, assuming perpetual use of the leachate collection system and perpetual life of the liner.

HELP runs 3 and 7 provide a range of estimates of leachate volumes and fates that will exist while the 130-acre landfill is operating. HELP run 3 computes the leachate generation rate in areas

¹⁷ For HELP run 3, 15-yr period of the simulation is insufficient to average out yearly changes in leachate storage within the landfill. The result, that average discharge from landfill is somewhat less than leachate infiltration, indicates that some net storage increase is still occurring during this averaging period.

¹⁸ This total presumes 24 acres of lined “bottom” areas. Other HELP simulations of “side” areas indicate little leakage through the liner there, so that area is not included.

¹⁹ HELP run 3 likely underestimates leachate generation rates for at least two reasons. First, as previously discussed, the use of Las Vegas weather data to generate precipitation problems uses data from an area with lower precipitation rates than seen closer to the facility. Second, HELP run 3 does not include in the simulation the properties of the final cover. The final cover described in the application will likely increase leachate infiltration into the landfill, primarily by decreasing evapotranspiration.

without watering as 12,000 gal/ac/yr. HELP run 7 computes the leachate generation rate over areas with watering as 4.5 Mgal/ac/yr. Using the Ross 10-acre estimate of watering, the combined leachate production is 46 Mgal/yr. The leachate migration to groundwater is the total leachate generated minus the leachate intercepted by the leachate collection system. If the 10-acre active watering area is located over the lined area, the leachate intercepted by the leachate collection system is 43 Mgal/yr, and 3.0 Mgal/yr penetrates to groundwater. If the 10-acre active watering area is located over the unlined area of the landfill, the volume of intercepted leachate is only 84,000 gal/yr and virtually the full 46 Mgal/yr penetrates to groundwater. Thus, active operations will produce annual leachate migration to groundwater of from 3 to 46 million gallons of leachate depending upon where the active area is located, and the closed landfill will produce 1.2 Mgal/yr of leachate that migrates to groundwater for the life of the liner system and 1.6 Mgal/yr in perpetuity thereafter.

Incremental Leachate Volumes with Time

The above HELP computations of leachate volumes and generation rates pertain to a presumption that the proposed facility is approved and operated as described in the application. It is important to note that the leachate generation rates are as applicable to the current landfill as to the proposed facility since the relevant differences are not at the surface of the landfill but only at the very bottom, where the engineered liner and leachate collection system occur. If the HELP simulation results are applied to the existing 91-acre landfill, using the same assumptions, the leachate production rate during active landfill management, with watering, is 46 Mgal/yr, and the leachate generation after closure is 1.1 Mgal/yr thereafter. In both cases, all of the leachate migrates

to groundwater. Each of these volumes is significant, and each is of the same order of magnitude as the simulations for the proposed expansion.

There is a major difference in impact between the existing and the proposed landfill facilities, however, when looked at over the increase in the proposed life available from the proposed expansion. The existing facility has remaining capacity until 2014.²⁰ The HELP modeling results indicate that leachate migration to groundwater, including watering of the active area would total almost 140 Mgal over that three-year period. Subsequently, migration to groundwater would decline to 1.1 Mgal/yr.

The proposed expansion of the facility extends the life of the RGS landfill to 2047.²¹ If the annual leachate rates of migration to groundwater are prorated based upon the relative areas that are lined and unlined, the average annual loss of leachate to groundwater from the proposed expanded landfill is 33 Mgal.²² The leachate loss to groundwater over the 36-year life of the proposed expansion is 1.2 billion gallons. Subsequently, migration to groundwater would stabilize eventually to 1.6 Mgal/yr. This is not an insignificant cumulative increase in volume of leachate that migrates to groundwater as a result of approving the proposed expansion.

The Deficiency of the NVE HELP Results in the Application.

Instead of processing the HELP data for the information required for the NAC 444.739 demonstration and presenting the leachate generation volumes in the application, NVE presents an

²⁰ Memo 15-10, p. 76, SNDH staff response to ASI # 40.

²¹ Memo 15-10, p. 86, SNDH staff response to ASI # 72, citing application as of December 22, 2009, then listing 35 to 37 years of disposal life with application for expansion.

²² Leachate migration to groundwater is 3.0 Mgal/yr when watering occurs over lined areas. This rate is applicable 40/130 of the time if prorated by area. Leachate migration to groundwater is 46 Mgal/yr when watering occurs over unlined areas. This rate is applicable 90/130 of the time if prorated by area. *I.e.*, $(3.0 \times 40/130) + (46 \times 90/130) = 33$

analysis of different data from the HELP runs. NVE assesses the depth of leachate on the liner system under various conditions.²³ The depth-of-leachate computation is not a measurement of, and is not a surrogate for, the rate or volume of leachate generation. It provides no relevant information for, nor method for developing, the demonstration that the landfill will not degrade waters of the State, as required by NAC 444.739.

The depth-of-leachate computation is a measure of the design adequacy of a proposed leachate collection system. It is a calculation required by good engineering practice. It is a calculation required in other Nevada regulations to establish adequate liner designs.²⁴ Meeting the criterion of those regulations means the design should provide effective leachate removal. Meeting those criteria cannot properly be translated into *any* statement of leachate volumes, let alone an assertion that, because the design should be acceptable, leachate volumes will be insignificant. That evaluation can *only* come from assessing the HELP model flow volumes, as has been done above. That assessment establishes without question that the leachate generation rates are very significant and so are the rates of leachate migration to groundwater.

The staff of SNHD did not object to the inappropriate substitution by the applicant of depth-of-leachate computations for the determination and discussion of generated volumes of leachate. In fact, the staff uncritically re-iterated this inappropriate substitution in the SNHD staff memo to the

²³ As examples, in Tab 4, Section 15, on page 15-2, instead of a generation rate, the application observes "... (i.e., less than one foot of depth)"; and in the October 15, 2010 CH2M HILL technical memorandum cited earlier, observations include, "... predicted contact water buildup over the liner is approximately 0.06 inches and 0.01 inch for the cell floor and side slopes, ..." and "... predicted contact water buildup over the liner is approximately 0.115 inches on the cell floor."

²⁴ The CH2M HILL technical memorandum identifies a 12" depth of leachate as a performance criterion for leachate collection systems that is established in NAC 444.681.

Board,²⁵ as if it were an acceptable methodology and a confirmation of little or no leachate generation. The lack of critical evaluation and independent evaluation by the staff on this issue, so fundamental to the core requirement of the regulations, is puzzling and worrisome.

Leachate and Waste Characterization in the Application for Expansion

Much of my testimony at the Moapa hearing and much of my memorandum submitted to the Board prior to that hearing focused on the characterization of the waste proposed for disposal at the expanded landfill. Specifically, my comments focused on the concern that the test results presented in the application as characterization of the leachates from the wastes were insufficient, and were insufficient largely because the test protocol that was used is incapable of predicting – and was never intended to predict – the composition of these wastes in this disposal setting. I repeat each of those concerns and issues herein by reference.

The Staff's response to my comments is solely and repetitively presented in Memo 15-10, Attachment M, as SNHD Response to ASI #71, on page 85. I use the terms solely and repetitively because that response is cited an additional 29 times in Memo 15-10, Attachment M, as all (18 times) or part (11 times) of the SNHD Response to issues raised in ASI #s 73, 75, 78, 79, 81-85, 89, 92-103, 111-117. Unfortunately, except for very limited statements, the SNHD Response to ASI #71 and subsequent citations, is largely irrelevant to the concern raised, damaged by misstatement or lack of understanding, weakened by misrepresentation of sources cited, or is simply in error. The weakness of the response to ASI #71 is so profound, it is necessary to parse it and counter-respond issue by issue.

Counter-Response to SNHD Response to ASI #71.

²⁵ E.g., Memo 15-10, p. 83, response to ASI 73.

TCLP is: ...

1) the analytical test standard for toxicity used to determine potential for health and environmental standards;

This statement is materially in error. As defined in federal regulation, and as described on the web site cited by SNHD Staff further into this response,²⁶ the only purpose for which this test is a “standard” is to demonstrate the characteristic of “toxicity” per 40 CFR 261.24.²⁷ A review of 40 CFR 261.24 establishes that *characteristic of toxicity* is unrelated to determining the “potential for health and environmental standards.” The TCLP is the only leaching protocol by which a non-exempt waste is classified as hazardous and therefore subject to management under the hazard waste rubric of RCRA.

In the context of the TCLP test, the “toxicity” characteristic is solely the statutory criterion for each contaminant with respect to the test protocol itself, not to some environmental or health standard. If the result of the TCLP exceeds the TCLP criterion of that constituent, a non-exempt waste is subject to management under Subtitle C or RCRA. If it does not, it is not. The criteria against which results are measured are simply not “health and environmental standards.” For example, the TCLP criteria for the 8 RCRA metals are 100x or more public drinking water standard (MCLs) and are unrelated to environmental threats entirely. At no place in federal statute or regulation, and at no point on the EPA web site cited in Memo 15-10, is there any statement or reasonable inference that the TCLP is an accepted protocol, or “standard,” to evaluate any waste for the potential exceedence of any “health and environmental standard.”

²⁶ http://www.epa.gov/osw/hazard/testmethods/faq/faq_tclp.htm

²⁷ *Ibid.*

2) *reflective of what occurs in a landfill (Ref-MOLO, McCoy);*

Unfortunately, I was unable to find a reference section in Memo 15-10 that allowed me to review this reference. However, unless the “landfill” in the McCoy document pertains to an industrial landfill filled with fly ash, the observation is irrelevant.

3) *Permit condition is to monitor and report volumes and for specified Profile 1 constituents of liquids in contact water ponds “field observations”*

It is unclear what this enumerated item has to do with the TCLP as a predictive tool for leachate composition. Notwithstanding that uncertainty, I infer this observation is offered as an alternative to the TCLP as a way to document the volume and composition of leachate. This alternative would be implemented by measuring and testing leachate draining from the leachate collection system *after* construction and during operations.

Monitoring discharge from a leachate collection system for composition and volume is a valuable and, I believe, necessary activity. It does not, however, alleviate my concern or address the deficiency of the permit application. NAC 444.739 requires that the application demonstrate, *before* acceptance of the application, that the design of the facility will not degrade waters of the State and that the determination must include an evaluation of the *volume* and *composition* of the leachate. Without knowing at the time of the application the volume and the composition of the leachate, the applicant simply cannot make the required demonstration. Equally certain, without knowing the volume and composition of the leachate, the Board cannot find that the applicant has made the required demonstration. NAC 444.739 does not offer the alternative to the Board to approve the application, issue the permit, and then check after-the-fact whether such a demonstration could have

been made at the time of the application. The demonstration must be made before the Board can approve the application.

As valuable as the prescribed monitoring of the contact water discharge required by this condition is, the data can only serve as a measure of the validity of the demonstration made prior to the application, and perhaps identify error in or departures from that demonstration. The condition is not a substitute for, nor an offset of, the requirements prior to approval of an application.

4) permit condition is to monitor for and report for specified profile/constituents of groundwater in specified groundwater monitoring wells “field observations;”

As with the previous topic, this does not appear relevant to issues related to TCLP as a predictive tool of leachate composition. That said, appropriate monitoring of groundwater at appropriate locations for appropriate constituents is part of necessary and valuable management of a waste disposal facility. It allows the regulatory agency, the applicant and the public to develop confidence that the facility is operating in a manner consistent with what was expected based upon the demonstration(s) made in the application, prior to the approval of the application and issuance of the permit. It can offer verification that waters of the State are not being degraded. Such after-the-fact monitoring is necessary for an expansion. After-the-fact groundwater monitoring in lieu of valid demonstrations at the time of the application is not an option of NAC 444.739.

5) A “HELP” or Hydrogeologic [sic] Evaluation of Landfill Performance computer model was submitted to aid the design of the Leachate (contact water) Collection and Management System and to predict the amount of leachate (contact water) which will be generated “computer modeling;”

This item is clearly unrelated to the TCLP test in any way. I have thoroughly discussed HELP modeling above. Since, however, this SNHD response was relied upon 30 times by SHND, I would suggest that the SNHD staff response should have included the following facts: (1) some of the HELP runs and all of the HELP model results were submitted to SNHD *after* the comments to which this response is offered, and (2) although the results of the HELP model would allow one to “predict the amount of leachate (contact water) which will be generated,” there is no indication in this comment response or any other record that I have examine that the applicant or the SNHD staff undertook and reported an evaluation of leachate generation.²⁸

6) SNHD Profile 1 ... [list of analytes] ... CaCO₃. NOTE: the following ... [list of analytes] ... TPH total.

The lists are what they are. The listing of the SNDH, like previous topics 3 through 5, appear unrelated to issues related to TCLP and its applicability for prediction of leachates that will form in and migrate from this landfill.

NV Energy demonstrated leachate generation using Environmental Protection Agency (EPA) Test method 1311 (Toxicity Characteristic Leaching Procedure [TCLP]).

This statement is true, but only as far as it goes. NV Energy demonstrated the composition of leachate that one gets when one performs a TCLP leaching test on the selected materials. What NV Energy did *not* demonstrate is the “chemical characteristics of predicted leachate” as required by NAC 444.739. As described thoroughly in my September 2010 memorandum to WELC that is before the board, the TCLP test is not designed to predict the field leachate quality of disposed

²⁸ To the contrary, as described earlier, all available information indicates the staff followed the applicant’s lead and ignored the relevant data in the HELP results, citing instead to assessments irrelevant to determining leachate generation volumes.

waste. The extensive earlier comments and references are incorporated by reference, and I urge the Board to read that detail. The bottom line is that the TCLP test is not *capable* of providing the “chemical characteristics of predicted leachate.” Further, as I describe in those comments, when the US EPA is attempting to perform a risk assessment, a study that is analogous to the requirements of NAC 444.739, the EPA ranks TCLP test as *last* with respect to reliability among leaching protocols.²⁹

There may be reasons for the State of Nevada, or SNHD, to require TCLP tests, independent of the need to meet the requirements of NAC 444.739. If the State, or SNHD, for example, stipulates that no waste that fails the TCLP test for being hazardous by characteristic per 40 CFR 261.24 can be disposed in a particular class of landfill, the TCLP test can make that determination. In fact, the TCLP is the only test protocol that can make that determination, and the TCLP would have to be run. But, whether or not such TCLP testing is required for other reasons, TCLP results do not and cannot be represented as capable of making a demonstration of the “chemical characteristics of predicted leachate” at the RGS ash landfill, a demonstration that is required for submission of a complete application by NAC 444.739.

It is disingenuous to imply, or lead one to infer, that because the TCLP is the EPA-stipulated test for implementation of a narrow, targeted, federal application, *i.e.*, 40 CFR 261.24, that TCLP is somehow endorsed or approved by the EPA for other purposes, such as meeting the requirements of NAC 444.739. I believe this statement and the following statements in the SNHD Response to ASI #71 are doing exactly that.

²⁹ As discussed and cited in my September 2010 memorandum to WELC. *See also* RTI, 2007, Human and Ecological Risk Assessment of Coal Combustion Wastes, Draft, Prepared for U.S. Environmental Protection Agency, Office of Solid Waste, Research Triangle Park, North Carolina, 333 pp, available at www.regulations.gov, docket EPA-HQ-RCRA-2006-0796.

The TCLP is the industry standard for modeling leachate.

This is an interesting assertion to be made without any documentation or support. Whether or not the TCLP is preferred by industry, and the reasons why that may be preferred, if it is, is irrelevant to the deficiencies in the application. The TCLP cannot provide a technically and scientifically defensible demonstration that is required by Nevada regulations and the SNHD cannot properly approve such an application without such demonstration.

The TCLP test is appropriate based on the EPA's description of the test:

“The test was designed to model a theoretical scenario in which a waste is mismanaged by placing it in an unlined landfill containing municipal solid waste. The acetic acid solution in Method 1311 is designed to simulate the result of rainwater infiltrating the landfill, reacting with the municipal solid waste, and then leaching through the waste being tested. (Source on October 8, 2010: http://www.epa.gov/osw/hazard/testmethods/faq/faq_tclp.htm)

One wonders what part of the above description leads the author of this response to perceive that the TCLP is appropriately used to satisfy the requirements of NAC 444.739. There is certainly nothing theoretical about the proposed expansion before the Board. Does the author find that the TCLP test is appropriate because expanded disposal over the 90 acres of unlined landfill constitutes mismanagement? Where does the author find in the application the municipal waste through which rainwater will infiltrate and with which it will react before entering the ash to leach from it? There is nothing in the theoretical scenario that bears remotely on the conditions of the RGS ash landfill, present or as proposed. How does this provide a basis to hold the TCLP as appropriate?

Notwithstanding the stretch of credulity of the above statement, it is more egregious for how what is cited from the EPA web site is taken out of context. A visit to the web site, which has not been updated since 2008,³⁰ establishes that the quote is part of a lengthy response by the EPA author to a foreign regulator who queried about the efficacy of modifying the TCLP test. Taken in its entirety, the answer establishes that the TCLP test is a specific protocol designed for a single disposal scenario and the test results are meaningful only in the context of the criteria that were selected for the purpose of 40 CFR 261.24. All aspects are linked. If any of those things change, the test loses its meaning.

Final Observations

There is no practical reason for the applicant to have avoided and to continue to avoid performing the studies needed to meet the requirements of NAC 444.739. The requirements are both reasonable and very doable.

With respect to the volume of the leachate, the applicant not only knows an appropriate program to provide the projected volumes, its consultant has made the basic runs that would have allowed the projections to have been made. Without endorsing all of the details of the HELP modeling that has been done, the extant model runs provide enough data for one to obtain a decent idea of the volumes of leachates that are generated as well as the volumes that can migrate to impact

³⁰ When citing an on-line source, the accepted practice is to provide the “updated as of” date when it is provided by the site, not the date of one’s visit, as appears to have been done here. In this case, the EPA indicates the last update to the page was August 28, 2008. It is also worth mentioning that the information on the page ends with the statement, “If you are interested in recent developments in leaching science, you may wish to review the proceedings of [EPA's July 1999 meeting on leaching](#).” The juxtaposition of “recent developments” with an 1999 EPA meeting suggests to the prudent browser that information on the pages may be somewhat dated.

groundwater. This is a major element of the demonstration needed to comply with NAC 444.739, and an explicitly required element.

With respect to waste and leachate characterization, there are no intractable difficulties to obtaining the necessary chemical characteristics of the predicted leachate and of the wastes. If SNHD expects a demonstration that the wastes are not hazardous by characteristic, whether or not they are exempt from hazardous classification, those TCLP tests have been performed. RGS station is lucky in its ability to directly sample predicted leachate, as opposed to some facilities that have no historical operations upon which to draw. Leachate from pond evaporation sediments can be directly sampled by collecting soil water directly under them. Leachate from the ash landfill can be collected directly from the landfill using temporary wells or piezometers to collect water from low in the ash. Increased precision could be obtained by sampling under both inactive and watered areas.

Integrating all of the available data into the demonstration will take work. It will have to be decided how to combine different leachate compositions into one average for the landfill, if that is appropriate. Alternatively, perhaps it would be more appropriate to keep different leachate sources spatially separate, reflecting local disposal details within the landfill. Effort would have to be expended to explore ways to project changes through time to the chemical characteristics of the projected leachates, as part of the demonstration. But, here, too, no wheel need be reinvented. The evolution of fly ash chemistry in industrial landfills has been and is being documented, from the initial flush of alkalinity, boron and molybdenum, to the common temporal patterns of sequential dominance by successive metals, to the changes that occur with devitrification of the glass component, to the changes that migrating leachate induces in native materials along migration paths. All that needs to be done is to merge the specific information of leachate volumes and chemistries

specific to RGS and the geology and hydrogeology of RGS setting with the geochemical processes documented at other ash disposal sites.

There is nothing onerous, unworkable, or impossible that prevents the development by the applicant of the demonstration of projected impact that is required by Nevada regulations. Much of the raw information needed to develop that demonstration either exists or can be readily obtained. All that then needs to be done is that the parts be put together into a defensible demonstration of the anticipatable impacts of the proposed expansion. Only after that is done, should the Staff of SNHD even consider recommendations and conditions for a permit. Only after that is done, can the Board review the demonstration to determine whether the proposal will, in fact, prevent degradation of waters of the State. But, not yet. The applicant has yet to do its job.

The above paragraph describes the mechanics of how all might proceed with the application before the Board. To be clear, when the applicant is sent back and does its job, as required by the statutes and regulations, it is my expectation that the demonstration will show and the Board will find that the proposed expansion *will* degrade waters of the State and the application will be denied. It is my further expectation that ultimately the Board will understand the existing landfill is today degrading the waters of the State and will cause remedial actions to be taken. These expectations are based upon my reviews of the application, the HELP modeling showing huge volumes of leachate with most having direct migration to groundwater, the chemistry of water in, below, and around the lower ponds, the contaminated groundwater around the landfill today, decades of experience with coal combustion waste disposal,³¹ and decades of experience in geology and hydrogeology.

³¹ This experience includes working for electric utility companies designing disposal facilities and trying to remediate groundwater around leaking ash disposal facilities.

My expectations also await proper evaluation of all of the information required of the applicant by the State for the proposed expansion. However, in my professional opinion, it is vanishingly unlikely that a defensible demonstration of the impacts of the proposed expansion could show anything except that such an expansion would greatly exacerbate conditions at a facility that is already degrading waters of the State.

Thank you for your time and consideration.

Sincerely,

A handwritten signature in black ink that reads "Charles H. Norris". The signature is written in a cursive, slightly slanted style.

Charles H. Norris