NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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December 1, 2015

VIA ELECTRONIC MAIL

Honorable Daniel P. O'Connell
Office of Hearings and Mediation Services
New York State Department of
Environmental Conservation
625 Broadway
Albany, New York 12223

Dear Judge O'Connell:

Department Response to the Municipal
Stakeholder's June 12, 2015 and
October 2, 2015 Submittals

In accordance with your October 19, 2015 memorandum, transmitted herewith are the responses of the New York State Department of Environmental Conservation (Department) staff pertaining to four subject areas outlined in the Municipal Stakeholder's submissions dated June 15, 2015 and October 2, 2015: (i) remediation of Facultative (Fac) Pond 8 pursuant to the conditions of the current Sitewide Part 373 permit; (ii) the potential of hydrostatic uplift relating to CWM's use of a Factor of Safety of 1.0 during RMU-2 excavation and liner construction; (iii) the alleged leaks in the RMU-1 liner as a potential source of hydrostatic uplift; and (iv) deficiencies with CWM's permit application to modify the Air State Facility permit for the RMU-2 proposal.

I. Fac Pond 8 Remediation Pursuant to the Current Sitewide Part 373 Permit

With respect to the current remedial efforts associated with Fac Pond 8, Department staff is merely maintaining that the closure plan for that mechanism, in the absence of RMU-2, should not be directly subject to adjudication in the current permit process for the RMU-2 proposal. Mr. Gary Abraham, on behalf of the Municipal Stakeholders, previously submitted comments upon the closure of Fac Pond 8 during the Sitewide permit review process, and did not undertake a legal challenge to that permit upon its issuance over two years ago. Therefore, the Municipal Stakeholders should be estopped from directly, and belatedly, challenging that permit at this time. Moreover, many of Mr. Abraham's concerns appear to fall within the ambit of potential issues raised by him on the adequacy of the SEMMP for the RMU-2 proposal and are more appropriately addressed in that context, rather than seeking a stoppage to the remedial work required under the terms of the existing Sitewide Part 373 Permit.

II. Alleged Inadequate Factor of Safety Used to Protect Against Hydrostatic Uplift

In his June 12, 2015 letter, Mr. Abraham relies primarily upon a June 9, 2015 memorandum from his consultant, Dr. De, to reiterate the concern that the Factor of Safety (FS) of 1.0 in the permit modification application as it relates to sump excavation and construction is insufficiently conservative, thus risking hydrostatic uplift pressure from groundwater during liner construction and excavation for the proposed RMU-2 landfill. Dr. De points to discrepancies in the calculated levels of the Glaciolacustrine Silt/Sand (GSS) layer and piezometric head and to the uncertainties thereby created relative to the FS at the time the sumps are installed during construction of the liner.

In the attached response, Department staff concur that there are some uncertainties in the GSS and piezometric head data. However, staff emphasize that excavation and installation of the sump are field activities subject to a permit condition requiring real time measurement of the GSS level and piezometric head and calculation of the FS just prior to commencing sump installation with required approval by on-site Department staff immediately prior to construction. In this regard, staff have reviewed its records for this process during construction of the RMU-1 landfill. These records revealed actual, calculated Factors of Safety for specific cells above 1.1 just prior to sump excavation and installation. Because of the provision in the draft permit, a similar process is envisioned for RMU-2.

Further, Dr. De acknowledges that field engineering techniques such as pumping the GSS layer to reduce piezometric head, might be used to increase the Factor of Safety. While Dr. De is concerned that such pumping might dislodge and mobilize contaminants in the area of sump preparation activity, Department staff are confident that such pumping may proceed safely. There is no history of contamination proximate to the proposed sump locations, and the relative impermeability of the soil in these areas would retard contaminant mobilization.

III. Alleged leaks as an Additional Potential Source of Hydrostatic Uplift

On two occasions in 2015, CWM reported to the Department exceedances of the secondary leachate collection system (SLCS) response rates for two cells in the RMU-1 landfill. In his October 2, 2015 letter, Mr. Abraham asserts that the exceedances are "leaks" in the RMU-1 secondary liner, caused by groundwater infiltration resulting from rapid rises in the site's groundwater elevation, above the maximum elevations assumed by CWM in its RMU-2 groundwater hydrostatic uplift calculations. In support of this argument, Mr. Abraham's letter enclosed memoranda from his consultants,

Dr. Michalski and Dr. De, dated September 30, 2015 and October 1, 2015 respectively. Dr. Michalski claims that the unusually high rates of flow into the SLCS are indicative of groundwater, not rainwater, leaking in to the landfill secondary liner of RMU-1. Dr. De incorporates Dr. Michalski's leakage theory, and argues that this is further evidence of potential hydrostatic uplift pressure on the landfill liner.

As set forth in great detail in the attachment, Department staff disagree with those arguments. In response to the reported exceedances, CWM, in accordance with Permit conditions, investigated the source of these flows. Upon examination, CWM identified breaches in the primary liner at the landfill perimeter - not beneath the liner - in the seal between an SLCS side riser pipe and the liner. Following the liner repairs, the flow rates in the SLCS returned to the historical levels below the response rates. In addition, the unusually high flow rates did not recur in the presence of later precipitation events. Moreover, examination of the liquid in the SLCS indicated that it was chemically consistent with surface water runoff, and not groundwater. For these reasons, Department staff are confident that the excessive flows into the SLCS were not groundwater leakage into the SLCS, but were surface waters entering the system through a temporary break in the seal between a SLCS pipe and the primary liner. Accordingly, the excessive flows into the SLCS do not support a theory of hydrostatic uplift pressure from beneath the liner.

IV. CWM's Air State Facility Permit Modification Application for RMU-2 is Incomplete

With respect to the draft Air State Facility permit modification application, Department staff have exchanged information with CWM and the participants regarding the source and sufficiency of the data underlying the modification. As background, CWM was issued an Air State Facility permit for the Sitewide facility, with an effective date of October 24, 2014. In February 2015, CWM filed a permit application to modify the Air State Facility permit for the proposed RMU-2 project. By letter dated March 20, 2015, Department staff deemed the permit modification application complete and circulated, among other documents, a modified draft Air State Facility permit which incorporated conditions for the proposed RMU-2 landfill.

Based on the documents recently provided by the petitioners following the issues conference, the Department is reversing its decision on the completeness of CWM's permit modification application for the Air State Facility permit. As discussed in greater detail below, a supplemental emissions inventory and clarification of certain calculations contained in the February 2015 permit modification application is required from CWM to render the modification application complete and for staff to determine if the draft Air State Facility permit for the proposed RMU-2 project needs to be modified. While

Department staff deems it unlikely that the revised application will trigger Title V permit applicability, a definitive determination may only be made following an evaluation of the revised submission

A. Modifications Required to the Air Emissions Inventory

As stated in the Department's February 27, 2015 submission in response to the petitions for party status, the air emission estimates provided by CWM in its Air State Facility permit modification application demonstrated that the emissions for the facility and proposed RMU-2 project were significantly below the thresholds for a major source, requiring only a modification to the Air State Facility permit. However, based on the recent information provided in Mr. Gary Abraham's June 12, 2015 and October 2, 2015 submissions, including the memoranda from Dr. Ranajit Sahu, and CWM's "Soil Stockpile Wind Erosion Calculation – RMU-2," provided by letter dated June 24, 2015 to the Department, staff re-evaluated the permit modification application and determined that the emissions inventory provided by CWM needs to be revised. Specifically, the emissions inventory did not include emissions for certain sources at the facility and the emission estimates provided for particular sources appear to be underestimated due to the calculations utilized by CWM.

The emissions inventory either did not list or underestimated the emissions estimates for (1) emissions from the facultative ponds, (2) VOC emissions associated with the waste transfer and handling operations, including (i) container loading, storage and cleaning, and (ii) tank loading and storage (other than the drum sampling and waste fuel transfer operations), (3) VOC emissions from the stabilization operations and (4) VOC emissions from the closed landfills at the facility (beyond the emissions associated with the leachate in the standpipes). For instance, CWM's emissions inventory states that the emissions emanating from the facultative ponds are zero. In its response to Dr. Sahu's report, entitled "Response to the Report on Air Quality Aspects at the Chemical Waste Management, LLC Model City, New York and RMU-2 Report Prepared by Dr. Ranajit Sahu," dated February 2015 (CWM's February 2015 Report), CWM explained that it used an emissions estimate as zero since the sample results for the treated wastewater discharged to the facultative ponds did not contain a VOC detected above laboratory reporting limits (which is commonly referred to as "non-detect"), with the exception of acetone. A non-detect laboratory result, however, does not necessarily mean that the chemical is not present in the sample; rather, it means that an amount below the reporting unit used for the analysis was not found since it was below the test equipment's detection limit. As such, a non-detect result can affect mass loading computations.

Similarly, Department staff also question CWM's emissions estimate of zero for fugitive dust emissions associated with wind erosion of soil stockpiles that will be utilized during construction and operation of the proposed RMU-2 landfill. While CWM appropriately utilized the U.S. Environmental Protection Agency's (EPA) AP-42, "Compilation of Air Pollutant Emission Factors," further clarification is required of the calculations performed by CWM's consultant in reaching the position that there will be no "quantifiable emissions" from the wind erosion of the soil stockpiles.

Further, while CWM's permit modification application included estimated emissions from leachate through the standpipes for the closed landfills, the inventory should also have included emission estimates associated with diffusion through the caps of the closed landfills and convective loss from barometric pumping. For instance, the type of waste contained in SLF 1-6, and the nature of the landfill covers (such as the air porosity of the caps, which impacts the diffusion rate through the covers), may result in more significant emissions than the other closed landfills at the facility.

In addition, CWM's February 2015 Report includes a VOC emission rate of 26 pounds per year from equipment leaks. CWM must include that emission rate in its revised emissions inventory and submit the supporting documentation.

In summary, Department staff recommend that CWM utilize existing air emission guidance documents and emission estimate models, including, but not limited to, the EPA's "Hazardous Treatment, Storage and Disposal Facilities (TSDF) – Air Emissions Models," dated December 1987, EPA's "Hazardous Waste TSDF- Background Information for Proposed RCRA Air Emission Standards," dated June1991, and EPA's "Air Emissions Models for Waste and Wastewater," dated November 1994 in developing its revised emissions inventory.

B. Items Not Required in the Revised Emissions Inventory

In the June and October 2015 submissions, Dr. Sahu argues for the inclusion of the vapor flux of VOCs from contaminated groundwater in the emissions inventory, that CWM improperly calculated emissions with the use of EPA's TANKS program, and that the PCB warehouse is an emission source that was not included in CWM's emissions inventory. Department staff disagrees with that position.

Dr. Sahu's comment regarding the vapor flux of VOCs is also commonly referred to as vapor intrusion, which typically occurs when there is a migration of VOCs from contaminated groundwater or soil into overlying or adjacent buildings. As Dr. Sahu correctly noted, the Department developed a program policy, entitled "DER-13/Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York," dated

October 18, 2006, which reflects the Department's policy of evaluating soil vapor intrusion pathways at all contaminated sites and determining how, where and when to conduct soil vapor intrusion evaluations. For the CWM site, however, the soil vapor intrusion pathway has been adequately addressed, resulting in the removal of such a pathway.

Due to the natural low permeability of the soils and flat groundwater flow gradients, groundwater contamination remains close to the source areas. In addition, there are no inhabitable structures on-site overlying residual shallow soil or groundwater contamination. As a reminder, CWM has performed 83 investigations at the solid waste management units and site-wide areas at the facility. The remedial work undertaken at the facility, performed pursuant to the Corrective Actions Study and Interim Corrective Measures, have met the goals of the corrective action program and are protective of human health and the environment. Such work has included groundwater and dense non-aqueous phase liquids (DNAPL) extraction, soil excavation, in-situ stabilization of sludge and sediments and installation and maintenance of caps. The decades of monitoring at the facility have indicated that hydraulic control is maintained by the groundwater extraction systems and migration of contamination beyond previously established extents is not occurring. Lastly, the CWM landfills contain hazardous and industrial waste that does not degrade as standard municipal or putrescible waste, the latter of which decompose to release methane and/or other greenhouse gases.

In addition, Department staff disagrees with the argument that CWM improperly calculated emissions with the use of EPA's TANKS program. As referenced on EPA's website, the TANKS model was developed using Windows XP. While Windows XP is outdated, the TANKS program is still functional. Accordingly, EPA has cautioned users that the TANKS model is not reliably functional on computers using newer certain operating systems such as Windows Vista or Windows 7. In order to verify the emission calculations associated with CWM's use of that program, CWM should use the equations/algorithms specified in Chapter 7 of EPA's AP-42 for estimating VOC emissions from storage tanks. The equations specified in that document can be performed with several current spreadsheet/software programs.

Department staff also disagree that the PCB warehouse is an emission source for inclusion in CWM's emissions inventory. That warehouse is used strictly for the storage of sealed drums. No opening or transferring of drums occurs in the PCB warehouse. CWM should, however, clarify the accuracy of staff's understanding of the activities performed in the PCB warehouse.

In addition, Department staff does not object to CWM's estimated emissions from the wastewater tanks containing greater than 500 ppm organics, such as those from the

storage of leachate from SLF 1-6, SLF 7, SLF 10, and SLF 11, as well as emission estimates for the biotowers associated with the Aqueous Water Treatment Plant. CWM's emissions estimates for those sources are conservative in that the estimates were not reduced to take credit for the reduction in VOC emissions based on the use of carbon canister emission controls.

V. Modifications to the Air Monitoring Program for the RMU-2 Proposal

Based on the additional information presented in the post-issues conference submissions, Department staff will require CWM to enhance the air monitoring program currently set forth in the draft Part 373 permit for the RMU-2 proposal to address dust and air emissions during construction to include additional monitoring for PM-2.5, PCBs, metals, and VOCs.

CWM is to submit to the Department either addenda to the Fugitive Dust Control Plan and Air & Meteorological Plan, or revise each plan, to expand the dust management protocols and air monitoring program for the above referenced analytical parameters during construction and operation of the landfill. Rather than rely on sampling data collected during RMU-1 construction, CWM is to provide information and emission estimates regarding the potential contaminants in the soil within the proposed RMU-2 footprint and the resultant air emissions that are typically generated with the use of heavy equipment and by soil displacement during construction.

Very truly yours,

David F. Stever
Assistant Regional Attorney

Teresa J. Mucha
Associate Attorney

TJM:jaf
Attachments

ec: CWM Service List
(with attachments via electronic mail)

Abraham (MS) to O'Connell (ALJ)
June 12, 2015 Correspondence
"Hydrostatic Uplift"
DEC Staff Evaluation

Summary of Abraham Comments & Consultant's Memorandum:

In his letter under the heading of "Hydrostatic Uplift", Mr. Abraham reiterates the argument made during the Issues Conference, that the Factor of Safety (FS) of 1.0 used by CWM to protect against groundwater hydrostatic uplift during RMU-2 excavation and liner construction, is inadequate. Specifically, Mr. Abraham points out that the stratigraphic contours depicting the estimated upper surface of the Glaciolacustrine Silt/Sand (GSS) layer as mapped by P.J. Carey and Associates using Terramodel software[1] are about six feet higher than those previously estimated and used by CWM in their application to calculate Factors of Safety for hydrostatic uplift during RMU-2 sump excavations. Mr. Abraham argues that this disparity in estimates of GSS layer elevations introduces significant uncertainty in hydrostatic uplift calculations and warrants use of a higher FS than the 1.0 value used in CWM's proposed design.

In support of this argument, Mr. Abraham provides a June 9, 2015 memorandum from his Landfill Design consultant (Dr. Anirban De). In his memorandum, Dr. De provides FS results from his hydrostatic uplift calculations for each RMU-2 cell sump excavation in which he uses estimated GSS elevations from the P.J. Carey Terramodel map in place of the generally lower elevations estimated from the Golder map used by CWM in their application calculations. Leaving all other input values unchanged (i.e., no different than those used by CWM in their calculations), Dr. De provides FS results which range from 0.77 to 1.07. Dr. De uses these results to illustrate that the paucity of actual GSS elevation data points creates wide variations in assumed GSS elevation values used in RMU-2 hydrostatic uplift calculations resulting in a wide variety of FS results, some of which can be less than one (FS < 1.0) indicating possible damage to the liner during construction. Consequently, Dr. De argues in his conclusions, for the use of a revised FS = 1.5 in hydrostatic uplift calculations to adequately compensate for possible errors in assumed GSS elevations and variations in GSS piezometric heads, and thusly to provide adequate protection against liner damage during construction. Dr. De also proposes some engineering solutions to inadequate Factors of Safety such as temporary localized pumping to lower GSS groundwater levels during sump construction, but expresses some concerns with regard to such pumping.

[1] Terramodel maps prepared by CWM's consultant P.J. Carey, were provided to ALJ O'Connell, NYSDEC staff and the Petitioners by E-mail dated May 27, 2015 from Mr. Daniel Darragh, CWM's legal counsel.

DEC Staff's Response:

Hydrostatic Uplift Evaluation –

Based on the concerns raised in Mr. Abraham's June 12, 2015 letter and the accompanying memorandum from his engineering expert Dr. De, NYSDEC staff has evaluated the RMU-2 hydrostatic uplift matter in a number of ways, as detailed below:

- RMU-2 Cell Sumps Hydrostatic Uplift FS Values at Excavated Sump Grades - NYSDEC staff has calculated FS values for RMU-2 excavated sump grades using the highest GSS piezometric heads from the Golder and P.J. Carey contour maps[2] for a number of different GSS layer surface elevations estimated at each sump. GSS layer elevations used at each sump by NYSDEC staff include those employed by CWM in their RMU-2 application[3]; those interpolated from P.J. Carey GSS stratigraphic contour map[4]; and those from the logs of borings or wells closest to each sump. Hydrostatic uplift FS values for excavated sumps determined from these calculations range from 0.65 to 1.1. From these calculations, NYSDEC staff has observed that FS values vary significantly depending on excavated sump elevations and on assumed GSS layer elevations at each sump which themselves vary significantly depending on their source (i.e., CWM application (Golder map), P.J. Carey map or boring logs). For instance, estimated GSS layer elevations in the area of the Cell 16 sump appear to vary from 278.0 ft. amsl (Golder map) to 287.47 ft. amsl (Well R210D boring log). Therefore, depending on the actual GSS layer elevation at each sump location, it appears that for some RMU-2 sumps, GSS piezometric heads must be lower than the maximum values used in these calculations in order to achieve adequate FS values for sump construction.

- RMU-2 Cell Sumps Hydrostatic Uplift GSS Head Limits at Excavated Sump Grades - NYSDEC staff has calculated GSS piezometric head limits[5] for FS values between 1.0 & 1.5 at RMU-2 excavated sump grades using the GSS layer surface elevations estimated at each sump as described above. NYSDEC staff has compared these GSS head limits to 2008-2009 GSS groundwater elevation data from the RMU-2 wells closest to each sump. Again, depending on the actual GSS layer elevation at each sump location, it appears that a lowering of GSS groundwater elevations may be necessary during construction of some sumps to insure that these FS-based head limits are not exceeded.

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[2] Both the Golder and P.J. Carey maps use CWM's May 2001 GSS groundwater elevation data from monitoring wells & piezometers which represent the highest GSS groundwater elevations observed to date. The contours on the Golder map were manually interpreted from this data, while the contours on the P.J. Carey map were determined from this data using the Terramodel. The interpolated GSS groundwater maximum elevation from each map at each sump were provided to ALJ O'Connell, NYSDEC staff and the Petitioners by E-mail dated May 27, 2015 from Mr. Daniel Darragh, CWM's legal counsel.

[3] Application Appendix C-4, GSS layer elevations interpolated from Golder stratigraphic contour maps.

[4] GSS layer elevations interpolated from the May 2015 P.J. Carey stratigraphic map developed from Terramodel software.

[5] GSS piezometric head limit is the highest GSS groundwater level that can occur without reducing the Hydrostatic Uplift FS below each specified value (i.e., below FS values ranging from 1.0 to 1.5).

- RMU-2 Cell Sumps Hydrostatic Uplift FS Values at Constructed Sump Grades - NYSDEC staff has calculated FS values for RMU-2 constructed sump grades[6] using the highest GSS piezometric heads from the Golder and P.J. Carey contour maps[2] for a number of different GSS layer surface elevations estimated at each sump, as explained above in the first bullet. Hydrostatic uplift FS values for constructed sumps determined from these calculations range from 1.33 to 1.82. From these calculations, it appears that FS values pertaining to hydrostatic uplift for constructed sumps are all consistently greater than 1.0 at the highest GSS piezometric heads[2] for every estimated GSS layer elevation at each sump. These results for constructed sumps are consistent with those provided by CWM in its April 17, 2015 submission. NYSDEC staff consider these FS values (1.33 to 1.82) as adequately protective against potential hydrostatic uplift of the RMU-2 liner system in constructed sumps prior to any waste placement.

DEC Response to Specific Concerns –

De Memorandum Issue #1 – Uncertainties Resulting from a Paucity of Data Require Greater Conservatism - NYSDEC staff agree that a FS at 1.0 is not adequately conservative, especially when there are significant uncertainties with regard to input parameters (e.g., current uncertainties regarding GSS layer elevation at each sump and GSS piezometric head at the time of sump construction). However, as stated in staff's May 29, 2015 response to CWM's April 17, 2015 submission, additional data will be collected just prior to each sump excavation which will provide GSS layer elevations and real time GSS piezometric heads at each sump. Also as previously stated in staff's May 29 response, conditions in the Part 373 RMU-2 Draft Permit Modification require CWM to calculate the actual, current hydrostatic uplift FS value at each sump just prior to excavation using the above described additional data. This Permit condition gives the Department the discretion in the field to accept the FS result and allow sump excavation to proceed, or reject the FS result as being inadequate and require a delay in excavation or implementation of additional measures to provide an adequate hydrostatic uplift FS value. In addition, NYSDEC staff would note that similar Permit conditions were employed during the construction of the RMU-1 landfill sumps. From review of records associated with the construction of RMU-1 Cells 7/8 and 9/10, hydrostatic uplift FS values which were accepted by Department staff for these sump excavations were 1.23 and 1.18, respectively. NYSDEC staff intend to require FS values similar to these in conjunction with field approval of RMU-2 sump excavations.

De Memorandum Issue #2 – Factors of Safety Under the Currently Proposed Design are Insufficiently Conservative – As illustrated by the FS results for each RMU-2 sump excavation presented in Dr. De's memorandum and the FS result presented by NYSDEC staff under the first bullet above, FS results are highly dependent on the assumed GSS layer elevations which presently vary considerably depending on the source used to estimate these elevations at each sump. The differences in GSS layer elevations at each sump between sources appear related to different interpolation methods (e.g., Golder manual verses P.J. Carey Terramodel interpolation methods) and a present lack of GSS layer elevation data points proximal to each sump. However, as indicated above, additional stratigraphic data to be collected prior to construction of

[6] Constructed sump grades are the lowest top of operations layer grade in each sump (prior to any waste placement) as depicted on Drawing 5 in Attachment J, Appendix D-6a of the RMU-2 Draft Permit modification.

each RMU-2 sump will provide GSS layer elevations within each sump, thereby resolving any interpolation errors and allowing accurate, current field calculation of hydrostatic uplift FS values.

De Memorandum Issue #3 – Arcadis' Lowest Allowable Piezometric Head Cannot Be Reliably Met – Based on the results of NYSDEC staff calculations of GSS piezometric head limits and comparisons to 2008-2009 piezometric heads in the RMU-2 area, as described under the second bullet above, NYSDEC staff agrees with Dr. De's concern that it may be difficult to provide adequate hydrostatic uplift FS values in some sumps, depending on GSS layer elevations in each sump and naturally occurring GSS piezometric heads[7] at the time of sump construction. However, if this situation arises, the RMU-2 Draft Permit Modification provides CWM the option of pumping groundwater in the vicinity of the sump to temporarily lower the GSS piezometric head during sump construction so as to provide an adequate hydrostatic uplift FS value. Dr. De acknowledges this as an appropriate "engineer fix", but raises questions regarding what effect such pumping would have on overall hydrogeological conditions and mobilization of any groundwater contaminants in the area. Regarding these concerns, such pumping is not anticipated to have a significant effect on the overall hydrogeology since it would be temporary in nature and the hydraulic conductivities of the GSS (generally in the range of 10^{-4} cm/sec.) would likely limit any effect to the local area near each sump. With respect to mobilizing groundwater contaminants, past investigations have shown that there is no significant GSS groundwater contamination in the RMU-2 sump areas that could become mobilized by such pumping of the GSS. Therefore, NYSDEC staff does not perceive any significant detrimental effects from pumping the GSS in RMU-2 sump areas, should such pumping be necessary to achieve an adequate hydrostatic uplift FS value at each sump.

De Memorandum Issue #4 – Insufficient Monitoring Wells to Provide Estimates of Piezometric Heads – Regardless whether the existing monitoring wells are sufficient to measure the GSS piezometric head proximal to each sump, the Draft Permit Modification requires installation of vibrating wire piezometers in/near sumps prior to construction, as previously noted in NYSDEC staff's May 29, 2015 response. These piezometers will provide additional piezometric data which will be used for field calculation of hydrostatic uplift FS values.

NYSDEC Staff Response Summary –

NYSDEC staff considers that additional data on GSS layer elevations in each sump and GSS piezometric heads collected just prior to construction of each RMU-2 sump, will provide adequate information on which to accurately calculate hydrostatic uplift FS values. Draft Permit conditions provide Department staff with sufficient discretionary authority in the field to insure that adequate hydrostatic uplift FS values (similar to those accepted during RMU-1 sump construction) are obtained prior to allowing sump excavation/construction. If necessary, localized pumping of the GSS in sump areas can be performed, lowering GSS piezometric heads in these areas during construction to achieve adequate hydrostatic uplift FS values without any significant detrimental effects. Subsequent to sump construction, hydrostatic uplift is unlikely to occur based on the calculated FS values for this situation.

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[7] "Naturally occurring GSS piezometric heads" means piezometric heads in the GSS layer without any artificial lowering through localized pumping.

Therefore, NYSDEC staff reaffirms its previous position on the potential hydrostatic uplift issue, and remains confident that conditions in the Draft permit modification provide sufficient discretion to the Department to insure adequate protection against hydrostatic uplift at the time of each cell's construction.

Abraham (MS) to O'Connell (ALJ)
October 2, 2015 Correspondence
"New Information on RMU-1 Landfill Leaks"
DEC Staff Evaluation

Background on RMU-1 Landfill "Leaks":

By E-mails dated January 6 & 9, 2015, CWM Chemical Services, LLC (CWM) reported to the New York State Department of Environmental Conservation (NYSDEC), exceedances of the Secondary Leachate Collection System (SLCS)[1] Response Rates for RMU-1 Cell 11/13 and Cell 1, respectively. The SLCS Response Rate[2] for partially open Cell 11/13 is 75 gallons per acre per day (gpad) and for closed Cell 1 is 20 gpad, as set by the RMU-1 Response Action Plan (RAP) in Attachment K of the Part 373 Permit. It was observed that the SLCS flows increased above the Response Rates in both cells shortly after significant precipitation/snow melt events, and returned to flows below the Response Rates during dry periods. CWM physical and chemical analysis of the SLCS liquids in both cells indicated that it was not similar to RMU-1 primary leachate, but rather similar to surface water runoff. Based on these analyses and the timing of SLCS exceedances relative to precipitation/snow melt events, CWM suspected that the most likely reason for the exceedances in both Cells 1 & 11/13 was surface water runoff rapidly entering the SLCS through primary liner defects along each cell's perimeter. The SLCS exceedances in both cells continued through the Winter and Spring of 2015, and continued to occur in correlation to precipitation/snow melt events.

In May and June of 2015, CWM submitted plans to the NYSDEC to investigate the SLCS exceedances in Cells 11/13 and 1, respectively. Both plans called for the removal of the RMU-1 final cover along each cell's perimeter in the area of the riser vaults where CWM suspected defects in the primary liner were allowing surface water run-off to enter each cell's SLCS. Subsequent to uncovering, the plans required inspection of the primary Flexible Membrane Liner (FML) for possible defects (e.g., rips, tears, holes, etc.) along each cell's perimeter and in the primary liner boot around each SLCS Side Slope Conduit[3]. The plans also called for the repair of any identified primary liner defects, re-installation of the final cover and follow up SLCS flow monitoring. NYSDEC approved these plans by letters dated July 9, 2015 (Cell 11/13 Plan) and July 17, 2015 (Cell 1 Plan).

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[1] The Secondary Leachate Collection System (SLCS) is a stone & geosynthetic drainage system located below the landfill's primary liner and above the secondary liner. Its purpose is to collect and remove any leakage coming through the landfill's primary liner.

[2] The SLCS Response Rate is the SLCS daily flow rate per acre of landfill cell that if exceeded for a week or more, triggers implementation of the Facility's Response Action Plan (RAP) to mitigate primary liner leakage and/or reduce the hydraulic head on the secondary liner.

[3] The SLCS Side Slope Conduit is a pipe that runs from the SLCS sump at the base of each landfill cell up to the cell's riser vault at the top of the landfill's perimeter berm. Its purpose is to provide access to the SLCS sump for a pump used to remove SLCS liquids. It runs up the landfill berm interior slope between the secondary and primary liners and penetrates the primary liner near the top of the berm. The primary liner is welded around the SLCS side slope conduit at the penetration (i.e., primary liner boot) to prevent any liquids above the primary liner from entering the SLCS.

Summary of Abraham Comments & Consultants' Memoranda:

In his comment under the heading of "New Information on RMU-1 leaks", Mr. Abraham offers "new evidence" that the site's groundwater elevation can be higher than the maximum elevation assumed by CWM in its RMU-2 groundwater hydrostatic uplift calculations. This evidence is in the form of what he describes as recent leaks in the RMU-1 liner (i.e., recent Cell 1 & Cell 11/13 SLCS Response Rate exceedances) which Mr. Abraham argues are the result of defects in the RMU-1 secondary liner (secondary liner consists of an 80 mil thick Flexible Membrane Liner (FML) and 3 feet of clay compacted to a permeability of 10^{-7} cm/sec) through which elevated groundwater is entering at the base of the RMU-1 landfill.

Mr. Abraham also provides a September 30, 2015 memorandum from his hydrogeologic consultant, Dr. Andrew Michalski. In his memo, Dr. Michalski contends that the excess liquid entering the RMU-1 SLCS is groundwater, not surface water as claimed by CWM. Dr. Michalski asserts that recent results from specific conductance and pH testing of SLCS liquid from RMU-1 Cells 1 & 11/13 show that the chemical characteristics of this liquid are similar to groundwater and dissimilar to rainwater. He further contends that precipitation events caused the groundwater table to rapidly rise above each landfill cells' baseliner elevation resulting in an inward hydraulic pressure on pre-existing defects in the RMU-1 secondary liner. This he argues created recurring periods of groundwater infiltration into each affected cell's SLCS after precipitation events causing the elevated SLCS flows. The Michalski memorandum then goes on to identify potential RMU-2 problems associated with the design depths of its liner system relative to the alleged elevated groundwater levels caused by precipitation events.

Mr. Abraham also offers an October 1, 2015 memorandum from his Landfill Design consultant Dr. Anirban De. In his memorandum, Dr. De relies upon Dr. Michalski's conclusion that the RMU-1 increased SLCS flows in Cells 1 & 11/13 are the result of groundwater elevations above the RMU-1 base liner to buttress his argument that a Factor of Safety of one (FS = 1.0) used by CWM in its RMU-2 hydrostatic uplift design calculations fails to provide adequate protection of the RMU-2 liner system during construction. Dr. De states this illustrates that the groundwater elevation can exceed the maximum level assumed by CWM in their RMU-2 hydrostatic uplift calculations, resulting in an actual FS less than one (FS < 1.0) and risking damage to the liner during construction.

DEC Staff's Response:

Source of recent RMU-1 SLCS Flow Rate Increases in Cells 1 & 11/13 -
As explained above, Dr. Michalski argues that the recent RMU-1 SLCS flow rate increases are due to precipitation events elevating groundwater levels above the landfill's bottom liner causing groundwater to infiltrate into the SLCS through defects in the RMU-1 secondary liner system. However, NYSDEC staff does not agree with this theory for the following reasons:

- CWM has provided NYSDEC with SLCS Flow Data for Cells 1 & 11/13 as well as data on precipitation events/amounts which span the period from late 2014, before the SLCS

Response Rate exceedances occurred, through September 2015. This data indicates a close correlation between precipitation/snow melt events and SLCS flow exceedance events. It shows that SLCS flows increased rapidly, shortly after each significant precipitation and/or a snow melt event (within 24 to 48 hours), and returned to flows below each cell's Response Rate shortly after the end of each precipitation or snow melt event. This short period of time is insufficient to allow precipitation/snow melt to migrate down through several feet of native soils and raise the groundwater table to a point where it creates enough hydraulic pressure to push groundwater through three (3) feet of compacted clay liner and through any defects in the bottom secondary FML, as proposed in Dr. Michalski's memorandum. The relatively low hydraulic conductivities of the native upper till soils (generally 10^{-4} to 10^{-6} cm/sec.) and the 3-feet of compacted clay bottom liner (minimum of 10^{-7} cm/sec.) are likely to preclude such rapid migration and groundwater table reaction. The short reaction time between precipitation/snow melt events and SLCS flow increases indicates that the increased flows were caused by surface water run-off entering the SLCS through primary liner defects along each cell's perimeter berm where the liner is closest to the ground surface.

- In his memorandum, Dr. Michalski states that results of specific conductance and pH testing of the SLCS liquids from Cells 1 & 11/13 show conductance and pH levels higher than would be expected in rain water. From this, Dr. Michalski concludes that the source of the liquid entering each Cell's SLCS cannot be direct precipitation, but instead groundwater. However, "rain water" would not directly enter the SLCS, but rather run down the landfill side slope and percolate through final cover soils before entering the SLCS through primary liner defects along each cell's perimeter. As a result, the specific conductance and pH of the precipitation is likely altered by contact with the ground surface and cover soils prior to entering each cell's SLCS. Therefore, the fact that SLCS liquid test results for these parameters do not match expected rain water values, is not definitive evidence that the source of the SLCS flow is groundwater as opposed to surface water run-off.

- CWM has executed the approved SLCS flow investigation plans mentioned in the background section above for both Cells 1 & 11/13. In both cases, CWM identified defects (e.g., rips, tears, holes, etc.) in the primary liner boot around each SLCS Side Slope Conduit which is located along each cell's perimeter near the toe of the landfill's final cover. These areas are susceptible to receiving surface run-off from the final cover which can get trapped behind the riser vaults and percolate down through the soil to the underlying primary liner anchor trench. Defects in the primary liner in these areas, such as those identified by CWM, can create a pathway for surface water run-off to rapidly enter each cell's SLCS during precipitation/snow melt events causing short term increases in SLCS flow. In both cases, CWM has repaired the identified primary liner defects and re-installed the final cover in these areas. CWM has submitted reports dated October 5, 2015 (Cell 11/13 report) and October 22, 2105 (Cell 1 report), documenting the completed investigations/repairs with respect to these cells.

- SLCS Flow Data for Cells 1 & 11/13 from completion of each cell's primary liner repairs to the present, indicate that these flow rates have consistently remained below each cell's

response rate, even during precipitation events which occurred after completion of repairs. This demonstrates that the SLCS response rate exceedances were due to the now repaired primary liner defects in the side riser conduit boots. Clearly, there is no discernable reason why subsequent precipitation events would not cause increases in SLCS flow if there were remaining unrepaired defects in the secondary liner at the bottom of these cells.

Based on the above, NYSDEC staff determined that the RMU-1 SLCS flow rate exceedances in both Cells 1 & 11/13 were due to surface water run-off entering the SLCS through identified primary liner defects along each cell's perimeter, and were not related to groundwater entering the SLCS at the bottom of each cell.

It should be noted that CWM also reported an exceedance of the SLCS Response Rate in RMU-1 Cell 12/14 in September of this year. An investigation of this exceedance identified defects in the cell's primary liner around the secondary conduit boot, similar to those found in Cells 1 & 11/13. CWM has repaired these defects and the SLCS flow in Cell 12/14 has returned to rates below the cell's response rate, again similar to Cells 1 & 11/13.

Purported Relationship of RMU-1 SLCS Flow Rate Increases to RMU-2 Hydrostatic Uplift – Mr. Abraham's comment and Dr. De's supporting memorandum argue that there is "new information" to back up their contention that an FS = 1.0 with respect to hydrostatic uplift is inadequate. This "new information" appears entirely based on Dr. Michalski's theory that the recent RMU-1 SLCS flow rate exceedances are due to precipitation events elevating groundwater levels above the landfill's bottom liner and causing groundwater to infiltrate into the SLCS through defects in the RMU-1 secondary liner system. As explained above, NYSDEC staff determined that the cause of the RMU-1 SLCS flow rate exceedances is not related to elevated groundwater levels above those previously assumed by CWM in RMU-2 hydrostatic uplift calculations. Therefore, these RMU-1 SLCS flow rate exceedances are not considered "new information" related to groundwater levels and RMU-2 hydrostatic uplift calculations. As a result, NYSDEC staff maintains its position on Mr. Abraham's RMU-2 Hydrostatic Uplift Issue as previously indicated and summarized in staff's accompanying response to Mr. Abraham's June 12, 2014 letter.

DEC Staff Response Summary –

- The accumulated evidence indicates that the cause of the RMU-1 SLCS Response Rate exceedances in Cells 1 & 11/13 was surface water run-off entering the SLCS through defects in the primary liner identified in the SLCS Side Riser boots, and not elevated groundwater entering the SLCS through defects in the secondary liner at the bottom of the landfill cells.

- There is no "new information" with respect to the RMU-1 SLCS flow rate exceedances that would warrant revision of the CWM RMU-2 hydrostatic uplift calculations.