

RESPONSE TO COMMENTS

April 16, 2013

Mr. Qu Qi, PG
NC Division of Waste Management
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Re: Response to Comments
Former Seaboard/Riverdale Drive Landfill Site
NCD 071 574 164

Dear Mr. Qi:

In response to review comments provided by correspondence from your office dated April 8, 2013, the following information is provided:

- 1) Monitoring well PW-19 will be located and included in the groundwater flow evaluation during the November 2013 monitoring event.
- 2) Monitoring wells PW-6I and PW-6D are the two damaged wells in need of repair or replacement. This well nest was constructed through uncompacted fill material which has shifted as a result of filling of the Randleman Reservoir in 2008. Repair of this well nest is considered unlikely as the uncompacted fill material extends well below the normal pool elevation of the Reservoir. These wells will require relocation to the south, closer to the closed landfill, in order to assure a stable environment for the well casings. The exact location has not yet been determined and approval of the new location will be obtained from the Division of Waste Management (DWM) prior to well construction. In addition to DWM approval, permits/approvals will be obtained from the Piedmont Regional Water Authority, Corp of Engineers, and NC Division of Water Quality as necessary. As we have discussed informally by phone, we plan to include funds in the 2014 budget to address replacement of this well nest. Until the issues have been resolved with the PW-6I/6D well nest, monitoring well OW-DR3 will be sampled and analyzed during the annual monitoring events as a replacement.
- 3) Figure 2 will be revised in future reports to include a scale bar.
- 4) As you are aware, this system has been having a series of problems in achieving sustained operation. The Parties retained an automation contractor in 2012 and undertook the development of completely new hardware and software to manage the process and provide the necessary alarm and interlock functions. This was addressed in Technical Memorandum Number 6 (TM-E6). This was necessitated by the fact that the equipment manufacturer, Purifics ES, Inc. of London, Ontario, Canada (Purifics), failed to provide a complete and fully functioning remedial system as specified in their contractual documents. They have also refused, after repeated requests, to return to the project and finish their tasks.

At this time that work has been completed by the automation contractor. By December 31, 2012, all of the necessary automation software and hardware had been installed and the Parties commenced a startup as indicated in TM-E6. Since this system requires a phased startup, the

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initial testing required that city water be used to pump through the system from Lift Station 1 (LS-1) to Lift Station 2 (LS-2) and then into the remaining components in the main treatment system. That test commenced in early January 2013. Unfortunately, that initial test revealed some deficiencies in the control system requiring additional programming and testing. That work was authorized immediately and has now been completed.

During that shutdown period, the Parties decided to collect and analyze the metals content of the leachate and groundwater to estimate the rate of sludge generation in order to anticipate the metals removal system maintenance requirements. Historically, the iron content of the leachate was reported to be in the 10 to 20 mg/l range. However, this sample event showed much higher concentrations, in the 100 to 150 mg/l range. The Parties reviewed work done shortly after the Remedial Investigation was completed and the RI Report submitted to DENR, to evaluate methods to address iron fouling in the lines running from LS-1 to LS-2. That work indicated that sequestration, chelation and ion exchange treatment were not practical, but aeration was an option worth considering. The option of doing nothing was also suggested in that early work when the iron level was thought to be in the lower range. It was concluded that a startup without any iron removal being performed at LS-1 was appropriate to see how long the system would operate without fouling of the LS-1 to LS-2 transfer piping. To ensure that the lines could be reopened, provisions were installed to clean the LS-1 to LS-2 transfer lines.

The Parties undertook an investigation in March 2013 to determine:

- What is the cause of the increased iron levels,
- What needs to be done to reduce the iron levels before the transfer from LS-1 to LS-2,
- What effect does the pH have on the iron levels,
- What effect does aeration have on the VOCs in the transfer liquid, and
- Does the iron in solution function effectively to drive a Fenton's reagent reaction and reduce some of the 1,4-Dioxane.

To perform this evaluation the Parties had samples of the leachate from the six leachate tanks, groundwater from the RWLF and SIS wells and groundwater from PWDR-1 collected and analyzed by a state certified laboratory. They then had a pilot study performed to evaluate some of the objectives of the investigation. The conclusions from the investigation were as follows:

- The cause of the increase in iron in the leachate was undetermined. There are several possible causes including the possibility that there was undetected sample dilution of the earlier leachate samples, there is some seasonal effect on the iron levels, and several other possible causes. However, since the exact cause was not as important as determining how it should be addressed, the Parties deferred this portion of the study.
- The pilot study revealed that aeration alone did not significantly reduce the iron levels in the LS-1 transfer liquid. In fact, after two hours of aeration simulating fine bubble diffusion the iron was essentially the same as before aeration. However, it did reduce the VOC levels significantly. Aeration also had very little effect on the BOD or COD, but did have a positive overall effect as the VOC reduction will reduce the overall load on the air

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stripper in the main treatment system and increase the overall system destruction and removal efficiency.

- The pilot study also revealed that a second aeration for two hours followed by filtration to 50 microns did have a significant effect on the iron and VOC levels. The only VOC remaining in the post-filter effluent was acetone, and the iron was reduced to less than 0.25 mg/l.
- The study indicated that, other than to drive a Fenton's reaction, lowering the pH of the liquid had no positive effect. It also revealed that raising the pH had very little effect on the liquid. There was indication that a Fenton's reaction may have an effect on the 1,4-Dioxane levels at a lower pH.

These results indicate that aeration alone has little or no effect on the iron level in the LS-1 transfer water; however, aeration at LS-1 has a beneficial effect on the process. It does strip some of the VOCs and precludes the potential domination of the liquid by leachate possibly causing it to become anaerobic. However, to avoid fouling of the transfer piping from LS-1 to LS-2 it will be necessary to determine a method to flocculate and settle or filter the iron in the LS-1 transfer liquid before it enters the transfer piping. This piping consists of two 2-inch HDPE pipes that flow uphill from LS-1 to LS-2, presenting an ideal condition for settling and iron deposition.

The results also indicated that a second stage of aeration followed by filtration before the liquid is transferred into the main treatment system also has a beneficial effect on the process by further reducing the loading on the air stripper and eliminating most of the iron and solids from the process. This reduces the loading on the "metals removal vat" in the main treatment system and on the air stripper and advanced oxidation process when in operation.

The results also indicated that by using iron as a catalyst and lowering the pH of the liquid, titration with hydrogen peroxide will reduce 1,4-Dioxane by the Fenton's reaction process. This may become important if the mass of 1,4-Dioxane entering the system exceeds the treat capability to destroy it. However, the reduction in this crude experiment was about 65%, and considerably more study would be needed to refine the process. The data was collected only for reference in the event it is determined at some later date that it may be beneficial to the process to address some of the mass of 1,4-Dioxane earlier in the process.

Up until this point, the Parties have considered that they were in the 6-month testing and evaluation period and that regardless of all the difficulties and delays that they would complete the drawdown test and capture zone test and be ready to submit the Completion Report by June 30, 2013. Unfortunately, within the past few days that goal appears to be less achievable. We have been informed of extended delivery times for the metals treatment system components that will press the schedule and make full startup by July 1, 2013 unlikely. The oversight consultants have informed the Parties that a seventh TM may be needed to request an additional extension. The exact duration cannot be determined until we confirm the delivery dates for the long-lead components. These delays are partially due to the components supplied by Purifics. All of the valves and instrumentation they installed were either the Canadian or the European models, and the manufacturers in North Carolina do not support those versions. Therefore, with every order it

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is necessary to either special order the component or to cross-reference and locate the U.S. equivalent.

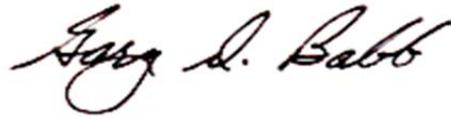
Some of the modifications are underway at this time. These include the installation of the aeration at LS-1, the installation of a new metals filter building near LS-2 and the revisions to some piping to simplify and improve system flows. We have also modified the metals removal vat to enhance solids removal and make it possible add and properly mix treatment chemicals if that is necessary. In the near future we will prepare and submit for approval TM-E7 explaining the status and requesting an extension.

The next monitoring event will be scheduled for November 2013. If there are any questions or comments regarding this information, please contact me at (919) 325-0696 or Jim LaRue at (281) 431-3571.

Respectfully,
Seaboard Group II and City of High Point



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