VB/I-70 Superfund Community Advisory Group (CAG) Meeting Notes

Date of Meeting: Tuesday, November 14, 2017

CAG members present: Roberto Eaton, Kim Morse, AE, Lloyd Burton, John Van Sciver (for Bridget Walsh), Jim Garcia, Mike Dugan, Drew Dutcher, Joan Seeman, Tad Bowman

CAG members absent: Candi CdeBaca

Ex-officio present: Jenny Luthi, Fonda Apostolopoulos, Celia VanDerLoop, Jesse Aviles, Jack Paterson, Andrew Ross, Kerra Jones, Lindsey Coulter, Andy Whitty (Denver note-taker)

Facilitator: Kerra Jones

Introduction: Ms. Jones announced that Ms. Suárez was travelling for business and that she would serve as the meeting’s facilitator. She then announced the attendance of Denver CART services, the agency that improves communication for deaf and hard of hearing persons. She introduced the interpreters. She noted that Andy Whitty was also recording the meeting. Each CAG member received a folder with the printed materials for the night’s meeting as well as the frequently asked questions document (for front of binder) created by Jennifer Chergo. One binder has been provided for each CAG member/alternate pair. The folder also contains an updated CAG member contact list that reflects recent membership changes.

Construction Update: (Ms. Luthi)
For discussion, Ms. Luthi referenced the construction scorecard update located in the folder, which pertains to the September Pollution Report. To date, 134,000 total cubic yards of material have been excavated, of which 75,000 total cubic yards have been handled as asbestos containing soils. Denver has removed and treated approximately 20 million gallons of groundwater from the construction site. The air monitoring report has been updated on the DEH website.

Work is continuing to progress to pave a portion of the coliseum parking lot, and construct the drop inlet, the drop outlet, the east part of the wall, and the coliseum conduit. Ms. Luthi clarified that prep work for the liner installation is underway, but the liner installation has not yet been initiated; installation is expected to begin within the next couple of months.

Several CAG members shared their concern for the format of Mr. Frobel’s presentation; they requested an abbreviated version of the presentation to allow for extra time to field specific questions following the presentation. Mr. Frobel noted that his presentation addresses the questions that people have recently submitted regarding the liner.

Liner Presentation: (Mr. Frobel)
He explained the dual purpose of the liner system as both a cover to prevent contaminated groundwater from infiltrating surface water and also as a liner to prevent surface water from percolating down into groundwater/waste materials below. The liner system consists of many parts designed to work together, including (bottom to top): stone columns to increase subsurface stability, a strengthening layer with geogrid, geotextile protection layers, the 60-mil textured linear low density polyethylene (LLDPE) liner, the geonet composite layer, and two feet minimum of soil cover protection with the orange detection layer.
CAG members had identified questions at the previous CAG meeting and in subsequent e-mails, and Mr. Frobel’s responses included:

**What forces act on the liner system?**
- It is situated in a wet, buried environment. The polymer has been chosen with 95-97% pure polyethylene to ensure low chemical extraction and ensure longevity.
- Stone columns and a strengthening layer system will address potential settlement in waste below.
- Low concentrations of organics/inorganics are present in groundwater/waste below.
- Potential installation stresses are addressed by robust QA/QC processes.

**Why was this liner system chosen?**
- Low density polyethylene is a flexible material that will conform to site conditions. It has high tensile strength and allows for elongation.
- The textured surface provides slope stability and minimizes slippage.
- The liner system design distributes loads both vertically and laterally to reduce stress.

**What is the liner warranty?**
- Manufacturer warranty – 20 years, industry standard
- Installation warranty – 2 years, industry standard

**Who is liable in the event of liner failure?**
- The Operations and Maintenance Plan (O&M) will address this question more fully.

Please discuss the long term maintenance of the liner.
- Electrical leak location surveys provide for post-installation performance testing as well as long-term monitoring. This is the only standard ASTM monitoring method capable of detecting leaks under a soil cover. During the test, the liner acts as an insulator. An electrode is placed above and below the liner, and electrical current paths reveal any leaks in the liner system.

**Why are we confident it is up to the task?**
- Geomembranes have been used for decades in waste and non-waste containment, such as hydroelectric dams. Longevity of the liner material and design concepts are well understood and have proven to be effective. The soil cover greatly extends the longevity of the liner.

Ms. Morse asked if there is there anything separating the groundwater and surface water in the current park design. What necessitates this separation for the GLO project? She introduced a community member--Chuck Norris, hydrogeologist.

Ms. VanDerLoop replied that this is a Superfund site and for this portion of the site, Denver has chosen this design for the long-term solution, as necessary to allow for the drainage channel construction. For the remaining areas within OU2, a remedy has not yet been selected.

Mr. Norris noted that the previous RI/FS never suggested that groundwater and surface water required a barrier and was never a proposed solution. If the GLO liner barrier is necessary, should there have been or should there be that kind of separation throughout OU2?

Ms. VanDerLoop replied that the RI/FS (2009 and 2010) did include a capping alternative (solution). Buried waste sites generally involve a cap as part of the site remedy. Ms. VanDerLoop explained that community soil cleanup (in OU1) constituted the highest priority for EPA and Denver in the years following the initial RI/FS from 2009/2010. EPA has requested that Denver update the RI/FS, which will describe options for the final remedy and which final remedy selection will be shaped within a
community-participatory process; a draft will be presented to the CAG. The long-term remedy will address the potential interaction of groundwater and surface water for the remainder of the site.

Mr. Norris asked and it was clarified that there is no liner providing separation of the groundwater and the surface water downstream of the outfall or outside of the vertical walls at the perimeter of the liner. Mr. Frobel clarified that this is a single liner system. Per Mr. Norris’ question, Mr. Frobel characterized the soil layer above the liner as most often unsaturated and the soil layer immediately below the liner as varied with regard to saturation conditions. Mr. Norris asked if the electrical conductivities of the soils/water above and below the liner were known values? Mr. Frobel replied, “No,” but stated that the water would be conductive. Mr. Apostolopoulos commented that extensive sampling has been conducted and the conductivity of the groundwater is known. Mr. Norris expressed concerns for the effectiveness of the electrical conductivity test under these site conditions. According to the work plan, the leak must have water in it at the time of the test for the test to detect the leak. He requested Mr. Frobel provide historical testing documents for a liner system under similar conditions. Mr. Frobel explained that the electrical leak location contractor can calibrate the system to account for a variety of conditions, including unsaturated soils. He asserted that many similar liner systems have been installed and tested in unsaturated soils. **Mr. Frobel agreed to provide some data or documentation from Leak Location Services.**

Mr. Burton asked if with reference to drinking water downstream and the public health protection, would the removal of all contaminated material have been a safer alternative solution.

Ms. VanDerLoop replied that the policy decisions to build GLO have been made by city decision-makers. She explained that it is cost-prohibitive to remove entire landfills. Landfills with water flow components have been closed in place, referencing the Sheridan landfill. There are many examples of closed, historical landfills throughout the region, including along the South Platte River that have been left in place.

Mr. Apostolopoulos added that the groundwater moving through these historical landfills has been sampled and resulted in mostly nutrient contamination but low levels of metal contamination. These were mostly “daily-burn” historical landfills with the groundwater passing through for decades into the South Platte River; it was difficult to justify removing all of the landfill materials.

Mr. Burton replied that with the potential subgrade I-70 design blocking and redirecting groundwater, the concern is that the contaminated groundwater may be directed toward the GLO to higher levels than the current conditions. Mr. Norris asked if there are any physical or chemical parameters for a monitoring system that will notify failure of the liner system.

Mr. Shangraw replied that no, there is not.

Mr. Norris asked if there is a measurable condition in any engineering document that would define a liner failure?

Ms. Luthi replied that the process of writing an Operations and Maintenance Plan is currently underway, under draft within collaborating city agencies. It will be sent to EPA and CDPHE in draft form before being shared with the CAG. These details will be addressed in the Operation and Maintenance Plan (O&M), including the parties responsible and defined intervals for required maintenance and inspections. Also, there is an existing document that will inform the initial liner installation inspection which also addresses some of these public concerns.

Mr. Shangraw emphasized the important role of the overlying soil layer to protect the liner and the accompanying orange fencing layer to alert and trigger maintenance as a safeguard against potential soil erosion issues. The liner should never be exposed following installation. It is designed to be left in place underground.

Mr. Norris commented that if the liner’s function is critical to ensure public health, he doesn’t see what the plan B is in case the liner fails to perform optimally.
Ms. Seeman shared concerns for the lack of a Worst Case Failure Evaluation document and the geotechnical stability of the subsurface. She characterized the landfill as a slag dump. 

Mr. Apostolopoulos replied that the slag components of the landfill had been removed many decades ago.

It was suggested and seconded that Mr. Aviles’ planned presentation on OU1 be moved to the December agenda, to allow for more discussion on the liner topic.

Mr. Eppler commented that the groundwater is already flowing into the South Platte River. The groundwater entering the site must be hauled offsite for treatment. He asked why hasn’t the contaminated water flowing into the South Platte River already been addressed?

Ms. VanDerLoop replied that Denver is treating the pumped groundwater at McDonald Farms for low-level metals contamination. The long-term remedy will help address groundwater conditions more comprehensively.

Ms. Fetter stated her concerns for the length of the warranty for the liner and the environmental conditions of the vacant lots near 39th Avenue. She asked if the channel beyond GLO will have a similar liner design component and if there are some unknown contaminants that might contact the liner via groundwater.

Ms. VanDerLoop explained that the channel will not be lined outside of the GLO area. It is only within the GLO area that environmental conditions, due to the landfill, warrant the liner system design.

Ms. Walsh discussed her research which indicated that arsenic and cadmium are endocrine disruptive chemicals even at very low concentrations. She stated that this new research has not yet been integrated into EPA regulations.

Ms. VanDerLoop replied that the city is using standards that are set by the state and federal agencies.

Ms. O’Connor criticized the logic that the groundwater has already been moving through the landfill onsite to justify increased flows through the site. In her opinion, the preexisting modifications to the watershed and groundwater systems preclude such a comparison. Mr. Apostolopoulos replied, emphasizing differentiation between surface water and groundwater. The GLO infrastructure will convey surface water. He also explained that this historical urban area has long ago incorporated urban infrastructure that has modified the natural landscape and must continue to evolve new infrastructure to protect public and environmental health for Denver’s growing population.

Mr. Brett Banwart introduced himself as the GLO Project Manager with Denver Public Works. He confirmed that the GLO is designed for the 100-year flood. Flows less than a 10-year flood will go under the Delgany Sewer Interceptor, and flows larger than a 10-year flood would go over through the park and spillway (not the landfill), which is armored with new riprap and materials.

Mr. Eppler asked if in the event of a 100-year flood, the groundwater augmented with percolating surface water might rise to compromise the liner?

Mr. Banwart replied that the rainfall events should have a minimum effect on groundwater levels in this area. Most of the terrain that will divert storm water to the GLO is capped by impervious surfaces.

Mr. Apostolopoulos responded to a suggestion that the reconstructed I-70 might divert groundwater such that it flows through GLO. He explained his sketch on the display board which showed that northwest trending groundwater will continue along the northwest path below the I-70 construction infrastructure and below the elevated portion of I-70 west of Brighton which has already been constructed. In his opinion, it is unlikely that CDOT will elect to design and build beneath the groundwater table because it is prohibitively expensive. In his opinion, the distance between GLO and the portion of the re-constructed I-70 which will approach groundwater levels is a significant distance, through which groundwater flows will follow normal patterns and move beneath the highway, thus negating any dam effects should these ever occur. Also, the slag pile element of the landfill has been excavated and removed decades ago. He added that he evaluates projects using scientific principles.
based on the potential benefits for the environment in his role as a CDPHE project manager/plans reviewer.

Ms. Seeman shared a concern for the grout column durability beneath the liner. Mr. Banwart explained that these components (cement grout columns) were designed to densify the subsurface material via expansion, not as load bearing elements.

A.E. asked the CAG to consider the risk assessment and the contingency plan in the event of a worst case scenario, given the preexisting inherent risks of civilization (urban infrastructure, etc). She explained that her role in this process is to ensure that the best science and engineering practices, given realistic constraints of these unique site conditions, are employed to minimize risk to the environment and public health.

**December Agenda Discussion:**

Mr. Ross clarified that the 39th Ave lots are currently under the process of acquisition; the contracts are not yet finalized. It was requested that presenters provide links or copies of the documents referenced in their presentations. Ms. VanDerLoop explained that the current timeline does not allow for the translation of these referenced documents, so they could not be distributed beforehand. Ms. Seeman asked about the UV treatment designs for the GLO. Mr. Banwart confirmed that there will be a UV treatment component at GLO.

The following items were suggested as topics for the next meeting:
Ground/Surface water presentation – EPA/Denver
- Ms. Morse will submit an outline of questions to guide the water discussion in December.
- CAG requested a brief presentation followed by a Q&A format.
OU1 Summary (Mr. Aviles)
Delgany Sewer Interceptor details from the engineer
Request for the Operations and Maintenance (O&M) Plan.
Possible impacts on downstream water users

The CAG members prioritized that a presentation on groundwater and surface water, and the OU1 summary would be provided.

The October meeting notes were approved by vote.
Mr. Burton asked for an update on the TASC. Mr. Aviles replied that it is available but has not yet been requested. Ms. Morse confirmed the lack of application for a TASC. Ms. Jones concluded the meeting and wished everyone a goodnight.
December 11, 2017

Report on Liner Questions at 20171114 Meeting of CAG

Dear CAG Members:

Thank you for the opportunity last month to explore some of the questions I developed regarding the liner that is proposed to be placed below the ‘open channel’ drains at the Globeville Loading Outfalls Project [GLOP]. Although the flow of the CAG meeting on November 14, 2017 did not allow me to ask all of the questions I previewed with CAG members the week prior to the meeting, many of the issues I hoped to raise were raised and answered. Others were answered in the course of the discussions, without being explicitly asked. Only a few remain unaddressed. Below I summarize the main issue I hoped to raise and what I understood to be the CCoD responses.

Section A questions sought to explore the conditions at OU2 that necessitate a liner to be built at GLOP under the open channels. An impermeable barrier beneath the open channels that are upstream of the drop structure is specified for two purposes.\(^1\) The barrier is to keep surface water that will run through those open channels from partially infiltrating into groundwater (where stream bottom is above the elevation of groundwater) and to keep groundwater from adversely impacting water within those channel along other reaches of the channel (where stream bottom is below the elevation of groundwater. The prescribed impermeable barrier is established

\(^1\) The objectives of the impermeable barrier are documented in the Administrative Settlement Agreement and Order on Consent, 20150701, Section VIII, paragraph 22, page 8.
to be an impermeable liner with appropriate support beneath and protective materials above and below the liner.\(^2\)

Discussions with CCoD at the November 2017 CAG meeting established that contaminated groundwater from beneath OU2 currently discharges to surface water (South Platte River), that surface water currently infiltrates into the waste materials underlying OU2, and that no engineering features have been constructed throughout the last 8 years to prevent such cross-flow and potential cross-contamination.\(^3\) Further, the discussion with CCoD established that the Feasibility Study\(^4\) [FS] did not evaluate a cap-with-liner as necessary at OU2 to separate groundwater from surface water. Demonstrating the need for such separation to protect public health, safety, and welfare would require RI/SF work beyond that done in 2009 and 2010. No opinion was offered to establish that the open channels proposed for the GLOP produced a significantly different site condition than otherwise exists at OU2, thereby justifying the $1.8-million for a liner barrier beneath the channels.\(^5\)

**Section B questions** sought to explore the extent to which the proposed liner system would provide separation between ground- and surface water cross-flows at OU2. The discussions with CCoD and its consultants established that the only impacts to OU2 by the impermeable liner system would be under the open channel portions of the GLOP that are above (east of) the drop structure that lowers the elevation of the storm water flow to below the sanitary sewers that traverse the Globeville Landing Park. Open channel flow below (west of) the drop structure

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\(^2\) Administrative Settlement Agreement and Order on Consent, 20150701, Appendix C, Statement of Work, Section II, Item 3, p. 2.

\(^3\) In the discussions CCoD cited EMSI 2009, Remedial Investigation [RI] Report for VB/I-70 Superfund Site OU2.


\(^5\) EMSI 2016, Final Design Report Environmental Components for (GLOP) VB/I-70 Superfund Site OU2, Table 5 d. Barrier System.
would have no barrier to cross-flow of ground- and surface water. The area of the liner beneath the open channels is less than 1.26 acres. The area of OU2 is 65.56 acres. Thus, the liner of the GLOP is proposed to prevent cross-flow of surface water and groundwater across less than 2% of the area of OU2. Alternatively, the area of OU2 that lies within the outline of Globeville Landing Park is 7.9 acres. The fraction of Globeville Landing Park that is proposed to be protected from ground- and surface water cross-flow is less than 16%.

Section C questions sought to explore how the belief developed that prevention of cross-flow of ground- and surface water was critical to the GLOP, by whom the concept was promoted, and when the decision was made. These questions did not get asked and there was no discussion that addressed them. Documents that I have reviewed to date establish that the concept of a critical need to separate ground and surface water dates to before 20150701. Further, by that date, it was accepted that the separation would be achieved by installation of a liner under the open channels above the drop structure at the GLOP. (See footnotes 1 and 2.)

Section D questions sought to expand upon information provided in previous presentations to the CAG regarding the liner. The discussions at the November 2017 CAG meeting established the following:

The GLOP will have a single, not double, liner design,
the soil overlying the liner will be saturated in some areas and unsaturated in other areas,
the soils underlying the liner will be saturated in some areas and unsaturated in other areas,
the boundary between saturated and unsaturated soil conditions both above and below the liner will migrate back and forth with time,

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6 Ibid. The budget item for the liner is 55,000 square feet (1.26 acres). This area of liner includes the horizontal area beneath the open channels and the addition liner necessary to rise vertically to the anchoring structures.  
7 EMSI 2009, Remedial Investigation Report for VB/I-70 Superfund Site OU2, Figure 3.  
the contractor for installing the liner did not have any knowledge of the electrical conductivity values and variability of ground- or surface water either above or below the liner, the contractor for installing the liner was confident an electrical survey was adequate to document the continuing integrity of the proposed liner under the complex conditions at this, and the liner contractor promised to provide reference(s) establishing the viability of electrical assessment of liner integrity for site-specific conditions at Globeville Landing Park.

To date, I have yet to received such references or documents relating to leak detection under conditions similar to those at the GLOP using electrical surveys.

Section E questions sought to explore alternative methods of assessing the liner integrity, in lieu of electrical surveys. In the event that periodic electrical surveys to verify continued liner integrity cannot be performed or would be of questionable reliability, what, if any, alternative monitoring methods might be available to determine whether or not the liner system continues to prevent cross-flow of ground- and surface water at the GLOP.

CCoD’s design consultant for the GLOP stated that there were no physical properties or parameters that could be measured as part of a monitoring system at the GLOP that could detect liner failure, were it to occur. Further, the consultant stated there were no chemical properties or parameters that could be measured as part of a monitoring system at the GLOP that could detect liner failure, were it to occur. That is, were a successfully installed liner to fail at some point in the future, there would be no discernable differences to ground- or surface water chemical or physical properties that would result from the failure.

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9 CCoD asserted such data was frequently measured and was readily available.
10 At the 20171114 CAG meeting, the liner consultant provided a link to a 1993 industry publication that demonstrated even properly installed liners can leak and that under some conditions electrical surveys can detect some leaks.
These are rather astounding statements. They are equivalent to stating that there is no expectation that a successful installation of a liner system at the GLOP will have any discernable impact on physical or chemical properties of surface water or groundwater, compared to a GLOP with no liner system. If that is the case, for what are the tax- and rate-payers of Denver being charged an estimated (actually, underestimated) $1.8-million? If the liner is expected to have no discernable impact on ground- or surface water distribution, flow, or quality, then the liner, notwithstanding CCoD’s protestations, must be considered window dressing.

**Section F questions** sought to explore what if any monitoring system was in place or might be under development that would allow confirmation of the integrity of the liner system once it was installed. As of the November 2017 CAG meeting, CCoD said that it had no such monitoring system available to the CAG for review or comment. CCoD further did not discuss what techniques or protocols might be in any such a monitoring system. CCoD did not provide a timetable for providing such a monitoring program and did not establish that any such a monitoring system would be available to review prior to the installation of the liner.

With the assertions that there is no way to monitor chemical or physical conditions at the site to establish the integrity of the liner after initial installation, there seemingly remains only electrical surveying. That greatly increases the need for the documentation promised by the representative of the company that has been awarded the contract for liner installation, as discussed above for Section D.

**Section G questions** sought to explore remedial mechanisms to restore or replace the liner in the event that it loses integrity after installation. Time constraints precluded any discussion related to this topic.
As I indicated above, these observations are what I understood to have been the responses of CCoD and/or its consultants and contractors. They are consistent with my memory, but I was a participant and may have missed something. The observations seem to be consistent with the summary of the discussion provided by the note taker at the meeting. If you saw or heard something substantially different than what I have described above, please contact me; it is important to me to get it right.

Sincerely,

Chuck

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Denver comments:

1. In section A, page 1, Mr. Norris refers to multiple open channels. We assume that Mr. Norris is referring to both the open channel under construction in the Coliseum parking lot, and the channel that will be constructed as part of the 39th Avenue Greenway. As discussed at the November meeting, the open channel within the current Coliseum parking lot will be lined. Open channel sections further upstream, such as the 39th Avenue Greenway, will not be lined.

2. In Section A, page 2, Mr. Norris states “Further, the discussion with CCoD established that the Feasibility Study\textsuperscript{11} [FS] did not evaluate a cap-with-liner as necessary at OU2 to separate groundwater from surface water. Demonstrating the need for such separation to protect public health, safety, and welfare would require RI/SF work beyond that done in 2009 and 2010.” As discussed at the November meeting, the 2011 Feasibility Study evaluated a cap over buried wastes to prevent surface water from infiltrating into groundwater. Additional work is contemplated to further evaluate appropriate remedies for OU2.

3. In Section B, page 3, Mr. Norris states “Thus, the liner of the GLOP is proposed to prevent cross-flow of surface water and groundwater across less than 2% of the area of OU2.” The Consent
Agreement which allows a Removal Action for GLO construction addresses only the portion of Operable Unit 2 necessary to complete GLO construction. The remainder of Operable Unit 2 will be addressed via a yet-to-be determined remedy, to be proposed and selected after the Remedial Investigation and Feasibility Study are updated and finalized, and after public comment is received.

4. In Section E, page 4, Mr. Norris states “CCoD’s design consultant for the GLOP stated that there were no physical properties or parameters that could be measured as part of a monitoring system at the GLOP that could detect liner failure, were it to occur.” Mr. Frobel clarified that the physical properties that would be evaluated would be settlement of the walls and of the lined area, which would be evaluated through regular visual inspections and survey. Mr. Frobel also discussed electrical leak detection as a mechanism to evaluate liner leakage. Mr. Frobel emphasized that liner damage was most likely to occur during construction. After the liner is buried, an orange webbing layer is installed to prevent accidental penetration during maintenance activities. The liner materials are highly resistant to degradation via ultraviolet light and/or chemical attack. In addition, once buried, the liner would not be subject to UV light and the groundwater contains very low concentrations of chemicals that might degrade plastics.

5. In Section F, Mr. Norris states “CCoD did not provide a time table for providing such a monitoring program and did not establish that any such a monitoring system would be available to review prior to the installation of the liner. Mr. Frobel discussed, as a part of his presentation and during the Q&A, using regular inspections and electrical leak location testing to evaluate the integrity of the liner system. CCoD representatives said that Denver is in the process of drafting an Operations and Maintenance Plan, which will include mechanisms for evaluating liner integrity.