July 20, 2017

Mr. Chris White, Deputy Director
Ulster County Planning Department
P.O. Box 1800
244 Fair Street
Kingston, NY 12402-1800

Re: Ulster & Delaware Railroad - Ashokan Reservoir Segment
Summary of Opinion Statement

Dear Mr. White:

HDR was engaged by the Ulster County Planning Department to develop a recommendation and Summary of Opinion Statement ("**Summary**") regarding the Ulster & Delaware Railroad Corridor between Milepost 10 at Basin Road in West Hurley and Milepost 21.6 at Route 28A in Boiceville, NY ("**Corridor**"). Specifically, HDR was asked to make a recommendation based on our railroad engineering experience and familiarity with the Corridor as to whether it is preferable from the perspective of restoring railroad uses in the future to remove the existing track infrastructure to construct a rail trail, or alternatively, bury the existing track infrastructure.

For background, I am currently the Association Vice President and Rail Section Manager for HDR with more than 35 years' experience in railroad engineering as well as a Licensed Professional Engineer in the State of New York with a Bachelor of Science Degree of Civil Engineering from the University of Pittsburgh, A Master of Science from New York Polytechnic and a Post Graduate Engineers Degree from Columbia University.

Summary Statement/ Recommendation:

As detailed below, it is our recommendation that the County remove the existing railroad infrastructure—including track, ties, and other track materials ("**OTM**")-- in developing the **Ashokan Rail Trail ("ART") rather than bury the** track and tie infrastructure for potential future use in building the ART. Based on cost, constructability, drainage considerations, current condition of the track and ties, and other factors, any future restoration of railroad uses on the Corridor is best served by removal of existing track and ties and stabilization of the underlying railroad infrastructure, including repairs to drainage structures, as proposed for the ART development. Burying and then uncovering the existing railroad infrastructure will make restoration of railroad uses on the Corridor more expensive and labor-intensive. It would also make trail construction and restoration of the drainage facilities much more difficult and expensive and make future maintenance of the trail problematic. Finally, leaving deteriorated ties in the corridor are likely to have environmental consequences that should be avoided.

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My recommendation is based on familiarity with the Corridor from prior inspection reports and on my experience with all aspects of railroad construction and maintenance. As you know, HDR's Rail Engineer and staff visited and documented the condition of the U&D Corridor between Kingston and Phoenicia, including this segment, in 2015 and 2016 and provided an assessment of the rail infrastructure to the County in reports dated June 6, 2014 and September 21, 2015 ("Condition Reports"). I reviewed the Condition Reports at the time they were produced and certified them as the supervising engineer. For purposes of this Summary, I have conducted a detailed review of the Condition Reports, including the accompanying photographs to re-familiarize myself with the Corridor and the condition of its railroad infrastructure. I have also researched other rail trail corridors to determine whether others have any experience in building trails on top of existing rail infrastructure that would inform my recommendation.

Current Conditions of the U&D Corridor:

As detailed in HDR's Condition Reports from 2015 and 2016, the U&D Corridor along the Ashokan Reservoir does not meet FRA Class I safety standards, the minimum safety standard for any operation of passenger or freight service. We understand that the last freight service on this segment was in the late 1970's, and it appears that for the most part, little or no maintenance of the railroad infrastructure has occurred since that time. HDR's Rail Engineer found and documented that the Corridor was in an advanced state of disrepair from this lack of maintenance, and the railroad infrastructure—including as culverts, bridges, drainage ditches, embankment and right-of-way have numerous locations of complete failure with the majority of the infrastructure evidencing marginal function as to its intended design purpose. In support of these statements I note that during the 2015 and 2016 inspections, HDR's Rail Engineer was unable to record every track defect as the condition of the Corridor was so poor. Many defects were hidden under debris, and the main charge of the inspection was to provide sufficient data to show that the areas that did not meet Class 1 standards. The Rail Engineer sampling throughout the Corridor at regular intervals did document 297 FRA Class I defects (77 Class Specific defects, 120 Non Class Specific). Most importantly for the purpose of this Opinion Statement, the photos and written statements in the Condition Report reveals that approximately 95% of the railroad ties were in an advanced state of decay or missing.

The inspections also detailed a long list of other railroad infrastructure issues in the Corridor. The rail, itself, is misaligned and has surface irregularities in many areas. Tie conditions are very poor, and ballast is no longer even visible in many areas due to build-up of organic materials over a period of decades. Drainage systems have largely failed, with ditches plugged and overgrown with trees, ballast missing (which allows drainage), many culverts heavily deteriorated (including the complete failure of the major culvert at Butternut Creek), and ditch lines that over a period of years have now become wetlands and left the railroad

bed saturated. All of these issues are critical factors in weighing the advisability of burying this infrastructure for reuse in the future.

Issues with Burying Rail Infrastructure:

The choice of whether to remove or bury the existing track and ties requires consideration of the impacts both on the trail and future ability to restore the rail that was buried to operating condition. The existing railroad ties throughout the corridor are in an advanced state of decay, which will only accelerate once they are buried. Their continued decay will likely foul trail construction materials resulting in a "**wash board**" trail surface over a short timeframe causing challenging trail maintenance. Removing the ties and track before constructing the trail allows for removal of the built-up organic material and refreshment of the existing ballast to restore its drainage capabilities. This, along with repair and replacement of other drainage structures, will better preserve the integrity of the rail corridor, and stabilized trail material itself will serve as an improved sub-base for any future track restoration.

Burying track infrastructure is not a typical rail-to-trail conversion practice. We have found no instances of it being used in similar situation or for this length. Leaving the track structure will complicate the installation of the trail as construction equipment will have to avoid damage to the rail, which is nearly impossible in many sections of the narrow corridor. Additionally, burying track and tie makes the correction of drainage issues along the rail gage similarly more difficult as construction of swales, new culverts, and replacement of ballast where washed out will need to be done while maintaining the track in place. Stabilization of the underlying railroad embankment/ bed is best accomplished by removing the track, ties and OTM, excavating the built-up organic materials layers, and re-establishing a functioning drainage system, including new ballast. The rail and OTM can be sold as scrap offsetting trail construction costs and help to offset the cost of disposal for the existing deteriorated ties.

In addition to the issues highlighted above, the following considerations also cause us to discourage burying the existing track materials for future re-use for railroad operations:

- Restoration of existing track to future service after burial will require heavy tie renewal. It is likely that, even after a short time, nearly 100% of the ties will require replacement as few, if any will survive being uncovered and set to final geometry.

- Reestablishment of alignment using the current 100 LB DY rail (which is no longer produced) with 6 hole joints throughout is problematic as it should not be welded **without cropping every end due to bolt hole fractures (i.e., not "weld friendly")**. The exiting 100 LB rail may require over 3000 welds plus each end being cropped due to 6 hole joints as **best practice does not support welding within 9.5" of a bolt hole.**

In addition, the condition of the existing rail that already has pitting and flange issues also makes replacement of the rail a better choice from a safety perspective.

- Continuous welded rail (CWR) is today's preference for rail corridor restoration. AREMA rail sections sizes 115 and up are the rail sections now used in railroad reconstruction and repair. Railroad ties for this type of rail can be spaced at 24 inches on center versus 19.5 inches common with 100 LB rail sections. Approximately 7000 less railroad ties would be required on the 11.6 mile section of the Corridor using 115 size rail.

- Modern track construction methods have economic and constructability advantages over any restoration attempts of this Corridor that leave the track and ties buried in place. The use of CWR/wood tie track structure on a graded restored ballast system with drainage improvements is likely to be more cost effective from a purely rail standpoint given the amount of ties needed to be replaced, the condition of the ballast and drainage in the corridor, and the type and condition of the rail itself.

- It is not clear how major reconstruction of the Butternut Creek Culvert and Boiceville Bridge could be accomplished without removing the track and tie infrastructure and stabilizing the road bed for construction vehicles. Much of the Corridor is remotely located and narrow, and retention of the existing track would make construction access very difficult and expensive.

- Significant costs will be incurred for trail construction associated as additional fill will have to be brought in over a long narrow corridor. Adding fill to cover the tracks is also likely to cause problems in maintaining trail width as side slopes and shoulder issues will arise on the narrow embankments and drainage issues will occur in the narrow rock cuts.

Conclusion:

Based on our inspection and review of the existing conditions in the Corridor, the Ulster & Delaware Railroad Corridor segment from Milepost 10 at Basin Road to Milepost 21.6 at Route 28A we offer the following:

- The Corridor in its current condition cannot support rail service without major rehabilitation and repair, burying this rail infrastructure will only add to its deficiencies and efforts needed to uncover and re-establish geometry will further add to the problems with the existing track.

- Significant barriers exist to the constructability and maintenance of a trail over the rail that include: removal of organic material now present throughout the existing

ballast; restoration and improvements to drainage systems; avoiding damage to the existing rail infrastructure during construction, particularly during placement of fill; and maintaining the trail width and need shoulders on narrow embankments and rock cuts.

- Each of the above factors will significantly increase the costs of trail construction as will the need for additional fill to cover the tracks. Maintenance costs for the trail will rise in both the near and long term as the underlying rail infrastructure deteriorates and shifts with usage.

- Environmental issues will be heightened with the existing ties being left in place.

For all of the reasons discussed above, the County would be best served by removing all existing rail appliances (Rail/Ties/OTM) before the installation the trail based on the cost, constructability and usability of the trail and the feasibility of restoring railroad services at some future date using the existing rail infrastructure. Future restoration of the Corridor to a properly functioning condition will best be accomplished with total replacement of rail/ties/OTM with more currently available materials installed by modern means and methods.

If there are further questions, I can be contacted at (212)-542-6028 or via email: richard.semenick@hdrinc.com.

Sincerely,

Richard C. Semenick, PE
Associate Vice President