DELAWARE RIVERKEEPER NETWORK

November 28, 2016

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Millennium Pipeline Company, LLC Eastern System Upgrade Project, CP16-486

Dear Ms. Bose,

The Delaware Riverkeeper Network submits the attached expert analysis undertaken by Dr. Stephen J. Souza with Princeton Hydro, LLC.

Sincerely,

Maya K. van Rossum
the Delaware Riverkeeper

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28 November 28, 2016

Scientists, Engineers & Environmental Planners Designing Innovative Solutions for Water, Wetland and Soil Resource Management

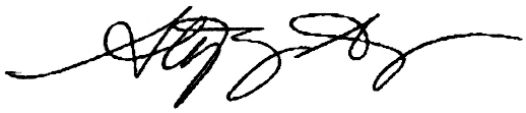
Maya K. van Rossum
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

Dear Ms. van Rossum:

Princeton Hydro, LLC submits the attached report that details our findings regarding the environmental impacts associated with the proposed Millennium Pipeline Eastern System Upgrade. Our findings are largely based on the information contained in a number of reports prepared by Millennium Pipeline and submitted to the Federal Energy Regulatory Commission (FERC). Our review of these materials confirms that this project will have both short and long term impacts on environmental and water resources located within both the Delaware River Basin and the Hudson River Basin. Among the negative impacts that we expect to occur as a result of this proposed project include significant negative changes to the upland, riparian and wetland plant communities, irreversible soil compaction, increases in stormwater runoff, and both acute and long-term degradation of stream communities. As discussed herein, although the measures proposed by Millennium to mitigate these impacts may satisfy the minimum standards needed to achieve regulatory approval, they will fall far short of restoring affected areas to pre-construction conditions. As a result the proposed Eastern System Upgrade will negatively impact the ecological services and functions of the upland, wetland and stream environments traversed by and located adjacent to the pipeline right of way (ROW). Further details of the anticipated impacts and irreversible consequences of this project are provided in our report.

Should you have any questions or comments please feel free to contact me.

Sincerely,



Stephen J. Souza, Ph.D., President
Princeton Hydro, LLC

1. The Millennium Pipeline Eastern System Upgrade

The Millennium Pipeline runs for 220 miles along the southern edge of New York from Independence in Steuben County to Ramapo in Rockland County, also passing through Chemung, Tioga, Broome, Delaware, Sullivan, and Orange counties. Jointly sponsored by subsidiaries of the Columbia Pipeline Group, National Grid, and DTE Energy, the pipeline was completed in 2008 and supplies the northeast United States with 0.5 billion cubic feet per day of natural gas from the Interstate pipeline system and Appalachia (US EIA). This 30-36 inch pipeline was installed within a 50 foot wide permanently cleared right-of-way (ROW).

The proposed Eastern System Upgrade (Project) involves the construction of 7.8 miles of additional 30-36 inch pipeline partially adjacent to the existing Millennium Pipeline in Orange County, NY, known as the Huguenot Loop. Beginning in the town of Deerpark, New York, the new pipeline will pass through the town of Greenville and end in the town of Minisink. Additionally, the Project will require the construction of multiple aboveground facilities. These include a new Highland Compressor Station and access road (Sullivan County, NY), and modification of the existing Hancock Compressor Station (Delaware County, NY), the Ramapo Meter and Regulator (M&R) Station (Rockland County, NY), the Wagoner Interconnect (Orange County, NY), the Huguenot M&R Station (Orange County, NY), and the Westtown M&R Station (Orange County, NY).

The Eastern System Upgrade affects lands and water resources located within the Delaware River and the Lower Hudson River watersheds. Approximately 2.6 miles of the Huguenot Loop, as well as the Highland and Hancock Compressor Stations, the Wagoner Interconnect, and the Huguenot M&R are located within the Delaware River watershed. The remaining 5.2 miles of the Huguenot Loop along with the Westtown M&R station are located within the Lower Hudson River watershed. Figure 1 provides an overview of the subject section of the pipeline that is part of the proposed Eastern System Upgrade.

The Project is subject to review by the Federal Energy Regulatory Commission (FERC). Details of the Project's potential impacts to the environment are presented in a number of publically accessible documents. In preparing this report Princeton Hydro conducted a fairly comprehensive review of the following publically accessible documents:

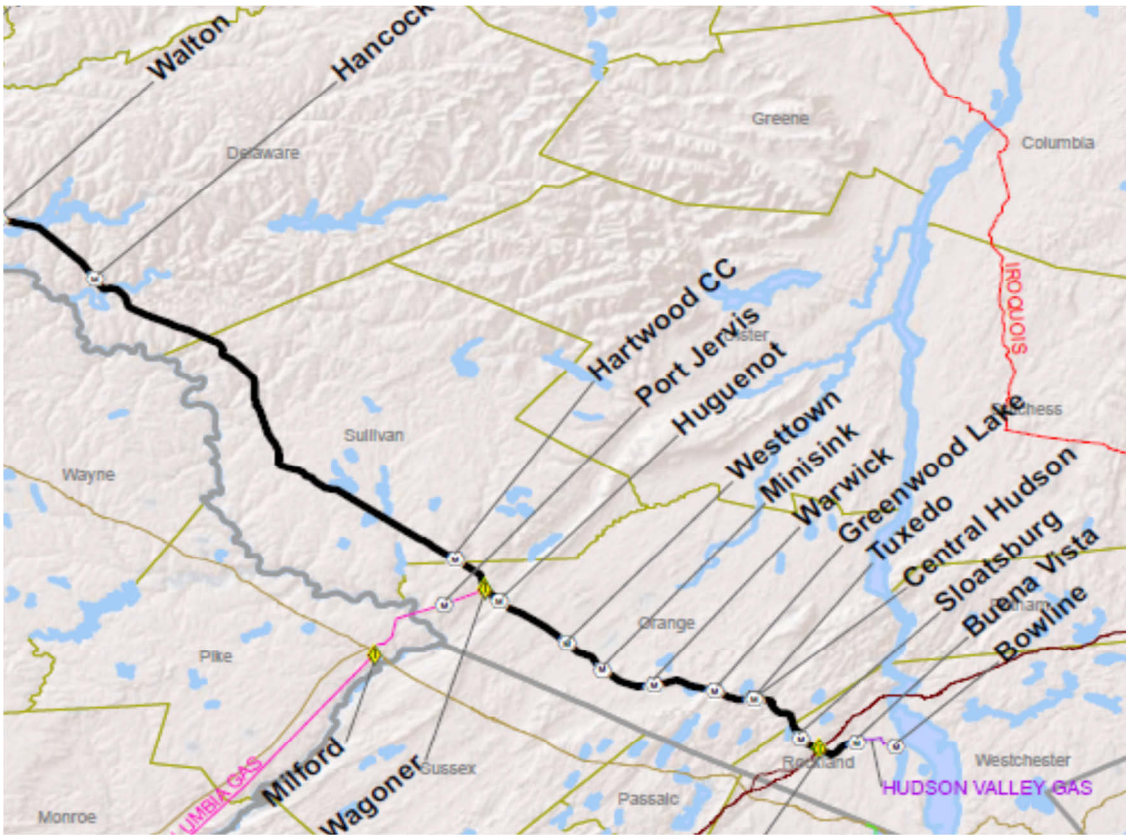
- Eastern System Upgrade, *Resource Report 1* (General Project Description*)*, July 2016
- Eastern System Upgrade, *Resource Report 2* (Water Use and Quality*)*, July 2016
- Eastern System Upgrade, *Resource Report 3* (Fisheries, Vegetation, and Wildlife), July 2016
- Eastern System Upgrade, *Resource Report 6* (Geological Resources), July 2016
- Eastern System Upgrade, *Resource Report 7* (Soils), July 2016

- Eastern System Upgrade, Final Environmental Report, Volume II-B – Appendix 1C, Maps And Figures, July 2016
- Eastern System Upgrade, Appendix C3, *Phase I Bog Turtle Habitat Survey Report,* April 2016
- TRC, Letter to the DRBC, prepared on Behalf of Millennium Pipeline Company, LLC, regarding the Eastern System Upgrade,
- 25 June Letter from the DRKN to the DRBC Commissioners and Executive Director, and
- Millennium Eastern System Upgrade Pre-filing Review Letter to FERC, 16 January 2016

Princeton Hydro's report also takes into account published literature and reports that pertain and discuss the short- and long-term impacts of gas pipelines. The additional materials that were reviewed in the preparation of this report are listed within Section 5.

FERC lists Millennium's Eastern System Upgrade as one of the major projects currently under FERC review (FERC filing date 29 July 2016). As is the case for any interstate project involving the construction and/or operation of a natural gas pipeline, FERC's review of this project is required as per Section 7(c) of the Natural Gas Act. Such reviews are also subject to the Energy Policy Act of 2005, which designates FERC as the lead agency for coordinating "all applicable Federal authorizations." The Energy Policy Act also mandates a National Environmental Policy Act (NEPA) compliance review of all interstate energy projects. On 19 January 2016 Millennium requested approval from the FERC to initiate the pre-filing NEPA review process. FERC in turn approved Millennium's pre-filing NEPA review request on 5 February 2016. The particular section of the Project that is reviewed herein is also subject to review by the New York State Department of Environmental Conservation (NYSDEC) and to the jurisdiction of the Delaware River Basin Commission (DRBC).

Figure 1 Approximate Path of Millennium Pipeline Eastern Upgrade within New York



Source: Millennium Pipeline Company, LLC

2. Overview of the Environmental Impacts of Pipelines and the Construction of the Eastern System Upgrade

Princeton Hydro's review of the proposed Eastern System Upgrade focused on the Project's potential short- and long-term environmental impacts, with the emphasis of our analysis placed on the Project's impacts to wetland, riparian and stream ecosystems traversed by the pipeline or associated with any of the above ground support facilities.

As noted above, Millennium has generated a number of reports that in part acknowledge and address the environmental consequences of the Project. The field work supporting some of these reports was conducted over an approximate 5-month period beginning in October of 2015 and concluding in early April of 2016. The field studies involved the delineation of wetlands and waterbodies, identification of threatened and endangered species (or their habitat) and surveys of cultural resources occurring within "the area of potential effect", which essentially is a 100 ft to 300 ft wide corridor. The corridor width designated by Millennium reportedly should account for disturbances attributable to pipeline construction activities, the

pipeline's permanent inspection/maintenance right-of-way (ROW), all above-ground support elements of the project, and potential "minor route realignments" that could arise due to specific site conditions. Additional analyses were conducted pertaining to the environmental impacts of construction activities and how such impacts could be mitigated. It should be noted that 27% of the area associated with the "area of potential effect" was not actually surveyed as part of the environmental assessment[1]. Summarizing the data presented in the various Resource Reports, the pipeline itself will result in a total land disturbance of 155 acres attributable to construction activities, with an additional 22 acres affected by post-construction pipeline operations and maintenance. There is an additional 73 acres of disturbance (temporary and permanent) attributable to the above ground support facilities.

2.1 Short term

The most obvious potential short-term environmental impacts are associated with the actual installation of the pipeline and the construction of the supporting infrastructure. Although the consequences of these activities are mostly viewed as triggering short-term impacts, they can elicit longer-term ecological perturbations and negative changes to the ecology of the area. Primary short term effects include vegetation removal, soil disruption and compaction, erosion, and damage to the water quality and hydrologic regime of streams and wetlands.

Vegetation must be cleared to create the pipeline ROW, as well as access roads, construction work spaces and staging areas, and is a major impact to the lands traversed by the pipeline. The clearing process involves the removal of all mature vegetation and the offsite transport of the material using heavy equipment. Collectively this results in an immediate, intense, disturbance of the work area. It also exposes the denuded soil setttig the stage for further erosion as construction activities progresses.

Pipeline construction also causes significant soil disturbance and compaction. As noted above, initially Soil disturbance occurs during the clearing of vegetation, but also results from the grading of construction areas, the operation of heavy machinery, and obviously the actual excavation of the pipeline trench. As noted the typical construction right-of-way for a 36 inch pipe is 100 feet. The pipeline trench itself has to be wide enough to not only accommodate the gasline, but to provide enough space to safely facilitate pipeline installation, construction and testing activities. The pipeline also needs to be suitably buried below the ground to prevent its exposure or damage. Typically it is buried with a soil overburden of 30-36 inches. However, the trench depth may be even greater when the pipeline runs under roads, streams, and agricultural lands.

The trenching operation therefore necessitates the removal of large amounts of soil. The soil removed to create the trench temporarily is stockpiled adjacent to the trench. This stockpiled soil is susceptible to erosion and offsite transport prior to being re-used to bury the bedded

[1] Page 1-11, *Draft Resource Report 1 – General Project Description; Eastern System Upgrade, April 2016*

pipeline. The threat of erosion and offsite transport is markedly increased on steeper sloped lands. As noted in the supporting materials submitted for the Eastern System Upgrade, the pipeline traverses a substantial amount of steep sloped lands.

Disturbing the soil also contributes to erosion and soil loss at the site, that may result in sedimentation issues down gradient of the site. Soil compaction due to machinery operation negatively impacts the soil's ability to support vegetation, reduces soil porosity, decreases infiltration, and negatively affects microbial composition. The decrease in permeability makes the disturbed sites susceptible to greater stormwater runoff both during and following construction, as less precipitation can now infiltrate into the soil.

Wetland and streams are the most sensitive ecosystems affected by pipeline crossings and associated construction activities. Vegetation clearing, excavation, and machinery operation increases the likelihood of erosion and turbidity in the waterbody, and disturbs habitat required by fish, amphibians, mollusks and aquatic insects. Hydric soils are particularly sensitive to compaction because of their higher soil moisture content. Once compressed the resulting loss in pore space negatively affects the soil's hydrologic properties. This can impact the successful re-colonization and re-establishment of wetland plants in disturbed sites. Erosion, turbidity and soil compaction issues also affect macroinvertebrate colonization, fish spawning, and feeding behaviors of various trophic groups that rely on wetland, riparian and stream habitats during any part of their life-history.

The common mitigative solution offered by the pipeline companies involves the implementation of construction-realted erosion control measures. However, the majority of these measures are designed to work in dry environments. As a result, they will either be less effective in a wetland or stream environment, or will require frequent maintenance (including dewatering), which in itself can further negatively affect the hydrology and ecology of the system. Machinery operating in riparian and aquatic settings increases the chance of fuel or lubricants leaking or spilling into streams and wetlands. Such spills, even those considered relatively minor, are detrimental to the environment.

Notably, in the materials reviewed, there is a lack of any hydrologic modeling or accounting for any local hydrologic data in the planning of the various stream crossings. This failure to model and properly plan each crossing will increase the likelihood that each crossing will to subject to disturbance and impact. Documented post-installation impacts caused by pipeline projects include stream bed and bank erosion, localized hydrologic changes, compromised habitat, and even the exposure of the bedded pipeline due to unforeseen strema hydrodynamics changes caused by the crossing. As these impacts occur they will need to be addressed and corrected. This will require once again accessing the site, resulting in further disturbance of the stream channel.

Although within the supporting documents generated by Millennium there appears an attempt to minimize the ecological significance of stream crossing, the potential environmental impacts are in fact substantial and must be viewed beyond the amount of land being disturbed. The significant disturbance associated with the project is compounded by the lack of appropriate modeling and site specific data collection.

Millennium states that the clearing process involves the removal of large obstacles (e.g., trees, boulders, rocks, and brush) and the subsequent grading of work areas to create a relatively flat, stable surface that facilitates the movement and operation of construction equipment and construction activities. They also state that all felled trees and any other brush and other vegetation removed as part of the clearing and site preparation effort may be "chipped, burned, sold, or otherwise disposed of." These actions (the removal of large obstacles, soil grading and removal and disposal of trees and brush) further add to the severity of the clearing process, especially when this occurs in steeper sloped areas, areas with shallow, highly compactable soils and within wetland and riparian areas.

It is important to note that over three (3) acres of forested wetlands and emergent wetlands will be disrupted by the pipeline's construction. The impacts arising during the clearing phase of the project will be especially acute in these areas.

As part of any disturbance activity Millennium will be required to implement certain erosion control measures. While these measures are intended to lessen or moderate the Project's unavoidable impacts to the environment or the health and safety of the affected populous, they need to be viewed as the minimum required level of protection. The Project will also require implementation of stormwater management measures used to control runoff and maintain work areas in an operational state. The reports refer to such devices as temporary flume pipes, interceptor dikes, and other flow diversion measures. The installation and maintenance of these stormwater and flow control devices add to the impacts of the project. For example, open trenches will need to be maintained in a water-free state. Whether originating as runoff, rainfall or groundwater, the water that collects in the trench will need to be pumped and removed. This affects pipe sections located not only in wetland and riparian areas, but also in upland areas.

Millennium understates the potential impacts of the dewatering process stating that "water will be pumped from the trench to a well vegetated area down-gradient of the trench and through a sediment filter" (e.g., hay bales, trench plugs or filter bags) and that this type of dewatering process will not cause any erosion or result in the transport of "heavily silt-laden water flowing into any waterbody or wetland." There are multiple examples of failed erosion and sediment control measures associated with pipeline projects. We view soil erosion (especially that related to trench de-watering activities) as one of the most significant environmental threats to the streams, wetlands, riparian areas, and even sensitive upland areas traversed by the pipeline.

Likewise soil stockpiles will need to be created along the pipeline ROW and adjacent to some of the above ground support facilities. Each of these stockpiles creates an opportunity for off-site soil transport and impact to wetlands, riparian areas and streams. With respect to any directional drilling there will be processed drilling fluids that will need to be managed before being returned to a stream or hauled off-site. The pumping of water for the drilling operation and the return of the drilling fluid all represent additional potential impacts to streams, wetlands and riparian areas.

2.2 Long term effects

Long term environmental impacts result from changes to the site that occur during the construction phase as well as changes due to the operation and maintenance of the pipeline. Though mitigation or restoration measures are taken to address construction related impacts, sites rarely return to pre-construction conditions due to irreversible changes to soil, vegetation, and hydrologic characteristics during construction.

In addition to the previously noted short-term issues, the extensive vegetation clearing associated with pipeline construction causes long-term effects. With the exception of the ROW, which is kept permanently mowed for access, cleared areas are allowed to regrow post-construction. However, it takes at least five years for grasslands and at least ten years for shrub and forest areas to attain densities and coverages similar to the pre-construction conditions. Also, complete clearing of vegetation in addition to construction activities causes changes in soil characteristics and the local environment by changing exposure to sunlight, soil moisture content, soil structure, soil compaction, and microbial composition. Additionally, in the time it takes for vegetation to grow back, cleared areas are more sensitive to erosion and soil loss. These changes may result in plant communities never recovering to the same level of complexity and ecological functioning. Forested wetlands that are cleared and become scrub-shrub or emergent wetlands are more likely to be invaded by non-native vegetation, decrease in diversity, and be affected hydrologically. Vegetation clearing also results in habitat fragmentation and the creation of edge habitat, a known ecological problem which breaks up previously continuous habitat, impacts species ability to access resources, decreases biodiversity, and increases invasive species establishment.

The hydrology and water quality of waterbodies are affected long term. Vegetation clearing and soil compaction increase runoff and associated erosion from the site, as less precipitation is intercepted or infiltrated into the soil. Along with sediment issues downstream of the site, increased runoff is associated with greater pollutant loading. Wetland and stream crossings are particularly sensitive to future erosion and water quality issues owing to their ecological importance. Increased sedimentation and pollutant loading in streams degrades in-stream habitat and causes eutrophication.

Thus, the long-term impacts associated with the Project will be realized after the completion of all construction activities. The most obvious long-term impacts will occur due to the routine, required system maintenance and operational activities. This will encompass activities within and adjacent to the ROW such as mowing, tree trimming and other mechanical vegetation removal, and the application of herbicides. There will also be the need to routinely inspect and maintain the pipeline and all its interconnections, as well as the operate and maintain the pipeline's above ground elements (compressors, PIGs, etc.). These on-going disturbances may compromise the ability of the pipeline ROW and immediately adjacent areas to become properly stabilized. It will also increase the occurrence of invasive species, especially non-native, edge species, such as Japanese knotweed, stilt grass, Canada thistle and mugwort.

However, the more serious long-term impacts are those resulting from the altered and/or lost ecological services and functions, impaired aesthetics, and reduced recreational quality of all areas disturbed by construction activities and subsequently routinely subject to the disturbances associated with the maintenance and operation of the pipeline and above ground support facilities.

The following sections of this report discusses in greater detail both the projected short- and long-term impacts of the Project, as based on the materials submitted by Millennium.

3. Specific Environmental Concerns Associated with the Proposed Eastern System Upgrade

3.1 Vegetation clearing

The construction ROW for the Huguenot Loop is 125 feet wide. This ROW accounts for the 45 feet of cleared ground that is part of the existing permanent easement, but also necessitates the clearing of an additional 80 feet (potentially 40 feet on either side of the existing ROW). Also, approximately 76 additional temporary workspaces (ATWS) are planned along the pipeline path. The actual size of each ATWS will vary, but will likely be greater in size in the more difficult to access areas to facilitate material stockpiles, etc. In total, the Huguenot Loop is expected to disturb 116 acres during construction, 86 acres of which are outside of the existing cleared easement of the Millennium pipeline. This new clearing is new disturbance and adds to total area that will need to be restored after the conclusion of construction activities.

Following the Project's completion, 36 acres will remain cleared in association with the operation and maintenance of the Huguenot Loop. Of this, 19 acres fall outside of the existing easement area and represent a new permanent impact (Resource Report 1, p. 33: Table 1.4-3).

The pipeline will cross 2,904 feet of wetland. Construction activities will permanently impact a total of 0.69 acres of forested wetland and 2.97 acres of emergent wetland. An additional 0.34 acres of forested wetland and 0.61 acres of emergent wetland will be affected by ongoing ROW clearing, with 0.16 acres of forested wetland permanently converted to emergent wetland

(Resource Report 2, p62: Table 2A-7). According to FERC standards, revegetation is considered successful if the density and cover of a restored area is similar to undisturbed land adjacent to the impacted area, excluding any colonization by invasive vegetation (Resource Report 1, p. 172). But this revegetation standard does not account for changes in the plant community or changes in overall species diversity if the disturbance results in change in the site's ecological services and functions. Such would be the case if forested wetlands are converted into emergent wetland.

The revegetation standard also does not address habitat fragmentation problems nor does it address the increased opportunity for the future colonization of the area by invasive species due to changes in the canopy cover and an increase in light penetration.

3.2 Water use

Millennium proposes to implement horizontal directional drilling (HDD) as a "non-disruptive method" of crossing the Neversink River, which is a NYSDEC Class C protected waterway supporting populations of trout and the endangered dwarf wedge mussel. Class C waters are subject to New York Protection of Waters regulations and permitting process. While HDD is less intrusive and damaging than conventional trenching methods, the operation does require 74,000 gallons of water. The water is mixed with bentonite clay and used as a drilling fluid continuously pumped into the borehole to remove cuttings (Resource Report 1). Millennium states that the water needed to support the HDD process will be transported by trucks from its source at MP 4.97, and discharged after use at MP 4.97, 5.4, and 2.65, all of which are located outside of the Delaware River watershed. However, a 25% water loss factor is estimated during normal drilling operations (Resource Report 2, p. 60: Table 2A-6), indicating that at least 18,500 gallons of water from the Hudson River watershed could be released into the Delaware River watershed. Another 310,000 gallons of water will be used for four additional HDD sites along the Huguenot Loop. All of these sites were confirmed to be located within the Hudson River watershed and as such do not affect the Delaware River watershed.

Another short-term impact having potential negative consequences to the streams and wetlands located within the project area pertains to the post-construction hydrostatic testing that must be conducted of the pipeline and above ground supporting structures. Approximately 2.6 million gallons of water will be required for this testing. Presently Millennium states that this "water will be obtained from and discharged within the Lower Hudson Watershed, [and that] no inter-basin transfer of water is anticipated." Millennium has yet to identify the source of the water that will be utilized for the testing; whether commercially available or naturally sourced water. Additionally, Millennium has not identified where this test wastewater will be discharged. Without that information there cannot be a proper or thorough assessment of potential resulting impacts.

As per the Resource Reports, spent hydrostatic test water will be discharged into "vegetated upland communities." This in itself could trigger erosion and sedimentation problems. The use

of energy dissipation devices and sediment barriers may achieve a regulatory standard of sediment control, but such devices cannot fully control all offsite soil and sediment transport. Given the proposed volume of water needed to conduct the testing and the fact that some of the testing will occur along steep sloped areas and within wetlands and riparian areas, there is a high probability that erosion and sediment migration will be experienced. Millennium has also not addressed the potential physical damage associated with trucking the water required for the testing through wetland areas or into some of the more remote or steeply sloped areas of the pipeline. This in itself could result in a significant amount of additional compaction of the construction corridor, impeding the post-construction revegetation of areas adjacent to the pipeline's permanent ROW.

Although 49 CFR Part 192, Subpart J details the procedures for the hydrostatic testing of gas pipelines, it does not speak to the composition or management of the testing fluid; even within §192.515 Environmental Protection and Safety Requirements. It is unrealistic to assume even if the spent test fluid is discharged into a well vegetated area that some of this fluid will not infiltrate into the surficial aquifer or runoff from the discharge area into a stream or wetland. Also the Resource Reports do not contain any substantive information regarding the projected chemical composition of the spent testing fluid. For example, water obtained from a potable water source could contain chlorine, chloramines or fluoride, all of which could impact the biota of a receiving stream or wetland. Similarly, additives mixed with the source water (such as some form of anti-freeze or a leak detection dye), could create an environmental threat/impact to the water quality or biota of the receiving stream or wetland. Thus, not only do we lack an understanding of the composition of the spent fluid, it is unclear how potential impacts resulting from the discharge of the spent test fluids to groundwater, surface water or wetland resources will be prevented, controlled or mitigated.

Appendix 1B of the Resource Report provides further information regarding hydrostatic testing and the mitigative measures associated with hydrostatic testing. Millennium states on page 14 of Appendix 1B, that the water required to conduct the testing will be purchased from "commercially-available" sources and if any water used in the testing is withdrawn from local surface water sources, any such withdrawals will be done in a manner consistent with FERC's Wetland And Waterbody Construction And Mitigation Procedures (Section VII.C), as well as any applicable NYSDEC or other regulatory permit limitations. Although Millennium proposes the use of commercially available water or water obtained exclusively from the Hudson River drainage, the Resource Report notes that other options are being considered and final details of the origin, volume and discharge of hydrostatic test water will be provided in the Project's final Environmental Review. That information is important for any ecological assessment.

Millennium also states within Appendix 1B that discharge of hydrostatic test water will be conducted in a manner consistent with FERC's Wetland and Waterbody Construction and Mitigation Procedures (Section VII.D), as well as any NYSDEC or other regulatory permit limitations. The mitigative measures that could be employed to decrease impacts to a receiving water beyond discharge into "well vegetated upland areas" include discharge into a transport

tank (for off-site disposal), return of the water to a stream or river, discharge into a temporary holding pond (followed by discharge into an upland area, stream or river), or discharge into some type of sediment filter or trap (followed by discharge into an upland area, stream or river). FERC notes that the Wetland and Waterbody Construction and Mitigation Procedures are baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Sections V11.C and V11.D of FERC's procedures are lacking with respect to the details of any of the mitigative strategies. This is especially true for water withdrawals or discharges occurring within environmentally sensitive areas (steeply sloped uplands, threatened and endangered species habitat) or high quality streams, rivers or wetlands. The general guidance provided by FERC when water is being withdrawn or discharged into high quality surface waters can be summarized as follows:

- State-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, are not to be used as source water unless appropriate federal, state, and/or local permitting agencies grant written permission.
- While water is being withdrawn, it is necessary to maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.
- Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

Thus, stating that the withdrawal or discharge of hydrostatic test water will be conducted in a manner consistent with FERC's Wetland and Waterbody Construction and Mitigation Procedures provides very little assurance that sensitive streams, rivers and wetlands will not be impacted by hydrostatic testing activities. Nor does it address the regulatory standards of the State or the DRBC.

3.3 Waterbody crossings

The Huguenot Loop will cross a total of 20 wetlands and 15 streams. Of the 15 streams crossed, 10 are categorized as New York State protected waters. These include Rutgers Creek, Shin Hollow Brook, and an unnamed tributary of the Neversink River which are classified by the NYS DEC as C(T), a protected category with the potential to support populations of wild brown and brook trout. The Neversink River has a B classification, indicating water supporting contact recreation and fisheries. Two unnamed tributaries to the Shawangunk Kill are Class A waters that support drinking water use. Most of these waterbodies also support coldwater fisheries.

While Millennium plans to use a less disruptive boring method (HDD or conventional) to cross many of these streams, the channel of Shin Hollow Brook at MP 2.5 is expected to be crossed with a flume or dam and pump method. This stream is classified as C(T) but should be more accurately classified as a C(TS) stream with the potential to support trout spawning habitat, according to biologists at the NYS DEC [Resource Report 1, App. D p. 442]. Headwater streams

are ecologically important and have a strong influence on downstream water quality and quantity, and are very sensitive to land use change including soil disturbance and loss of riparian vegetation (Alexander et al., 2007). The headwaters of Shin Hollow Brook are already impacted by damming upstream of the pipeline location, and will be negatively affected further by pipeline construction. Likewise, Rutgers Creek at MP 7.3 and two unnamed tributaries at MP 6.3 and 7.7 are classified as C(T) and C respectively, and will be crossed using conventional stream crossing techniques which will impact these protected waterbodies.

At stream crossing sites, Millennium states that construction will occur within 24 hours and restoration in the following 24 hours, but this time limit does not include vegetation clearing, grading, or equipment installation or removal, all of which involve significant disturbance with enduring footprints and impacts. Even if not a protected waterway, each stream or wetland crossing is an opportunity for damaging sedimentation, loss of bank stability, and a disturbance to the site's soil and hydrology that may prevent complete restoration of vegetation. Multiple soils with poor revegetation potential were mapped in wetlands in the project area. Even with temporary erosion and sediment control devices, these measures are unlikely to achieve 100% efficiency (Reed, 1978). Additionally, Millennium has stated that streams will be surveyed pre-construction and monitored post-construction, and that they will address stream bed and bank stability issues at that time [Resource Report 2, p 30-31]. However, stream surveys to date as described in the submitted Resource Reports are limited to a delineation of waterbodies, with no discussion of habitat quality or ecological functioning. Likewise, plans for post-construction monitoring lack detail, with no description of what parameters will be monitored or how frequently.

No soils in the project area were described by Millennium as compaction prone, defined as soils that are clay loam or finer and have somewhat poor, poor, or very poor drainage. However, this does not mean that compaction will not be an issue. Any soil can be compacted from wheel traffic, in particular wet soils such as those found in wetlands and riparian areas. Compaction limits root growth, which will impact revegetation, and restricts infiltration leading to runoff and erosion, which will cause water quality problems during and after construction.

3.4 Erosion

Millennium claims that only 9.75 acres or 0.05 % of the total project area affects soils that are highly erodible [Resource Report 7, p.11, 24]. However, erodibility was determined by the average K-factor of each soil type, which is a problem for several reasons. The K-factor is a function of soil physical characteristics such as grain size and structure, and does not take into account the slope of the soil, which is a critical component of erosion risk. Also, Millennium calculated the overall K-factor of each soil type as an average of all the soil horizons, when most erodible soil in the construction zone, aside from the trench itself, will be the surface soil layers. Finally, the K-factor is designed to represent soils in their natural condition, and the reported K-factor is not accurate for disturbed soils (NRCS-USDA).

Millennium reports slopes of greater than 30% at 28 locations along the Huguenot Loop for a combined distance of 1 mile along the pipeline route. This is 13% of the total length of the project [Rpt. 6, p.16], and does not account for slopes less than 30% which might still be prone to significant erosion. Within these steep areas, multiple soil series were mapped that are listed both as stony and having poor revegetation potential. These include the Swartswood, Mardin, Nassau, Arnot, and Lordstown soil types. These areas are susceptible to erosion during construction due to their steep slopes, and are unlikely to be effectively mitigated due to their limitations on revegetation. In addition to the areas identified as steep (>30%), multiple soil types were mapped along the route with slopes from 8-25%. The prevalence of steep slopes in the construction area greatly increase the likelihood of short term construction related erosion in addition to long term decreased stability of these steep slopes, which will be damaging to both upland areas and nearby waterbodies. Despite Millennium's assurances that they will use sediment control measures appropriately and mitigate damages, these measures frequently are applied incorrectly, fail, or fall short. There have been multiple occasions of fines levied against pipeline construction companies for improper erosion and sediment control, equipment outside of the permit area, drilling mud spills, discharge of fluids, and failure to minimize wetland disturbance (e.g. Legere, 2014; Mayer, 2009; Phillips, 2016; Rittenbaugh, 2014; Hamill and Olson, 2012).

4. Conclusion

The Eastern System Upgrade to the Millennium Pipeline is expected to have both short and long term impacts to the affected areas and to water resources within the Delaware River Basin. The vegetation clearing associated with construction activities and maintenance of the permanent ROW will result in a loss of habitat and soil disturbance in the short term, but will cause irreversible changes in longer-term ecological services and functions of traversed areas. These impacts extend to areas adjacent to the permanent ROW due to alterations in canopy cover, plant assemblage, light penetration into core forest areas, the introduction of invasive species, and the compaction of soil.

Even with the implementation of erosion and sediment control techniques we expect significant erosion to occur as a result of soil disturbance, loss of vegetative cover, disturbance of steep slopes, and the discharge of large amounts of water in upland areas. These expectations are supported by past studies of other pipelines. Stream and wetland crossings are particularly susceptible to erosion-related damage due to their sensitivity to change and unique ecological characteristics. Measures taken to mitigate these issues to the level of regulatory approval fall short of restoring these sites to pre-construction conditions. Soil compaction is expected to increase stormwater runoff and reduce aquifer recharge.

Similarly, with respect to the discharge of hydrostatic testing fluids, concerns remain regarding the impacts that these fluids could elicit in terms of localized erosion as well as the contamination of groundwater, surface water and wetland resources.

Overall, the reports prepared by Millennium in support of the Eastern System Upgrade are lacking with respect to environmental impact prevention and mitigation. Again, even when details are provided, the proposed mitigation measures are standard techniques that are not designed to fully protect the more sensitive areas traversed by the pipeline or minimize impacts along the steeply sloped sections of the pipeline.

5. References

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