

Outline of possible scoping comments for DOE-NYSERDA Draft Supplemental Environmental Impact Statement (Draft SEIS) for West Valley site closure and decommissioning
RV 3/25/18 **DRAFT**

Scoping background/overview

Scope can include alternatives, impacts that need to be considered, impact analysis methods, assumptions (climate change?), etc.¹ Any or all of these, and various other topics that deal with things that the Draft SEIS should or shouldn't include, are topics to which scoping comments might be directed. As described in the *Federal Register* notice, "DOE and NYSERDA invite interested parties to participate in the scoping process to help identify the range of reasonable alternatives and the environmental issues to be analyzed."² Note that the Draft SEIS will support the Phase 2 decision that is expected to be made in 2022. The Draft SEIS and Phase 2 decision will deal mainly with site closure and decommissioning for the *buried* wastes (SDA, NDA, tanks) and *won't* deal with the main plant building, the casks of vitrified high-level waste, and other onsite wastes and facilities for which decisions have already been made.³ However, if the ongoing presence of the casks or other onsite wastes and facilities would affect or complicate the Phase 2 decision, then this may be an appropriate topic for scoping comments.

Alternatives that DOE and NYSERDA are currently considering for the site are:

- Sitewide close-in-place, which would rely on engineered barriers to prevent erosion from impacting buried wastes including the tank farm and state and federally licensed low-level disposal sites.
- Sitewide removal alternative, which would remove all facilities, contaminated soil and groundwater to allow unrestricted release of the property.
- Hybrid alternatives that would provide for complete or partial removal of some facilities while leaving other facilities under close-in-place protocols.⁴

Scoping comments might include, for example, recommendations or statements on whether and why each these proposed alternatives should or shouldn't be considered in the Draft SEIS.

For scoping comments on alternatives that involve exhumation and removal of wastes from the site, note that offsite disposal capacity is currently considered available for about 99% of the exhumed waste (by volume), while about 1% of the waste would be "orphan" waste for which offsite disposal is not currently available. Thus, no substantial need for temporary onsite storage

¹ Vaughan, presentation at public meeting on scoping, Springville, NY, 3/11/18.

² 83 *Federal Register* 7464 (Feb. 21, 2018) at 7468.

³ For example, the Phase 1 decision determined in 2010 that the main plant would be demolished and its rubble removed, and the West Valley Demonstration Project Act specified that the high-level liquid waste would be solidified and removed.

⁴ *Salamanca Press*, Mar 23, 2018 (http://www.salamancapress.com/news/ny-senators-earmark-m-for-west-valley-cleanupproject/article_2fa85c-2e9f-11e8-a09c-97cf2bfb0658.html); also 83 *Federal Register* 7464 (Feb. 21, 2018) at 7466-77.

is anticipated, and most of the waste “is expected to be shipped off site as it is exhumed and processed.”⁵

A possible CTF recommendation on the Preferred Alternative: Do we want to be more specific about the alternative(s) that would be consistent with our 1997 Final Report?

1. DOE and NYSERDA are planning “to identify a preferred alternative in the Draft SEIS.”⁶ According to the CTF’s early ground rules, “The CTF was formed to ‘assist in the development of a preferred alternative for the completion of the West Valley Demonstration Project and cleanup, closure and/or long-term management of the facilities at the site.’”⁷ Thus, helping to develop DOE and NYSERDA’s Preferred Alternative was – and presumably still is – an important CTF responsibility. One of the proposed alternatives listed above, or possibly some other alternative, will be chosen by the agencies as their Preferred Alternative. Twenty years ago, the CTF’s recommendation on the Preferred Alternative said:

The CTF expects that the Site Managers will develop a Preferred Alternative which complies with the Policies and Priorities contained in Section III and responds to the Guidelines in Section IV.”⁸

Based on the alternatives that are now being proposed, does the CTF want to make a more specific recommendation on which one should be the Preferred Alternative?

Issues and impacts that need to be considered if wastes are left onsite, and if site closure and license termination involve Restricted Release

If restricted-release alternatives are considered in the Draft SEIS, does the CTF want to offer recommendations on whether and how partial exhumation should be done, and how its impacts are assessed and predicted? Potential comments on topics identified on the 3/2/18 CTF Work Group call include:

2. Unrestricted release is preferred because it provides greater potential for site re-use and economic development, which in turn may serve as an economic “engine” for the local community and region.
3. Unrestricted release is preferred because it would facilitate reuse of site infrastructure improvements. Such improvements have been substantial during the course of the project and are unique for the local area.

⁵ West Valley Exhumation Working Group, *Task 3.3: Consolidated Report – Applicability of Exhumation Working Group Findings to WVDP and WNYNSC...*, Revision 1 (September 2017), available at <https://www.westvalleyphaseonestudies.org/Documents/EXWG%20Task%203.3%20Consolidated%20Report%20-%20Rev.%201.As%20Submitted.09-20-17.pdf>, page 78.

⁶ 83 *Federal Register* 7464 (Feb. 21, 2018) at 7467, column 3.

⁷ Ground Rules of the Citizen Task Force, as revised and approved on January 29, 1997; CTF Final Report, p. 2, Background.

⁸ CTF Final Report, p. 1, Introduction.

As explained by DOE (B. Bower on 3/2/18 Work Group call), hybrid alternatives that use partial exhumation might target longer-lived radionuclides for removal and allow much of the shorter-lived cesium-137 and strontium-90 to decay in place to essentially undetectable levels during the next 300 years or so.⁹ For alternatives other than unrestricted release, DOE and NYSERDA are required to assume loss of institutional controls at some point in the future. Depending on the alternative, passive and active controls may be included, and Mr. Bower also mentioned options such as re-routing of streams. In looking at hybrid alternatives and their impacts and costs, Neptune and Company will break down source areas into units such that a cost benefit analysis can be performed that includes selective removal or delayed removal. A hypothetical situation is a cost comparison of full removal with selective removal addressing various cost increments and improvement in performance. For example, is there a scenario where 80% of the risk could be removed for 20% of the cost? Potential comments on topics identified on the 3/2/18 Work Group call and additional issues suggested later by R. Vaughan include:

4. Erosion modeling (landscape evolution modeling) of the Buttermilk Creek watershed will be needed if any of the alternatives will depend on re-routing of streams. Current modeling of the Franks Creek watershed cannot support re-routing of streams into Buttermilk Creek.

5. For any alternatives that involve future costs, a discount rate of *zero* should be assumed (in other words, future costs should *not* be discounted) unless a higher rate can be justified.¹⁰ Such justification might be based, for example, on past and present estimates of clean-up costs for the West Valley site. If historical estimates of site clean-up costs have grown more slowly than the rate of inflation, then a discount rate higher than zero may be justified. If not, a discount rate higher than zero would not appear to be justified.

6. For various alternatives, what if there was a future loss of funding? Would this cause delays that would increase the total cost? Note that part of the cost of full exhumation (even without unexpected delays) would be the so-called “hotel costs” needed to maintain some level of site facilities for the duration of the exhumation work.

Potentially significant adverse impacts to Community Character from waste left onsite

7. Radiological impacts currently recognized by DOE and NYSERDA include impacts to the general population and onsite workers (NOI p. 7468, col. 1), with such impacts generally being rated against NRC’s 25 millirem-per-year exposure standard for unrestricted release of the site. However, for any alternatives in which wastes are left in place, there may be significant adverse impacts to “Community Character” resulting from *radiological releases that substantially exceed background levels but do not exceed NRC’s 25 millirem-per-year exposure standard for a maximally exposed individual*. Examples of such impacts are provided below. Note that effects

⁹ Radionuclides generally decay to negligible levels of radioactivity after 10 half-lives. The half-lives of Sr-90 and Cs-137 are both about 30 years, so the time required for these radionuclides to decay to negligible levels is about 300 years.

¹⁰ For example, see A. Napoleon et al., *The Real Costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site* (Cambridge, MA: Synapse, 2008), available at http://westvalleyctf.org/DEIS-DP_Docs/Full_Cost_Study/WV_Full_Cost_Accounting_Report.pdf, pp. 9-10 and 81ff.

on Community Character are a specific type of impact that must be considered under New York's State Environmental Quality Review (SEQR) requirements.¹¹ Such impacts would not apply to the No-Action alternative but would apply to the "actions" of any of the other alternatives.

8. For any alternative that leaves waste onsite, the Draft SEIS should address the adverse impacts on the community character of Ashford, including such impacts on the town's residents and its prospects for economic development, resulting from the stigma of radioactive waste.

9. For any alternative that leaves waste onsite, the Draft SEIS should address the adverse impacts on the community character of the Seneca Nation of Indians, including such impacts on the Nation's residents, traditional cultural practices, and prospects for economic development, resulting from any detectable above-background level of radioactive contamination moving along Cattaraugus Creek through the Nation's Cattaraugus Territory.

10. For any alternative that leaves waste onsite, the Draft SEIS should address the adverse impacts on the community character of Erie County, including such impacts on the county's residents, their enjoyment of the lakeshore waterfront, and prospects for tourism and economic development, resulting from any detectable above-background level of radioactive contamination moving along the Lake Erie shoreline from Irving to Buffalo, and along the Niagara River shoreline from Buffalo to Tonawanda.

11. For any alternative that leaves waste onsite, the Draft SEIS should address the adverse impacts on the community character of the City of Buffalo, including such impacts on the city's residents, their enjoyment of the waterfront, and prospects for tourism and economic development, resulting from any detectable above-background level of radioactive contamination moving past and through the city's waterfront.

12. For any alternative that leaves waste onsite, the Draft SEIS should address the adverse impacts on the community character of other downstream communities in the U.S. and Canada, resulting from any detectable above-background level of radioactive contamination moving through their waterways or along their shorelines.

Other potentially significant adverse impacts from waste left onsite

13. In addition to Community Character impacts, the CTF may have comments or recommendations on other "non-tangible" impacts to nearby communities and natural resources (including the Great Lakes, for example) that should be identified and vetted as scoping issues for any site closure alternative other than full exhumation.

14. For any alternative that leaves or stores waste on any bedrock portion of the site which serves as a recharge area for the underlying bedrock-valley aquifer(s), (e.g., west of Rock Springs Road and some portions of the site east of Buttermilk Creek), the SEIS process would need to include studies to characterize the underlying bedrock-valley aquifer(s), and the Draft SEIS would need

¹¹ See NYSDEC, *The SEQR Handbook*, 3rd ed. (2010), pp. 87-89 and 204-05; also *Matter of Village of Chestnut Ridge et al. v. Town of Ramapo et al.*, 45 AD3d 74 (2d Dept. 2007) at 85-87 and 94-95.

to assess impacts to such aquifer(s).¹² Current characterization of this/these aquifer(s) is too sparse to support waste storage or disposal within bedrock portions of the site that serve as recharge areas.

Maximally Exposed Individual (MEI) Dose Analysis

15. The dose analysis to the Maximally Exposed Individual (MEI) should include the resident farmer or other person living on the SDA or NDA.

As possible guidance on the magnitude of such dose, a question was raised during the 3/2/18 CTF Work Group call as to whether measurements could be taken in the near future for radon, iodine and other chemically volatile radionuclides under the burial ground geomembrane covers. Mr. Bower was not sure about the gas permeability of the XR-5 material and indicated he would inquire about that and as to whether any current sampling measured daughter products of the radionuclides mentioned.

Probabilistic Performance Assessment (PPA) methodology issues

16. The PPA computer model runs will require *probability estimates for the input variables* (input parameters) that control or affect the predicted radiological doses. Probability distributions for these variables – potentially including variables such as rainfall, erodibility of till, or abstract variables that represent these real-world variables – are typically based on expert opinion. Scientists working in this field recognize potential problems such as expert overconfidence, lack of calibration, and lack of empirical validation of such probability estimates.¹³ Various scientists have recommended procedures that can guard against errors in expert estimates. The CTF may want to recommend in its scoping comments that such safeguards be incorporated into the SEIS process, and that the safeguards be described fully and transparently.

17. PPA computer model runs typically use Bayesian methods that require assumptions about the “prior” probability distributions of different variables.¹⁴ Developing these “priors” or “prior

¹² See Vaughan, “Geologic and Hydrologic Implications of the Buried Bedrock Valley that Extends from the Western New York Nuclear Service Center into Erie County, N.Y.”, in *Geology Reports of the Coalition on West Valley Nuclear Wastes* (East Concord, NY, 1994), available online at http://www.westvalleyctf.org/2008_Materials/2008-01-Materials/Core_Team_Issues-Vaughan_with_Appendices.pdf, at pp. 180-207 of the pdf file. See also Vaughan EIS comments §§ 50-56. [Note that citations to “Vaughan EIS comments” refer herein to the consolidated EIS comments by R. Vaughan, most of which can be found in the response-to-comments portion of the 2010 FEIS, available at https://www.wv.doe.gov/final/EIS-0226_F-Vol3-CRDPart1.pdf, on pdf pages 238-303. Some of the Vaughan EIS-comment appendices that were omitted from the 2010 FEIS volumes can be found at http://www.westvalleyctf.org/2008_Materials/2008-01-Materials/Core_Team_Issues-Vaughan_with_Appendices.pdf.]

¹³ See K. Shrader-Frechette, “Uncertainty Analysis, Nuclear Waste, and Million-Year Predictions,” in S.O. Hansson and G. Hirsch Hadorn, eds., *The Argumentative Turn in Policy Analysis* (Springer, 2016), 291-303, esp. pp. 298-99.

¹⁴ For example, R.E. Kass and L. Wasserman, “The Selection of Prior Distributions by Formal Rules,” *Journal of the American Statistical Association* **91**, 1343-70 (1996); H. Chipman et al., “The Practical

distributions” can be procedurally difficult because the supporting data have not yet been applied to the distribution. The CTF may want to recommend in its scoping comments that safeguards against poorly chosen “priors” be incorporated into the SEIS process, and that the safeguards be described fully and transparently.

In addition to such scoping comments, the CTF may want to recommend that one or more scientists with specialized statistical expertise be invited to speak on these issues (including expert estimates and prior distributions) at a CTF meeting or workshop in the near future.

Erosion modeling issues and the related need for extending the Draft SEIS comment period

18. The 10-year time step that is reportedly used by Tucker et al. in the EWG erosion modeling (landscape-evolution modeling) runs is unacceptably long; it introduces an unrealistic rainfall intensity-frequency distribution¹⁵ into the EWG modeling runs that will be used in the SEIS process to support the Phase 2 decision.¹⁶

19. Any and all such modeling runs need to have *recognizable* rainfall intensity-frequency distributions. Independent experts and the public must be able to review the rainfall intensity-frequency distributions, and must be able to compare them to realistic current rainfall distributions and to defensible estimates of paleo (post-glacial) and future (climate-change-adjusted) rainfall distributions.¹⁷

20. The EWG erosion modeling runs reportedly do not have directly recognizable rainfall intensity-frequency distributions; they reportedly use surrogate inputs to represent such distributions. Whether independent experts and the public will be able to translate such surrogates into rainfall intensity-frequency distributions in a clearcut and undisputed manner remains to be seen. Such a “translation” effort cannot begin in any case until the EWG erosion modeling report and supporting data files are released for public and expert review, as is scheduled to occur at approximately the same time as the 4/23/18 scoping comment deadline. Any “translation” effort would necessarily take weeks or months after the release date for the report and supporting data. Given the importance of this issue and the impossibility of determining prior to the 4/23 deadline whether or not the model runs are using reasonably reliable rainfall distributions, a time extension such as six months should be granted for the Draft SEIS scoping comments.

21. The various erosion modeling runs employ *other* input parameters in addition to their direct or indirect rainfall-distribution parameters. These other input parameters must likewise be reviewable, such that independent experts and the public can compare them to realistic field-

Implementation of Bayesian Model Selection,” IMS Lecture Notes - Monograph Series **38**, 65-134 (2001), available at http://www-stat.wharton.upenn.edu/~edgeorge/Research_papers/ims.pdf.

¹⁵ Note that the term “intensity” in the widely used phrase “intensity-frequency distribution” corresponds to rainfall “depth” – particularly the “depth” of 24-hour rainfall with a certain recurrence interval or probability – in the terminology of Tucker et al.

¹⁶ For overview, see Vaughan 6-28-17 CTF presentation, slide 10; Vaughan 9-27-17 CTF update presentation, slides 3 and 6-7.

¹⁷ Regarding paleo and future rainfall distributions, see Vaughan EIS comments §§ 166-71.

tested or field-testable parameters. If any of these other parameters are not directly recognizable and field-testable, the type of “translation” process described above will be needed¹⁸ and will encounter the same time constraints, thus necessitating a time extension such as six months for meaningful scoping comments to be developed and submitted.

Site stability & integrity issues relating to seismic activity (earthquakes)

22. Evidence of two deep-seated faults – one at Sardinia and one at the north end of the US 219 bridge over Cattaraugus Creek near Springville – was released in 2001 in the Bay Geophysical seismic study,¹⁹ but no follow-up work has been done to identify or clarify the strike of these faults, their geographic extent, their surface expression (if any), and their likelihood of reactivation. Such follow-up investigation is needed in the DEIS process in order to understand long-term seismic risks to site stability and containment integrity.²⁰

23. The Sardinia fault identified by the Bay Geophysical seismic survey is particularly relevant because it is aligned with, and may be part of, the seismically active Attica Splay of the Clarendon-Linden Fault. The SEIS process needs to investigate and determine whether the Sardinia fault connects with the Attica Spay at/near Varysburg and also needs to investigate and determine whether it extends southwestward toward the West Valley site – and if so, how closely it approaches the site.

24. Earthquakes pose a risk to slope stability. Extreme examples were seen in the 1964 Alaska earthquake,²¹ but quakes of lesser magnitude will have similar but less dramatic effects on unstable or quasi-stable slopes. Relevant slopes at the West Valley site include the same valley walls, ravine walls, and gully walls that are subject to erosion and slumping. Thus, given the fact that seismic events will accelerate the overall loss of site integrity by causing large-scale landsliding, slumping, and mass wasting,²² and given the apparent lack of any seismic component in the recently completed EWG erosion modeling runs, *those erosion modeling runs need to be re-done with intermittent (probabilistic) seismic “jumps” incorporated into the model(s).*

25. Soil liquefaction may in some cases contribute to seismically induced slope failures; however, in other cases a slump-prone slope may fail in an abruptly accelerated episode of slumping without observable liquefaction. In any case, liquefaction of onsite soils adjacent to

¹⁸ Vaughan 9-27-17 CTF update presentation, slide 8.

¹⁹ Bay Geophysical, *Seismic Reflection Survey to Identify Subsurface Faults near the West Valley Demonstration Project*, report prepared for West Valley Nuclear Services Company (Traverse City, MI: Bay Geophysical, 2001).

²⁰ Vaughan EIS comment § 57A.

²¹ For example, see W.R. Hansen, “Effects at Anchorage,” in *The Great Alaska Earthquake of 1964* (Washington: National Academy of Sciences, 1971), available online at http://www.westvalleyctf.org/2008_Materials/2008-01-Materials/Core_Team_Issues-Vaughan_with_Appendices.pdf, at pp. 30-140 of the pdf file.

²² Vaughan EIS comments §§ 103-04.

existing slopes needs to be investigated in the SEIS process and incorporated into landscape-evolution modeling.²³

Site stability & integrity issues relating to possible aseismic movement of rock or soil

26. Aseismic (non-seismic) horizontal movement of large blocks of either *bedrock* or *overlying fill and soil* may be occurring on the site. Any such movement of either rock or soil would be a type of topographic instability with potentially serious but currently uncharacterized effects on long-term site stability and containment integrity. The probability of such movement appears low but cannot be ruled out without further investigation. The SEIS process needs to engage in such investigation and needs to treat horizontal movement of either *bedrock* or *overlying fill and soil* as a low-probability but potentially high-consequences phenomenon in accordance with environmental review requirements such as 6 NYCRR 617.9(b)(6)(iii).

27. If investigation shows horizontal movement of large blocks of bedrock, fill, and/or soil, the Draft SEIS should quantify and document the rate(s) of movement and associated implications or impacts on long-term site stability and containment integrity. Alternatively, if investigation shows that horizontal movement of large blocks of bedrock, fill, and/or soil can be ruled out, the Draft SEIS should document this conclusion and how it was reached.

28. *Horizontal bedrock movement?* Evidence of aseismic horizontal bedrock movement at one location in WNY comes from a paper by the late Prof. Wm. Brennan of SUNY Geneseo.²⁴ Brennan reported horizontal offset (partial blockage) in the steel casing of brine wells in the Wyoming valley near Wyoming and Warsaw, NY. The offset occurred at the depth of the thalweg of the adjacent bedrock valley, implying an essentially horizontal detachment surface or decollement in the local shale at the depth of the thalweg, with the movement of the overlying bedrock block driven by the prevailing regional compressive stress. Given the regional extent of this ENE-WNW-oriented tectonic stress, and given the fact that the Buttermilk valley's NNW-SSE alignment is even more favorably oriented (essentially perpendicular to the regional compressive stress), it is reasonable to investigate whether the type of bedrock movement observed by Brennan is also occurring in the West Valley site's injection wells which have remained inactive since about 1970. Some of the West Valley injection wells are known to be blocked by grout, but others are considered grout-free and could/should be checked for offset and/or casing blockage at the approximate depth of the adjacent bedrock-valley thalweg.

29. Effects of regional compressive stress in WNY bedrock are well-known to at least two members of the Phase 1 Studies Erosion Working Group (Fakundiny and Young), both of whom have written about such horizontally-oriented stress and its role in causing observable displacement of bedrock.²⁵ Fakundiny and coauthors have noted, for example, that "Foundation

²³ See especially Vaughan, "Geologic and Hydrologic Implications of the Buried Bedrock Valley...", *op. cit.*, available online at http://www.westvalleyctf.org/2008_Materials/2008-01-Materials/Core_Team_Issues-Vaughan_with_Appendices.pdf, esp. pp. 203-207 of the pdf file.

²⁴ W.J. Brennan, "Stress-Relief Phenomena Observed During Solution Mining in Western New York," presented at Fall 1996 Meeting, Solution Mining Research Institute, Cleveland, Ohio.

²⁵ R. Fakundiny et al., "Structural Stability Features in the Vicinity of the Clarendon-Linden Fault System, Western New York and Lake Ontario," in *Advances in Analysis of Geotechnical Instabilities*, (University

instability, produced by lateral expansion of rock into excavation voids, prevails throughout western New York and the Niagara Peninsula of Ontario, Canada...and is generally thought to be the result of regional stresses acting with a high, horizontal compressive component oriented in a generally east-west to northeast-southwest direction at shallow depths in the earth's crust..."²⁶

30. *Horizontal soil/till movement?* Soils and tills are typically plastic materials that may undergo slow creep toward unbuttressed voids such as valleys, potentially including the Buttermilk valley. Possible evidence of such movement immediately southeast of the West Valley site has been described by Vaughan, EIS comments, § 105 and Figure 4. The work currently being done by Neptune risks missing such movement if any/every horizontal discrepancy in airphotos (relative to LiDAR maps) is assumed to be from airphoto distortion. The SEIS process should investigate whether horizontal soil/till movement is occurring, document the findings, and address the implications and impacts if any such movement is detected.

Site stability & integrity issues relating to climate

31. Effects of climate change that do not appear to be adequately incorporated into the EWG erosion model runs include lake-effect rain²⁷ and similar weather systems driven by prevailing winds off Lake Erie and associated precipitation in the "shadow" of the lake. The SEIS process should investigate such precipitation and whether it is changing over time, including whether the winds and precipitation levels have changed in the past 1000 years or so.

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Site stability & integrity issues relating to stream piracy or capture

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Attainment of Clean Water Act goals and protection of existing watee resources

of Waterloo Press, 1978), esp. p. 121. The decollements shown therein in Figs. 15B (p. 162) and 19-20 (pp. 169-70) may also be relevant. See also A.S. Nieto and R.A. Young, "Retsof Salt Mine Collapse and Aquifer Dewatering, Genesee Valley, Livingston County, New York," in J.W. Borchers, ed., *Land Subsidence: Case Studies and Current Research* (Association of Engineering Geologists, 1998), esp. Fig. 8 and pp. 322-23.

²⁶ Fakundiny et al., *op. cit.*, p. 121.

²⁷ CTF memo entitled "Actions Needed Related to Potential [Climate] Change Impacts," July 27, 2015, available at http://westvalleyctf.org/2015_Materials/07/2015-07-27_Memo-Climate_Change_Considerations_Incorporation_in_Decisionmaking.pdf, esp. p. 6.

²⁸ A.F. Prein et al., "Increased rainfall volume from future convective storms in the US," *Nature Climate Change* **7**, 880-86 and Supplementary Information (2017), esp. Supplementary Fig. 2E.

²⁹ Vaughan EIS comments §§ 187-88.

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³⁰ Newly completed New York Natural Heritage riparian assessment: See <http://buffalonews.com/2018/03/23/watersheds-in-cattaraugus-county-among-healthiest-in-new-york-state-data-shows/> and <http://www.nynhp.org/treesfortribsny>