SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF NASSAU
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In the Matter of the Application of

SIERRA CLUB-Long Island Group, The Concerned Citizens of the Mill River Flood Plain, and Joseph P. Forgione,

Petitioners,

Index No.

for a Judgment Pursuant to Article 78 of the New York Civil Practice Law and Rules,

AFFIDAVIT

-against-

Governor's Office of Storm Recovery; New York State Office of Parks, Recreation and Historic Preservation; New York State Division of Housing and Community Renewal; New York State Department of Environmental Conservation; and Matt Accardi, Assistant General Counsel and Certifying Corporate Officer for the Governor's Office of Storm Recovery,

Respondents.
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STATE OF NEW YORK)
) ss.:
COUNTY OF DUTCHESS)

PAUL A. RUBIN, being duly sworn, hereby deposes and says:

1. I am a hydrologist, hydrogeologist, geologist, and cartographer with thirty-eight years of professional experience. I earned a B.A. degree from the State University of New York at Albany in 1977 and an M.A. degree in geology with a specialty in hydrogeology from the State University of New York at New Paltz in May, 1983. My professional experience includes work conducted for the New York State Attorney General's Office (Environmental Protection Bureau) and Oak Ridge National Laboratory (Environmental Sciences Division), and work as an environmental consultant as President of HydroQuest. I have extensive experience in surface and

groundwater hydrology, including the assessment of flooding, related flood impacts, and wetlands regulation, development, and mitigation. This experience includes analyses for multiple reports, professional guidebook papers, affidavits, public presentations, and trial exhibits. As part of my work, I routinely review and interpret environmental reports, aerial photography, and topographic maps. My educational background and professional experience are more fully set forth in my Curriculum Vitae, attached as Exhibit "1" and included on my web page at: http://hydroquest.com.

2. I personally reviewed the hydrologic aspects of the Hempstead Lake State Park Project ("Project") being undertaken by the Governor's Office of Storm Recovery "(GOSR"). While the Hempstead Lake State Park Project Environmental Assessment ("EA") provides certain base-line information related to hydrologic aspects of the Project, it severely lacks critical information and analyses on how each of the impacts of Project actions will cumulatively affect other actions when completed, the very thing the EA is supposed to include.

3. Furthermore, my examination of the EA for the Hempstead Lake State Park Project indicates that the data fed into models used by GOSR were woefully out of date and that additional calibration and analysis should have been performed to incorporate recent precipitation data and nearby stream flow data that are available. Because GOSR did not do this, the EA is inaccurate and does not represent the conditions in the Mill River watershed of which the Hempstead Lake State Park Project is a significant part.

4. Specifically, GOSR's model estimating probable maximum precipitation and probable maximum floods, which GOSR used in its design of the remediation plans for the Hempstead Lake dam, spillways, and other flood controls to protect downstream populations, was based on: (a) woefully out-of-date precipitation data and stream flow data; (b) an improper calibration of the model; (c) insufficient data on the frequency and magnitude of flood events; (d) a

failure to consider the known climate change effects of increased extreme storm events, precipitation quantities, and flood frequencies; (e) a failure to assess the flood risk stemming from channel inundation from Hewlett Bay storm surges; and (f) a failure to consider the additive and/or synergistic effects of multiple sources of increased flooding.

5. The prediction of potential adverse impacts from major flood events is assessed through the use of widely-accepted hydrologic models. The quality and reliability of the model's predictive ability depends, in large part, on the appropriateness of model input parameters such as annual peak stream flows, documented 24-hour precipitation totals, documented high magnitude runoff events, areal inundation and elevation of tidal storm surges, and calibration to site-specific empirical data when they are available. Therefore, an essential aspect of evaluating the quality of modeled data and resultant project design lies in assessing the reasonableness of model input parameters and the results obtained from calibration.

6. GOSR's modeling, in part, relies on determination of the "Probable Maximum Precipitation" ("PMP") over a 24-hour period. The World Meteorological Organization ("WMO") defines PMP as the greatest depth of precipitation for a given duration that is meteorologically possible for a watershed or an area at a particular time of year, with no allowance made for long-term climatic trends. It is a theoretical concept used by hydrologists to arrive at estimates for probable maximum floods for use in planning, design, and risk assessment of high-hazard hydrological structures such as flood control dams upstream of populated areas (Chavan and Srinivas, 2015). As data on extraordinary storms and floods form the basis for estimating PMP, it is necessary to extensively collect, process and analyze them. The accuracy of PMP estimation rests on the quantity and quality of data on extraordinary storms and floods and the depth of analysis and study (Manual on Estimation of Probable Maximum Precipitation, WMO, 2009).

Once determined, lower precipitation values are used in model runs to assess likely stream discharges associated with storms of various return intervals (e.g., 5-year, 25-year, 50-year, and 100-year frequency storms). In part, this is because all portions of design watersheds are not likely to receive the possible maximum precipitation.

7. The PMP must be accurately determined in order to predict stream peak flow rates that would result from storms of various magnitudes and recurrence intervals, such as 50-year and 100-year floods. (A 100-year flood is a flood that statistically has a 1% chance of being equaled or exceeded at a specific location in any given year, and a 50-year flood is a flood that statistically has 2% chance of being equaled or exceeded in any given year). Therefore, high discharge flood events may occur more frequently and may, regardless of statistical analysis, occur more frequently (e.g., two major floods in 1955). The PMP procedural method produces a storm that could have potentially created a historical flood. This is done through hydrological watershed models. The results of this modeling effort are important because they are used in project engineering design that needs to be protective of downstream residents, buildings, and the environment. Yet, GOSR failed to undertake comprehensive calibration and, as a result, the EA presents an inaccurate and deficient depiction of the true hydrologic impacts of the Project.

8. Appendix O to the EA (GOSR's Hydrological and Hydraulic Assessment; Exhibit 2[1]) states that the PMP value for the Project was generated using data published by the USACOE, NOAA, and National Weather Service in June 1978, some *42 years ago*. While the Hydrological and Hydraulic Assessment refers to a model update on February 12, 2014, GOSR did not clarify whether this also included updated precipitation data. If it did not, then the model results are far from being current and complete and should not have been used, or be used in engineering project

[1] Given the size of the document only the first few pages are annexed. The entire document will be part of the record submitted by Respondents.

design. Projects involving floodwaters should always be predicated on the most recent data available. With regard to flood prediction, the longer the period over which stream gaging and precipitation data is collected and used in a model, the more reliable model predictions will be. Without current data, the models used are very likely to be incorrect.

9. GOSR's models were used to predict maximum precipitation and peak flow rates and then employed as the basis for the engineering design of the Mill River Watershed projects, including the Hempstead Lake State Park Project. Specifically, Appendix O, Section 3.0, discusses the computer models and methodologies that were used to estimate the PMP and the amount of runoff generated by various storms in the watershed. GOSR's HMR52-FL model, developed by converting HEC HMR52 FORTRAN code into a more user-friendly Excel spreadsheet format, calculated the PMP for the Project study area to be 32.84 inches of rain based on a fixed storm size of 10 square miles at an orientation of 207.97 degrees, with a maximum possible rainfall of 34 inches for the Project area given in HMR51 over a 24-hour period.

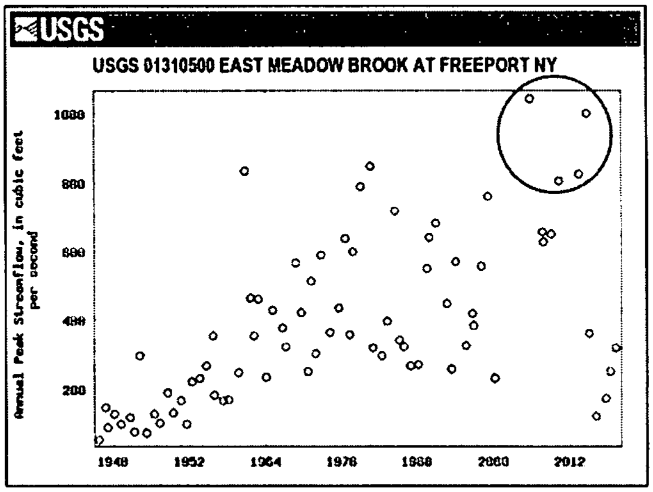
10. An official New York State 24-hour precipitation record was set at Islip, New York on August 12-13, 2014 with 13.57 inches of rain breaking the previous record of 11.6 inches set at Tannersville, NY on August 27-28, 2011 during Hurricane/Tropical Storm Irene. (*See* NOAA National Weather Service, "Historic Long Island Flash Flooding - August 12-13, 2014," available at https://www.weather.gov/okx/HistoricFlooding_081314). Thus, GOSR's PMP value of 32.84 inches of rainfall over a 24-hour period is 2.4 times the highest recorded 24-hour precipitation record in all of New York State. By itself, this 32.84-inch value is possible because the maximum amount of moisture held within the atmosphere for a watershed can exceed what is released by individual storms such as the August 2014 storm. Significantly, the measured Islip 24-hour precipitation value of 13.57 inches shows that at least this quantity of rainfall can fall within a time

period of less than one hundred years. Model calibration and project design must therefore be adjusted to incorporate this critical empirical data. Importantly, as discussed below, this 32.84-inch precipitation value is not the value used in engineering design.

11. The Town of Islip recorded 13.57-inches of rainfall over a 24-hour period, an amount that is roughly *twice* the applicant's 7.0-inch and 7.5-inch rainfall values used in their 50-year and 100-year design storms (Appendix O, Table 3.3, reproduced below). (A "design storm" is a hypothetical storm event of a given duration, rainfall intensity, return frequency, and total depth of rainfall that will be used in designing drainage facilities and flood protection structures.) Yet, as analyzed and discussed below, the August 2014 flood event recorded in nearby East Meadow Brook has a predicted flood return interval of only 25 to 40 years, rendering GOSR's estimation of rainfall amounts for 50-year and 100-year storms entirely off the mark. While further analysis could be conducted to determine the predicted frequency of large rainfall events, it is unlikely that the total rainfall amounts associated with assorted design storms are consistent with actual measured rainfall totals. This means that project modeling and design may be based on underestimated rainfall totals. As a result, flood magnitudes and environmental impacts may be greater than anticipated, resulting in the need to reassess project design. Some of GOSR's model inputs and results lack available empirical hydrologic data, bringing into question numerous assumptions that were used as model inputs and, logically, the safety of downstream individuals and structures that rely on model-derived engineering project design.

Table 3.3 – Precipitation (from Appendix O)

Design Storm	**Total Rainfall**
(Frequency)	(in)
5 year	4.5
25 year	6.0
50 year	7.0
100 year	7.5
PMP	32.84



12. Additionally, climate change may result in increased precipitation quantities and increased flood frequency. For example, the USGS peak flow data recorded at the East Meadow Brook gaging station (figure above) indicates a number of increasingly high annual peak discharges in recent years. The plot of the USGS annual peak flow data shows that some of the highest discharge events have occurred in recent time (circled area).

13. In the EA, GOSR states that there was no available stream gauge data for Mill River and that there was only a limited amount of data available for the Pines Brook, which is in the Mill River watershed. As part of their hydrologic model checking process, GOSR used USGS peak stream flow data for Pines Brook and the corresponding rainfall data for a storm that occurred on January 3, 1999. Based on GOSR's evaluation of the flow results being too high, GOSR reduced the curve numbers used by 10% and re-ran their model. The EA then says: "*The model predicted flows while lower, were still more conservative than the recorded data. It was determined that we would use the lower curve numbers throughout the model.* ***No further calibration was attempted since the information about the Pines Brook gauge was very limited.***" (Appendix O, page 31, emphasis added).

14. Hydrologic models should be calibrated with as much empirical data as possible before the design of costly engineered projects is finalized, even if additional time must be built into the planning process to obtain it. Empirical hydrologic data from a single storm event gives a picture of the outcome from a set of factors that may respond differently under alternate conditions, such as pre-storm flow, soil type, antecedent soil moisture condition, vegetative cover, precipitation amount and intensity, snowmelt, temperature.

15. Another source of hydrologic data that GOSR could have used for comparative purposes is the data collected at USGS gaging station 01310500 at East Meadow Brook at Freeport, New York. This station is just 4.0 miles east of the Hempstead Lake Dam and has excellent records of streamflow data spanning from 1937 to present (comprising 76 water years), with only a few years missing from the data set.

16. Hydrologically, flood frequency predictions (or probable flood return periods) are used to assess potential adverse flood impacts to dams, berms, levees, and downgradient structures. This is based on widely used and accepted statistical analysis.

17. There is no active stream gaging station on Mill River, which traverses through several bodies of water in Hempstead Lake State Park, including the Northeast and Northwest Ponds, Hempstead Lake, McDonald Pond, and South Pond. The Park's 6.5 mi^2 watershed area is densely urbanized, resulting in limited natural infiltration and high surface runoff rates. High percentages of impermeable ground cover such as road and parking lot pavement and building roofs retard the natural downward infiltration or percolation into underlying soil. This results in rapid and concentrated runoff to streams, rivers, and reservoirs.

18. Because we are in a period of increased precipitation and extreme storm events associated with climate change, it is important to ensure that the Project's components, such as the

two dams in the Park, are able to handle major flood events (e.g., 100-year storms), not just minor ones (e.g., 5-year, 10-year storms). My estimation of the relative frequency and comparative magnitude of flood events that may affect the Hempstead Lake and South Pond dams is based on my examination of annual peak flood events that have occurred in East Meadow Brook at Freeport, NY located some 4.0 miles to the east of Hempstead Park. I examined 76 years of historic peak flows were statistically examined using Type I Gumbel Distributions, Log-Pearson Type III Distributions, Log-Normal Distributions, and Normal Distribution analyses (Exhibit 3).

19. The longer the period of hydrologic record, the greater the reliability of flood predictions. The East Meadow Brook data include the "water years" spanning the period from 1937 to 2019, with omissions of the water years 2001 to 2005, 2011, and 2012. (A "water year" runs from October 1 of one year to September 30 of the following year.) The Type I Gumbel Distribution provided the best statistical fit of the data for the much larger East Meadow Brook 28.7 mi^2 watershed. For example, the two largest recorded runoff events occurred on October 14, 2005, resulting in the production of a high runoff event with a flow of 1,040 cubic feet per second ("cfs") and on August 13, 2014, resulting in the production of a high runoff event with a flow of 998 cfs. Statistically, based on the line of best fit through the data, flood events of this magnitude (1,040 cfs) can be expected about every 40 to 50 years. Log-Pearson Type II Distribution and Log-Normal Distribution analyses yielded a predicted/statistical flood return interval for the 2005 peak recorded flood (1,040 cfs) of about 25 years, respectively. While the statistical lines of best through the data varies somewhat from that derived via Type I Gumbel Distribution analysis, the predicted return intervals are similar.

20. Among the water years of missing data are those which include Tropical Storm Irene in August 2011 and Hurricane Sandy in October 2012. A model that omits hydrologic data

from very high runoff events will substantially underestimate stream discharges associated with floods. In addition, because these two storm events have not been included in the dataset, the flood recurrence interval may be much shorter than the model predicts, meaning that floods will occur more frequently. GOSR made no attempt to account for these critical omissions in its flood risk analysis, resulting in the significant underestimation of magnitude and frequency of extreme flood events.

21. The second highest flood of record for East Meadow Brook at Freeport, which occurred on August 13, 2014, had a recorded peak flow of 998 cfs. Exhibit 3 shows a predicted flood return interval for the August 13, 2014 flood to be approximately 40 years, 25 years, and 25 years for Type I Gumbel Distributions, Log-Pearson Type III Distributions, Log-Normal Distributions, respectively. (See Exhibit 3.) As discussed above, Islip, NY recorded 13.57 inches of rain during this event. Islip is 19 miles east of the East Meadow Brook gaging station. A 24-hour rainfall total recorded from the same storm in Merrick, one mile to the southeast, was 6.81 inches. While there was variability in the amount of rainfall responsible for flooding in Islip, Freeport, and other towns, the same storm system brought heavy rains throughout the area.

22. EA Appendix O, Table 3.3 - Precipitation (*see* paragraph 11 above) shows the various rainfall totals that GOSR used in modeling design storm flows. Total modeled rainfall values for 25-year, 50-year, and 100-year design storms are 6.0 inches, 7.0 inches, and 7.5 inches, respectively. Thus, the Merrick 24-hour rain total value of 6.81 inches is close to the 7.0-inch EA value associated with a 50-year design storm - not the 25-year predicted flood recurrence interval associated with Exhibit 3's findings. Furthermore, the 13.57 inch 24-hour rainfall recorded only 19 miles away raises serious questions regarding the use of a 7.5-inch total rainfall value as being representative of a 100-year design storm. In short, the 7.0-inch rainfall amount that GOSR's

model estimates as having a 1 in 50 chance of occurring in a given year actually will likely occur far more frequently. And the same is true of the 7.5-inch rainfall value, which GOSR presents as having a 1 in 100 chance of occurring in a given year.

23. All of this information was readily available to GOSR at the time it was preparing the EA, yet GOSR chose to base its assessment of likely impacts upon a gross undervaluation of flood events, while it concomitantly concluded that the Hempstead Lake State Park Project will have no significant impacts.

24. As discussed above, GOSR used hydrologic data available from Pines Brook (part of the Mill River Watershed) from a storm which occurred on January 3, 1999, to assess its model's reasonableness. For comparative purposes, this same storm event resulted in a peak flow of 759 cfs in nearby East Meadow Brook. A statistical analysis of 76 years of East Meadow Brook peak flow data reveals that this flood event ranked as 8th highest in 76 years and has a predicted return interval of 10 years (Exhibit 3). This finding, that the Pines Brook storm event of January 3, 1999 most likely correlates with a 10-year flood return event (based on 76 years of nearby empirical peak flow data), is significant because it was used in model checking and is far from representative of flow conditions present during a 100-year flood event. By rough analogy with nearby East Meadow Brook recorded peak flows, 50-year (1054 cfs) and 100-year (1192 cfs) peak flows may be proportionally 39% and 57 % higher than the 10-year flood return event in the Project area, respectively. In terms of project engineering design, this is particularly important because construction and/or use of undersized spillways, inlet and outlet structures, and culverts may result in back flooding and increased pressure against revitalized dams. Engineering design and dam safety analysis should be reexamined and assessed using all available peak flood and precipitation data collected both onsite and in the surrounding area.

25. Stream flows recorded at the East Meadow Brook gaging station do not include the water years associated with either Tropical Storm Irene or Hurricane Sandy that occurred in late August 27-29, 2011 and October 29, 2012, respectively. In an effort to correlate potential flood discharges associated with these storms, if any with the Project area, I analyzed peak annual flood events based on USGS data from the Connetquot Brook gaging station, USGS 01306460, near Central Islip, some 27.6 miles northeast from the East Rockaway High School. Again, data from this stream gaging station was used because the nearby East Meadow Brook gaging station did not record stream flow during either storm.

26. Review of annual peak streamflow for water years 2011 through 2013 (see Exhibit 4), reveals that neither Tropical Storm Irene nor Hurricane Sandy produced sufficient streamflow to register as annual peak flows. Precipitation data measured on October 28, 2012 and October 29, 2012 (associated with Hurricane Sandy) at Weather Underground weather stations in Valley Stream (KNYVALLE1) and South Freeport (KNYFREEP2) explain this. The October 28, 2012 precipitation total for these two stations was measured as 0.00 inches and 0.03 inches, respectively. The October 29, 2012 precipitation total for these two stations was measured as 0.87 inches and 0.53 inches, respectively. Thus, major lower Mill River flooding associated with Hurricane Sandy was not due to copious amounts of precipitation and resultant runoff.

27. The *actual* cause of Mill River flooding during Hurricane Sandy was the 17-foot storm surge that drove water from Hewlett Bay up the river to and beyond the East Rockaway High School. This caused overbank floodwater inundation of Patten Avenue that was measured as extending 300 feet eastward from the river bank. Similarly, floodwater overbank conditions occurred coincident with Tropical Storm Irene, but not as far eastward as during Hurricane Sandy.

28. Logically, when floodwaters fill and overflow the available channel cross-sectional area in the Project area without any significant precipitation generated runoff, it is critical to assess the likely magnitude of added impact floodwaters associated with high runoff events might contribute. While GOSR's model attempted to assess this, little or no empirical data was used to validate the model results. Without validation, there is no way to ascertain whether any of the model's predictions are likely to be anywhere near accurate. For this reason, it is instructive to start with examination of stream discharge as a function of a single high precipitation and runoff event. This type of data (i.e., actual precipitation and stream discharge data) must be incorporated into empirically-based models and then expanded to examine the combined impact of high runoff events and large precipitation events. Once this is done, project design elements can be drafted or modified to address the projected risks.

29. The following analysis provides an example of how a single major rainfall event can increase stream flow and alter statistically-derived flood return interval predictions. Therefore, it is instructive to start with examination of stream discharge as a function of a single high precipitation and runoff event. The following analysis provides an example of how a single major rainfall event can increase streamflow and alter statistically derived flood return interval predictions. Examination of this type of empirical information (i.e., actual precipitation and stream discharge) should be incorporated into empirically based modeling and then expanded to examine the combined impact of high runoff events and large precipitation events. Once this is done, then project design elements can be assessed and, potentially, modified to best ensure public safety.

30. Stream flows associated with both Irene and Sandy fail to register as peak flows for their respective water years. Instead, comparative analysis of Connetquot Brook discharge with and without the highest recorded flow stemming from a major rainstorm on August 13, 2014 is

instructive. The USGS Connetquot Brook gaging station is located 3.0 miles from the Islip Airport.

31. As discussed above, some 13.57 inches of rain were measured within a 24-hour period (August 12-13, 2014) at the Long Island MacArthur Airport in Islip, 30 miles northeast of the East Rockaway High School. Had this amount of rainfall occurred within the East Meadow Brook watershed or within the Mill River watershed, it is highly likely that overbank flood conditions observed coincident with Hurricane Sandy in October 2012 would have been greater.

32. A substantial difference (i.e., increase) in the 2014 Connetquot Brook annual peak flow stands out from peak flows in other water years (See Exhibit 4, page 1 graph). My analysis shows a stream flow value of about 510 cfs for this storm event and statistically predicts a 100-year flood discharge ranging between 364 cfs and 294 cfs based on Log-Pearson Type III Distribution and Log-Normal Distribution analyses, respectively based on 42 years of annual peak flow data (see Table 1 summary below). The Log-Normal Distribution provides the best statistical fit for Connetquot Brook flood data. As depicted on the graph on page 1 of Exhibit 4, unusually high magnitude flood events do occur as do major adverse flood impacts. Dam safety evaluations must factor in worst case scenario flood events of this nature.

Table 1. Statistical Results Extracted from Exhibit 4.

STATISTICALLY PREDICTED CONNETQUOT BROOK FLOOD RECURRENCE INTERVALS				
Predicted Flood Return Interval	**Log-Pearson Distribution (cfs)**	**Flow Percentage *with* 2014 Flood Data**	**Log-Normal Distribution (cfs)**	**Flow Percentage *with* 2014 Flood Data**
10 Year	177	118	173	115
25 Year	241	132	219	119
50 Year	298	144	256	122
100 Year	364	158	294	125

33. A second flood return statistical analysis was conducted for the Connetquot Brook peak flow data, with the exception that peak flow data from water year 2014 was omitted (Exhibit 5). Removal of the 510 cfs discharge value resulted in decreased predicted flood return interval discharges as presented in Table 2 below. Comparison of values in Table 1 and Table 2 shows that a single unusually high runoff event, when statistically added to much lower annual peak flows, will statistically improve the database and predict higher discharge runoff events. Thus, it is important to conduct and validate hydrologic modeling with long-term empirical data as part of the engineering design process.

Table 2. Statistical Results Extracted from Exhibit 5.

STATISTICALLY PREDICTED CONNETQUOT BROOK FLOOD RECURRENCE INTERVALS				
Predicted Flood Return Interval	**Log-Pearson Distribution (cfs)**	**Flow Percentage *without* 2014 Flood Data**	**Log-Normal Distribution (cfs)**	**Flow Percentage *without* 2014 Flood Data**
10 Year	150	100	151	100
25 Year	182	100	184	100
50 Year	207	100	210	100
100 Year	231	100	236	100

34. It is essential that hydrologic models include worst case empirical data (e.g., precipitation and stream flow). The occurrence of unusually high magnitude runoff events will increase the predicted discharge values for set flood return intervals, sometimes substantially. This will occur over time as more storm events occur and longer periods of record are amassed. Thus, project design must plan for at least 100-year flood return intervals and must factor in existing empirical data from major 24-hour precipitation events. Because the Islip rainfall of 13.57 inches in 24 hours occurred only 30 miles from East Rockaway High School, this empirical data should be incorporated into model runs. As a result, for example, different Total Rainfall values associated with various Design Storms may need to be revised upward to reflect documented

empirical rainfall data. Appendix O, Table 3.3 - Precipitation indicates that a Total Rainfall value of 7.5 inches was used in modeling the 100-year Design Storm. This may necessitate project redesign.

35. As discussed above, it is critically important that project design not rely solely on modeled results for 100-year storms as the basis for construction of multi-million-dollar projects that have the potential to adversely impact the health and safety of the community. These same concerns apply to proposed Mill River channel modifications at and near the East Rockaway High School. Here, GOSR proposes raising the grade of the athletic field two (2) feet, and constructing a flood protection berm and knee wall to protect a block of residential homes on the west side of the project area (along River Road). Hydrologically, River Road homes are situated on the outside of a meander bend in the river where turbulent stream power forces are greatest during flood events. Extensive modeling was conducted by GOSR that ultimately concluded that these construction projects would not result in significant effects on river flood levels or property damage during a 100-year flood event. It is essential that modeling examine worst case scenarios that must include the combined impact of high storm surges **and** high runoff events. This should occur in an Environmental Impact Statement available for full public scoping, review, and comment.

36. The May 28, 2020 Tetra Tech Living with the Bay East Rockaway High School/Lister Park Hydraulic Model Report provides a modeled 100-year peak flow value of 2,704 cfs, yet does not provide information on what, if any, river flow data was used to critique this value. Furthermore, no long-term stream gaging data is presented as an empirical basis for running models or to calibrate them for peak flow/storm events. Exhibits 3, 4, and 5 provide examples of the type of empirically-based statistical analysis used to examine and predict 100-year flood

recurrence discharges. As discussed above, the results of HydroQuest's flood frequency analysis for nearby East Meadow Brook show that the limited Pines Brook storm hydrograph data used by GOSR was likely associated with only a 10-year flood event.

37. It must be demonstrated and clearly documented to reviewers that the model results used as the basis for project design correlate with actual empirical stream flow and precipitation data. Models based largely on best estimate input parameters in the absence of empirical data may potentially underestimate flood levels and impacts.

38. What stands out is that the applicant's modeling efforts did not make use of nearby existing meteorological and hydrological data that was readily available and of crucial importance in both model calibration and, then, safe project design.

39. As a result, as illustrated within this affidavit, project design is very likely predicated on modeled rainfall totals that are almost certainly far below what will occur during a 100-year flood event. The documented the 13.57 inch 24-hour Islip rainfall recorded only 23 miles from Hempstead Lake is higher than the 100-year 7.5-inch EA total rainfall value used in project design by 6.07 inches. Clearly, six or more inches of additional rainfall above that used in project design for the 100-year design storm could have devastating health and safety impacts if not fully considered in project design. The additional study that would have been required for GOSR to ensure that project design fully supports public health and safety was simply not done.

40. Regulations seek to protect wetland integrity and protect and conserve freshwater wetlands, their functions and the benefits derived from them. GOSR's EA predicts that project construction would result in a loss of 2.92 acres of wetlands (Table 9: Summary of Wetland Impacts Across All Project Components). While mitigation projects have been proposed to offset this loss (Table 11), it is important to recognize that upgraded model results and project design

may require substantial project modification that may necessitate consideration of existing wetland benefits. The removal of invasive species should not be viewed as a mitigation activity but should, instead, be viewed as required annual maintenance. Similarly, plastics removal should also be undertaken as a routine operation and maintenance function within the park. Wetlands provide many important hydrologic and ecologic functions (e.g., floodwater storage; filtration of pollutants; wetland ecosystems for reptiles and amphibians, fish, insects, and plants; bird habitat) that may be degraded by activities such as dredging; the installation, removal, and maintenance of small water control structures, dikes, and berms; the removal of existing drainage structures; and the construction of open water areas. Any alteration of wetland ecosystems may adversely affect wildlife. Following upgraded modeling, project design should be revisited with an eye towards maintaining all existing wetland acreage. Yet, GOSR's EA reflects that GOSR has little or no comprehension of these impacts.

41. With the current administration's relaxation of wetland protection regulations, entitled the Navigable Waters Protection Rule, it is more important than ever to protect and fully maintain those wetlands that meet this rule's criteria (e.g., protection of wetlands that abut or connect to a large protected water body). This is the situation at Hemlock Lake State Park. The determination to physically alter and reduce the size of a wetland ecosystem and its surrounding buffer area should only be considered as a last resort after comprehensive assessment of all hydrologic fluxes and ecologic functions that make it viable. Project site wetlands are part of a hydrologic system that is hydraulically connected to both surface and groundwater fluxes and must be protected to the fullest extent of the law. The health and viability of the wetland ecosystems present require that the natural surface and groundwater fluxes that make them viable be fully

understood and maintained. This requires additional study, specifically evaluation by hydrogeologists, hydrologists, and biologists in the context of an Environmental Impact Statement.

42. Additional hydrologic evaluation using newly acquired and existing empirical/hydrologic data should be conducted and modeled as part of project reevaluation within the framework of a full Environmental Impact Statement (EIS), complete with public participation. Project design should then be modified as necessary. Review and particular emphasis should be placed on reviewing the cross-sectional areas and conveyance capacity of all potential flow constrictions (e.g., inlet and outlet structures, culverts) both within and downstream of project areas. All hydrologic evaluation must be conducted in a comprehensive manner that fully evaluates hydraulically interconnected portions of the Mill River Watershed area, inclusive of potential impacts that the project will have on other segments of the Watershed and its communities.

Paul A. Rubin

Paul A. Rubin

Sworn to before me this
21st day of August, 2020

Notary Public

DENIS P. O'LEARY
Notary Public, State of New York
No. 4846221
Qualified in ~~Kings County~~ my cty
Commission Expires January 31, 2024