DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
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September 14, 2016

Mr. Scott Peyton, P.E.
Stantec Consulting Services, Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

RE: Response to Questions for Clarification dated August 16, 2016
Blanchard River Watershed Study, Hancock County, Ohio.

Dear Mr. Peyton;

As requested in your letter dated August 16, 2016 regarding clarification of several issues encountered during a review of data provided by the Buffalo District of the U.S. Army Corps of Engineers for the Blanchard River Watershed Study, the following responses have been prepared to address the questions presented in the referenced letter.

BASE MAP DATA

Q1: Is documentation and metadata available for the GIS information?

A1: This depends. Some of the layers we created in-house from DEMs, CADD, and other sources as needed. If they were created from other layers (such as NWI, OWI, NHD) then the metadata is contained in the previous layers. A more specific question on actual data files would be more helpful. With regards to utility data USACE had to digitize them from pdf's received from the utility companies.

Q2: What is the source of the provided DEM - "blan_dem"?

A2: The data came from 2006 OSIP data. The metadata for this set is : "The 2006 OSIP bare-earth Digital Elevation Model (DEM) was derived from digital LiDAR data was collected during the months of March and May (leaf-off conditions)..."

Q3: What is the source of the GIS utilities data? Is it available for the area around Findlay outside of the footprint of the proposed alternative?

A3: The pipeline data was digitized from topographic maps and then verified with the pipeline companies with very specific areas. We do not have pipeline data for the entire pipeline; however, a good estimate of pipelines in the area can be found online at the National Pipeline Mapping System (https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf).

The well data was acquired through the Ohio Oil & Gas Well locator (http://oilandgas.ohiodnr.gov/well-information/oil-gas-well-locator).

Water well data was acquired from the ODNR database but can be viewed online at this website: https://gis.ohiodnr.gov/MapViewer/?config=waterwells.

The aqueduct layer was digitized from topographic maps.

The overhead lines layer was digitized from NAIP imagery and only includes overhead lines visual from imagery. Finally, Hancock Woods Electric, Benton Ridge Fiber Cable, Benton Ridge Copper Cable, CNI Fiber Optics, and Ohio Power utilities were all digitized from engineering plans provided by the different service providers.

ALTERNATIVES

Q1: Does documentation exist on the extent of analysis for other alternatives reviewed (model runs, data or other documentation)?

- What type of data/documentation exists on other scenarios such as detention/storage?
- What is the extent of the analysis performed on the diversion channel extension to the Blanchard River?
- What is the extent of the analysis performed on the alignment through Aurand Run?

A1: The Blanchard River Flood Risk Management Study was performed using a tiered process of increasing level of detail. The Feasibility Scoping Report (FSR) dated December 2011 considered the broadest array of alternatives. These analyses were supported by preliminary HEC-HMS and steady state HEC-RAS models and preliminary layouts, cost, benefit, and environmental assessments. The Feasibility Scoping Report has been provided under separate cover.

The FSR recommended continued analysis of a limited number of alternatives which are documented in the Report Synopsis - Final Array of Plans dated March 2013. This report used an unsteady HEC-RAS model to evaluate the Eagle Creek diversion channel and several other alternatives. Again this assessment was based on preliminary hydrology which was revised for the 2015 Feasibility Report. The diversion alternative analysis includes Civil 3-D layouts and excavation quantity analyses. Concept bridge designs and cost estimates are a part of the Cost Appendix support documentation. Detailed supporting documentation is available for use if a re-analysis of alternatives is to be performed.

No detailed analysis of extending the diversion channel to either Lye Creek or the Blanchard River was conducted. A qualitative assessment indicated the length of the channel would increase dramatically as a result of likely blasting of rock as a potential diversion channel extended eastward; the construction of additional diversion structures on both the Blanchard River and Lye Creek; and the additional sizing required to accommodate additional flows from Lye Creek and the Blanchard River. This qualitative analysis indicated the potential costs of an extension would exceed the potential benefit pool after implementation of the Eagle Creek Diversion channel. In addition, the concept of extending the channel to Lye Creek to the Blanchard River was considered in the Value Engineering Study but discarded as being cost prohibitive. Formal costs were not developed; however, general per foot costs were considered in the assessment.

The Aurand Run diversion alignment was included in the Report Synopsis - Final Array of Plans dated March 2013, included HEC-RAS models and preliminary layouts/quantity takeoffs in Civil -

3D. This alternative was screened from consideration primarily for environmental reasons as this alternative would not be the Least Environmentally Damaging Practicable Alternative (LEDPA). As a replacement, this alternative would include significantly more stream and wetland impacts than the selected alternative. In addition, an offset of the diversion channel along Aurand Run was also considered, but was also not selected due to several factors including the impacts to the existing stream and wetlands as a result of groundwater disruption as well as increased cost due to significantly more rock excavation.

HYDROLOGY AND HYDRAULICS

Q1: It isn't clear what happens when the discharge on Eagle Creek exceeds a 25-year event for the recommended plan. Presumably, the diversion structure would be designed to allow the excess flow (beyond the diversion channel capacity) to continue downstream along Eagle Creek, but that isn't clearly described in the reports provided. Does flow exceeding the capacity of the diversion channel continue downstream of the diversion structure into Eagle Creek?

A1: Yes. The intent of the diversion structure design is to pass any flows down Eagle Creek that exceed the diversion channel capacity.

Q2. The results of the provided HEC-FDA models are inconsistent with the reported values in Final w/ Project runs in HEC-RAS and the reported results in the H&H Report and Feasibility Study for Alternative 13. The HEC-RAS model has the "Flow Optimization" option activated for the lateral structure on Eagle Creek. This leads to correct discharges along the diversion channel, but reduces discharges along the Blanchard River. The HEC-FDA model uses a profile that has a drop in water surface elevation in downtown Findlay of approximately 2 feet, while the floodplain figures appear to show a drop of approximately 4.5 feet. In other words, is the actual reduction in water surface elevation for the Blanchard River in downtown Findlay approximately 4.5 feet or 2 feet for the 100-year event? Figures are attached for clarification.

A2: It appears the 4.5 feet drop in water surface elevation in downtown Findlay is based on a model run where the flow optimization feature did not properly converge on an internally consistent result.

Q3: Were there any statistical analyses performed to determine the likelihood of Eagle Creek being able to reduce flood impacts from the Lye Creek or Blanchard River watersheds? A multi-variate analysis considered storms of multiple durations, sizes, and center locations could help characterize this uncertainty.

A3: The precipitation scenario analyzed was one of uniform rainfall over the entire drainage basin. The Eagle Creek diversion provides flood reduction to the extent there is flow in Eagle Creek to divert and only up to the capacity of the diversion channel (equivalent to a 25-year flow on Eagle Creek minus 100 cfs). For a geographically skewed rainfall event that generated 100-year flows in the Lye Creek and the upper Blanchard, and a 25-year flow in Eagle Creek, the project could still deliver a level of control equivalent to that for a 100-year flood throughout the entire basin.

Q4: If the Eagle Creek Diversion Channel (Alt. 13) only has capacity for a 25-year event, what is the combined probability for a given event of the Blanchard River flooding downtown Findlay after the channel is constructed. In other words, what is the aggregate risk reduction or effective return period reduction in Findlay for the proposed channel?

A4: The FDA analysis we performed assessed expected damages for both existing and with-project conditions for a range of flow frequencies.

USACE policy does not evaluate alternatives in terms obtaining a level of reduction of flood risk as particular flow frequencies. USACE evaluated alternatives in terms of providing the highest benefits from flood risk less the project costs. As with any flood risk management project, there will be a level of residual risk from the without project condition. As demonstrated in Section 6.4 of the Draft Final EIS, Plan 13 provided a 66% reduction in expected annual damages from the without project condition, leaving 34% in residual risk.

Q5: Was connecting diversions between Eagle Creek, Lye Creek, and the Blanchard River considered to further reduce the risk in Findlay? What types of analyses were performed in screening this alternative?

A5: No detailed analysis of extending the diversion channel to either Lye Creek or the Blanchard River was conducted which would involve preparing hydraulic or economic models. A qualitative assessment indicated that the length of the channel would increase dramatically as a result of likely blasting of rock as a potential diversion channel extended eastward, the construction of additional diversion structures on both the Blanchard River and Lye Creek, and the additional sizing of the proposed Eagle Creek diversion channel required to accommodate additional flows from Lye Creek and the Blanchard River. This qualitative analysis indicated the potential costs of an extension would easily exceed the potential benefit pool after implementation of the Eagle Creek Diversion channel. In addition, the concept of extending the channel to Lye Creek and to the Blanchard River was considered in the Value Engineering study but discarded as cost prohibitive. Formal costs were not developed; however, general per foot costs were considered in the assessment based on the formal costs prepared for the Eagle Creek Diversion channel.

Q6. The digital data includes some gage frequency analyses using Bulletin 17B, but it is unclear how/if this was used and how it compares to the HMS model results. The H&H Report doesn't mention gage analyses.

A6: The HMS model was used to generate the flow frequencies used in the feasibility study. The Bulletin 17B analysis was performed as part of the evaluation of the potential impact of climate change on the Blanchard watershed hydrology. The climate change white paper discusses a mismatch between the Bulletin 17B and HMS flow frequencies and was proposing to update flow frequencies starting from the Bulletin 17B flow frequencies and then adjusting them to account for an observed trend in annual peak flows.

Q7. Climate change is discussed in the H&H Report, but it is unclear how that was accounted for in the model. Were the Frequency Storm based runs that add 103 to the rainfall depths intended to account for climate change? How were those results applied to the hydraulic model?

A7: Climate change was assessed in the feasibility report but was not incorporated in any of the modeling associated with the feasibility report as at this stage of the project such an incorporation would not be required. The climate change white paper proposed accounting for an observed trend in annual peak flows by adjusting the flow frequencies using a statistical

technique to account for the trend. The white paper did not consider adjusting precipitation frequencies.

Q8: The Feasibility Study mentions consideration of options other than flood diversion channels (such as inline detention), but the hydrologic model does not appear to include those options. Are there model runs for these other options?

A8: Other options such as inline detention were considered earlier in the project. The files associated with any model runs performed to simulate these other options are not readily available. Model runs for these alternatives would be available by contacting AECOM who prepared the modelling. However in t reports documenting the alternative selection, , there are few alternatives where retention could be considered feasible and this is contributed to the flat terrain in the area. Where retention was found to be feasible, other alternatives were determined to be more efficient at managing flood risk.

Q9. The linkage between the hydrograph peaks predicted by the HEC-HMS model and the steady state discharges entered into the HEC-RAS model is not well documented and it cannot be determined if the discharge values in the HEC-RAS model are consistent because there's not a one-to-one match between junction nodes in the HMS model and cross sections in the RAS model.

A9: The flow change locations in RAS can be verified by overlaying the basin shapefile from HMS with the cross-section coverage from RAS.

Q10: Additional documentation on calibration and parameter sensitivity/accuracy would help clarify the H&H Report.

A10: The full extent of our documentation on calibration and parameter sensitivity for the models is included in the feasibility report. The model developer has since left the Buffalo District. His contact information could be provided if needed.

Q11. The source of the geometry for the HEC-RAS model is not fully documented. The H&H Report alludes to OGRIP LiDAR (2-foot contours) being used to supplement a previous model developed by USACE Buffalo. It is unclear if current channel and bridge surveys were incorporated. Is the geometry of the Blanchard River through Findlay (including all the structures) based on a current or recent survey?

A11: USACE Buffalo District originally built a RAS model that was later transferred to URS. The latest version of the RAS model is based on the RAS geometry developed during the original modeling effort prior to 2010 with bridge and structure geometries added to the model by AECOM in 2011.

The following text from the H&H appendix summarizes how the bridges and structures were input into the HEC-RAS models AECOM received initially from the USACE:

"Field survey measurements were also obtained to supplement the topographic information derived from the DEM of the watershed and to obtain additional information on the structures in the reaches of the HEC-RAS model. In addition, "as-built" and plan information of bridges, inline structures (such as "low-head" dams), culverts, private foot bridges, public roadway bridges,

and railroad bridges were obtained from county and local municipality bridge and culverts plans, county bridge and culvert inventory records, Ohio Department of Transportation bridge and culvert plans, and National Resource Conservation Service (NRCS)bridge data."

We have numerous CD's (15-20) with bridge and geometry related data, apparently from the original model development effort, which we could provide copies of if needed.

Q12: Hydraulic results for various alternatives considered are not presented in the H&H Report, other than tables 17-22 which only consider the diversion channel and its derivatives. Are results of other alternatives documented?

A12: See A1 under Alternatives section.

Q13: Will there be a new FEMA regulatory floodplain and floodway along the diversion channel alignment (and potentially overland to Aurand Run) for the 1% ACE (100-year) flood event? Figures or exhibits that present the residual/resulting floodplain for this alternative other than Figure 39 in the H&H Report and Figure 8.5 in the Feasibility Report are not available.

A13: A feature of the diversion structure design was that it would allow all flows greater than the Eagle Creek 25-year flood minus 100 cfs, to continue down Eagle Creek. The diversion structure gates would be operated to divert flows into the diversion channel only up to the maximum capacity of the channel. Operation of the diversion channel inlet structure would need to take into account any additional lateral flows along the length of the diversion channel. The intersections of Aurand Run and the Unnamed Tributary with the diversion channel include gates on the downstream side of the diversion channel that are meant to be controlled to allow outflows equivalent to tributary inflows, resulting in no net gain or loss of flow in the tributaries or diversion channel. As such, there should be no need to define a floodplain for the diversion channel. However, FEMA requirements may require outlining a floodplain within the diversion channel footprint. However, for the intersection of two streams with the diversion channel, the water surface in the diversion channel exceeds that of the estimated 100-year water surface in the two tributaries, and thus would result in an increased backwater, thus affecting floodplain boundaries for Aurand Run and the Unnamed Tributary.

Floodplain mapping, including floodplain analysis, and subsequent submission to FEMA is typically performed during the design phase of the project. The purpose of preliminary floodplain mapping during feasibility is primarily for use in performing an economic analysis for alternative comparison.

Q14. Sections 7.3 and 8.5 of the Feasibility Report indicates an increase in discharge at the confluence of the diversion channel and the Blanchard River of approximately 250 cfs. This is referenced to the 1% ACE, and Section 7.3 indicates it will be resolved during the Planning, Engineering and Design [PED) phase. A potential mitigation strategy is not presented or discussed. Did USACE have a conceptual approach they were going to investigate?

A14: Potential resolutions considered were: 1) enhancing Ottawa's flood risk management project; or 2) legal/policy decision that impact was inconsequential enough to not require mitigation. This is a legal analysis that is performed during the PED phase once the impact is known based on the final design of the project. A final real estate plan is then prepared which analyzes the impacts

of the increase in discharge and whether the impacts rise to the level of a legal taking of property rights which require mitigation or compensation.

COST/ECONOMICS

Q1: NED Benefits associated with transportation and agricultural damages were planned for the project, but not included in the analysis. Is documentation available on these draft analyses that were not included in the report?

A1: Yes documentation is available. See the following zip file: “Transportation & Agricultural Benefits.zip”

Q2: II is unclear how USACE defined the project objective in terms of Benefit/Cost Determination related specifically to flooding. Any of these flood risk reduction objectives could apply and would/should result in different benefit calculations.

1) Any solution that results in reduced flooding and a B/C > 1.0 . This could result in considerable residual flood risk to Findlay although the net benefit is favorable.

2) Reduce WSE in downtown Findlay by X amount for a given return period.

3) The optimal project to maximize flood reduction for all areas considered.

A2: The objective from the economic perspective was to mitigate flood risk, including physical damages associated with flooding. The predominant benefit category in any flood risk management study is damages avoided to industrial/commercial/residential buildings (structure and content damage). These benefits are calculated using HEC-FDA, by comparing existing damages (without project condition), to the damages that occur given a proposed structural or non-structural alternative. Using this framework you are able to estimate project benefits, and residual damages.

The overall economic framework, including benefit estimation, was developed pursuant to ER1105-2-100 (Planning Guidance Notebook), and the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

Q3: The final EIS states that while some of the flood risk management measures may have met the criteria for completeness, effectiveness, efficiency, and acceptability, they were subsequently screened from further evaluation because they were implemented using another source of funding.

Are measures implemented through other sources of funding needing to be incorporated into the H&H modeling to account for flood reduction and control?

A3 -1: Yes, if measures currently exist, they are part of the existing or without project condition, and should be incorporated as such into the H&H modeling.

Do the benefits of the recommended plan overlap any benefits of other measures using other sources of funding?

A3-2: No, there should be no overlap if the measures were taken into account under the existing or without project condition.

Q4: The O&M spreadsheet mentions O&M costs for sluice gate crossings and drainage, tide flex backflow replacement costs, mowing, and the Obermeyer weir structure. Are there other operations and maintenance costs that were not considered?

The following O&M activities were listed in the report, but not broken out in the costing: Removing vegetation, obstructions, and encroachments (trash, debris, unauthorized structures, excavations, or other obstructions present within the easement area); repairing erosion; repairing or replacing riprap; and repairing or replacing revetments other than riprap. Is there documentation on how O&M costs were derived for the diversion channel? The Final EIS mentions three aqueduct crossings that need to be maintained to ensure proper flow during non-flood events. Are these the sluice gate crossings?

A4: There may be other O&M costs that could be considered. However, the O&M costs provided in the final report are cursory in nature and were determined either through a percentage of construction costs or from professional opinion based on similar projects. As the O&M costs are relatively small portion of total project costs, performance of a detailed O&M cost analysis was not performed as such costs would not have a significant impact on alternative selection. The aqueduct crossings are the sluice gate crossings.

Q5: Is the ending date of November 2021 the latest schedule considered?

A5: November 2021 is the latest date considered for economic analysis reasons. Later dates would require cost escalation and interest during construction, likely resulting in a lower benefit to cost ratio.

Q6: The HEC-FDA data suggests a discount rate of 7.5% was used for the benefit analysis. Is there documentation supporting this value?

A6: A discount rate of 7.5% was not in the benefit analysis. Expected annual damages avoided (benefits) are estimated based on probability of flood occurrence. More details related to benefit estimation can be found in:

1/ HEC-FDA Flood Damage Reduction Analysis User Manual Version 1.2.4,
2/ ER1105-2-100 (Planning Guidance Notebook),
3/Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

The Office of Management and Budget (OMB) requires projects be evaluated utilizing two discount rates. The present discount rate (3.125% for FY2016) is used to evaluate a project for

USACE Chief's Report approval and Congressional Authorization. The OMB evaluates projects using a 7.5% discount rate for inclusion in the President's Budget each year.

Q7: The HEC-FDA profile data used for benefits does not appear to match the final HEC-RAS results for Alt. 13.

A7: See H&H A9.

DESIGN/ENGINEERING

Q1: The following assumptions were made by Stantec based on the diversion channel as recommended in the Feasibility Report. The following items need to be discussed with Hancock County and/or USACE to confirm our interpretation.

- The Interstate I-75 crossing will remain on the existing grade.
- The Norfolk Southern RR crossing will remain on the existing grade.
- CR 313 (between the RR and 1-75) will remain on the existing grade.
- Utility coordination will be completed for the project.
- Roadway/bridge improvements will follow ODOT PDP; Path 3 and will be designed to meet the County and ODOT standards.
- Lengths of roadway improvements will be based on a 2.5 foot levee for the Stale Route 12 crossing and the other local roadways.
- The USACE Feasibility Report, Section 9.3 discusses and makes recommendations for each of the crossings, and breaks them down into five categories: These are Dry Crossings, Local Road Bridges, Slate Road Bridge, Interstate Highway Bridge and Railroad Bridges. It should be noted that this section of the report indicated that a bridge type studies had been completed. Is this the case?

A1: The Norfolk Southern Rail Crossing was assumed to be designed to remain at existing grade. However, it was assumed that there would be availability for changes in grade for all other road crossings, including Interstate 75 if required. Final grade requirements for new bridges including I-75, Norfolk and Southern RR Crossing, CR 313, and SR 12 will depend on the selected channel capacity, vertical alignment, and design cross section.

Utility coordination for the project included requesting utility location information via a design ticket with OUPS. The purpose of utility information at a feasibility stage is to determine the extent of the need for utility relocation, the potential for utility avoidance, and to determine preliminary costs for such relocations. Further coordination will be necessary as the final design progresses. The types of structures used in costing was based on the pertinent ODOT standards.

The approach to implementing roadway / bridge improvements should be coordinated directly with the County and/or ODOT. For the USACE project, it was assumes that bridge and roadway improvements were to be contracted separately by the non-Federal sponsor as these costs are a 100% responsibility of the non-Federal sponsor. A report providing conceptual bridge designs was prepared and is available. The preliminary bridge improvement designs used to develop the feasibility-level quantities and costs are included in the Engineering and Design Appendix. The complete report will be provided if requested

Thank you for your questions. We are able to provide additional clarifications or answering any questions you may have and look forward to making a successful transition of the project. If you have additional questions, please contact the undersigned at michael.d.pniewski@usace.army.mil or via phone at 419-726-9121.

Respectfully,

Michael D. Pniewski, P.E., P.S., PMP
Project Manager