Mississippi River Valley Division
Regional Planning and Environmental Division South

Amite River and Tributaries East of the Mississippi River, Louisiana

Appendix H-1: Hydrologic and Hydraulic Models

December 2023

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1.0 GENERAL DESCRIPTION OF WORK

The US Army Corps of Engineers (USACE), New Orleans District (MVN), Hydraulics, Hydrology, and Coastal Engineering Branch (HH&C) performed hydrologic and hydraulic modeling for the Amite River and Tributaries (AR&T) Flood Risk Management (FRM) project. The purpose of this hydrologic and hydraulic analysis was to estimate water surface elevations to design non-structural flood mitigation measures in the AR&T basin. Hydrologic and hydraulic models of the Amite River Basin were provided by the Louisiana Department of Transportation and Development (LADOTD) and modified by HH&C for use in modeling this watershed. These models were originally built by Dewberry Engineers, Inc. The Dewberry Report is referenced several times in this appendix and should be referred to for more background about the model development (Dewberry Engineers Inc., 2019 [1]). Hydrologic and hydraulic modeling was performed for the 10%, 4%, 2%, 1%, 0.5%, and 0.2% annual exceedance probability (AEP) rainfall events for existing conditions (year 2026) and future conditions (year 2076). Originally, the Tentatively Selected Plan (TSP) was a proposed dam located in Darlington, LA for a 0.01 Annual Exceedance Probability (AEP). This was changed to a non-structural plan due to low benefit-cost ratio (BCR). To assess residual risk, hydraulic modeling was also performed for coastal storm events by setting downstream boundary conditions in Lake Maurepas equal to storm surge elevations calculated by ADCIRC modeling for the same annual exceedance probabilities. The coastal models were run with negligible rainfall to isolate the effects of storm surge. The maximum water surface elevation (WSE) was calculated for all rainfall and coastal only model runs. In addition to the rainfall and coastal only model results, HH&C provided a predominant water surface elevation for each AEP event for both existing and future conditions. To determine the predominant WSE for each respective AEP, the rainfall and coastal modeling results were calculated in ArcGIS Pro, and the higher value WSE at each raster cell from the two models became the output raster. The WSE raster files were provided to the Project Delivery Team (PDT) for use in economic, environmental, and engineering analyses. The horizontal and vertical datums for all georeferenced files in this study are the NAD 1983 and NAVD 1988 (Geoid 12B) datums respectively.

2.0 SUMMARY OF PREVIOUS WORK

The Amite Rivers & Tributaries study was funded by the Bipartisan Budget Act of 2018, H. R. 1892—13, Title IV, Corps Of Engineers—Civil, Department Of The Army, Investigations, where funds are being made available for the expenses related to the completion, or initiation and completion, of flood and storm damage reduction, including shore protection studies, which are currently authorized or which are authorized after the date of enactment of this act, to reduce risk from future floods and hurricanes.

The hydrologic and hydraulic models used in this study were provided by the Louisiana Department of Transportation and Development (LA DOTD). They contracted Dewberry Engineers Inc. (Dewberry) for this project to develop the suite of modeling tools, referred to as the Amite River Basin Numerical Model (ARBNM), to simulate hydrology and hydraulics within the Amite River Basin (ARB), and to quantify the potential consequences of floods simulated with the tools. Forte & Tablada, Inc. and FTN Associates, Ltd supported Dewberry on this project. Forte & Tablada, Inc. provided survey services, and FTN Associates, Ltd provided independent quality control, stakeholder engagement and hydraulic modeling support.

The ARBNM suite was utilized by USACE to evaluate the following alternatives: Future Without Project (FWOP), Baseline, Darlington Dam, Lily Bayou, Bluff Creek, and Darlington Creek Dry Detention Ponds (Alternative 8A), Sandy Creek Dry Detention Pond (Alternative 8C), Spanish Lake Pump Station and Gate Operation, Highway 22, Port Vincent Bridge, Amite River Re-meandering, and Highway 16. Of these, five (5) alternatives were selected for modeling: FWOP, Baseline, Alternative 8A, Alternative 8C, and Darlington Dam. The descriptions for all alternatives and the results of the 5 selected alternatives that were modeled are presented in a former draft of the appendix in Annex H-6 “Appendix G: Hydrologic and Hydraulic Models.”

During review, the Darlington Dam Alternative as the Tentatively Selected Plan (TSP) was identified to have extensive technical and policy concerns, which found the dam was constrained by site conditions that made it in-feasible as designed and potentially increased life safety risk. With removal of the Dry Dam alternative from further consideration, the next highest NED Plan and likely the only economically justified alternative is the nonstructural plan.

3.0 SOFTWARE

3.1 HEC-HMS 4.5

Version 4.5 of the Hydraulic Engineering Center’s Hydrologic Modeling System (HEC-HMS) was used to calculate rainfall runoff estimates.

3.2 HEC-RAS 5.0.7

Version 5.0.7 of the HEC’s River Analysis System (HEC-RAS) was used to calculate hydraulic routing as well as flooding due to coastal storm surge.

4.0 MODEL DEVELOPMENT

The hydrologic and hydraulic models of the Amite River Basin were provided to the MVN HH&C Branch by the LADOTD. Development, calibration, and validation of the models was done by Dewberry Engineers. Those steps are discussed in the Amite River Basin Numerical Model Project Report (Dewberry Report). This appendix includes descriptions of the changes made to the models after the Dewberry Report. Figure H-1 shows the model geometry for the HMS and RAS models.

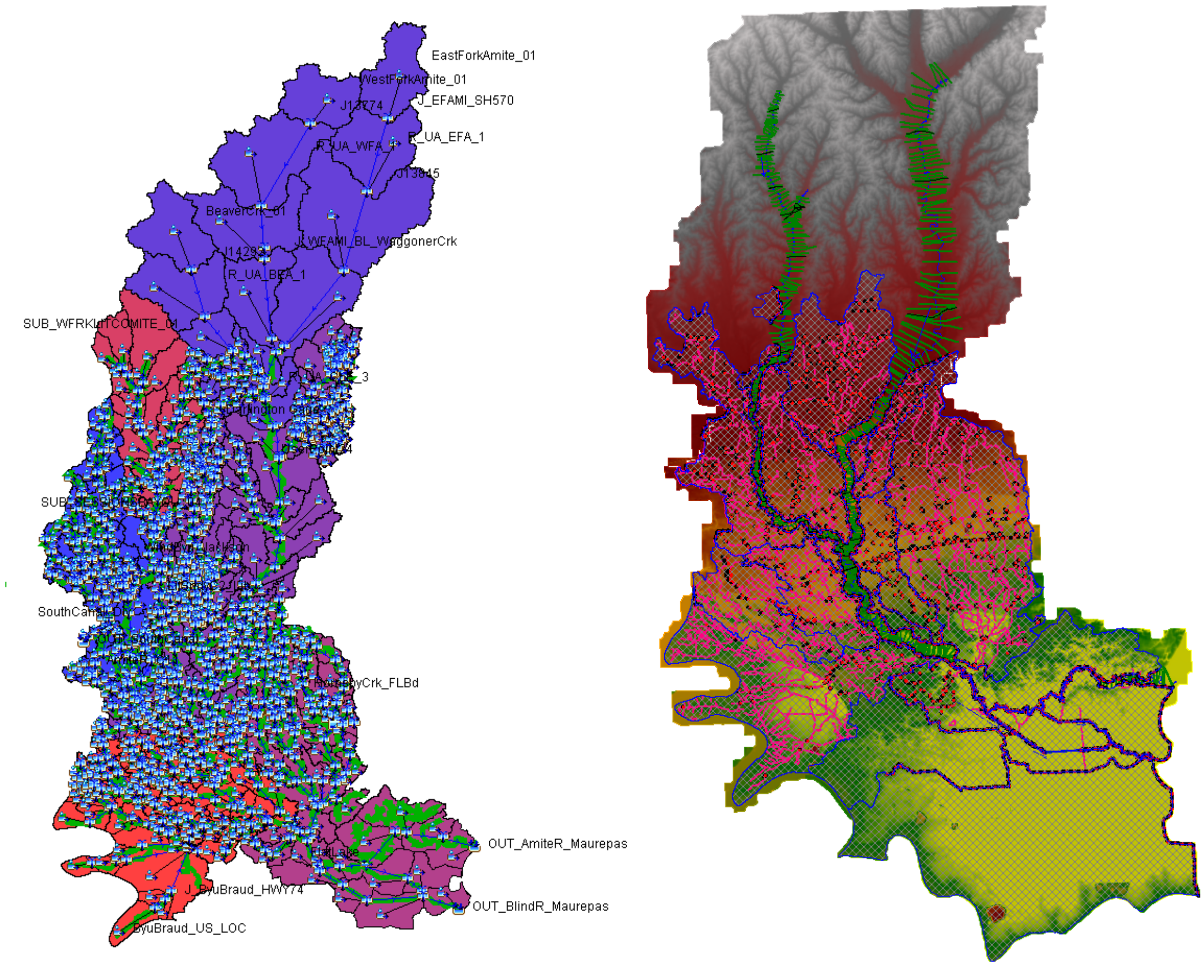


Figure H-1 HEC-HMS Model Geometry (left) and HEC-RAS Model Geometry (right)

4.1 HYDROLOGIC MODELING

4.1.1 Basin Hydrology

The Amite River Basin covers approximately 2,200 square miles in Mississippi and Louisiana. The Amite River runs for approximately 117 miles in a mostly southerly direction through Mississippi and Louisiana. The Amite River begins with an East Fork and a West Fork in southwest Mississippi. These forks are the steepest portions of the Amite River, both starting at elevations of over 450 feet and dropping to approximately 200 feet with lengths of approximately 49 miles. The forks merge just south of Mississippi's border with Louisiana. The middle portion of the Amite River runs for approximately 61 miles and drops approximately 180 feet between the confluence of the upper forks and the confluence with the Comite River. The Comite River, a right bank tributary that meets the Amite River near Denham Springs, is the Amite's largest tributary. The lower portion of the Amite River runs for approximately 54 miles and discharges into Lake Maurepas. This is the flattest portion of the Amite River, dropping from approximately 20 feet to nearly sea level. Near French Settlement, downstream of Port Vincent, the Amite River Diversion Canal splits off from the Amite River, sending a portion of the river's water southwest to the Blind River, which also flows into Lake Maurepas. Lake Maurepas is connected to Lake Pontchartrain via Pass Manchac and marshes. Lake Pontchartrain is connected to the Gulf of Mexico via The Rigolets and Chef Menteur Pass, as well as marshes. Through this connection of Lake Maurepas to the Gulf of Mexico, there is some tidal influence in Lake Maurepas. Figure H-2 shows the boundary of the Amite River Basin.

Figure H-2 Amite River Basin in Louisiana and Mississippi

4.1.2 Precipitation and Runoff

Six precipitation events were evaluated: the 10-year, 25-year, 50 -year, 100-year, 200-year, and 500-year average recurrence interval as 96-hour duration events. Precipitation hyetographs were developed for each event based on rainfall intensities from the National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 Point Precipitation Frequency Estimates. In the original storm formulation performed by Dewberry, the storms were designed as concentric elliptical isohyets, with a maximum rain depth falling at the storm center near Olive Branch, Louisiana. This storm location and orientation was adjusted during the modeling of the Darlington Dam, and these changes were maintained in the non-structural alternative modeling. The location and orientation of the isohyets are shown in figure H-3. The isohyet precipitation scaling was applied using the HMS gage weight method, where each subbasin has a scaling factor between 0 and 1 that dampens the rainfall volume. As the subbasins do not fit perfectly into the isohyets, area-weighted averages were used to estimate gage weights for each subbasin.

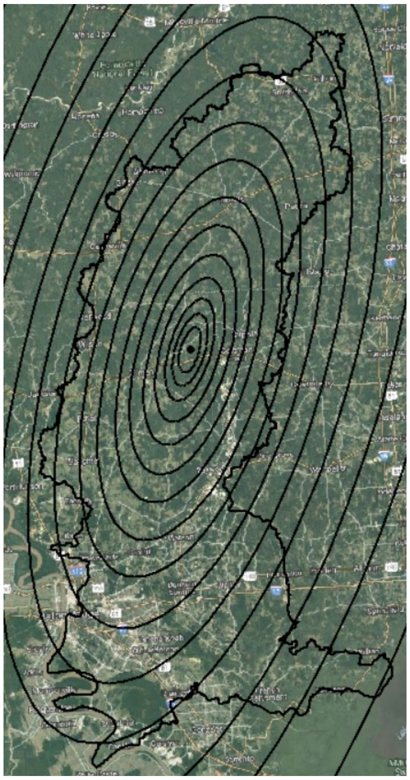


Figure H-3 Design Storm Location and Isohyets

Figure H-4 shows estimates of precipitation intensity for different durations and annual exceedance probabilities in the Amite River Basin from NOAA Atlas 14. The total depth falling on the center of the isohyet ellipse for each design storm was 11.29, 13.75, 15.72, 17.79, 20.00, and 23.11 inches respectively. When the rainfall is averaged across the gage weights and area for each isohyet, the total rainfall is equivalent to the median values provided by Atlas 14 for the respective storm intensities.

AMS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Annual exceedance probability (1/years)								
	1/2	1/5	1/10	1/25	1/50	1/100	1/200	1/500	1/1000
5-min	**0.565** (0.458-0.689)	**0.708** (0.572-0.865)	**0.819** (0.658-1.00)	**0.969** (0.751-1.22)	**1.08** (0.822-1.39)	**1.20** (0.880-1.57)	**1.32** (0.928-1.77)	**1.49** (1.00-2.04)	**1.61** (1.06-2.24)
10-min	**0.828** (0.671-1.01)	**1.04** (0.838-1.27)	**1.20** (0.963-1.47)	**1.42** (1.10-1.79)	**1.59** (1.20-2.03)	**1.76** (1.29-2.30)	**1.94** (1.36-2.59)	**2.18** (1.47-2.98)	**2.36** (1.55-3.28)
15-min	**1.01** (0.818-1.23)	**1.26** (1.02-1.55)	**1.46** (1.17-1.79)	**1.73** (1.34-2.18)	**1.94** (1.47-2.47)	**2.15** (1.57-2.80)	**2.36** (1.66-3.16)	**2.66** (1.79-3.64)	**2.88** (1.89-4.00)
30-min	**1.52** (1.23-1.86)	**1.91** (1.54-2.33)	**2.20** (1.77-2.70)	**2.61** (2.02-3.29)	**2.92** (2.21-3.73)	**3.24** (2.37-4.23)	**3.57** (2.50-4.77)	**4.01** (2.70-5.49)	**4.35** (2.85-6.04)
60-min	**2.05** (1.66-2.50)	**2.55** (2.06-3.11)	**2.94** (2.36-3.60)	**3.46** (2.69-4.37)	**3.88** (2.94-4.95)	**4.30** (3.14-5.60)	**4.72** (3.31-6.32)	**5.31** (3.57-7.27)	**5.76** (3.77-7.98)
2-hr	**2.58** (2.11-3.12)	**3.19** (2.60-3.87)	**3.67** (2.97-4.46)	**4.32** (3.38-5.40)	**4.83** (3.69-6.12)	**5.35** (3.94-6.92)	**5.88** (4.15-7.80)	**6.60** (4.48-8.97)	**7.16** (4.73-9.86)
3-hr	**2.90** (2.38-3.49)	**3.60** (2.94-4.34)	**4.14** (3.37-5.01)	**4.89** (3.85-6.09)	**5.47** (4.20-6.90)	**6.07** (4.50-7.83)	**6.69** (4.75-8.84)	**7.54** (5.14-10.2)	**8.19** (5.43-11.2)
6-hr	**3.47** (2.88-4.14)	**4.37** (3.61-5.22)	**5.09** (4.18-6.11)	**6.10** (4.85-7.56)	**6.90** (5.35-8.65)	**7.73** (5.78-9.90)	**8.60** (6.16-11.3)	**9.79** (6.74-13.2)	**10.7** (7.17-14.6)
12-hr	**4.06** (3.40-4.80)	**5.27** (4.40-6.25)	**6.26** (5.19-7.45)	**7.66** (6.16-9.46)	**8.80** (6.90-11.0)	**9.99** (7.55-12.7)	**11.3** (8.14-14.7)	**13.0** (9.03-17.4)	**14.4** (9.71-19.5)
24-hr	**4.68** (3.96-5.49)	**6.22** (5.24-7.31)	**7.48** (6.26-8.83)	**9.30** (7.56-11.4)	**10.8** (8.53-13.4)	**12.4** (9.42-15.6)	**14.0** (10.2-18.2)	**16.4** (11.5-21.8)	**18.2** (12.4-24.4)
2-day	**5.38** (4.59-6.26)	**7.15** (6.08-8.33)	**8.61** (7.27-10.1)	**10.7** (8.78-13.0)	**12.4** (9.92-15.3)	**14.2** (11.0-17.9)	**16.2** (11.9-20.8)	**18.9** (13.3-24.9)	**21.1** (14.4-28.0)
3-day	**5.86** (5.02-6.77)	**7.72** (6.60-8.95)	**9.26** (7.86-10.8)	**11.4** (9.43-13.8)	**13.2** (10.6-16.2)	**15.1** (11.7-18.9)	**17.1** (12.6-21.9)	**19.9** (14.1-26.1)	**22.1** (15.2-29.3)
4-day	**6.26** (5.39-7.21)	**8.16** (7.00-9.43)	**9.72** (8.29-11.3)	**11.9** (9.87-14.4)	**13.7** (11.1-16.7)	**15.6** (12.1-19.5)	**17.6** (13.1-22.5)	**20.4** (14.5-26.7)	**22.6** (15.6-29.9)
7-day	**7.32** (6.35-8.37)	**9.23** (7.98-10.6)	**10.8** (9.26-12.4)	**13.0** (10.8-15.5)	**14.8** (12.0-17.8)	**16.6** (13.0-20.6)	**18.6** (13.9-23.6)	**21.4** (15.3-27.8)	**23.6** (16.4-31.0)
10-day	**8.25** (7.20-9.39)	**10.2** (8.86-11.6)	**11.8** (10.2-13.5)	**14.0** (11.7-16.7)	**15.8** (12.9-19.0)	**17.7** (13.9-21.8)	**19.7** (14.8-24.9)	**22.5** (16.2-29.1)	**24.8** (17.3-32.4)
20-day	**10.9** (9.59-12.3)	**13.2** (11.6-15.0)	**15.1** (13.2-17.2)	**17.7** (14.9-20.7)	**19.7** (16.2-23.5)	**21.9** (17.3-26.6)	**24.1** (18.2-30.0)	**27.1** (19.6-34.7)	**29.5** (20.7-38.2)
30-day	**13.2** (11.7-14.8)	**16.0** (14.1-18.0)	**18.1** (15.9-20.5)	**21.1** (17.8-24.5)	**23.3** (19.2-27.5)	**25.6** (20.3-30.8)	**27.9** (21.2-34.5)	**31.0** (22.6-39.4)	**33.4** (23.6-43.1)
45-day	**16.2** (14.5-18.1)	**19.6** (17.4-22.0)	**22.2** (19.6-24.9)	**25.4** (21.6-29.2)	**27.9** (23.1-32.5)	**30.2** (24.1-36.1)	**32.6** (24.8-40.0)	**35.6** (26.0-44.9)	**37.8** (26.9-48.5)
60-day	**18.9** (16.9-21.0)	**22.9** (20.4-25.5)	**25.7** (22.8-28.8)	**29.2** (24.8-33.3)	**31.7** (26.3-36.8)	**34.1** (27.3-40.5)	**36.4** (27.8-44.4)	**39.1** (28.7-49.1)	**41.1** (29.3-52.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of annual maxima series (AMS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and annual exceedance probability) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

Figure H-4 Point Precipitation Frequency Estimates from NOAA Atlas 14 for the Amite River Basin

A 96-hour precipitation duration was used for each design storm. This duration was used since it maximized the stage in the Darlington Dam when the dam was the tentatively selected plan (TSP). After the TSP was changed to a fully non-structural plan, the 96-hour rainfall duration was kept, since the without project conditions had been validated with the 96-hour rainfall duration.

Forecasts of the Amite River Basin over the project life predict an increase in urban development. Urban development correlates with an increase in impervious area, which leads to increases in runoff. A forecast of urban growth provided by the project delivery team showed an expected 35% increase over the project life. HH&C utilized this forecast to increase the impervious area percentages by 35% for future conditions (2076), which impacts the hydrologic loss calculations. The total impervious area in the AR&T Basin models is 5.1% and 6.9% for 2026 and 2076 respectively. Annex H-5 at the end of this report provides of a summary of the infiltration values used in the HMS model.

4.1.3 HEC-HMS Model Methodology

Hydrologic modeling was performed using the HEC-HMS model provided by the LADOTD. The hydrologic model domain covers the entire Amite River Basin, from southern Mississippi to southeast Louisiana. The Modified Clark (ModClark) transform method was chosen for the subbasins, which uses a gridded method to give refined travel times to the outlet of a subbasin based on starting location in the subbasin. The ModClark method utilizes the Clark parameters of time of concentration and storage. In some of the marshy areas at the downstream end of the watershed, short times of concentration were used, in conjunction with large storage coefficients. This allowed those subbasins to drain slowly, in accordance with the standard hydrology of marshy regions. Hydrologic losses were calculated in the model using the Green and Ampt loss method. This method uses five parameters to estimate loss in a subbasin: initial water content, saturated water content, wetted suction front, hydraulic conductivity, and percentage impervious. Discussion of those parameters can be found in the Dewberry Report. The percent impervious data was updated with the 2019 USGS National Land Cover Dataset data. Figure H-5 shows the geometry of the hydrologic model.

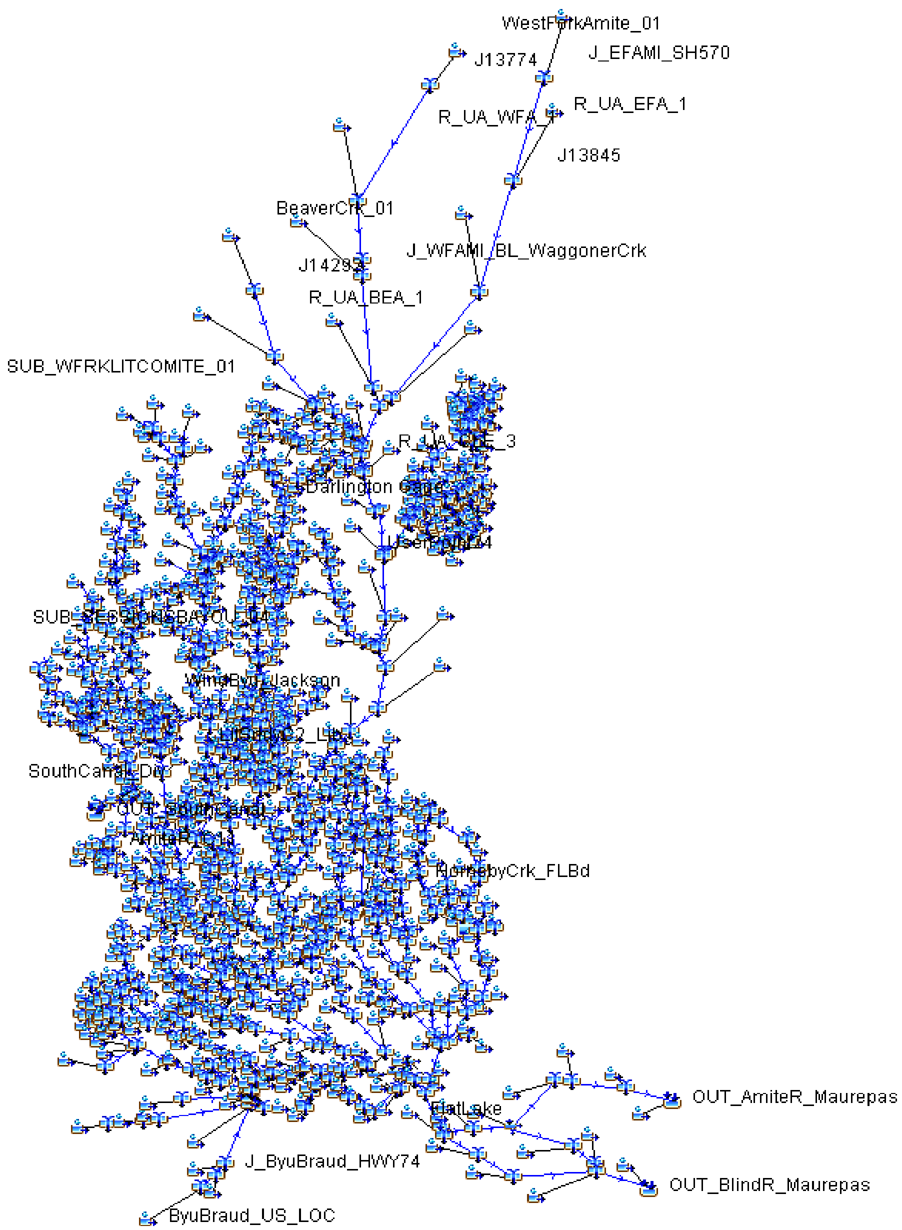


Figure H-5 Hydrologic Model Domain

Hydrologic routing calculations were performed using the Lag, Muskingum, and Modified Puls methods. All reaches that used the lag methods had lag parameters equal to zero, which instantaneously routed runoff through the respective reaches. The Muskingum method routs runoff using two parameters, X and K, that represent flow and channel characteristics. The Modified Puls method uses reach geometry, slope, and roughness to estimate flow in a reach. However, the HEC-RAS model was linked directly to the subbasin outflow at 422 riverine output locations. These 422 output locations were utilized as unsteady inflow boundary conditions in the hydraulic model. Therefore, the routing between HMS subbasins described above does not significantly impact the hydraulic modeling results. Nevertheless, the routing methods should be noted in case of future use of the model. Figure H-6 shows the sub-basins and junctions for Claycut Bayou, a tributary of the Amite River. A portion of those hydrologic nodes are used as model output locations.

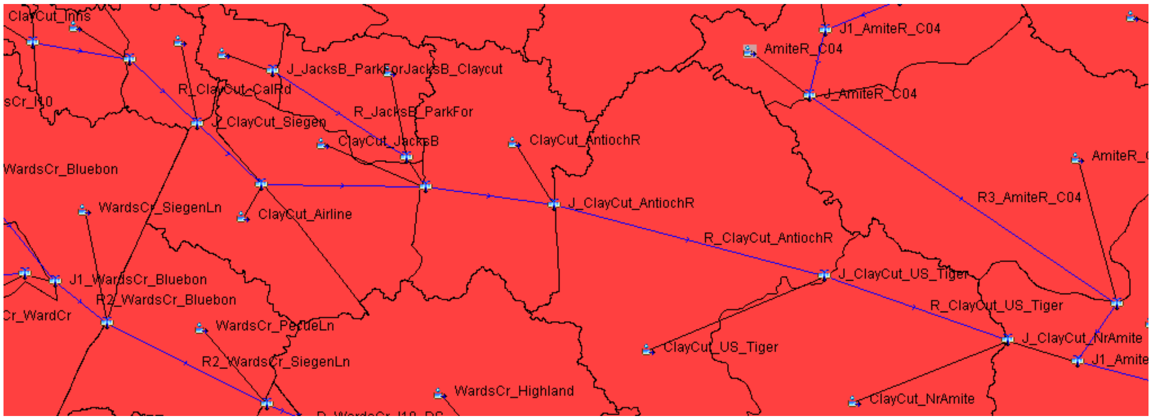


Figure H-6 Example Hydrologic Nodes for Claycut Bayou

4.1.4 HMS Calibration

The HMS model was calibrated using Stage IV historic gridded rainfall events, which is described in detail in the Dewberry report. The calibration targeted observed excess precipitation percentage to match the model to. The observed excess precipitation percentage was calculated based on observed hydrograph volumes, baseflow volumes, and basin averaged precipitation volumes for several gages in the AR&T Basin.

4.1.5 Modeling the Design Storms

Each of the 96-hour AEP precipitation events was applied to the entire Amite River Basin in the HMS model. This was done with the existing model for the baseline year (2026), and with the adjusted imperviousness percentages for the future conditions (2076). The isohyet precipitation scaling was applied using the HMS gage weight method, where each subbasin has a scaling factor between 0 and 1 that dampens the rainfall volume. As the subbasins do not fit perfectly into the isohyets, area-weighted averages were used to estimate gage weights for each subbasin.

Each HMS model run created a .dss file output of flow hydrographs at the subbasin stations in the HMS basin model. These hydrographs are used as input for the HEC-RAS model. Figure H-7 shows the 100-year precipitation hyetograph and flow output hydrograph for Sandy Creek near Mahoney Road.

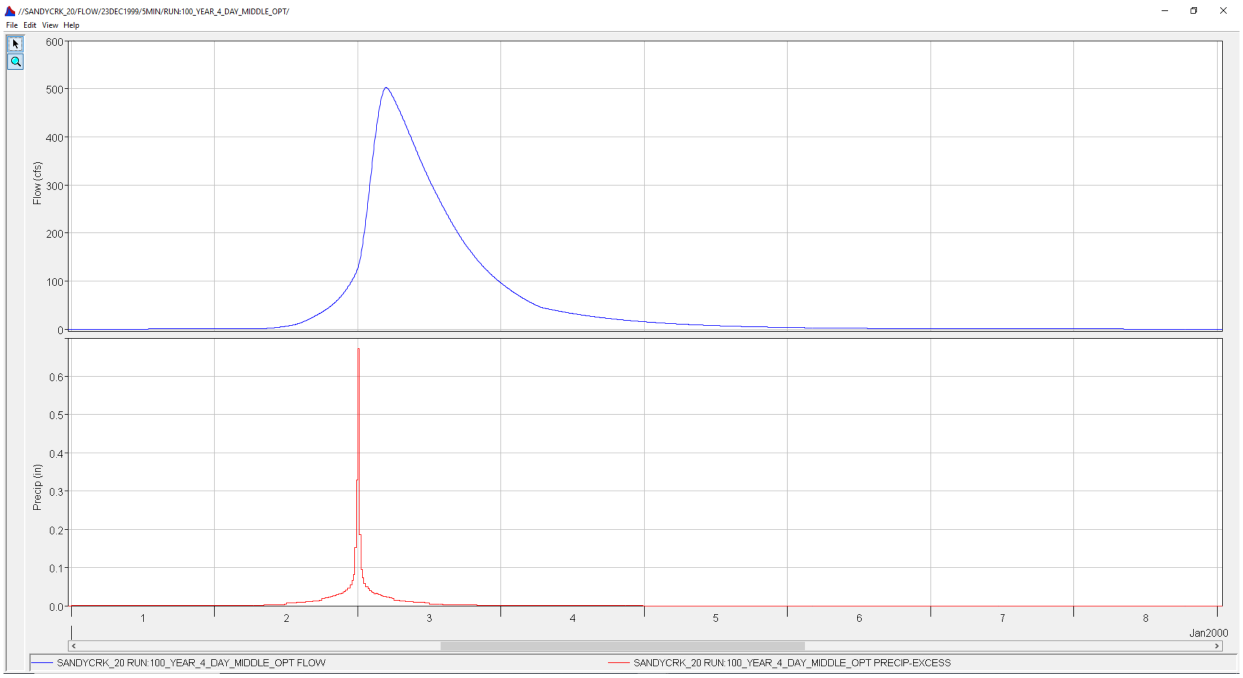


Figure H-7 Example Precipitation Hyetograph and Flow Output Hydrograph

4.2 HYDRAULIC MODELING

4.2.1 Overview

Hydraulic modeling was performed using the HEC-RAS model obtained from the LADOTD. The model is a one-dimensional/two-dimensional (1D/2D) unsteady flow hydraulic model. The model covers the Amite River Basin near the Louisiana/Mississippi border to the outlet of Amite River at Lake Maurepas. The hydraulic model does not cover the portion of the Amite River Basin that is north of the state border. The datum of the model is NAVD 1988 (Geoid 12B). Detailed discussion of model development and parameter selection can be found in the Dewberry Report.

4.2.2 Model Geometry

The model geometry is representative of the Amite River Basin existing conditions. That geometry was used for both existing conditions and future conditions. Distinguishing hydraulic features between existing and future conditions are the stage boundary conditions at Lake Maurepas, which are discussed in the Stage Boundary Conditions section. Figure H-8 shows the model geometry.

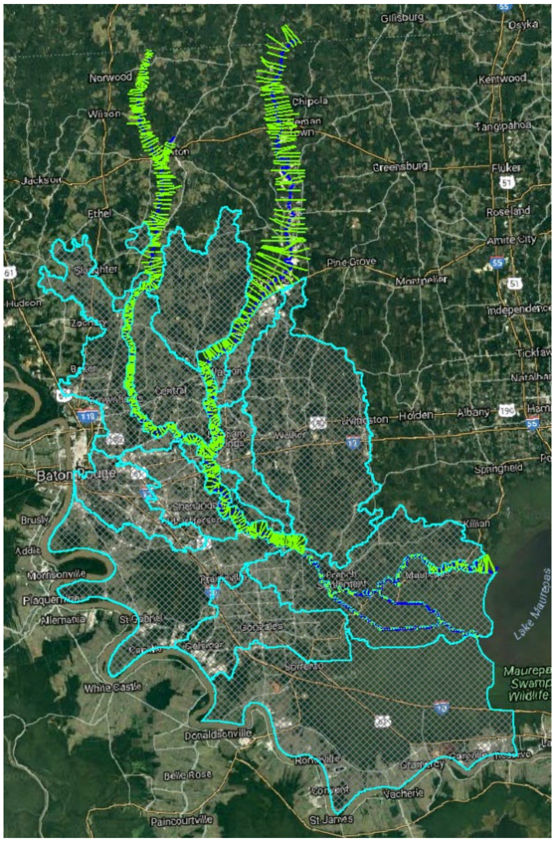


Figure H-8 Model Geometry for 2026 and 2076 Conditions

The Amite and Comite Rivers are modeled as one-dimensional reaches, while smaller tributaries and overland flow areas are modeled as two-dimensional regions. This was done to achieve finer details in the Amite and Comite Rivers, where more detailed information was known about channel cross sections and hydraulic structures, and where more detailed results were desired. Less detailed results were required in overland flow areas and in tributaries, and thus two-dimensional modeling was deemed reasonable for those regions. Two-dimensional cells ranged from areas of 100x100 to 1000x1000 square feet, with smaller cells in regions of complex topography and where higher levels of flooding detail were necessary. Also, near model features such as culverts, lateral structures, 2D area connections, and 2D inflow points, smaller cells were used to allow better model stability and accuracy.

4.2.3 Terrain and Land Cover

Topography data is used by 2D flow areas to calculate storage within and flow between 2D cells. Topography data came from a LIDAR dataset that was collected by the LADOTD in 2017. That LIDAR dataset has a spatial resolution of 2 feet. The terrain is associated with the USA Contiguous Albers Equal Area Conic USGS projection. Figure H-9 shows the LADOTD LIDAR dataset. It should be noted that the RAS terrain does not include the bathymetry for tributaries to the Amite and Comite rivers, instead setting the tributary elevation as the water surface elevation. This impacts flood levels by inducing more overbank flooding in the areas around the tributaries and reducing the amount of flow reaching the downstream sections of the model. The impact of not accounting for the full tributary channel geometries is uncertain and depends on the tributary water surface elevation at the time of the LiDAR surveys, compared to the full channel volumes. Solutions to this inaccuracy include conducting bathymetric surveys for each tributary or estimating cross sections by some other means. The error introduced by not fully resolving each tributary was deemed acceptable for this study.

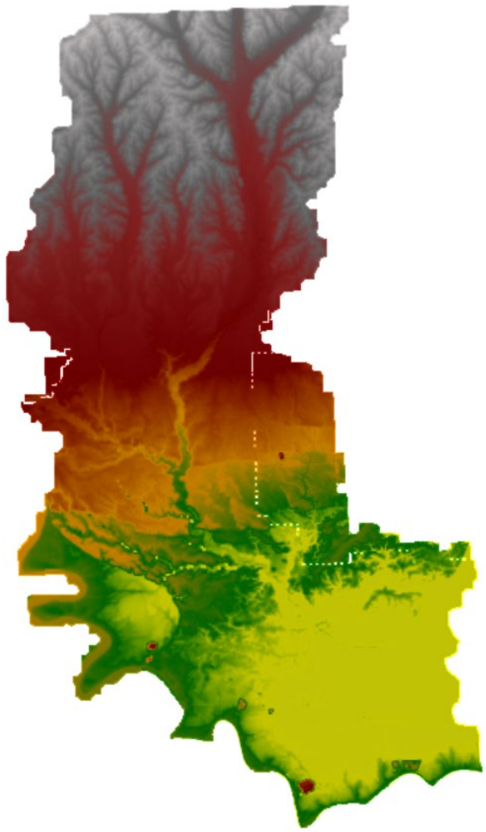


Figure H-9 LADOTD 2017 LIDAR Dataset

Land cover data is used to determine the distribution of Manning's roughness coefficients throughout the 2D flow areas. Manning's roughness coefficients are used in the calculation of flow between 2D cells. Land cover data was sourced from the 2011 National Land Cover Database. Manning's roughness coefficients were selected based on land cover type in the subbasins. Figure H-10 shows the Dewberry Report's Table 8: Summary of Manning's N Values for 2D Flow Areas.

Table 8: Summary of Manning's N Values for 2D Flow Areas

2011 NLCD Code	Description	Manning's N
11	Open Water	0.035
21	Developed, Open Space	0.09
22	Developed, Low Intensity	0.10
23	Developed, Medium Intensity	0.10
24	Developed High Intensity	0.15
31	Barren Land (Rock/Sand/Clay)	0.10
41	Deciduous Forest	0.12
42	Evergreen Forest	0.12
43	Mixed Forest	0.12
51	Shrub/Scrub	0.12
71	Grassland/Herbaceous	0.07
81	Pasture/Hay	0.09
82	Cultivated Crops	0.10
91	Woody Wetlands	0.12
95	Emergent Herbaceous Wetlands	0.12

Figure H-10 Table 8 from Dewberry Report: Summary of Manning's N Values for 2D Flow Areas

The base and future year models have the same land cover and Manning's N values. While the impervious area percentage was increased due to anticipated urbanization, anticipating specific changes in Manning's N values was deemed too uncertain to attempt since it's impossible to know which areas will become developed. Additionally, the consequence of not considering this change is uncertain, since development from low intensity to high intensity developed land cover would raise the average N value, but developing undeveloped land to low or medium intensity developments would lower the average N value.

4.2.4 Boundary Conditions

Inflow boundary conditions to the hydraulic model were imported from results of the hydrologic model. There are three types of inflow boundary conditions in this hydraulic model: 1D inflow hydrographs, lateral inflow hydrographs, and 2D inflow hydrographs. There are two types of downstream boundary conditions in this hydraulic model: 1D stage hydrographs and 2D stage hydrographs.

(1) 1D Inflow Hydrographs

The upstream boundaries of the 1D portion of the hydraulic model are the Amite River and the Comite River near the Mississippi-Louisiana border, as well as Pretty Creek approximately 3 miles upstream of the Comite River. Inflow hydrographs are applied at those locations to represent flow from the portion of their basins that are upstream of the boundaries. Figures H-11, H-12, and H-

13 show the locations of the upstream boundaries of the Amite River, Comite River, and Pretty Creek.

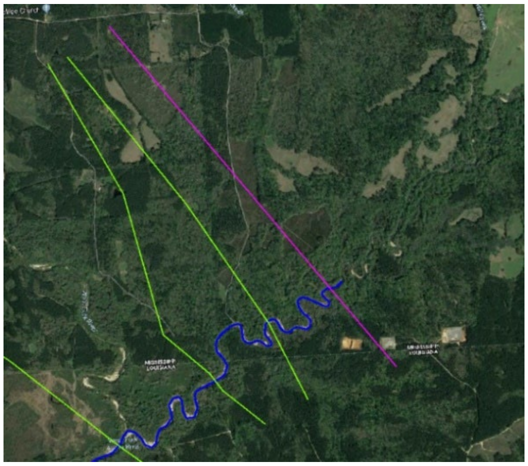


Figure H-11 Amite River Upstream Boundary Location

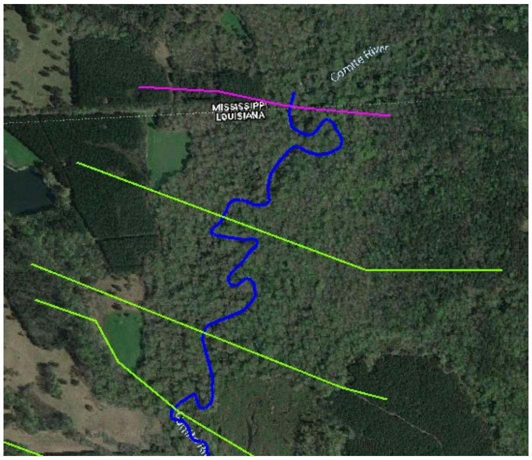


Figure H-12 Comite River Upstream Boundary Location

Figure H-13 Pretty Creek Upstream Boundary Location

(2) Lateral Inflow Hydrographs

Inflow hydrographs are applied to 1D portions of the model in the form of lateral inflow hydrographs. These hydrographs represent flow from basins that are either not included in the 2D domain or that are near intersections of the 1D and 2D domains. There are 99 lateral inflow hydrographs in the model. Figure H-14 shows the location of the lateral inflow hydrograph that represents flow from Bluff Creek into the Amite River.

Figure H-14 Lateral Inflow Location Representing Flow from Bluff Creek into the Amite River

(3) 2D Inflow Hydrographs

Inflow hydrographs are applied to the 2D portions of the model at 2D boundary condition lines. 2D boundary condition lines are located at intervals along tributaries of the Amite and Comite Rivers, as well as smaller streams that flow to those tributaries. These hydrographs represent the runoff from local rainfall, as well as rainfall from areas upstream that is not captured at another boundary condition line. There are 320 2D boundary condition lines in the model. Figure H-15 shows the location of the 2D inflow hydrograph that inputs flow to Claycut Bayou near Airline Highway.

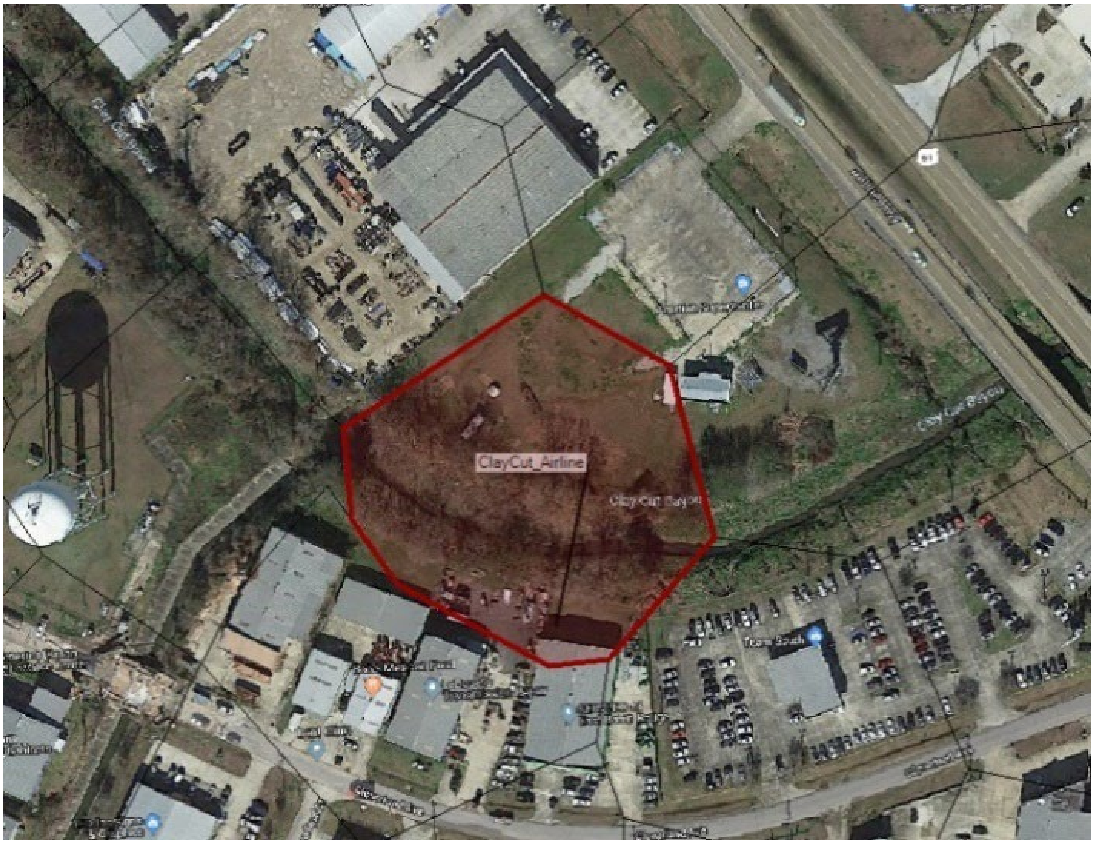


Figure H-15 2D Boundary Condition Line for Flow into Claycut Bayou near Airline Highway

(4) Stage Boundaries

The downstream boundaries of the hydraulic model are stage boundaries that represent the water surface elevation of Lake Maurepas. Stage boundaries are used where the Amite River and Blind River enter Lake Maurepas, on the lake's western end. Stage boundaries are also used where the 2D domain interacts with Lake Maurepas. A "normal high water" stage was selected as the existing conditions no storm surge boundary condition. For baseline (year 2026) model runs, this value was calculated from USACE gage 85420 Pass Manchac near Pontchatoula, which is located on the eastern end of Lake Maurepas. The stage measurements for the years 2019 and 2020 showed that the 87.5-percentile stage was approximately 2.02 feet. 0.3 feet was added to account for tidal fluctuation. 0.2 feet of sea level rise (from the intermediate sea level rise estimate from 2020 to 2026) was added to produce a stage boundary of 2.52 feet. For future conditions (2076), 2.1 feet of sea level rise (from the intermediate sea level rise estimate from 2020 to 2076) was added to the Lake Maurepas stage, resulting in a stage boundary of 4.42 feet. Figure H-16 shows the locations of the downstream stage boundaries of the 1D reaches, and figure H-17 shows the locations of the 2D stage boundary condition lines. The sea level rise calculations are described in section 6.3.

Figure H-16 Stage Boundary Locations at Lake Maurepas for Amite River (left) & Blind River (right)

Figure H-17 2D Stage Boundary Locations at Lake Maurepas

(5) Storm Surge Stage Boundaries

A set of models with higher downstream stage boundaries were run to assess the impact of storm surge on the project area. The lower portion of the Amite River Basin experiences storm surge, which propagates through the mouth of the Amite at Lake Maurepas. ADCIRC storm surge modeling was performed in 2017 for the West Shore Lake Pontchartrain (WSLP) project using a refined grid in the Lake Pontchartrain and Lake Maurepas region (West Shore Lake Pontchartrain Surge Hazard and Design Assessment, 2022 [2]). Results from that modeling for years 2020 and 2070 were used to estimate surge. The surge values located closest to the 5 stage BC locations were interpolated/extrapolated to 2026 and 2076 values, as well as adjusted for sea-level rise (SLR). The variance in ADCIRC output between the five boundary condition locations was considered negligible. To represent surge in the HEC-RAS model, a constant stage hydrograph was set at the downstream BC locations, which created backwater flooding in the lower reaches of the RAS model. The SLR-adjusted values are shown in table H-1 below. The intermediate SLR curve was used to estimate future surge values. The storm surge boundary conditions were run with a negligible rainfall timeseries, which is approximately equal to the 0.99 AEP event for the region based on the NOAA Atlas 14 precipitation estimates. The post-processing of these model outputs for economic analysis is discussed in the results section.

Table H-1 Interpolated ADCIRC Outputs for the Modeled AEP Events near the West Edge of Lake Maurepas

Return Frequency	2026 interpolated plus SLR (ft NAVD 88)	2076 interpolated plus SLR (ft NAVD 88)
0.1	5.5	7.0
0.04	6.6	8.3
0.02	7.7	9.5
0.01	8.9	10.6
0.005	10.0	11.7
0.002	11.5	13.2

4.2.5 Incorporation of Comite River Diversion, East Baton Rouge, and West Shore Lake Pontchartrain FRM Projects

Three major authorized projects in the Amite River Basin are projected to be complete or in construction prior to the baseline year of the Amite River and Tributaries FRM project (2026). Those projects are the Comite River Diversion (CRD) project, the East Baton Rouge (EBR) FRM project, and the West Shore Lake Pontchartrain project. The impacts of those projects were considered for this hydraulic modeling. The locations of the CRD and EBR projects in East Baton Rouge Parish are shown in figure H-18.

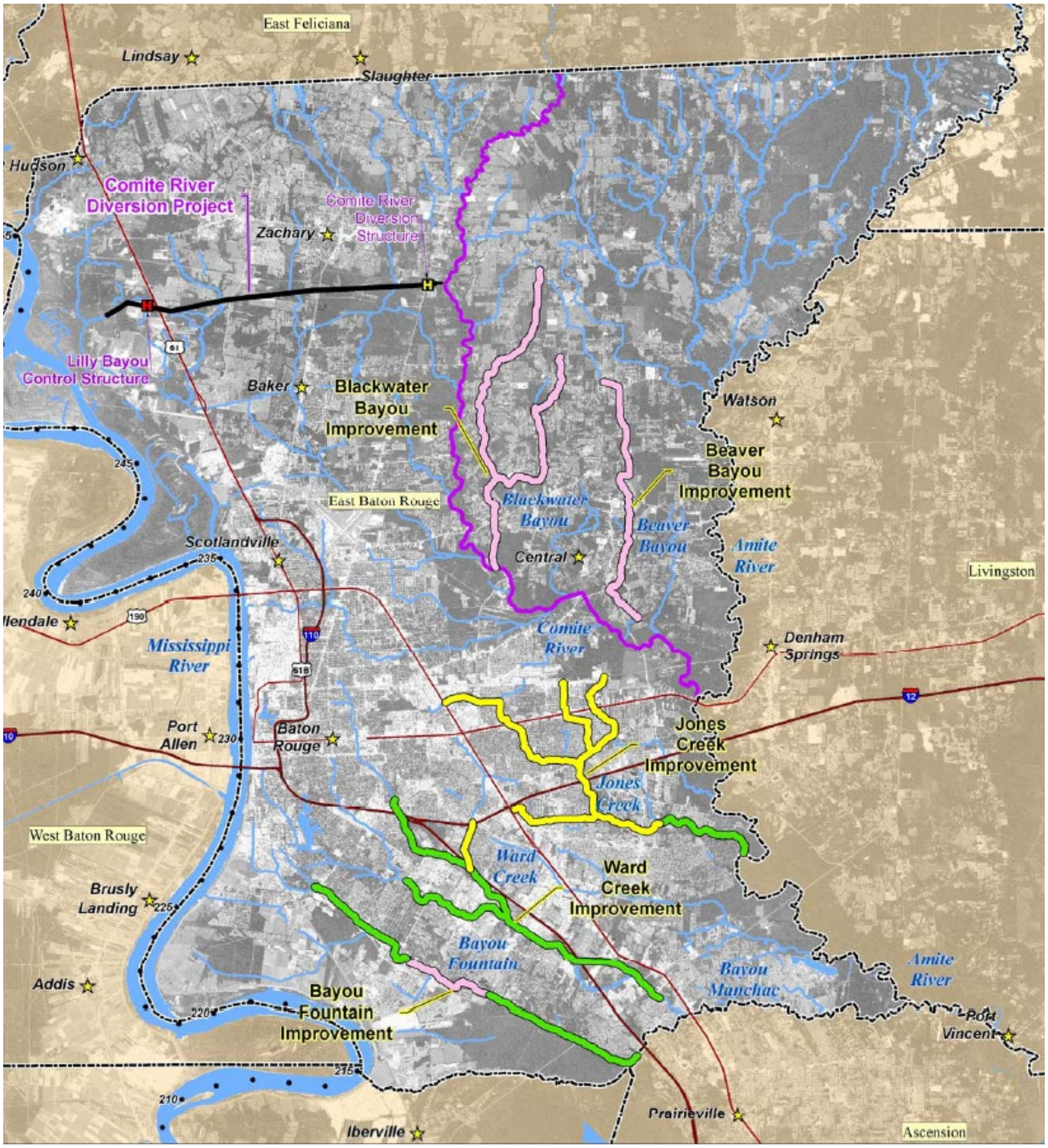


Figure H-18 Locations of CRD and EBR Projects

(1) Comite River Diversion Project

The Comite River Diversion will be located approximately 20 river miles upstream of the confluence of the Comite and Amite Rivers. Figure H-19 shows the expected location of the Comite River Diversion relative to the hydraulic model. The project will divert water from the Comite River west to the Mississippi River, between the cities of Zachary and Baker. The authorized diverted flows are based on flow rates in the Comite River immediately upstream of the diversion. To incorporate the impacts of the Comite River Diversion into this hydraulic modeling, a lateral diversion feature was implemented at the location of the diversion. The lateral diversion removes water from the Comite River based on a flow-flow rating curve. Figure H-20 shows the flow-flow rating curve. This rating curve is the only representation of the diversion in the Amite model at this time. At the time of the writing of this HH&C Appendix, construction of the Comite River Diversion project has not been completed.

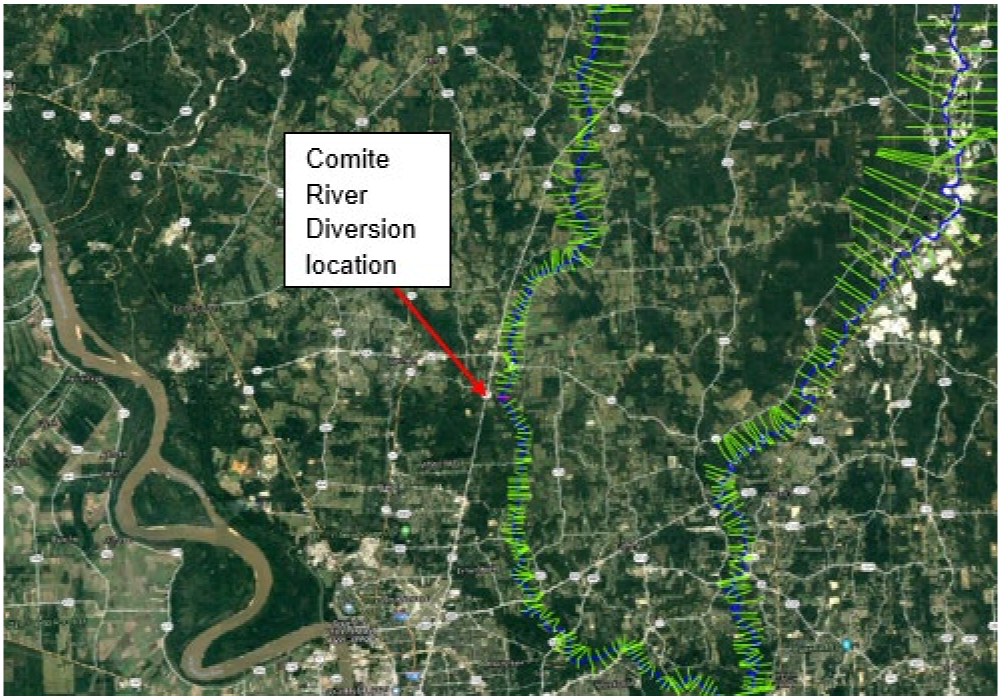


Figure H-19 Location of Incorporation of Comite River Diversion Project into Hydraulic Model

Outlet Rating Curve	
US Flow	Outlet Flow
0	0
6850	4450
10700	6150
16200	9300
22100	12700
28400	16800
37500	20800
45800	23900
50300	24900
56200	25800

Figure H-20 Authorized Flow-Flow Rating Curve for Comite River Diversion

(2) East Baton Rouge FRM Project

The authorized East Baton Rouge (EBR) FRM project includes clearing and snagging projects on five separate streams: Beaver Bayou, Blackwater Bayou, Jones Creek, Ward Creek, and Bayou Fountain.

The feasibility study for the EBR project reported flow rates that are expected at the downstream ends of the five streams with and without the authorized EBR projects in place. The EBR study prescribed low tailwater stages to represent conservative conditions and had shorter design events than the AR&T modeling. Therefore, the AR&T model could not directly incorporate EBR RAS model flow rate outputs as an inflow boundary. To estimate the impacts from the EBR project, the ratio of peak flow rates for the with versus without project was calculated at downstream locations in the EBR model. Figure H-24 shows the with and without project hydrograph at Jones Creek from the EBR model. The ratio of the peak flow rates is approximately 1.25. Therefore, the inflow hydrographs at the five EBR locations in the AR&T Basin model were multiplied by 1.25 for sensitivity testing.

Figures H-21, H-22, and H-23 show the locations where the flow multiplier for the five EBR streams were applied to the hydraulic model. Table H-2 lists the location in the AR&T hydraulic model where the flow multiplier for each EBR stream was applied. Sensitivity tests were run to see how adjusting these 5 inflow hydrographs would impact WSEs throughout the basin. These tests showed that even right next to the inflow locations, WSE increases were less than 0.02 feet for the 25-year event. Based on the outcome of the sensitivity runs, the 1.25 multiplier was not used in the main AR&T production runs. Thus, the EBR project is not represented in the AR&T model results.

Table H-2 Hydraulic Model Locations for Application of EBR Hydrographs

EBR Stream	1D River and Reach	Cross Section
Beaver Bayou	ComiteRiver Abv_AmiteR	22408.94
Blackwater Bayou	ComiteRiver Abv_AmiteR	52579.85
Jones Creek	AmiteRiver Blw_ComiteR	258117.4
EBR Stream	**2D Flow Area**	**Boundary Condition Line**
Wards Creek	BayouManchac	WardsCr_Manchac
Bayou Fountain	BayouManchac	BFount_ByuManch

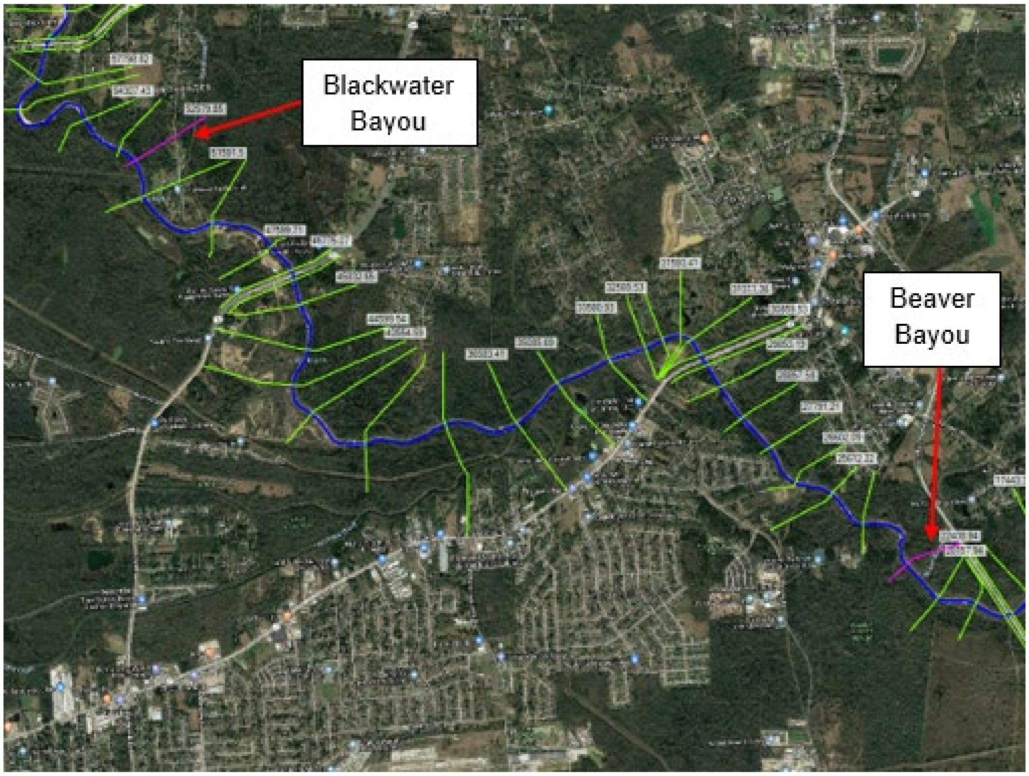


Figure H-21 Cross Sections where Blackwater Bayou and Beaver Bayou EBR Flows Were Applied

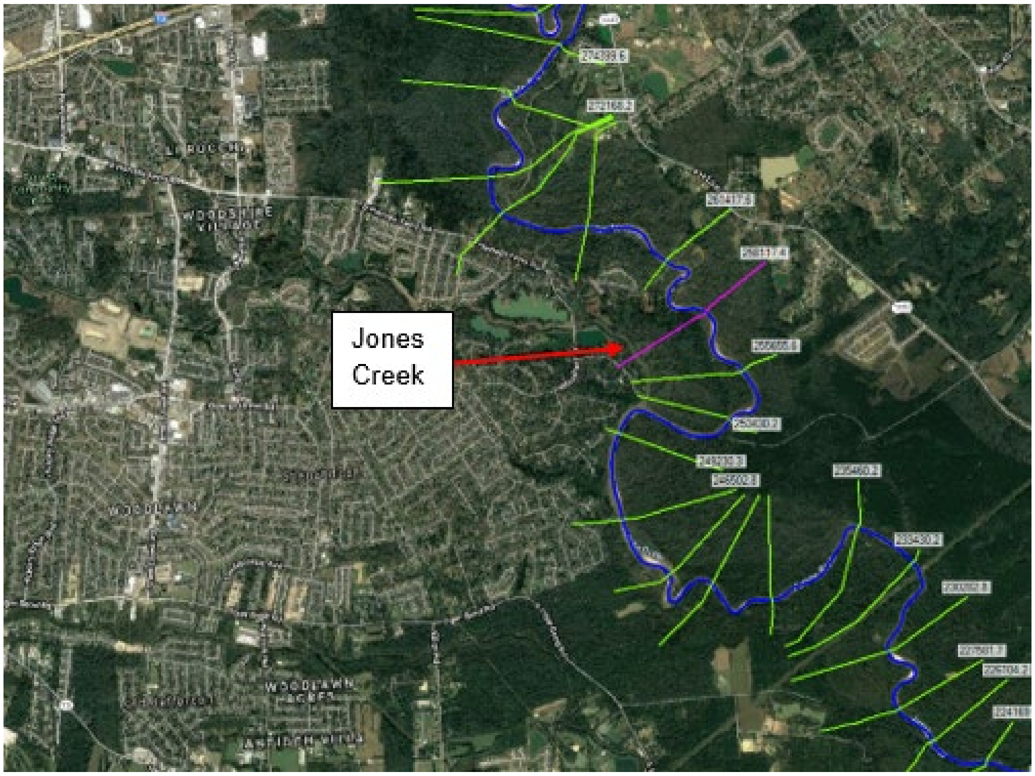


Figure H-22 Cross Section where Jones Creek EBR Flows Were Applied

Figure H-23 Cross Sections where Ward Creek and Bayou Fountain EBR Flows Were Applied

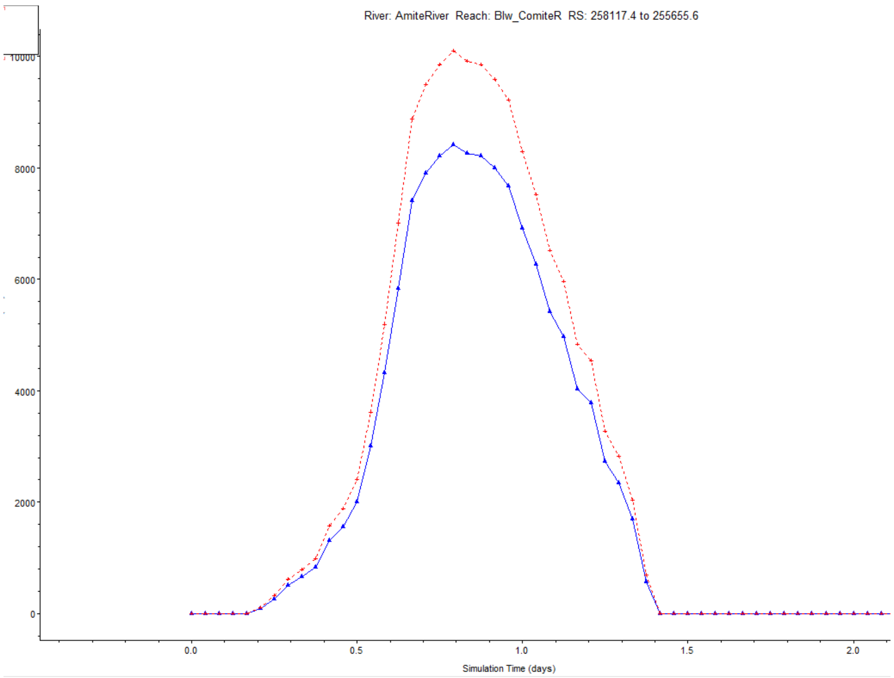


Figure H-24 25-Year EBR With Project (Red) versus Without Project (Blue) Hydrographs at Jones Creek

(3) West Shore Lake Pontchartrain FRM Project

The West Shore Lake Pontchartrain Levee Project was not included in the model geometry. The impact of the levee project on water levels in the Amite project area was determined based on ADCIRC modeling documented in the West Shore Lake Pontchartrain Surge Hazard and Design Assessment. Figure H-25 shows the modeled increase in WSE according to ADCIRC modeling comparing with and without project runs. The dark blue portion of the figure shows where the WSLP levee will protect. This figure indicates that WSE increase due to the WSLP project will be less than 0.1 feet in the AR&T project area. While there are some areas just outside of the WSLP levee that will experience higher flood levels due to the project, structures in this area are not included in the Amite non-structural plan, since eligibility for the Amite project is based on susceptibility to Amite River flooding.

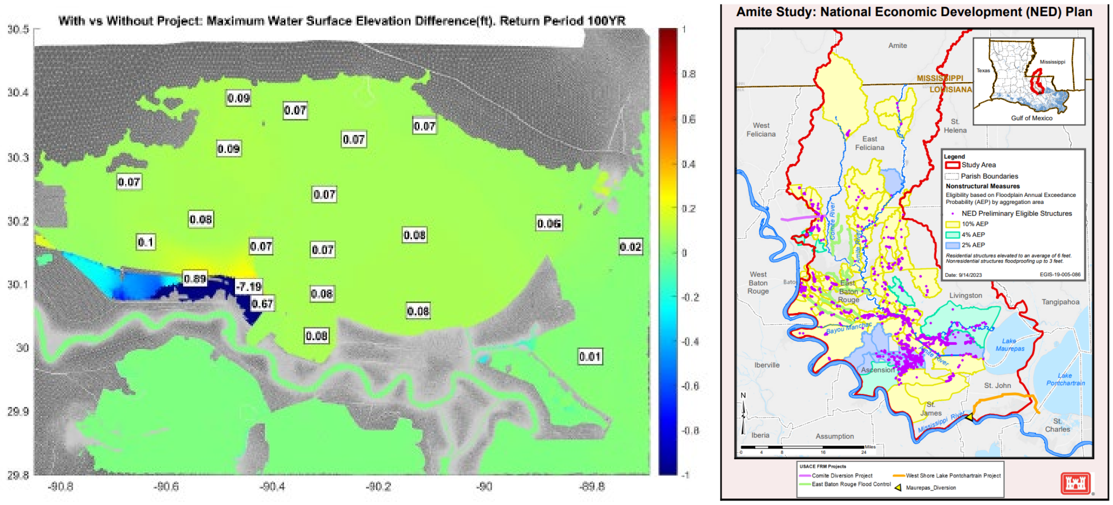


Figure H-25 West Shore Lake Pontchartrain With vs. Without Project Max WSE Difference for 100-Year Event and Amite Eligible Structure Inventory

4.2.6 Calibration

The Dewberry report describes the HEC-RAS model calibration steps. The model was calibrated using low and high flow events, with the objectives of correlating hydrograph timing, peak flows, and peak stages. The primary parameter that was adjusted during the Dewberry calibration was the Manning's roughness coefficient in the 1D channel reaches. The calibration performed by Dewberry was deemed sufficient. The PDT did not create any other historic precipitation events to validate the peak flow rates and hydrograph timing in the RAS model. This would have significantly extended the schedule and budget of the project, and the Dewberry calibration process was well documented and thorough, and used the most significant rain events on record.

Instead, MVN-EDH validated the model results for the 96-hour design storm with the updated storm center location using Bulletin 17C streamflow frequency analysis. A discharge-frequency analysis was performed at the locations of four gages on the Amite River with at least 35 years of peak annual streamflow data. That discharge-frequency analysis was performed with HEC-SSP software, using Bulletin 17C procedures. Those gages are located (from upstream to downstream) at Darlington, Magnolia, Denham Springs, and Port Vincent, which are shown as red diamonds in figure H-26. The flow frequency curves calculated at four USGS gages along the Amite River were compared to the HEC-RAS computed flows for the six AEP events. Figures H-27 through H-30 show the results of this comparison. The modeled peak flow rates are within the 90% confidence interval of the computed flow frequency curves for every event at every gage, and nearly match the expected flow rate for some of the AEP events calculated by the SSP analysis. The comparison does however show consistent overestimation of flow by the RAS model during more frequent events (0.1, 0.04 AEP), and underestimation of flow for less frequent events, with the Bulletin 17C curve showing a steeper change in flow estimates between the AEP events. One hypothesis to explain this trend is that the RAS outputs are based on rainfall frequency estimates from NOAA Atlas 14, and the Atlas 14 statistical analysis considers a larger data set of observations than the Bulletin 17C peak annual streamflow observations for each of these gauges, leading to less extreme values associated for each frequency event for the Atlas 14 analysis. Both frequency event estimating methods carry uncertainty. One way to improve the Bulletin 17C analysis would be to add synthetic streamflow data using statistical techniques or improve confidence in the RAS model using more historic storm events for calibration. As all AEP storm model outputs factor into the flood damage calculations, it is unclear what the impact of this uncertainty would be, since some AEP events are overestimated in RAS, and some AEP events are underestimated compared to Bulletin 17C. This result increases confidence that the model accurately depicts the hydraulics of the AR&T Basin.

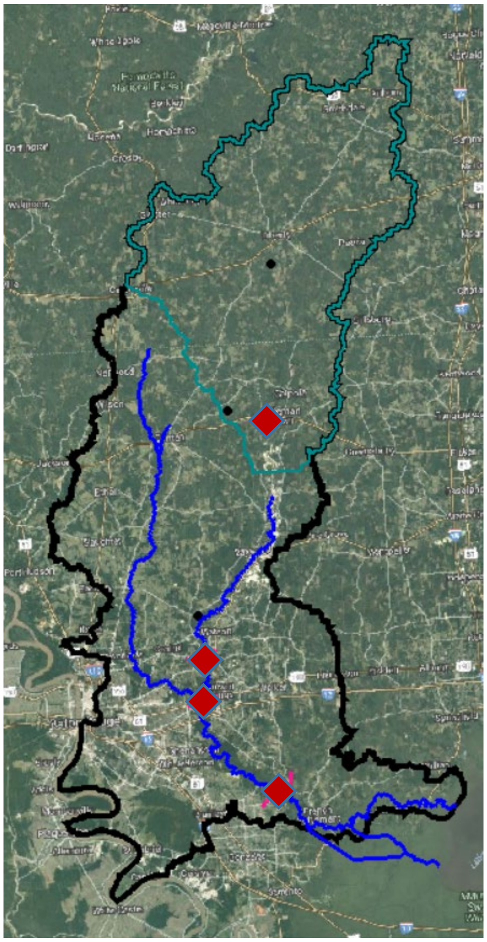


Figure H-26 USGS Gage Locations Used for Bulletin 17C Analysis (red diamonds) within AR&T Basin

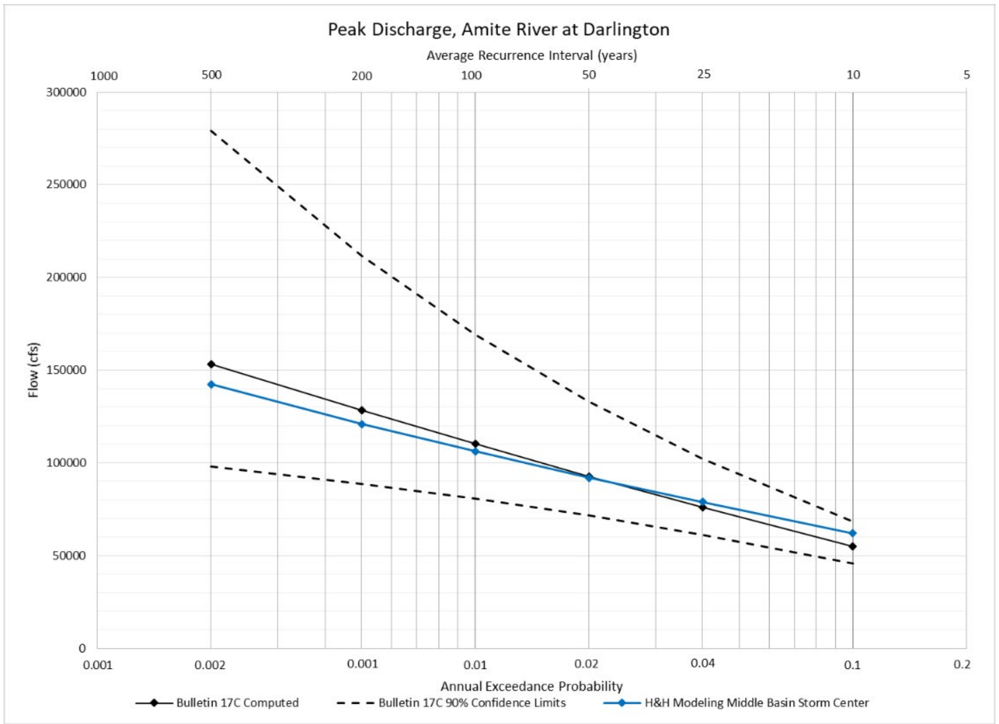


Figure H-27 Amite River at Darlington, comparison of flow-frequency analysis to H&H modeling

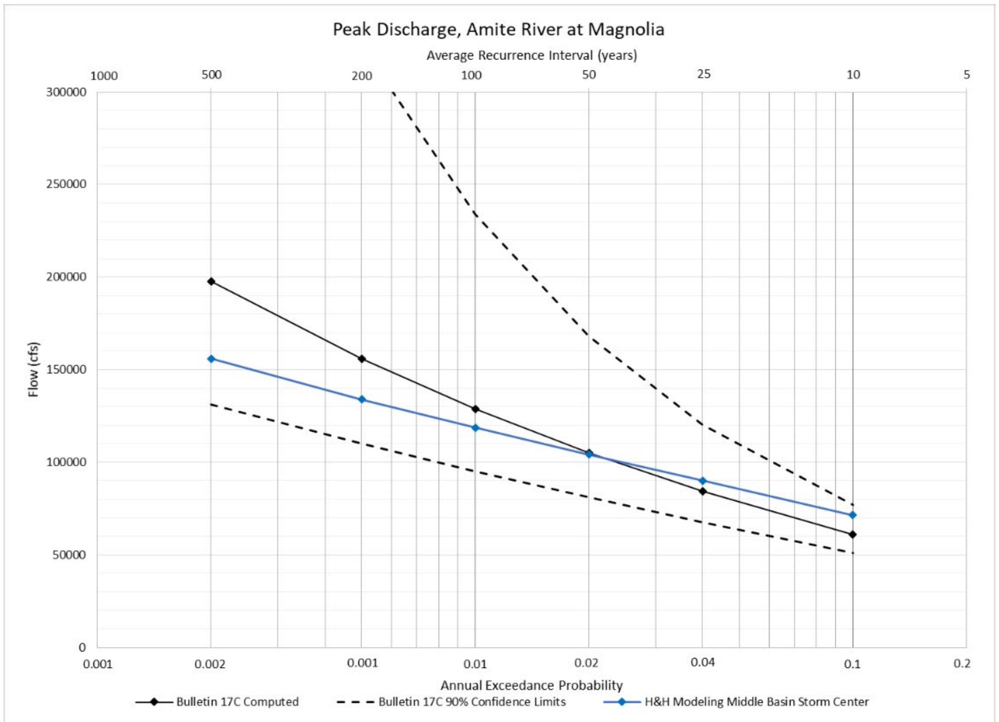


Figure H-28 Amite River at Magnolia, comparison of flow-frequency analysis to H&H modeling

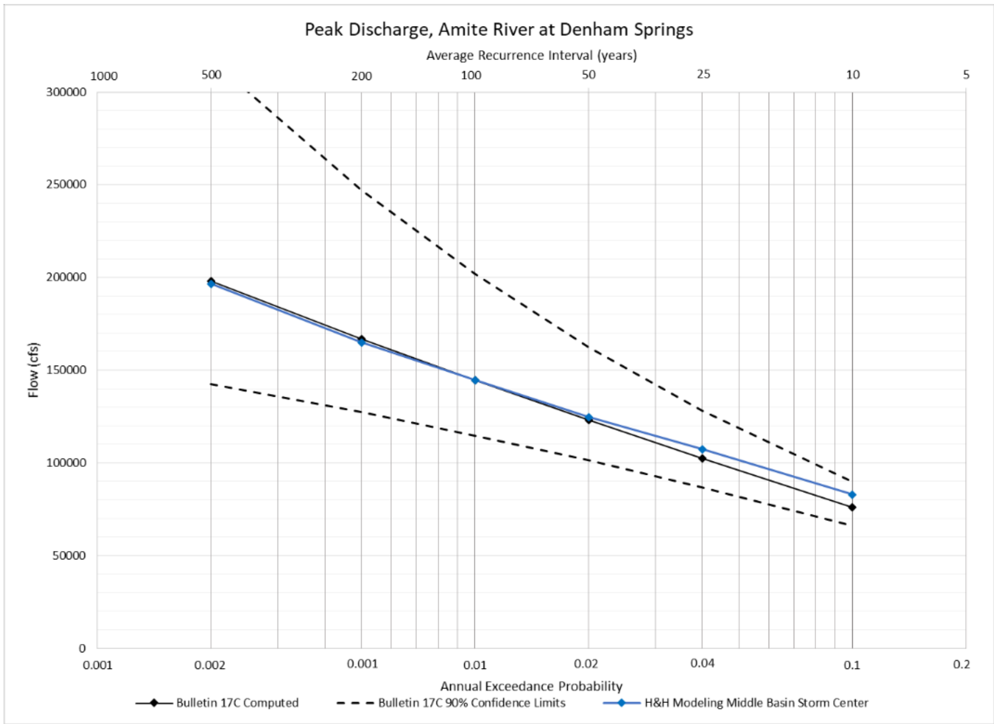


Figure H-29 Amite River at Denham Springs, comparison of flow-frequency analysis to H&H modeling

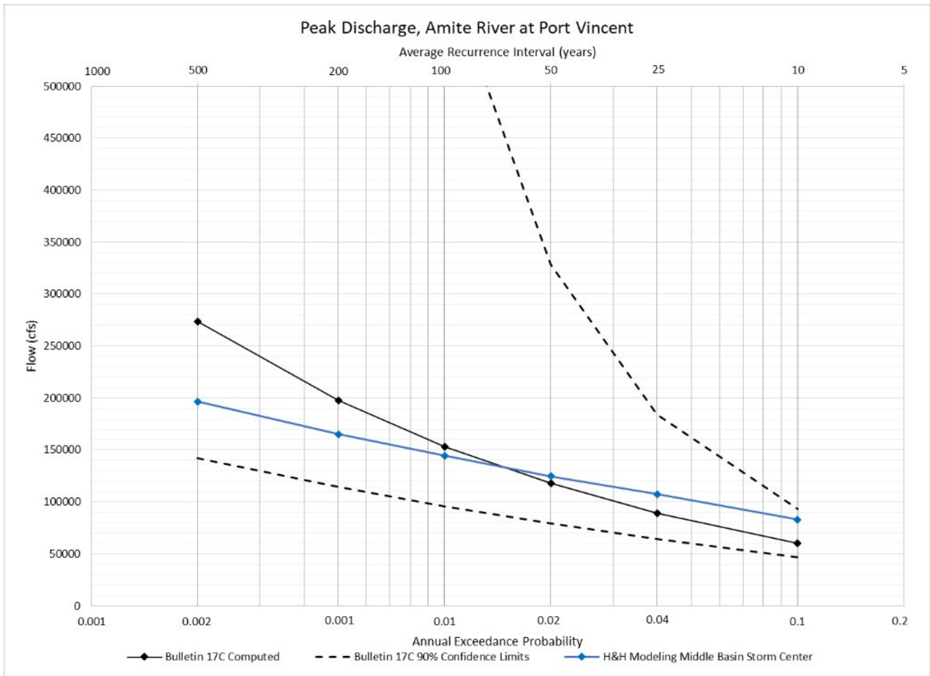


Figure H-30 Amite River at Port Vincent, comparison of flow-frequency analysis to H&H modeling

4.2.7 Compound Flooding

This study investigated the potential for compound flooding. Compound flooding is flooding that occurs due to simultaneous flood forcings, such as rainfall and storm surge. The goal of the H&H analysis is to establish the most likely maximum water surface elevation for a given recurrence interval. It is possible that the maximum water surface for a given return frequency would be caused by simultaneous river and coastal flooding, since higher tailwater stages lead to slower inland drainage. However, the rareness of simultaneous large rainfall and coastal events with basin-wide impacts may make the compound-event water surface elevation (WSE) statistically insignificant for the purpose of this study.

Compound flood analysis (CFA), as defined by EM 1110-2-1415, explores the statistical likelihood of simultaneous flooding using observed data. It starts by estimating maximum water surface profiles for fully coincident and fully independent flood events, which was done by running 3 HEC-RAS models for each recurrence interval: profile 1 (rainfall flooding, storm surge stage boundary), profile 2 (rainfall flooding, normal high water stage boundary), and profile 3 (negligible rainfall, storm surge stage boundary). Profile 4 was created by comparing profiles 2 and 3 and taking the higher of the two water surface elevations at every location in the model domain. Profile 1 represents the full coincident WSE and profile 4 represents the independent WSE. Profile 1 is referred to as the compound flood profile and profile 4 is referred to as the predominant flood profile.

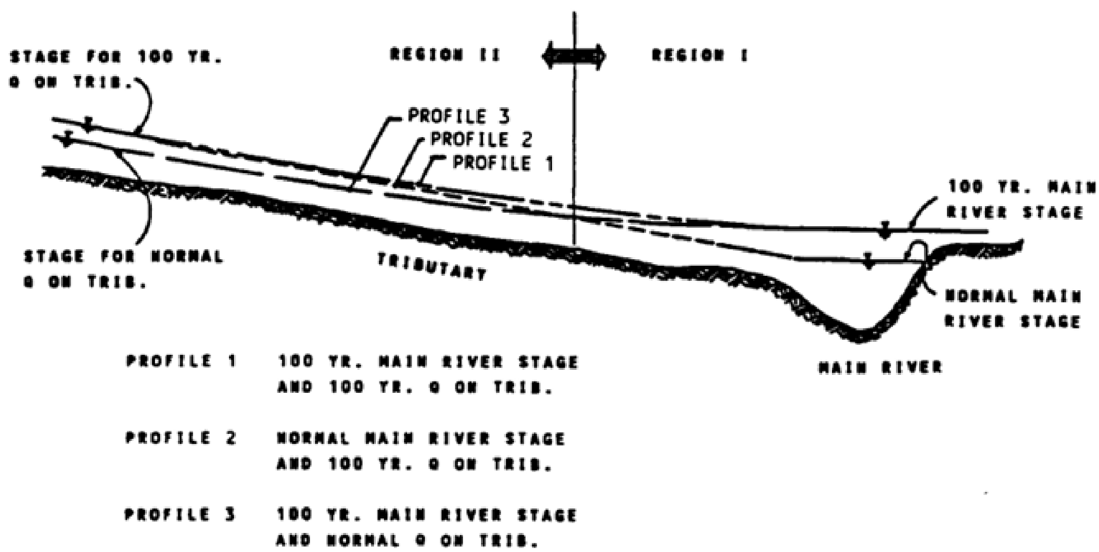


Figure H-31 Illustration of Water Surface Profiles in Coincident Frequency Analysis from EM 1110-2-1415

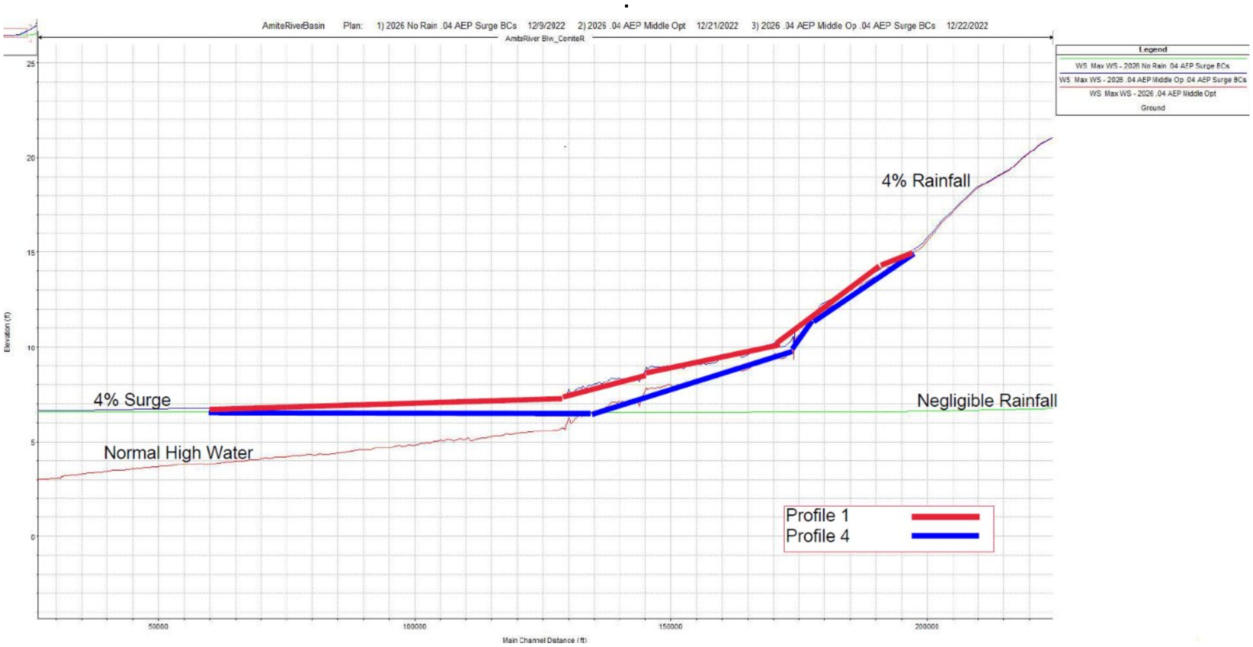


Figure H-32 RAS Profile Outputs from River Reach “Amite Below Comite”

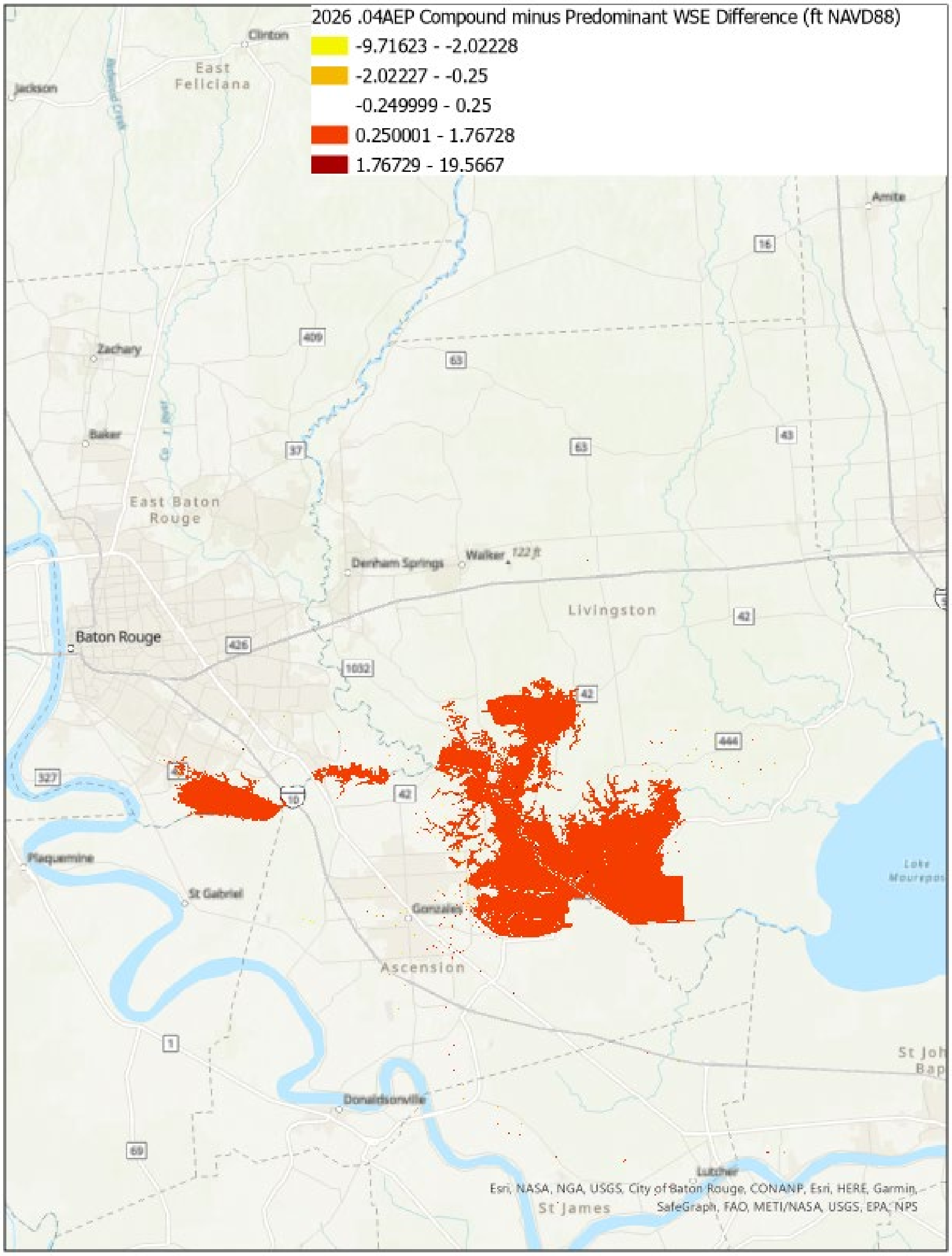


Figure H-33 Difference in maximum water surface elevations for the 2026 25-year compound and predominant events

As shown in Figure H-33, the consequences of assuming full independence versus full coincidence are felt mostly by the communities of French Settlement and Port Vincent. The difference in WSE in this area is between 0.25 and 1.75 feet. WSE changes of less than 0.25 feet (3 inches), were considered insignificant for visualization purposes. The spatial extent of the increased WSE due to full compounding is consistent for both 2026 and 2076 models, and across return frequencies. The plots for the 2076 25-year comparison, and 100-year comparisons are shown in annex H-2. The intermediate sea level rise curve was used for both models. Section 6.3 provides a more detailed discussion of considering the impacts of relative sea level rise. Damages for the 2076 25-year (0.04 AEP) and 100-year (0.01 AEP) predominant and compound events are shown in Table H-3. The terms compound and predominant are defined in the second paragraph of section 4.2.7. There is a 12 percent difference in the 0.04 AEP, and 7 percent for the 0.01 AEP.

Table H-3 Comparison of Compound and Predominant Flooding Damages

	Compound Flooding	Predominant Flooding	% Difference
2076 0.04 AEP Flood Damages	$430,000,000	$380,000,000	12%
2076 0.01 AEP Flood Damages	$1,070,000,000	$990,000,000	7%

(1) Gage Correlation

To assess the likelihood of coincident flood events, a gage correlation assessment was performed. Kim et al 2022 [reference 3] present a method to assess the correlation between high rainfall and coastal stage, using Kendall's Tau to compute the "strength of dependence" between the two variables. To do this, two data sets were assembled: the historic flows at Port Vincent with the concurrent stage at Pass Manchac, and historic stages at Pass Manchac with the concurrent flows at Port Vincent. Kendall's Tau ranges from -1 (negative correlation between variables) to 1 (positive correlation between variables), with a zero-value indicating no correlation. The tau computed between peak Port Vincent flows and Pass Manchac stages is -0.143 (n = 14) and between peak Pass Manchac stages and Port Vincent flows is 0.059 (n = 18). This analysis is summarized in Tables H-4 and H-5. Events associated with tropical storms are indicated with initials TS which stands for Tropical Storm. Those that are not associated with tropical storms are marked NTS (No Tropical Storm). Neither of the tau values are high enough to reject a hypothesis test that tau is equal to zero at a confidence level above 60%, according to a table of significant tau values provided by real-statistics.com [reference 4]. This result means that based on these gage records, the annual maximum flow rate at the Port Vincent gage does not have a strong correlation with the Pass Manchac stage, and the annual maximum stage at Pass Manchac does not have a strong correlation with the Port Vincent flow rate. Following the first few steps of Kim et al 2022, the Kendall's correlation test was also performed on the peak Manchac stage – Port Vincent flow dataset, testing the events associated with TS and non-NTS separately. Both tests produced tau values of 0.29, which was not statistically significant for the sample sizes of 10 and 8 respectively.

Table H-4 Port Vincent peak flows Kendall's Correlation with Pass Manchac stages

Date	PV Flow (cfs)	Manchac Stage (ft)	Tropical Storm
8/15/2016	199000	1.3	NTS
1/28/1990	69500	0.73	NTS
1/23/1993	48400	1.79	NTS
4/30/1997	45300	1.08	NTS
4/13/1995	44700	1.92	NTS
3/8/1992	43100	1.05	NTS
11/1/1985	42200	3.62	TS
2/24/2003	42100	0.95	NTS
3/14/2016	41700	2.59	NTS
4/4/1988	38300	2.29	NTS
1/13/2013	35200	2.05	NTS
3/17/1999	33900	0.72	NTS
2/28/1997	31800	1.33	NTS
5/18/2004	31400	2.09	NTS

n	14
C(n,2)	91
D	52
C	39
tau	-0.14286

Table H-5 Pass Manchac peak stages with Port Vincent flows

Date	Manchac Stage (ft)	PV Flow (cfs)	Tropical Storm
8/30/2012	6.54	14600	TS
8/30/2021	6.11	7650	TS
10/11/2004	4.85	8350	TS
9/4/2011	4.28	9250	TS
9/22/2020	4.04	-121	TS
10/26/2015	3.86	12800	NTS
10/10/2018	3.58	215	TS
7/13/2019	3.33	117	TS
10/8/2017	3.29	523	TS
4/18/2016	3.28	2150	NTS
2/2/2005	3.24	9770	NTS
7/1/2003	3.1	3890	TS
12/13/2009	2.72	9410	NTS
4/13/2023	2.54	3080	NTS
7/7/2010	2.54	1410	TS
11/26/2013	2.49	1320	NTS
12/20/2022	2.3	6930	NTS
5/31/2014	2.23	8990	NTS

n	18
C(n,2)	153
D	72
C	81
tau	0.058824

(2) Gage Lag Times

Table H-6 shows the lag time between peak stages at the Port Vincent and French Settlement gages in the lower Amite Basin and the peak stage at Pass Manchac during historic tropical storm events. Given the duration of the observed stage hydrographs (annex H-3), it is likely that there is influence from high downstream tailwaters on the flood levels further upstream. The two highest Port Vincent stage measurement that coincided with a tropical event occurred during Hurricane Gustav (9/6/2008, 9.72 feet) and Hurricane Hilda (10/8/1964, 9.22 feet). There are no Pass Manchac stage measurements for these events, but the storms dissipated on 9/4/2008 and 10/4/1964 respectively, so there was likely a significant lag time between the peak surge and rainfall runoff. The 3rd highest measured stage at Port Vincent that coincided with a tropical storm was during Hurricane Isaac, and Table H-6 shows 2.9 days between the peak at Manchac and the peak at Port Vincent. The time lag between the French Settlement peak stage and the Pass Manchac peak stage is only 0.6 days. One possible explanation for the difference in time lags is that French Settlement's high WSE was caused predominantly by storm surge as it is closer to Lake Maurepas, and Port Vincent's high WSE was driven by rainfall runoff.

Table H-6 Peak Stage Lag Time Analysis for Storm Events Affecting Pass Manchac

Event	Year	Pass Manchac Peak Stage (ft)	Port Vincent Lag Time, Peak Stage (days, ft)	French Settlement Lag Time, Peak Stage (days)
Hurricane Ida	2021	6.11	0.7, 6.6	0.6, 5.9
Hurricane Isaac	2012	6.54	2.9, 8.92	0.6, 6.87
Tropical Storm Lee	2011	4.28	1.0, 6.13	0.7, 5.15
Tropical Storm Beta	2020	4.04	0.7, 4.98	0.7, 4.45

The PDT made a risk-informed decision to not conduct the full compound flood analysis, as described in Kim et al 2022 and EM 1110-2-1415. The above section shows the first few steps of the analysis following Kim et al 2022 and fails to establish a statistically significant correlation in the same way that is accomplished in that paper, likely due to the smaller sample size available for the Amite Basin compared to the dataset used in the Kim et al paper. While the lower Amite Basin is susceptible to hypothetical compound flooding, a full compound flood analysis would have high uncertainty due to the sparse data, making it difficult to quantify the dependence relationship necessary to estimate design events with compound flooding accounted for. Furthermore, Table H-3 shows that the calculated damages are not highly sensitive on the level of dependence since full dependence shows increases of only 12%.

5.0 RESULTS

Hydraulic model production runs were made for six recurrence interval events for both 96-hour rainfall and coastal surge events respectively. The annual exceedance probability events that were modeled were the 0.1, 0.04, 0.02, 0.01, 0.005, and 0.002 events (10-year, 25-year, 50-year, 100-year, 200-year, and 500-year). Models were run for baseline conditions (2026) and future without project conditions (2076), with impervious percentages and downstream boundary conditions changed to represent the baseline and future years. The model runs generated water surface elevation grids. Corresponding rainfall and coastal grids for each AEP event were stitched together using ArcGIS Pro to create WSE grids that used the higher of the two events at every point, representing the predominant condition. This process was done for both the 2026 and 2076 model results. The production run modeling created 36 WSE raster files in the .tif format. The WSE raster files are associated with the USA Contiguous Albers Equal Area Conic USGS projection.

The MVN Geospatial Team conducted quality checks (QC) on the production run outputs by performing raster difference calculations on subsets of the model results. These calculations compared WSE values at every location to check that increasing event intensity, and baseline versus future condition modeling of the same event intensity, showed increasing trends. This quality check identified modeling errors that were subsequently corrected for the final set of model results. The quality checked model results were transferred to the economics team to calculate damages and benefits.

Annex H-1 contains maps of the maximum WSE results of the 3 different conditions (Rainfall, Coastal, Predominant). The maps are presented with geometrical interval classification, a type of classification scheme for classifying a range of values based on a geometric progression. In this classification scheme, class breaks are based on class intervals that have a geometrical series. This classification method is useful for visualizing data that is not distributed normally, or when the distribution is extremely skewed. For example, rainfall distribution or flooding. The geometrical intervals classification is better than quantiles for visualizing prediction surfaces, which often do not have a normal data distribution. Geometric interval works best when the data is spread over a large area and is not well distributed. In population data, for example, it is possible to show a better display and distribution of the data in a more natural way. It is possible to see the difference between the more populated areas to medium and low areas, so you can see more distribution in the area selected. This classification shows more variation on the data due to the class breaks that happen at a constant geometric increase from the interval preceding the breaks.

6.0 CLIMATE CHANGE ASSESSMENT

6.1 Climate Assessment: Hydrology Non-Stationarity

To evaluate potential impacts to project performance in the future due to climate-based changes in hydrology, the USACE Non-Stationarity Detection Tool was used. This analysis was done in compliance with ECB 2018-14. This analysis followed the directions described in the US Army Corps of Engineers Non-stationarity Detection Tool User Guide, in section 3.4, titled Monotonic Trend Analysis. The non-stationarity tests and monotonic trend analysis were conducted on the annual peak flow values at most upstream Amite River gage (at Darlington) and the most downstream (at Port Vincent).

Darlington

The non-stationarity tool detected a non-stationarity at the year 1984 at the Darlington Gage (figure H-34). Therefore, the years used in the trend analysis are 1985 – 2021. The trend analysis showed no statistically significant trend in annual peak streamflow (Figure H-35).

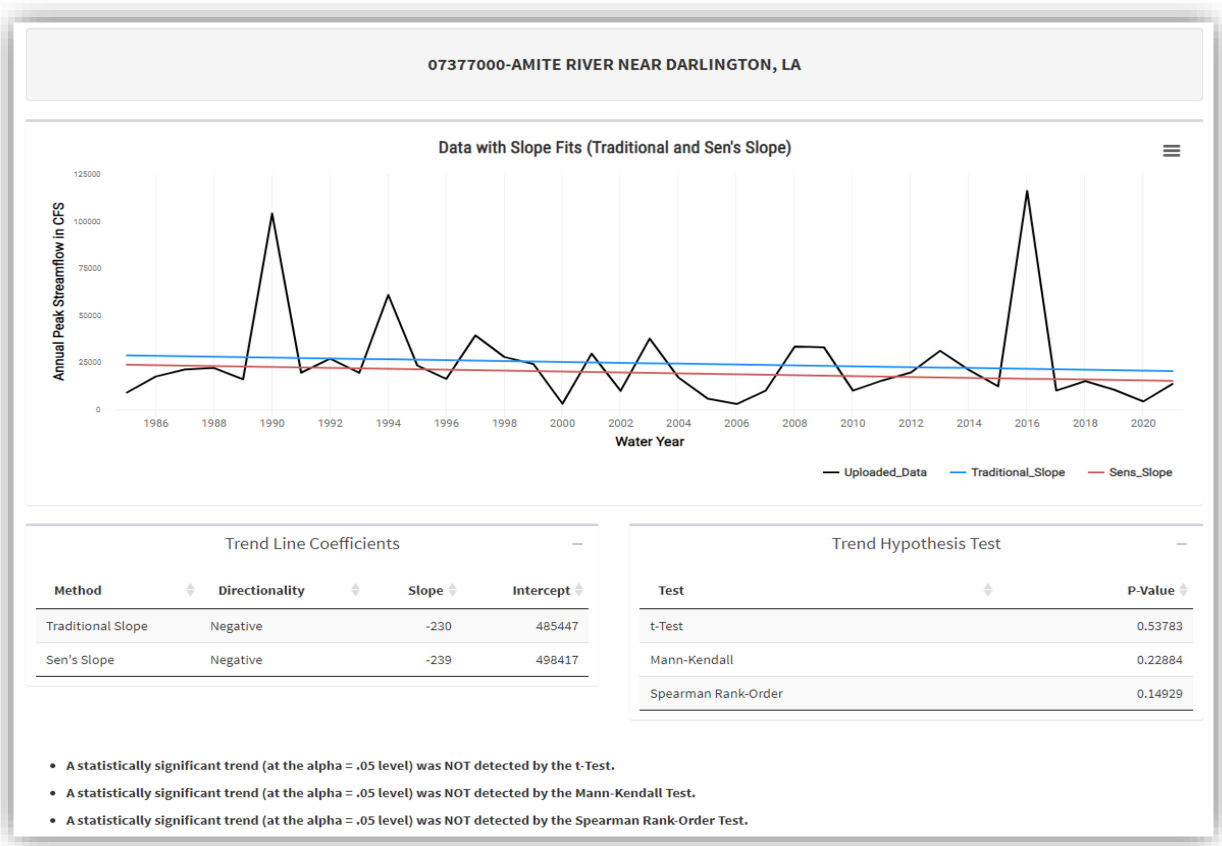


Figure H-34 Darlington Gage Non-Stationarity

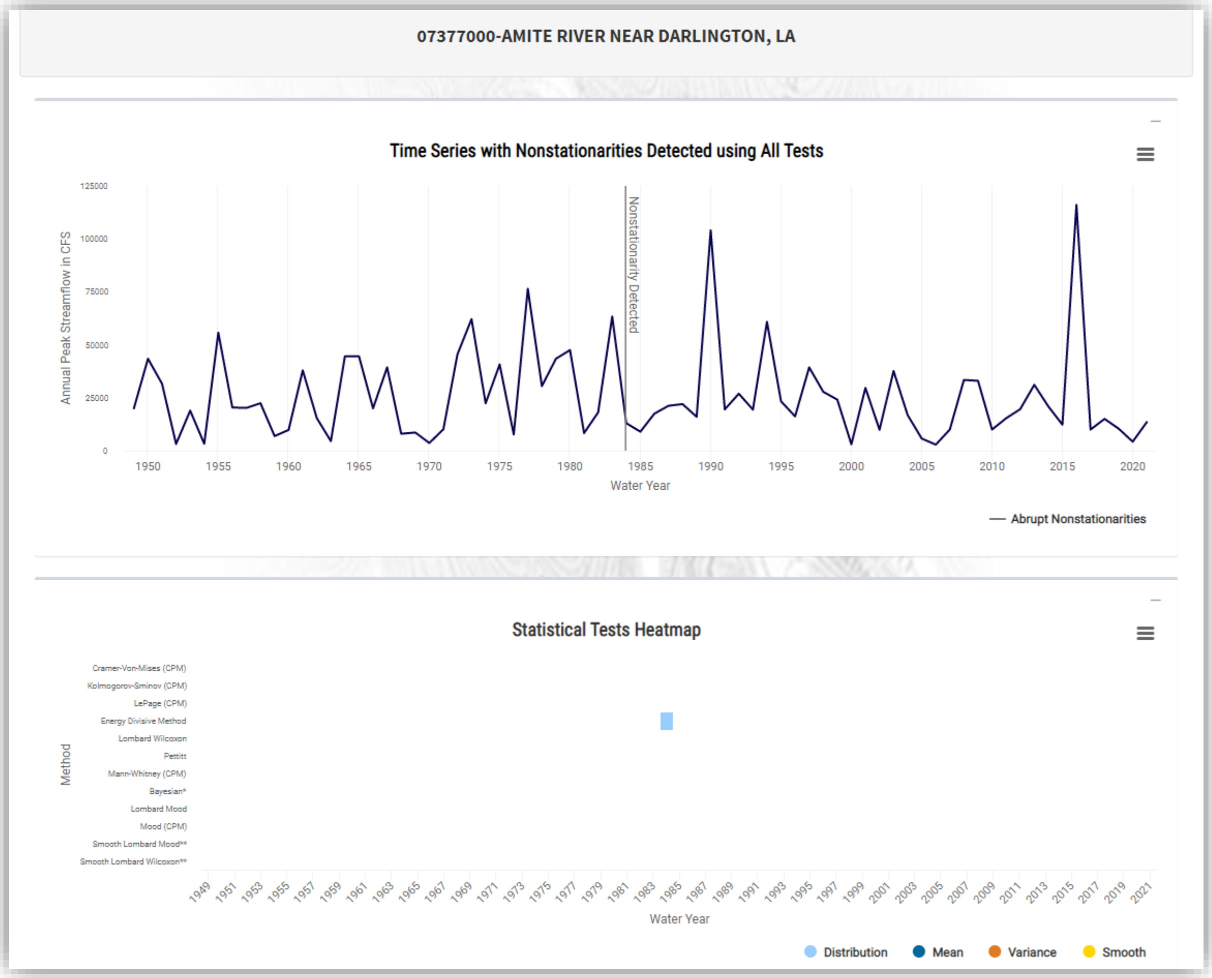
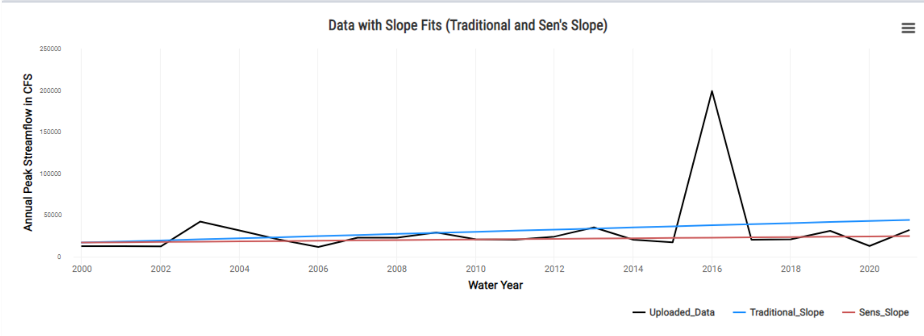


Figure H-35 Darlington Gage Trend Test

Port Vincent

The non-stationarity tool detected a non-stationarity at the year 1999 at the Port Vincent Gage (figure H-36). Therefore, the years used in the trend analysis are 2000 – 2021. The trend analysis showed no statistically significant trend in annual peak streamflow (figure H-37).

07380120-AMITE RIVER AT PORT VINCENT, LA



Trend Line Coefficients

Method	Directionality	Slope	Intercept
Traditional Slope	Positive	1301	-2584835
Sen's Slope	Positive	369	-721538

Trend Hypothesis Test

Test	P-Value
t-Test	0.32658
Mann-Kendall	0.28317
Spearman Rank-Order	0.19321

- **A statistically significant trend (at the alpha = .05 level) was NOT detected by the t-Test.**
- **A statistically significant trend (at the alpha = .05 level) was NOT detected by the Mann-Kendall Test.**
- **A statistically significant trend (at the alpha = .05 level) was NOT detected by the Spearman Rank-Order Test.**

Figure H- 36 Port Vincent Gage Non-Stationarity

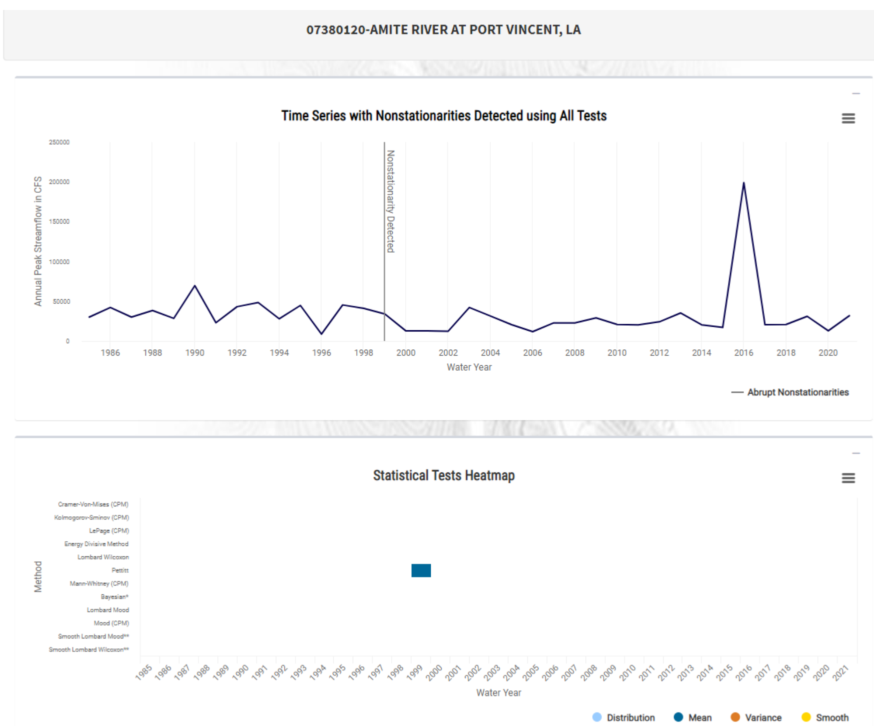


Figure H-37 Port Vincent Gage Trend Test

6.2 Climate Assessment: Climate Hydrology Assessment Tool

The Climate Hydrology Assessment Tool (CHAT) was used to estimate projected changes in the annual-maximum of mean monthly streamflow (AMMMS) and 1-day precipitation for the 4.5 W/m^2 and 8.5 W/m^2 representative concentration pathways (RCP) at Amite River stream segments 08001284 (adjacent to Baton Rouge) and 08000705 (furthest downstream). This analysis was done in compliance with ECB 2018-14. The tool projected no statistically significant trend in the AMMMS at either stream segment for the 4.5 RCP and projected statistically significant downward trends in the AMMMS for the 8.5 RCP. Figures H-38 and H-39 show the CHAT results for AMMMS.

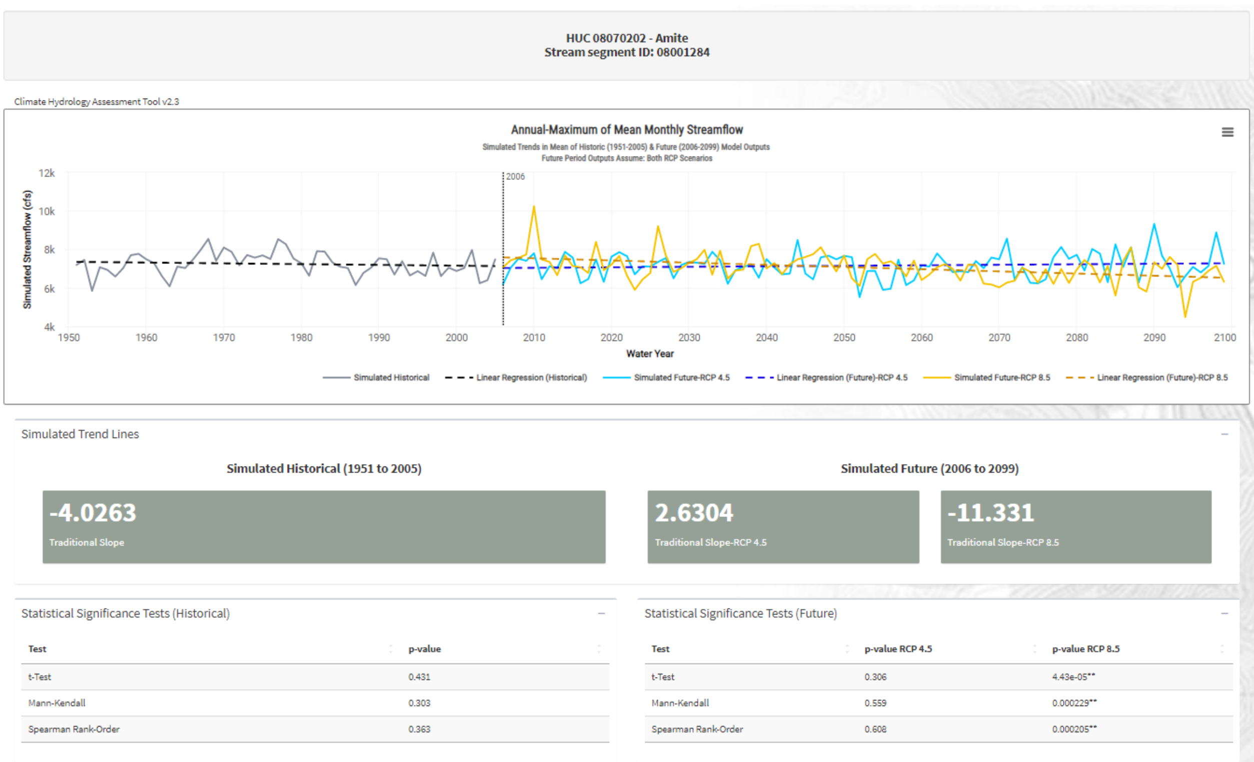
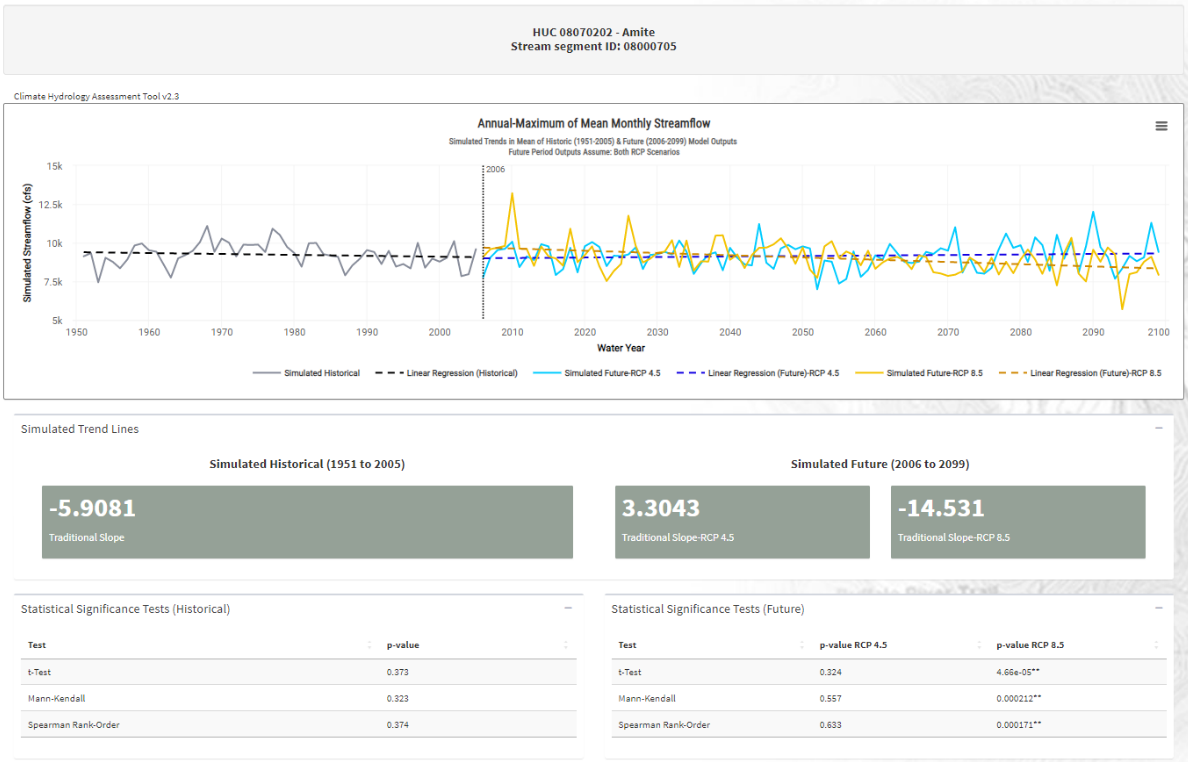


Figure H-38 Annual-maximum of mean monthly streamflow trends for stream segment 08001284 (adjacent to Baton Rouge)



Test	p-value
t-Test	0.373
Mann-Kendall	0.323
Spearman Rank-Order	0.374

Test	p-value RCP 4.5	p-value RCP 8.5
t-Test	0.324	4.66e-05**
Mann-Kendall	0.557	0.000212**
Spearman Rank-Order	0.633	0.000171**

Figure H-39 Annual-maximum of mean monthly streamflow trends for stream segment 08000705 (furthest downstream)

The CHAT tool predicted statistically significant increases in 1-day annual maximum precipitation depths for the 4.5 RCP but no statistically significant trend for the 8.5 RCP (figure H-40). This prediction was identical for both stream segments. The increase in precipitation estimated by the CHAT tool is approximately 4% between 2026 and 2076. This estimate is considered qualitative and should not be used to make quantitative engineering judgements, according to ECB 2018-14. However, a 4% increase would equate to between a 0.45-to-0.92-inch increase in total rainfall depths for the range of design storms. A sensitivity test was run for the 2076 100-year event with 4% higher rainfall totals, which showed up to two feet of additional flooding with the higher rainfall.

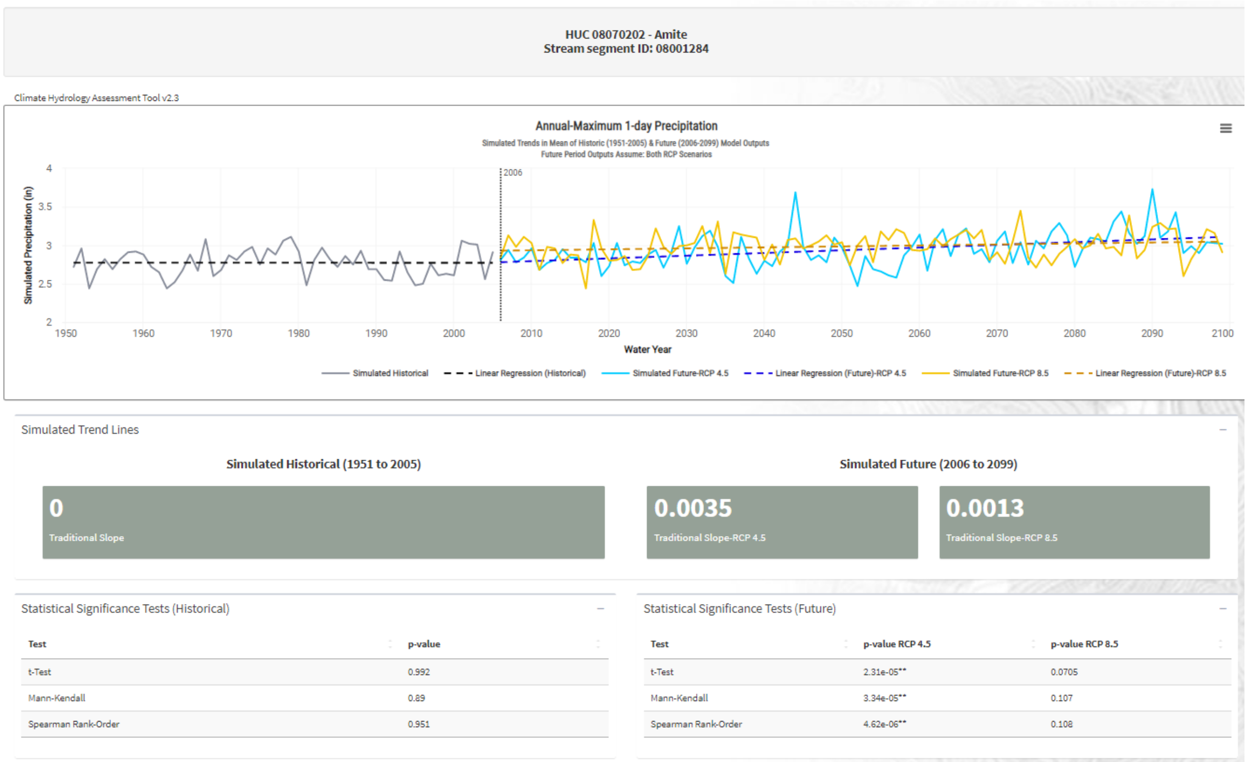


Figure H-40 CHAT-predicted precipitation trends in the Amite Basin

6.3 Climate Assessment: Sea Level Rise Analysis

Future relative sea level rise (RSLR) is expected to impact the project area due to the project area's proximity to the coastline. Higher sea levels in the future reduce the hydraulic gradient which slows the drainage of storm runoff, increasing flooding levels from the same amount of rain. SLR will also raise storm surge levels. SLR was estimated using the USACE Sea-Level Calculator for Non-NOAA Long-Term Tide Gauges (Version 2020.88). This tool was designed for coastal Louisiana and accounts for the high rates of land subsidence. ER 1100-2-8162 (2019) describes the procedure for estimating SLR using historic tide gage data and equations provided by the National Research Council. ECB 2013-27 (2013) describes how to use non-NOAA gages to estimate SLR, which is necessary for this project since there are only non-NOAA gages in the vicinity of the project area. SLR was estimated using the Lake Pontchartrain at Frenier gage record (USACE gage 85550). Between 2018 and the project baseline year (2026), the low, intermediate, and high estimates of sea level rise are 0.2 ft, 0.2 ft, and 0.4 ft, respectively. Between the project baseline year (2026) and the 50-year project life (2076), the low, intermediate, and high estimates of sea level rise are 1.37 ft, 1.90 ft, and 3.56 ft, respectively. The AR&T Project Delivery Team (PDT) determined that the intermediate rate of sea level rise should be used in this project for future conditions model runs. This was decided since the probability of which curve sea level rise will follow is highly uncertain, and the PDT determined that the middle option is the most reasonable choice for calculating the most likely future water surface. This decision is supported by the fact that the gage at the New Canal Station (8761927) has most closely tracked the intermediate SLR curve over the past decade. The TSP performance will be evaluated under all three RSLR curves to inform the residual risk of designing the TSP using the intermediate curve. The boundary conditions section describes how these curves were incorporated into the modeling effort. Figure H-41 shows the estimates of sea level rise for Lake Pontchartrain at Frenier.

USACE Curves computed using criteria in USACE EC 1165-2-212

Gauge 85550: Lake Pontchartrain at Frenier: Jan 1950 to Dec 2002 All values are in feet			
Year	USACE Low	USACE Int	USACE High
2018	0.7	0.8	1.0
2019	0.7	0.8	1.0
2020	0.8	0.8	1.1
2021	0.8	0.9	1.1
2022	0.8	0.9	1.2
2023	0.9	0.9	1.2
2024	0.9	1.0	1.3
2025	0.9	1.0	1.3
2026	0.9	1.0	1.4

USACE Curves computed using criteria in USACE EC 1165-2-212

Gauge 85550: Lake Pontchartrain at Frenier: Jan 1950 to Dec 2002 All values are in feet			
Year	USACE Low	USACE Int	USACE High
2026	0.94	1.04	1.37
2031	1.07	1.21	1.64
2036	1.21	1.38	1.93
2041	1.35	1.56	2.24
2046	1.49	1.75	2.57
2051	1.63	1.94	2.92
2056	1.76	2.13	3.28
2061	1.90	2.32	3.67
2066	2.04	2.53	4.07
2071	2.18	2.73	4.49
2076	2.31	2.94	4.93

Figure H-41 Estimated Sea Level Change from Sea-Level Calculator for Lake Pontchartrain at Frenier

Sensitivity analysis results from model runs for the 2076 100-year events with high SLR added at the downstream boundary are shown in annex H-4. These results will be transmitted to the economics team to quantify residual flood risk. EP 1100-2-1 (Procedures to Evaluate Sea Level Change) states that PDTs must estimate a “future affected area” by estimating the floodplain for 100 years from the baseline year using the high sea level rise curve. The guidance states that with this information, “if the level of risk is shown to be high, later stages of the study may improve on the quality or quantity of data in order to better capture the risks associated with project area vulnerability.” Annex H-4 also shows the floodplain for the 2126 .01 AEP predominant event.

6.4 Climate Assessment: Literature Review

6.4.1 USACE Climate Change Literature Review

In response to climate policy requirements enacted in 2011 and 2014, the USACE Institute for Water Resources conducted a literature synthesis on climate and hydrologic trends in each region of the United States. The report for the Lower Mississippi River (LMR) Region 08 covers an area that includes the Amite River and Tributaries project area [reference 5]. Its findings are summarized below. The report for region 08 focuses on 6 climate variables: mean temperature, minimum temperature, maximum temperature, average precipitation, extreme precipitation events, and mean stream-flows. For each variable, the report compiles studies on observed trends, as well as studies estimating future changes.

(1) Temperature

The report found no studies on observed temperature trends specific to the LMR region. Instead, nationwide studies were referenced showing, one of which showed a slight cooling trend in mean temperatures for region 08 (Westby et al., 2013). Other studies show that more recent observed data may have a slight increasing trend in mean temperature (Liu et al. 2012). In one study, the one-day extreme minimum temperatures showed increasing trends, whereas the one-day extreme maximum temperatures showed no statistical trend (Grundstein and Dowd, 2011). Overall, observed temperature trends are not strong in region 08. The report focused on studies that incorporated global climate models (GCMs) to estimate future temperature trends. Strong consensus exists in the literature that projected temperature will dramatically increase in the next century.

(2) Precipitation

For the observed record, one study found significant increases in winter and fall, along with decreases in spring and summer precipitation (Palecki et al., 2005). Other studies observed overall increases in annual precipitation as well as soil moisture measurements (Grundstein, 2009). The report also mentions studies that show increases in the frequency of the 20-year rainfall event (Wang and Zhang, 2008). Other studies observed the frequency of occurrence of heavy rainfall and found that most of the gages included that fell within region 08 showed no significant trend, though some stations did show statistically significant increasing trends (Villarini et al., 2013). This report also looks at the trends in droughts, identifying a decrease in drought frequency (Chen et al., 2012). Overall, the observed record shows slight precipitation increases, though the consensus is not strong. Future precipitation was estimated in many studies using GCMs. There was generally low consensus between studies on future precipitation patterns. One study concluded that there would be dryer summers in future years, whereas another projected significant springtime increases in precipitation (Liu et al., 2011).

(3) Streamflow

Several studies have looked at observed streamflow trends. The report distinguishes between Mississippi River streamflow trends and smaller tributary trends within the region, noting that the MS River stream-flows are largely driven by inflows from other regions further upstream. Nevertheless, most of the studies for both the MS River and smaller rivers such as the Amite detected increasing trends in streamflow. Many studies projected future stream-flows by combining GCMs with macro-hydrologic models. One study compared two GCMs, combined with one hydrologic model, and found that the two GCMs produced opposite results, with one increasing water yield, and the other decreasing water yield, for the same set of inputs (Thomson et atl., 2005). Another study concluded that the uncertainty associated with the hydrologic models was as great or greater than the GCMs (Hagemann et al., 2013). Most of these studies indicate a decreasing trend in stream-flows for region 08.

6.4.2 4th National Climate Assessment

The 4th National Climate Assessment (NCA) provides another overview of regional trends due to climate change. The NCA assesses multi-state regions of the United States. The Amite River and Tributaries project area is within the Southeast region of the assessment [reference 6]. The report analyzes historical trends and projects future trends for maximum temperatures, extreme precipitation, and other climate variables. The report states that under the representative concentration pathway (RCP) 8.5, which “most closely tracks with our current consumption of fossil fuels,” daytime maximum and nighttime minimum temperatures in the Southeast will increase significantly. The report also highlights the observed and projected increase in coastal flooding due to sea level rise, stating that “annual occurrences of high tide coastal flooding have increased 5- to 10- fold since the 1960s.” The NCA estimates that global sea level is “very likely to rise by… 0.5 to 1.2 feet by 2050.” The NCA states that there is “high confidence” in the increase in frequency and intensity of extreme rainfall events, using the August 2016 Baton Rouge floods as an example of the impacts of such events. The report also describes the March 2016 flooding in northern Louisiana as an example of similar impacts. Overall, the NCA is consistent with the findings of the USACE climate analysis, often providing more details on real world examples and impacts.

6.4.3 Other Climate Literature Relating to the Amite River Basin

Colten et al 2021 focus on the post-2016 efforts in the Amite River Basin to improve flood drainage, highlighting the impact on downstream communities by the growing urban area around Baton Rouge [reference 7]. Johnson et al 2015 use SWAT modeling combined with regional climate models used to forecast meteorological inputs for the SWAT modeling. The forecasted variables include total precipitation, precipitation above/below 70th percentile, air temperature, relative humidity, surface downwelling shortwave radiation, and wind speed. This study reports that temperature in the Amite Basin will rise, but that there is less certainty in the trends for precipitation and total streamflow. The study does however estimate that peak stream-flows will rise, and minimum stream-flows will fall in future scenarios [reference 8]. Cowles, 2021 investigates the sensitivity of the Dewberry HMS and RAS models to imperviousness changes, which are forecasted to rise in the future. Cowles concluded that the AR&T Basin was not particularly sensitive to changes in impervious area [reference 9].

6.5 Climate Assessment: Climate Vulnerability

Climate vulnerability was assessed to determine if the USACE's mission of flood risk management is vulnerable to climate change in the Amite River Basin. USACE's Screening-Level Climate Change Vulnerability Assessment Tool at the Watershed Scale, which assesses vulnerabilities to climate change for USACE's missions, was used for this assessment. For the Lower Mississippi-Lake Maurepas watershed (hydrologic unit code-4 (HUC-4) watershed 0807), which includes the Amite River basin, no vulnerability to Flood Risk Reduction was found. The only vulnerability found for HUC-4 watershed 0807 was for the Recreation business line for the Dry – 2085 scenario & Epoch, as shown in Figure H-42.

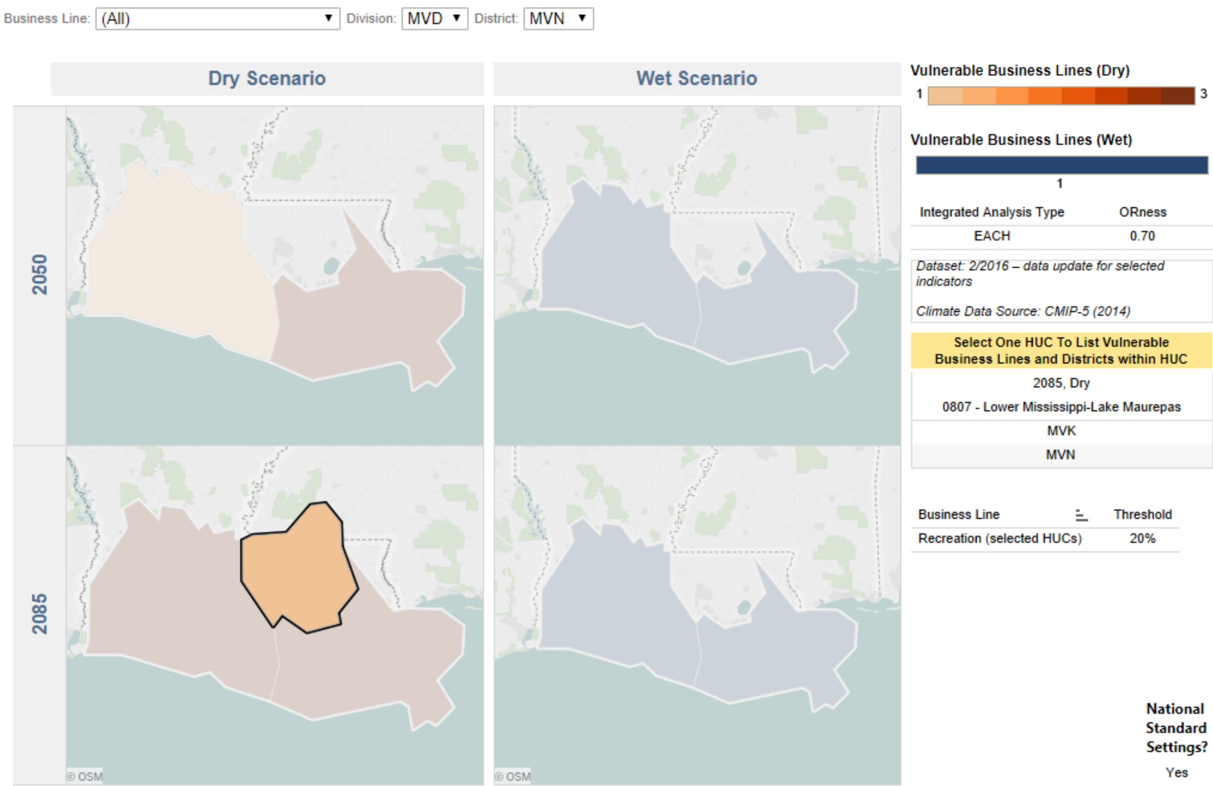


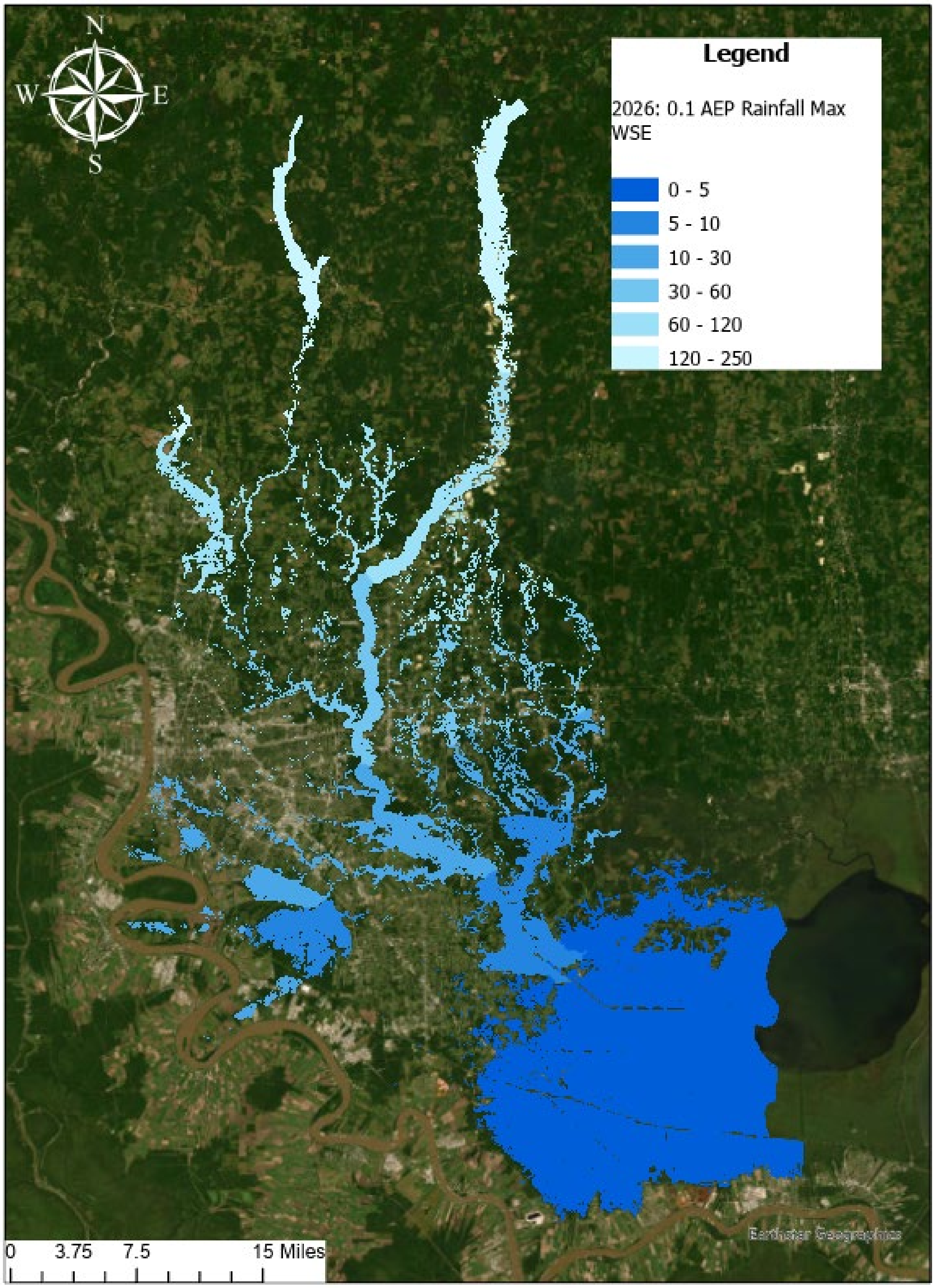
Figure H-42 Scenario Comparison Over Time map for MVN. The only vulnerability shown for HUC-4 watershed 0807 is for recreation.

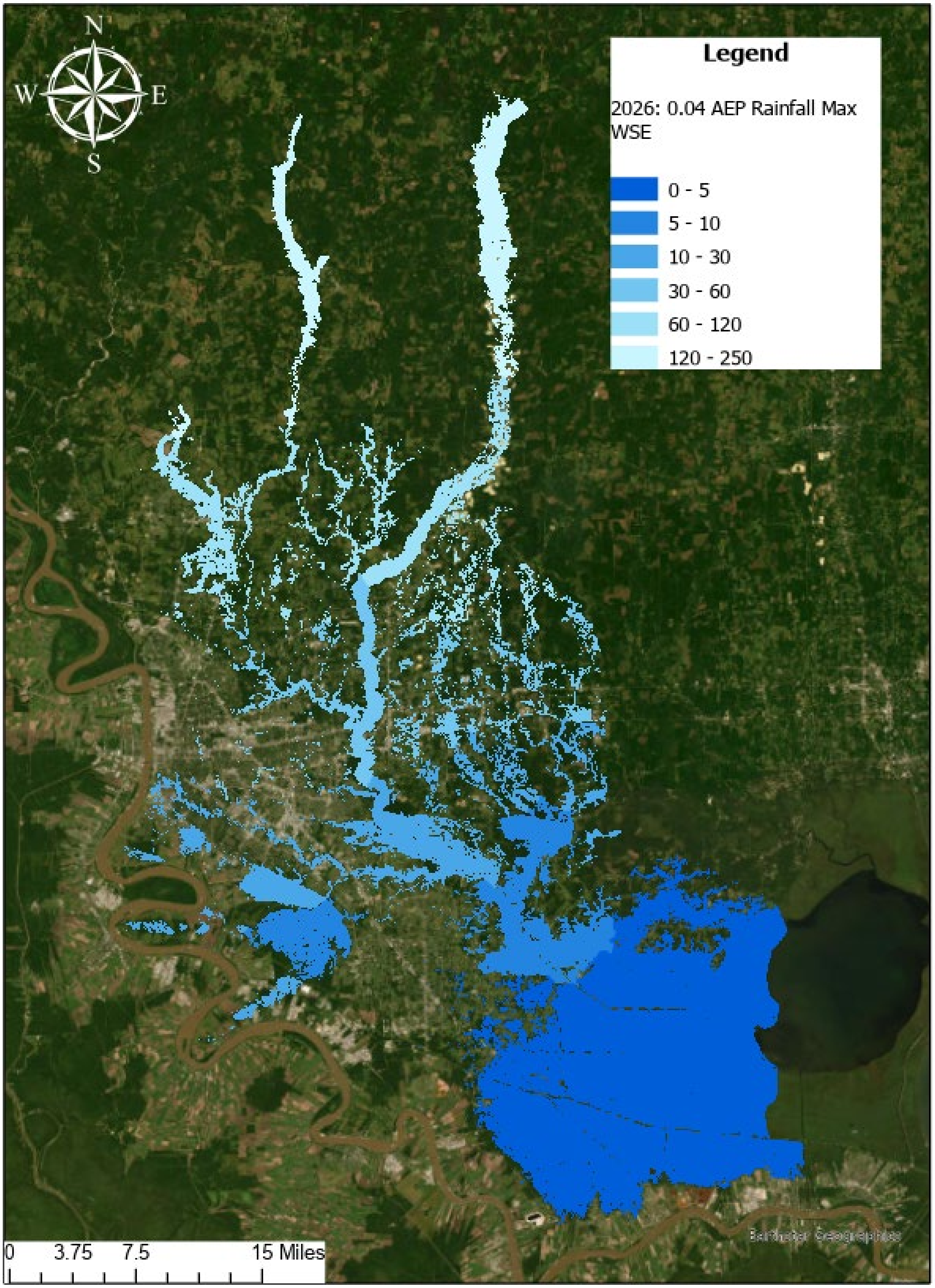
7.0 REFERENCES

1. Dewberry Engineers Inc., Louisiana Department of Transportation and Development, *Amite River Basin Numerical Model*, 2019
2. USACE-MVN, *West Shore Lake Pontchartrain Surge Hazard and Design Assessment*, 2022
3. Kim et al., *On the generation of high-resolution probabilistic design events capturing the joint occurrence of rainfall and storm surge in coastal basins*, 2022
4. Charles Zaiontz, *Kendall's Tau* Table, https://real-statistics.com/statistics-tables/kendalls-tau-table/, 2021
5. White et al, *Recent US Climate Change and Hydrology Literature Applicable to US Army Corps of Engineers Missions Lower Mississippi River Region 08*, 2015
6. Terando et al, *Impacts, Risks, and Adaptation in the United States - Fourth National Climate Assessment, Volume II - Chapter 19*, 2018 *Southeasthttps*://nca2018.globalchange.gov/chapter/19/
7. Colten, Craig E., *As Inland Becomes Coastal: Shifting Equity and Flood Risk in the Amite River Basin (USA)*, https://www.ingentaconnect.com/content/whp/ge/2021/00000014/00000003/art00005, 2021
8. Johnson et al, *Modeling Streamflow and Water Quality Sensitivity to Climate Change and Urban Development in 20 U.S. Watersheds*, https://onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12308, 2015
9. Cowles, Alexandre G.H., *EFFECTS OF HISTORICAL LAND-USE CHANGE ON SURFACE RUNOFF AND FLOODING IN THE AMITE RIVER BASIN, LOUISIANA, USA USING COUPLED 1D/2D HEC-RASHEC-HMS HYDROLOGICAL MODELING*, 2021

8.0 ANNEXES

8.1 Annex H-1: Production Run WSE Maps

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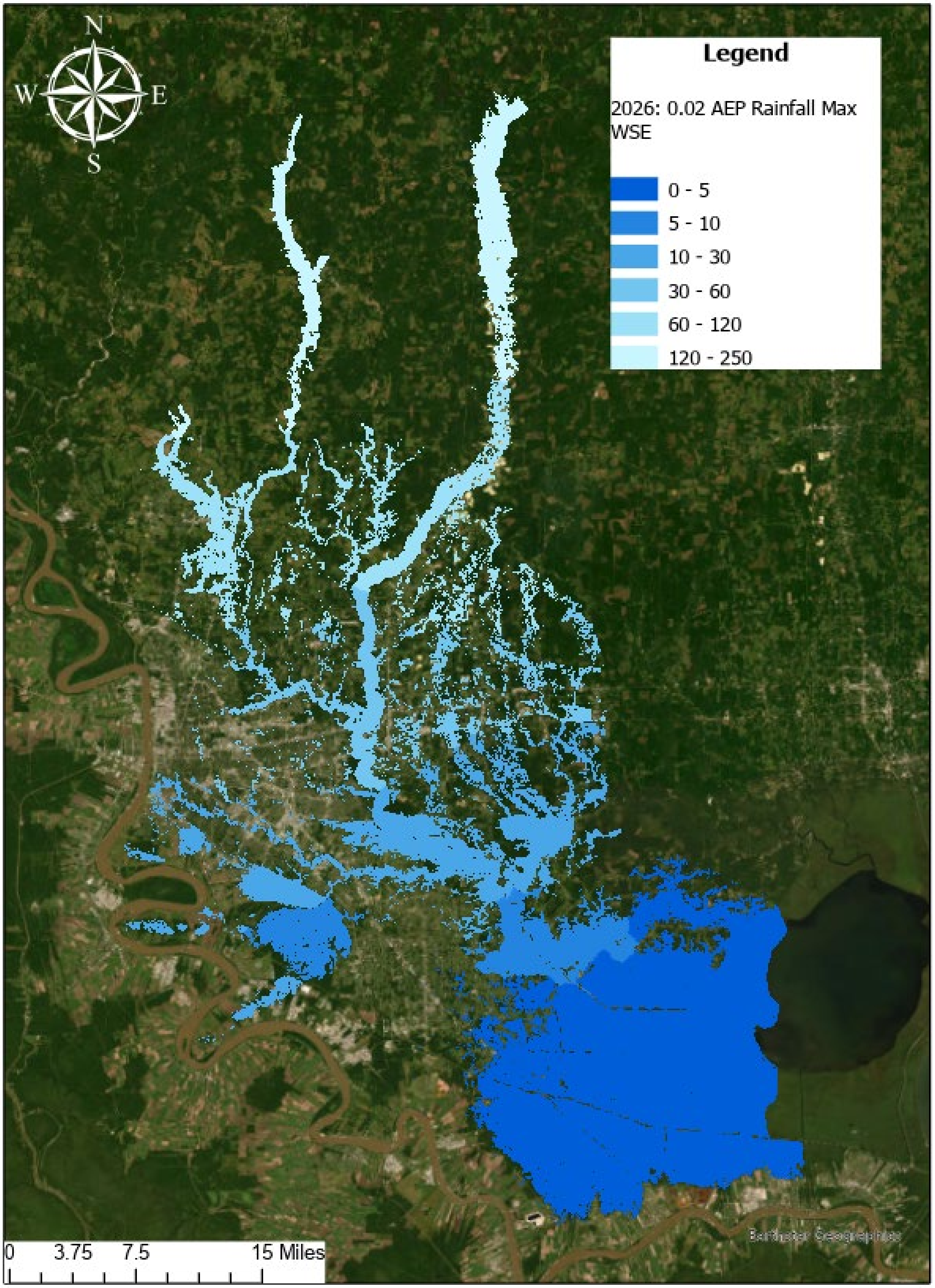
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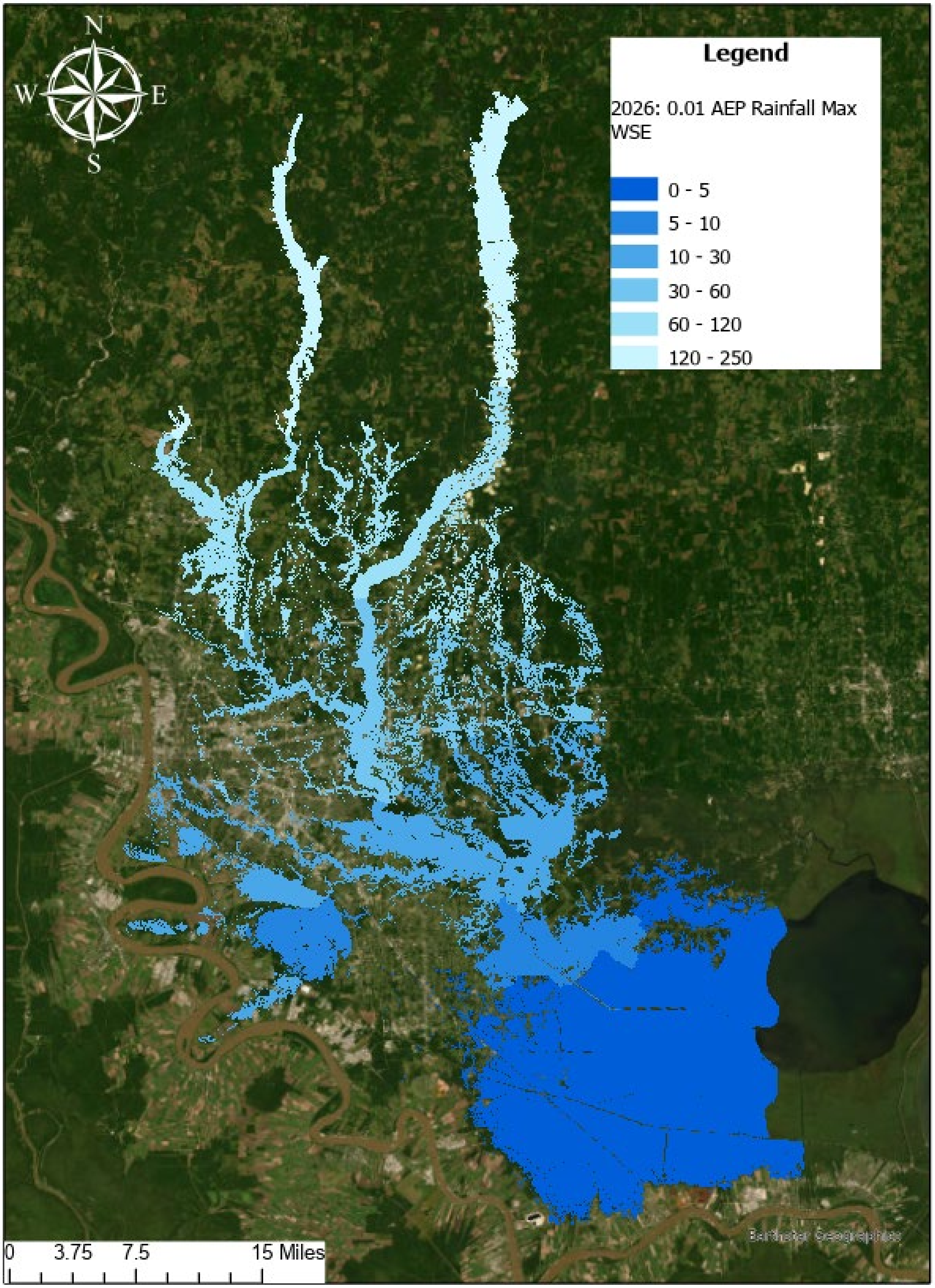
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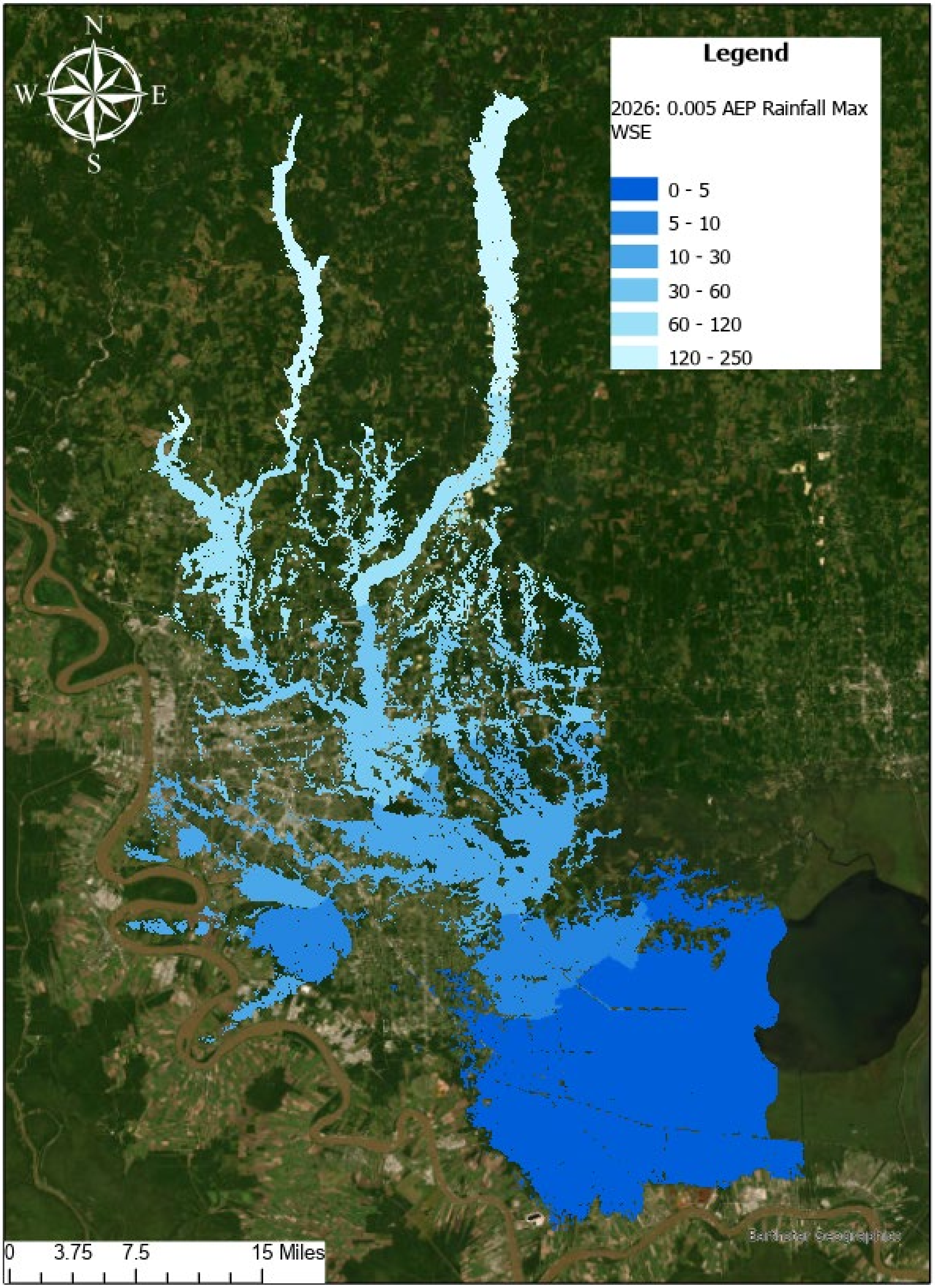
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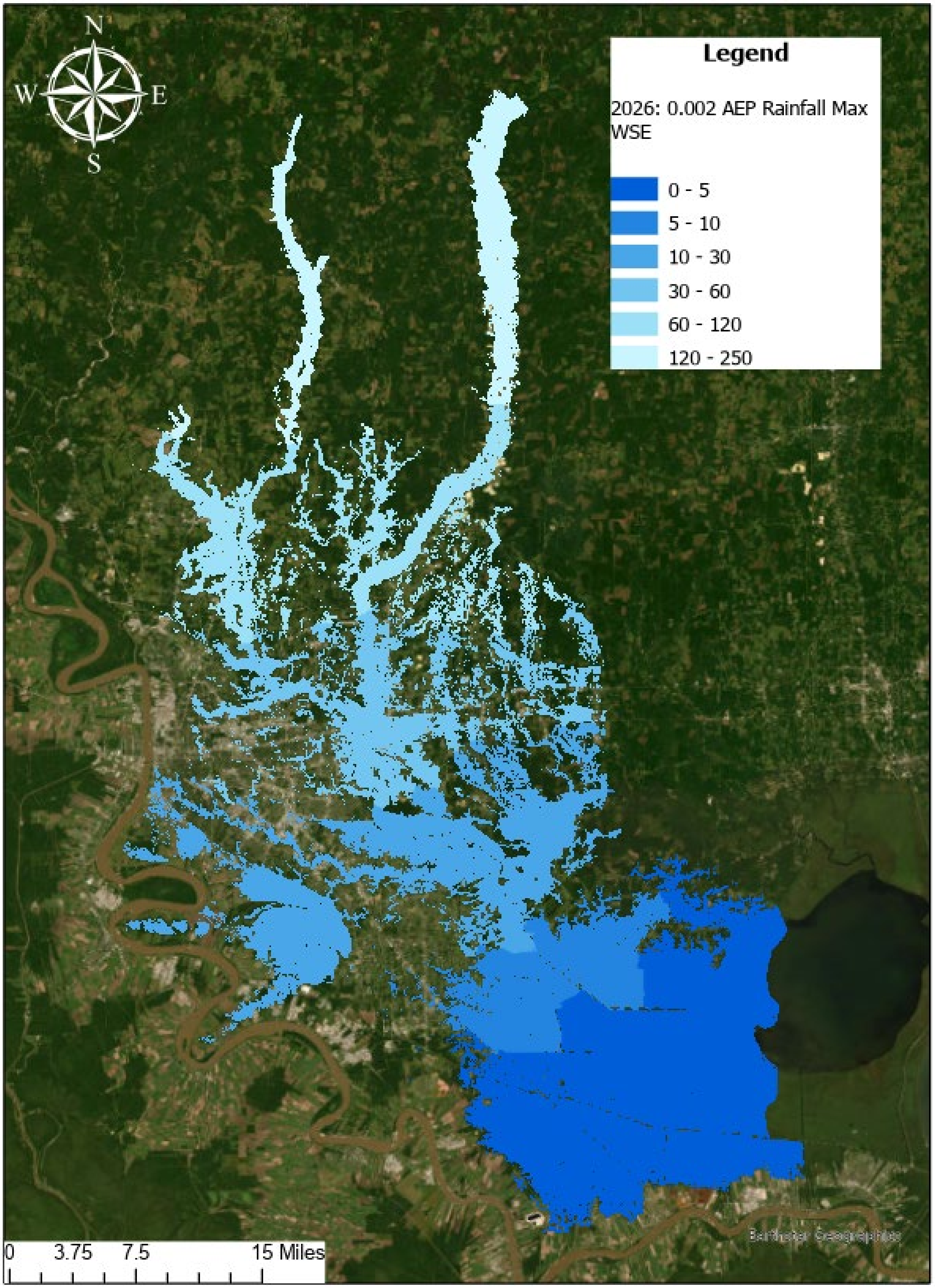
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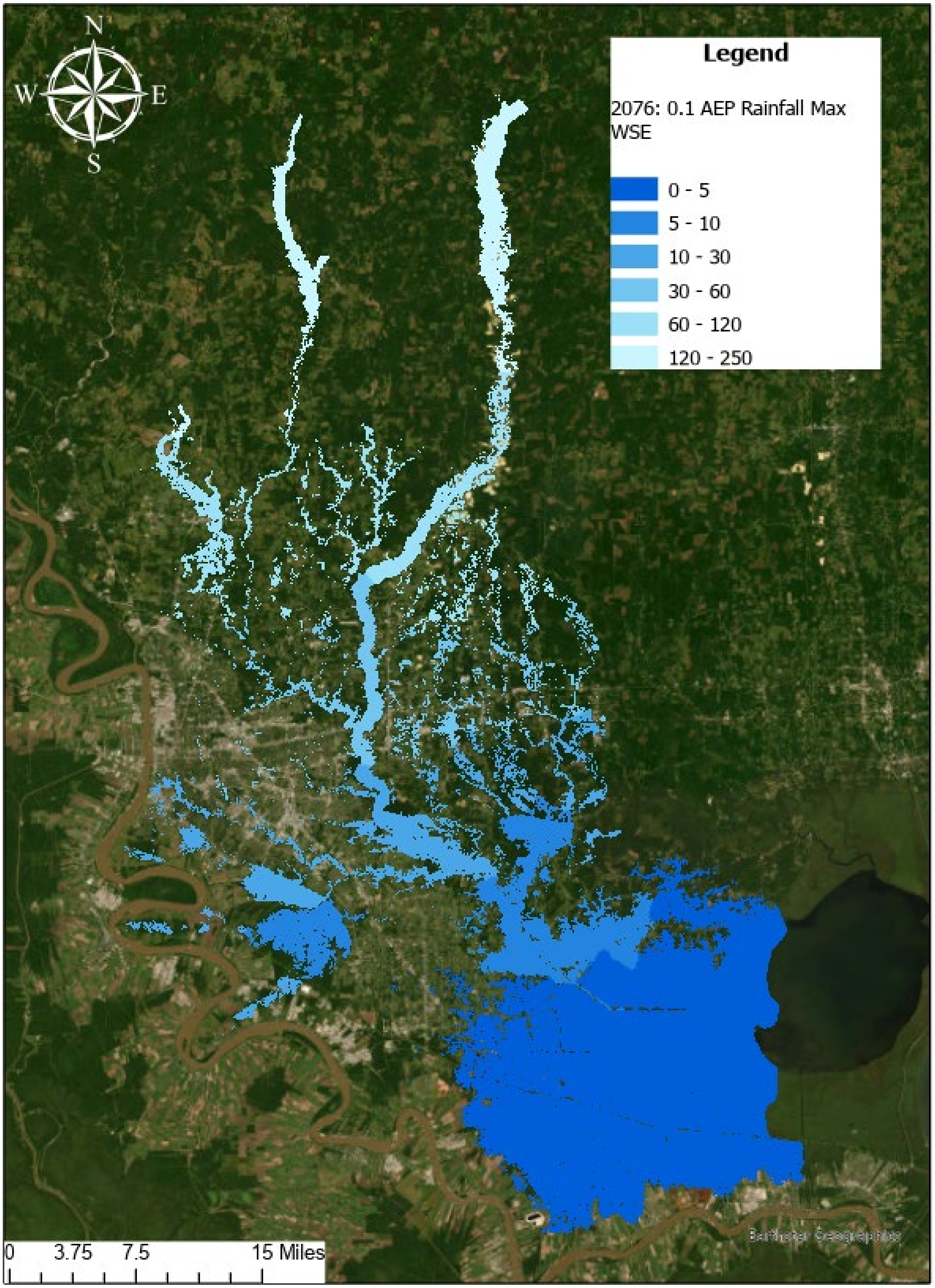
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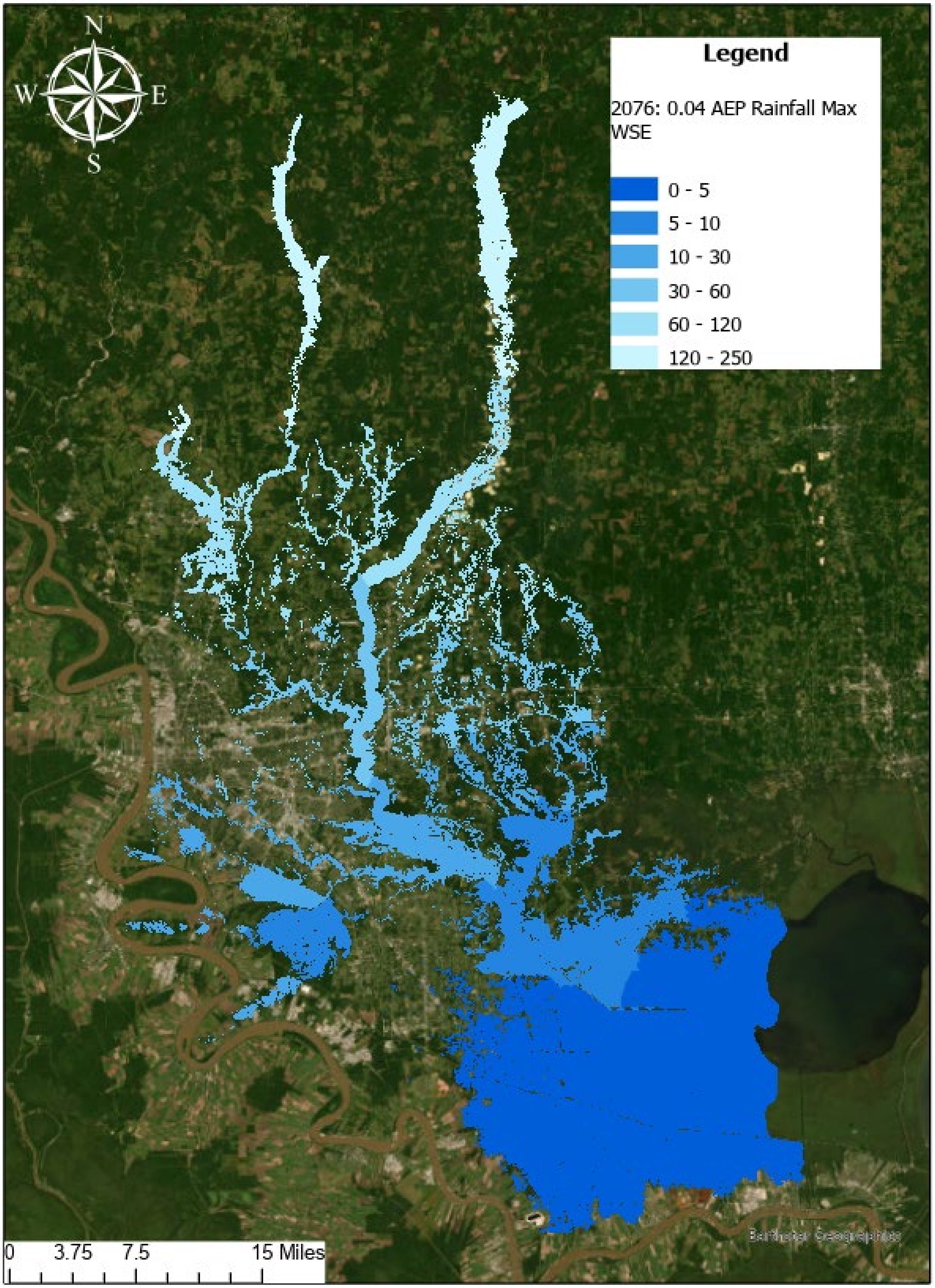
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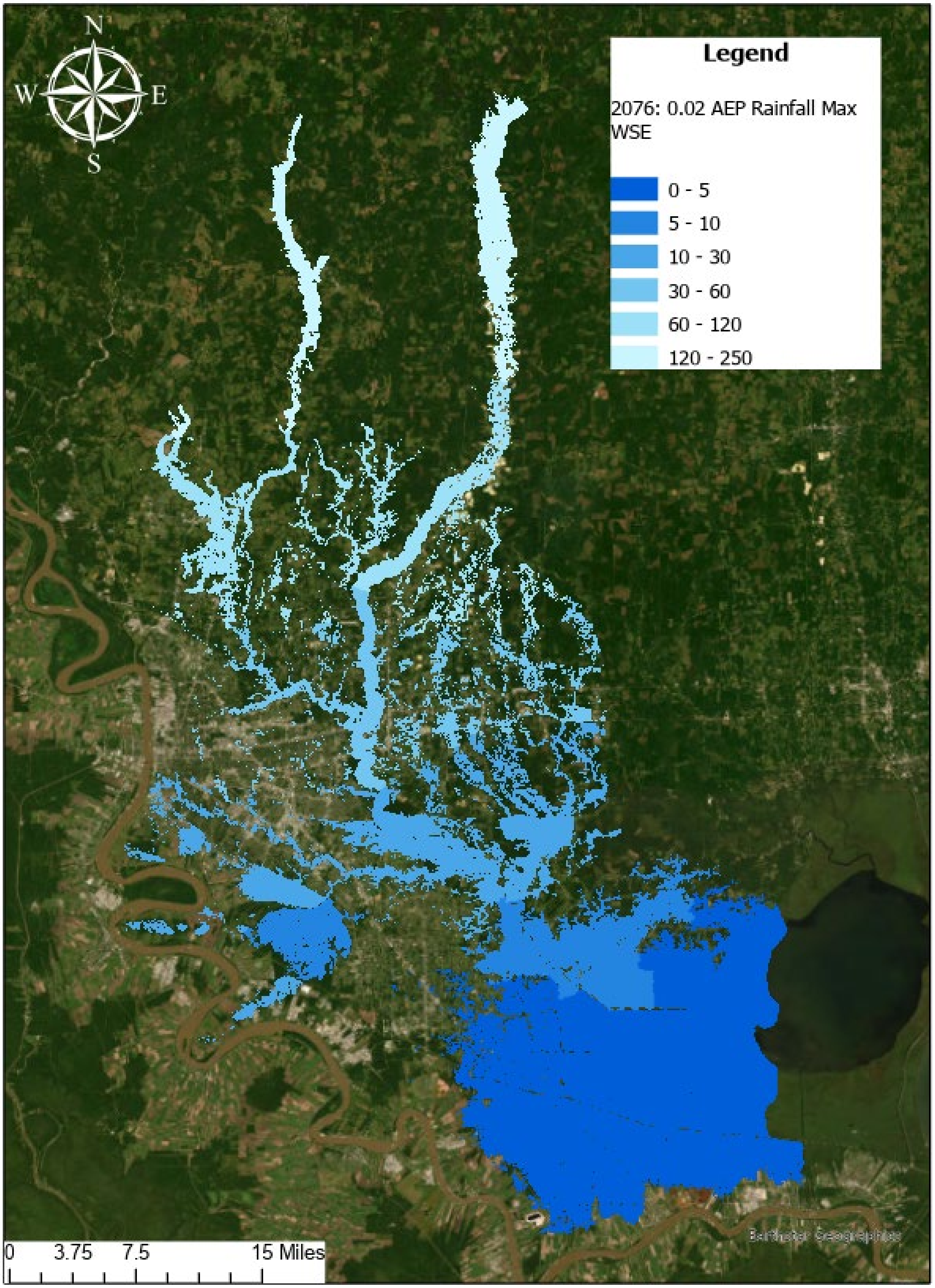
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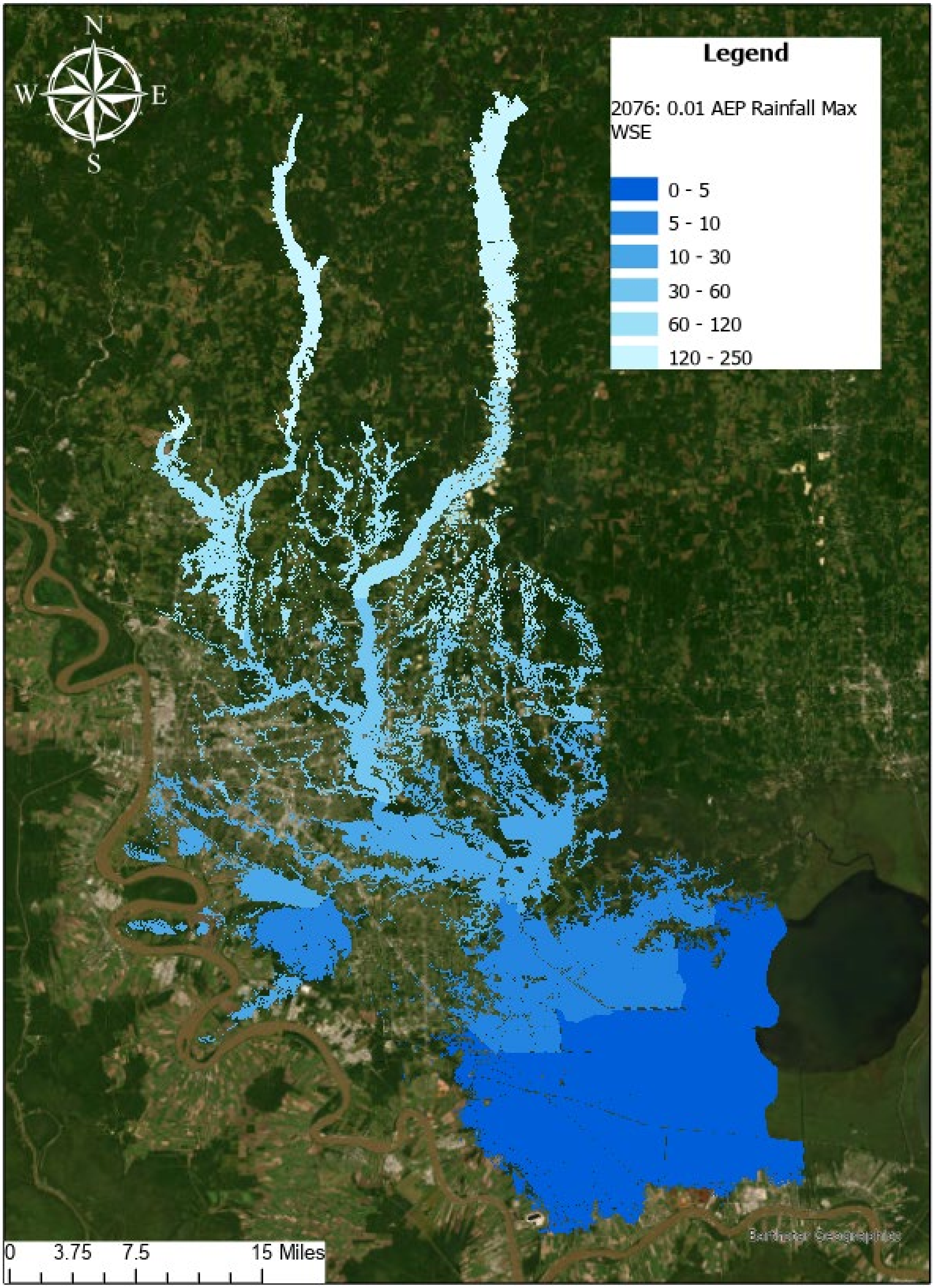
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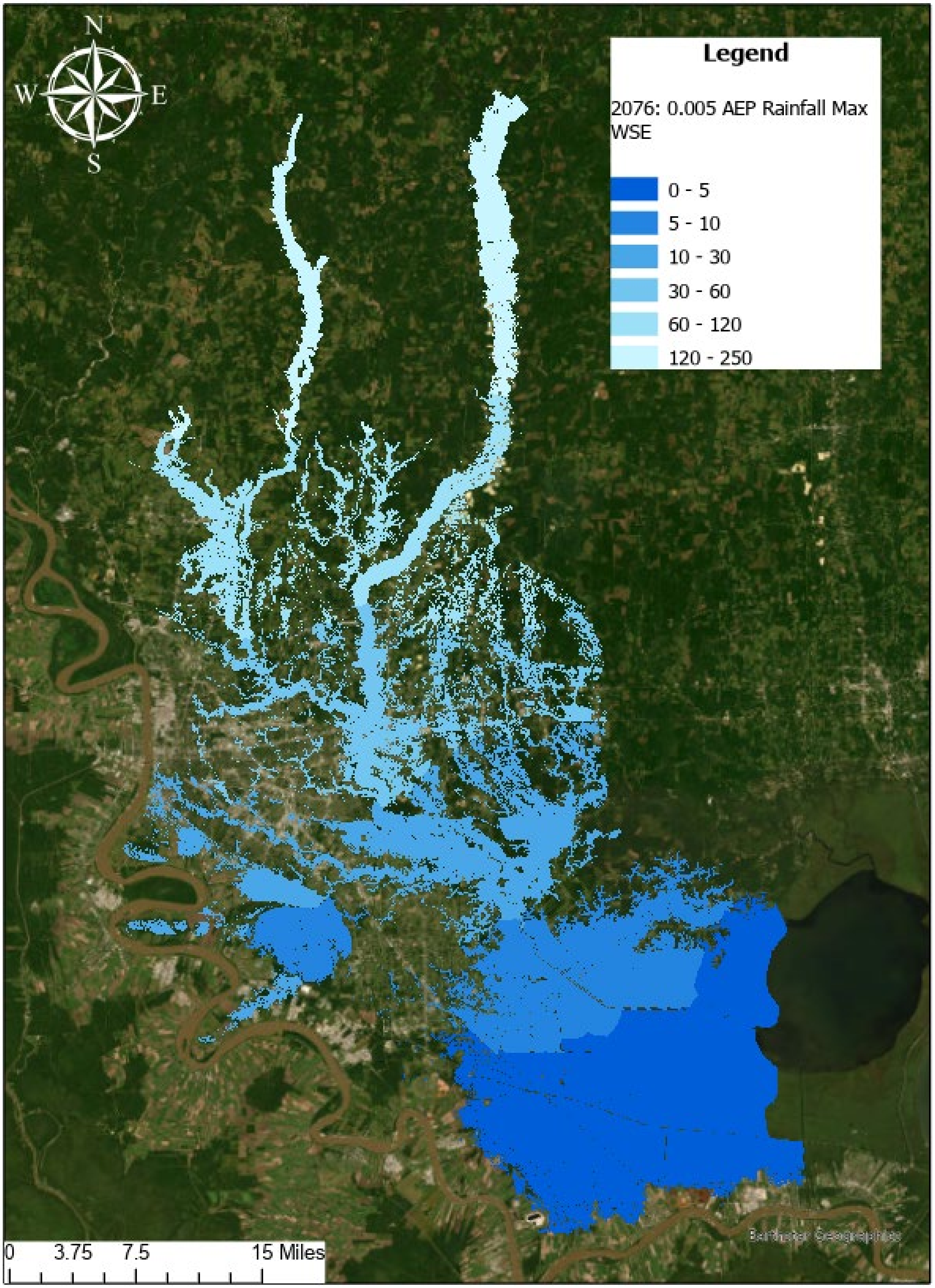
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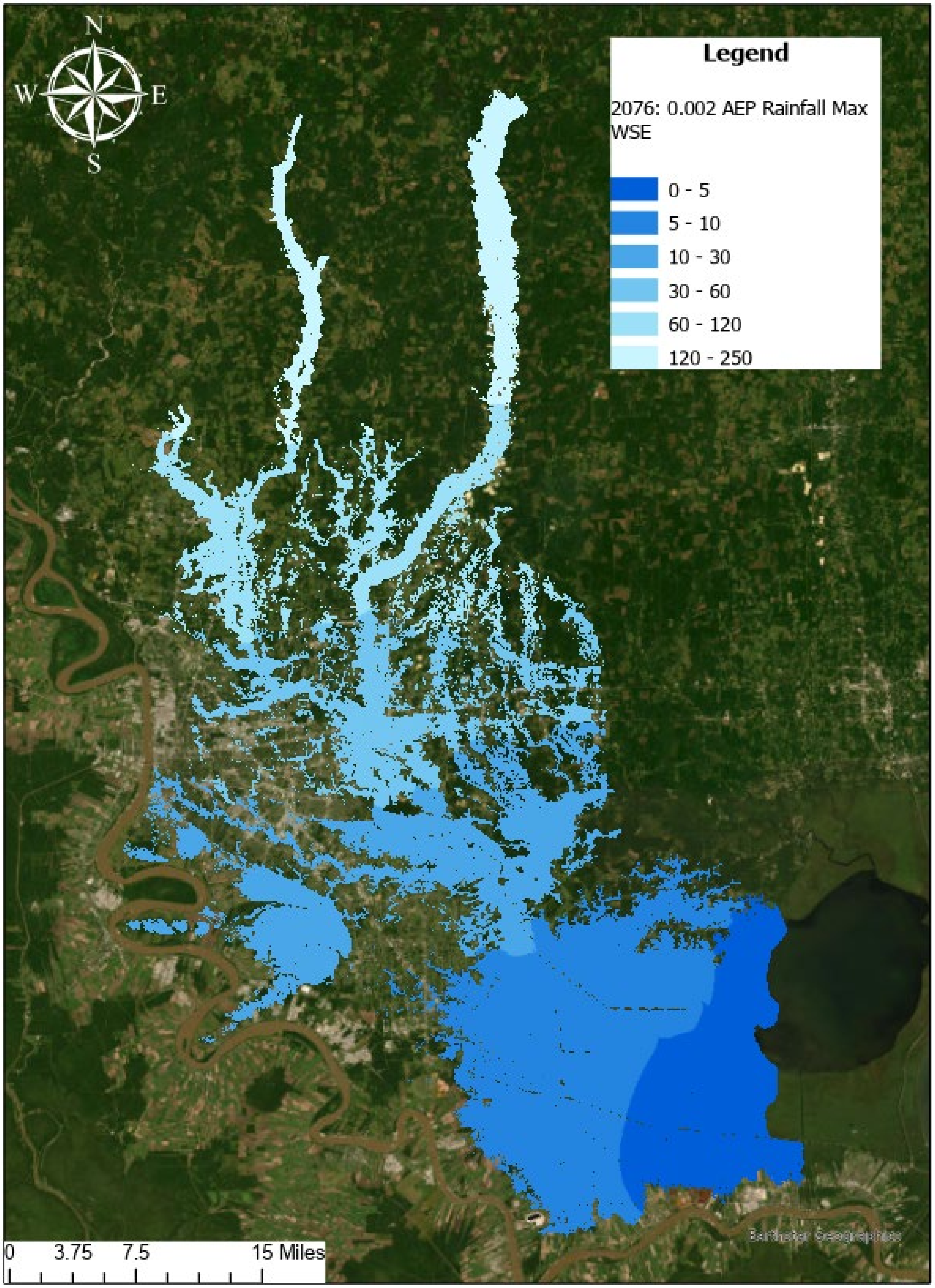
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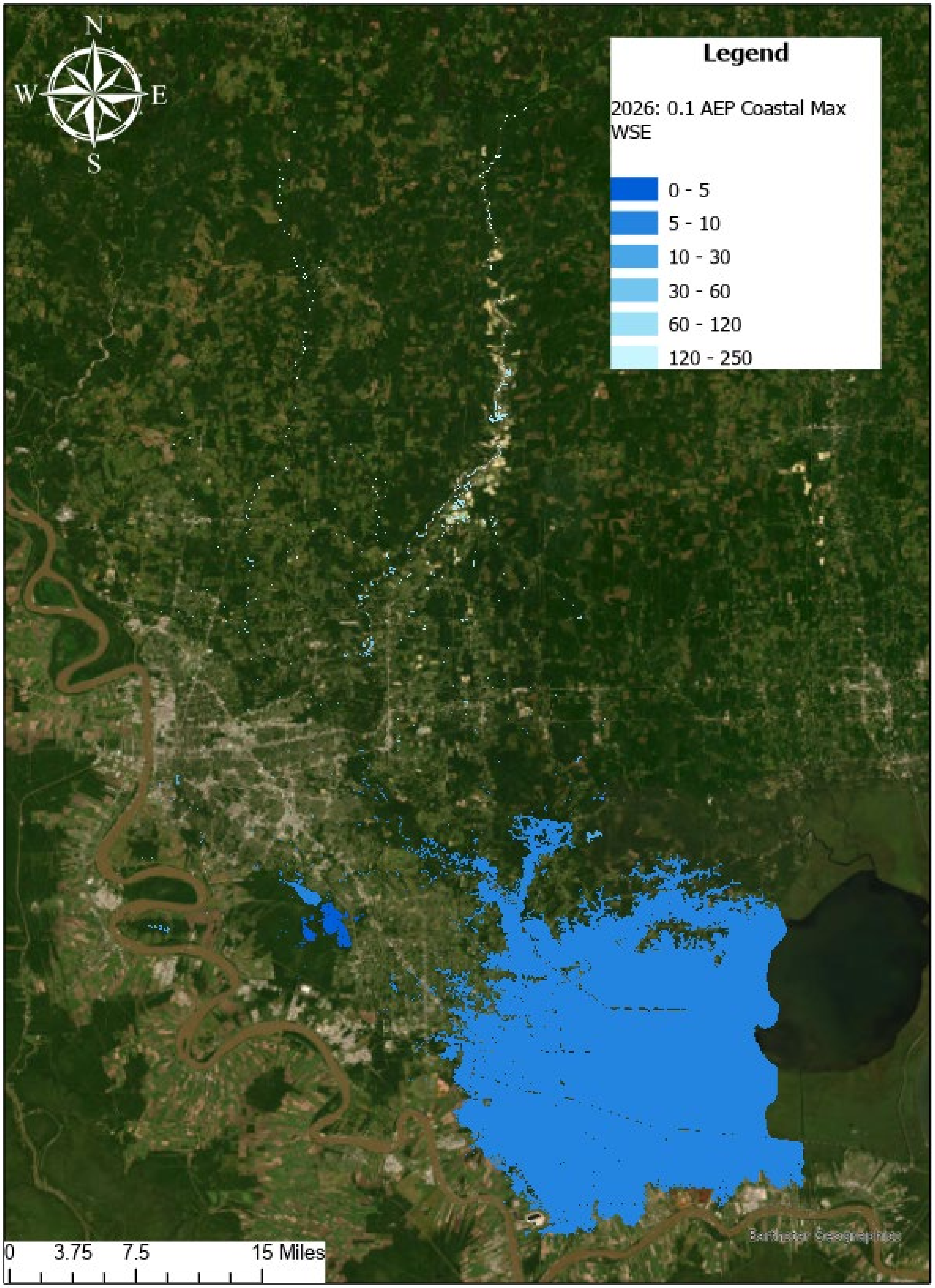
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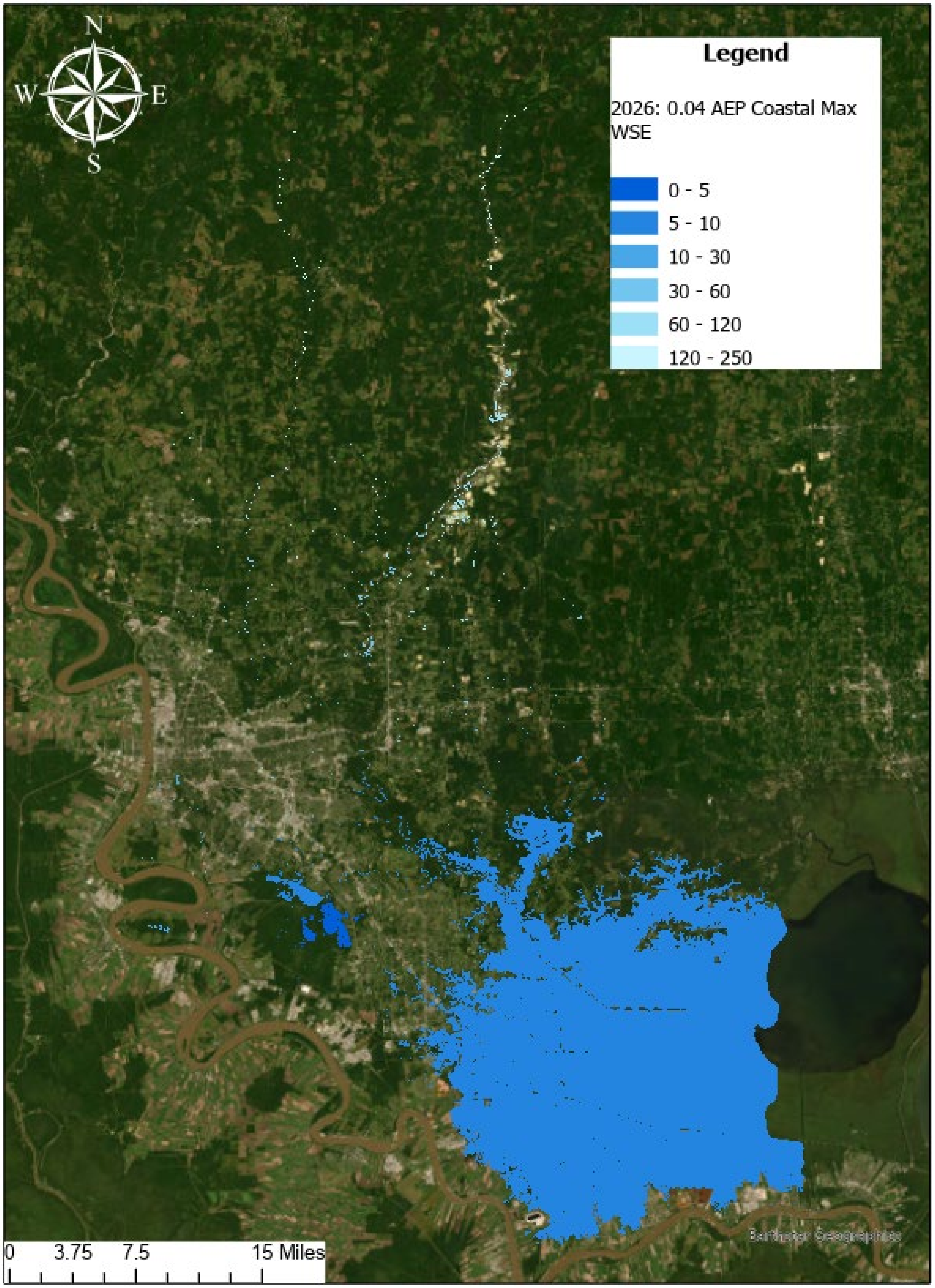
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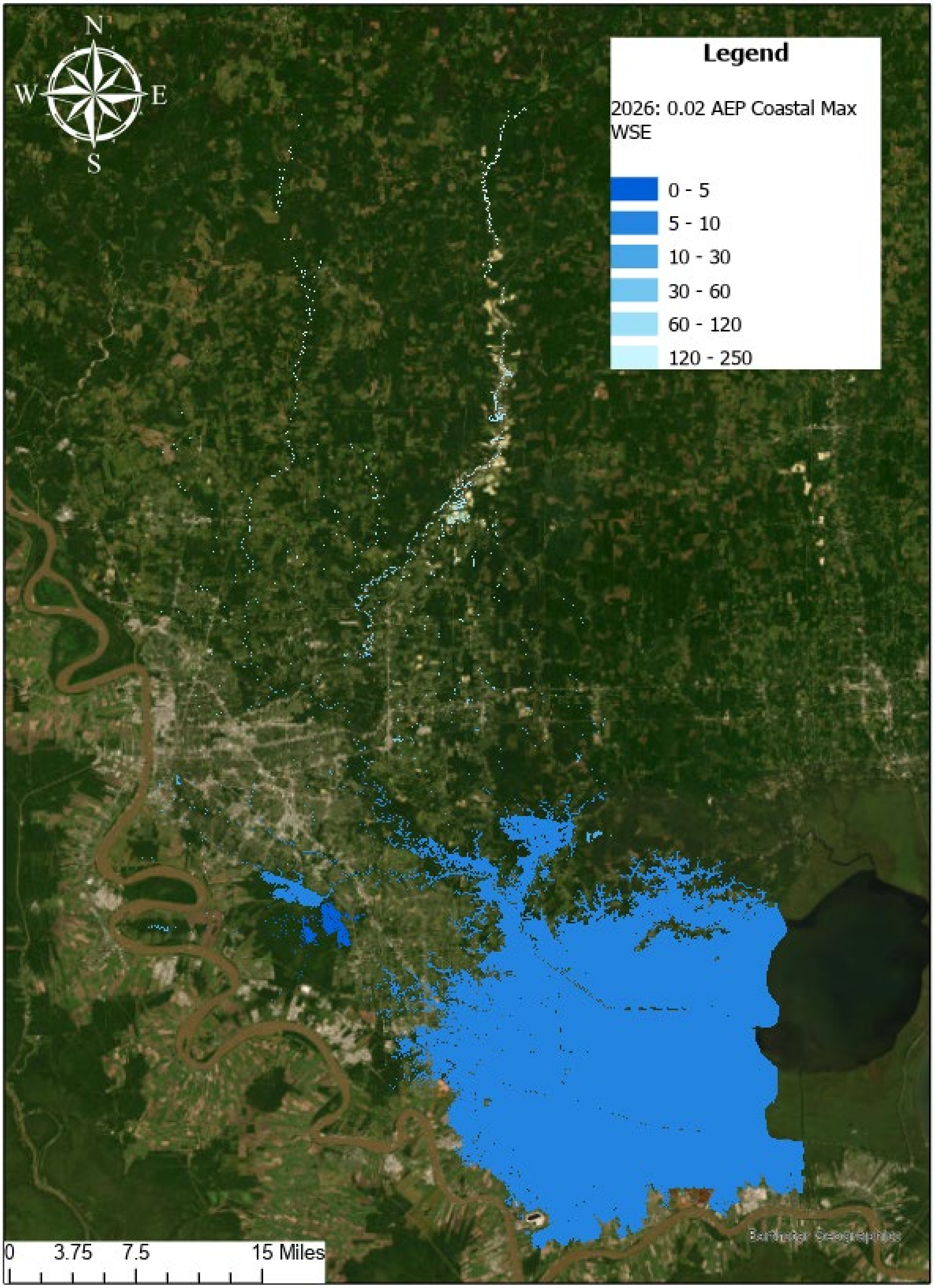
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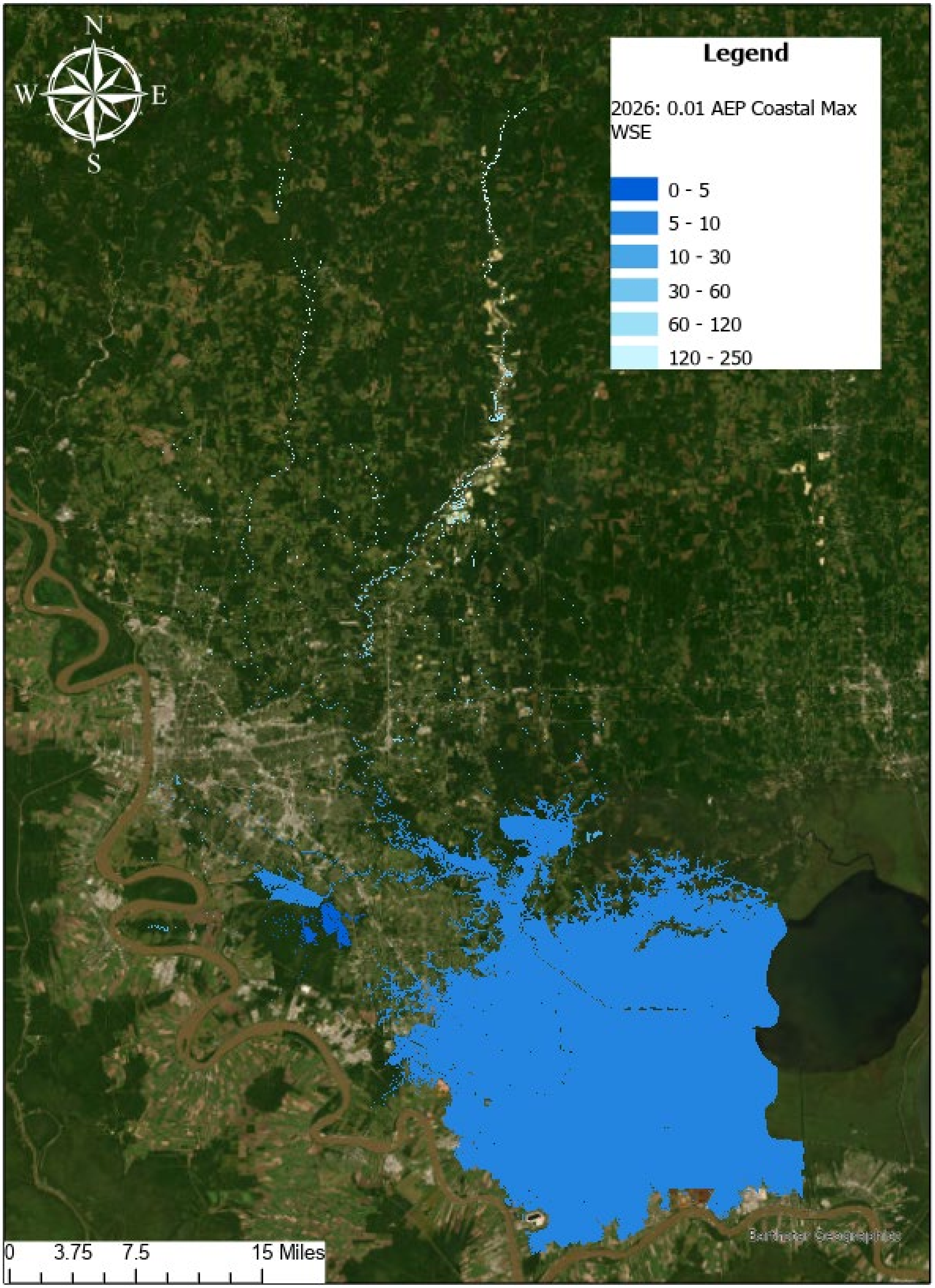
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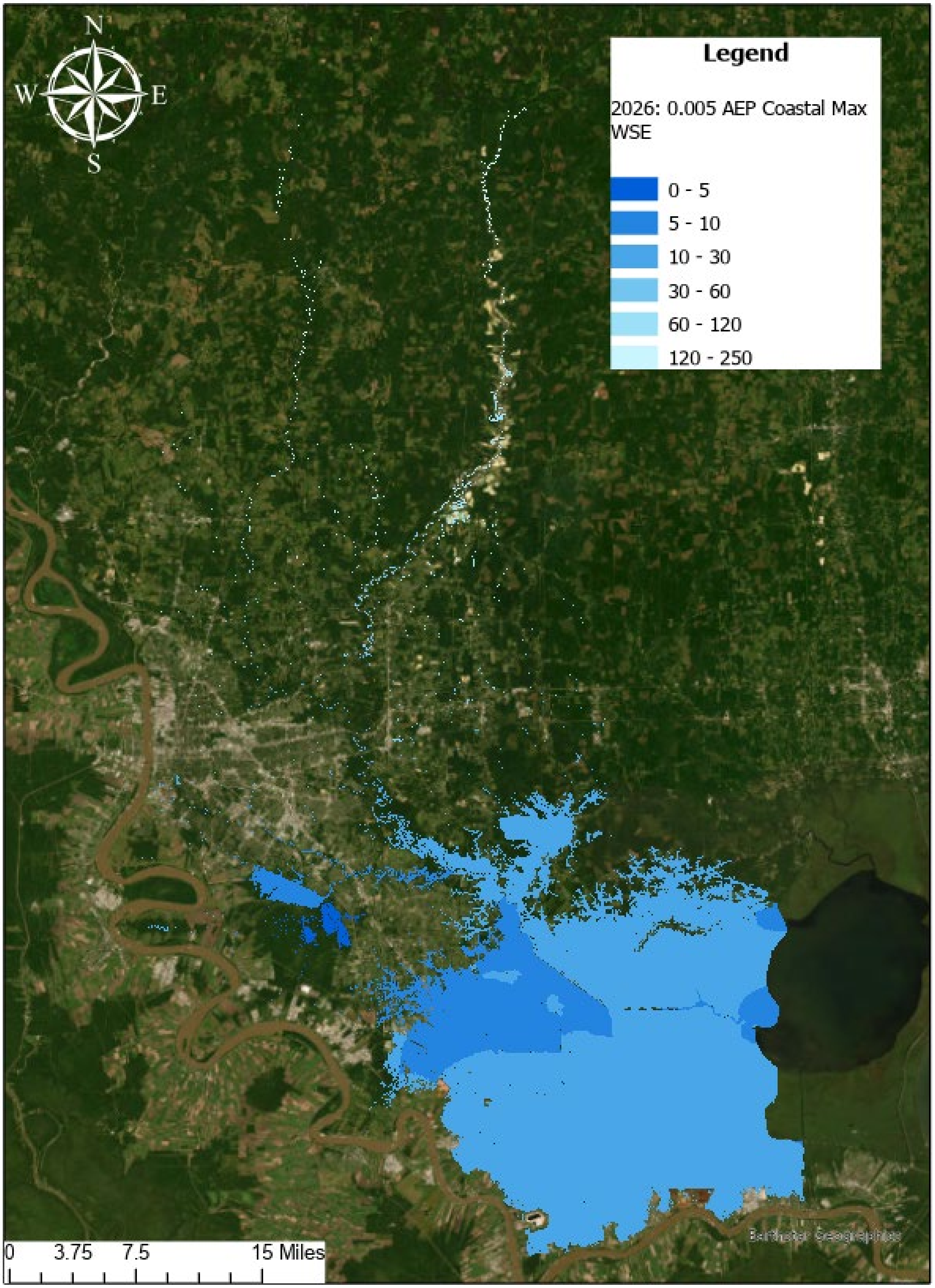
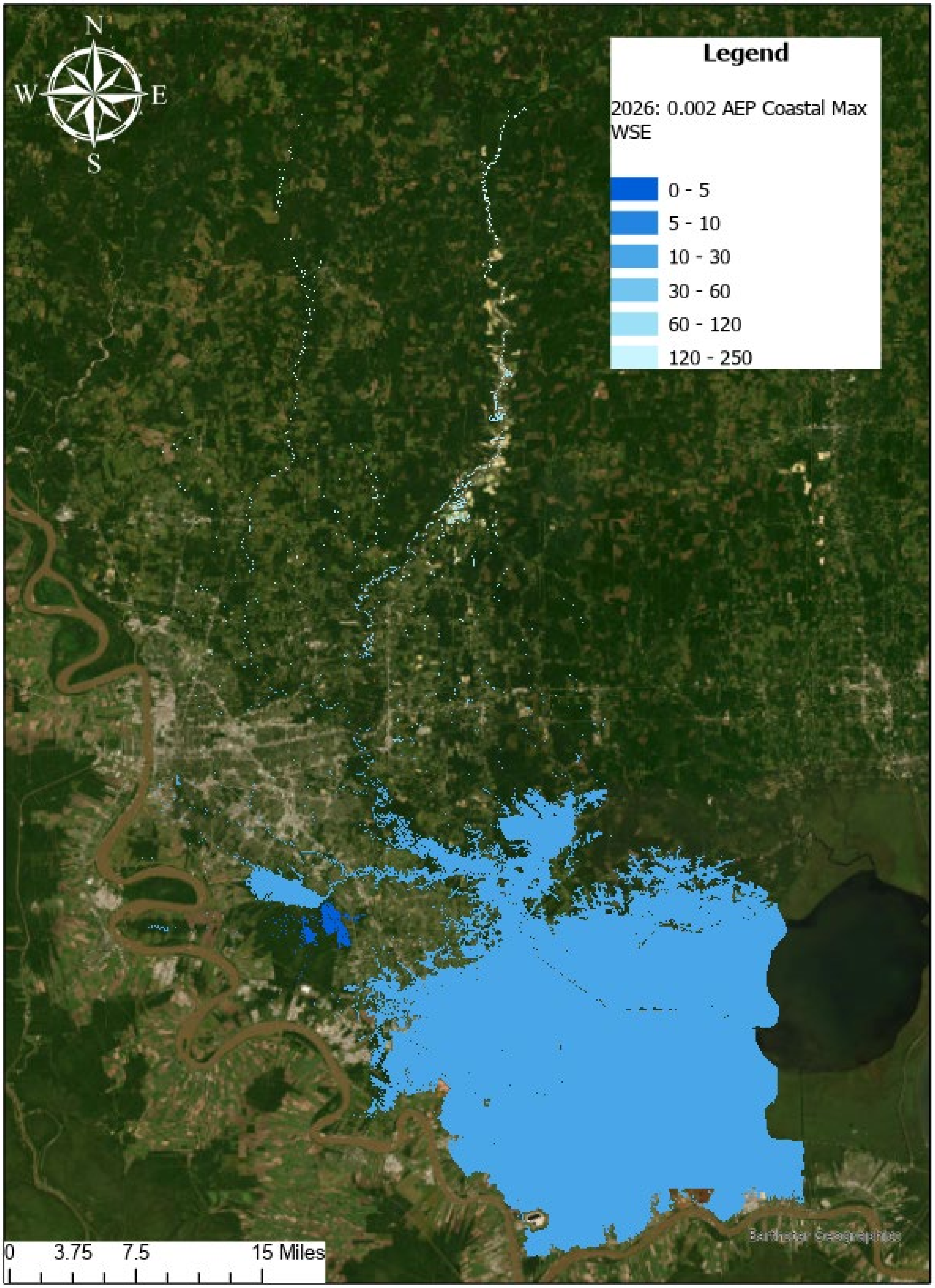
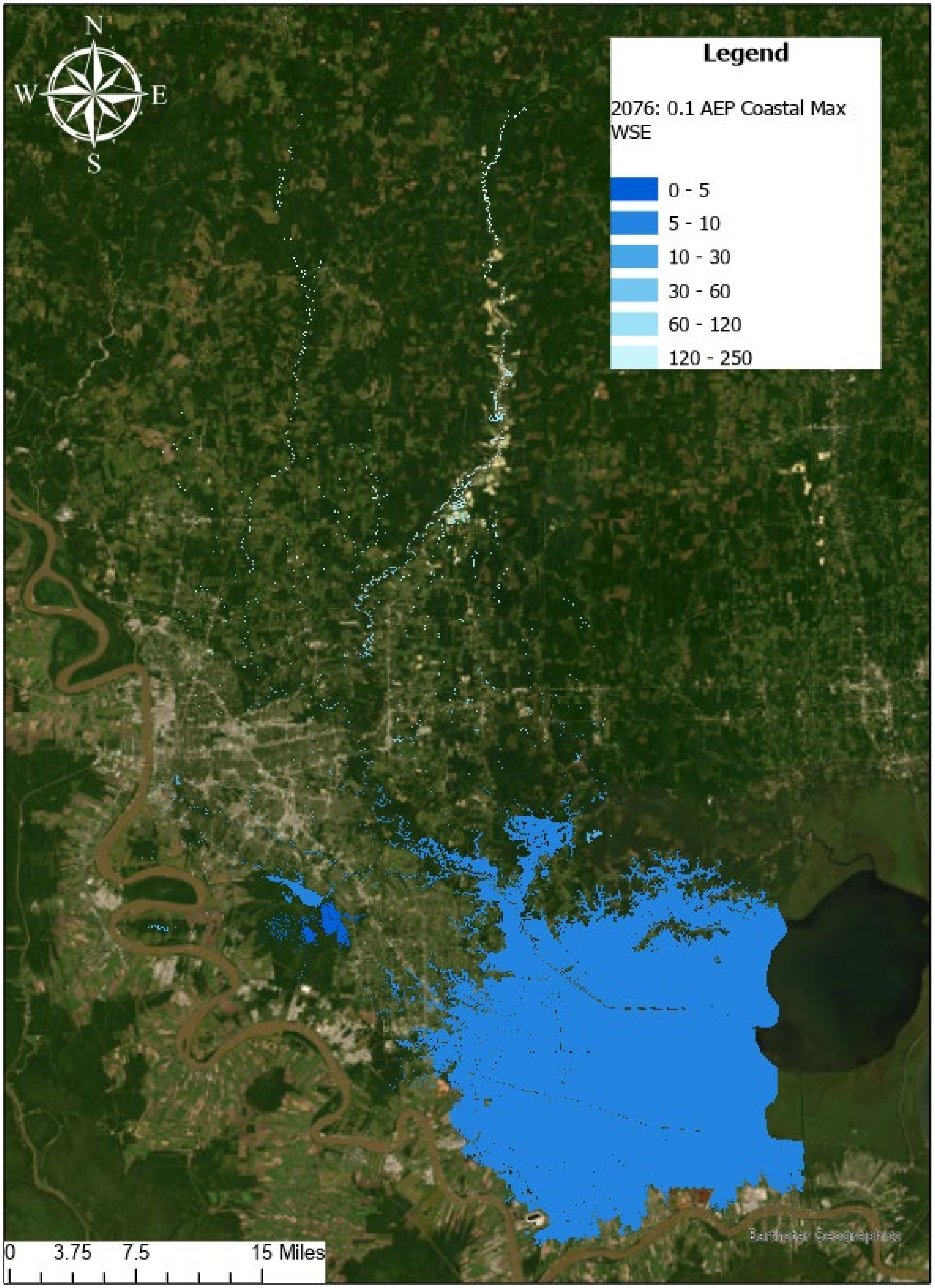
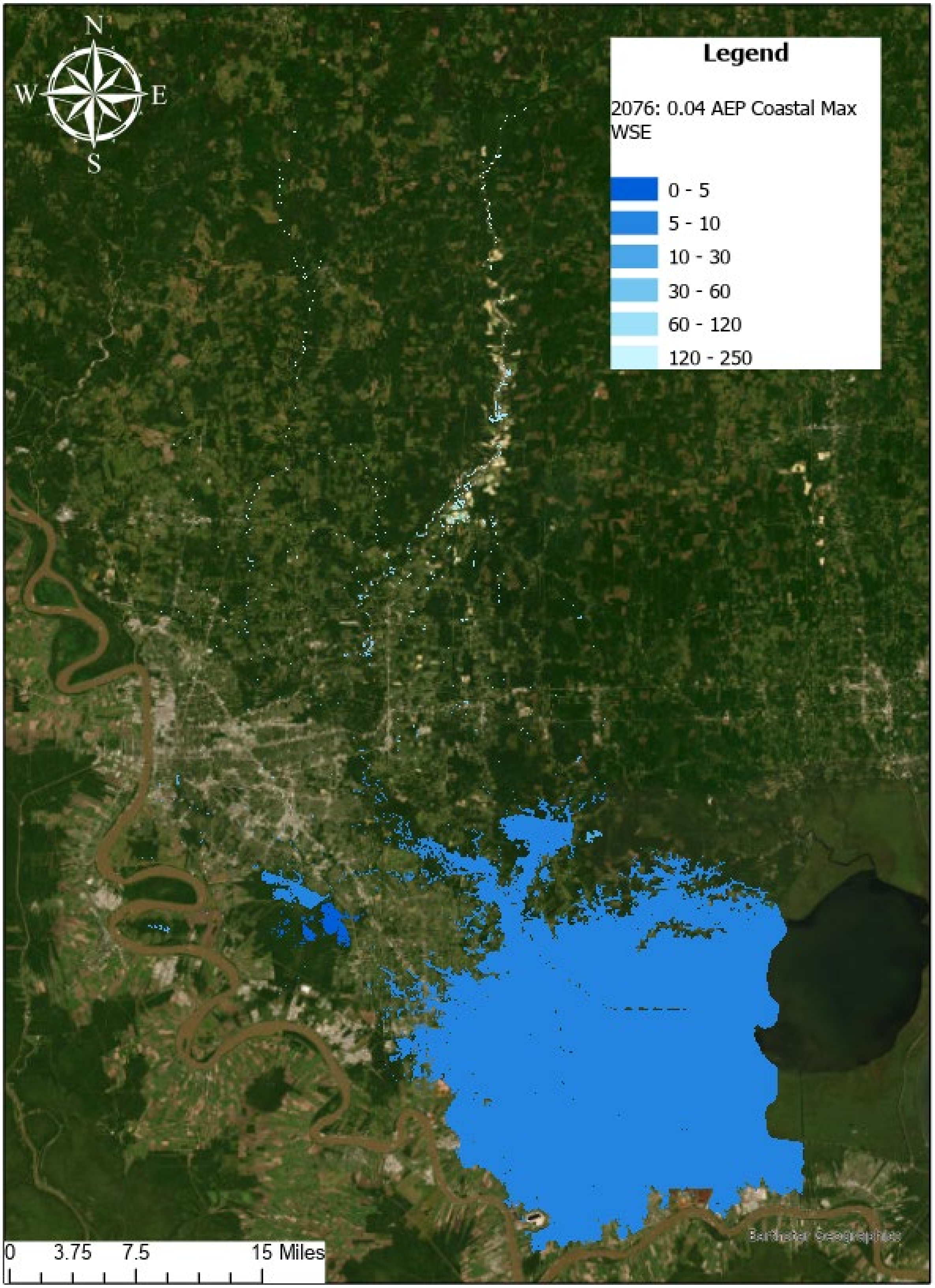
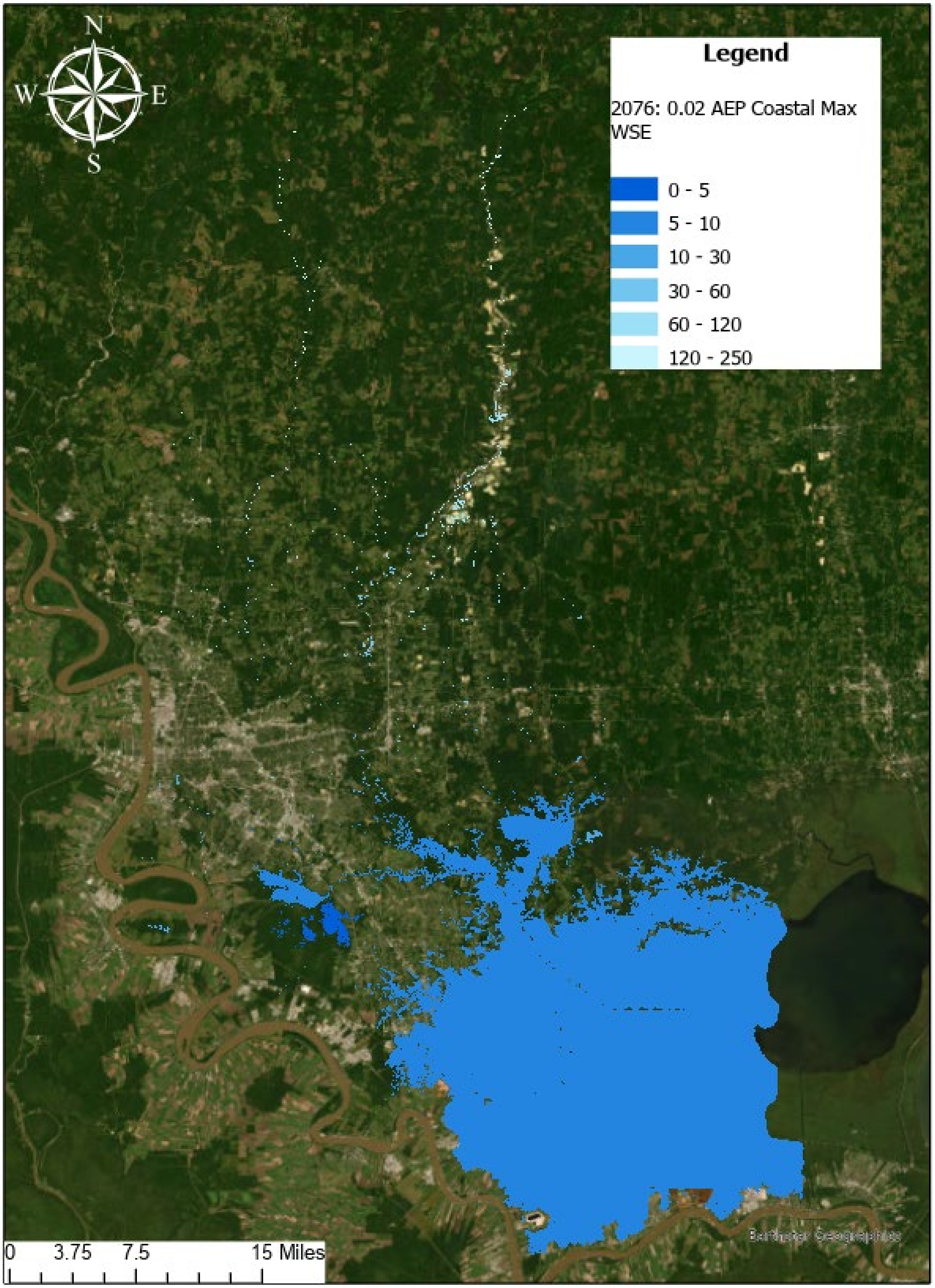
7.5
15 Miles

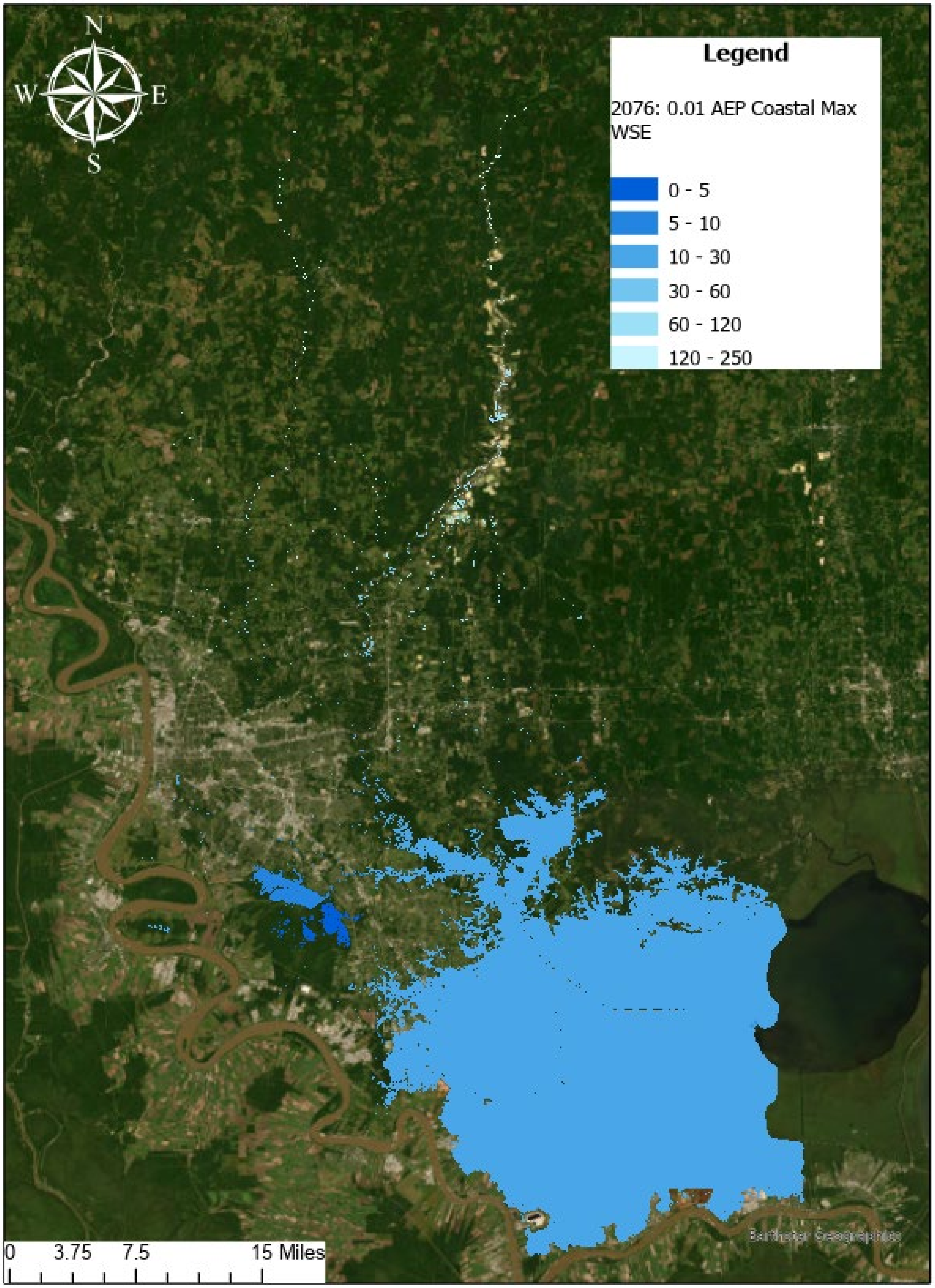

N
W
E
S
Legend
2026: 0.005 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

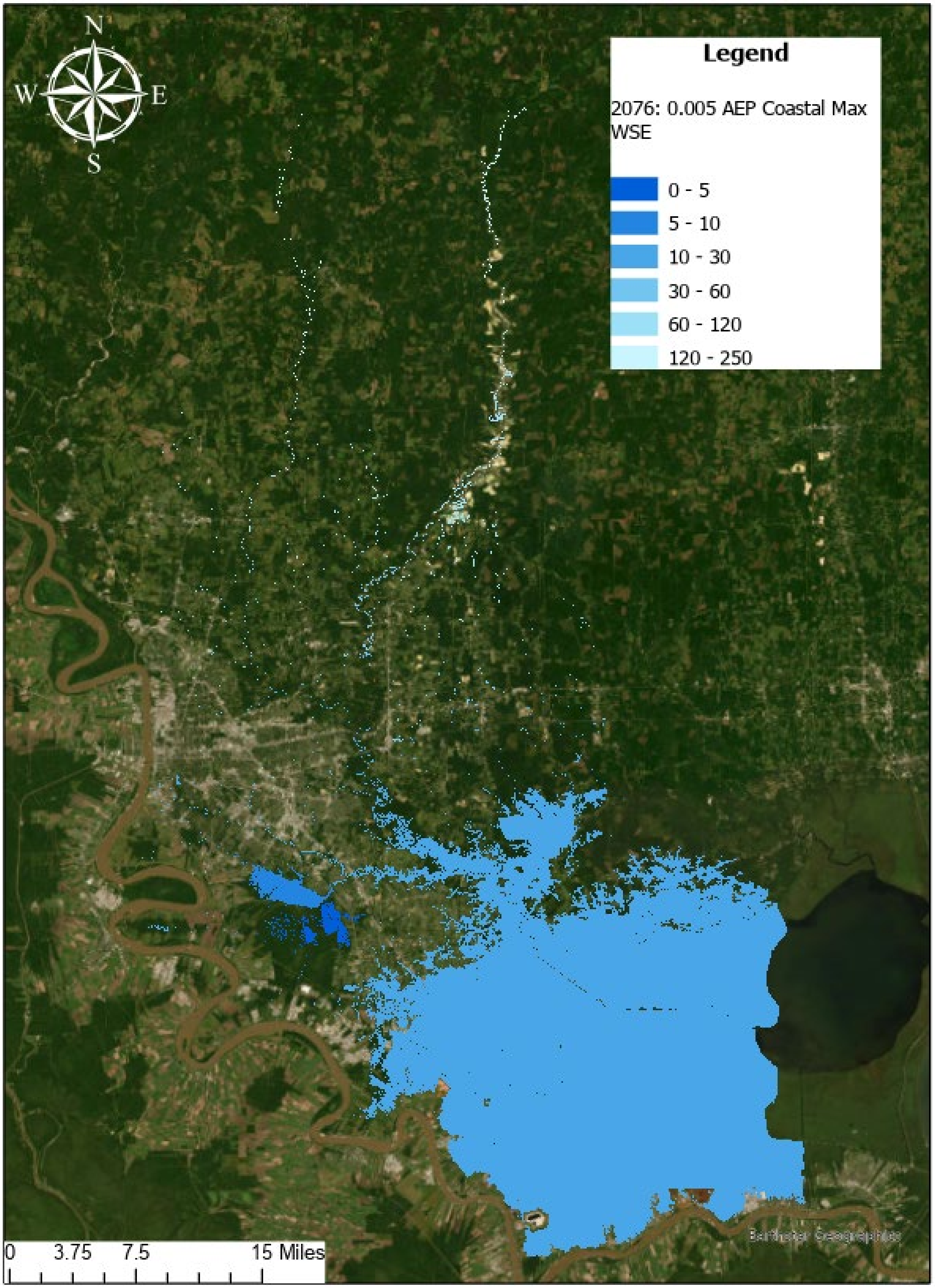

N
S
E
W
Legend
2026: 0.002 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles
Earthstar Geographics

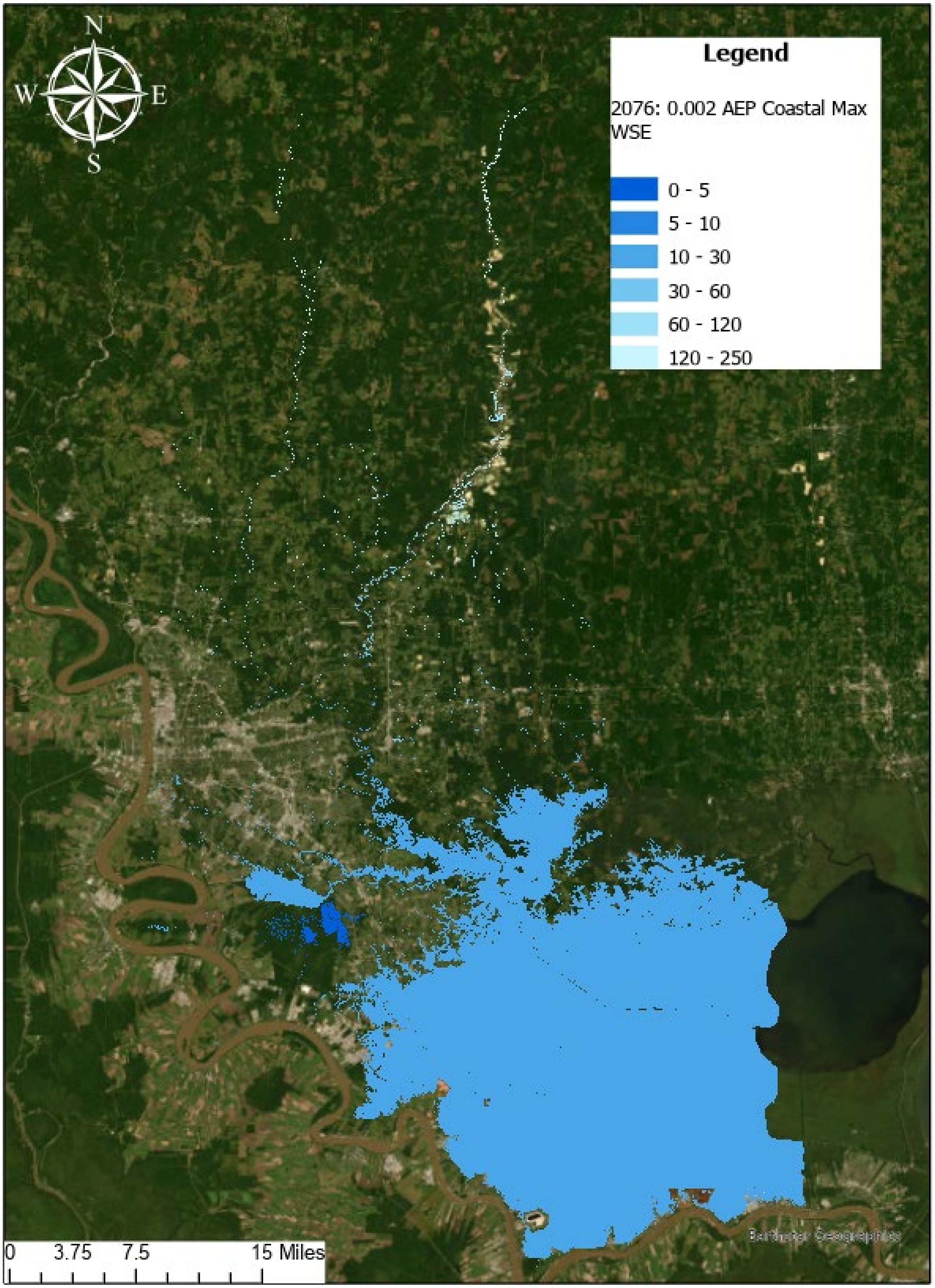

N
S
W
E
Legend
2076: 0.1 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

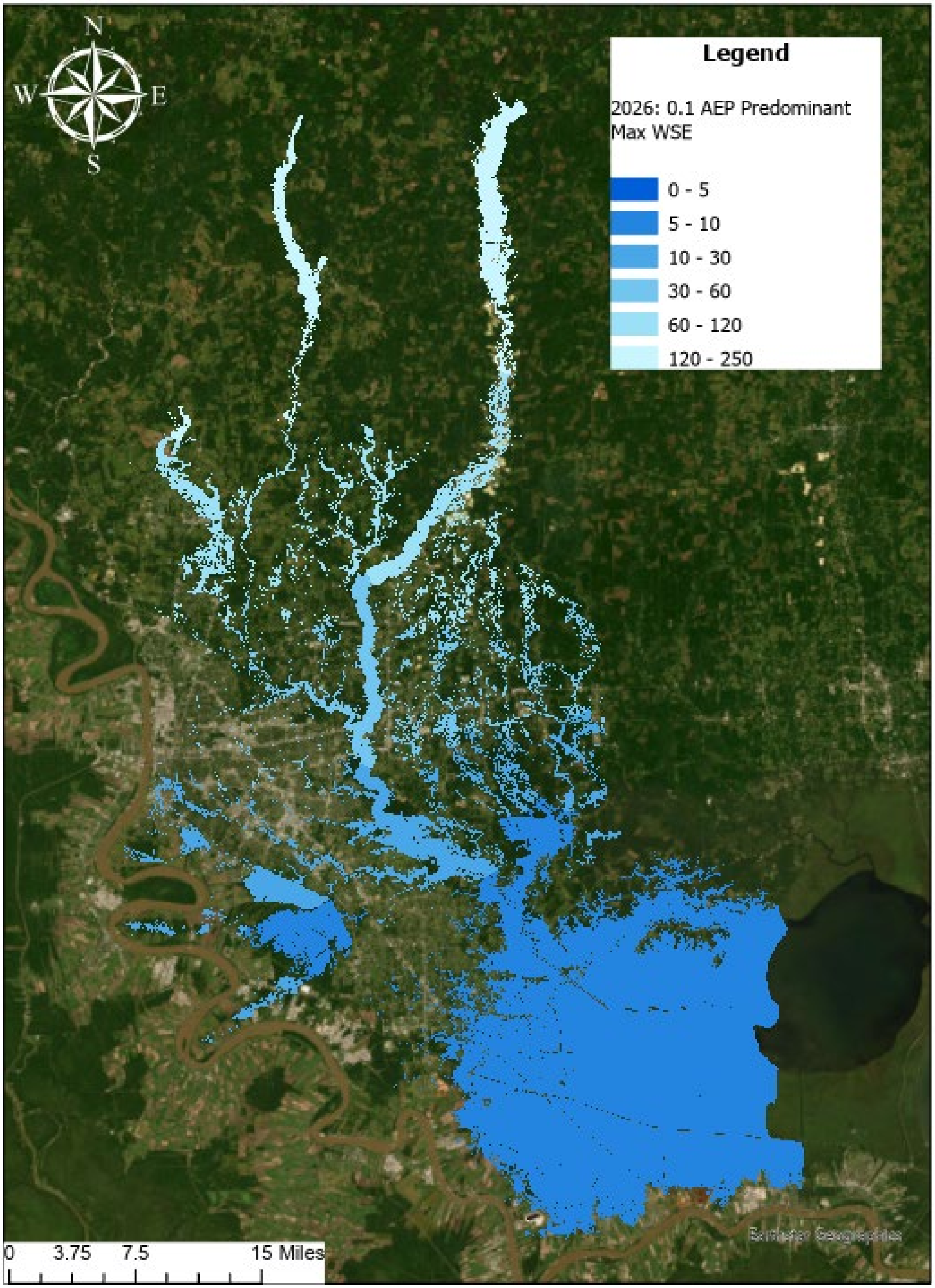

N
W
E
S
Legend
2076: 0.04 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles

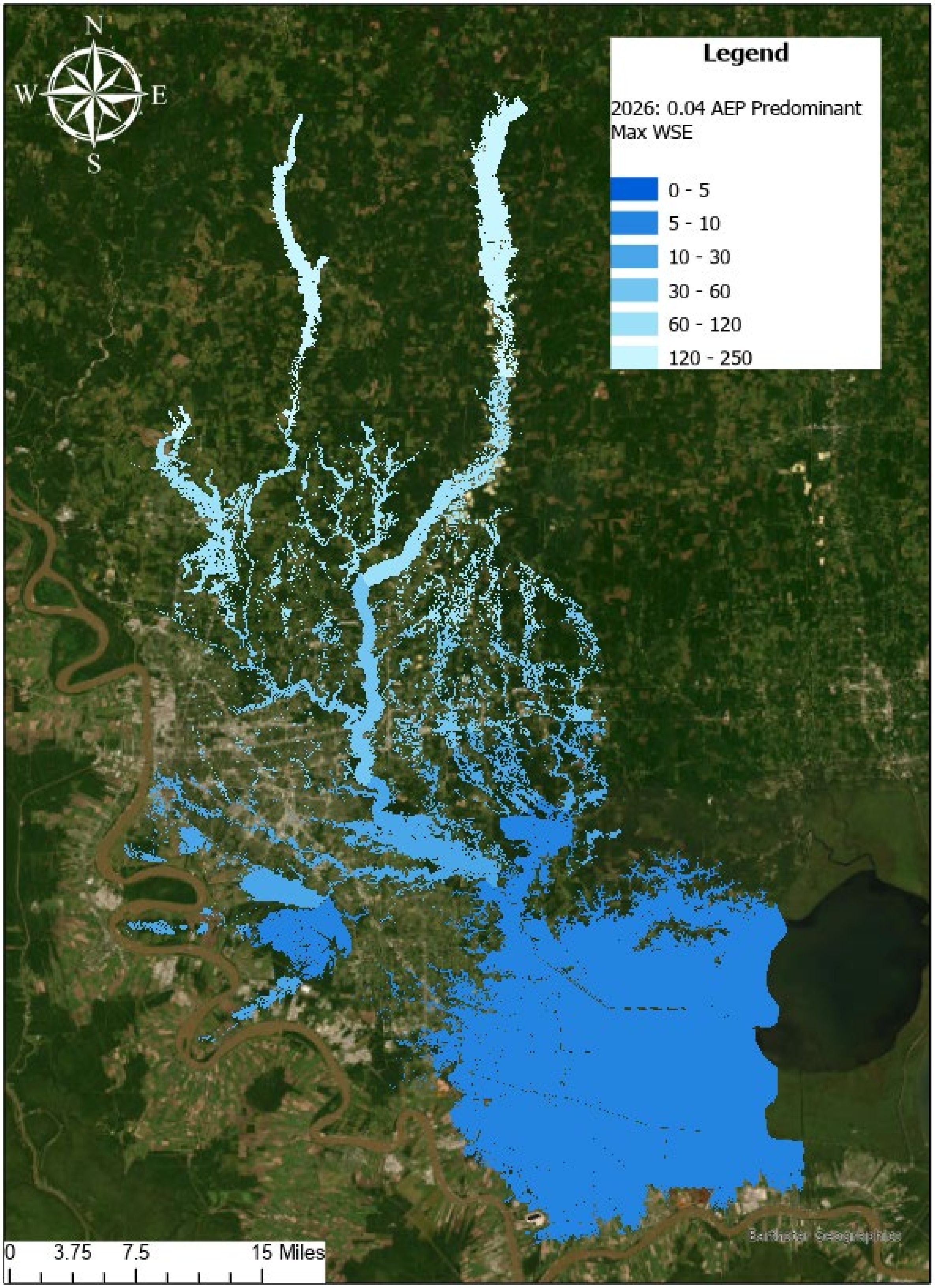

N
S
E
W
Legend
2076: 0.02 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles

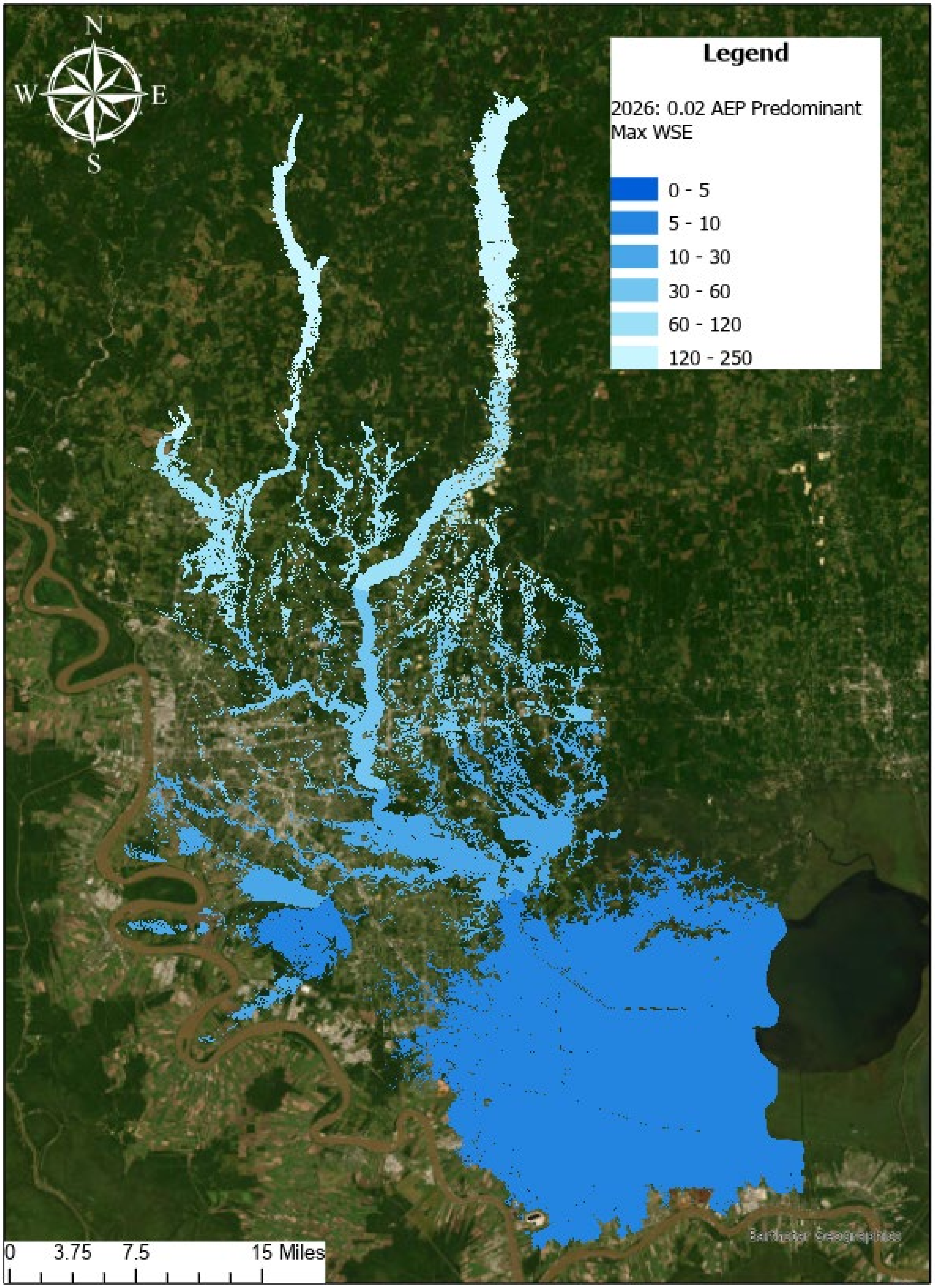

N
S
W
E
Legend
2076: 0.01 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

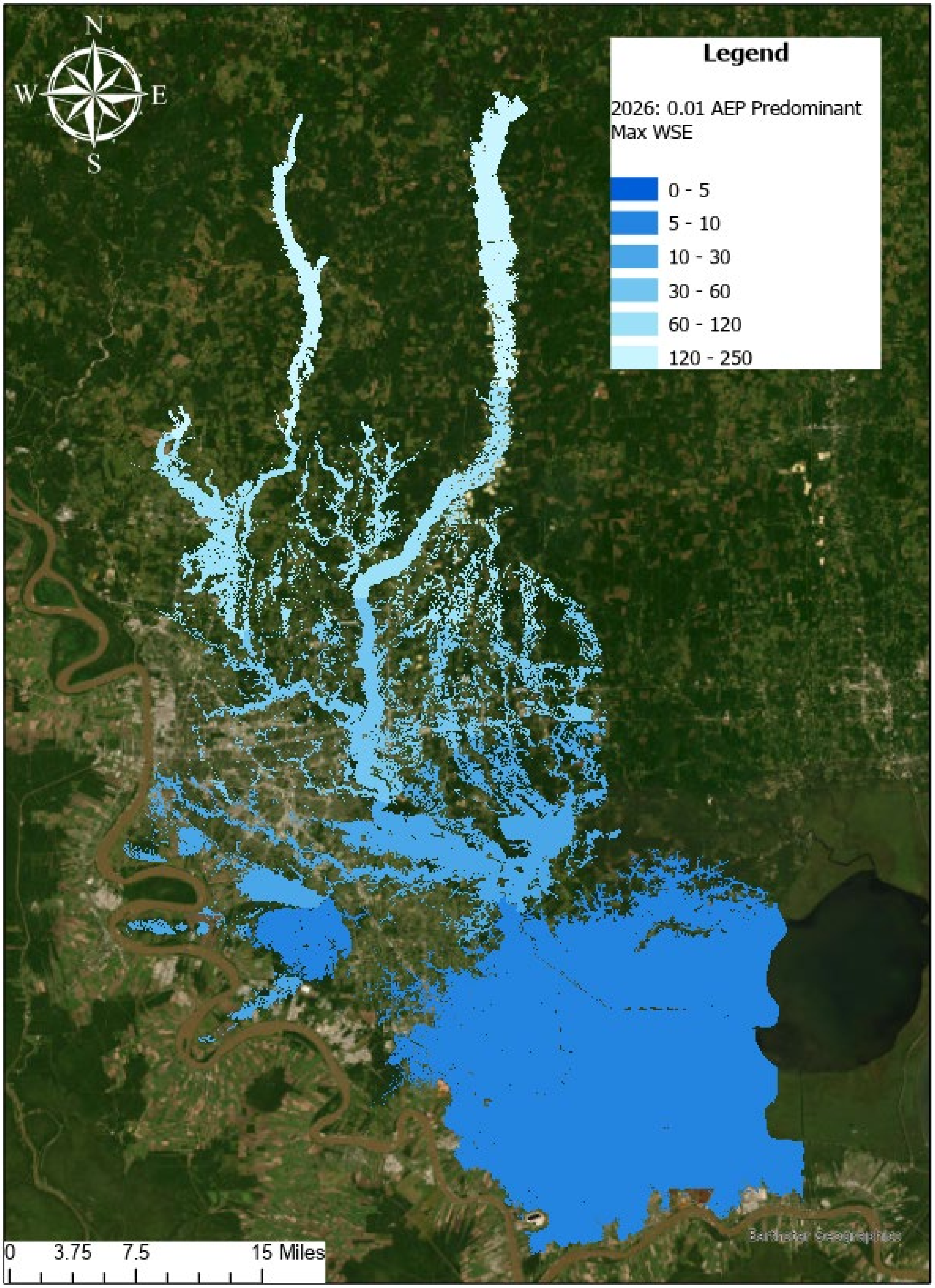

N
W
E
S
Legend
2076: 0.005 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

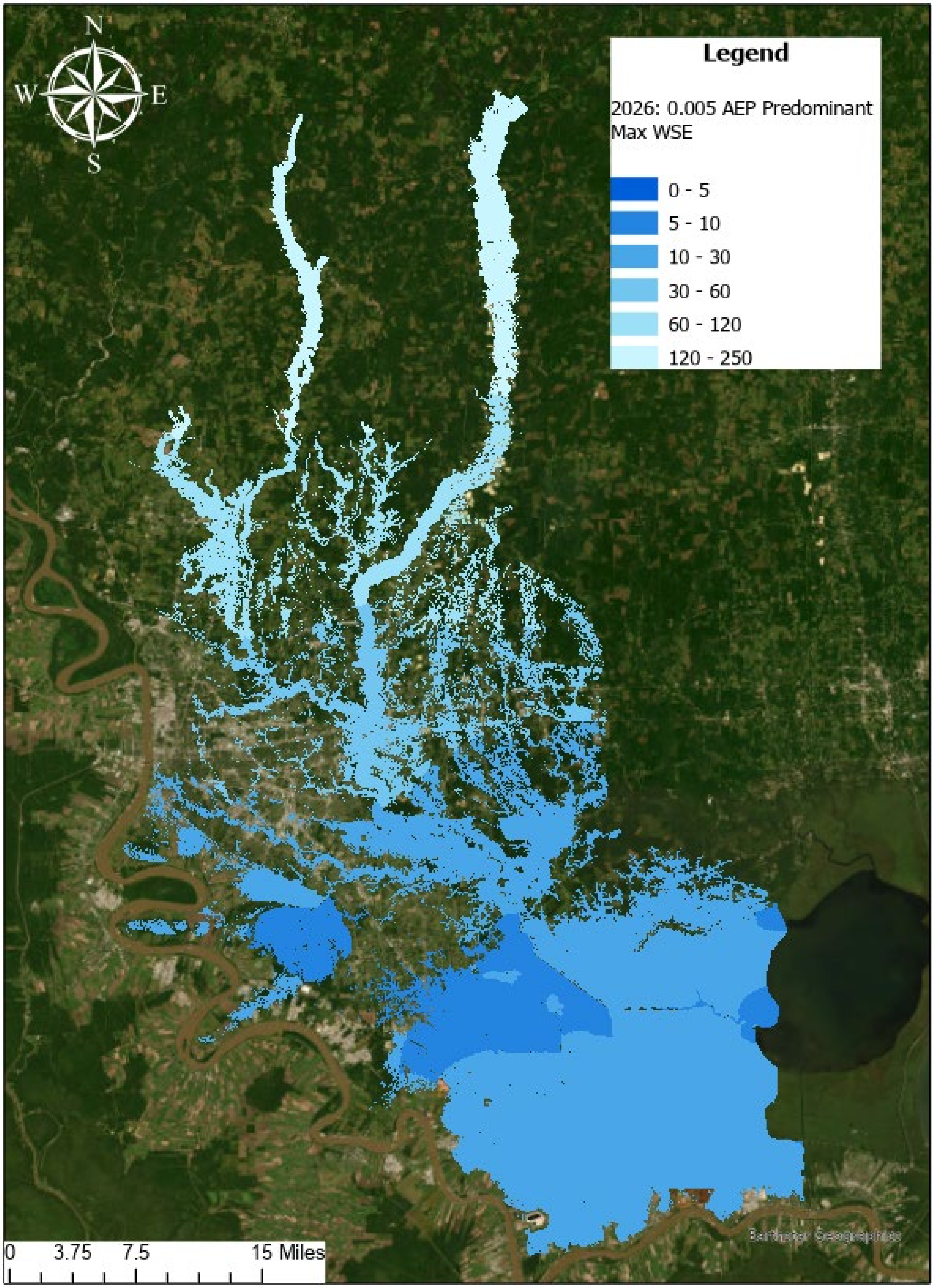

N
W
E
S
Legend
2076: 0.002 AEP Coastal Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles
Earthstar Geographics

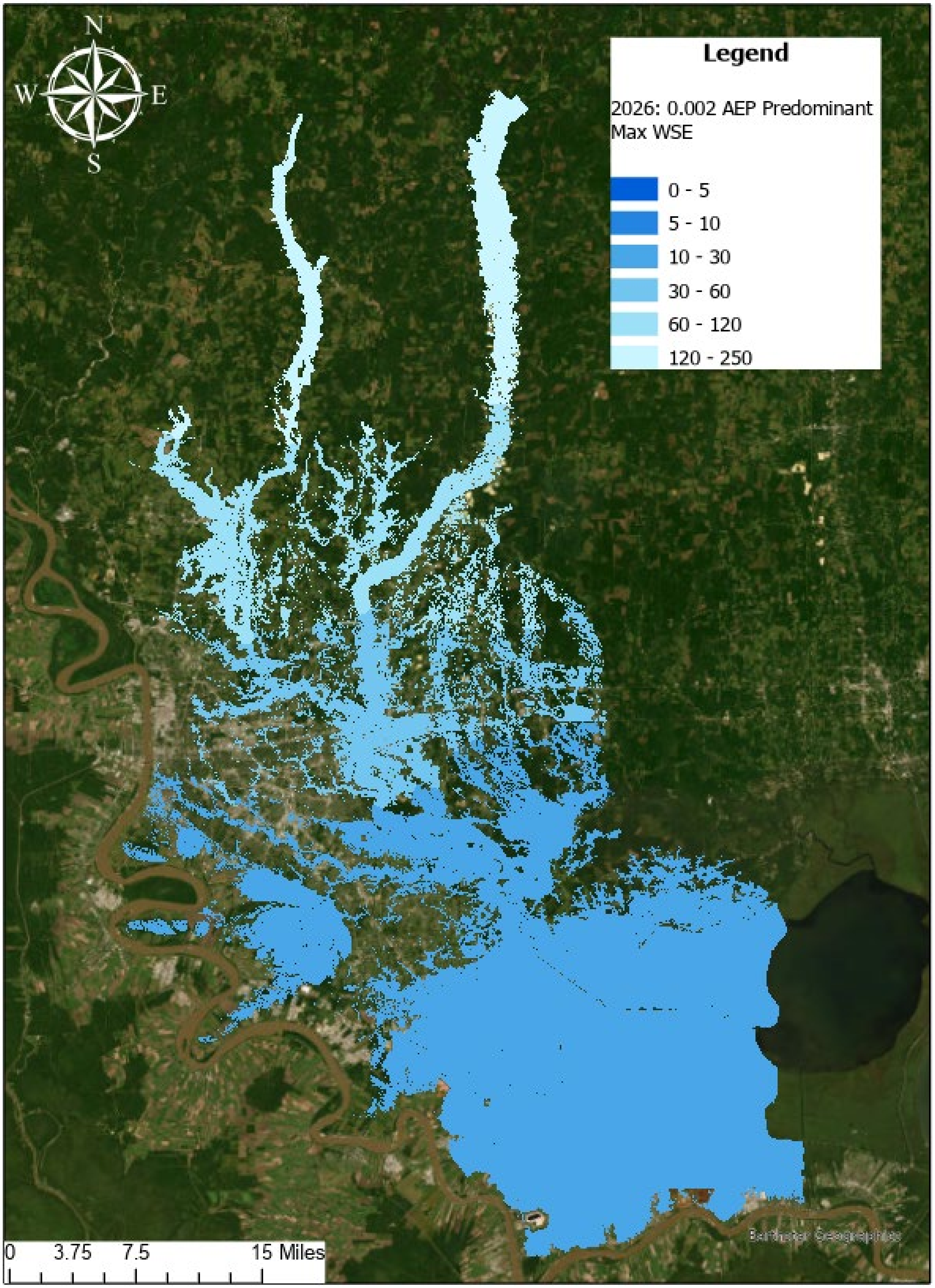

N
W
E
S
Legend
2026: 0.1 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
Earthstar Geographics
0
3.75
7.5
15 Miles

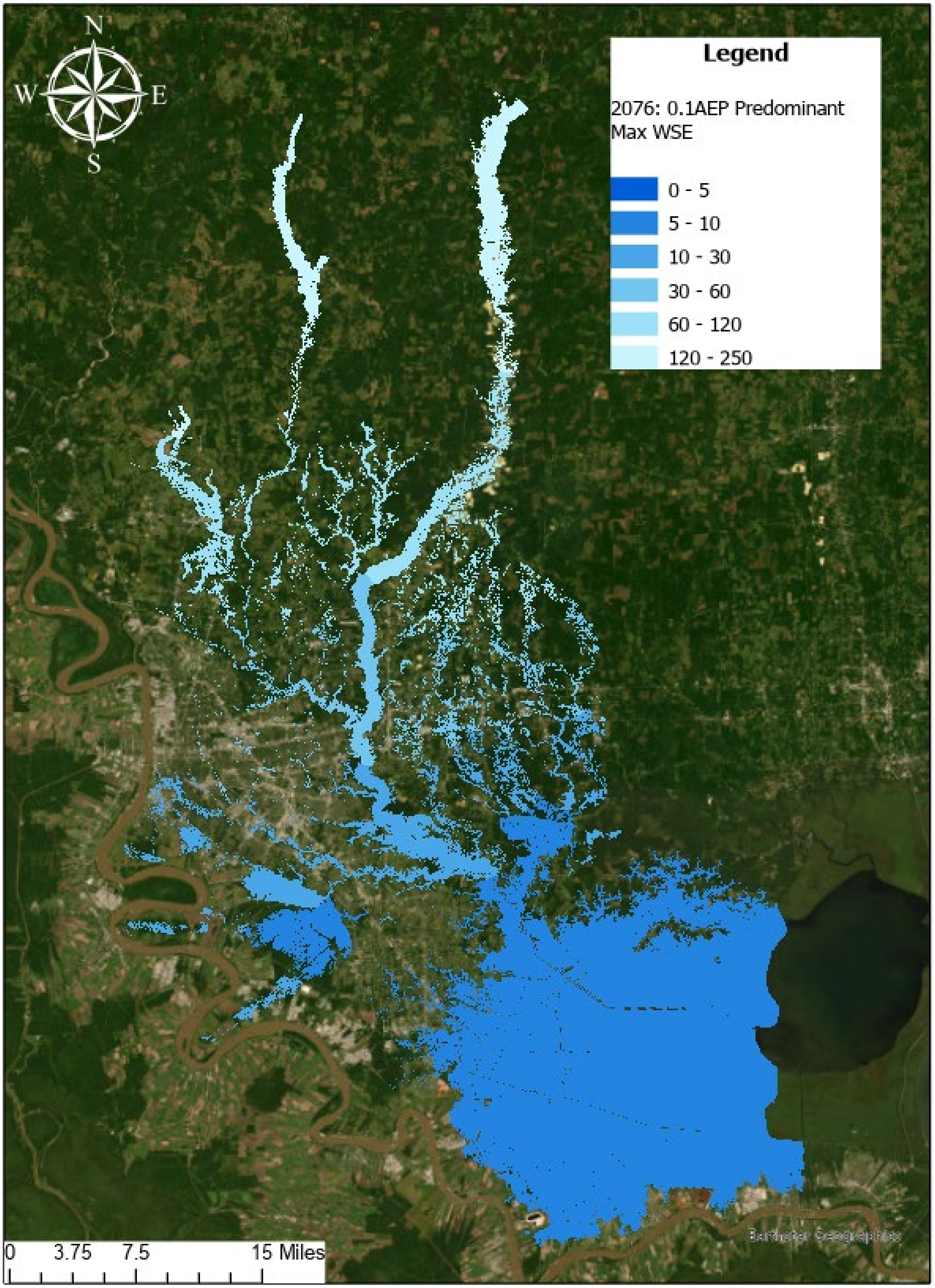

N
W
E
S
Legend
2026: 0.04 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

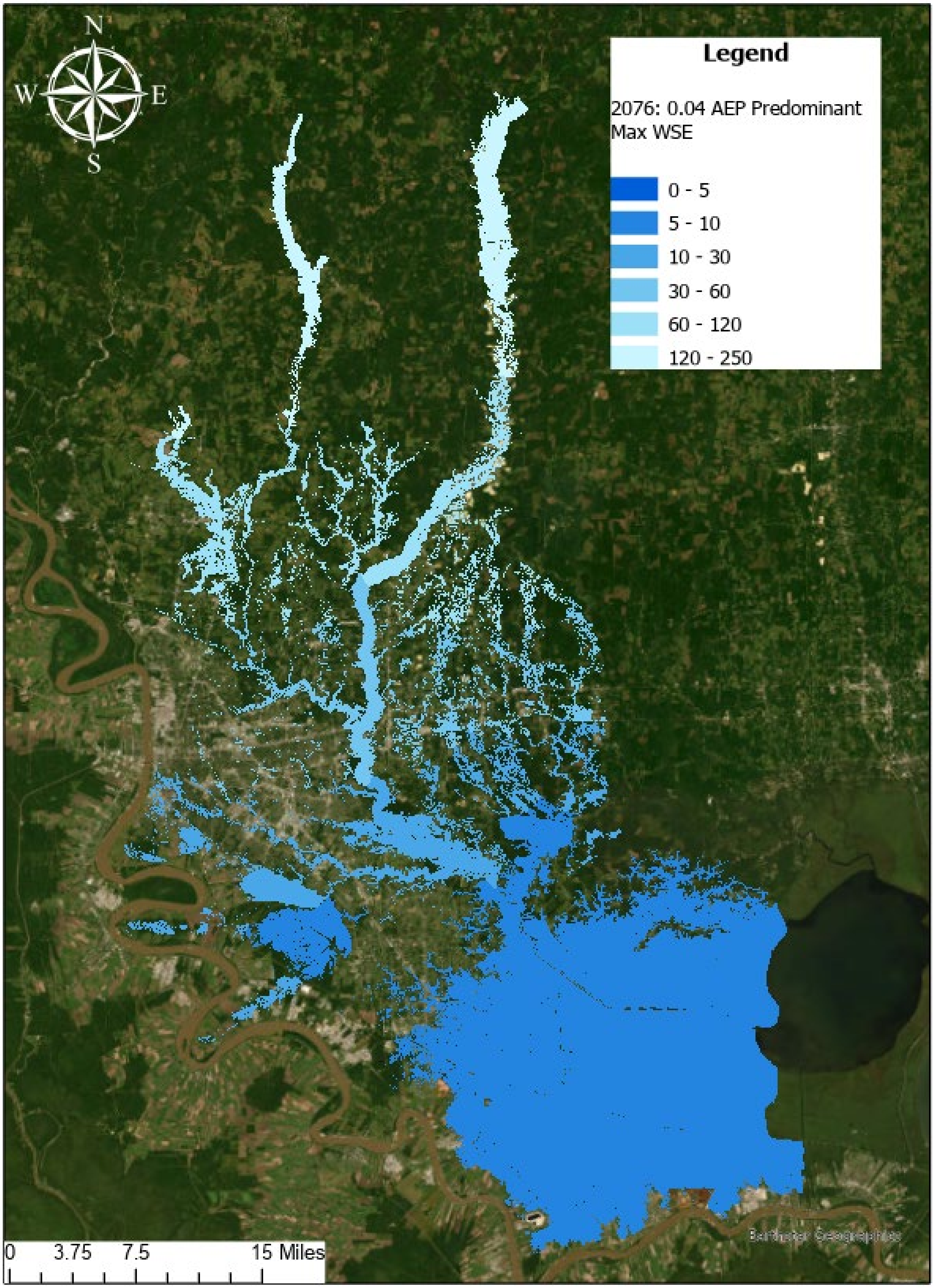

N
S
E
W
Legend
2026: 0.02 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles
Earthstar Geographics

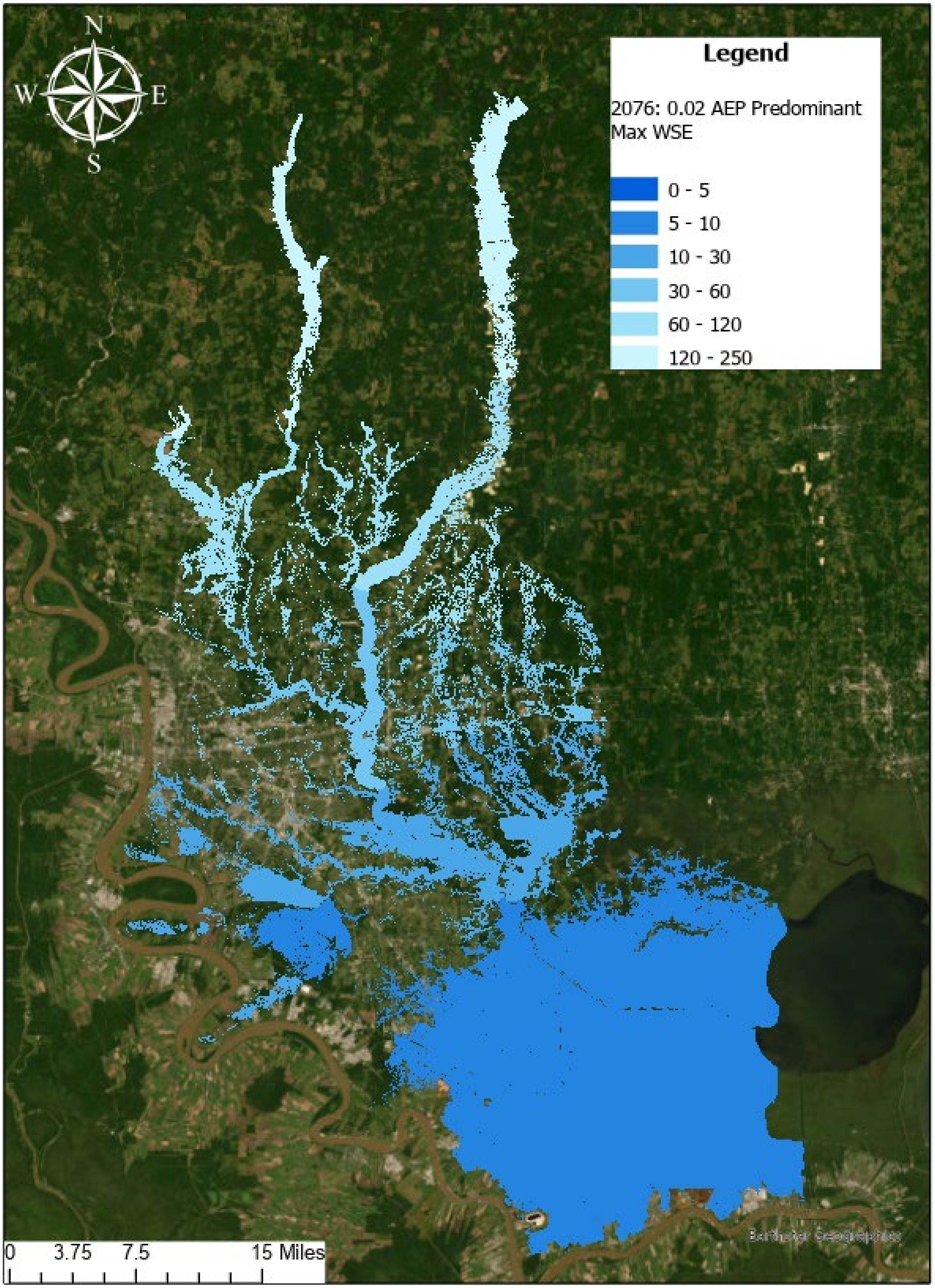

N
W
E
S
Legend
2026: 0.01 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles

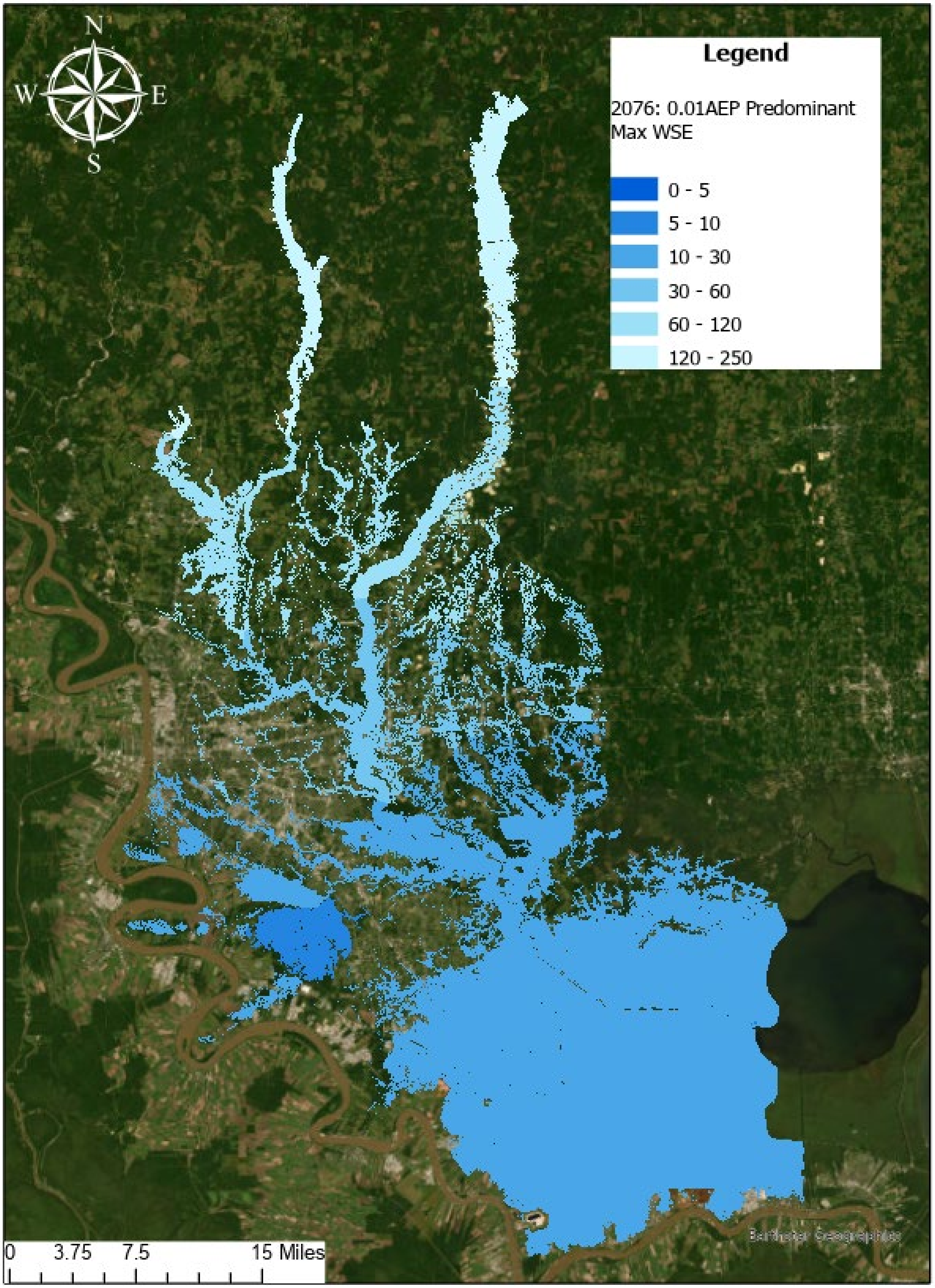

N
W
E
S
Legend
2026: 0.005 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

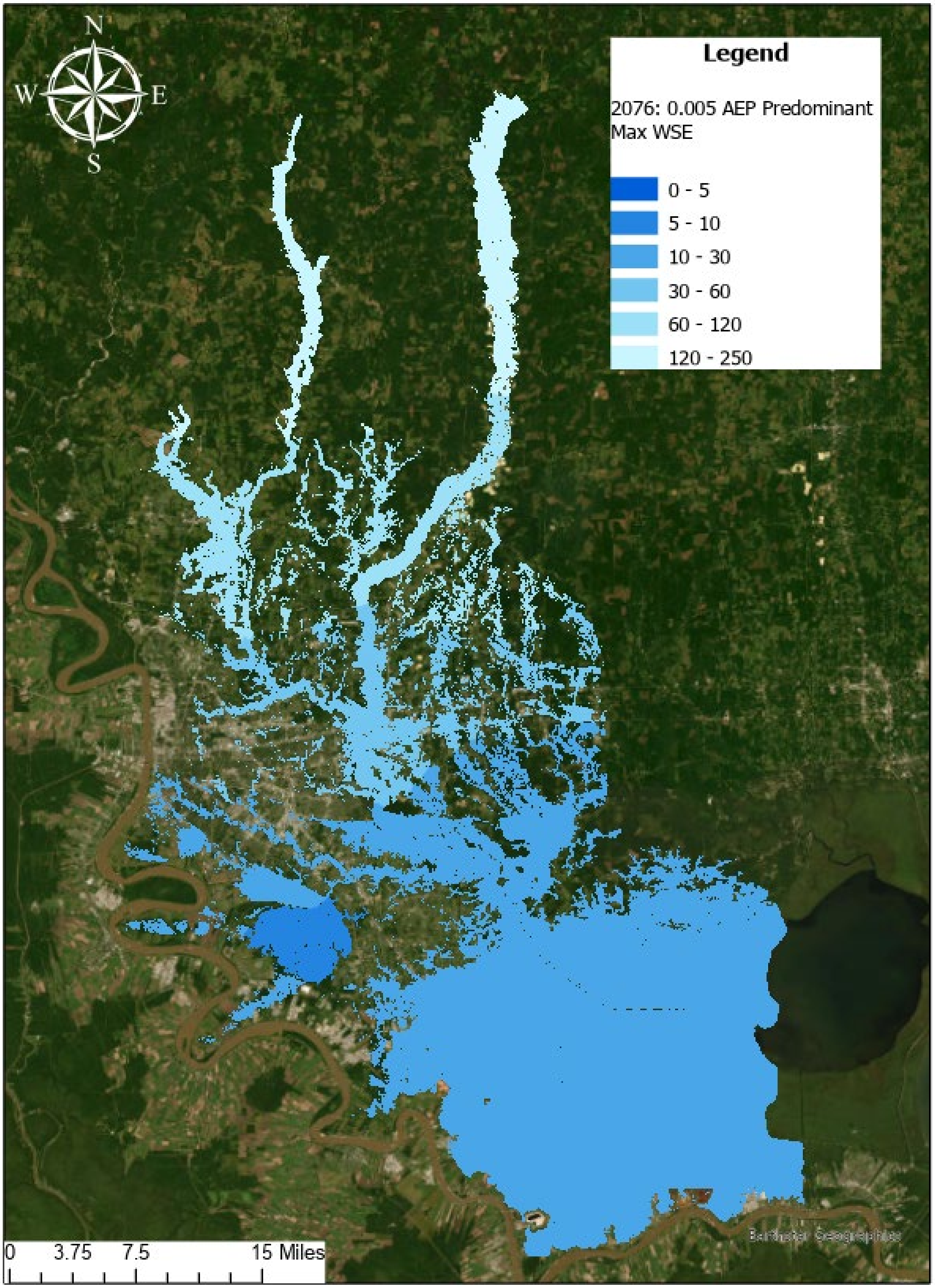

N
W
E
S
Legend
2026: 0.002 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

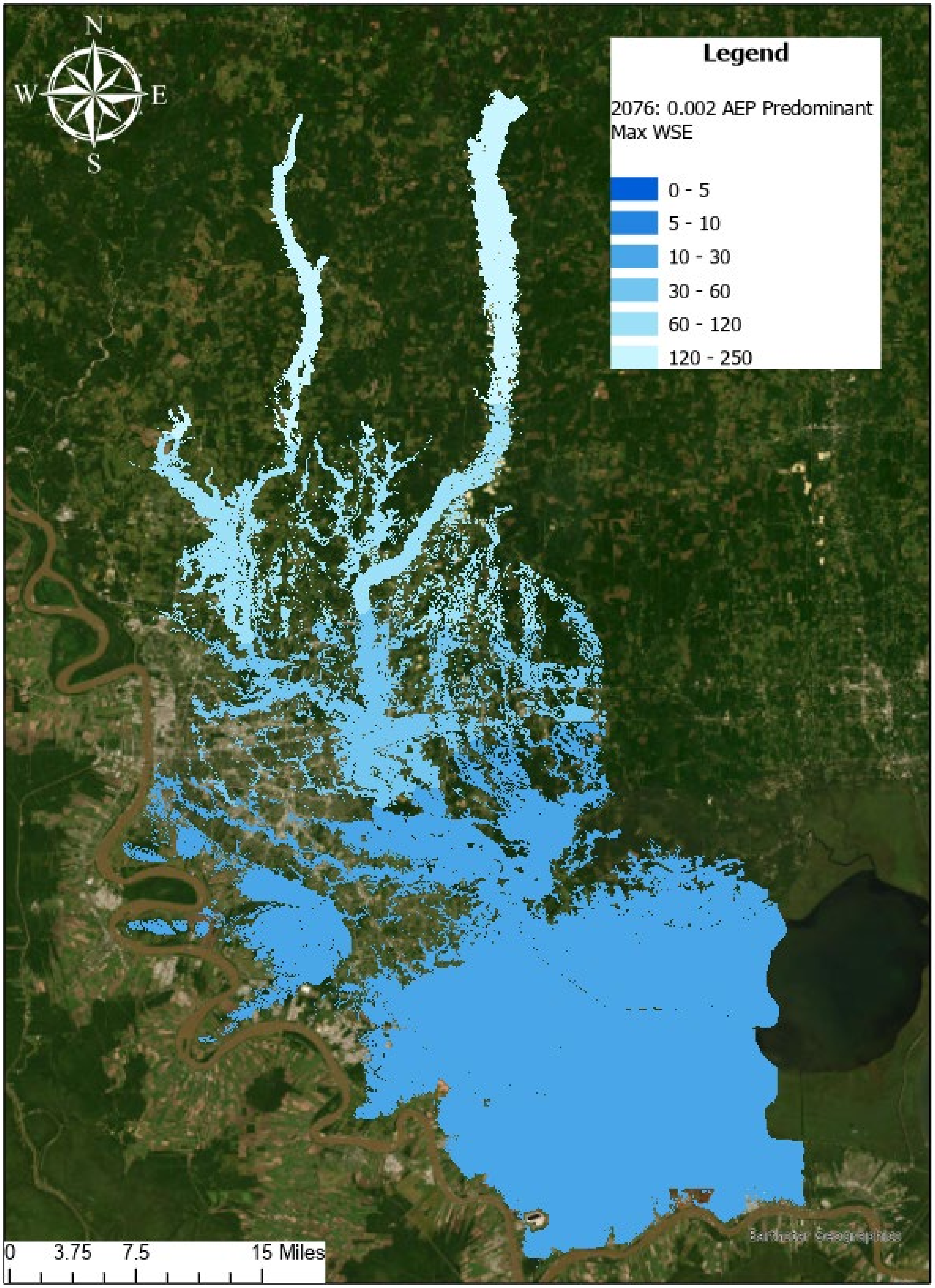

N
W
E
S
Legend
2076: 0.1AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles
Earthstar Geographics


N
W
E
S
Legend
2076: 0.04 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles
Earthstar Geographics

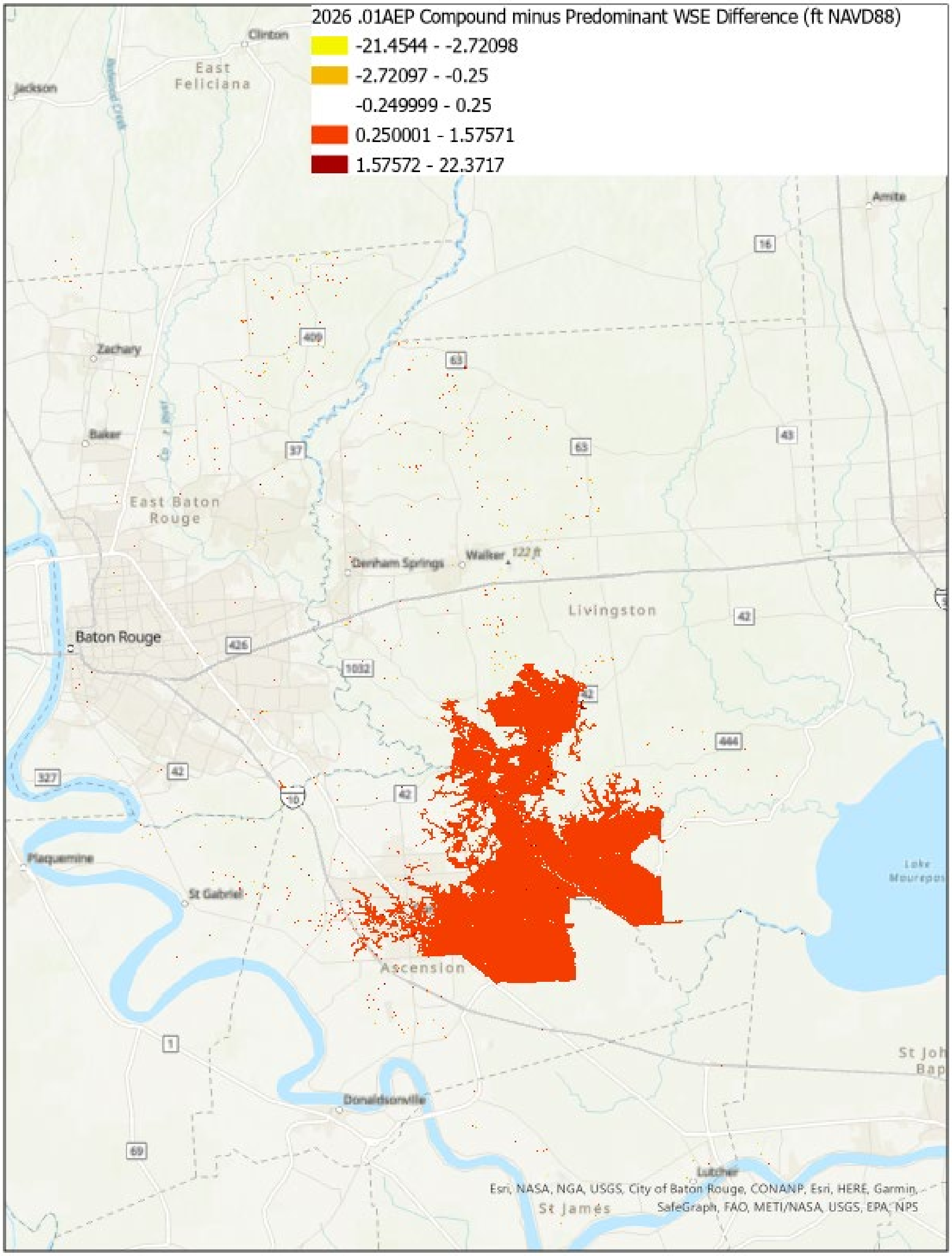

N
S
E
W
Legend
2076: 0.02 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles
Earthstar Geographics

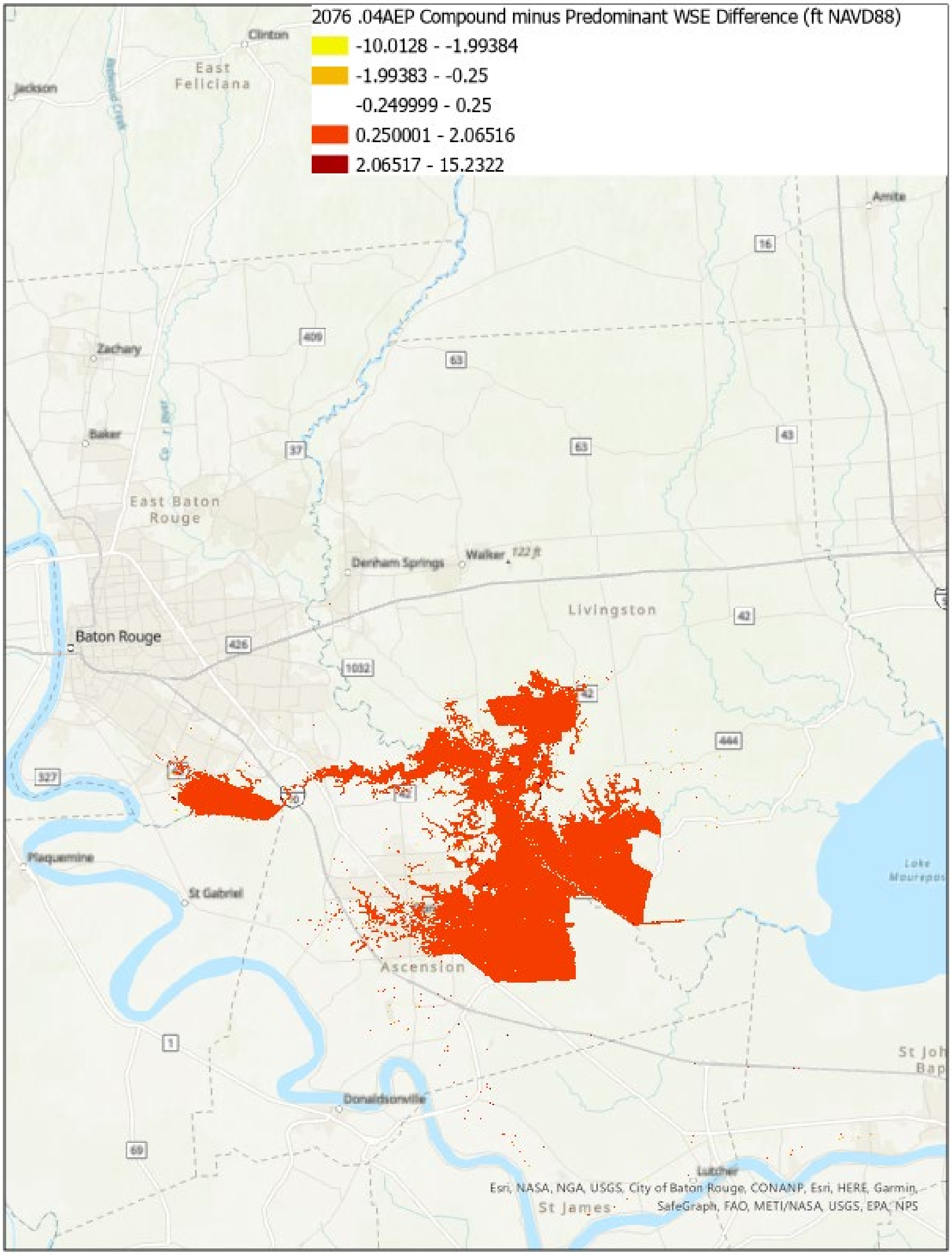

N
W
E
S
Legend
2076: 0.01AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0
3.75
7.5
15 Miles
Earthstar Geographics

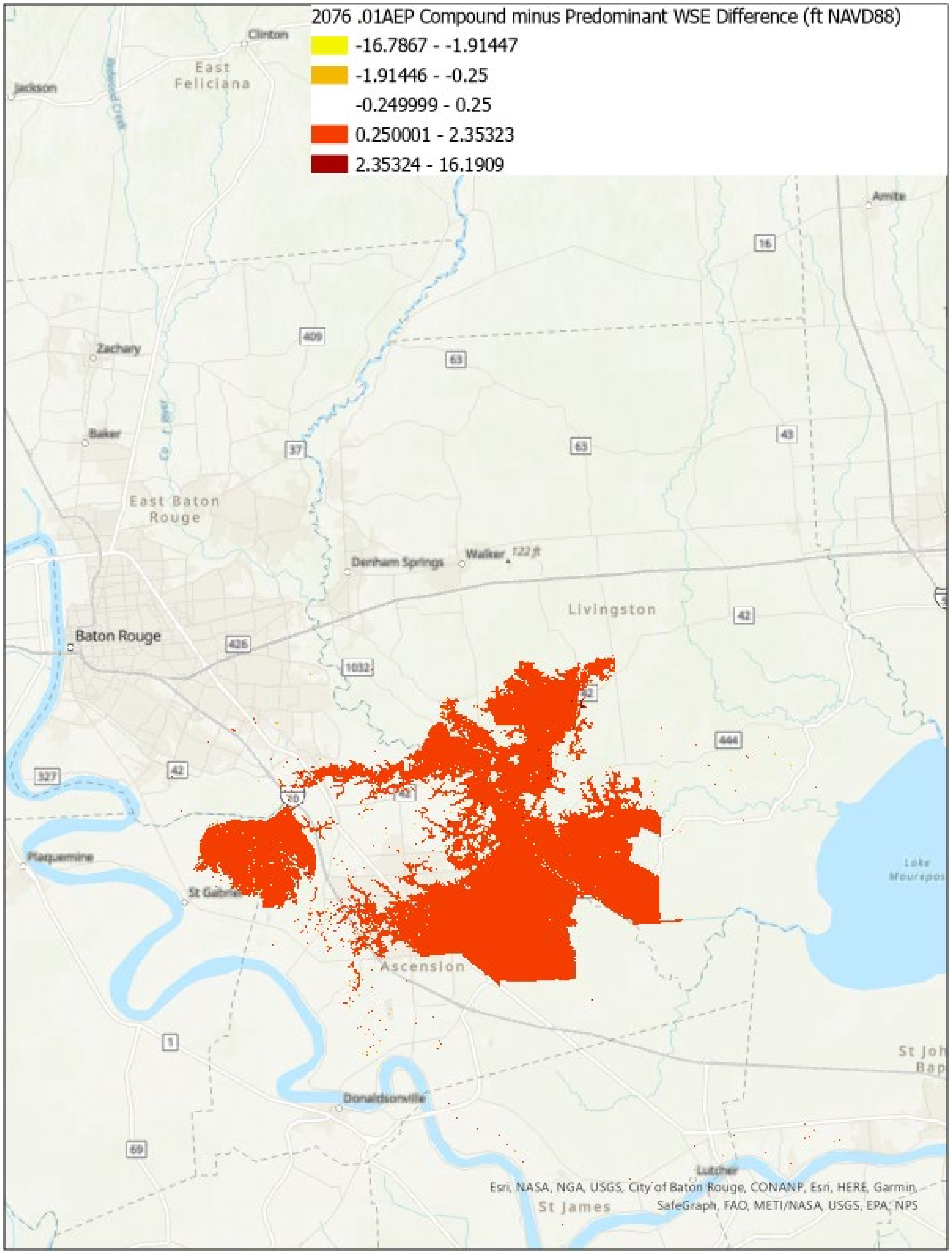

N
W
E
S
Legend
2076: 0.005 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles


N
S
W
E
Legend
2076: 0.002 AEP Predominant Max WSE
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
0 3.75 7.5 15 Miles

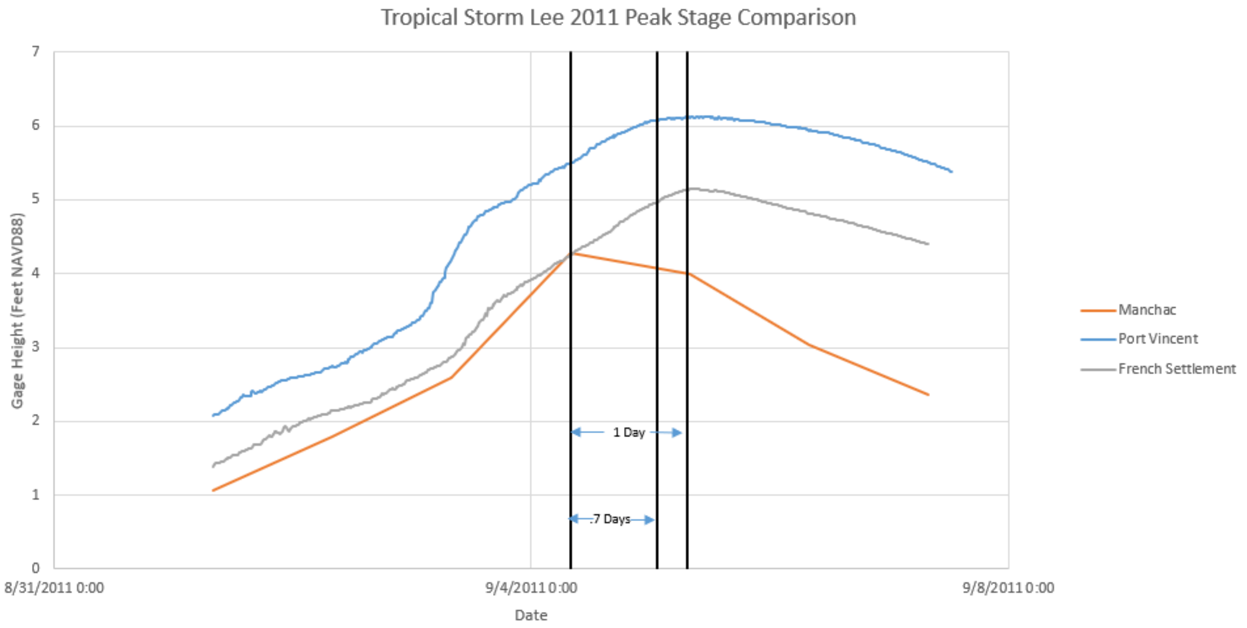
8.2 Annex H-2: Predominant versus Compound Flood Comparison Figures

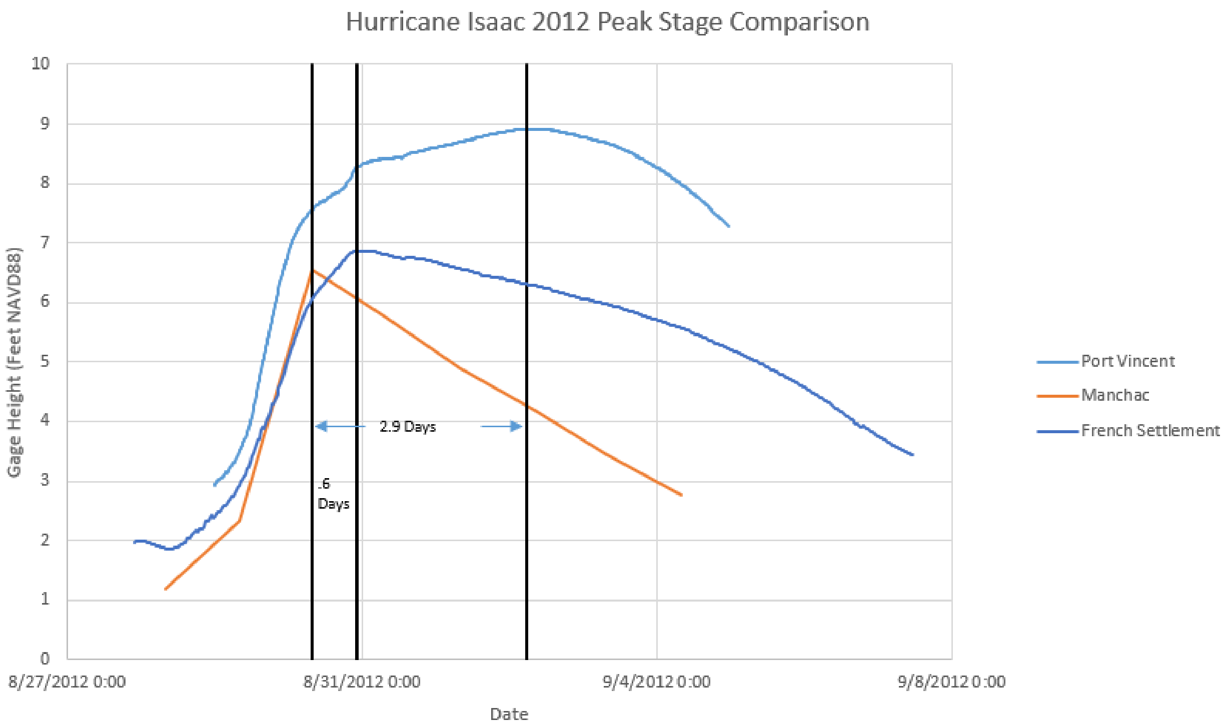


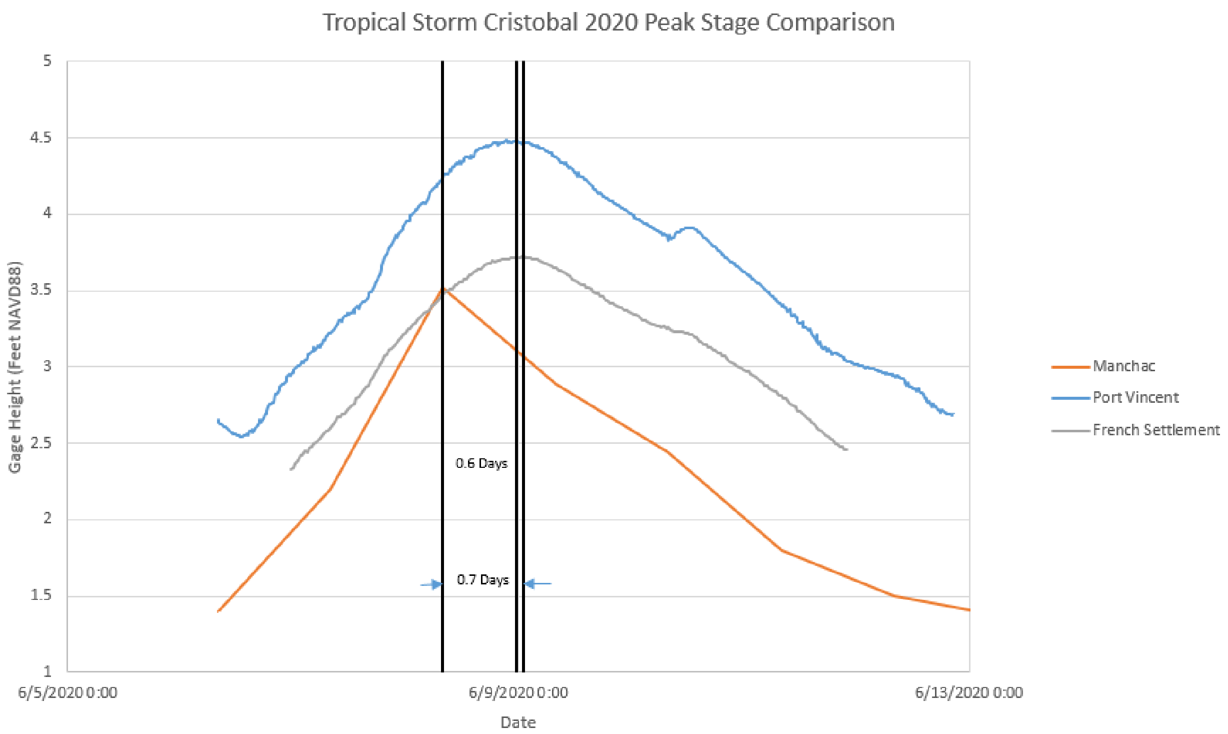

2076 .04AEP Compound minus Predominant WSE Difference (ft NAVD88)
-10.0128 - -1.99384
-1.99383 - -0.25
-0.249999 - 0.25
0.250001 - 2.06516
2.06517 - 15.2322
Clinton
East Feliciana
Jackson
Amite
Zachary
Baker
East Baton Rouge
Denham Springs
Walker
Livingston
Baton Rouge
Plaquemine
St Gabriel
Ascension
Donaldsonville
Lutcher
St James
Esri, NASA, NGA, USGS, City of Baton Rouge, CONANP, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

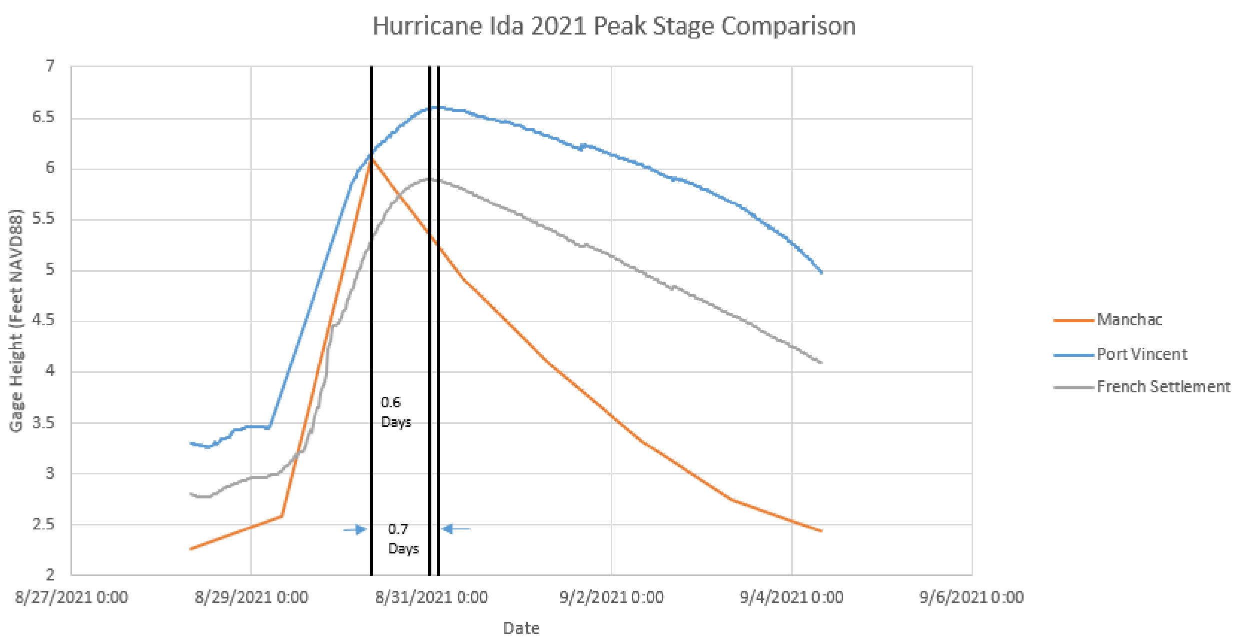

2076 .01AEP Compound minus Predominant WSE Difference (ft NAVD88)
-16.7867 - -1.91447
-1.91446 - -0.25
-0.249999 - 0.25
0.250001 - 2.35323
2.35324 - 16.1909
East Feliciana
Clinton
Jackson
Zachary
Baker
East Baton Rouge
Baton Rouge
Denham Springs
Walker
Livingston
Amite
Plaquemine
St Gabriel
Ascension
Donaldsonville
Lutcher
St James
Esri, NASA, NGA, USGS, City of Baton Rouge, CONANP, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

8.3 Annex H-3: Compound Flood Analysis - Gage Lag Time Plots

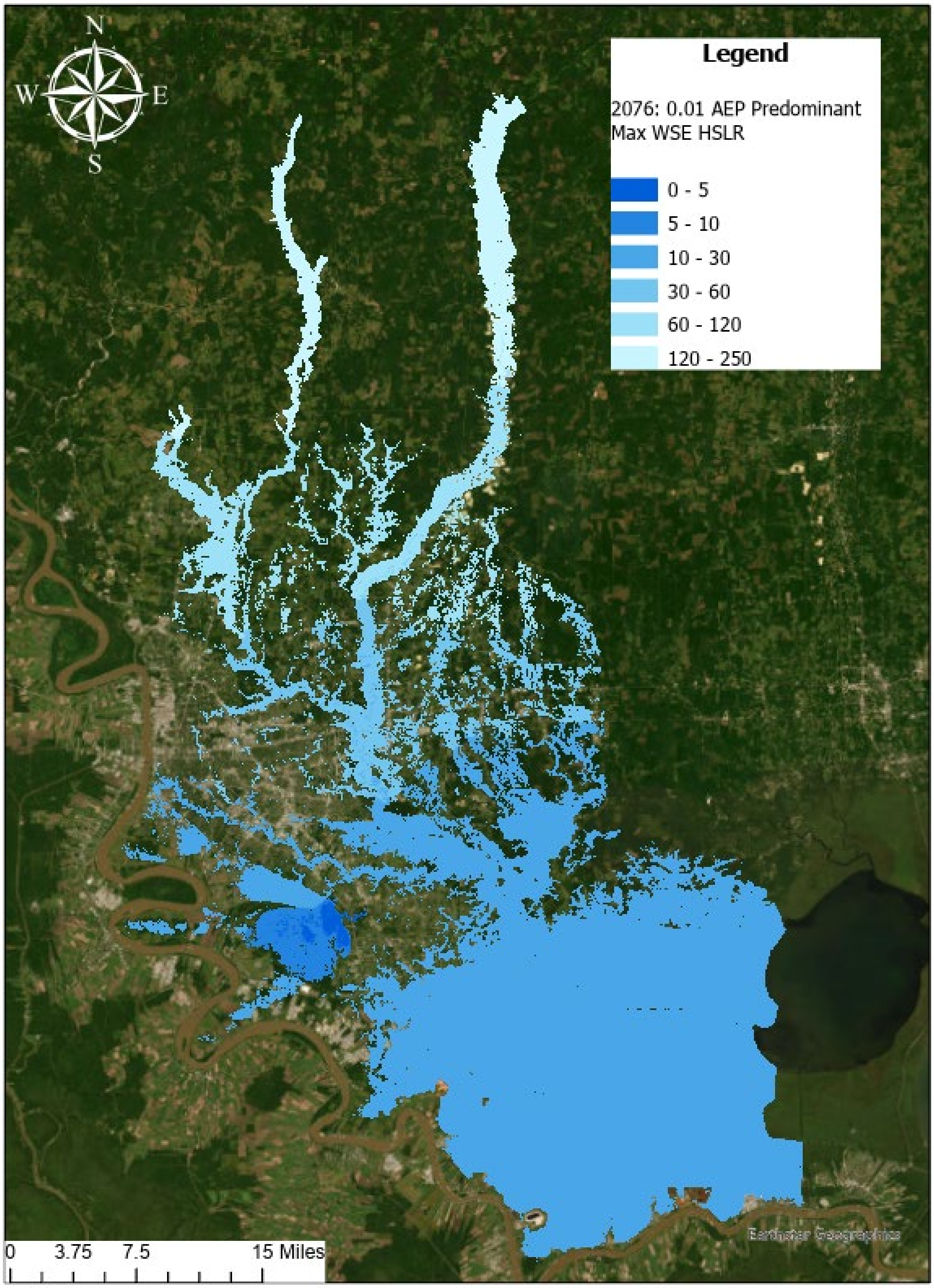


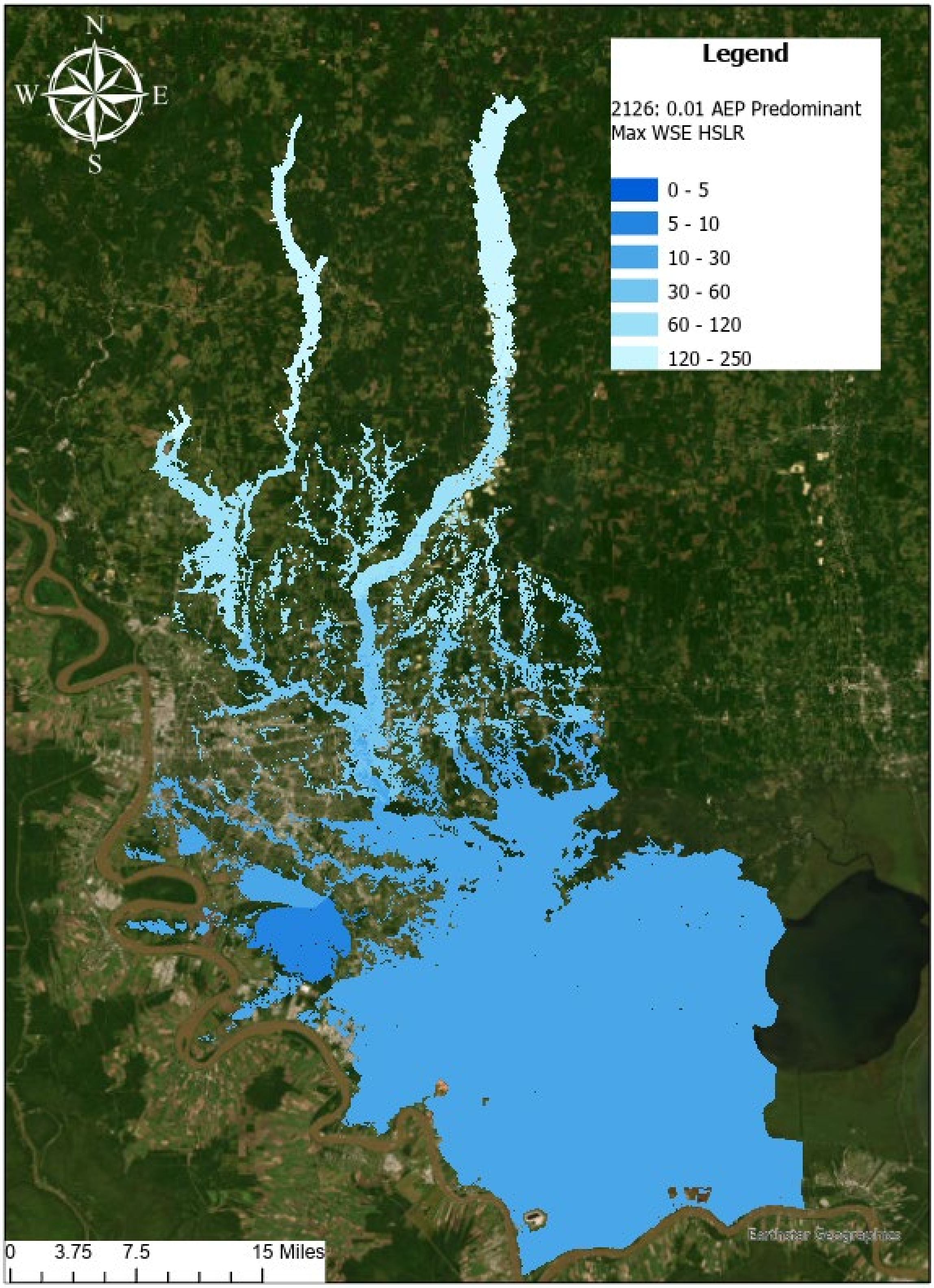



Tropical Storm Cristobal 2020 Peak Stage Comparison
Gage Height (Feet NAVD88)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.6 Days
0.7 Days
6/5/2020 0:00
6/9/2020 0:00
6/13/2020 0:00
Date
Manchac
Port Vincent
French Settlement


Hurricane Ida 2021 Peak Stage Comparison
Gage Height (Feet NAVD88)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
0.6
Days
0.7
Days
8/27/2021 0:00
8/29/2021 0:00
8/31/2021 0:00
9/2/2021 0:00
9/4/2021 0:00
9/6/2021 0:00
Date
Manchac
Port Vincent
French Settlement

8.4 Annex H-4: WSE Outputs for High Sea Level Rise Sensitivity Runs




Legend
2126: 0.01 AEP Predominant
Max WSE HSLR
0 - 5
5 - 10
10 - 30
30 - 60
60 - 120
120 - 250
N
S
E
W
0
3.75
7.5
15 Miles
Earthstar Geographics

8.5 Annex H-5: Hydrologic Parameters

Hydrologic Parameters for Baseline Conditions Year 2026

Subbasin	Initial Content	Saturated Content	Suction	Conductivity	Impervious %
AllenByu_HWY1032	0.24	0.34	6.55	0.042	14.723
AlligatorT_Bluff	0.25	0.35	6.99	0.034	24.689
AmiteDivCnl_C01	0.21	0.29	11.09	0.008	0.32278
AmiteDivCnl_C02	0.19	0.26	10.59	0.012	1.9516
AmiteDivC_HWY22	0.19	0.27	8.42	0.026	5.0764
AmiteRT34_HWY16	0.23	0.32	6.12	0.048	18.7578473
AmiteR_BarbByu	0.24	0.34	7.59	0.037	0.59844
AmiteR_BeaverCrk	0.24	0.33	6.45	0.043	0.31386
AmiteR_BluffCrk	0.22	0.31	7.29	0.082	0.98757
AmiteR_ChaneyBr	0.27	0.38	8.4	0.018	1.9461
AmiteR_ChinqCan	0.24	0.33	8.23	0.027	2.5637
AmiteR_ClearCrk	0.24	0.34	5.51	0.056	0.73317
AmiteR_ColBay	0.2	0.29	6.96	0.025	3.5710
AmiteR_C01	0.23	0.32	6.31	0.041	0.69007
AmiteR_C02	0.21	0.3	5.91	0.038	2.3832
AmiteR_C03	0.23	0.32	6.22	0.046	0.72344
AmiteR_C04	0.22	0.32	6.18	0.039	7.1112
AmiteR_C05	0.23	0.32	6.25	0.047	5.4095
AmiteR_C06	0.23	0.33	6.76	0.032	8.6628
AmiteR_C07	0.23	0.32	6.32	0.041	5.1488
AmiteR_C08	0.23	0.33	6.31	0.041	19.699
AmiteR_C09	0.23	0.32	6.31	0.054	2.9932
AmiteR_C10	0.23	0.32	6.3	0.041	13.018
AmiteR_C11	0.25	0.35	7.42	0.03	12.184
AmiteR_C12	0.23	0.32	6.43	0.041	14.810
AmiteR_C13	0.22	0.31	6.21	0.04	4.2200
AmiteR_C14	0.23	0.32	6.31	0.053	1.9264
AmiteR_C15	0.24	0.34	7.04	0.029	3.4939
AmiteR_DarlingCrk	0.24	0.33	6.45	0.049	0.79697
AmiteR_HendByu	0.16	0.22	8.77	0.02	7.8905
AmiteR_HWY16	0.21	0.3	9.06	0.021	2.5172
AmiteR_HWY22	0.25	0.35	8.87	0.027	0.83423
AmiteR_KingGByu	0.24	0.34	8.88	0.027	1.5132
AmiteR_L03	0.24	0.34	6.37	0.041	27.497
AmiteR_Magnolia	0.24	0.34	7.03	0.06	12.071
AmiteR_Maurepas	0.26	0.36	10.43	0.016	0.86512
AmiteR_PigeonCrk	0.21	0.3	7.73	0.06	0.74927
AmiteR_PtVincent	0.21	0.29	6.27	0.033	4.5773
AmiteR_RockyCrk	0.21	0.3	7.45	0.055	0.66443
AmiteR_R03	0.26	0.36	6.85	0.039	34.110
AmiteR_StateHwy10	0.21	0.3	6.58	0.047	0.49325
AmiteR_StateHwy37	0.2	0.28	7.2	0.06	0.65396
AmiteR_StateHwy432	0.22	0.31	6.58	0.041	0.56963
AmiteR_US_Div	0.04	0.05	3.77	0.004	2.4739
AmiteR_WhittenCrk	0.23	0.32	7.2	0.052	1.0736
AmiteR_17	0.24	0.34	6.86	0.06	1.1705
AmiteR_18	0.26	0.37	7.4	0.033	0.56497
AntiochC_LeeMrtn	0.25	0.35	6.56	0.042	1.1370
BeaverBr_CnMkt	0.23	0.32	6.55	0.042	13.484
BeaverBr_DuffRd	0.23	0.32	6.55	0.042	8.2960
BeaverBr_RR	0.23	0.32	6.55	0.042	6.6681
BeaverByuNP_Hoop	0.23	0.33	6.53	0.041	14.739

BeaverByuNP_US	0.22	0.31	6.56	0.042	10.364
BeaverByu_Denham	0.22	0.31	6.56	0.041	3.0422
BeaverByu_French	0.25	0.35	6.94	0.036	17.338
BeaverByu_GrnSp	0.24	0.33	6.51	0.04	23.236486
BeaverByu_Hooper	0.22	0.31	6.52	0.041	6.0753
BeaverByu_US_LOC	0.23	0.32	6.57	0.041	2.2699
BeaverByu_Wax	0.23	0.32	6.55	0.039	9.2804
BeaverCrk_01	0.28	0.39	6.12	0.049	1.3090
BeaverCrk_02	0.27	0.38	6.18	0.048	0.48949
BeaverCrk_03	0.27	0.38	5.98	0.05	0.49493
BeaverCrk_04	0.26	0.37	6.21	0.046	0.28041
BeaverCrk_05	0.24	0.34	6.12	0.047	0.48243
BeaverCrk_06	0.22	0.3	6.21	0.041	0.26139
BeaverCrk_07	0.22	0.31	6.35	0.041	0.32677
BeaverC2_CnMkt	0.22	0.32	6.55	0.042	17.116
BeaverC2_ForeRd	0.22	0.32	6.57	0.042	10.3381436
BeaverC2_HWY16	0.23	0.32	6.44	0.043	20.842
BeaverC2_Magnol	0.23	0.33	6.47	0.043	26.513
BeaverC2_Sprgfld	0.23	0.32	6.56	0.042	25.043
BeaverC3_DS_Pear	0.22	0.31	7.22	0.041	0.38158
BeaverC3_Jackson	0.25	0.36	7.31	0.042	1.0266
BeaverC3_LSandy	0.23	0.32	7.02	0.042	0.23095
BeaverC3_Milldal	0.25	0.35	6.75	0.042	0.73204
BeaverC3_Peairs	0.23	0.32	6.85	0.042	0.80608
BeaverC3_US_LOC	0.25	0.35	7.03	0.042	0.77363
BeaverPondByu_DS	0.23	0.32	6.44	0.039	0.30185
BeaverPondByu_US	0.25	0.35	6.56	0.041	0.27816
BFountainNP	0.23	0.33	6.79	0.039	27.468
BFountNBr_Boyd	0.3	0.42	11.83	0.011	72.1858883
BFountNBr_Lee	0.24	0.33	11.34	0.015	32.0528194
BFountSBr_BF	0.2	0.29	12.02	0.009	17.297
BFountSBr_Gour	0.23	0.32	12.27	0.008	45.999
BFountSBr_US	0.31	0.44	10.21	0.02	53.402
BFountT1_DS	0.22	0.32	7.22	0.035	16.7117172
BFountT1_Highlnd	0.24	0.34	6.66	0.041	37.865
BFount_BFSBr	0.2	0.28	12.41	0.007	52.696
BFount_Bluebon	0.21	0.29	8.42	0.034	35.483
BFount_Burbank	0.27	0.39	12.14	0.009	34.035
BFount_BurbankDr	0.22	0.31	7.58	0.034	34.082
BFount_ByuManch	0.19	0.26	11.15	0.015	6.2996
BFount_ElbowByu	0.17	0.23	11.01	0.016	31.328
BFount_Nich_DS	0.15	0.22	12.2	0.01	29.420
BFount_Nich_US	0.34	0.48	11.96	0.01	72.902
BFount_US_Trib	0.17	0.23	10.49	0.02	7.4834
BirchCrk_01	0.25	0.35	4.72	0.069	1.2671
BlackCrk_01	0.25	0.35	4.93	0.066	0.0019691
BlackCrk_02	0.2	0.29	6.39	0.048	0.37477
BlackCrk_03	0.25	0.35	5.18	0.062	1.0179
BlackCrk_04	0.25	0.35	4.94	0.065	1.1032
BlackCrk_05	0.23	0.32	5.6	0.057	0.19161
BlackCrk_06	0.21	0.3	6.62	0.043	1.1174
BlackCrk_07	0.21	0.29	6.42	0.046	0.35036
BlackCrk_08	0.24	0.33	6.04	0.05	1.5068
BlackCrk_09	0.24	0.33	5.71	0.058	1.3245
BLACKCR_CMB	0.26	0.37	6.45	0.041	0.34810
BLACKCR_HWY412	0.26	0.36	6.55	0.042	0.30503
BlackwtrBT1_BB	0.23	0.33	6.55	0.042	9.1557
BlackwtrBT1_Core	0.23	0.32	6.57	0.042	2.4212

BlackwtrBT1_Mcul	0.22	0.31	6.55	0.041	3.1923
BlackwtrBT2_BB	0.23	0.32	6.53	0.042	1.7124
BlackwtrBT2_DW	0.23	0.32	6.56	0.042	1.3900
BlackwtrBT3_US	0.23	0.32	6.46	0.043	2.2482
BlackwtrB_BBT1	0.23	0.32	6.59	0.041	2.0121
BlackwtrB_BBT2	0.22	0.31	6.56	0.042	1.7963
BlackwtrB_Comite	0.23	0.33	6.57	0.041	12.772
BlackwtrB_McCull	0.22	0.31	6.56	0.042	6.2855
BlackwtrB_US	0.22	0.31	6.48	0.041	0.54737
BlackwtrT3_DS	0.22	0.31	6.53	0.043	1.4630
BluffCrk_AmiteR	0.23	0.32	6.54	0.044	0.73484
BluffCrk_01	0.24	0.33	6.85	0.039	0.65580
BluffCrk_02	0.22	0.31	7.15	0.037	0.52837
BluffCrk_03	0.19	0.27	7.63	0.033	0.75950
BluffCrk_04	0.2	0.28	7.43	0.035	0.17941
BluffCrk_05	0.2	0.28	7.41	0.035	0.40574
BluffCrk_06	0.2	0.28	7.36	0.035	0.64808
BluffCrk_07	0.21	0.3	7.22	0.036	0.59503
BluffSwamp_Gage	0.23	0.32	7.92	0.027	30.022
ByuBraud_HWY30	0.13	0.19	10.83	0.019	16.177
ByuBraud_HWY74	0.11	0.15	12.24	0.01	20.580
ByuBraud_US_LOC	0.18	0.25	10.15	0.029	9.9852
ByuDuplant_LeeDr	0.28	0.39	8.81	0.025	23.718
ByuDuplant_NrDaw	0.26	0.37	8.13	0.03	21.230
ByuManch_Airline	0.21	0.3	6.76	0.038	30.314
ByuManch_BFount	0.19	0.27	9.48	0.022	9.6016
ByuManch_Cotton	0.22	0.32	6.44	0.039	8.3104
ByuManch_Gator	0.19	0.27	10.69	0.029	12.217
ByuManch_NrAmite	0.22	0.31	6.85	0.04	6.5531
ByuManch_NrLiPra	0.23	0.32	6.46	0.04	3.6651
ByuManch_NrMSRiv	0.2	0.28	8.28	0.034	16.124
ByuManch_Perkins	0.23	0.32	6.43	0.036	30.1701488
ByuManch_Welsh	0.21	0.3	6.41	0.039	25.997
ByuPaul_HWY30	0.18	0.25	10.75	0.034	1.0466
ByuPaul_US_HWY30	0.16	0.23	10.67	0.028	2.9060
ByuPaul_US_LOC	0.16	0.23	11.38	0.023	2.4796
CampCreek_HWY42	0.24	0.34	6.69	0.042	0.83508
ChaneyBr_HWY16	0.23	0.32	6.49	0.041	2.9566
ChinqCan_C01	0.26	0.37	10.85	0.015	0.59205
ChinqCan_C02	0.25	0.35	9.94	0.018	2.8574
ClayCut_Airline	0.3	0.43	9.34	0.025	70.440
ClayCut_AntiochR	0.24	0.33	6.9	0.041	42.587
ClayCut_CalRd	0.26	0.37	7.56	0.036	47.481
ClayCut_Inns	0.24	0.34	6.64	0.041	52.619
ClayCut_JacksB	0.27	0.38	7.92	0.034	52.137
ClayCut_NrAmite	0.23	0.33	6.4	0.041	9.0344
ClayCut_Siegen	0.28	0.4	8.36	0.031	68.083
ClayCut_US_Tiger	0.24	0.34	6.85	0.041	20.025
ClaytonByuT1	0.23	0.32	6.54	0.043	6.9108
ClaytonByu_Bend	0.22	0.31	6.4	0.044	14.714
ClearCrkT1_01	0.25	0.35	6.56	0.042	0.22820
ClearCrkT1_02	0.25	0.34	6.55	0.042	0.25593
ClearCrk_01	0.25	0.36	6.32	0.046	0.26314
ClearCrk_02	0.25	0.35	6.39	0.044	0.68698
ClearCrk_03	0.23	0.32	6.54	0.04	1.1078
ClearCrk_04	0.24	0.34	6.55	0.042	0.79159
ClintonAllenLat	0.23	0.32	6.54	0.042	10.857
ClyellCrkNP	0.24	0.34	6.54	0.042	1.4517

ClyellT9_DS_FL	0.26	0.36	6.57	0.042	3.1219
ClyellT9_FL	0.26	0.36	6.56	0.042	0.74846
Clyell_CB	0.24	0.34	7.03	0.039	1.4374
Clyell_DS_I12	0.25	0.35	6.55	0.042	3.1873
Clyell_DS_LigoLn	0.22	0.31	6.51	0.043	1.2261676
Clyell_FLBlvd	0.25	0.35	6.56	0.042	1.7015
Clyell_I12	0.24	0.34	6.56	0.042	2.3278
Clyell_JoelWatts	0.24	0.34	6.56	0.042	1.1747
Clyell_LigoLn	0.24	0.34	6.54	0.042	1.5288
Clyell_LilClyell	0.24	0.34	6.57	0.042	1.0330
Clyell_LodStafrd	0.23	0.33	6.48	0.041	0.80894
Clyell_US_LOC	0.24	0.33	6.57	0.042	0.87043
Clyell_W_Hood	0.24	0.34	6.57	0.042	0.29336
ColtonCrk_HWY16	0.23	0.32	6.39	0.041	19.577
ColyellBay	0.24	0.33	7.41	0.037	1.7259
COMITE_atComite	0.22	0.31	7	0.088	1.3061
COMITE_Baker	0.23	0.33	6.76	0.071	3.1388
COMITE_DenhamSpr	0.25	0.34	6.47	0.055	13.447
COMITE_dsJOORRD	0.25	0.35	7.17	0.036	10.715
COMITE_dsLA37	0.23	0.32	6.43	0.044	14.171
COMITE_DS_OB	0.22	0.31	5.98	0.084	2.7268
COMITE_HooperRd	0.24	0.34	6.76	0.058	9.4396
COMITE_Hurricane	0.23	0.32	6.55	0.039	8.3836
COMITE_nrComite	0.26	0.37	7.74	0.053	3.6714
COMITE_RR	0.23	0.32	6.43	0.055	3.1842
COMITE_usLA37	0.25	0.36	7.23	0.032	15.661
COMITE_US_OB	0.22	0.3	6.17	0.039	3.5024
COMITE_Zachary	0.23	0.32	6.48	0.056	1.4482
CooperMillB_BC	0.26	0.36	6.5	0.041	2.5463
CooperMillB_Midw	0.24	0.34	6.55	0.042	5.6997
CooperMillB_UWB	0.22	0.31	6.07	0.038	0.88789
CorpCanalNP	0.3	0.42	10.32	0.018	57.073
CorpCanal_Myrtle	0.32	0.45	9.55	0.023	68.716
CorpCanal_Stanfrd	0.34	0.48	10.42	0.013	47.923
CorpCanal_State	0.33	0.46	10.23	0.017	55.738
DarlingCrk_AmiteR	0.2	0.29	7.95	0.041	0.80363
DarlingCrk_01	0.25	0.35	5.29	0.062	0.58469
DarlingCrk_02	0.25	0.34	4.84	0.066	0.49348
DarlingCrk_03	0.25	0.35	4.89	0.066	0.33802
DarlingCrk_04	0.24	0.34	5.42	0.059	0.33313
DarlingCrk_05	0.24	0.34	5.44	0.058	0.59307
DarlingCrk_06	0.24	0.34	6.25	0.059	0.32537
DarlingCrk_07	0.24	0.34	5.23	0.063	0.43465
DarlingCrk_08	0.23	0.33	5.45	0.059	0.73648
DarlingCrk_09	0.22	0.3	5.81	0.054	0.85908
DarlingCrk_10	0.23	0.33	5.5	0.057	0.97239
DarlingCrk_11	0.19	0.27	7.02	0.043	0.35708
DarlingCrk_12	0.19	0.26	8.12	0.036	0.68996
DarlingCrk_13	0.2	0.28	7.58	0.041	2.0228
DawsonCr_Bluebon	0.27	0.38	7.97	0.032	38.771
DawsonCr_College	0.3	0.42	9.13	0.026	44.4804083
DawsonCr_GovtSt	0.3	0.42	9.04	0.027	56.107
DawsonCr_Hund_DS	0.28	0.4	8.35	0.03	35.505
DawsonCr_QuailDr	0.27	0.38	8.23	0.032	41.939
DawsonCr_WardCr	0.28	0.4	8.49	0.03	53.245
DraughnsC_French	0.24	0.34	6.57	0.037	12.639
DraughnsC_GrnSpr	0.23	0.32	6.55	0.041	12.349
DraughnsC_MagBr	0.22	0.32	6.56	0.041	21.651

DuffByu_Jackson	0.23	0.33	6.64	0.042	1.7328
DuffByu_PtHud	0.26	0.36	6.58	0.042	0.29514
DuffB_DS_Jack	0.24	0.33	6.58	0.04	1.0838
DumplinC_DS_RR	0.24	0.34	6.57	0.042	30.589
DumplinC_I12	0.23	0.33	6.46	0.041	18.758
DumplinC_RR	0.22	0.31	6.53	0.042	13.630
DumplinC_US_LOC	0.22	0.31	6.55	0.042	14.160
DunnCrk_01	0.26	0.36	6.65	0.043	0.0148556
DunnCrk_02	0.23	0.32	6.9	0.041	0.38838
DunnCrk_03	0.26	0.36	5.59	0.055	0.79527
DunnCrk_04	0.25	0.36	5.57	0.055	0.56951
EastForkAmite_01	0.25	0.35	6.43	0.043	1.0971
EastForkAmite_02	0.27	0.38	6.16	0.048	0.54958
EastForkAmite_03	0.26	0.37	5.83	0.053	0.60027
EastForkAmite_04	0.26	0.37	5.87	0.051	0.46100
EFDumplin_Corbin	0.22	0.31	6.55	0.042	5.3992
EFDumplin_RR	0.23	0.32	6.52	0.042	19.431
ELatCypB_Lavey	0.26	0.37	6.57	0.042	26.556
ELatCypB_LCB	0.23	0.33	6.63	0.041	19.207
ElbowBayou	0.14	0.2	10.91	0.015	4.1475
ElbowByu_Burbank	0.18	0.25	10.33	0.022	6.4746
ENGINEERDEPOT_DS	0.25	0.35	6.73	0.041	32.4815429
ENGINEERDEPOT_US	0.28	0.39	7.8	0.034	48.736
FeldersB_BrownRd	0.25	0.35	6.57	0.042	5.0476
FeldersB_DSJMay	0.24	0.34	6.6	0.042	6.8146
FeldersB_WC	0.23	0.33	7.18	0.042	20.3136039
FlanaganByu_SC	0.24	0.33	6.62	0.042	1.1087
FlanaganByu_01	0.24	0.34	7.33	0.041	0.10746
FlatLake	0.15	0.22	9.86	0.014	1.6352
GatorByu_Gage	0.17	0.24	9.64	0.019	6.6041
GatorByu_USGage	0.14	0.2	11.21	0.015	6.0133
GraysCrkBr_BMcD	0.25	0.36	6.55	0.042	34.789
GraysCrkBr_Dunn	0.24	0.34	6.3	0.046	21.193
GraysCrkBr_I12	0.24	0.33	6.57	0.042	28.892
GraysCrkBr_RR	0.25	0.36	6.45	0.041	24.885
GraysCrkBr_USI12	0.24	0.34	6.57	0.042	15.633
GraysCrkLat_RR	0.23	0.33	6.45	0.043	32.240
GraysCrk_Hwy1033	0.24	0.34	6.49	0.043	5.0771
GraysCrk_HWY16	0.25	0.35	6.52	0.042	13.373
GraysCrk_I12	0.24	0.34	6.57	0.042	25.698
GraysCrk_Julban	0.22	0.31	5.83	0.037	15.817
GraysCrk_NrAmite	0.24	0.34	6.53	0.042	3.9243
GraysCrk_RR	0.24	0.34	6.56	0.042	29.655
GraysCrk_US	0.25	0.35	6.55	0.042	31.059
GraysCrk_WaxD	0.24	0.33	6.57	0.042	24.438
HannaC_PrideBar	0.21	0.3	7.19	0.037	0.39341
HareLat_Airline	0.26	0.37	7.5	0.036	44.206
HareLat_OldHmd	0.26	0.37	7.32	0.034	49.169
HendByu_DSPtVinc	0.24	0.34	6.82	0.032	8.8496
HendByu_HWY431	0.22	0.31	7.93	0.029	6.6224
HendByu_Joboy	0.24	0.33	6.57	0.042	25.642
HendByu_NrPtVinc	0.24	0.34	6.52	0.039	22.903462
HendByu_US_Timbr	0.24	0.34	6.57	0.036	18.8210413
HogBayou_BC	0.26	0.37	6.53	0.042	0.0410698
HoneyCut_East	0.26	0.37	7.02	0.039	46.597
HoneyCut_NrAmite	0.26	0.37	7.12	0.038	28.236
HoneyCut_West	0.27	0.38	6.95	0.04	45.153
HornsbyCrk_CnMkt	0.24	0.34	6.52	0.042	0.87147

HornsbyCrk_DSCan	0.25	0.35	6.56	0.042	1.2479
HornsbyCrk_FLBd	0.24	0.34	6.55	0.042	4.7545
HornsbyCrk_HCT1	0.23	0.32	6.48	0.043	1.9965
HornsbyCrk_HCT3	0.23	0.32	6.55	0.042	0.80977
HornsbyCT1_Corbn	0.23	0.32	6.53	0.042	1.2429
HornsbyCT3_Corbn	0.22	0.31	6.49	0.043	0.83705
HornsbyCT3_HC	0.22	0.31	6.53	0.042	1.1953
HornsbyC_I12	0.24	0.34	6.5	0.041	5.8602
HubByu_DS_GS_PH	0.22	0.31	6.53	0.041	1.5891
HubByu_GrnwelSpr	0.22	0.31	6.52	0.042	4.7680
HubByu_GS_PtHud	0.23	0.32	6.56	0.041	1.6434
HubByu_Peairs	0.22	0.31	6.47	0.043	0.17180
HunterByu_01	0.2	0.28	7.58	0.034	0.11622
HunterByu_02	0.2	0.28	7.46	0.034	0.20264
HunterByu_03	0.22	0.31	6.96	0.04	0.11391
HunterByu_04	0.21	0.29	7.41	0.034	0.72964
HunterByu_05	0.21	0.29	7.25	0.036	0.42069
HURRICANE_dsJOOR	0.25	0.36	7.2	0.038	37.3431941
HURRICANE_HOWELL	0.28	0.39	7.77	0.035	39.5094315
HURRICANE_Joor	0.27	0.38	8.02	0.034	33.617
HURRICANE_Presct	0.26	0.36	7.19	0.039	37.593
HURRICANE_Wildwd	0.27	0.37	7.66	0.036	47.5165675
IndianByu_PtHud	0.25	0.35	7.5	0.042	1.0859
IndianByu_UWB	0.24	0.34	7.54	0.042	0.89337
JacksB_Claycut	0.25	0.35	6.73	0.041	51.0796345
JacksB_ParkFor	0.3	0.42	8.4	0.031	55.294
JoinerCrk_01	0.19	0.26	6.46	0.048	0.45325
JoinerCrk_02	0.25	0.35	4.83	0.067	0.15623
JoinerCrk_03	0.24	0.34	4.84	0.067	0.75277
JoinerCrk_04	0.25	0.35	4.7	0.069	1.2911
JoinerCrk_05	0.23	0.32	5.47	0.059	0.45938
JoinerCrk_06	0.22	0.31	6.11	0.054	0.62268
JonesBayou	0.24	0.34	7.59	0.041	4.4986
JonesCr_Airline	0.34	0.48	10.81	0.017	70.532
JonesCr_FLBlvd	0.28	0.39	8.35	0.032	49.452
JonesCr_Mont	0.28	0.4	8.71	0.029	55.750
JonesCr_NrAmite	0.23	0.33	6.34	0.036	28.484
JonesCr_OldHamd	0.27	0.38	7.51	0.036	41.540
JonesCr_ONealLn	0.25	0.36	6.89	0.035	42.330
JonesCr_WeinerCr	0.27	0.39	7.73	0.034	46.875
KnoxBr_Firewood	0.26	0.37	7.07	0.036	53.614348
KnoxBr_ONealLn	0.24	0.34	6.47	0.041	39.615
LCypByu_Comite	0.25	0.35	7.11	0.039	13.959
LCypByu_DS_Lavey	0.21	0.3	6.9	0.039	8.9461
LCypByu_GBL	0.27	0.38	8.58	0.033	25.915
LCypByu_Hooper	0.23	0.33	7.48	0.041	11.256
LCypByu_Lavey	0.24	0.34	7.21	0.04	20.359
LCypByu_Thomas	0.24	0.33	7.3	0.041	8.1149
LCypByu_US_SL	0.25	0.35	7.02	0.041	16.664
LilClyell_DS_I12	0.24	0.34	7.68	0.039	4.8898
LilClyell_I12	0.24	0.33	6.51	0.042	7.5698
LilClyell_L01	0.25	0.36	6.53	0.043	8.6743
LilClyell_Prloux	0.22	0.31	8.22	0.042	7.8638
LilClyell_Range	0.23	0.33	6.53	0.043	23.691
LilClyell_RangLn	0.24	0.33	7.35	0.042	1.7862
LilClyell_Satsu	0.24	0.34	6.89	0.042	3.2243
LilSndyC2_DS_Jac	0.22	0.31	7.32	0.041	0.90336
LilSndyC2_DS_Mil	0.23	0.32	6.64	0.041	3.0768

LilSndyC2_DS_Per	0.23	0.32	6.46	0.041	0.75879
LilSndyC2_Jack	0.23	0.32	6.62	0.041	0.63725
LilSndyC2_Lib	0.23	0.32	6.33	0.044	0.54631
LilSndyC2_Milld	0.22	0.31	6.68	0.042	1.0885
LilSndyC2_Peairs	0.23	0.32	6.59	0.041	1.1749
LilSndyC2_US_Jac	0.23	0.33	6.89	0.041	0.79547
LilSndyC2_US_LOC	0.21	0.3	7.32	0.036	0.38812
LilSndyC2_Wind	0.23	0.32	6.48	0.043	0.58583
LittleSandyCrk_01	0.2	0.28	7.42	0.035	0.86589
LittleSandyCrk_02	0.2	0.29	7.33	0.035	0.81863
LittleSandyCrk_03	0.19	0.27	7.57	0.033	0.66558
LittleSandyCrk_04	0.2	0.28	7.53	0.034	0.39079
LittleSandyCrk_05	0.2	0.28	7.46	0.035	0.30085
LittleSandyCrk_06	0.21	0.29	7.14	0.037	0.29685
LivelyBT_FL	0.29	0.41	8.32	0.032	56.229
LivelyBT_LB	0.27	0.38	7.21	0.039	50.357
LivelyB_FLBlvd	0.28	0.39	7.72	0.035	39.952
LivelyB_HoneyCut	0.28	0.39	7.6	0.036	43.403
LivelyB_LBT	0.26	0.37	7.36	0.037	55.135
LivelyB_Pvt	0.25	0.36	6.57	0.042	10.351
LongSlashBranch	0.24	0.34	6.32	0.046	41.730
LSU_NP_MaySt	0.25	0.35	7.15	0.029	34.950
LSU_NP_Stanfrd	0.16	0.22	4.76	0.019	19.399
LWhiteByu_Comite	0.25	0.35	7.25	0.041	15.384
LWhiteByu_Pettit	0.23	0.33	7.57	0.041	5.8383
LWhiteByu_US_Pet	0.24	0.34	7.77	0.041	8.9864
MidClyellT3	0.23	0.32	6.57	0.042	4.7465
MidClyellT5_CnMk	0.23	0.32	6.52	0.042	7.3276483
MidClyellT5_MC	0.23	0.33	6.55	0.042	4.3389
MidClyellT5_Sprg	0.22	0.31	6.53	0.042	2.8569
MidClyellT6_GalG	0.24	0.33	6.55	0.042	18.635
MidClyellT6_MC	0.22	0.31	6.54	0.042	5.2490
MidClyell_CB	0.25	0.35	6.94	0.04	1.5404
MidClyell_CnMkt	0.24	0.33	6.5	0.043	1.7291
MidClyell_FLBlvd	0.23	0.32	6.57	0.042	5.8383
MidClyell_HoodRd	0.24	0.34	6.56	0.042	0.88321
MidClyell_I12	0.24	0.34	6.59	0.041	9.6887
MidClyell_MCT1	0.23	0.32	6.5	0.043	1.4727
MidClyell_MCT3	0.23	0.32	6.57	0.042	1.3646
MidClyell_MCT5	0.24	0.34	6.56	0.042	6.0060
MidClyell_MCT6	0.23	0.32	6.55	0.042	7.6729
MidClyell_TylrBy	0.24	0.34	6.55	0.042	3.0558
MidClyell_US_LOC	0.21	0.29	7.25	0.04	1.1465
MidClyell_WeissR	0.23	0.32	6.54	0.042	0.77599
MillCrk_CarsonRd	0.23	0.32	6.51	0.041	1.9742
MillCrk_MahoneyRd	0.2	0.28	7.47	0.034	0.55722
MillCrk_PrideBar	0.22	0.31	6.36	0.039	1.0121
MillC_SandyC	0.23	0.32	6.57	0.042	0.83369
MillersCT_I12	0.24	0.34	6.57	0.042	26.636
MillersCT_MC	0.24	0.33	6.45	0.041	36.358
MillersCT_UnT	0.24	0.34	6.55	0.043	44.669
MillersC_Julban	0.25	0.35	6.54	0.042	14.935
MolerB_CnMkt	0.22	0.31	6.56	0.042	2.0932
MolerB_Springfld	0.22	0.31	6.55	0.042	7.5495
MolerB_WC	0.21	0.3	6.5	0.041	8.2659
MuddyCrk_Henry	0.25	0.35	6.65	0.041	31.573
MuddyCrk_HWY42	0.24	0.34	6.6	0.04	19.8114269
MuddyCrk_LilPra	0.25	0.35	6.52	0.039	20.079

MuddyCrk_NrManch	0.25	0.35	6.71	0.038	14.587
MuddyCrk_NrOakGr	0.25	0.36	6.57	0.037	20.0852463
NBrWardsCr_atBR	0.28	0.39	8.14	0.032	47.344
NBrWardsCr_FL	0.33	0.46	10.08	0.021	64.625
NBrWardsCr_Hare	0.31	0.43	9.44	0.025	58.947
NBrWardsCr_I10	0.28	0.39	8.07	0.033	46.571
NewR_Maurepas	0.29	0.41	11.78	0.006	0.0227242
ROBERTCN_dsJOOR	0.23	0.32	6.88	0.041	10.771
ROBERTCN_Grnwell	0.25	0.35	7.49	0.037	36.330
ROBERTCN_Joor	0.23	0.32	6.87	0.042	11.061
ROBERTCN_T	0.24	0.33	6.74	0.041	36.252
ROBERTCN_US_LOC	0.26	0.36	7.06	0.039	30.201
RobertsByu_01	0.2	0.28	7.54	0.033	1.3567
RobertsByu_02	0.19	0.27	7.62	0.032	0.15016
RobertsByu_03	0.2	0.27	7.58	0.033	0.22279
RobertsByu_04	0.2	0.28	7.25	0.036	0.18000
SandyCrk_01	0.24	0.34	6.78	0.04	1.0143
SandyCrk_02	0.24	0.33	6.77	0.039	1.3716
SandyCrk_03	0.22	0.3	7.05	0.036	0.23185
SandyCrk_04	0.25	0.35	6.55	0.042	0.25371
SandyCrk_05	0.25	0.35	6.55	0.042	0.91705
SandyCrk_06	0.24	0.33	6.64	0.041	0.81362
SandyCrk_07	0.25	0.34	6.31	0.044	0.88330
SandyCrk_08	0.23	0.33	6.58	0.04	0.79449
SandyCrk_09	0.24	0.34	6.52	0.043	0.17275
SandyCrk_10	0.21	0.3	6.37	0.041	0.68851
SandyCrk_11	0.25	0.35	6.47	0.043	0.0819601
SandyCrk_12	0.22	0.31	6.62	0.041	1.1217
SandyCrk_13	0.22	0.31	6.89	0.041	0.60896
SandyCrk_14	0.21	0.29	7.41	0.036	0.41164
SandyCrk_15	0.21	0.3	7.84	0.039	0.0979339
SandyCrk_16	0.2	0.28	7.43	0.035	0.24939
SandyCrk_17	0.22	0.31	6.79	0.04	0.12967
SandyCrk_18	0.22	0.31	6.61	0.042	0.61230
SandyCrk_19	0.21	0.3	7.08	0.038	0.24765
SandyCrk_20	0.22	0.31	7	0.039	0.60173
SandyC_AlphonFor	0.22	0.3	5.87	0.05	0.45016
SandyC_BeaverPnd	0.23	0.33	6.5	0.04	1.2173
SandyC_FB	0.24	0.34	6.48	0.043	0.20566
SandyC_GrnwelSpr	0.23	0.32	6.37	0.043	1.8158
SandyC_MillC	0.23	0.33	6.51	0.042	0.63514
SandyC_PrideBay	0.23	0.33	6.44	0.041	2.1578
SandyC_StnyPtBur	0.23	0.32	6.47	0.041	0.95215
SandyC_UN3SC	0.25	0.35	6.51	0.043	0.28040
SandyRun_01	0.25	0.35	4.78	0.068	0.64430
SandyRun_02	0.24	0.34	5.07	0.064	0.56290
SandyRun_03	0.22	0.31	5.77	0.055	0.87739
SandyRun_04	0.19	0.27	6.41	0.048	0.86224
SandyRun_05	0.2	0.29	6.28	0.05	0.44846
SandyRun_06	0.2	0.28	6.47	0.048	0.62503
SandyRun_07	0.24	0.33	5.55	0.06	0.15926
SandyRun_08	0.22	0.31	6.74	0.045	0.18695
ScalousCr	0.21	0.29	7.46	0.036	0.36214
SCanal_Dyer	0.23	0.32	8.61	0.042	2.6231
SCanal_Plank	0.24	0.34	7.4	0.041	1.4444
ShoeCT1_SC	0.24	0.34	6.56	0.042	24.160
ShoeCT1_US_LOC	0.25	0.35	7.09	0.039	23.794
ShoeC_Comite	0.24	0.34	6.57	0.037	11.666

ShoeC_DS_Hooper	0.23	0.32	6.52	0.042	16.075
ShoeC_Gurney	0.25	0.35	6.49	0.041	7.5678
ShoeC_Hooper	0.26	0.36	7.24	0.038	14.541
ShoeC_Pecos	0.24	0.34	6.59	0.039	14.807
ShoeC_SCT1	0.23	0.32	6.73	0.041	10.928
SouthCanal_Div	0.23	0.33	8.5	0.04	7.3115
SouthCanal_HWY19	0.24	0.33	9.11	0.039	10.635
SOUTHLATERAL	0.25	0.35	6.72	0.042	27.981
SouthSandyRun_01	0.25	0.35	4.64	0.069	0.0017219
SouthSandyRun_02	0.25	0.35	5.14	0.062	0.19926
SouthSandyRun_03	0.25	0.35	5.02	0.064	0.71773
SouthSandyRun_04	0.25	0.35	5.04	0.064	1.6888
SpillersCT2_	0.25	0.35	7.33	0.037	1.9036
SpillersCT2_SC	0.23	0.32	6.52	0.038	3.1768
SpillersCT2_Wei	0.23	0.33	6.92	0.039	4.2960
SpillersCT2_3	0.22	0.31	6.3	0.048	3.3285
SpillersC_DS_Sim	0.22	0.31	6.55	0.042	3.4475
SpillersC_Hess	0.21	0.3	5.91	0.051	4.6047
SpillersC_HWY16	0.23	0.33	6.38	0.043	8.4231
SpillersC_Sims	0.21	0.3	6.13	0.048	0.70794
SpillersC_WeissRd	0.22	0.3	6.18	0.048	1.1227
StoneByu_01	0.23	0.32	6.12	0.039	0.95509
StoneByu_02	0.25	0.35	6.53	0.042	1.4037
StoneByu_03	0.23	0.32	6.84	0.039	1.0589
StoneByu_04	0.2	0.29	7.41	0.035	0.26012
StoneByu_05	0.19	0.26	6.99	0.032	0.59025
SUB_BLACKCRK_01	0.23	0.33	6.39	0.041	1.0418
SUB_BLACKCRK_02	0.24	0.34	6.4	0.041	1.6049
SUB_BLACKCRK_03	0.25	0.35	6.54	0.042	0.20261
SUB_BLACKCRK_04	0.25	0.35	6.5	0.041	0.33370
SUB_BLACKCRK_05	0.26	0.36	6.52	0.042	0.39154
SUB_COMITENP_01	0.26	0.37	6.57	0.042	1.5156
SUB_COMITENP_02	0.25	0.35	6.41	0.049	1.5850
SUB_COMITE_01	0.26	0.37	6.64	0.046	1.1991
SUB_COMITE_02	0.21	0.3	6.98	0.037	0.36478
SUB_COMITE_03	0.23	0.32	6.69	0.041	0.20981
SUB_COMITE_04	0.23	0.33	6.58	0.043	0.0857510
SUB_COMITE_05	0.24	0.34	6.56	0.042	0.26831
SUB_COMITE_06	0.22	0.31	6.98	0.039	0.14066
SUB_COMITE_07	0.21	0.29	7.21	0.036	0.21030
SUB_COMITE_09	0.21	0.29	7.05	0.036	0.5289632
SUB_COMITE_10	0.23	0.32	6.58	0.043	0.53244
SUB_COMITE_12	0.2	0.29	6.38	0.037	0.0078490
SUB_COMITE_13	0.22	0.31	6.95	0.038	1.4115
SUB_COMITE_14	0.22	0.31	6.87	0.039	1.2635
SUB_COMITE_15	0.21	0.3	6.94	0.037	0.52291
SUB_COMITE_18	0.22	0.3	6.4	0.039	0.39953
SUB_COMITE_19	0.23	0.33	6.63	0.041	0.43824
SUB_COMITE_21	0.22	0.31	6.58	0.055	0.51890
SUB_COMITE_22	0.22	0.31	6.84	0.05	0.53337
SUB_COMITE_23	0.24	0.34	6.22	0.085	0.59344
SUB_COMITE_25	0.23	0.32	6.19	0.148	0.78046
SUB_COMITE_26	0.23	0.33	6.44	0.111	0.50065
SUB_DOYLEBAYOU_01	0.25	0.35	6.57	0.042	0.81833
SUB_DOYLEBAYOU_02	0.24	0.34	6.55	0.042	0.22393
SUB_DOYLEBAYOU_03	0.26	0.36	6.56	0.042	0.47093
SUB_DOYLEBAYOU_05	0.25	0.35	6.57	0.042	0.44875
SUB_DOYLEBAYOU_06	0.24	0.34	7.17	0.041	0.59077

SUB_DOYLEBAYOU_07	0.25	0.35	6.5	0.04	1.3423
SUB_DOYLEBAYOU_08	0.25	0.35	6.81	0.041	1.3841
SUB_DOYLENP1_01	0.25	0.36	6.56	0.042	10.183
SUB_DOYLENP1_02	0.25	0.35	6.52	0.042	0.56884
SUB_FISHERBAYOU_01	0.2	0.29	7.44	0.034	0.15143
SUB_FISHERBAYOU_02	0.2	0.28	7.43	0.034	0.28530
SUB_FISHERBAYOU_03	0.2	0.29	7.38	0.034	0.24757
SUB_HOGBAYOU_01	0.25	0.35	6.53	0.042	0.33751
SUB_HOGBAYOU_02	0.25	0.35	6.55	0.042	0.21282
SUB_IRONBAYOU_01	0.24	0.34	6.56	0.042	0.99105
SUB_IRONBAYOU_02	0.24	0.34	6.55	0.042	0.75138
SUB_IRONBAYOU_03	0.26	0.36	6.53	0.042	0.82828
SUB_IRONBAYOU_04	0.26	0.36	6.54	0.042	0.43611
SUB_KNIGHTONBAYOU_01	0.2	0.28	7.38	0.035	0.45135
SUB_KNIGHTONBAYOU_02	0.2	0.28	7.35	0.036	0.10101
SUB_KNIGHTONBAYOU_03	0.2	0.28	7.45	0.034	0.23569
SUB_KNIGHTONBAYOU_04	0.22	0.3	6.78	0.04	0.0915768
SUB_LEWISCRK_01	0.21	0.3	7.09	0.037	6.4559
SUB_LEWISCRK_02	0.21	0.3	7.05	0.039	8.2446
SUB_LEWISCRK_03	0.21	0.3	6.82	0.039	1.1490
SUB_LITCOMITE_01	0.23	0.32	7.99	0.042	0.59420
SUB_LITCOMITE_02	0.23	0.32	6.78	0.041	0.0287793
SUB_LITCOMITE_03	0.24	0.34	6.63	0.041	0.56850
SUB_LITREDWOOD_01	0.22	0.31	6.12	0.039	0.68200
SUB_LITREDWOOD_02	0.24	0.33	6.49	0.041	0.17075
SUB_LITREDWOOD_03	0.24	0.33	6.66	0.041	0.23111
SUB_LITREDWOOD_04	0.22	0.3	6.83	0.039	0.30272
SUB_LITREDWOOD_05	0.2	0.28	7.45	0.034	0.5411356
SUB_MONAHANBAYOU_01	0.2	0.28	7.5	0.033	0.85356
SUB_MONAHANBAYOU_02	0.2	0.28	7.29	0.034	0.41186
SUB_PRETTYCRK_01	0.23	0.32	7	0.039	0.36189
SUB_PRETTYCRK_02	0.22	0.31	7.04	0.039	0.30823
SUB_PRETTYCRK_03	0.22	0.31	7.01	0.037	0.38800
SUB_PRETTYCRK_04	0.2	0.28	7.48	0.034	0.0727358
SUB_PRETTYCRK_05	0.24	0.34	6.37	0.046	0.76929
SUB_PRETTYCRK_06	0.21	0.29	7.1	0.036	0.42798
SUB_PRETTYCRK_07	0.22	0.31	6.99	0.039	0.70143
SUB_PRETTYCRK_08	0.23	0.32	6.46	0.041	8.5520
SUB_PRETTYCRK_09	0.21	0.29	5.86	0.038	0
SUB_REDWOODCRK_01	0.19	0.27	7.61	0.032	1.5693
SUB_REDWOODCRK_02	0.21	0.29	7.05	0.036	2.2165
SUB_REDWOODCRK_03	0.21	0.3	7.25	0.036	0.61863
SUB_REDWOODCRK_04	0.22	0.31	6.82	0.039	0.29699
SUB_REDWOODCRK_05	0.24	0.34	6.56	0.042	0.0899121
SUB_REDWOODCRK_06	0.22	0.32	6.93	0.038	1.7682
SUB_REDWOODCRK_08	0.23	0.32	6.63	0.04	0.25317
SUB_REDWOODCRK_09	0.2	0.28	7.39	0.034	0.84067
SUB_REDWOODCRK_10	0.23	0.32	6.85	0.039	0.25623
SUB_REDWOODCRK_11	0.25	0.35	6.59	0.041	0.70533
SUB_REDWOODCRK_12	0.23	0.32	6.94	0.038	0.48680
SUB_REDWOODCRK_13	0.24	0.33	6.55	0.042	0.44197
SUB_REDWOODCRK_14	0.24	0.34	6.55	0.042	0.34258
SUB_REDWOODCRK_15	0.25	0.35	6.77	0.041	0.20187
SUB_REDWOODCRK_16	0.24	0.34	6.49	0.042	0.0182202
SUB_REDWOODCRK_17	0.25	0.35	6.88	0.041	0.25766
SUB_REDWOODCRK_18	0.24	0.34	6.47	0.042	1.7623
SUB_REDWOODNP	0.25	0.35	6.55	0.042	0.0670558
SUB_SCHLEIBAYOU_01	0.2	0.29	7.47	0.034	1.1456

SUB_SCHLEIBAYOU_02	0.21	0.3	7.21	0.036	0.6438293
SUB_SCHLEIBAYOU_03	0.21	0.29	7.11	0.037	0.58500
SUB_SESSIONSBAYOU_NP	0.2	0.28	7.54	0.034	0.22409
SUB_SESSIONSBAYOU_01	0.2	0.28	7.42	0.034	0.0947252
SUB_SESSIONSBAYOU_02	0.21	0.29	7.25	0.037	0.51677
SUB_SESSIONSBAYOU_03	0.21	0.29	7.11	0.037	0.15278
SUB_SESSIONSBAYOU_04	0.22	0.31	6.49	0.043	0.54576
SUB_UNT_LEWISCRK	0.2	0.28	7.49	0.034	5.6627
SUB_UNT3_REDWOOD_1	0.26	0.37	6.57	0.042	2.6908
SUB_UNT3_REDWOOD_2	0.26	0.36	6.57	0.042	0.27021
SUB_UN_UN3_REDWOOD	0.26	0.37	6.57	0.042	2.8807
SUB_UN_UN4_REDWOOD_1	0.25	0.35	6.56	0.042	0.33138
SUB_UN_UN4_REDWOOD_2	0.25	0.36	6.56	0.042	0.40056
SUB_UN_UN4_REDWOOD_3	0.24	0.33	6.5	0.043	0.25333
SUB_UN3_REDWOOD_02	0.25	0.35	6.96	0.041	0.93988
SUB_UN4_REDWOOD_01	0.25	0.36	6.57	0.042	1.0741
SUB_UN4_REDWOOD_02	0.25	0.35	6.49	0.042	0.61594
SUB_WALNUTBR_01	0.25	0.35	6.56	0.042	0.21045
SUB_WALNUTBR_02	0.25	0.35	6.56	0.042	0.21054
SUB_WALNUTBR_03	0.24	0.34	6.38	0.043	0.29968
SUB_WFRKLITCOMITE_01	0.22	0.3	8.29	0.042	0.33878
SUB_WFRKLITCOMITE_02	0.22	0.31	6.99	0.04	0.34513
SUB_WHITEBAYOU_01	0.25	0.35	6.57	0.042	0.0955966
SUB_WHITEBAYOU_02	0.25	0.35	6.51	0.041	0.0632219
SUB_WHITEBAYOU_03	0.26	0.36	6.53	0.042	0.38256
SUB_WHITEBAYOU_04	0.26	0.36	6.56	0.042	0.46165
SUB_WHITEBAYOU_05	0.26	0.37	6.56	0.042	0.28198
SUB_WHITEBAYOU_06	0.25	0.35	6.51	0.041	0.33652
TaberC_CarsonRd	0.23	0.32	6.54	0.041	0.70421
TaberC_HannaC	0.23	0.32	6.84	0.04	0.80381
TaylorByu_DS_I12	0.24	0.34	6.58	0.041	11.301
TaylorByu_FL	0.23	0.32	6.57	0.042	34.622
TaylorByu_I12	0.23	0.32	6.51	0.041	26.543
TaylorByu_RR	0.23	0.32	6.55	0.042	17.894
UnDuffByu_DS	0.22	0.31	7.3	0.041	0.13907
UnDuffByu_US	0.24	0.34	6.67	0.042	11.790
UnT_GreenwellSp	0.23	0.32	6.55	0.041	1.0947
UNT1ADarlingCrk_01	0.25	0.35	4.71	0.069	0.40829
UNT1BlackCrk_01	0.25	0.35	5.06	0.064	0.28070
UNT1BluffCrk_01	0.22	0.3	7.15	0.036	0.65190
UNT1DarlingCrk_01	0.2	0.28	6.2	0.051	0.53803
UNT1DarlingCrk_02	0.24	0.33	4.76	0.064	0.47753
UNT1DarlingCrk_03	0.24	0.33	5.92	0.059	0.23218
UNT1DunnCrk_01	0.2	0.28	7.32	0.036	0.63681
UNT1SouthSandyRun_01	0.23	0.33	5.19	0.061	1.0359
UNT1WoodlandCrk_01	0.25	0.35	6.38	0.044	0.55089
UNT2ASSandyRun	0.24	0.34	4.49	0.068	0.14167
UNT2BlackCrk_01	0.24	0.34	5	0.065	1.7942
UNT2BluffCrk_01	0.2	0.28	7.54	0.034	0.59597
UNT2DarlingCrk_01	0.25	0.35	4.9	0.066	0.67620
UNT2DarlingCrk_02	0.25	0.35	4.71	0.068	0.92827
UNT2DarlingCrk_03	0.25	0.35	4.93	0.065	0.66776
UNT2SouthSandyRun_01	0.25	0.35	4.61	0.07	0
UNT2SouthSandyRun_02	0.24	0.34	4.92	0.064	0.12417
UNT3ADarlingCrk_01	0.24	0.34	5.19	0.062	0.0038889
UNT3BlackCrk_01	0.23	0.33	5.35	0.061	0.60149
UNT3DarlingCrk_01	0.24	0.34	5.09	0.065	0.45067
UNT3DarlingCrk_02	0.23	0.32	5.75	0.055	0.0077778

UNT3DarlingCrk_03	0.23	0.32	5.83	0.054	0.48229
UNT3DarlingCrk_04	0.21	0.3	6.15	0.05	0.27196
UnT3SandyC_Librt1	0.24	0.34	6.48	0.041	1.2096
UnT3SandyC_Librt2	0.23	0.33	6.49	0.043	1.7715
UNT3SouthSandyRun_01	0.25	0.35	4.63	0.07	0.11078
UNT3SouthSandyRun_02	0.25	0.35	4.69	0.069	0.89279
UNT3SouthSandyRun_03	0.25	0.35	4.78	0.067	0.76607
UNT4ADarlingCrk_01	0.25	0.35	5.19	0.062	0.10751
UNT4ADarlingCrk_02	0.25	0.35	5.57	0.056	0.31880
UNT4DarlingCrk_01	0.25	0.36	5.15	0.064	0.40187
UNT4DarlingCrk_02	0.25	0.34	5.37	0.06	0.0216583
UNT4DarlingCrk_03	0.23	0.33	6.24	0.048	0
Un_UpperWhiteByu	0.23	0.32	5.95	0.038	0.12629
Un1LilSndyC2_DS	0.23	0.33	7.1	0.042	1.4170
Un1LilSndyC2_US	0.25	0.35	6.57	0.042	0.71452
Un1MillC_PrideB	0.22	0.31	6.59	0.042	0.99213
Un1MillC_US_LOC	0.22	0.31	6.57	0.042	0.90915
Un1SandyC	0.23	0.32	6.89	0.041	0.0113031
Un2LilSndyC2_DS	0.23	0.32	6.62	0.041	0.32715
Un2LilSndyC2_US	0.23	0.33	6.99	0.041	0.84247
Un2_NBrWards_DS	0.24	0.34	6.73	0.041	43.778
Un2_NBrWards_US	0.28	0.39	8.09	0.033	45.003735
Un3LilSndyC2_DS	0.23	0.33	6.57	0.042	0.86592
Un3LilSndyC2_US	0.24	0.34	6.55	0.041	2.3949
Un4LilSndyC2	0.23	0.32	6.53	0.041	2.2116
Un4SandyC_DS	0.24	0.34	6.24	0.041	2.8390
Un4SandyC_US	0.23	0.32	6.55	0.04	2.8062
UpperWhiteByu_DS	0.25	0.35	7.62	0.042	2.2551
UpperWhiteByu_US	0.25	0.36	7.43	0.042	2.8131
UWhiteByu_Div	0.25	0.35	6.57	0.04	0.0050346
UWhiteByu_DW	0.25	0.36	6.55	0.042	1.1735
UWhiteByu_Hudson	0.25	0.35	6.62	0.042	3.1703
UWhiteByu_HWY64	0.25	0.35	6.75	0.042	8.2619
UWhiteByu_LowZac	0.25	0.35	7.08	0.041	12.254
UWhiteByu_US_Div	0.24	0.34	6.61	0.041	0.27039
UWhiteByu_UT	0.25	0.36	6.87	0.042	1.3593
WardsCr_Bluebon	0.32	0.45	9.69	0.023	55.8322501
WardsCr_Choctaw	0.28	0.4	8.21	0.032	49.443
WardsCr_College	0.26	0.37	7.71	0.035	29.460
WardsCr_EssenLn	0.27	0.38	7.96	0.035	34.257
WardsCr_GovtSt	0.29	0.42	8.92	0.028	51.109
WardsCr_GusYoung	0.25	0.36	7.07	0.038	51.183
WardsCr_Highland	0.24	0.33	7.03	0.039	30.984
WardsCr_I10_DS	0.23	0.32	7.84	0.039	42.099
WardsCr_I10_US	0.27	0.38	7.79	0.035	37.493733
WardsCr_Manchac	0.24	0.34	7.47	0.037	38.567
WardsCr_PecueLn	0.25	0.35	7.78	0.034	51.403
WardsCr_SiegenLn	0.26	0.36	7.34	0.036	50.555
WaxDitch	0.24	0.34	6.57	0.042	33.013
WClyellT1_DS_Spr	0.22	0.3	6.54	0.042	6.5104
WClyellT1_Pvt	0.23	0.32	6.37	0.045	1.4230
WClyellT1_SprfdR	0.22	0.31	6.54	0.042	1.4653
WClyell_ArnoldR	0.23	0.32	6.56	0.042	2.1512
WClyell_CnMkt	0.22	0.31	6.57	0.042	0.97486
WClyell_DS_Arnld	0.23	0.32	6.54	0.042	11.584
WClyell_DS_I12	0.24	0.34	6.51	0.041	11.052
WClyell_DS_Spr	0.22	0.32	6.56	0.042	2.9345
WClyell_HoodRd	0.24	0.34	6.61	0.042	4.3869

WClyell_I12	0.23	0.33	6.49	0.041	16.610
WClyell_JoeMayR	0.24	0.34	6.56	0.042	11.377
WClyell_NanWes	0.21	0.3	5.96	0.05	8.9421
WClyell_RR	0.23	0.33	6.51	0.042	15.850
WClyell_SprgfldR	0.22	0.31	6.55	0.042	2.1066
WeinerCr_DS	0.28	0.39	8.06	0.031	58.901
WeinerCr_I12	0.31	0.44	9.15	0.027	63.9663432
WeinerCr_US	0.31	0.43	9.02	0.027	59.846
WelshGullyT1	0.26	0.37	6.57	0.039	20.6953453
WelshGul_Manchac	0.21	0.3	6.96	0.041	7.7812
WelshGul_NrPrair	0.26	0.36	6.57	0.039	34.437
WestForkAmite_01	0.27	0.38	6.27	0.046	1.1152
WestForkAmite_02	0.27	0.37	5.88	0.052	0.44427
WestForkAmite_03	0.27	0.38	5.87	0.052	1.1260
WestForkAmite_04	0.26	0.37	5.91	0.05	0.56039
WFrkBeaverC2_Spr	0.23	0.32	6.44	0.043	23.4165698
WFrkBeaverC2_US	0.22	0.3	5.88	0.048	22.254
WindByu_Jackson	0.23	0.32	6.57	0.042	1.4493
WindByu_LSC2	0.23	0.33	6.48	0.043	0.95044
WindByu_Milldale	0.24	0.34	6.55	0.042	1.0838
WindByu_PeairsRd	0.23	0.32	6.52	0.041	2.5236
WLatCypB_ScotZac	0.25	0.36	7.91	0.038	24.655
WLatCypB_US_LOC	0.24	0.34	7.96	0.041	0.0493801
WoodlandCrk_01	0.25	0.35	6.5	0.041	1.3454
WoodlandCrk_02	0.25	0.35	6.32	0.044	0.37148
WoodlandCrk_03	0.23	0.32	6.92	0.04	0.11902
WoodlandCrk_04	0.23	0.32	6.99	0.039	0.83871
WoodlandCrk_05	0.25	0.35	6.57	0.042	0.43565
WoodlandCrk_06	0.24	0.34	6.6	0.042	0.0442563
WoodlandCrk_07	0.22	0.3	6.69	0.041	.000542479

Hydrologic Parameters for Future Conditions Year 2076

Subbasin	Initial Content	Saturated Content	Suction	Conductivity	Impervious %
AllenByu_HWY1032	0.24	0.34	6.55	0.042	19.876
AlligatorT_Bluff	0.25	0.35	6.99	0.034	33.33
AmiteDivCnl_C01	0.21	0.29	11.09	0.008	0.43575
AmiteDivCnl_C02	0.19	0.26	10.59	0.012	2.6346
AmiteDivC_HWY22	0.19	0.27	8.42	0.026	6.8531
AmiteRT34_HWY16	0.23	0.32	6.12	0.048	25.323
AmiteR_BarbByu	0.24	0.34	7.59	0.037	0.80789
AmiteR_BeaverCrk	0.24	0.33	6.45	0.043	0.42372
AmiteR_BluffCrk	0.22	0.31	7.29	0.082	1.3332
AmiteR_ChaneyBr	0.27	0.38	8.4	0.018	2.6272
AmiteR_ChinqCan	0.24	0.33	8.23	0.027	3.461
AmiteR_ClearCrk	0.24	0.34	5.51	0.056	0.98978
AmiteR_ColBay	0.2	0.29	6.96	0.025	4.8208
AmiteR_C01	0.23	0.32	6.31	0.041	0.9316
AmiteR_C02	0.21	0.3	5.91	0.038	3.2174
AmiteR_C03	0.23	0.32	6.22	0.046	0.97664
AmiteR_C04	0.22	0.32	6.18	0.039	9.6001
AmiteR_C05	0.23	0.32	6.25	0.047	7.3028
AmiteR_C06	0.23	0.33	6.76	0.032	11.695
AmiteR_C07	0.23	0.32	6.32	0.041	6.9509
AmiteR_C08	0.23	0.33	6.31	0.041	26.594
AmiteR_C09	0.23	0.32	6.31	0.054	4.0408
AmiteR_C10	0.23	0.32	6.3	0.041	17.573771
AmiteR_C11	0.25	0.35	7.42	0.03	16.448
AmiteR_C12	0.23	0.32	6.43	0.041	19.993
AmiteR_C13	0.22	0.31	6.21	0.04	5.697
AmiteR_C14	0.23	0.32	6.31	0.053	2.6007
AmiteR_C15	0.24	0.34	7.04	0.029	4.7168
AmiteR_DarlingCrk	0.24	0.33	6.45	0.049	1.0759
AmiteR_HendByu	0.16	0.22	8.77	0.02	10.652
AmiteR_HWY16	0.21	0.3	9.06	0.021	3.3982
AmiteR_HWY22	0.25	0.35	8.87	0.027	1.1262
AmiteR_KingGByu	0.24	0.34	8.88	0.027	2.0428
AmiteR_L03	0.24	0.34	6.37	0.041	37.1204606
AmiteR_Magnolia	0.24	0.34	7.03	0.06	16.296
AmiteR_Maurepas	0.26	0.36	10.43	0.016	1.1679
AmiteR_PigeonCrk	0.21	0.3	7.73	0.06	1.0115
AmiteR_PtVincent	0.21	0.29	6.27	0.033	6.1793
AmiteR_RockyCrk	0.21	0.3	7.45	0.055	0.89698
AmiteR_R03	0.26	0.36	6.85	0.039	46.048
AmiteR_StateHwy10	0.21	0.3	6.58	0.047	0.66589
AmiteR_StateHwy37	0.2	0.28	7.2	0.06	0.88284
AmiteR_StateHwy432	0.22	0.31	6.58	0.041	0.769
AmiteR_US_Div	0.04	0.05	3.77	0.004	3.3398
AmiteR_WhittenCrk	0.23	0.32	7.2	0.052	1.4494
AmiteR_17	0.24	0.34	6.86	0.06	1.5802
AmiteR_18	0.26	0.37	7.4	0.033	0.7627
AntiochC_LeeMrtn	0.25	0.35	6.56	0.042	1.535
BeaverBr_CnMkt	0.23	0.32	6.55	0.042	18.204
BeaverBr_DuffRd	0.23	0.32	6.55	0.042	11.2
BeaverBr_RR	0.23	0.32	6.55	0.042	9.0019
BeaverByuNP_Hoop	0.23	0.33	6.53	0.041	19.898
BeaverByuNP_US	0.22	0.31	6.56	0.042	13.992

BeaverByu_Denham	0.22	0.31	6.56	0.041	4.1070368
BeaverByu_French	0.25	0.35	6.94	0.036	23.407
BeaverByu_GrnSp	0.24	0.33	6.51	0.04	31.3692561
BeaverByu_Hooper	0.22	0.31	6.52	0.041	8.2017
BeaverByu_US_LOC	0.23	0.32	6.57	0.041	3.0644
BeaverByu_Wax	0.23	0.32	6.55	0.039	12.529
BeaverCrk_01	0.28	0.39	6.12	0.049	1.7672
BeaverCrk_02	0.27	0.38	6.18	0.048	0.66082
BeaverCrk_03	0.27	0.38	5.98	0.05	0.66816
BeaverCrk_04	0.26	0.37	6.21	0.046	0.37856
BeaverCrk_05	0.24	0.34	6.12	0.047	0.65128
BeaverCrk_06	0.22	0.3	6.21	0.041	0.35288
BeaverCrk_07	0.22	0.31	6.35	0.041	0.44113
BeaverC2_CnMkt	0.22	0.32	6.55	0.042	23.106
BeaverC2_ForeRd	0.22	0.32	6.57	0.042	13.956
BeaverC2_HWY16	0.23	0.32	6.44	0.043	28.137
BeaverC2_Magnol	0.23	0.33	6.47	0.043	35.792
BeaverC2_Sprgfld	0.23	0.32	6.56	0.042	33.808
BeaverC3_DS_Pear	0.22	0.31	7.22	0.041	0.51513
BeaverC3_Jackson	0.25	0.36	7.31	0.042	1.3859
BeaverC3_LSandy	0.23	0.32	7.02	0.042	0.31179
BeaverC3_Milldal	0.25	0.35	6.75	0.042	0.98826
BeaverC3_Peairs	0.23	0.32	6.85	0.042	1.0882
BeaverC3_US_LOC	0.25	0.35	7.03	0.042	1.0444
BeaverPondByu_DS	0.23	0.32	6.44	0.039	0.4075
BeaverPondByu_US	0.25	0.35	6.56	0.041	0.37552
BFountainNP	0.23	0.33	6.79	0.039	37.0823975
BFountNBr_Boyd	0.3	0.42	11.83	0.011	97.4509492
BFountNBr_Lee	0.24	0.33	11.34	0.015	43.271
BFountSBr_BF	0.2	0.29	12.02	0.009	23.351
BFountSBr_Gour	0.23	0.32	12.27	0.008	62.099
BFountSBr_US	0.31	0.44	10.21	0.02	72.0927236
BFountT1_DS	0.22	0.32	7.22	0.035	22.561
BFountT1_Highlnd	0.24	0.34	6.66	0.041	51.1179616
BFount_BFSBr	0.2	0.28	12.41	0.007	71.14
BFount_Bluebon	0.21	0.29	8.42	0.034	47.902
BFount_Burbank	0.27	0.39	12.14	0.009	45.947
BFount_BurbankDr	0.22	0.31	7.58	0.034	46.011
BFount_ByuManch	0.19	0.26	11.15	0.015	8.5045
BFount_ElbowByu	0.17	0.23	11.01	0.016	42.293
BFount_Nich_DS	0.15	0.22	12.2	0.01	39.717
BFount_Nich_US	0.34	0.48	11.96	0.01	98.418
BFount_US_Trib	0.17	0.23	10.49	0.02	10.103
BirchCrk_01	0.25	0.35	4.72	0.069	1.7106
BlackCrk_01	0.25	0.35	4.93	0.066	0.0026584
BlackCrk_02	0.2	0.29	6.39	0.048	0.50594
BlackCrk_03	0.25	0.35	5.18	0.062	1.3741
BlackCrk_04	0.25	0.35	4.94	0.065	1.4893
BlackCrk_05	0.23	0.32	5.6	0.057	0.25867
BlackCrk_06	0.21	0.3	6.62	0.043	1.5085
BlackCrk_07	0.21	0.29	6.42	0.046	0.47298
BlackCrk_08	0.24	0.33	6.04	0.05	2.0342
BlackCrk_09	0.24	0.33	5.71	0.058	1.7881
BLACKCR_CMB	0.26	0.37	6.45	0.041	0.46994
BLACKCR_HWY412	0.26	0.36	6.55	0.042	0.41178
BlackwtrBT1_BB	0.23	0.33	6.55	0.042	12.36
BlackwtrBT1_Core	0.23	0.32	6.57	0.042	3.2686
BlackwtrBT1_Mcul	0.22	0.31	6.55	0.041	4.3095

BlackwtrBT2_BB	0.23	0.32	6.53	0.042	2.3118
BlackwtrBT2_DW	0.23	0.32	6.56	0.042	1.8765
BlackwtrBT3_US	0.23	0.32	6.46	0.043	3.0351
BlackwtrB_BBT1	0.23	0.32	6.59	0.041	2.7163
BlackwtrB_BBT2	0.22	0.31	6.56	0.042	2.4249
BlackwtrB_Comite	0.23	0.33	6.57	0.041	17.242
BlackwtrB_McCull	0.22	0.31	6.56	0.042	8.4855
BlackwtrB_US	0.22	0.31	6.48	0.041	0.73895
BlackwtrT3_DS	0.22	0.31	6.53	0.043	1.9751
BluffCrk_AmiteR	0.23	0.32	6.54	0.044	0.99203
BluffCrk_01	0.24	0.33	6.85	0.039	0.88534
BluffCrk_02	0.22	0.31	7.15	0.037	0.7133
BluffCrk_03	0.19	0.27	7.63	0.033	1.0253
BluffCrk_04	0.2	0.28	7.43	0.035	0.2422
BluffCrk_05	0.2	0.28	7.41	0.035	0.54775
BluffCrk_06	0.2	0.28	7.36	0.035	0.87491
BluffCrk_07	0.21	0.3	7.22	0.036	0.80329
BluffSwamp_Gage	0.23	0.32	7.92	0.027	40.5299776
ByuBraud_HWY30	0.13	0.19	10.83	0.019	21.8392782
ByuBraud_HWY74	0.11	0.15	12.24	0.01	27.784
ByuBraud_US_LOC	0.18	0.25	10.15	0.029	13.48
ByuDuplant_LeeDr	0.28	0.39	8.81	0.025	32.019
ByuDuplant_NrDaw	0.26	0.37	8.13	0.03	28.66
ByuManch_Airline	0.21	0.3	6.76	0.038	40.923
ByuManch_BFount	0.19	0.27	9.48	0.022	12.962
ByuManch_Cotton	0.22	0.32	6.44	0.039	11.219
ByuManch_Gator	0.19	0.27	10.69	0.029	16.493
ByuManch_NrAmite	0.22	0.31	6.85	0.04	8.8466
ByuManch_NrLiPra	0.23	0.32	6.46	0.04	4.9479
ByuManch_NrMSRiv	0.2	0.28	8.28	0.034	21.767
ByuManch_Perkins	0.23	0.32	6.43	0.036	40.73
ByuManch_Welsh	0.21	0.3	6.41	0.039	35.096
ByuPaul_HWY30	0.18	0.25	10.75	0.034	1.413
ByuPaul_US_HWY30	0.16	0.23	10.67	0.028	3.9231
ByuPaul_US_LOC	0.16	0.23	11.38	0.023	3.3475
CampCreek_HWY42	0.24	0.34	6.69	0.042	1.1274
ChaneyBr_HWY16	0.23	0.32	6.49	0.041	3.9914
ChinqCan_C01	0.26	0.37	10.85	0.015	0.79927
ChinqCan_C02	0.25	0.35	9.94	0.018	3.8575
ClayCut_Airline	0.3	0.43	9.34	0.025	95.093
ClayCut_AntiochR	0.24	0.33	6.9	0.041	57.4921456
ClayCut_CalRd	0.26	0.37	7.56	0.036	64.099
ClayCut_Inns	0.24	0.34	6.64	0.041	71.035
ClayCut_JacksB	0.27	0.38	7.92	0.034	70.386
ClayCut_NrAmite	0.23	0.33	6.4	0.041	12.196
ClayCut_Siegen	0.28	0.4	8.36	0.031	91.912
ClayCut_US_Tiger	0.24	0.34	6.85	0.041	27.0335976
ClaytonByuT1	0.23	0.32	6.54	0.043	9.3295
ClaytonByu_Bend	0.22	0.31	6.4	0.044	19.864
ClearCrkT1_01	0.25	0.35	6.56	0.042	0.30807
ClearCrkT1_02	0.25	0.34	6.55	0.042	0.34551
ClearCrk_01	0.25	0.36	6.32	0.046	0.35524
ClearCrk_02	0.25	0.35	6.39	0.044	0.92743
ClearCrk_03	0.23	0.32	6.54	0.04	1.4955
ClearCrk_04	0.24	0.34	6.55	0.042	1.0686
ClintonAllenLat	0.23	0.32	6.54	0.042	14.657
ClyellCrkNP	0.24	0.34	6.54	0.042	1.9598
ClyellT9_DS_FL	0.26	0.36	6.57	0.042	4.2146

ClyellT9_FL	0.26	0.36	6.56	0.042	1.0104
Clyell_CB	0.24	0.34	7.03	0.039	1.9405239
Clyell_DS_I12	0.25	0.35	6.55	0.042	4.3029
Clyell_DS_LigoLn	0.22	0.31	6.51	0.043	1.6553
Clyell_FLBlvd	0.25	0.35	6.56	0.042	2.297
Clyell_I12	0.24	0.34	6.56	0.042	3.1425
Clyell_JoelWatts	0.24	0.34	6.56	0.042	1.5858
Clyell_LigoLn	0.24	0.34	6.54	0.042	2.0639
Clyell_LilClyell	0.24	0.34	6.57	0.042	1.3946
Clyell_LodStafrd	0.23	0.33	6.48	0.041	1.0921
Clyell_US_LOC	0.24	0.33	6.57	0.042	1.1751
Clyell_W_Hood	0.24	0.34	6.57	0.042	0.39604
ColtonCrk_HWY16	0.23	0.32	6.39	0.041	26.429
ColyellBay	0.24	0.33	7.41	0.037	2.3299
COMITE_atComite	0.22	0.31	7	0.088	1.7632
COMITE_Baker	0.23	0.33	6.76	0.071	4.2373
COMITE_DenhamSpr	0.25	0.34	6.47	0.055	18.153
COMITE_dsJOORRD	0.25	0.35	7.17	0.036	14.465
COMITE_dsLA37	0.23	0.32	6.43	0.044	19.131
COMITE_DS_OB	0.22	0.31	5.98	0.084	3.6812
COMITE_HooperRd	0.24	0.34	6.76	0.058	12.743
COMITE_Hurricane	0.23	0.32	6.55	0.039	11.318
COMITE_nrComite	0.26	0.37	7.74	0.053	4.9564
COMITE_RR	0.23	0.32	6.43	0.055	4.2987
COMITE_usLA37	0.25	0.36	7.23	0.032	21.142
COMITE_US_OB	0.22	0.3	6.17	0.039	4.7282
COMITE_Zachary	0.23	0.32	6.48	0.056	1.9551
CooperMillB_BC	0.26	0.36	6.5	0.041	3.4374
CooperMillB_Midw	0.24	0.34	6.55	0.042	7.6946
CooperMillB_UWB	0.22	0.31	6.07	0.038	1.1987
CorpCanalNP	0.3	0.42	10.32	0.018	77.048
CorpCanal_Myrtle	0.32	0.45	9.55	0.023	92.767
CorpCanal_Stanfrd	0.34	0.48	10.42	0.013	64.696
CorpCanal_State	0.33	0.46	10.23	0.017	75.246
DarlingCrk_AmiteR	0.2	0.29	7.95	0.041	1.0849
DarlingCrk_01	0.25	0.35	5.29	0.062	0.78933
DarlingCrk_02	0.25	0.34	4.84	0.066	0.66619
DarlingCrk_03	0.25	0.35	4.89	0.066	0.45633
DarlingCrk_04	0.24	0.34	5.42	0.059	0.44972
DarlingCrk_05	0.24	0.34	5.44	0.058	0.80065
DarlingCrk_06	0.24	0.34	6.25	0.059	0.43924
DarlingCrk_07	0.24	0.34	5.23	0.063	0.58677
DarlingCrk_08	0.23	0.33	5.45	0.059	0.99424
DarlingCrk_09	0.22	0.3	5.81	0.054	1.1598
DarlingCrk_10	0.23	0.33	5.5	0.057	1.3127
DarlingCrk_11	0.19	0.27	7.02	0.043	0.48206
DarlingCrk_12	0.19	0.26	8.12	0.036	0.93145
DarlingCrk_13	0.2	0.28	7.58	0.041	2.7308
DawsonCr_Bluebon	0.27	0.38	7.97	0.032	52.34
DawsonCr_College	0.3	0.42	9.13	0.026	60.0485512
DawsonCr_GovtSt	0.3	0.42	9.04	0.027	75.745
DawsonCr_Hund_DS	0.28	0.4	8.35	0.03	47.931
DawsonCr_QuailDr	0.27	0.38	8.23	0.032	56.617
DawsonCr_WardCr	0.28	0.4	8.49	0.03	71.881
DraughnsC_French	0.24	0.34	6.57	0.037	17.062
DraughnsC_GrnSpr	0.23	0.32	6.55	0.041	16.6708704
DraughnsC_MagBr	0.22	0.32	6.56	0.041	29.229
DuffByu_Jackson	0.23	0.33	6.64	0.042	2.3392

DuffByu_PtHud	0.26	0.36	6.58	0.042	0.39844
DuffB_DS_Jack	0.24	0.33	6.58	0.04	1.4631
DumplinC_DS_RR	0.24	0.34	6.57	0.042	41.295
DumplinC_I12	0.23	0.33	6.46	0.041	25.324
DumplinC_RR	0.22	0.31	6.53	0.042	18.4
DumplinC_US_LOC	0.22	0.31	6.55	0.042	19.116
DunnCrk_01	0.26	0.36	6.65	0.043	0.0200551
DunnCrk_02	0.23	0.32	6.9	0.041	0.52431
DunnCrk_03	0.26	0.36	5.59	0.055	1.0736
DunnCrk_04	0.25	0.36	5.57	0.055	0.76883
EastForkAmite_01	0.25	0.35	6.43	0.043	1.48113
EastForkAmite_02	0.27	0.38	6.16	0.048	0.74193
EastForkAmite_03	0.26	0.37	5.83	0.053	0.81036
EastForkAmite_04	0.26	0.37	5.87	0.051	0.62235
EFDumplin_Corbin	0.22	0.31	6.55	0.042	7.2889
EFDumplin_RR	0.23	0.32	6.52	0.042	26.232
ELatCypB_Lavey	0.26	0.37	6.57	0.042	35.85
ELatCypB_LCB	0.23	0.33	6.63	0.041	25.929
ElbowBayou	0.14	0.2	10.91	0.015	5.5992
ElbowByu_Burbank	0.18	0.25	10.33	0.022	8.7407
ENGINEERDEPOT_DS	0.25	0.35	6.73	0.041	43.85
ENGINEERDEPOT_US	0.28	0.39	7.8	0.034	65.794
FeldersB_BrownRd	0.25	0.35	6.57	0.042	6.8142
FeldersB_DSJMay	0.24	0.34	6.6	0.042	9.1997
FeldersB_WC	0.23	0.33	7.18	0.042	27.423
FlanaganByu_SC	0.24	0.33	6.62	0.042	1.4968
FlanaganByu_01	0.24	0.34	7.33	0.041	0.14507
FlatLake	0.15	0.22	9.86	0.014	2.2075
GatorByu_Gage	0.17	0.24	9.64	0.019	8.9155
GatorByu_USGage	0.14	0.2	11.21	0.015	8.1179
GraysCrkBr_BMcD	0.25	0.36	6.55	0.042	46.965
GraysCrkBr_Dunn	0.24	0.34	6.3	0.046	28.611
GraysCrkBr_I12	0.24	0.33	6.57	0.042	39.004
GraysCrkBr_RR	0.25	0.36	6.45	0.041	33.595
GraysCrkBr_USI12	0.24	0.34	6.57	0.042	21.105
GraysCrkLat_RR	0.23	0.33	6.45	0.043	43.5236504
GraysCrk_Hwy1033	0.24	0.34	6.49	0.043	6.8541
GraysCrk_HWY16	0.25	0.35	6.52	0.042	18.054
GraysCrk_I12	0.24	0.34	6.57	0.042	34.692
GraysCrk_Julban	0.22	0.31	5.83	0.037	21.352
GraysCrk_NrAmite	0.24	0.34	6.53	0.042	5.2978
GraysCrk_RR	0.24	0.34	6.56	0.042	40.034
GraysCrk_US	0.25	0.35	6.55	0.042	41.93
GraysCrk_WaxD	0.24	0.33	6.57	0.042	32.992
HannaC_PrideBar	0.21	0.3	7.19	0.037	0.5311
HareLat_Airline	0.26	0.37	7.5	0.036	59.6776898
HareLat_OldHmd	0.26	0.37	7.32	0.034	66.379
HendByu_DSPtVinc	0.24	0.34	6.82	0.032	11.947
HendByu_HWY431	0.22	0.31	7.93	0.029	8.9403
HendByu_Joboy	0.24	0.33	6.57	0.042	34.617
HendByu_NrPtVinc	0.24	0.34	6.52	0.039	30.9196737
HendByu_US_Timbr	0.24	0.34	6.57	0.036	25.408
HogBayou_BC	0.26	0.37	6.53	0.042	0.0554442
HoneyCut_East	0.26	0.37	7.02	0.039	62.906
HoneyCut_NrAmite	0.26	0.37	7.12	0.038	38.118
HoneyCut_West	0.27	0.38	6.95	0.04	60.956
HornsbyCrk_CnMkt	0.24	0.34	6.52	0.042	1.1765
HornsbyCrk_DSCan	0.25	0.35	6.56	0.042	1.6846

HornsbyCrk_FLBd	0.24	0.34	6.55	0.042	6.4186
HornsbyCrk_HCT1	0.23	0.32	6.48	0.043	2.6952
HornsbyCrk_HCT3	0.23	0.32	6.55	0.042	1.0932
HornsbyCT1_Corbn	0.23	0.32	6.53	0.042	1.6779
HornsbyCT3_Corbn	0.22	0.31	6.49	0.043	1.13
HornsbyCT3_HC	0.22	0.31	6.53	0.042	1.6137
HornsbyC_I12	0.24	0.34	6.5	0.041	7.9113
HubByu_DS_GS_PH	0.22	0.31	6.53	0.041	2.1452
HubByu_GrnwelSpr	0.22	0.31	6.52	0.042	6.4368
HubByu_GS_PtHud	0.23	0.32	6.56	0.041	2.2186
HubByu_Peairs	0.22	0.31	6.47	0.043	0.23193
HunterByu_01	0.2	0.28	7.58	0.034	0.1569
HunterByu_02	0.2	0.28	7.46	0.034	0.27356
HunterByu_03	0.22	0.31	6.96	0.04	0.15378
HunterByu_04	0.21	0.29	7.41	0.034	0.98502
HunterByu_05	0.21	0.29	7.25	0.036	0.56793
HURRICANE_dsJOOR	0.25	0.36	7.2	0.038	50.413
HURRICANE_HOWELL	0.28	0.39	7.77	0.035	53.338
HURRICANE_Joor	0.27	0.38	8.02	0.034	45.383
HURRICANE_Presct	0.26	0.36	7.19	0.039	50.75
HURRICANE_Wildwd	0.27	0.37	7.66	0.036	64.147
IndianByu_PtHud	0.25	0.35	7.5	0.042	1.4659
IndianByu_UWB	0.24	0.34	7.54	0.042	1.2061
JacksB_Claycut	0.25	0.35	6.73	0.041	68.958
JacksB_ParkFor	0.3	0.42	8.4	0.031	74.647
JoinerCrk_01	0.19	0.26	6.46	0.048	0.61189
JoinerCrk_02	0.25	0.35	4.83	0.067	0.21091
JoinerCrk_03	0.24	0.34	4.84	0.067	1.0162
JoinerCrk_04	0.25	0.35	4.7	0.069	1.743
JoinerCrk_05	0.23	0.32	5.47	0.059	0.62016
JoinerCrk_06	0.22	0.31	6.11	0.054	0.84062
JonesBayou	0.24	0.34	7.59	0.041	6.0732
JonesCr_Airline	0.34	0.48	10.81	0.017	95.218
JonesCr_FLBlvd	0.28	0.39	8.35	0.032	66.76
JonesCr_Mont	0.28	0.4	8.71	0.029	75.263
JonesCr_NrAmite	0.23	0.33	6.34	0.036	38.453
JonesCr_OldHamd	0.27	0.38	7.51	0.036	56.079
JonesCr_ONealLn	0.25	0.36	6.89	0.035	57.145
JonesCr_WeinerCr	0.27	0.39	7.73	0.034	63.281
KnoxBr_Firewood	0.26	0.37	7.07	0.036	72.3793698
KnoxBr_ONealLn	0.24	0.34	6.47	0.041	53.481
LCypByu_Comite	0.25	0.35	7.11	0.039	18.845
LCypByu_DS_Lavey	0.21	0.3	6.9	0.039	12.077
LCypByu_GBL	0.27	0.38	8.58	0.033	34.986
LCypByu_Hooper	0.23	0.33	7.48	0.041	15.195
LCypByu_Lavey	0.24	0.34	7.21	0.04	27.485
LCypByu_Thomas	0.24	0.33	7.3	0.041	10.955
LCypByu_US_SL	0.25	0.35	7.02	0.041	22.496
LilClyell_DS_I12	0.24	0.34	7.68	0.039	6.6012
LilClyell_I12	0.24	0.33	6.51	0.042	10.219
LilClyell_L01	0.25	0.36	6.53	0.043	11.71
LilClyell_Prloux	0.22	0.31	8.22	0.042	10.616
LilClyell_Range	0.23	0.33	6.53	0.043	31.982
LilClyell_RangLn	0.24	0.33	7.35	0.042	2.4114
LilClyell_Satsu	0.24	0.34	6.89	0.042	4.3528
LilSndyC2_DS_Jac	0.22	0.31	7.32	0.041	1.2195
LilSndyC2_DS_Mil	0.23	0.32	6.64	0.041	4.1537
LilSndyC2_DS_Per	0.23	0.32	6.46	0.041	1.0244

LilSndyC2_Jack	0.23	0.32	6.62	0.041	0.86029
LilSndyC2_Lib	0.23	0.32	6.33	0.044	0.73752
LilSndyC2_Milld	0.22	0.31	6.68	0.042	1.4694
LilSndyC2_Peairs	0.23	0.32	6.59	0.041	1.5861
LilSndyC2_US_Jac	0.23	0.33	6.89	0.041	1.0739
LilSndyC2_US_LOC	0.21	0.3	7.32	0.036	0.52396
LilSndyC2_Wind	0.23	0.32	6.48	0.043	0.79088
LittleSandyCrk_01	0.2	0.28	7.42	0.035	1.1689
LittleSandyCrk_02	0.2	0.29	7.33	0.035	1.1052
LittleSandyCrk_03	0.19	0.27	7.57	0.033	0.89853
LittleSandyCrk_04	0.2	0.28	7.53	0.034	0.52756
LittleSandyCrk_05	0.2	0.28	7.46	0.035	0.4061514
LittleSandyCrk_06	0.21	0.29	7.14	0.037	0.40075
LivelyBT_FL	0.29	0.41	8.32	0.032	75.9090292
LivelyBT_LB	0.27	0.38	7.21	0.039	67.983
LivelyB_FLBlvd	0.28	0.39	7.72	0.035	53.9348218
LivelyB_HoneyCut	0.28	0.39	7.6	0.036	58.594
LivelyB_LBT	0.26	0.37	7.36	0.037	74.432
LivelyB_Pvt	0.25	0.36	6.57	0.042	13.974
LongSlashBranch	0.24	0.34	6.32	0.046	56.3349429
LSU_NP_MaySt	0.25	0.35	7.15	0.029	47.183
LSU_NP_Stanfrd	0.16	0.22	4.76	0.019	26.189
LWhiteByu_Comite	0.25	0.35	7.25	0.041	20.768
LWhiteByu_Pettit	0.23	0.33	7.57	0.041	7.8817
LWhiteByu_US_Pet	0.24	0.34	7.77	0.041	12.131588
MidClyellT3	0.23	0.32	6.57	0.042	6.4077
MidClyellT5_CnMk	0.23	0.32	6.52	0.042	9.8923
MidClyellT5_MC	0.23	0.33	6.55	0.042	5.8575
MidClyellT5_Sprg	0.22	0.31	6.53	0.042	3.8568
MidClyellT6_GalG	0.24	0.33	6.55	0.042	25.157
MidClyellT6_MC	0.22	0.31	6.54	0.042	7.0861
MidClyell_CB	0.25	0.35	6.94	0.04	2.0796
MidClyell_CnMkt	0.24	0.33	6.5	0.043	2.3343
MidClyell_FLBlvd	0.23	0.32	6.57	0.042	7.8818
MidClyell_HoodRd	0.24	0.34	6.56	0.042	1.1923
MidClyell_I12	0.24	0.34	6.59	0.041	13.08
MidClyell_MCT1	0.23	0.32	6.5	0.043	1.9882
MidClyell_MCT3	0.23	0.32	6.57	0.042	1.8422
MidClyell_MCT5	0.24	0.34	6.56	0.042	8.1081
MidClyell_MCT6	0.23	0.32	6.55	0.042	10.358
MidClyell_TylrBy	0.24	0.34	6.55	0.042	4.1254
MidClyell_US_LOC	0.21	0.29	7.25	0.04	1.5478
MidClyell_WeissR	0.23	0.32	6.54	0.042	1.0476
MillCrk_CarsonRd	0.23	0.32	6.51	0.041	2.6651
MillCrk_MahoneyRd	0.2	0.28	7.47	0.034	0.75225
MillCrk_PrideBar	0.22	0.31	6.36	0.039	1.3664
MillC_SandyC	0.23	0.32	6.57	0.042	1.1255
MillersCT_I12	0.24	0.34	6.57	0.042	35.958
MillersCT_MC	0.24	0.33	6.45	0.041	49.083
MillersCT_UnT	0.24	0.34	6.55	0.043	60.303
MillersC_Julban	0.25	0.35	6.54	0.042	20.162
MolerB_CnMkt	0.22	0.31	6.56	0.042	2.8258
MolerB_Springfld	0.22	0.31	6.55	0.042	10.1918145
MolerB_WC	0.21	0.3	6.5	0.041	11.159
MuddyCrk_Henry	0.25	0.35	6.65	0.041	42.624
MuddyCrk_HWY42	0.24	0.34	6.6	0.04	26.745
MuddyCrk_LilPra	0.25	0.35	6.52	0.039	27.106
MuddyCrk_NrManch	0.25	0.35	6.71	0.038	19.693

MuddyCrk_NrOakGr	0.25	0.36	6.57	0.037	27.1150825
NBrWardsCr_atBR	0.28	0.39	8.14	0.032	63.914
NBrWardsCr_FL	0.33	0.46	10.08	0.021	87.244
NBrWardsCr_Hare	0.31	0.43	9.44	0.025	79.578
NBrWardsCr_I10	0.28	0.39	8.07	0.033	62.87
NewR_Maurepas	0.29	0.41	11.78	0.006	0.0306776
ROBERTCN_dsJOOR	0.23	0.32	6.88	0.041	14.541
ROBERTCN_Grnwell	0.25	0.35	7.49	0.037	49.046
ROBERTCN_Joor	0.23	0.32	6.87	0.042	14.9318039
ROBERTCN_T	0.24	0.33	6.74	0.041	48.94
ROBERTCN_US_LOC	0.26	0.36	7.06	0.039	40.771
RobertsByu_01	0.2	0.28	7.54	0.033	1.8315
RobertsByu_02	0.19	0.27	7.62	0.032	0.20272
RobertsByu_03	0.2	0.27	7.58	0.033	0.30076
RobertsByu_04	0.2	0.28	7.25	0.036	0.2429991
SandyCrk_01	0.24	0.34	6.78	0.04	1.3693
SandyCrk_02	0.24	0.33	6.77	0.039	1.8517
SandyCrk_03	0.22	0.3	7.05	0.036	0.313
SandyCrk_04	0.25	0.35	6.55	0.042	0.34251
SandyCrk_05	0.25	0.35	6.55	0.042	1.238
SandyCrk_06	0.24	0.33	6.64	0.041	1.0984
SandyCrk_07	0.25	0.34	6.31	0.044	1.1925
SandyCrk_08	0.23	0.33	6.58	0.04	1.0726
SandyCrk_09	0.24	0.34	6.52	0.043	0.23322
SandyCrk_10	0.21	0.3	6.37	0.041	0.92948
SandyCrk_11	0.25	0.35	6.47	0.043	0.11065
SandyCrk_12	0.22	0.31	6.62	0.041	1.5142
SandyCrk_13	0.22	0.31	6.89	0.041	0.8221
SandyCrk_14	0.21	0.29	7.41	0.036	0.55571
SandyCrk_15	0.21	0.3	7.84	0.039	0.13221
SandyCrk_16	0.2	0.28	7.43	0.035	0.33668
SandyCrk_17	0.22	0.31	6.79	0.04	0.17505
SandyCrk_18	0.22	0.31	6.61	0.042	0.82661
SandyCrk_19	0.21	0.3	7.08	0.038	0.33433
SandyCrk_20	0.22	0.31	7	0.039	0.81234
SandyC_AlphonFor	0.22	0.3	5.87	0.05	0.60771
SandyC_BeaverPnd	0.23	0.33	6.5	0.04	1.6434
SandyC_FB	0.24	0.34	6.48	0.043	0.27765
SandyC_GrnwelSpr	0.23	0.32	6.37	0.043	2.4514
SandyC_MillC	0.23	0.33	6.51	0.042	0.85744
SandyC_PrideBay	0.23	0.33	6.44	0.041	2.9131
SandyC_StnyPtBur	0.23	0.32	6.47	0.041	1.2854
SandyC_UN3SC	0.25	0.35	6.51	0.043	0.37854
SandyRun_01	0.25	0.35	4.78	0.068	0.86981
SandyRun_02	0.24	0.34	5.07	0.064	0.75992
SandyRun_03	0.22	0.31	5.77	0.055	1.1845
SandyRun_04	0.19	0.27	6.41	0.048	1.164
SandyRun_05	0.2	0.29	6.28	0.05	0.60542
SandyRun_06	0.2	0.28	6.47	0.048	0.84378
SandyRun_07	0.24	0.33	5.55	0.06	0.215
SandyRun_08	0.22	0.31	6.74	0.045	0.25238
ScalousCr	0.21	0.29	7.46	0.036	0.48889
SCanal_Dyer	0.23	0.32	8.61	0.042	3.5412
SCanal_Plank	0.24	0.34	7.4	0.041	1.9499
ShoeCT1_SC	0.24	0.34	6.56	0.042	32.6155493
ShoeCT1_US_LOC	0.25	0.35	7.09	0.039	32.122
ShoeC_Comite	0.24	0.34	6.57	0.037	15.75
ShoeC_DS_Hooper	0.23	0.32	6.52	0.042	21.701

ShoeC_Gurney	0.25	0.35	6.49	0.041	10.216
ShoeC_Hooper	0.26	0.36	7.24	0.038	19.63
ShoeC_Pecos	0.24	0.34	6.59	0.039	19.9900628
ShoeC_SCT1	0.23	0.32	6.73	0.041	14.753
SouthCanal_Div	0.23	0.33	8.5	0.04	9.8705
SouthCanal_HWY19	0.24	0.33	9.11	0.039	14.358
SOUTHLATERAL	0.25	0.35	6.72	0.042	37.774
SouthSandyRun_01	0.25	0.35	4.64	0.069	0.0023245
SouthSandyRun_02	0.25	0.35	5.14	0.062	0.269
SouthSandyRun_03	0.25	0.35	5.02	0.064	0.96894
SouthSandyRun_04	0.25	0.35	5.04	0.064	2.2798
SpillersCT2_	0.25	0.35	7.33	0.037	2.5698
SpillersCT2_SC	0.23	0.32	6.52	0.038	4.2887
SpillersCT2_Wei	0.23	0.33	6.92	0.039	5.7996
SpillersCT2_3	0.22	0.31	6.3	0.048	4.4935
SpillersC_DS_Sim	0.22	0.31	6.55	0.042	4.6541
SpillersC_Hess	0.21	0.3	5.91	0.051	6.2163
SpillersC_HWY16	0.23	0.33	6.38	0.043	11.371
SpillersC_Sims	0.21	0.3	6.13	0.048	0.95572
SpillersC_WeissRd	0.22	0.3	6.18	0.048	1.5157
StoneByu_01	0.23	0.32	6.12	0.039	1.2894
StoneByu_02	0.25	0.35	6.53	0.042	1.8951
StoneByu_03	0.23	0.32	6.84	0.039	1.4295
StoneByu_04	0.2	0.29	7.41	0.035	0.35117
StoneByu_05	0.19	0.26	6.99	0.032	0.79683
SUB_BLACKCRK_01	0.23	0.33	6.39	0.041	1.4065
SUB_BLACKCRK_02	0.24	0.34	6.4	0.041	2.1666
SUB_BLACKCRK_03	0.25	0.35	6.54	0.042	0.27352
SUB_BLACKCRK_04	0.25	0.35	6.5	0.041	0.4505
SUB_BLACKCRK_05	0.26	0.36	6.52	0.042	0.52858
SUB_COMITENP_01	0.26	0.37	6.57	0.042	2.0461
SUB_COMITENP_02	0.25	0.35	6.41	0.049	2.1397
SUB_COMITE_01	0.26	0.37	6.64	0.046	1.6188
SUB_COMITE_02	0.21	0.3	6.98	0.037	0.49245
SUB_COMITE_03	0.23	0.32	6.69	0.041	0.28324
SUB_COMITE_04	0.23	0.33	6.58	0.043	0.11576
SUB_COMITE_05	0.24	0.34	6.56	0.042	0.36222
SUB_COMITE_06	0.22	0.31	6.98	0.039	0.18989
SUB_COMITE_07	0.21	0.29	7.21	0.036	0.28391
SUB_COMITE_09	0.21	0.29	7.05	0.036	0.7141
SUB_COMITE_10	0.23	0.32	6.58	0.043	0.71879
SUB_COMITE_12	0.2	0.29	6.38	0.037	0.0105962
SUB_COMITE_13	0.22	0.31	6.95	0.038	1.9055
SUB_COMITE_14	0.22	0.31	6.87	0.039	1.7058
SUB_COMITE_15	0.21	0.3	6.94	0.037	0.70593
SUB_COMITE_18	0.22	0.3	6.4	0.039	0.53936
SUB_COMITE_19	0.23	0.33	6.63	0.041	0.59163
SUB_COMITE_21	0.22	0.31	6.58	0.055	0.70051
SUB_COMITE_22	0.22	0.31	6.84	0.05	0.72005
SUB_COMITE_23	0.24	0.34	6.22	0.085	0.80115
SUB_COMITE_25	0.23	0.32	6.19	0.148	1.0536
SUB_COMITE_26	0.23	0.33	6.44	0.111	0.67587
SUB_DOYLEBAYOU_01	0.25	0.35	6.57	0.042	1.1047
SUB_DOYLEBAYOU_02	0.24	0.34	6.55	0.042	0.30231
SUB_DOYLEBAYOU_03	0.26	0.36	6.56	0.042	0.63575
SUB_DOYLEBAYOU_05	0.25	0.35	6.57	0.042	0.60582
SUB_DOYLEBAYOU_06	0.24	0.34	7.17	0.041	0.79754
SUB_DOYLEBAYOU_07	0.25	0.35	6.5	0.04	1.8121

SUB_DOYLEBAYOU_08	0.25	0.35	6.81	0.041	1.8686
SUB_DOYLENP1_01	0.25	0.36	6.56	0.042	13.747
SUB_DOYLENP1_02	0.25	0.35	6.52	0.042	0.76793
SUB_FISHERBAYOU_01	0.2	0.29	7.44	0.034	0.20443
SUB_FISHERBAYOU_02	0.2	0.28	7.43	0.034	0.38516
SUB_FISHERBAYOU_03	0.2	0.29	7.38	0.034	0.33422
SUB_HOGBAYOU_01	0.25	0.35	6.53	0.042	0.45564
SUB_HOGBAYOU_02	0.25	0.35	6.55	0.042	0.28731
SUB_IRONBAYOU_01	0.24	0.34	6.56	0.042	1.3379
SUB_IRONBAYOU_02	0.24	0.34	6.55	0.042	1.0144
SUB_IRONBAYOU_03	0.26	0.36	6.53	0.042	1.1182
SUB_IRONBAYOU_04	0.26	0.36	6.54	0.042	0.58875
SUB_KNIGHTONBAYOU_01	0.2	0.28	7.38	0.035	0.60933
SUB_KNIGHTONBAYOU_02	0.2	0.28	7.35	0.036	0.13636
SUB_KNIGHTONBAYOU_03	0.2	0.28	7.45	0.034	0.31818
SUB_KNIGHTONBAYOU_04	0.22	0.3	6.78	0.04	0.12363
SUB_LEWISCRK_01	0.21	0.3	7.09	0.037	8.7155
SUB_LEWISCRK_02	0.21	0.3	7.05	0.039	11.1302238
SUB_LEWISCRK_03	0.21	0.3	6.82	0.039	1.5511
SUB_LITCOMITE_01	0.23	0.32	7.99	0.042	0.80217
SUB_LITCOMITE_02	0.23	0.32	6.78	0.041	0.038852
SUB_LITCOMITE_03	0.24	0.34	6.63	0.041	0.76748
SUB_LITREDWOOD_01	0.22	0.31	6.12	0.039	0.9207
SUB_LITREDWOOD_02	0.24	0.33	6.49	0.041	0.23051
SUB_LITREDWOOD_03	0.24	0.33	6.66	0.041	0.31199
SUB_LITREDWOOD_04	0.22	0.3	6.83	0.039	0.40867
SUB_LITREDWOOD_05	0.2	0.28	7.45	0.034	0.73053
SUB_MONAHANBAYOU_01	0.2	0.28	7.5	0.033	1.1523
SUB_MONAHANBAYOU_02	0.2	0.28	7.29	0.034	0.55601
SUB_PRETTYCRK_01	0.23	0.32	7	0.039	0.48855
SUB_PRETTYCRK_02	0.22	0.31	7.04	0.039	0.41612
SUB_PRETTYCRK_03	0.22	0.31	7.01	0.037	0.5238
SUB_PRETTYCRK_04	0.2	0.28	7.48	0.034	0.0981933
SUB_PRETTYCRK_05	0.24	0.34	6.37	0.046	1.0385
SUB_PRETTYCRK_06	0.21	0.29	7.1	0.036	0.57777
SUB_PRETTYCRK_07	0.22	0.31	6.99	0.039	0.94693
SUB_PRETTYCRK_08	0.23	0.32	6.46	0.041	11.545
SUB_PRETTYCRK_09	0.21	0.29	5.86	0.038	0
SUB_REDWOODCRK_01	0.19	0.27	7.61	0.032	2.1186
SUB_REDWOODCRK_02	0.21	0.29	7.05	0.036	2.9923
SUB_REDWOODCRK_03	0.21	0.3	7.25	0.036	0.83515
SUB_REDWOODCRK_04	0.22	0.31	6.82	0.039	0.40094
SUB_REDWOODCRK_05	0.24	0.34	6.56	0.042	0.12138
SUB_REDWOODCRK_06	0.22	0.32	6.93	0.038	2.3871
SUB_REDWOODCRK_08	0.23	0.32	6.63	0.04	0.34178
SUB_REDWOODCRK_09	0.2	0.28	7.39	0.034	1.1349
SUB_REDWOODCRK_10	0.23	0.32	6.85	0.039	0.34591
SUB_REDWOODCRK_11	0.25	0.35	6.59	0.041	0.9521915
SUB_REDWOODCRK_12	0.23	0.32	6.94	0.038	0.65718
SUB_REDWOODCRK_13	0.24	0.33	6.55	0.042	0.59666
SUB_REDWOODCRK_14	0.24	0.34	6.55	0.042	0.46249
SUB_REDWOODCRK_15	0.25	0.35	6.77	0.041	0.27253
SUB_REDWOODCRK_16	0.24	0.34	6.49	0.042	0.0245973
SUB_REDWOODCRK_17	0.25	0.35	6.88	0.041	0.34784
SUB_REDWOODCRK_18	0.24	0.34	6.47	0.042	2.3792
SUB_REDWOODNP	0.25	0.35	6.55	0.042	0.0905253
SUB_SCHLEIBAYOU_01	0.2	0.29	7.47	0.034	1.5465
SUB_SCHLEIBAYOU_02	0.21	0.3	7.21	0.036	0.86917

SUB_SCHLEIBAYOU_03	0.21	0.29	7.11	0.037	0.78975
SUB_SESSIONSBAYOU_NP	0.2	0.28	7.54	0.034	0.30252
SUB_SESSIONSBAYOU_01	0.2	0.28	7.42	0.034	0.12788
SUB_SESSIONSBAYOU_02	0.21	0.29	7.25	0.037	0.69764
SUB_SESSIONSBAYOU_03	0.21	0.29	7.11	0.037	0.20625
SUB_SESSIONSBAYOU_04	0.22	0.31	6.49	0.043	0.73677
SUB_UNT_LEWISCRK	0.2	0.28	7.49	0.034	7.6447
SUB_UNT3_REDWOOD_1	0.26	0.37	6.57	0.042	3.6326
SUB_UNT3_REDWOOD_2	0.26	0.36	6.57	0.042	0.36478
SUB_UN_UN3_REDWOOD	0.26	0.37	6.57	0.042	3.8889
SUB_UN_UN4_REDWOOD_1	0.25	0.35	6.56	0.042	0.44736
SUB_UN_UN4_REDWOOD_2	0.25	0.36	6.56	0.042	0.54076
SUB_UN_UN4_REDWOOD_3	0.24	0.33	6.5	0.043	0.342
SUB_UN3_REDWOOD_02	0.25	0.35	6.96	0.041	1.2688
SUB_UN4_REDWOOD_01	0.25	0.36	6.57	0.042	1.45
SUB_UN4_REDWOOD_02	0.25	0.35	6.49	0.042	0.83152
SUB_WALNUTBR_01	0.25	0.35	6.56	0.042	0.28411
SUB_WALNUTBR_02	0.25	0.35	6.56	0.042	0.28423
SUB_WALNUTBR_03	0.24	0.34	6.38	0.043	0.40457
SUB_WFRKLITCOMITE_01	0.22	0.3	8.29	0.042	0.45736
SUB_WFRKLITCOMITE_02	0.22	0.31	6.99	0.04	0.46593
SUB_WHITEBAYOU_01	0.25	0.35	6.57	0.042	0.12906
SUB_WHITEBAYOU_02	0.25	0.35	6.51	0.041	0.0853496
SUB_WHITEBAYOU_03	0.26	0.36	6.53	0.042	0.51646
SUB_WHITEBAYOU_04	0.26	0.36	6.56	0.042	0.62323
SUB_WHITEBAYOU_05	0.26	0.37	6.56	0.042	0.38068
SUB_WHITEBAYOU_06	0.25	0.35	6.51	0.041	0.45431
TaberC_CarsonRd	0.23	0.32	6.54	0.041	0.95069
TaberC_HannaC	0.23	0.32	6.84	0.04	1.0851
TaylorByu_DS_I12	0.24	0.34	6.58	0.041	15.256
TaylorByu_FL	0.23	0.32	6.57	0.042	46.74
TaylorByu_I12	0.23	0.32	6.51	0.041	35.833
TaylorByu_RR	0.23	0.32	6.55	0.042	24.1565793
UnDuffByu_DS	0.22	0.31	7.3	0.041	0.18774
UnDuffByu_US	0.24	0.34	6.67	0.042	15.916
UnT_GreenwellSp	0.23	0.32	6.55	0.041	1.4778
UNT1ADarlingCrk_01	0.25	0.35	4.71	0.069	0.55119
UNT1BlackCrk_01	0.25	0.35	5.06	0.064	0.37894
UNT1BluffCrk_01	0.22	0.3	7.15	0.036	0.88006
UNT1DarlingCrk_01	0.2	0.28	6.2	0.051	0.72634
UNT1DarlingCrk_02	0.24	0.33	4.76	0.064	0.64466
UNT1DarlingCrk_03	0.24	0.33	5.92	0.059	0.31344
UNT1DunnCrk_01	0.2	0.28	7.32	0.036	0.85969
UNT1SouthSandyRun_01	0.23	0.33	5.19	0.061	1.3985
UNT1WoodlandCrk_01	0.25	0.35	6.38	0.044	0.7437
UNT2ASSandyRun	0.24	0.34	4.49	0.068	0.19125
UNT2BlackCrk_01	0.24	0.34	5	0.065	2.4222
UNT2BluffCrk_01	0.2	0.28	7.54	0.034	0.80456
UNT2DarlingCrk_01	0.25	0.35	4.9	0.066	0.91286
UNT2DarlingCrk_02	0.25	0.35	4.71	0.068	1.2532
UNT2DarlingCrk_03	0.25	0.35	4.93	0.065	0.90147
UNT2SouthSandyRun_01	0.25	0.35	4.61	0.07	0
UNT2SouthSandyRun_02	0.24	0.34	4.92	0.064	0.167625
UNT3ADarlingCrk_01	0.24	0.34	5.19	0.062	0.00525
UNT3BlackCrk_01	0.23	0.33	5.35	0.061	0.81201
UNT3DarlingCrk_01	0.24	0.34	5.09	0.065	0.6084
UNT3DarlingCrk_02	0.23	0.32	5.75	0.055	0.0105
UNT3DarlingCrk_03	0.23	0.32	5.83	0.054	0.65109

UNT3DarlingCrk_04	0.21	0.3	6.15	0.05	0.36714
UnT3SandyC_Librt1	0.24	0.34	6.48	0.041	1.6329
UnT3SandyC_Librt2	0.23	0.33	6.49	0.043	2.3916
UNT3SouthSandyRun_01	0.25	0.35	4.63	0.07	0.14955
UNT3SouthSandyRun_02	0.25	0.35	4.69	0.069	1.2053
UNT3SouthSandyRun_03	0.25	0.35	4.78	0.067	1.0342
UNT4ADarlingCrk_01	0.25	0.35	5.19	0.062	0.14514
UNT4ADarlingCrk_02	0.25	0.35	5.57	0.056	0.43038
UNT4DarlingCrk_01	0.25	0.36	5.15	0.064	0.54252
UNT4DarlingCrk_02	0.25	0.34	5.37	0.06	0.0292387
UNT4DarlingCrk_03	0.23	0.33	6.24	0.048	0
Un_UpperWhiteByu	0.23	0.32	5.95	0.038	0.17049
Un1LilSndyC2_DS	0.23	0.33	7.1	0.042	1.913
Un1LilSndyC2_US	0.25	0.35	6.57	0.042	0.9646
Un1MillC_PrideB	0.22	0.31	6.59	0.042	1.3394
Un1MillC_US_LOC	0.22	0.31	6.57	0.042	1.2274
Un1SandyC	0.23	0.32	6.89	0.041	0.0152592
Un2LilSndyC2_DS	0.23	0.32	6.62	0.041	0.44166
Un2LilSndyC2_US	0.23	0.33	6.99	0.041	1.1373
Un2_NBrWards_DS	0.24	0.34	6.73	0.041	59.1
Un2_NBrWards_US	0.28	0.39	8.09	0.033	60.755
Un3LilSndyC2_DS	0.23	0.33	6.57	0.042	1.169
Un3LilSndyC2_US	0.24	0.34	6.55	0.041	3.2331
Un4LilSndyC2	0.23	0.32	6.53	0.041	2.9856
Un4SandyC_DS	0.24	0.34	6.24	0.041	3.8327
Un4SandyC_US	0.23	0.32	6.55	0.04	3.7883
UpperWhiteByu_DS	0.25	0.35	7.62	0.042	3.0444
UpperWhiteByu_US	0.25	0.36	7.43	0.042	3.7977
UWhiteByu_Div	0.25	0.35	6.57	0.04	0.0067967
UWhiteByu_DW	0.25	0.36	6.55	0.042	1.5842
UWhiteByu_Hudson	0.25	0.35	6.62	0.042	4.28
UWhiteByu_HWY64	0.25	0.35	6.75	0.042	11.154
UWhiteByu_LowZac	0.25	0.35	7.08	0.041	16.5425064
UWhiteByu_US_Div	0.24	0.34	6.61	0.041	0.3650287
UWhiteByu_UT	0.25	0.36	6.87	0.042	1.835
WardsCr_Bluebon	0.32	0.45	9.69	0.023	75.374
WardsCr_Choctaw	0.28	0.4	8.21	0.032	66.748
WardsCr_College	0.26	0.37	7.71	0.035	39.77051
WardsCr_EssenLn	0.27	0.38	7.96	0.035	46.246
WardsCr_GovtSt	0.29	0.42	8.92	0.028	68.997
WardsCr_GusYoung	0.25	0.36	7.07	0.038	69.096
WardsCr_Highland	0.24	0.33	7.03	0.039	41.828
WardsCr_I10_DS	0.23	0.32	7.84	0.039	56.834
WardsCr_I10_US	0.27	0.38	7.79	0.035	50.617
WardsCr_Manchac	0.24	0.34	7.47	0.037	52.066
WardsCr_PecueLn	0.25	0.35	7.78	0.034	69.3940296
WardsCr_SiegenLn	0.26	0.36	7.34	0.036	68.25
WaxDitch	0.24	0.34	6.57	0.042	44.567
WClyellT1_DS_Spr	0.22	0.3	6.54	0.042	8.7891
WClyellT1_Pvt	0.23	0.32	6.37	0.045	1.921
WClyellT1_SprfdR	0.22	0.31	6.54	0.042	1.9782
WClyell_ArnoldR	0.23	0.32	6.56	0.042	2.9041
WClyell_CnMkt	0.22	0.31	6.57	0.042	1.3161
WClyell_DS_Arnld	0.23	0.32	6.54	0.042	15.639
WClyell_DS_I12	0.24	0.34	6.51	0.041	14.921
WClyell_DS_Spr	0.22	0.32	6.56	0.042	3.9616
WClyell_HoodRd	0.24	0.34	6.61	0.042	5.9223
WClyell_I12	0.23	0.33	6.49	0.041	22.423

WClyell_JoeMayR	0.24	0.34	6.56	0.042	15.359
WClyell_NanWes	0.21	0.3	5.96	0.05	12.0717793
WClyell_RR	0.23	0.33	6.51	0.042	21.3979277
WClyell_SprgfldR	0.22	0.31	6.55	0.042	2.8439
WeinerCr_DS	0.28	0.39	8.06	0.031	79.517
WeinerCr_I12	0.31	0.44	9.15	0.027	86.355
WeinerCr_US	0.31	0.43	9.02	0.027	80.792
WelshGullyT1	0.26	0.37	6.57	0.039	27.939
WelshGul_Manchac	0.21	0.3	6.96	0.041	10.505
WelshGul_NrPrair	0.26	0.36	6.57	0.039	46.49
WestForkAmite_01	0.27	0.38	6.27	0.046	1.505565
WestForkAmite_02	0.27	0.37	5.88	0.052	0.59976
WestForkAmite_03	0.27	0.38	5.87	0.052	1.5201
WestForkAmite_04	0.26	0.37	5.91	0.05	0.75653
WFrkBeaverC2_Spr	0.23	0.32	6.44	0.043	31.612
WFrkBeaverC2_US	0.22	0.3	5.88	0.048	30.043
WindByu_Jackson	0.23	0.32	6.57	0.042	1.9565
WindByu_LSC2	0.23	0.33	6.48	0.043	1.2831
WindByu_Milldale	0.24	0.34	6.55	0.042	1.4631
WindByu_PeairsRd	0.23	0.32	6.52	0.041	3.4069
WLatCypB_ScotZac	0.25	0.36	7.91	0.038	33.285
WLatCypB_US_LOC	0.24	0.34	7.96	0.041	0.0666631
WoodlandCrk_01	0.25	0.35	6.5	0.041	1.8163
WoodlandCrk_02	0.25	0.35	6.32	0.044	0.5015
WoodlandCrk_03	0.23	0.32	6.92	0.04	0.16068
WoodlandCrk_04	0.23	0.32	6.99	0.039	1.1323
WoodlandCrk_05	0.25	0.35	6.57	0.042	0.58812
WoodlandCrk_06	0.24	0.34	6.6	0.042	0.059746
WoodlandCrk_07	0.22	0.3	6.69	0.041	0.000732347

8.6 Annex H-6: Appendix G: Hydrologic and Hydraulic Models – Description of Past Alternatives

Darlington Dam

Darlington Dam is a proposed dam on the Amite River near Darlington, Louisiana. The dam would provide FRM benefits by attenuating floodwater in its impoundment, and releasing water for an extended time at a lower rate, thus saving downstream areas from the peak flows of the upper Amite River.

This alternative was considered potentially effective for providing significant FRM benefits, so it was selected as an alternative to model. The Darlington Dam was modeled as a Dry Dam, meaning that it began with no water in the impoundment. This allowed for maximum storage capacity for purposes of evaluating potential effectiveness.

The dam is intended to retain the 25-year flood event and smaller events within the flood control pool. For those events, water will not reach the elevation of the emergency spillway, and only the low level outlet works will be utilized for outflow. For events larger than the 25-year event, the emergency spillway will be activated and the surcharge pool will be utilized.

The Darlington Dam model obtained from LaDOTD utilized a 100-year dam design. For this modeling effort, HH&C was tasked with modeling the 25-year dry dam. HH&C edited the 2D area connection of the Darlington Dam to represent the 25-year dry dam. Those edits included lowering the dam crest and the emergency spillway elevation. When the water surface elevation in the impoundment is below the elevation of the emergency spillway, water flows through the dam via the low level outlet, which is three 10-ft by 10-ft culverts at the base of the dam. When the water surface is higher than the emergency spillway, the low level outlet is closed.

In order to properly represent the operation of the dam outlets in the model, stage-flow rating curves were extracted from model results of both the low level outlet and the emergency spillway. The low level outlet was represented as three 10-ft by 10-ft box culverts, and the spillway was represented as a 1000-ft wide weir at elevation 172.8 ft NAVD 88. The stage-flow rating curves that resulted from both of those structures were combined into one rating that that is controlled by the culvert rating curve below elevation 172.8 ft NAVD 88, and controlled by the weir at elevations above 172.8 ft NAVD 88. Those curves were combined into a single stage-flow rating curve that was applied to the 2D area connection of the Darlington Dam.

Lily Bayou, Bluff Creek, and Darlington Creek Dry Detention Ponds (Alternative 8A)

The Lily Bayou, Bluff Creek, and Darlington Creek dry detention ponds are dams on three tributaries of the upper Amite River. The dams would provide FRM benefits by attenuating floodwater in their impoundments, and releasing water for an extended time at lower rates, thus saving the Amite River Basin from the peak flows of the three streams.

This alternative was considered potentially effective for providing significant FRM benefits, so it was selected as an alternative to model. This alternative was modeled by assuming that all of the flow upstream of each detention pond would be stored in the ponds for every flood event. The assumption of storing all floodwater in the detention ponds allowed for the maximum potential benefits to be gained from this alternative. Because of this assumption of complete storage, detailed analysis was not performed for sizing of outlet works.

Sandy Creek Dry Detention Pond (Alternative 8C)

Sandy Creek Dry Detention Pond is a dam on Sandy Creek, a right bank tributary of the Amite River. The dam would provide FRM benefits by attenuating floodwater in its impoundment, and releasing water for an extended time at a lower rate, thus saving the lower Sandy Creek Basin and the lower Amite River Basin from the peak flows of upper Sandy Creek.
This alternative was considered potentially effective for providing significant FRM benefits, so it was selected as an alternative to model. This alternative was modeled by assuming that all of the flow upstream of the detention pond would be stored in the pond for every flood event. The assumption of storing all floodwater in the detention pond allowed for the maximum potential benefits to be gained from this alternative. Because of this assumption of complete storage, detailed analysis was not performed for sizing of outlet works.

Spanish Lake Pump Station and Gate Operation

The Spanish Lake area and surrounding bayous (Bayou Fountain and Bayou Manchac) historically flood due to backwater from the Amite River. A pump station that collects water from the northwest portion of Spanish Lake and pumps to the Mississippi River was originally considered to divert incoming floodwaters flowing upstream up Bayou Manchac. That alternative was modeled with the 100 year event, and it was determined that the influence area of a pump station in that location could not have significant FRM benefits to the Spanish Lake area. A pump station located nearer to the confluence of Bayou Fountain and Bayou Manchac (near the entrance to Spanish Lake) was considered, as that could have a more significant influence area. But that pump station location was several miles from where it would pump water to in the Mississippi River, and thus was screened out due to cost.

This alternative was considered not economically feasible for FRM, and thus was not modeled for all ACE events.

Highway 22

Highway 22 crosses the Amite River Diversion approximately 3 miles downstream from the Amite River. For large events where there is significant flow out of the banks of the Amite River Diversion, Highway 22 acts as a barrier to flow. This causes backup of water upstream of Highway 22. Adding additional drainage underneath Highway 22, or turning Highway 22 into a short causeway, was considered as a way to mitigate the flow blockage. Both of these options were modeled with the 100 year event. Water levels were able to be lowered upstream of Highway 22, but it was determined that there were not enough structures in the region that could see benefit from this project.

This alternative was considered not beneficial enough to be modeled for all ACE events.

Port Vincent Bridge

Highway 42 crosses the Amite River at Port Vincent, Louisiana. The Port Vincent Bridge has several piers and a bridge deck that were assumed to act as a restriction to flow, causing an increase in water levels upstream of the bridge. Replacing the existing bridge with a clear span bridge and raising the bridge deck were considered as an alternative to mitigate the flow blockage. Evaluation of the impacts of the existing bridge for the 500 year event shows that water levels do not reach the elevation of the bridge deck. Several bridge piers are in the flow path, so conceivably a clear span bridge could show FRM benefits. But water levels upstream of the bridge could only be expected to be lowered by approximately one foot at the 500 year event, and by less than that for higher frequency events.

Based on the small expected hydraulic impact of the bridge, this alternative was not modeled for the suite of ACE events.

Amite River Re-meandering

Adding meanders to the Amite River above the Comite River was an alternative suggested recently by other federal agencies. The potential benefit is that there would be additional length in the river, and thus additional storage capacity, and floodwaters would be slowed down on their journey to inundate populated areas downstream. There are potential benefits from this alternative, especially at higher frequency events where the Amite River is still in its banks.

There are design and feasibility challenges with this alternative and the true potential for FRM benefits is quite unclear. At lower frequency events, the Amite River is out of its banks, and mostly flowing as sheet flow across the entire flood plain. In those cases, the shape and length of the river channel is less significant. There would be difficulty in “adding” meanders to the river in a stable way. Man-made shaping of rivers in a “natural” manner requires a thorough understanding of river morphodynamics, and significant erosion control measures would need to be taken.

This alternative was not modeled, because it was not presented to USACE or considered until hydraulic modeling was mostly complete. It cannot be definitively be said that river meander restoration will not yield FRM benefits downstream, especially for high frequency events. It may be worth modeling this alternative.

Highway 16

Highway 16 crosses Colyell Creek south of Port Vincent, Louisiana, approximately one mile upstream from the confluence with the Amite River. The Highway 16 Bridge has several piers and a bridge deck that are assumed to act as a restriction to flow, causing an increase in water levels upstream of the bridge. Due to the relative small size of Colyell Creek, the Highway 16 Bridge was not included in the hydraulic model that was used for this modeling effort. Analysis of the potential impacts of this bridge for the 200 year event show that the likely elevation of the bridge deck is above the peak water surface. The bridge deck is likely not a restriction to flow to any of the model events except for the 500 year. In order to model this alternative, a survey of the existing Highway 16 Bridge would be required, as well as further refinement of the hydraulic model.

There is a low density of structures in the region where water backs up behind the Highway 16 Bridge. Based on the low density of structures in the region, the lack of survey data for the bridge, and the small expected hydraulic impact of the bridge deck, this alternative was not modeled for the suite of ACE events.

Results

Hydraulic model runs were made for the full suite of eight 24-hour average recurrence interval events (2-year, 5-year, 10-year, 25-year, 50-year, 100-year, 200-year, and 500-year) for baseline without project (2026) and FWOP (2076). Model runs were also made for the full suite of eight 24-hour ACE events for three alternatives: Darlington Dam, Alternative 8A, and Alternative 8C. All alternative model runs were made using the baseline (2026) hydrology.

Results of hydraulic modeling were used to generate water surface elevation and depth grids for every alternative for the full suite of eight 24-hour ACE events. Those results grids were provided to the GIS and Economics branches for use in developing economics analyses.

Water surface elevations at three key locations on the Amite River (Baywood, Denham Springs, and Port Vincent) are shown in Tables 2 through 4 for each alternative and each frequency event.

Table 2
Stages in the Amite River at Baywood, Louisiana (ft NAVD88)

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	200 Year	500 Year
FWOP	85.2	87.8	89.5	91.3	92.4	93.5	94.5	96.5
Baseline	85.2	87.8	89.5	91.3	92.4	93.5	94.5	96.5
Alternative 8A	85.0	87.6	89.3	91.2	92.4	93.4	94.4	96.3
Alternative 8C	85.2	87.8	89.5	91.3	92.4	93.5	94.5	96.5
Darlington Dam	79.4	80.5	81.4	82.4	83.1	83.7	83.9	84.5

Table 3
Stages in the Amite River at Denham Springs, Louisiana (ft NAVD 88)

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	200 Year	500 Year
FWOP	30.0	32.4	34.1	36.6	38.5	40.1	41.7	43.3
Baseline	30.0	32.4	34.1	36.6	38.5	40.1	41.7	43.3
Alternative 8A	29.8	32.2	33.8	36.4	38.2	39.9	41.6	43.1
Alternative 8C	29.6	32.0	33.6	36.1	38.0	39.6	41.4	43.0
Darlington Dam	26.1	27.7	29.1	31.1	32.6	33.9	35.2	37.5

Table 4
Stages in the Amite River at Port Vincent, Louisiana (ft NAVD 88)

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	200 Year	500 Year
FWOP	7.8	9.0	10.1	11.5	12.6	13.5	14.5	16.1

Baseline	7.6	8.9	9.9	11.4	12.5	13.5	14.5	16.0
Alternative 8A	7.5	8.7	9.8	11.2	12.4	13.3	14.3	15.9
Alternative 8C	7.4	8.7	9.7	11.1	12.3	13.2	14.2	15.8
Darlington Dam	5.8	6.9	7.7	8.7	9.7	10.6	11.6	13.1