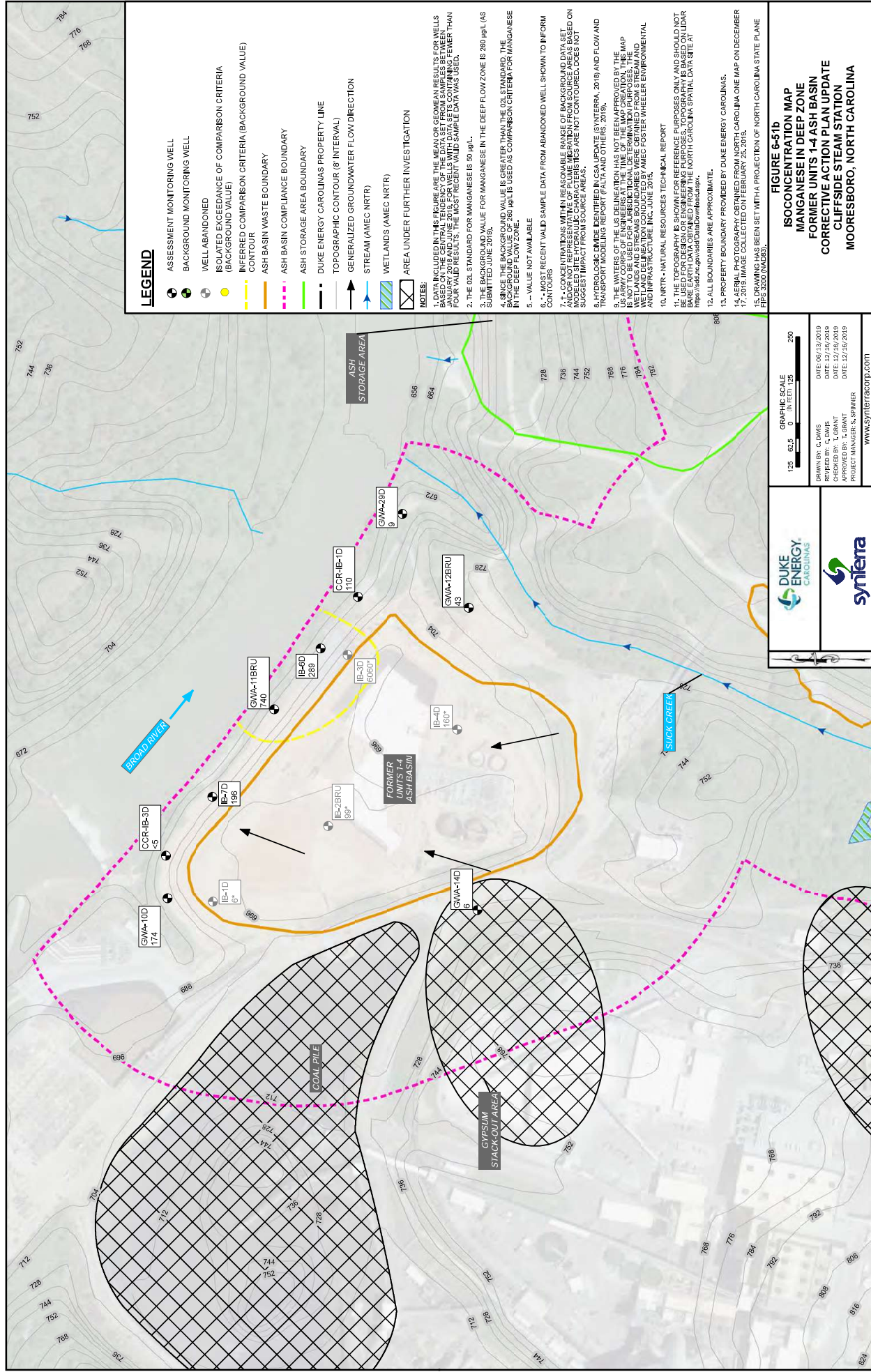
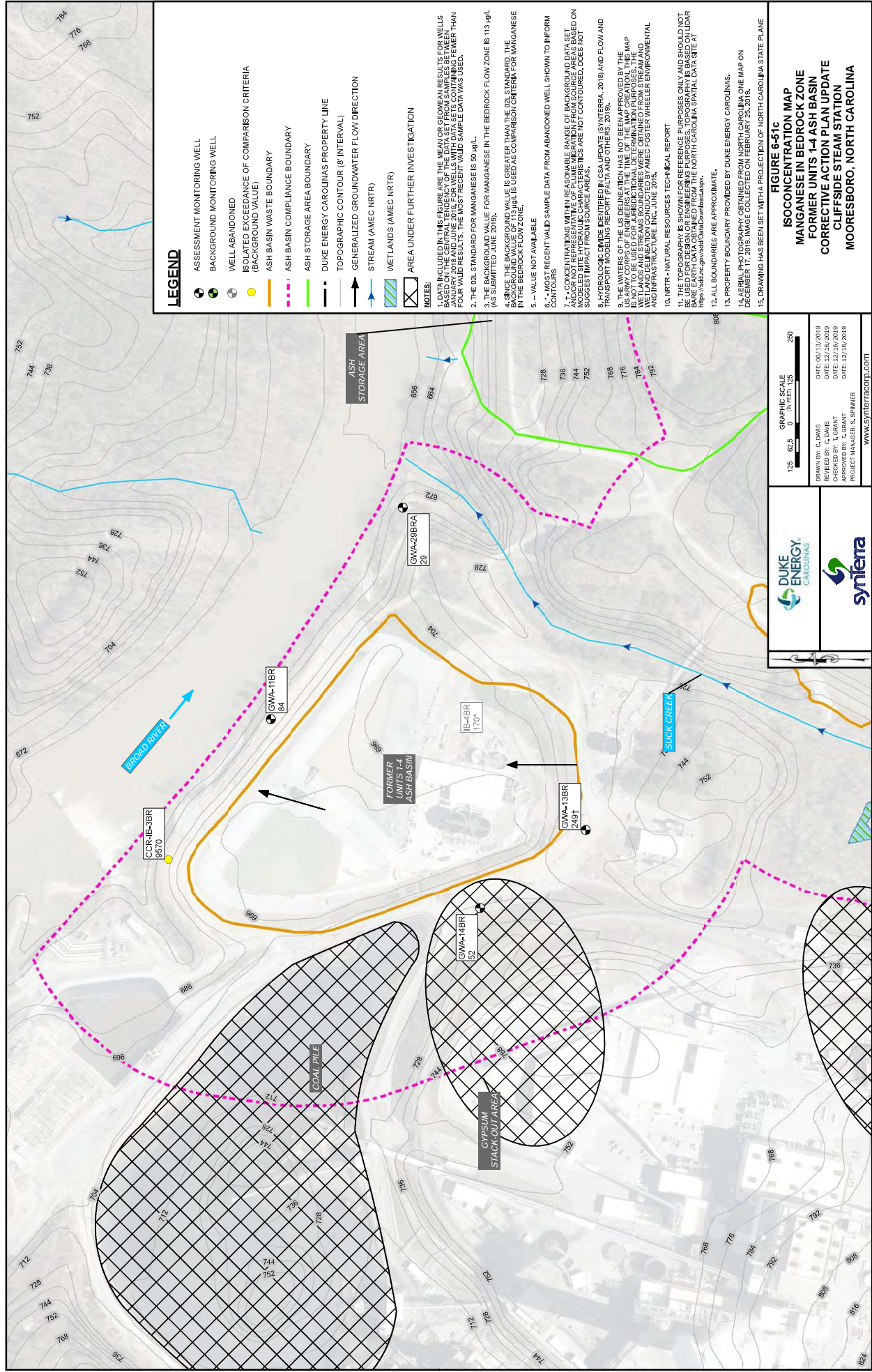
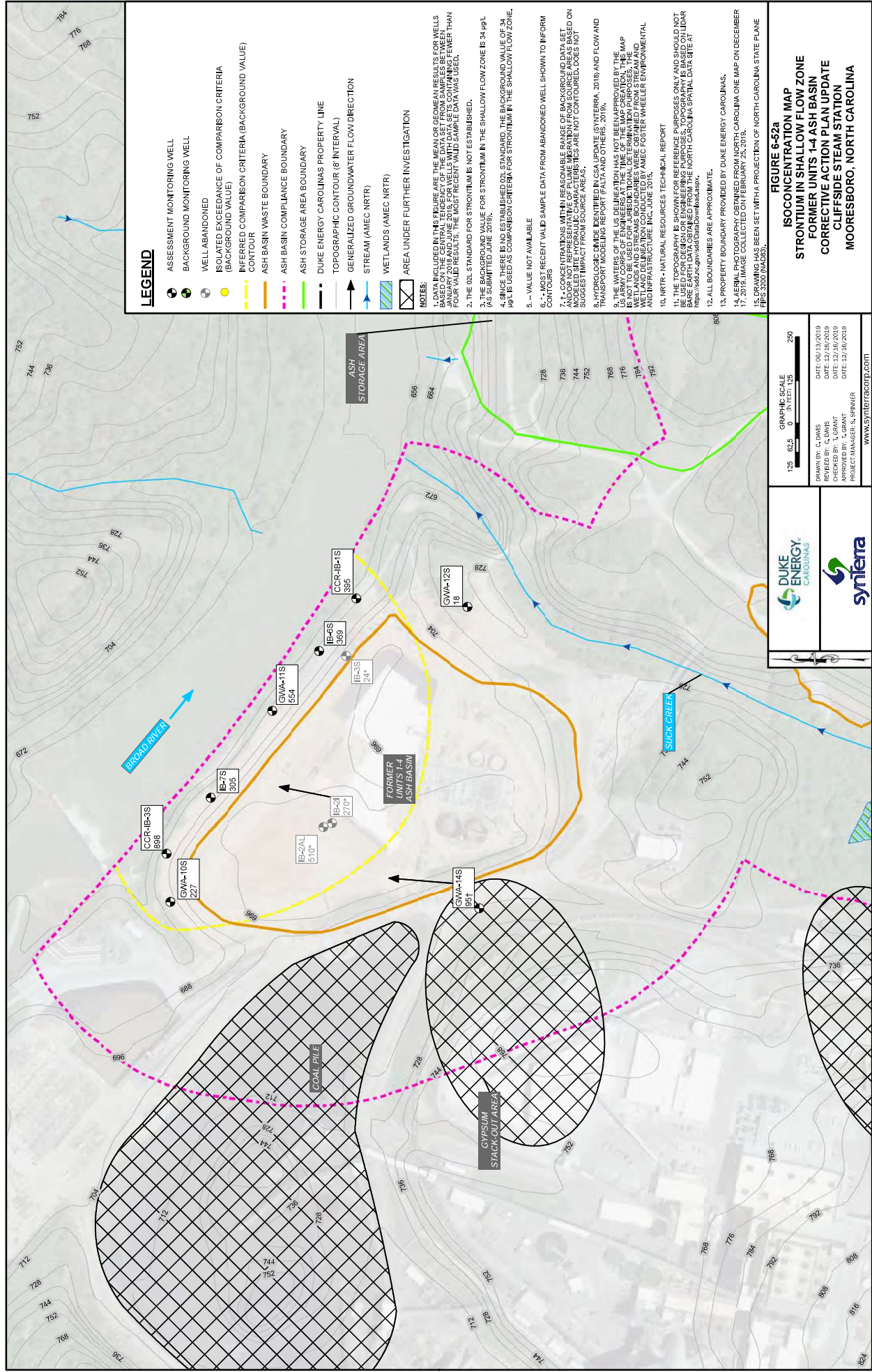








LEGEND

- ASSESSMENT MONITORING WELL
- BACKGROUND MONITORING WELL
- WELL ABANDONED
- ISOLATED EXCEEDANCE OF COMPARISON CRITERIA (BACKGROUND VALUE)
- INFERRED COMPARISON CRITERIA (BACKGROUND VALUE) CONTOUR
- ASH BASIN WASTE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- ASH STORAGE AREA BOUNDARY
- DUKE ENERGY CAROLINAS PROPERTY LINE
- TOPOGRAPHIC CONTOUR (8' INTERVAL)
- GENERALIZED GROUNDWATER FLOW DIRECTION
- STREAM (AMEC NTR)
- WETLANDS (AMEC NTR)
- AREA UNDER FURTHER INVESTIGATION

NOTES:

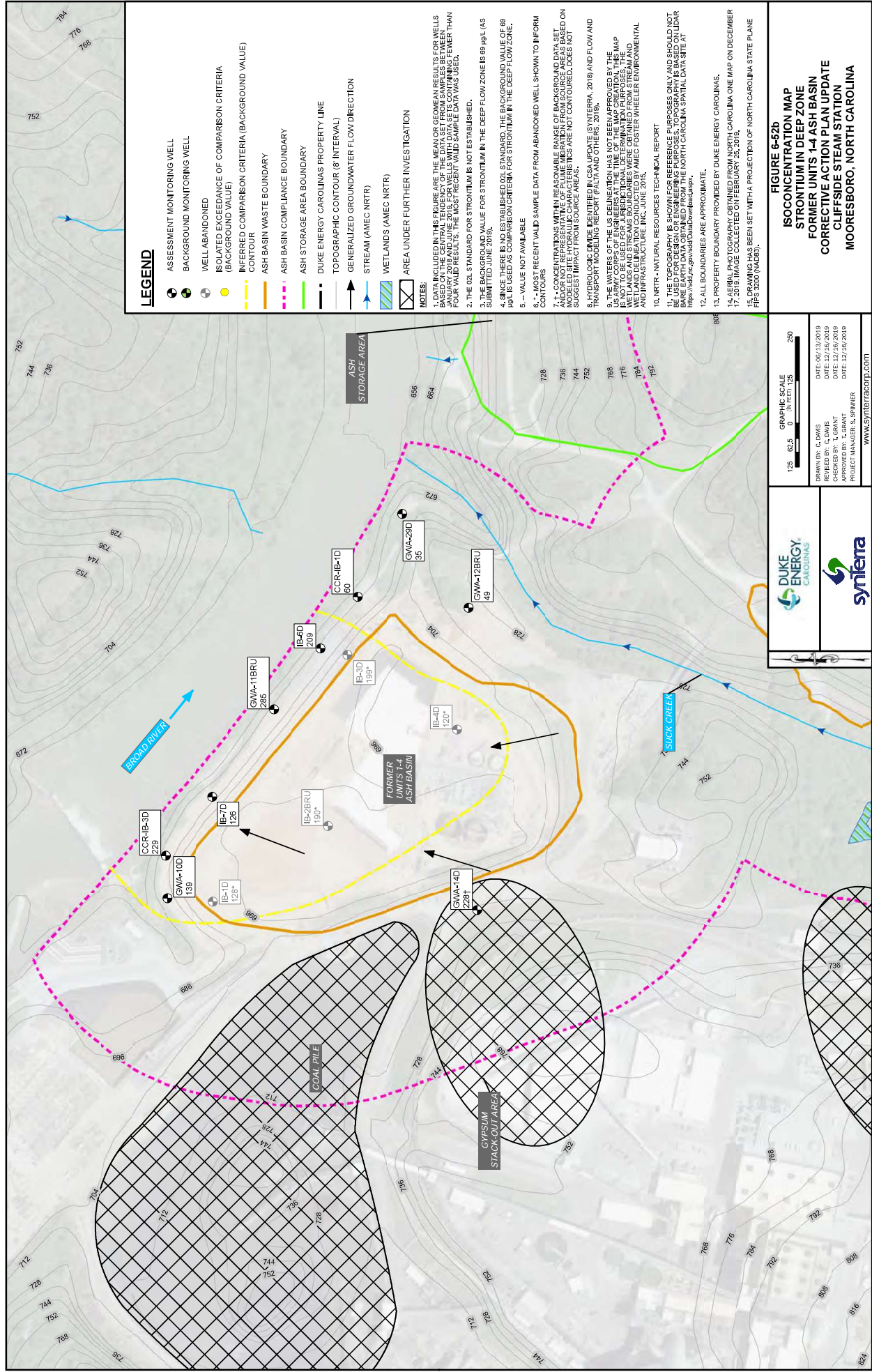
1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMEAN RESULTS FOR WELLS BASED ON THE CENTRAL TENDENCY OF THE DATA SET FROM SAMPLES BETWEEN FOUR VALID RESULTS. THE MOST RECENT VALID SAMPLE DATA WAS USED.
2. THE OIL STANDARD FOR STROMTUM IS NOT ESTABLISHED.
3. THE BACKGROUND VALUE FOR STROMTUM IN THE SHALLOW FLOW ZONE IS 34 µg/L (AS SUBMITTED JUNE 2019).
4. SINCE THERE IS NO ESTABLISHED OIL STANDARD, THE BACKGROUND VALUE OF 34 µg/L IS USED AS COMPARISON CRITERIA FOR STROMTUM IN THE SHALLOW FLOW ZONE.
5. - VALUE NOT AVAILABLE
6. - MOST RECENT VALID SAMPLE DATA FROM ABANDONED WELL SHOWN TO INFORM CONCENTRATION
7. 1. CONCENTRATIONS WITHIN REASONABLE RANGE OF BACKGROUND DATA SET AND/OR NOT REPRESENTATIVE OF PLUME MIGRATION FROM SOURCE AREAS BASED ON 3000 FEET RADIUS OF PLUME MIGRATION FROM SOURCE AREAS ARE NOT CONTOURED.
8. 2. PROPOSED MODEL RESULTS IN CONJUNCTION WITH (SYNTERRA, 2019) AND FLOW AND TRANSPORT MODELING REPORT DATA AND OTHERS, 2019).
9. 3. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE US ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THIS MAP DOES NOT SHOW DELINEATION OF WATERS OF THE US. WETLANDS AND STREAMS BOUNDARIES WERE OBTAINED FROM STREAM AND WETLAND DELINEATION CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL CONSULTANTS (2019).
10. NTR - NATURAL RESOURCES TECHNICAL REPORT
11. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSES. THE TOPOGRAPHY IS BASED ON A 2018 AERIAL PHOTOGRAPHY OBTAINED FROM THE NORTH CAROLINA STATE PLANE DATUM.
12. ALL BOUNDARIES ARE APPROXIMATE.
13. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
14. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2018. IMAGE COLLECTED ON FEBRUARY 25, 2019.
15. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE NAD83 3500 MADS3.



GRAPHIC SCALE
125 62.5 0 62.5 125
IN FEET

PROJECT INFORMATION
DRAWN BY: C. DAVIS
CHECKED BY: T. GRANT
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER
DATE: 06/12/2019
DATE: 12/16/2019
DATE: 12/16/2019
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FIGURE 6-52a
ISOCONCENTRATION MAP
STROMTUM IN SHALLOW FLOW ZONE
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA



LEGEND

- ASSESSMENT MONITORING WELL
- BACKGROUND MONITORING WELL
- WELL ABANDONED
- ISOLATED EXCEEDANCE OF COMPARISON CRITERIA (BACKGROUND VALUE)
- INFERRED COMPARISON CRITERIA (BACKGROUND VALUE) CONTOUR
- ASH BASIN WASTE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- ASH STORAGE AREA BOUNDARY
- DUKE ENERGY CAROLINAS PROPERTY LINE
- TOPOGRAPHIC CONTOUR (8' INTERVAL)
- GENERALIZED GROUNDWATER FLOW DIRECTION
- STREAM (AMEC NTR)
- WETLANDS (AMEC NTR)
- AREA UNDER FURTHER INVESTIGATION

NOTES:

1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMEAN RESULTS FOR WELLS BASED ON THE CENTRAL TENDENCY OF THE DATA SET FROM SAMPLES BETWEEN FOUR VALID RESULTS. THE MOST RECENT VALID SAMPLE DATA WAS USED.
2. THE DOL STANDARD FOR STRONTIUM IS NOT ESTABLISHED.
3. THE BACKGROUND VALUE FOR STRONTIUM IN THE DEEP FLOW ZONE IS 69 µg/L (AS SUBMITTED JUNE 2019).
4. SINCE THERE IS NO ESTABLISHED DOL STANDARD, THE BACKGROUND VALUE OF 69 µg/L IS USED AS COMPARISON CRITERIA FOR STRONTIUM IN THE DEEP FLOW ZONE.
5. - VALUE NOT AVAILABLE
6. * MOST RECENT VALID SAMPLE DATA FROM ABANDONED WELL SHOWN TO INFORM CONTOURS
7. 1. CONCENTRATIONS WITHIN REASONABLE RANGE OF BACKGROUND DATA SET ARE USED TO DETERMINE THE MOST REASONABLE SET OF HYDRAULIC CHARACTERISTICS SUGGESTED IMPACT FROM SOURCE AREAS.
8. HYDROLOGIC MODEL IDENTIFIED IN CSA UPDATE (SYNTERRA, 2018) AND FLOW AND TRANSPORT MODELING REPORT (FALC AND OTHERS, 2019).
9. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE U.S. ARMY CORPS OF ENGINEERS. THIS DELINEATION IS NOT TO BE USED FOR JURISDICTIONAL DETERMINATION PURPOSES. THE WATERS OF THE US DELINEATION IS FOR REFERENCE ONLY. SYNTERRA AND WETLAND DELINEATION CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL AND INFRASTRUCTURE, INC. JUNE 2015.
10. NTR - NATURAL RESOURCES TECHNICAL REPORT
11. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR DESIGN OR ENGINEERING PURPOSES. TOPOGRAPHY IS BASED ON LIDAR DATA FROM THE STATE OF NORTH CAROLINA SPATIAL DATA CENTER (<https://sdc.state.nc.gov/sdc/DataDownload.aspx>).
12. ALL BOUNDARIES ARE APPROXIMATE.
13. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
14. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2018. IMAGE COLLECTED ON FEBRUARY 23, 2019.
15. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE FIPS 3200 (NAD83).

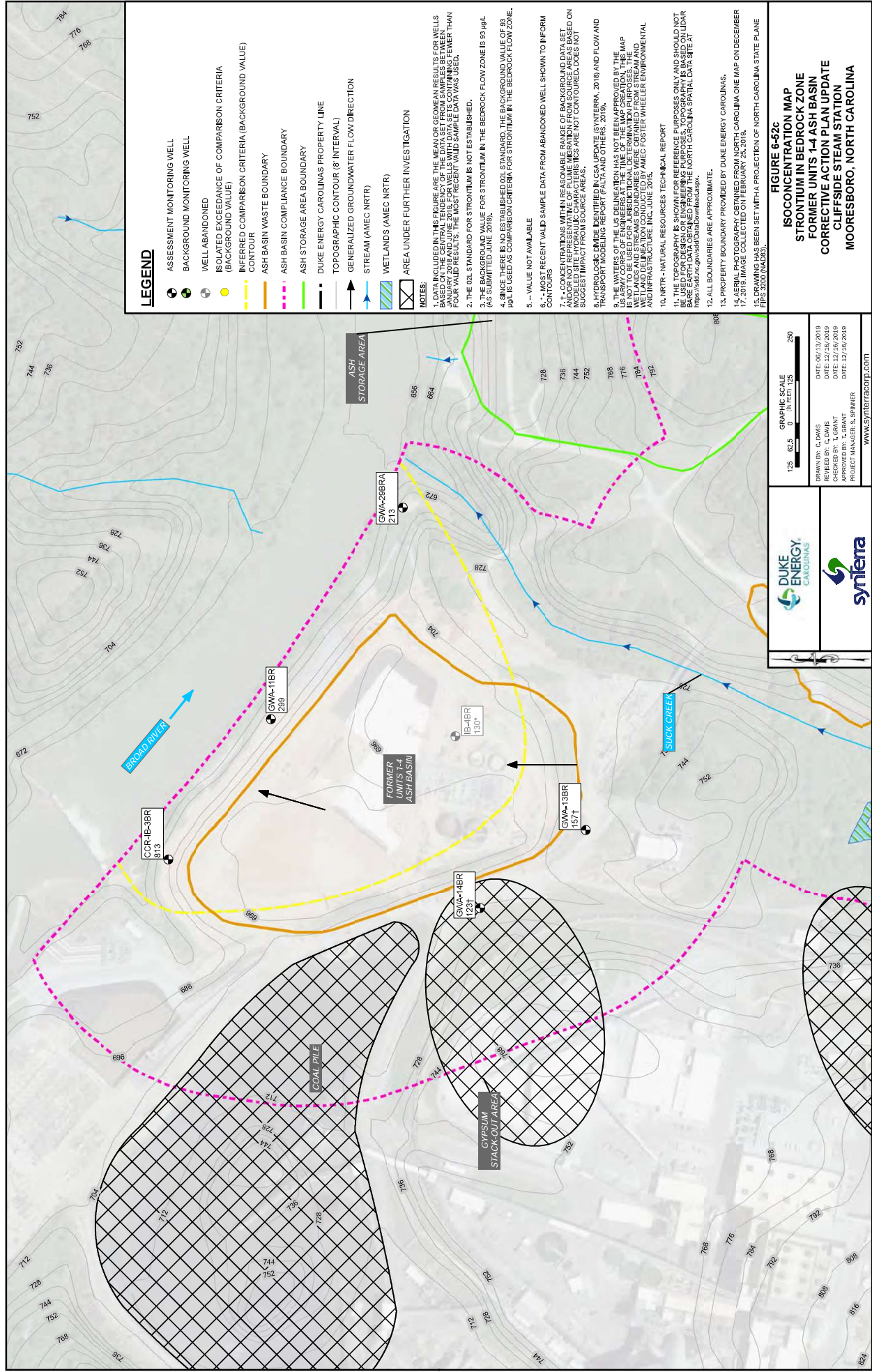


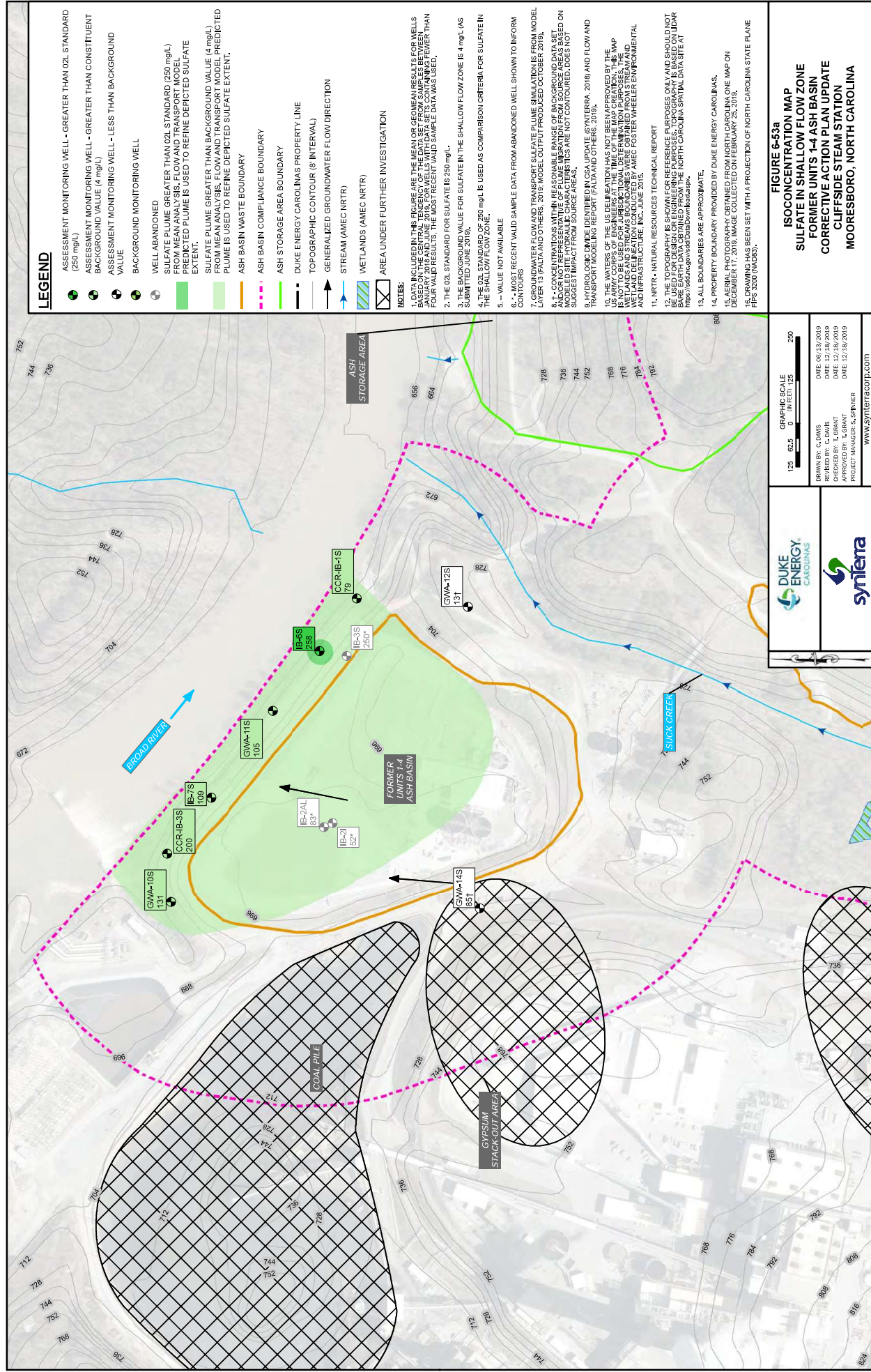
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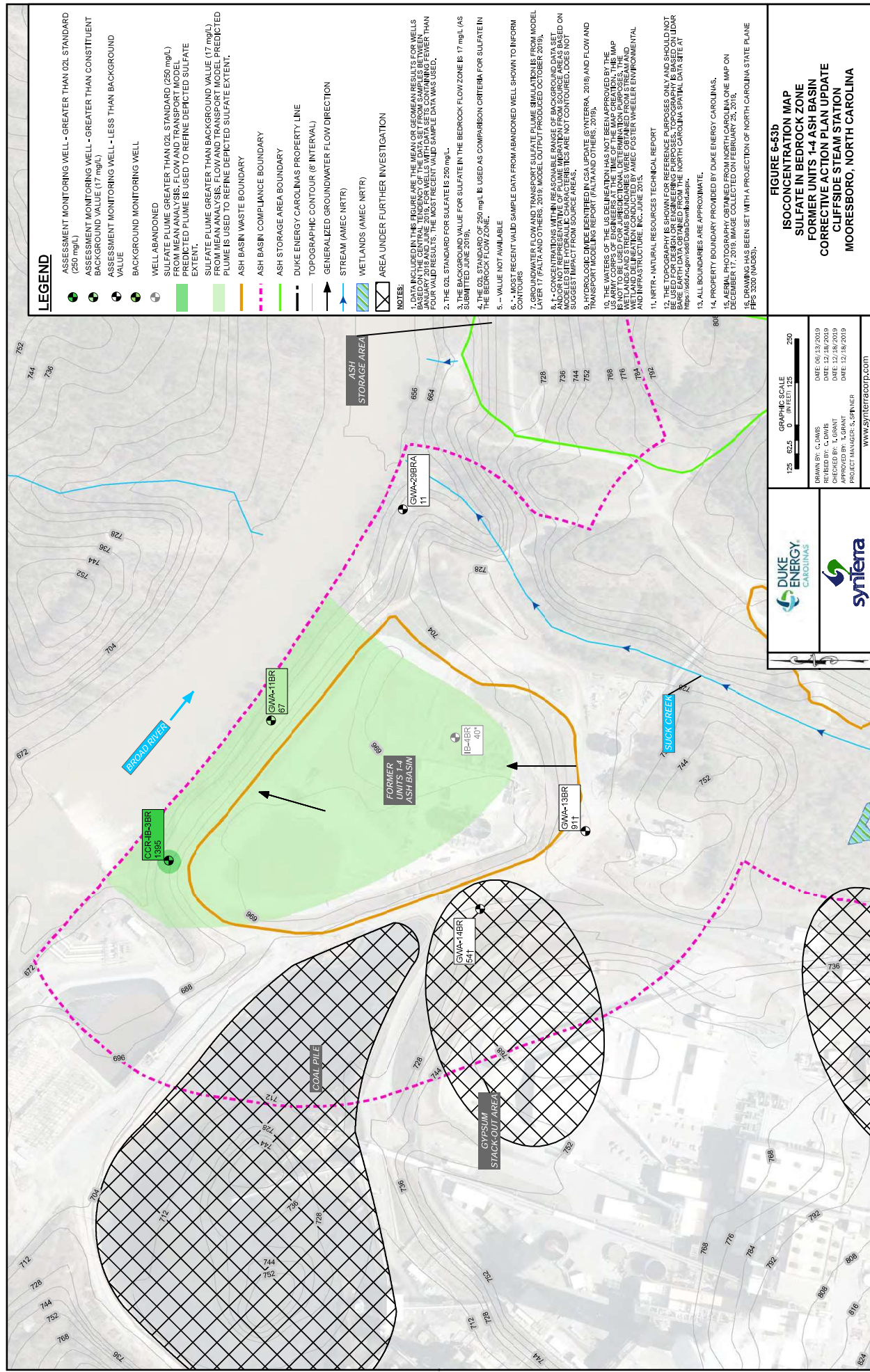
DATE: 06/12/2019
REVIEWED BY: C. DAVIS
CHECKED BY: T. GRANT
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER

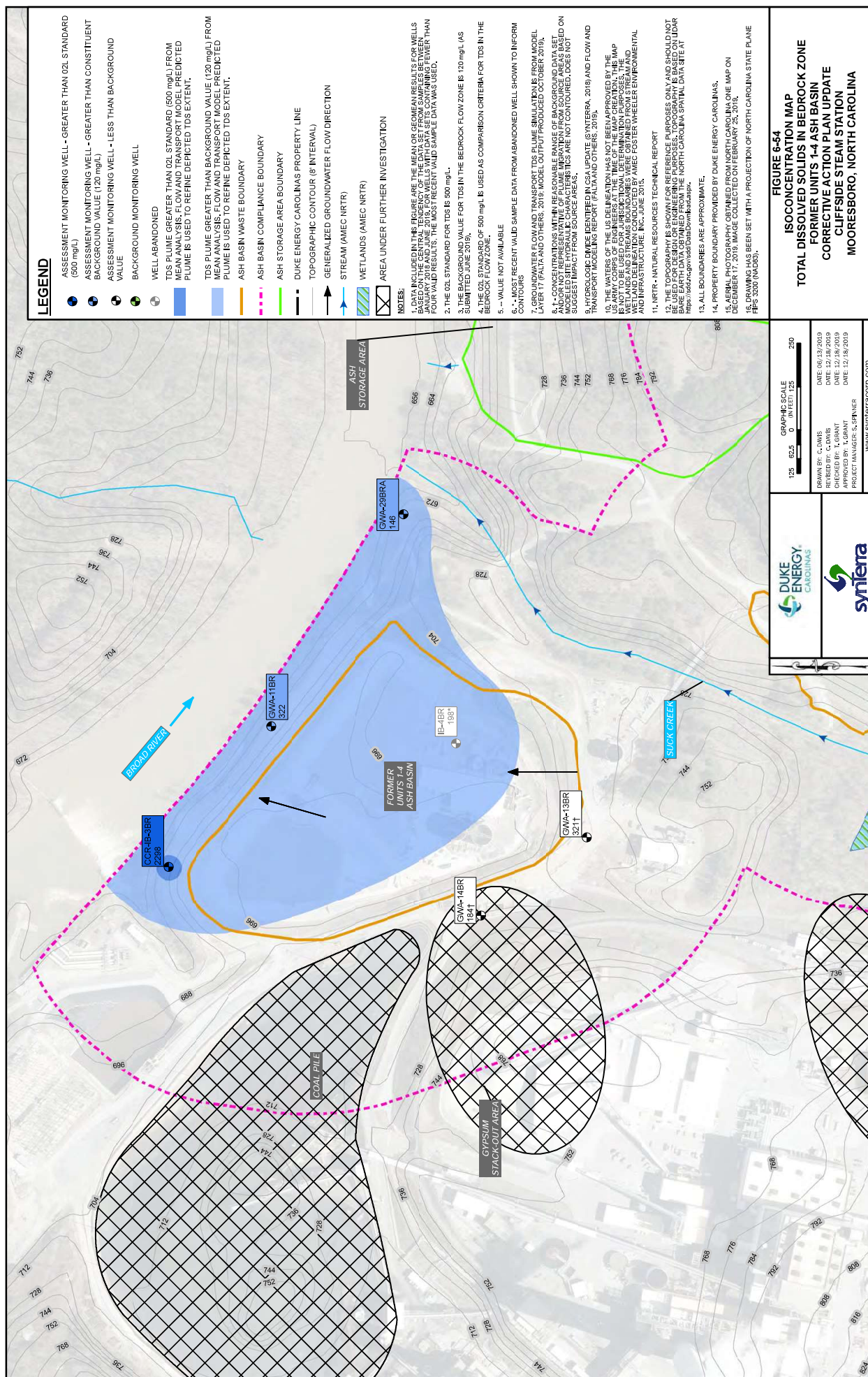
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FIGURE 6-52B
ISOCONCENTRATION MAP
STRONTIUM IN DEEP ZONE
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA









LEGEND

- ASSESSMENT MONITORING WELL - GREATER THAN 02L STANDARD (500 mg/L)
- ASSESSMENT MONITORING WELL - GREATER THAN CONSTITUENT BACKGROUND VALUE (120 mg/L)
- ASSESSMENT MONITORING WELL - LESS THAN BACKGROUND VALUE
- BACKGROUND MONITORING WELL
- WELL ABANDONED
- TDS PLUME GREATER THAN 02L STANDARD (500 mg/L) FROM MEAN ANALYSIS, FLOW AND TRANSPORT MODEL PREDICTED PLUME IS USED TO REFINE PREDICTED TDS EXTENT.
- TDS PLUME GREATER THAN BACKGROUND VALUE (120 mg/L) FROM MEAN ANALYSIS, FLOW AND TRANSPORT MODEL PREDICTED PLUME IS USED TO REFINE PREDICTED TDS EXTENT.
- ASH BASIN COMPLIANCE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- ASH STORAGE AREA BOUNDARY
- DUKE ENERGY CAROLINAS PROPERTY LINE
- TOPOGRAPHIC CONTOUR (8' INTERVAL)
- GENERALIZED GROUNDWATER FLOW DIRECTION
- STREAM (AMEC NRTR)
- WETLANDS (AMEC NRTR)
- AREA UNDER FURTHER INVESTIGATION

NOTES:

1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMEAN RESULTS FOR WELLS BASED ON THE CENTRAL TENDENCY OF THE DATA SET. THE DATA SET IS BASED ON FOUR WILD RESULTS. THE MOST RECENT WILD SAMPLE DATA WAS USED.
2. THE 02L STANDARD FOR TDS IS 500 mg/L.
3. THE BACKGROUND VALUE FOR TDS IN THE BEDROCK FLOW ZONE IS 120 mg/L AS SUBMITTED JUNE 2019.
4. THE 02L STANDARD OF 500 mg/L IS USED AS COMPARISON CRITERIA FOR TDS IN THE BEDROCK FLOW ZONE.
5. - VALUE NOT AVAILABLE
6. * MOST RECENT WILD SAMPLE DATA FROM ABANDONED WELL SHOWN TO INFORM CONTOURS
7. GROUNDWATER FLOW AND TRANSPORT TDS PLUME SIMULATION IS FROM MODEL LATER 17 JULIA AND OTHERS, 2019. MODEL OUTPUT PRODUCED OCTOBER 2019.
8. THE PLUME SIMULATION WAS CONDUCTED USING THE DUKESOURCE PLUME MODEL AND OF NOT REPERCUSS WITH THE FLOW AND TRANSPORT MODEL. THE PLUME MODEL SUGGESTS IMPACT FROM SOURCE AREAS.
9. THE PLUME SIMULATION WAS CONDUCTED IN 2019. THE PLUME SIMULATION WAS CONDUCTED IN 2019.
10. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE US ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THE MAP WITH AND USES THE US DELINEATION. THE PLUME SIMULATION WAS CONDUCTED IN 2019. THE PLUME SIMULATION WAS CONDUCTED IN 2019.
11. NRTR - NATURAL RESOURCES TECHNICAL REPORT
12. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSES. THE TOPOGRAPHY WAS OBTAINED FROM THE DUKE ENERGY CAROLINAS DATA CENTER.
13. ALL BOUNDARIES ARE APPROXIMATE.
14. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
15. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2019. IMAGE COLLECTED ON FEBRUARY 25, 2019.
16. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE FPS 3200 (NAD83).



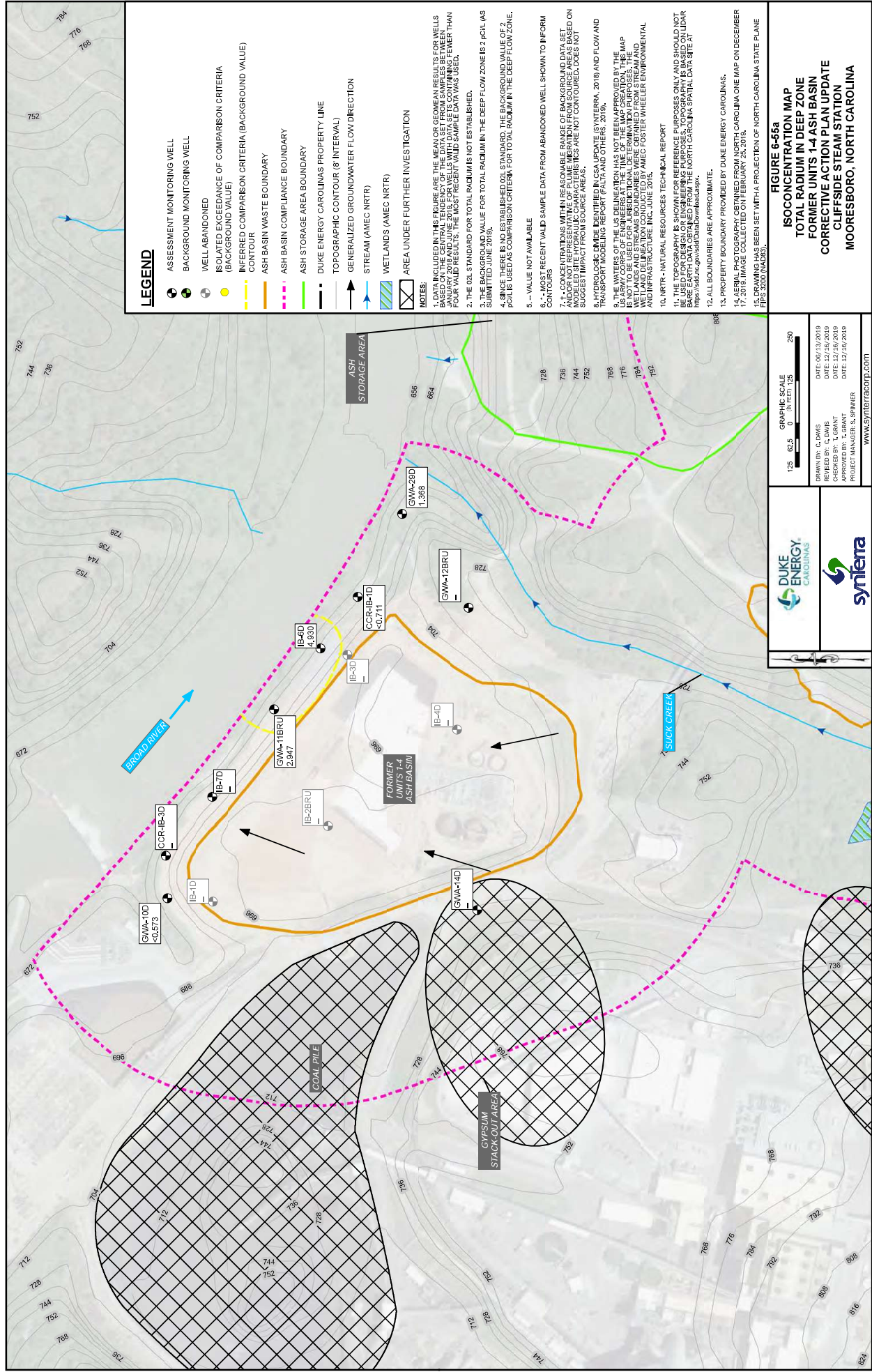
GRAPHIC SCALE 125 60.5 0 IN FEET 125

DRAWN BY: C. DAVIS
REVIEWED BY: C. DAVIS
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER

DATE: 06/13/2019
DATE: 12/18/2019
DATE: 12/18/2019

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FIGURE 6-54
ISOCONCENTRATION MAP
TOTAL DISSOLVED SOLIDS IN BEDROCK ZONE
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA



LEGEND

- ASSESSMENT MONITORING WELL
- BACKGROUND MONITORING WELL
- WELL ABANDONED
- ISOLATED EXCEEDANCE OF COMPARISON CRITERIA (BACKGROUND VALUE)
- INFERRED COMPARISON CRITERIA (BACKGROUND VALUE) CONTOUR
- ASH BASIN WASTE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- ASH STORAGE AREA BOUNDARY
- DUKE ENERGY CAROLINAS PROPERTY LINE
- TOPOGRAPHIC CONTOUR (8' INTERVAL)
- GENERALIZED GROUNDWATER FLOW DIRECTION
- STREAM (AMEC NRTR)
- WETLANDS (AMEC NRTR)
- AREA UNDER FURTHER INVESTIGATION

NOTES:

1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMEAN RESULTS FOR WELLS BASED ON THE CENTRAL TENDENCY OF THE DATA SET FROM SAMPLES BETWEEN FOUR VALID RESULTS. THE MOST RECENT VALID SAMPLE DATA WAS USED.
2. THE DQL STANDARD FOR TOTAL RADIUM IS NOT ESTABLISHED.
3. THE BACKGROUND VALUE FOR TOTAL RADIUM IN THE DEEP FLOW ZONE IS 2 PCIL (AS SUBMITTED JUNE 2019).
4. SINCE THERE IS NO ESTABLISHED DQL STANDARD, THE BACKGROUND VALUE OF 2 PCIL IS USED AS COMPARISON CRITERIA FOR TOTAL RADIUM IN THE DEEP FLOW ZONE.
5. - VALUE NOT AVAILABLE
6. - MOST RECENT VALID SAMPLE DATA FROM ABANDONED WELL SHOWN TO INFORM CONCENTRATION
7. 1. CONCENTRATIONS WITHIN REASONABLE RANGE OF BACKGROUND DATA SET AND/OR NOT REPRESENTATIVE OF PLUME MIGRATION FROM SOURCE AREAS BASED ON KNOWN SITE HYDRAULIC CHARACTERISTICS ARE NOT CONTOURED. DOES NOT INCLUDE DATA FROM MONITORING WELL 12BRU.
8. 2. PROPOSED DMLC BEING USED IN CONJUNCTION WITH (SYNTERRA, 2019) AND FLOW AND TRANSPORT MODELING REPORT DATA AND OTHERS, 2019).
9. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE US ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THIS MAP DOES NOT SHOW THE WATERS OF THE US DELINEATION. WETLANDS AND STREAMS BOUNDARIES WERE OBTAINED FROM STREAM AND WETLAND DELINEATION CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL CONSULTANTS (2019).
10. NRTR - NATURAL RESOURCES TECHNICAL REPORT
11. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSES. THE TOPOGRAPHY IS BASED ON A 2018 AERIAL PHOTOGRAPHY OBTAINED FROM THE NORTH CAROLINA STATE PLANE DATUM. THE TOPOGRAPHY IS NOT A SURVEY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSES.
12. ALL BOUNDARIES ARE APPROXIMATE.
13. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
14. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2018. IMAGE COLLECTED ON FEBRUARY 25, 2019.
15. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE NAD83 3500 MADS3.

FIGURE 6-55a

**ISOCONCENTRATION MAP
TOTAL RADIUM IN DEEP ZONE
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA**

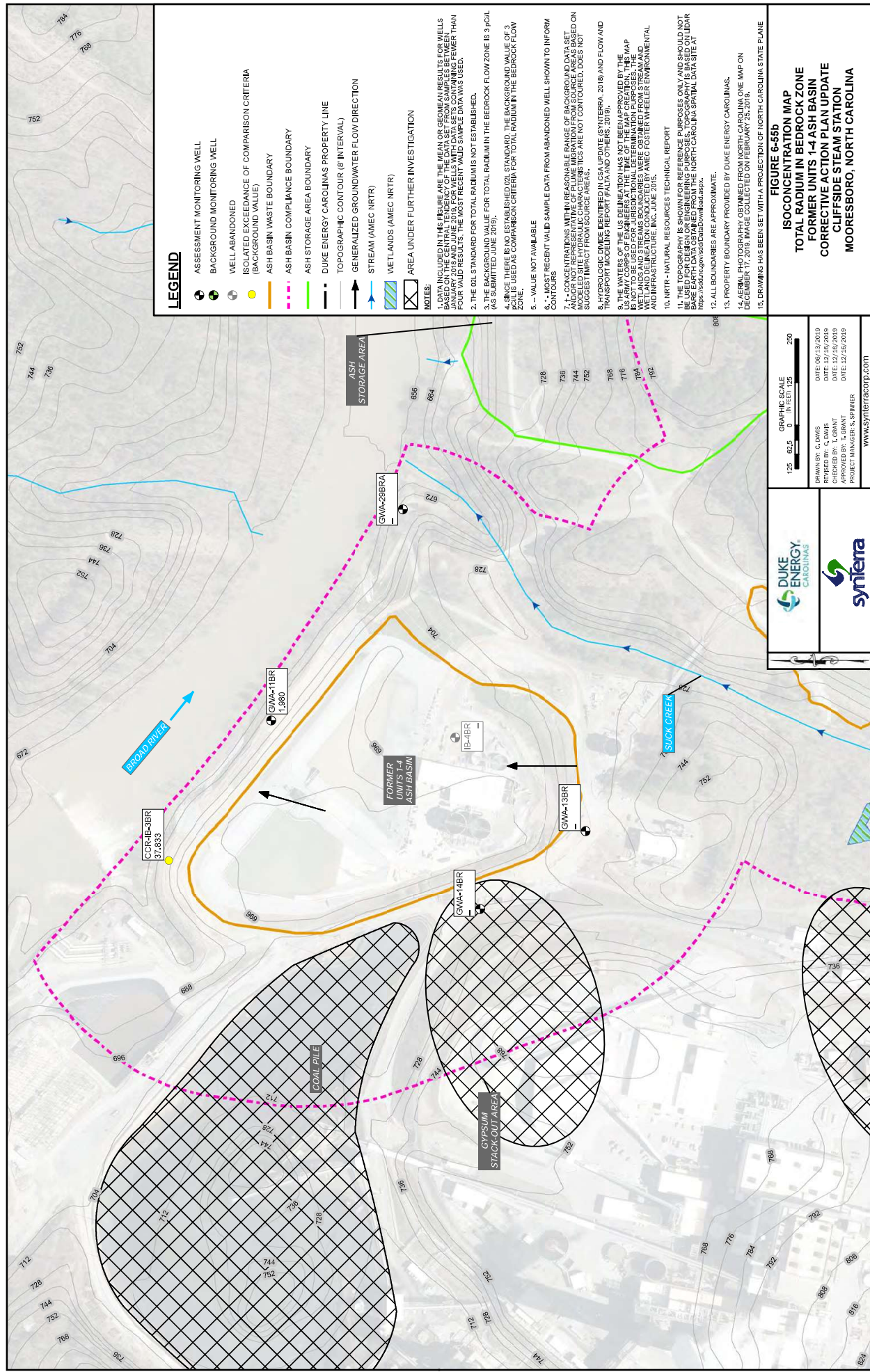
GRAPHIC SCALE 125 0 125 250
1" = 125'

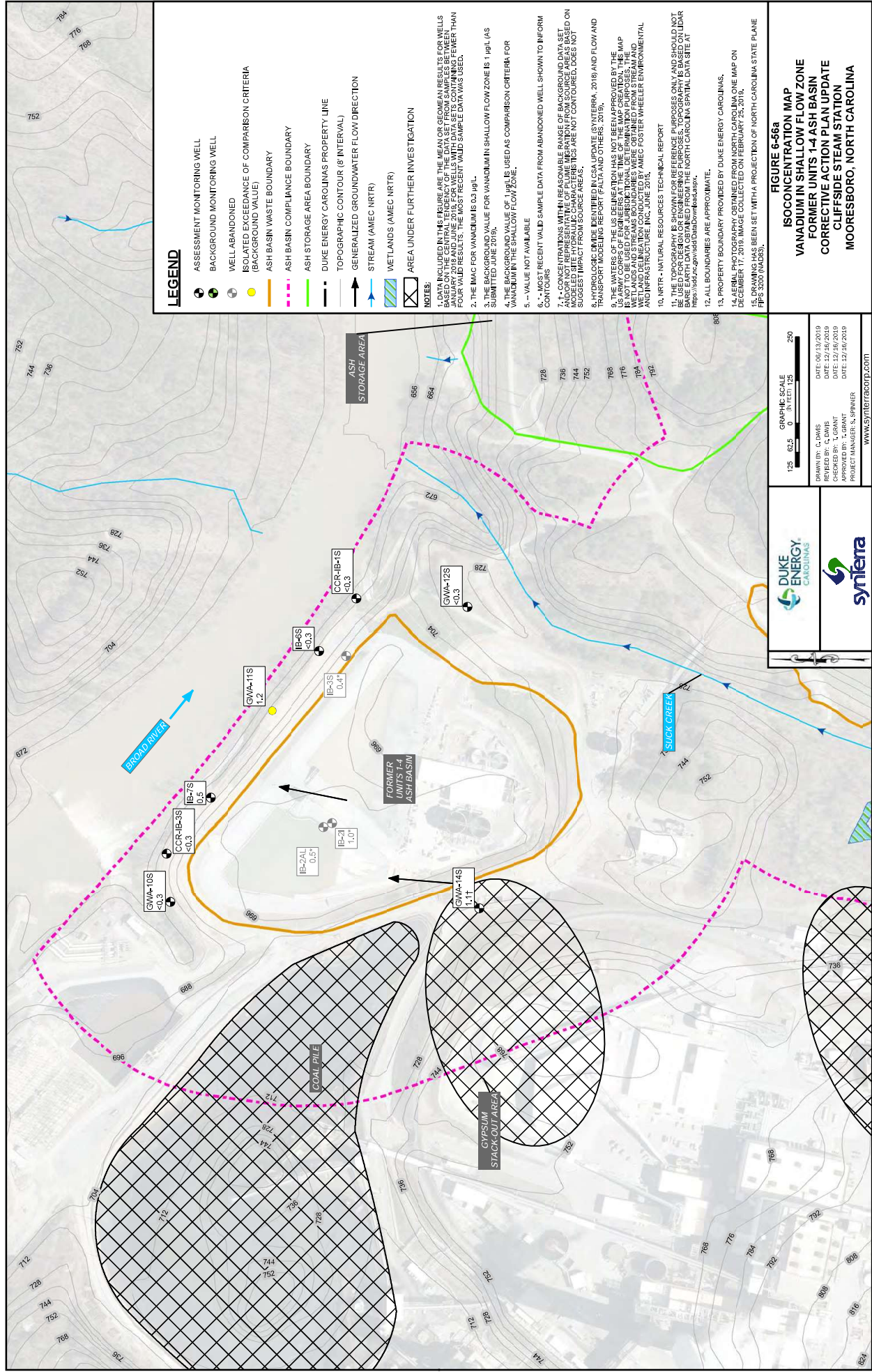


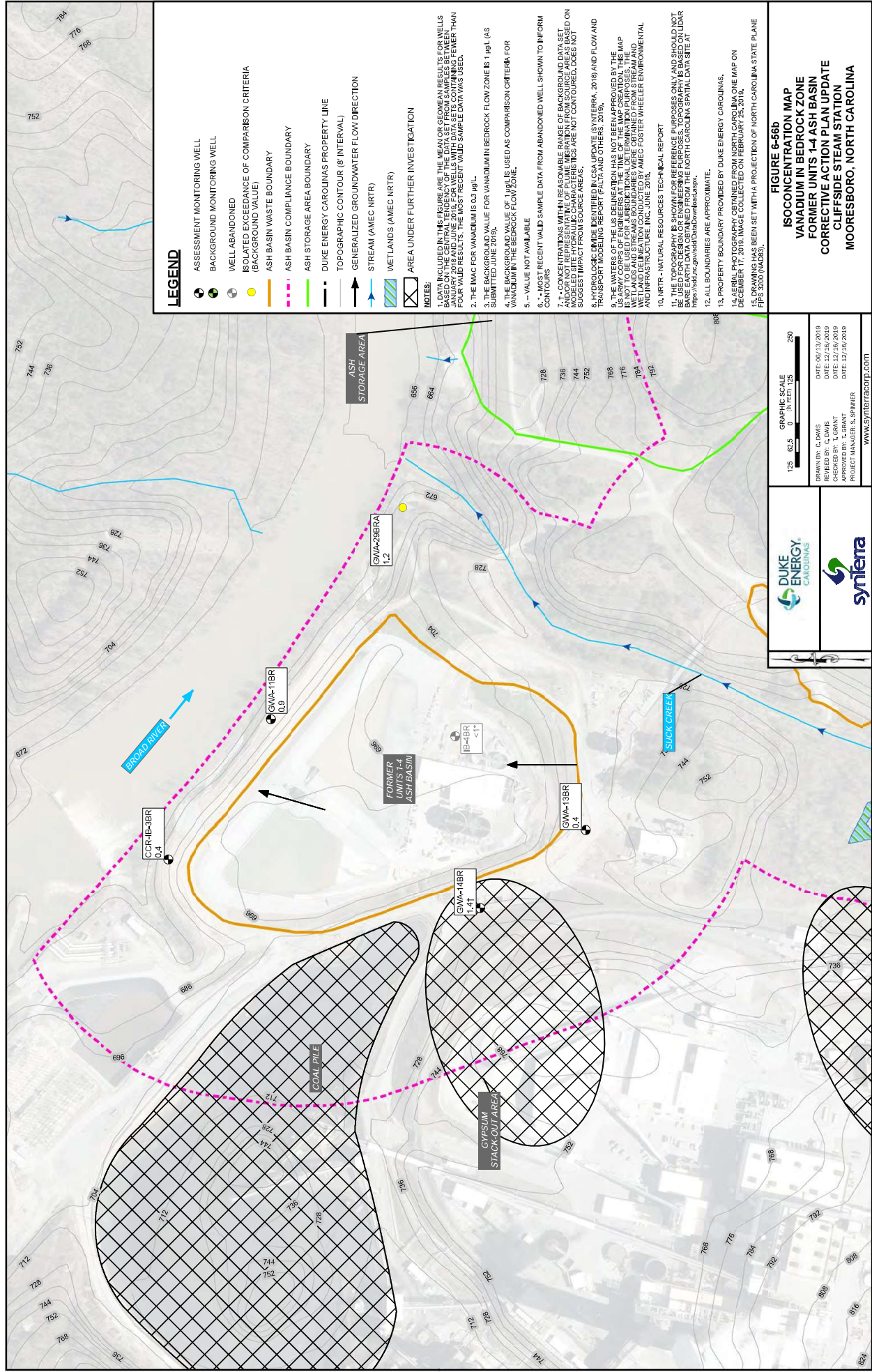
DRAWN BY: C. DAVIS
CHECKED BY: C. DAVIS
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER

DATE: 06/12/2019
DATE: 12/16/2019
DATE: 12/16/2019

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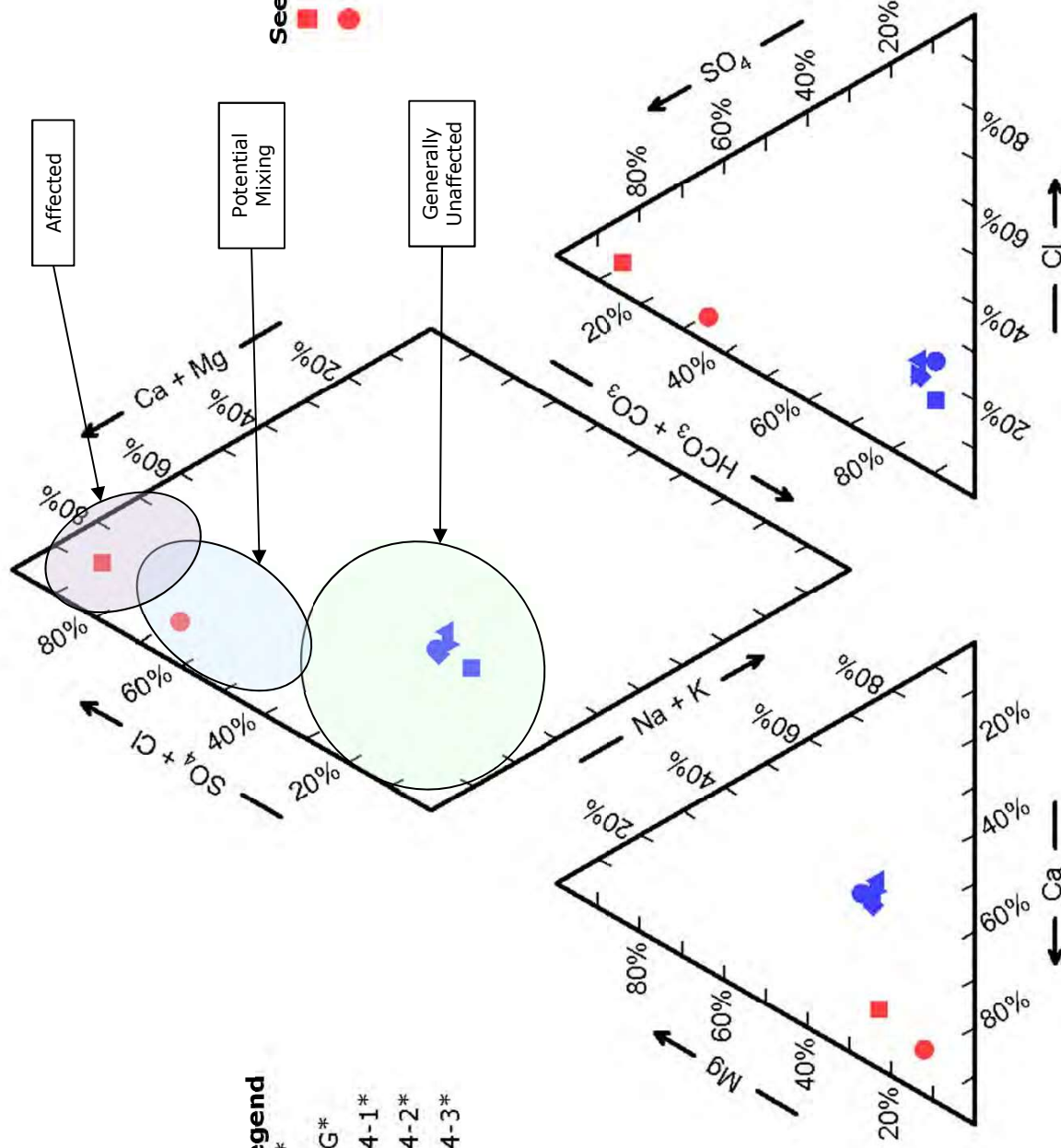
Note:
* - Sampling events prior to 1/1/2018

Surface Water Legend

- SW-BR-3*
- SW-SBRBG*
- ▲ SW-BRU14-1*
- ▼ SW-BRU14-2*
- ◆ SW-BRU14-3*

Seeps Legend

- S-3*
- S-10*



DRAWN BY: R. Badum
REVISED BY: R. Badum
CHECKED BY: T. Grant
APPROVED BY: T. Grant
PROJECT MANAGER: S. Spinner

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DATE: 10/18/2019

FIGURE 6-57
SEEP AND SURFACE WATER
QUALITY PIPER DIAGRAMS
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

Figure 6-58a

Remedial Alternative 2 – System Layout – Groundwater Remediation by Phytoremediation and TreeWell Technology

Provided in separate electronic figure file as a
large sheet size

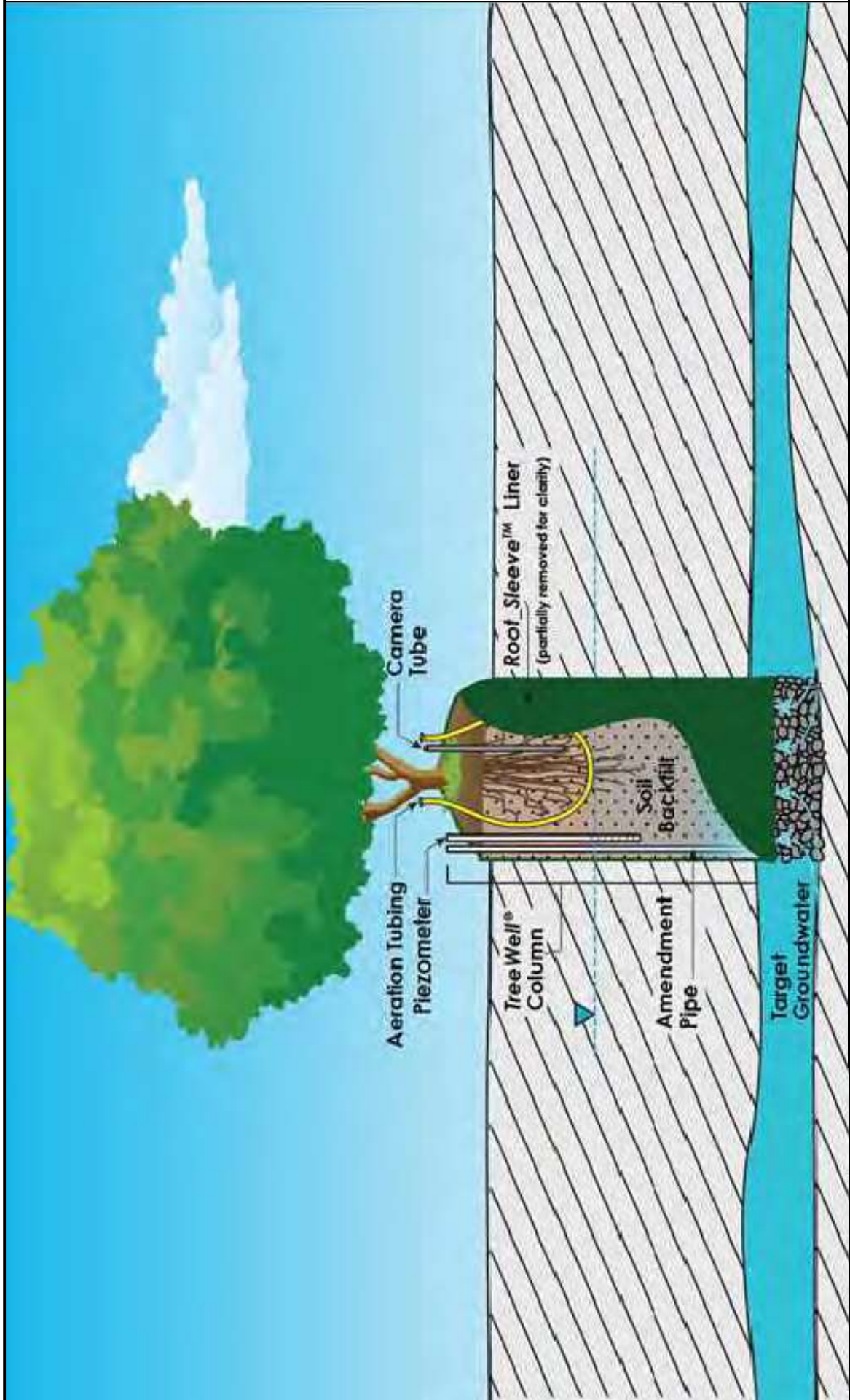


FIGURE 6-58b
REMEDIAL ALTERNATIVE 2
CONCEPTUAL TREE WELL
GROUNDWATER REMEDIATION BY PHYTOREMEDIATION
AND TREE WELL TECHNOLOGY
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

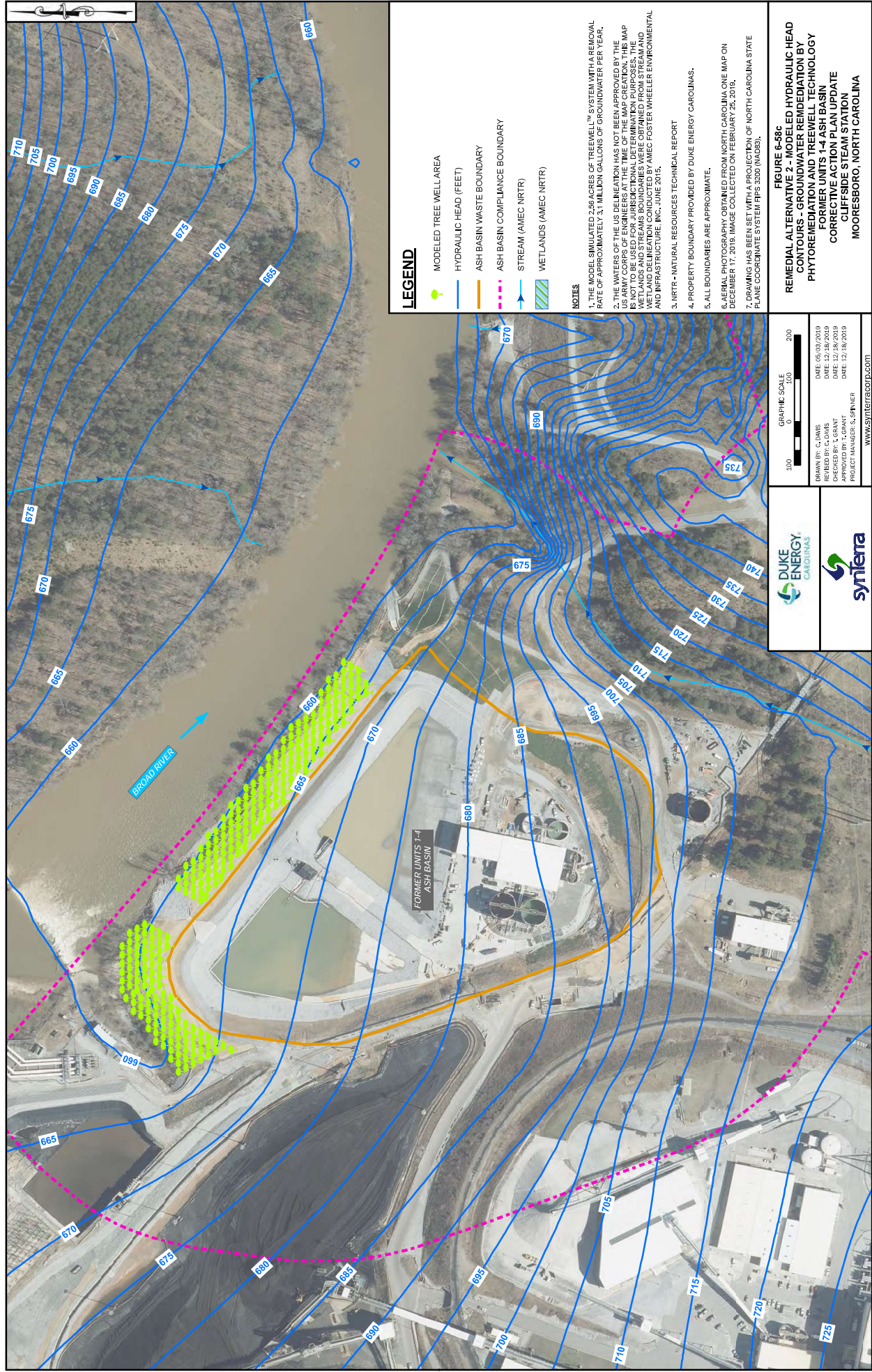
NOT TO SCALE

DRAWN BY: J. CHASTAIN
 REVISOR: J. CHASTAIN
 CHECKED BY: T. GRANT
 APPROVED BY: T. GRANT
 PROJECT MANAGER: S. SPINNER

DATE: 12/21/2019
 DATE: -
 DATE: 12/21/2019
 DATE: 12/21/2019

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LEGEND

- MODELED TREE WELL AREA
- HYDRAULIC HEAD (FEET)
- ASH BASIN WASTE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- STREAM (AMEC NRTR)
- WETLANDS (AMEC NRTR)

NOTES

1. THE MODEL SIMULATED 2,566 ACRES OF TREEWELL™ SYSTEM WITH A REMOVAL RATE OF APPROXIMATELY 3.1 MILLION GALLONS OF GROUNDWATER PER YEAR.
2. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE US ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THIS MAP IS NOT TO BE USED FOR JURISDICTIONAL DETERMINATION PURPOSES. THE WATERS OF THE US DELINEATION WAS CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL AND INFRASTRUCTURE, INC. IN JUNE 2015.
3. NRTR - NATURAL RESOURCES TECHNICAL REPORT
4. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
5. ALL BOUNDARIES ARE APPROXIMATE.
6. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2019. IMAGE COLLECTED ON FEBRUARY 25, 2019.
7. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE COORDINATE SYSTEM FIPS 3200 (NAD83).

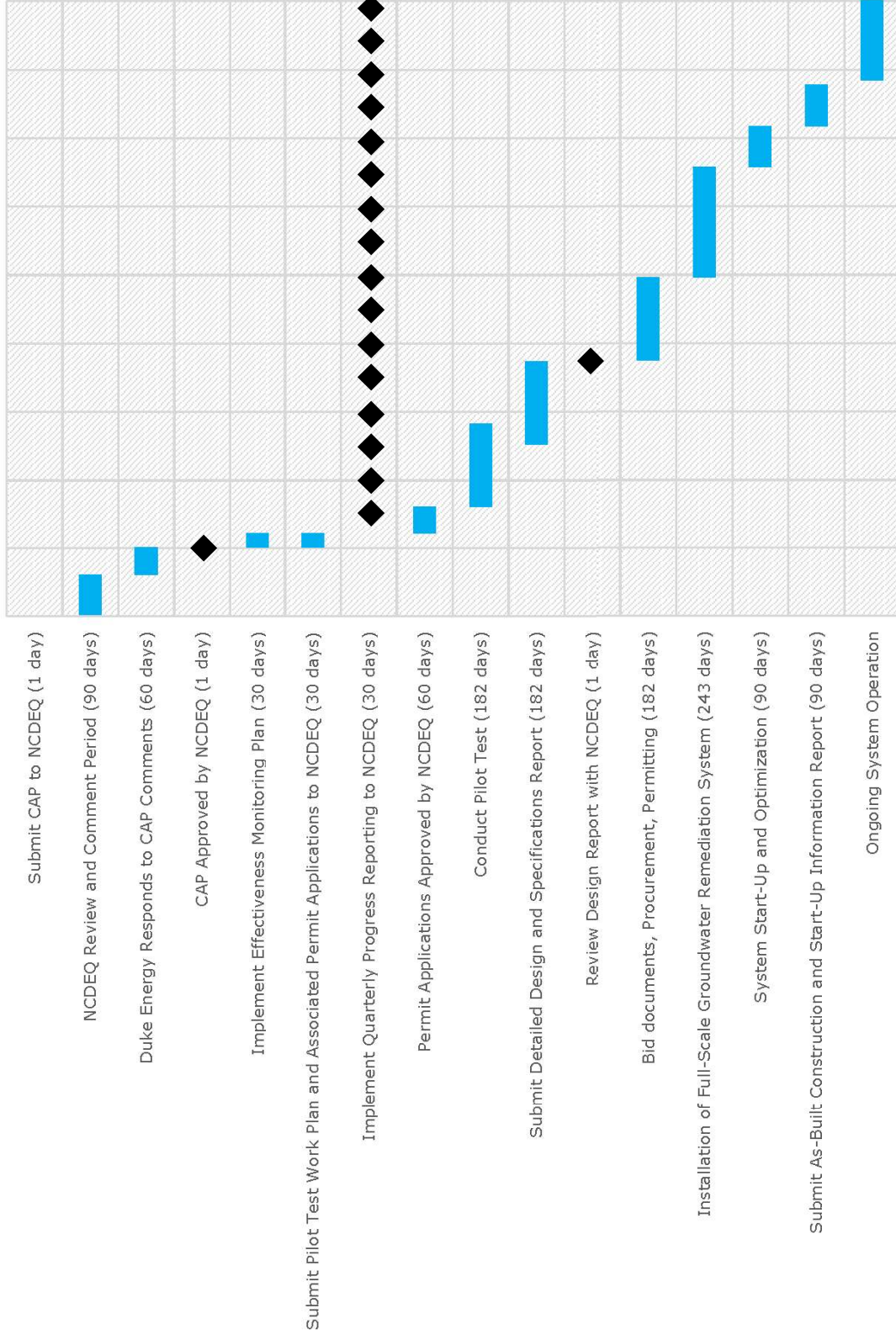
FIGURE 5-58c
REMEDIAL ALTERNATIVE 2 - MODELED HYDRAULIC HEAD
CONTOURS - GROUNDWATER REMEDIATION BY
PHYTOREMEDIATION AND TREEWELL TECHNOLOGY
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOOREBORO, NORTH CAROLINA

GRAPHIC SCALE	100 0 100 200
DRAWN BY: C. DAVIS	DATE: 06/03/2019
REVIEWED BY: C. DAVIS	DATE: 12/18/2019
CHECKED BY: T. GRANT	DATE: 12/18/2019
APPROVED BY: T. GRANT	DATE: 12/18/2019
PROJECT MANAGER: S. SPINER	
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Days

0 150 300 450 600 750 900 1050 1200 1350



Notes:

* - Either submittal of the Effectiveness Monitoring Plan or the pilot test work plan and permit applications (as applicable) will fulfill section G.S.130A-309.209.(b)(3).

** - Actual time may vary due to a variety of factors including agency review and approvals, weather delays, equipment availability, etc.

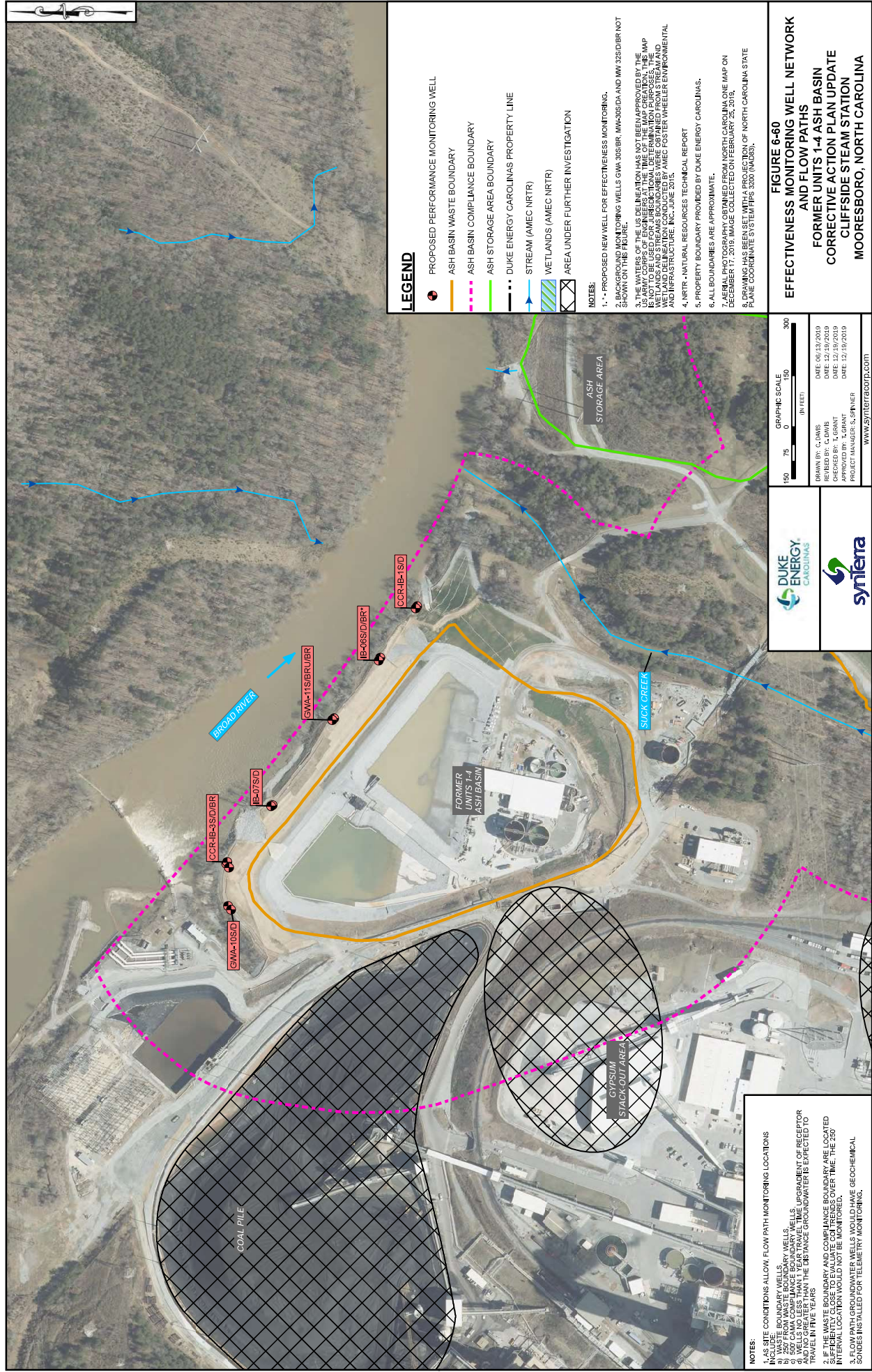


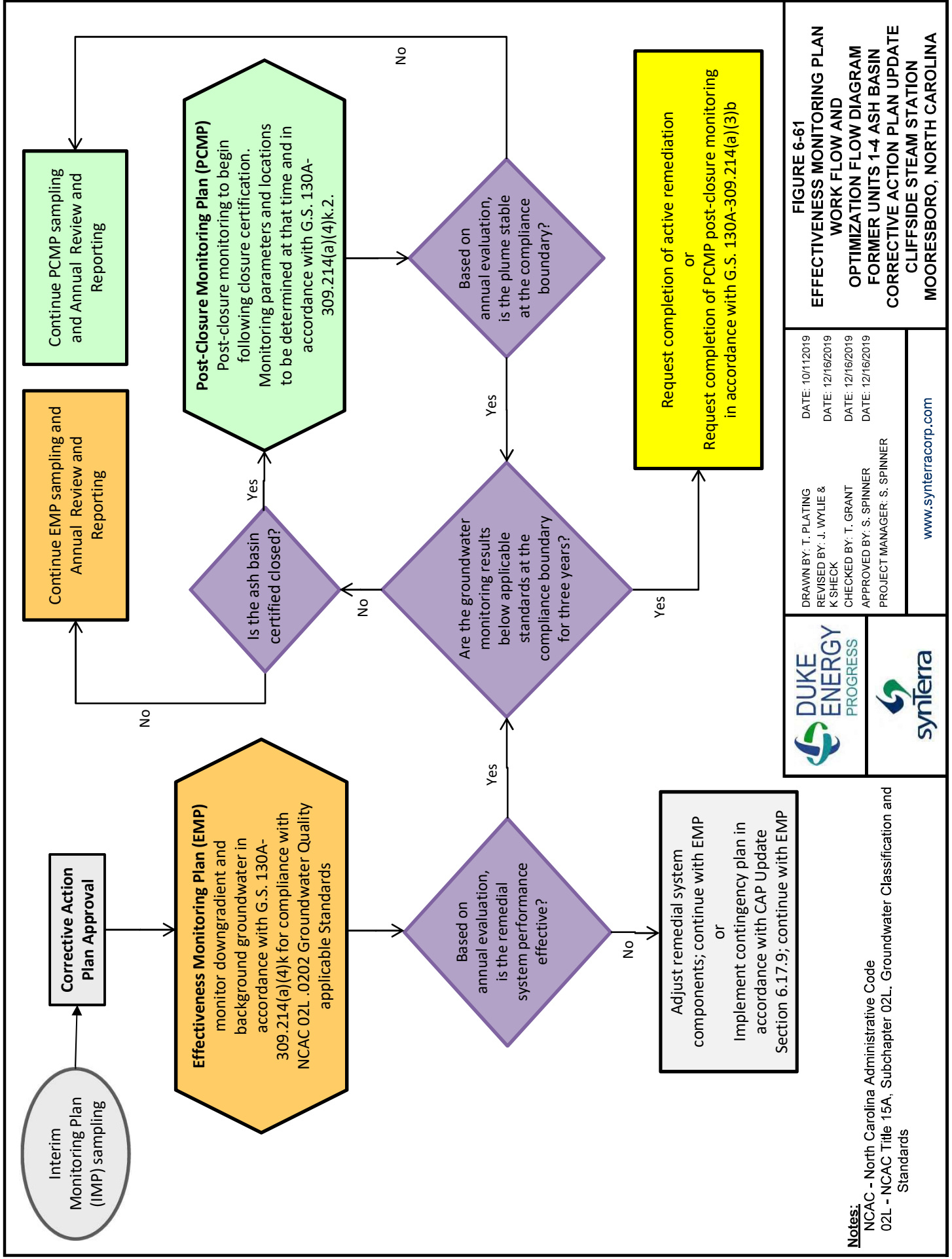
DRAWN BY: R. ISHAM
 REVISD BY:
 CHECKED BY: S. WOOD
 APPROVED BY: T. GRANT
 PROJECT MANAGER: S. SPINNER

DATE: 12/5/2019

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FIGURE 6-59
CAP IMPLEMENTATION GANTT CHART
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA



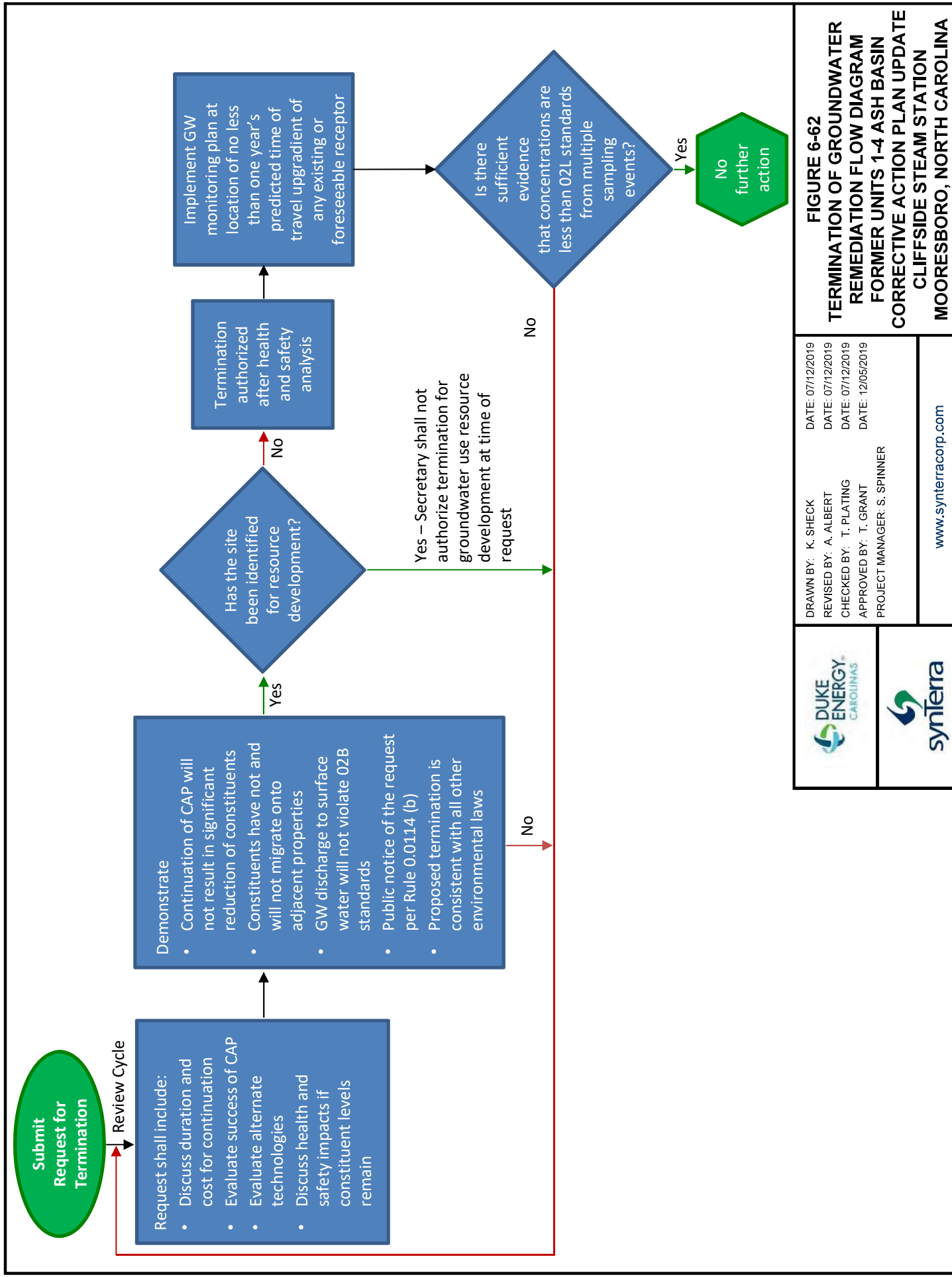


Notes:
NCAC - North Carolina Administrative Code
02L - NCAC Title 15A, Subchapter 02L, Groundwater Classification and Standards



DRAWN BY: T. PLATING REVISED BY: J. WYLIE & K. SHECK CHECKED BY: T. GRANT APPROVED BY: S. SPINNER PROJECT MANAGER: S. SPINNER	DATE: 10/11/2019 DATE: 12/16/2019 DATE: 12/16/2019 DATE: 12/16/2019
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FIGURE 6-61
EFFECTIVENESS MONITORING PLAN
WORK FLOW AND
OPTIMIZATION FLOW DIAGRAM
FORMER UNITS 1-4 ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA



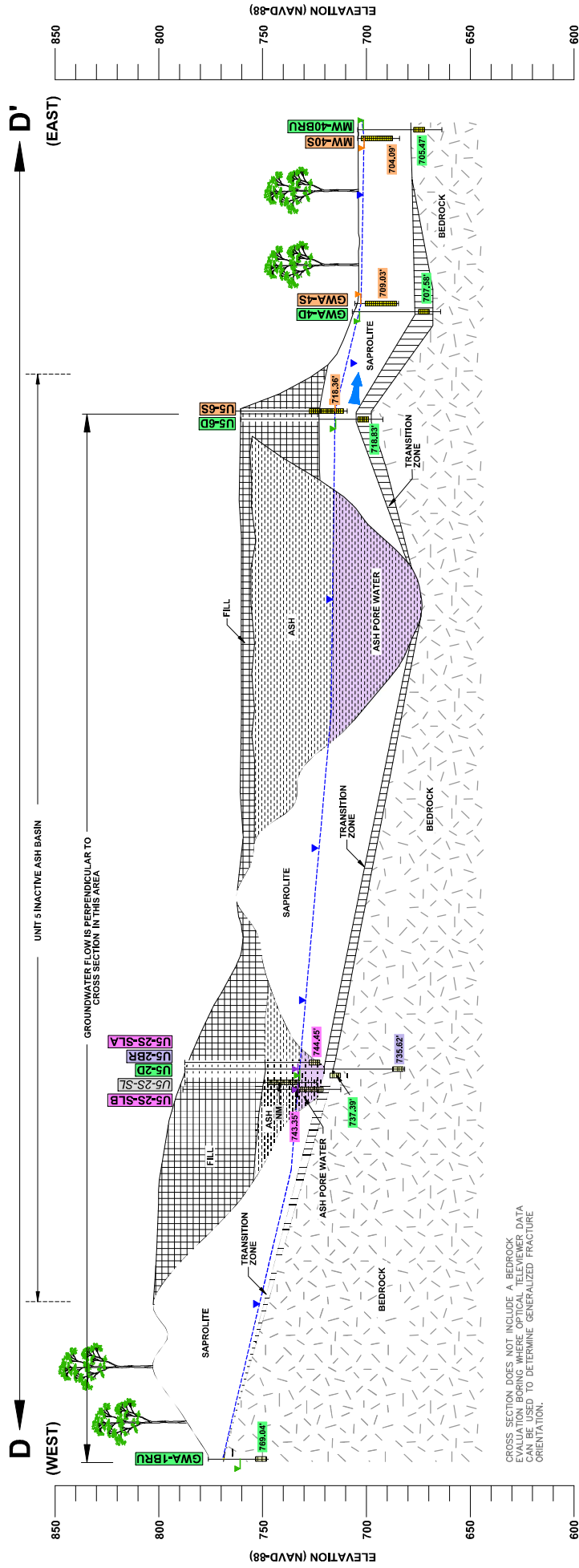
Source Area 3

(Unit 5 Inactive Ash Basin)

Figure 6-63

**Fly Ash and Bottom Ash Interbedded
Depiction**

Included in Section 6 text



CROSS SECTION DOES NOT INCLUDE A BEDROCK EVALUATION BORING WHERE OPTICAL TELEVIEWER DATA CAN BE USED TO DETERMINE GENERALIZED FRACTURE ORIENTATION.

LEGEND

- WELL IN SHALLOW FLOW LAYER
- WELL IN DEEP FLOW LAYER
- WELL IN BEDROCK FLOW LAYER
- WELL IN ASH PORE WATER
- ABANDONED WELL/ GEOTECHNICAL BORING
- GENERALIZED WATER TABLE
- GENERALIZED GROUNDWATER FLOW DIRECTION
- ASH
- ASH PORE WATER
- FILL
- SAPROLITE
- TRANSITION ZONE
- BEDROCK
- ASH PORE WATER ELEVATION
- SHALLOW GROUNDWATER ELEVATION
- DEEP GROUNDWATER ELEVATION
- BEDROCK GROUNDWATER ELEVATION
- WATER LEVEL ELEVATION (NAVD-88) (LABEL COLORING BY FLOW ZONE)
- WELL SCREEN
- COMPLIANCE BOUNDARY

- ### NOTES
1. DEPTH TO WATER GAUGED IN MONITORING WELLS ON APRIL 22, 2019.
 2. NW - NOT MEASURED DURING 24-HOUR WATER LEVEL EVENT.
 3. ALL VERTICAL ELEVATIONS ARE MEASURED IN FEET, NORTH AMERICA VERTICAL DATUM (NAVD) OF 1988.

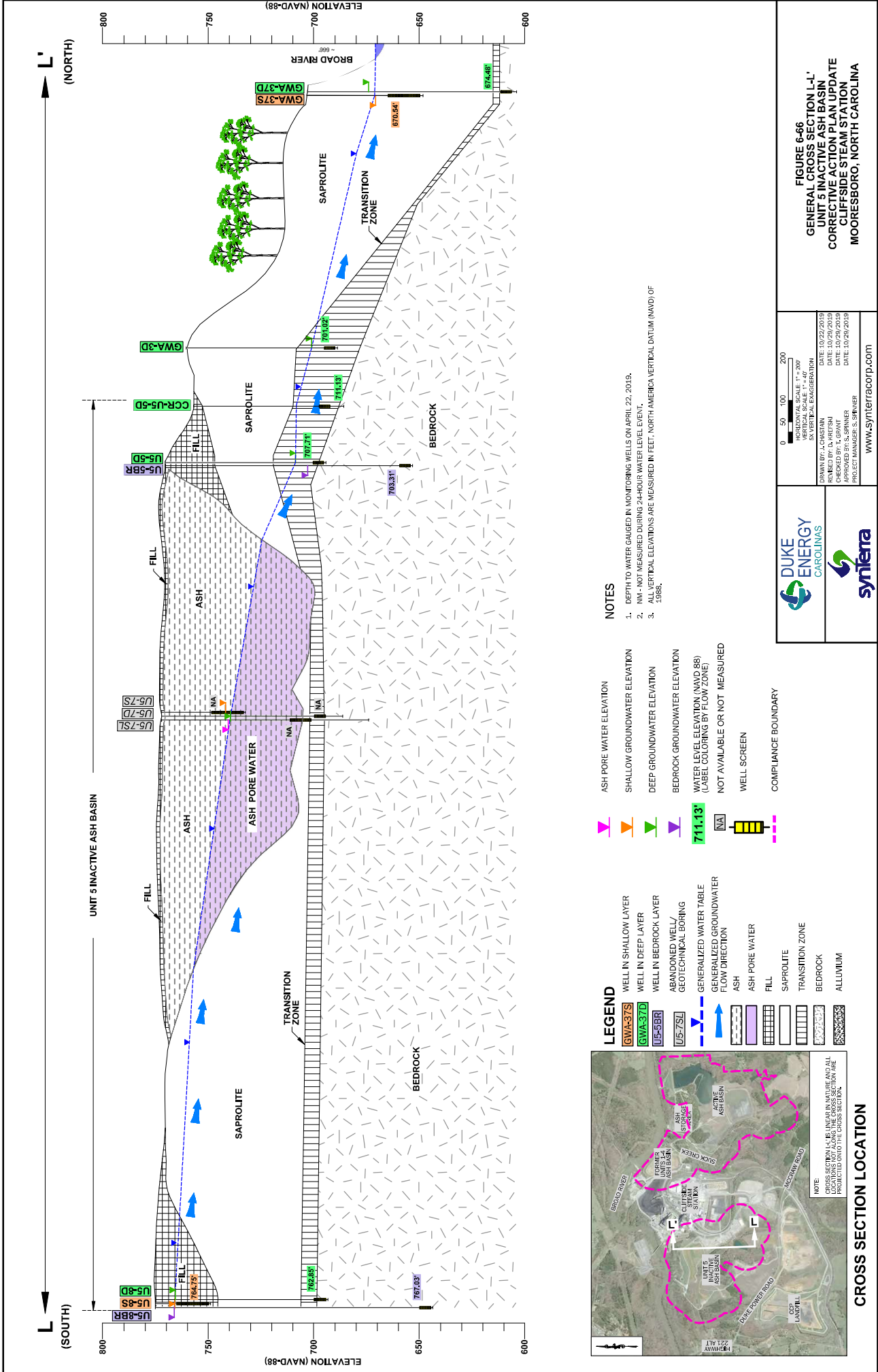


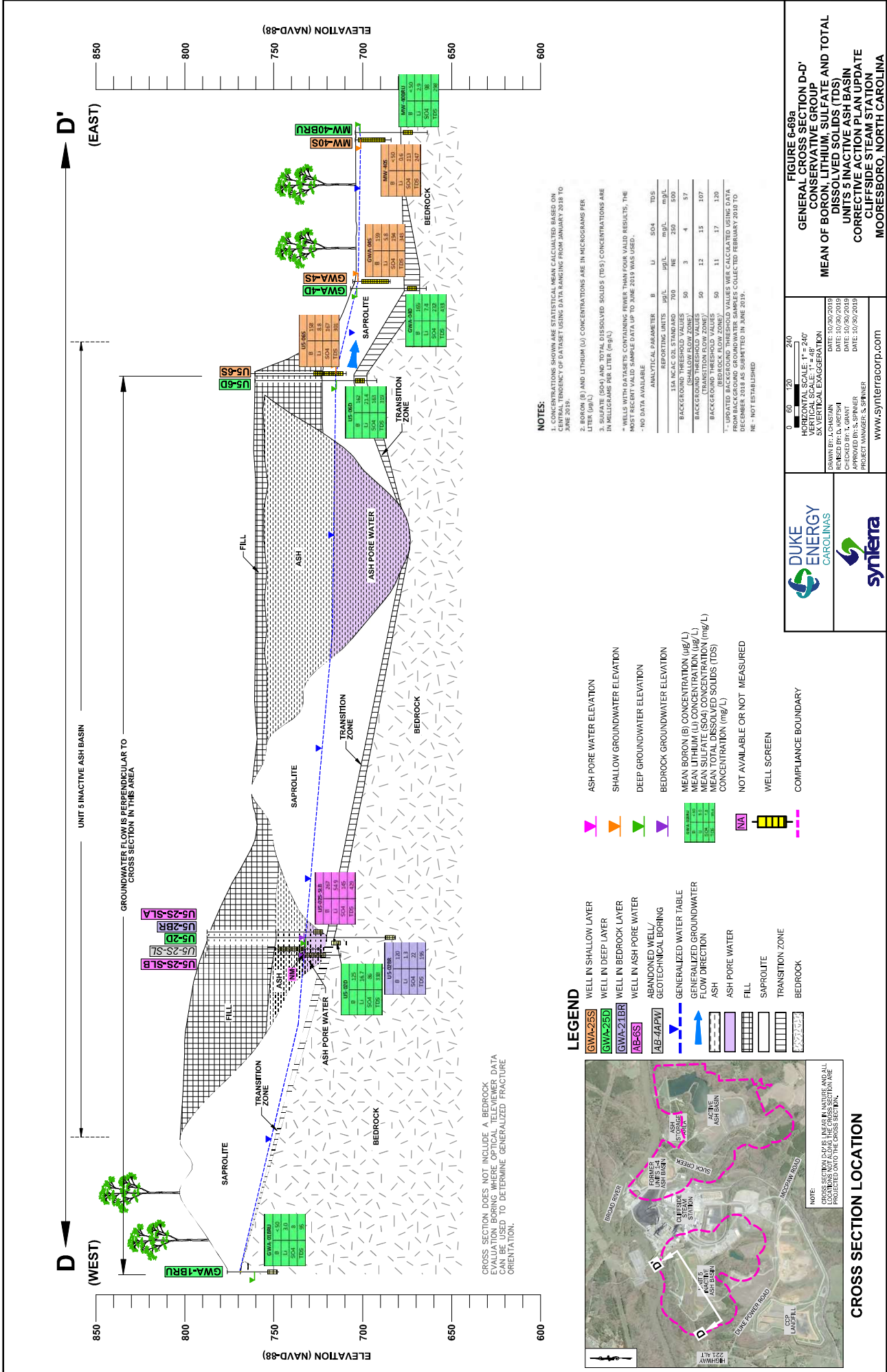
CROSS SECTION LOCATION



FIGURE 6-64
GENERAL CROSS SECTION D-D'
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

DATE: 10/30/2019
 DRAWN BY: L. GRANT
 CHECKED BY: T. GRANT
 APPROVED BY: S. SPINER
 PROJECT MANAGER: S. SPINER
 DATE: 10/30/2019
 DATE: 10/30/2019
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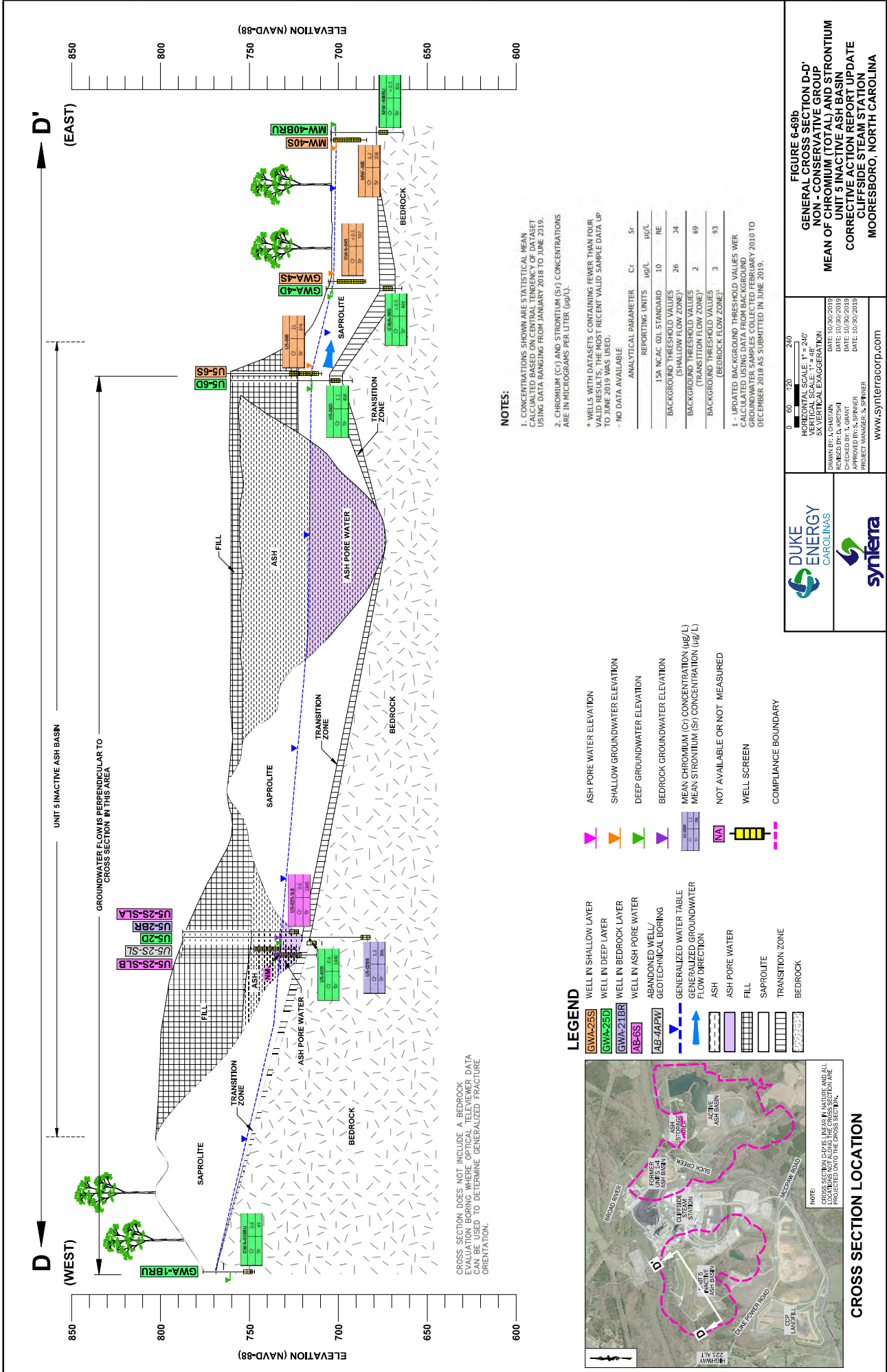


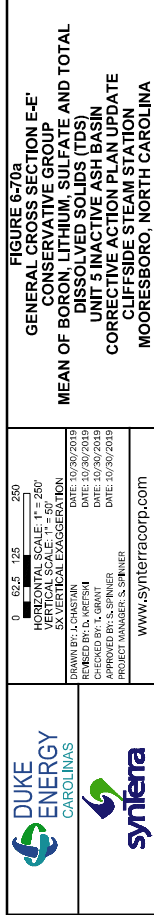


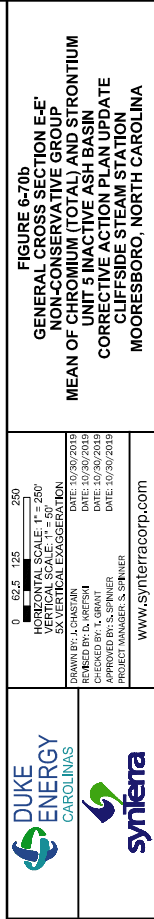
FIGURE 6-69b
GENERAL CROSS SECTION D-D'
NON-CONSERVATIVE GROUP
MEAN OF CHROMIUM (TOTAL) AND STRONTIUM
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION REPORT UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

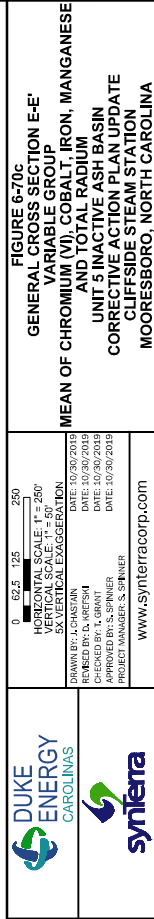
0 50 100 200 240
HORIZONTAL SCALE: 1" = 240'
VERTICAL SCALE: 1" = 40'
5X VERTICAL EXAGGERATION

DRAWN BY: L. GRIFFIN
CHECKED BY: T. GRANT
APPROVED BY: S. SPINER
PROJECT MANAGER: S. SPINER
DATE: 10/30/2019
DATE: 10/30/2019
DATE: 10/30/2019

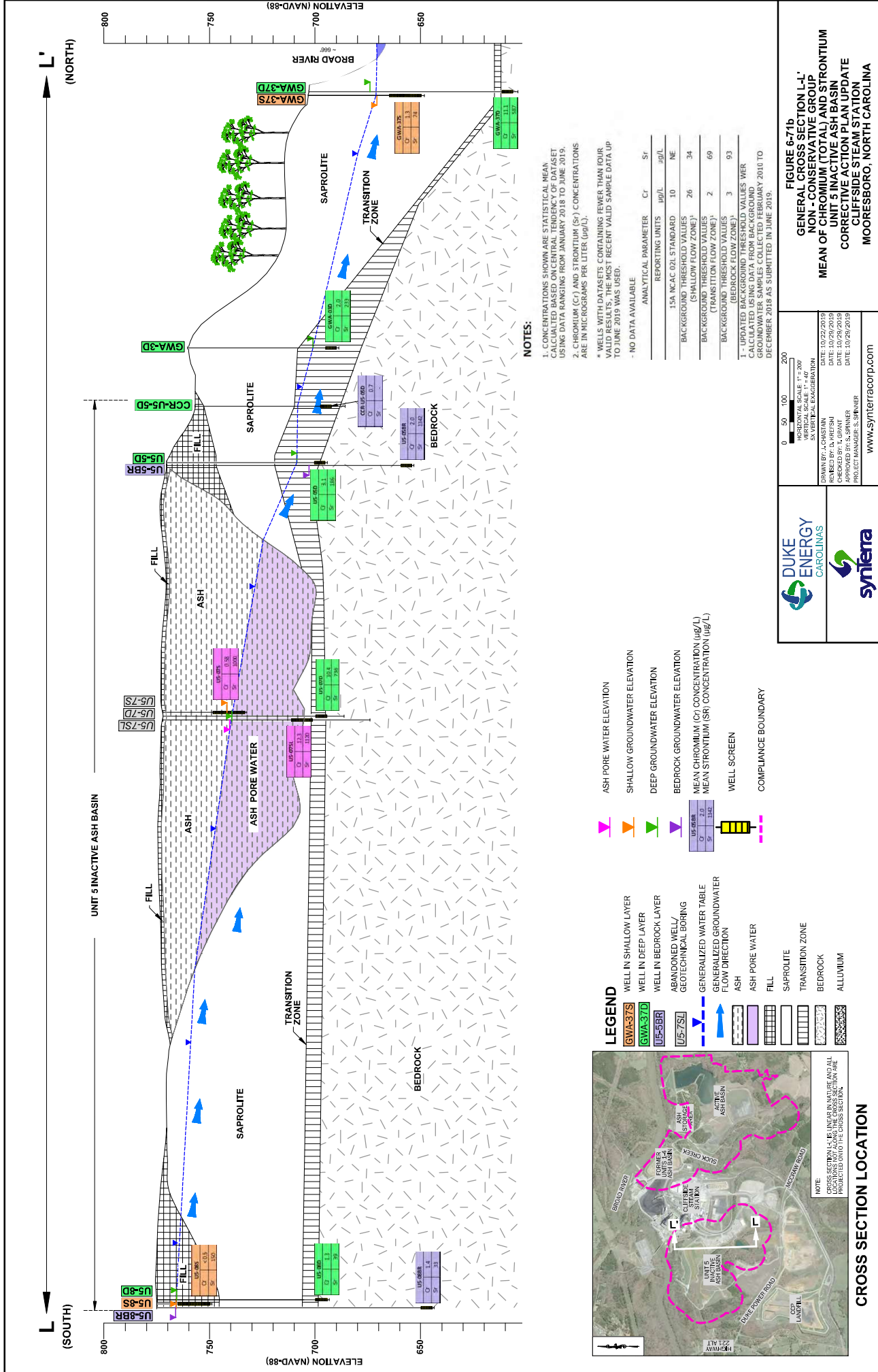
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Note:
*sampling events prior to 1/1/2018

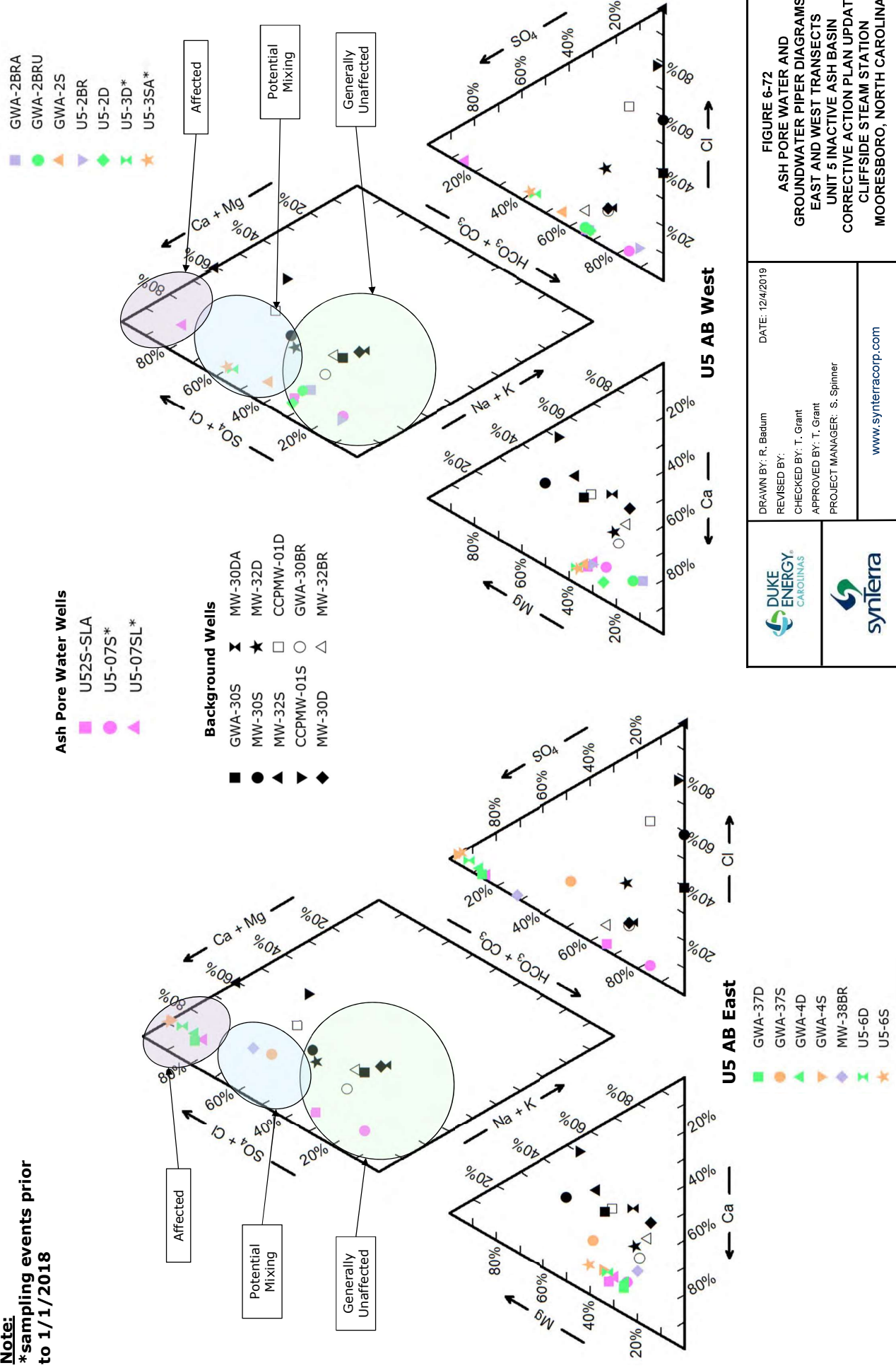
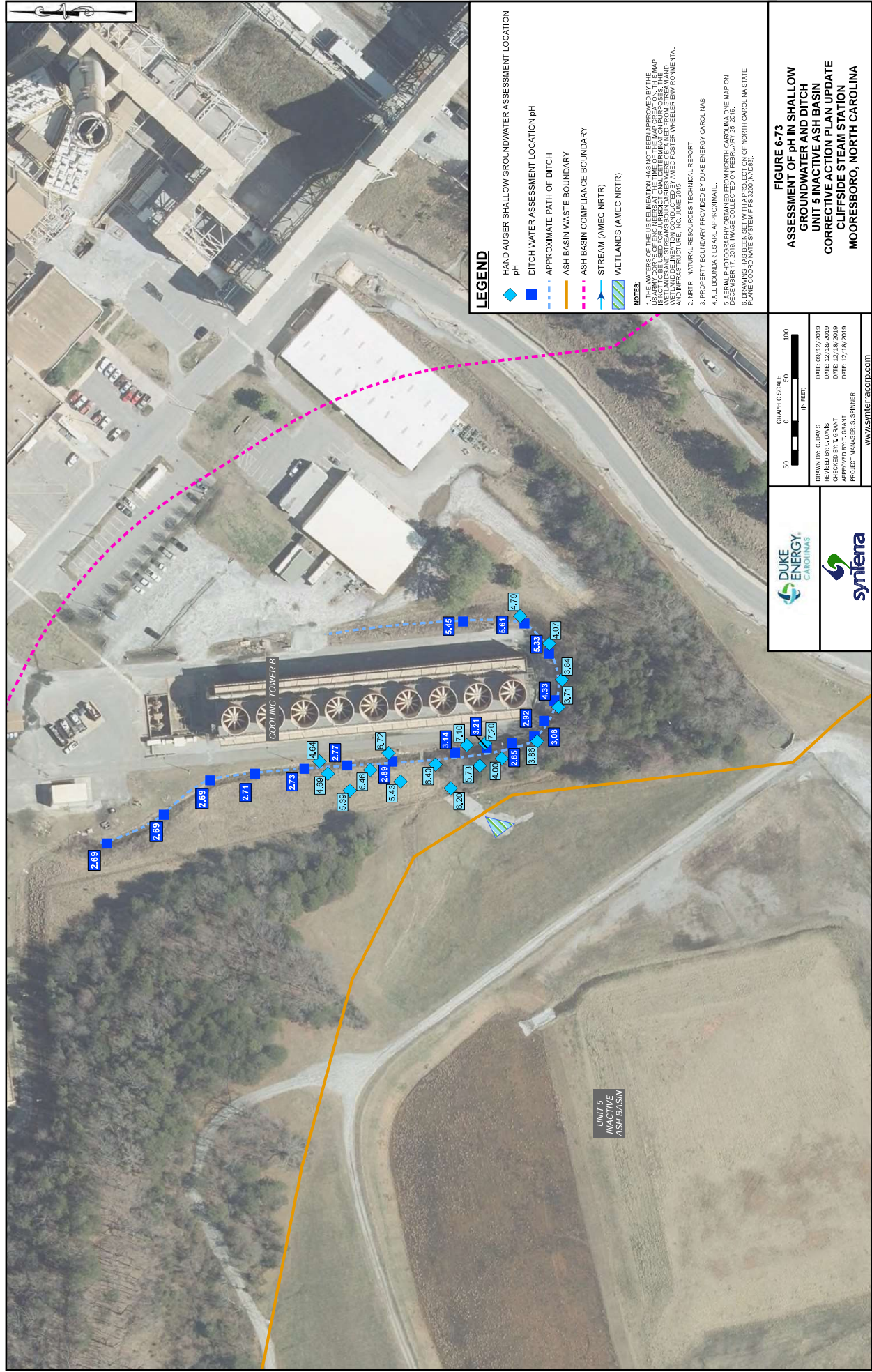
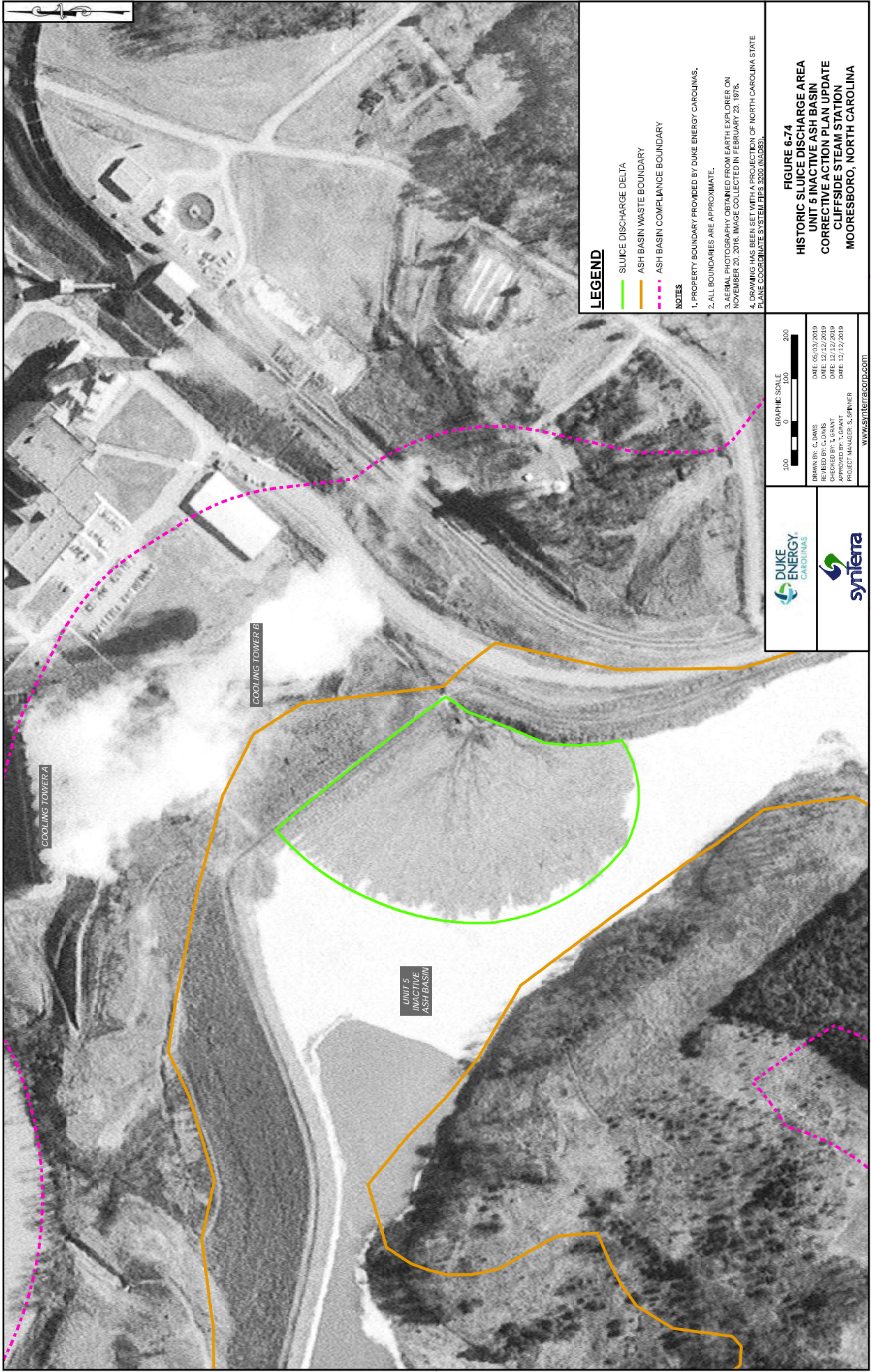


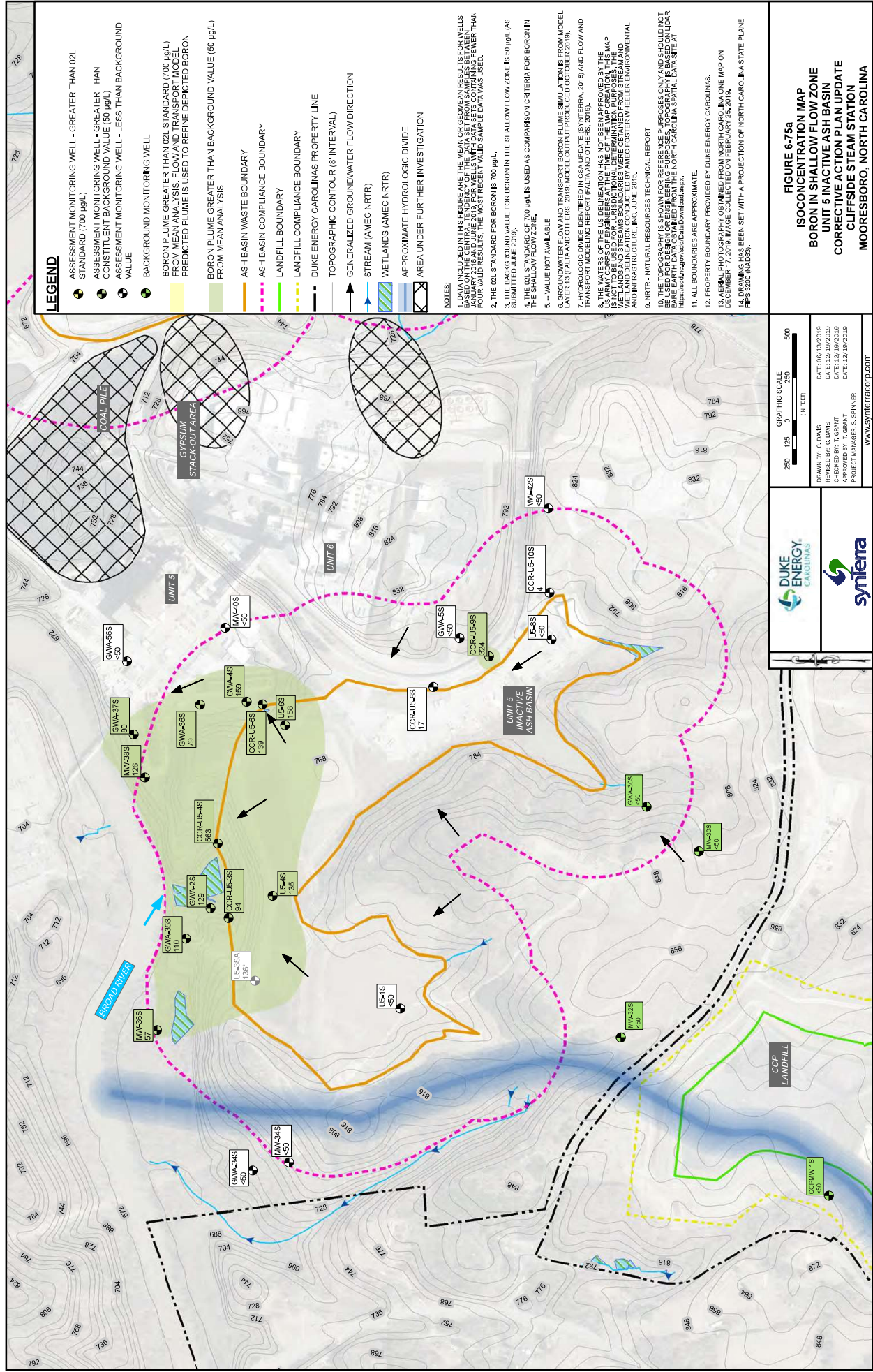
FIGURE 6-72
ASH PORE WATER AND
GROUNDWATER PIER DIAGRAMS
EAST AND WEST TRANSECTS
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

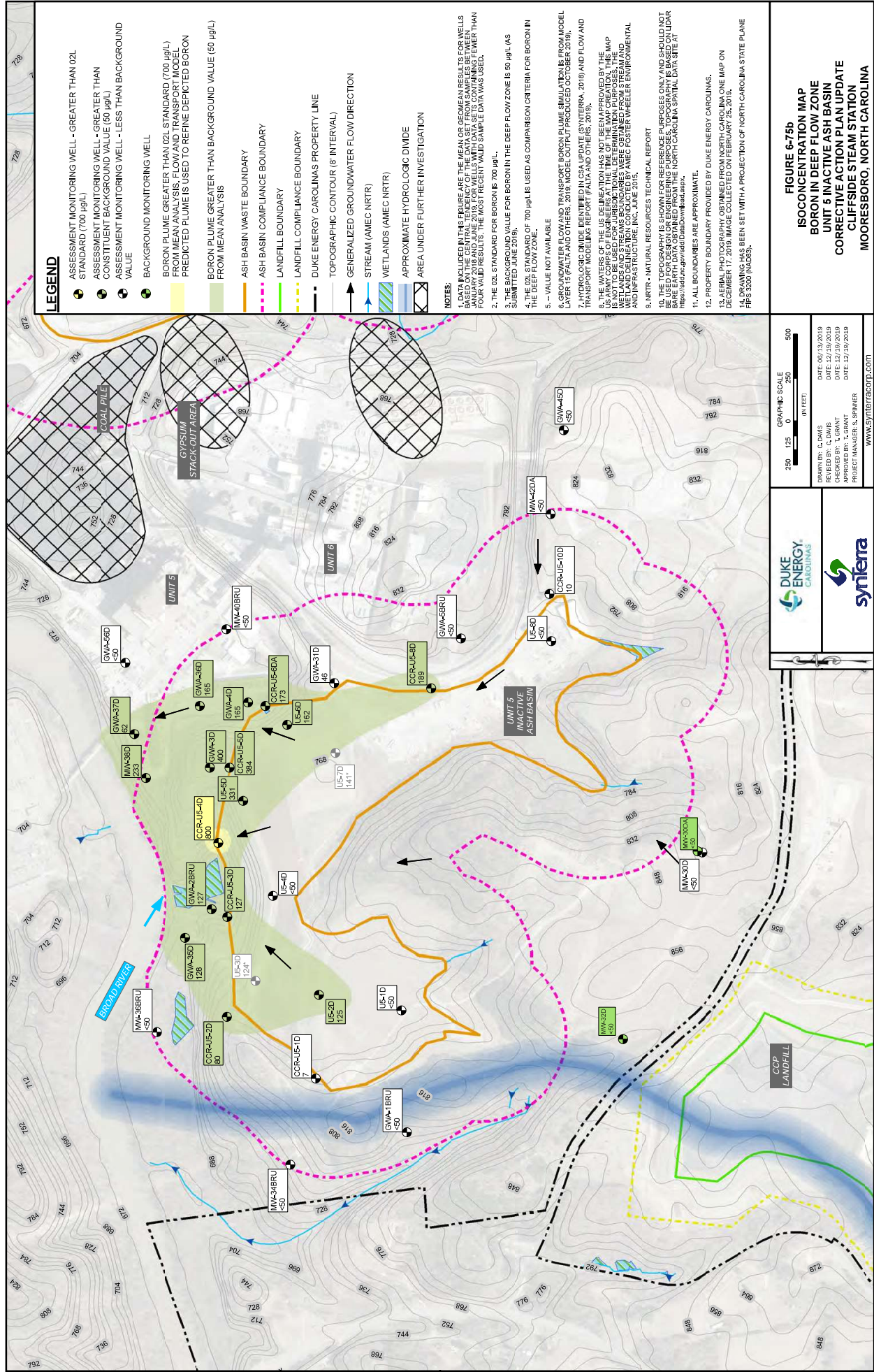
DRAWN BY: R. Badum
REVISED BY:
CHECKED BY: T. Grant
APPROVED BY: T. Grant
PROJECT MANAGER: S. Spinner
DATE: 12/4/2019
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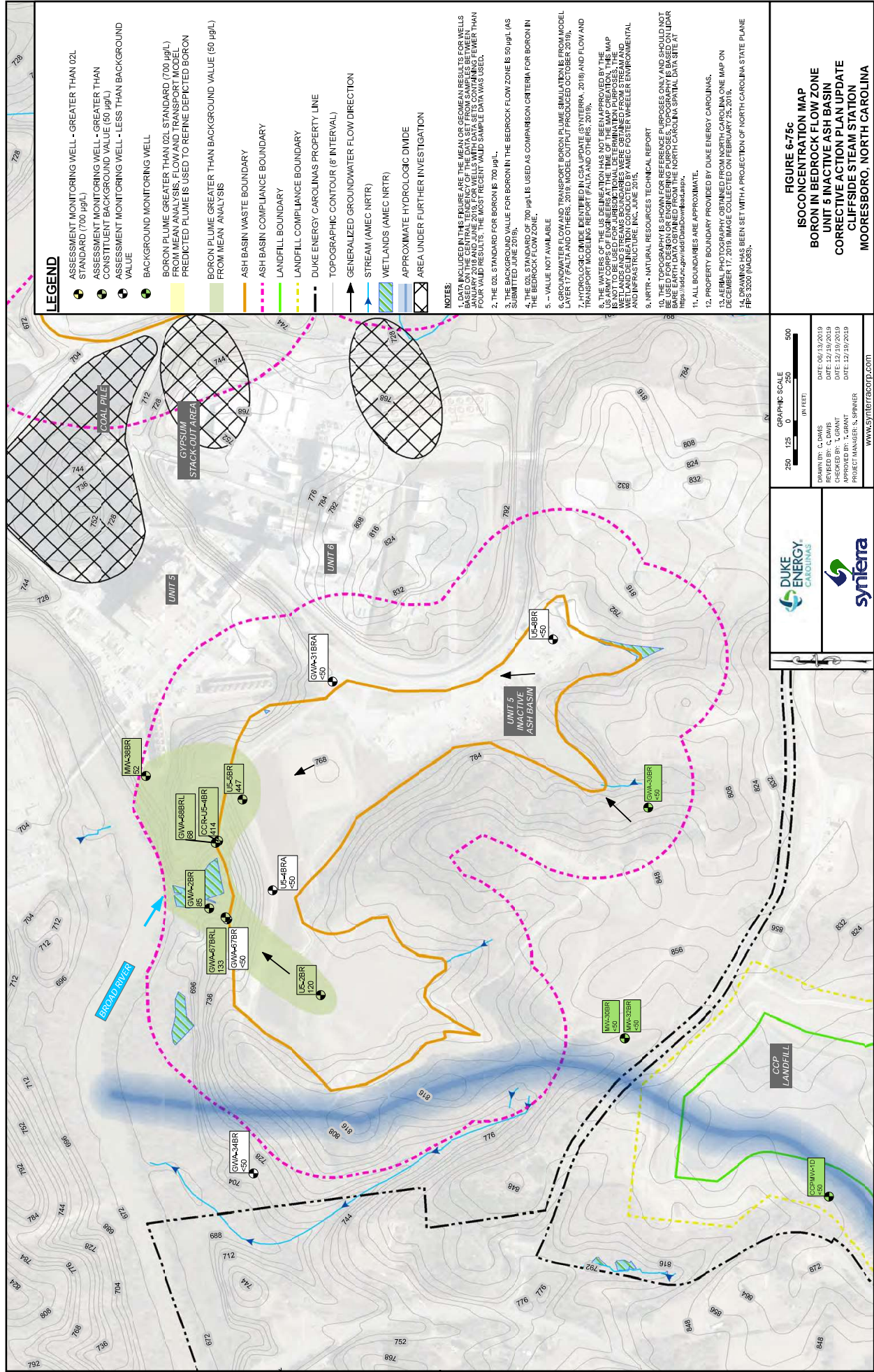


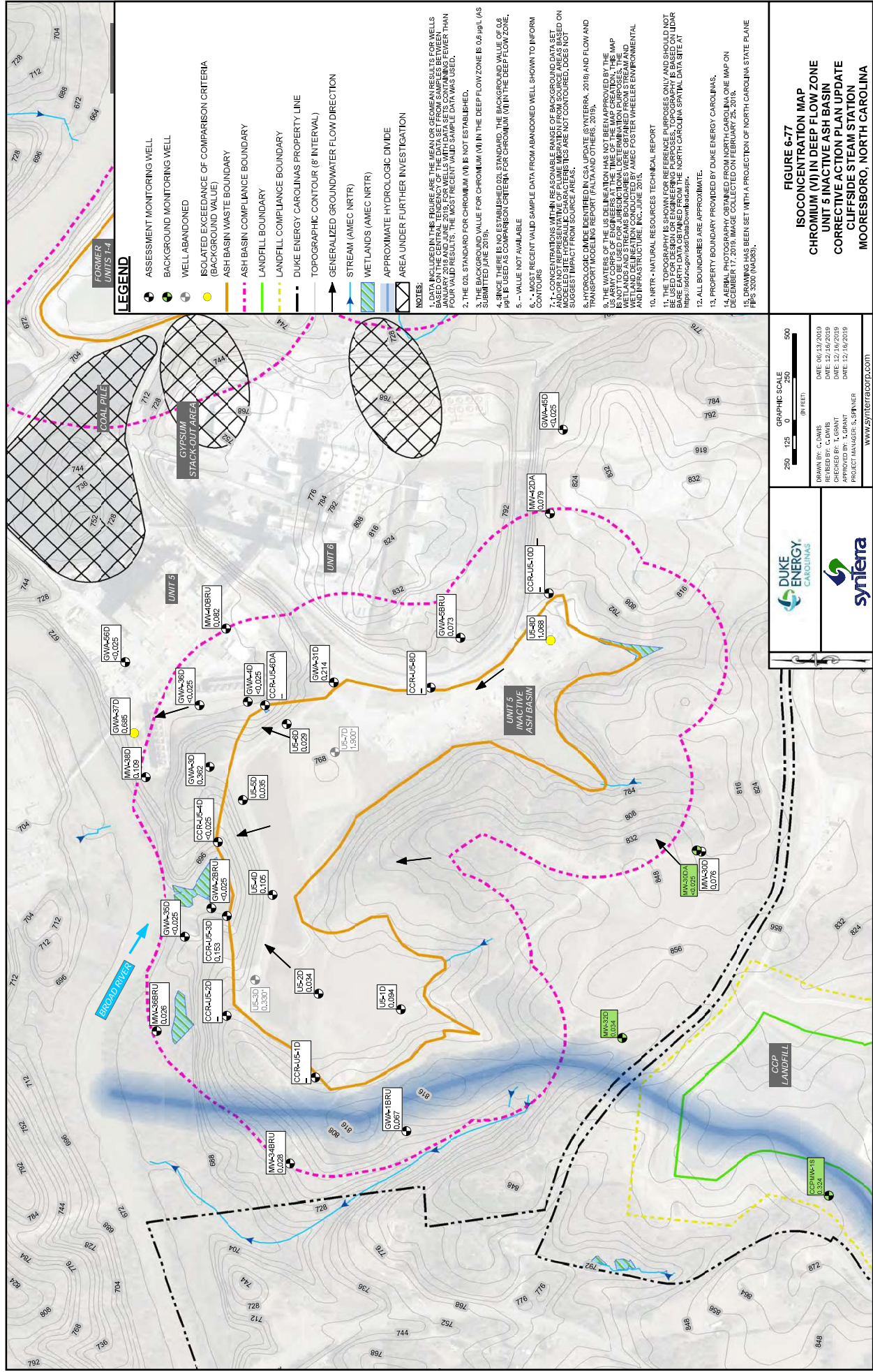


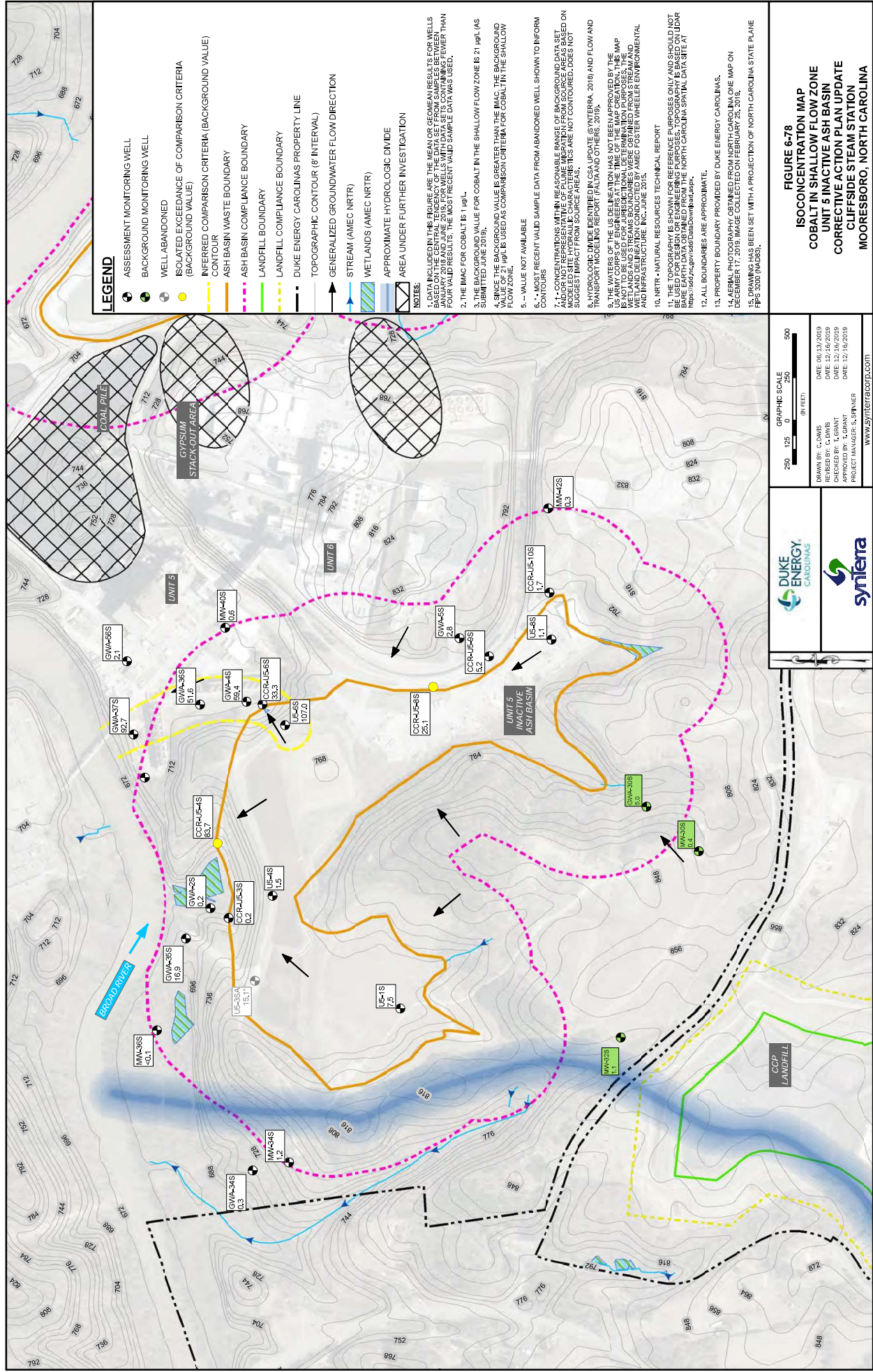


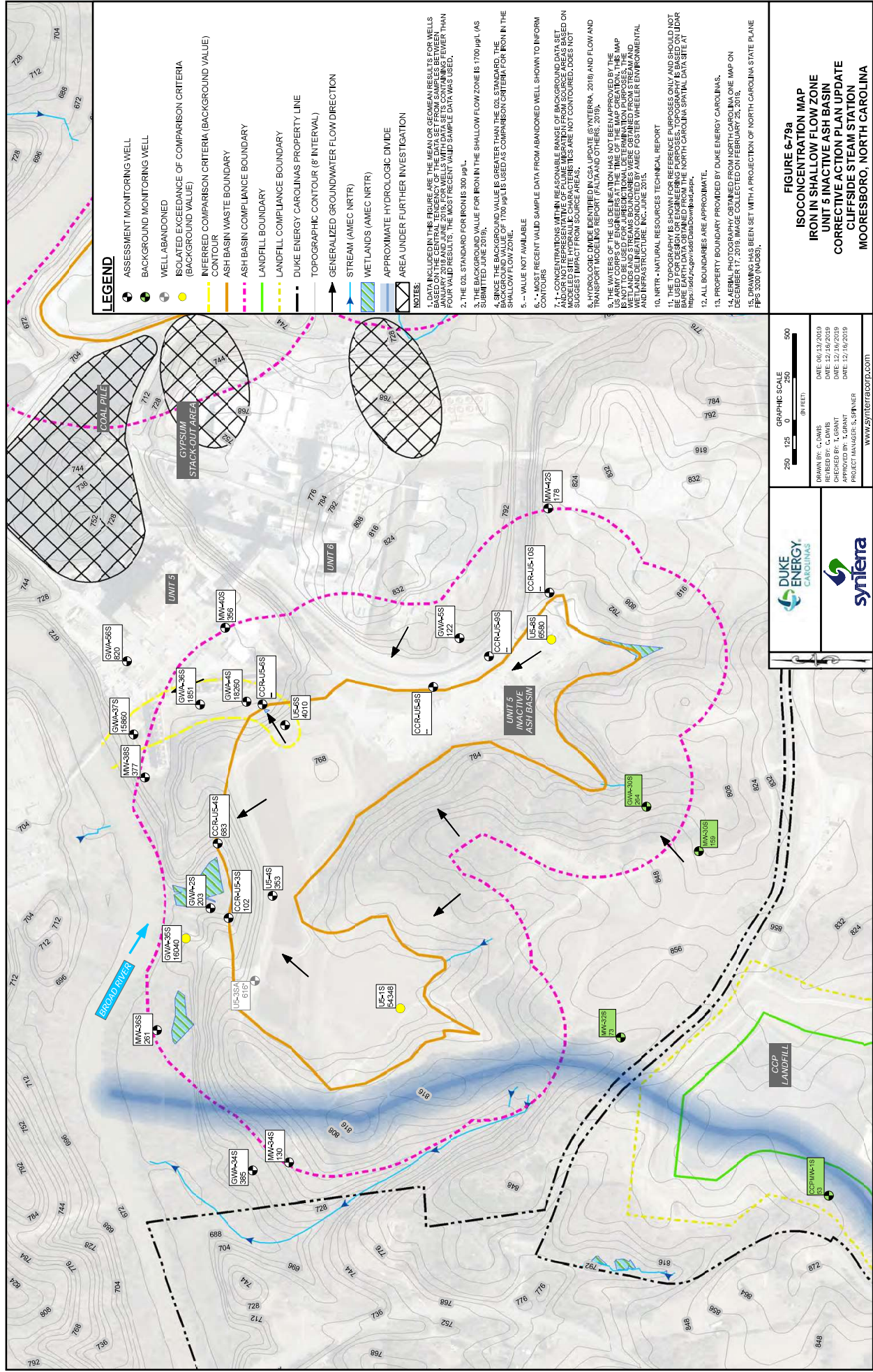


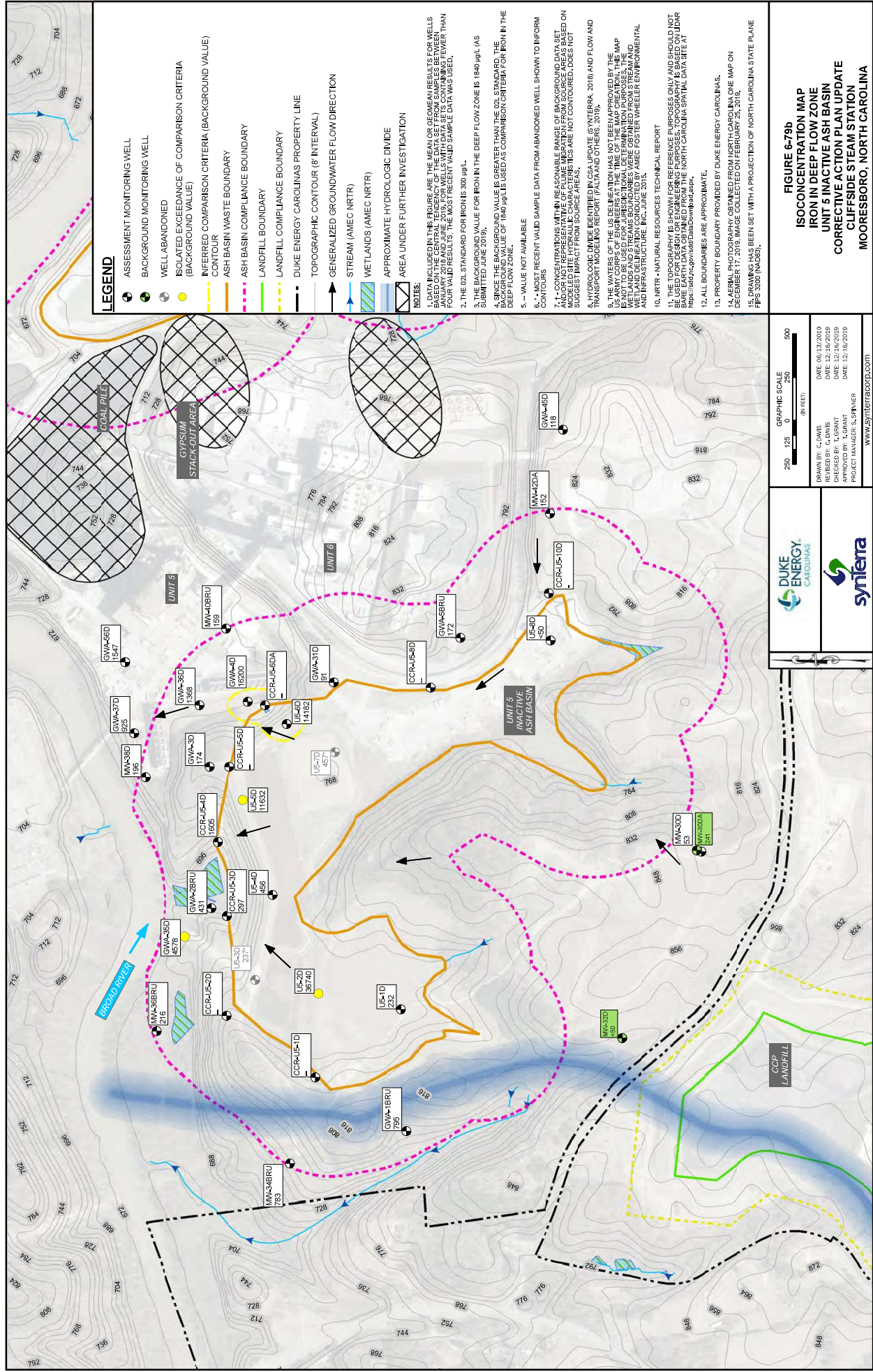


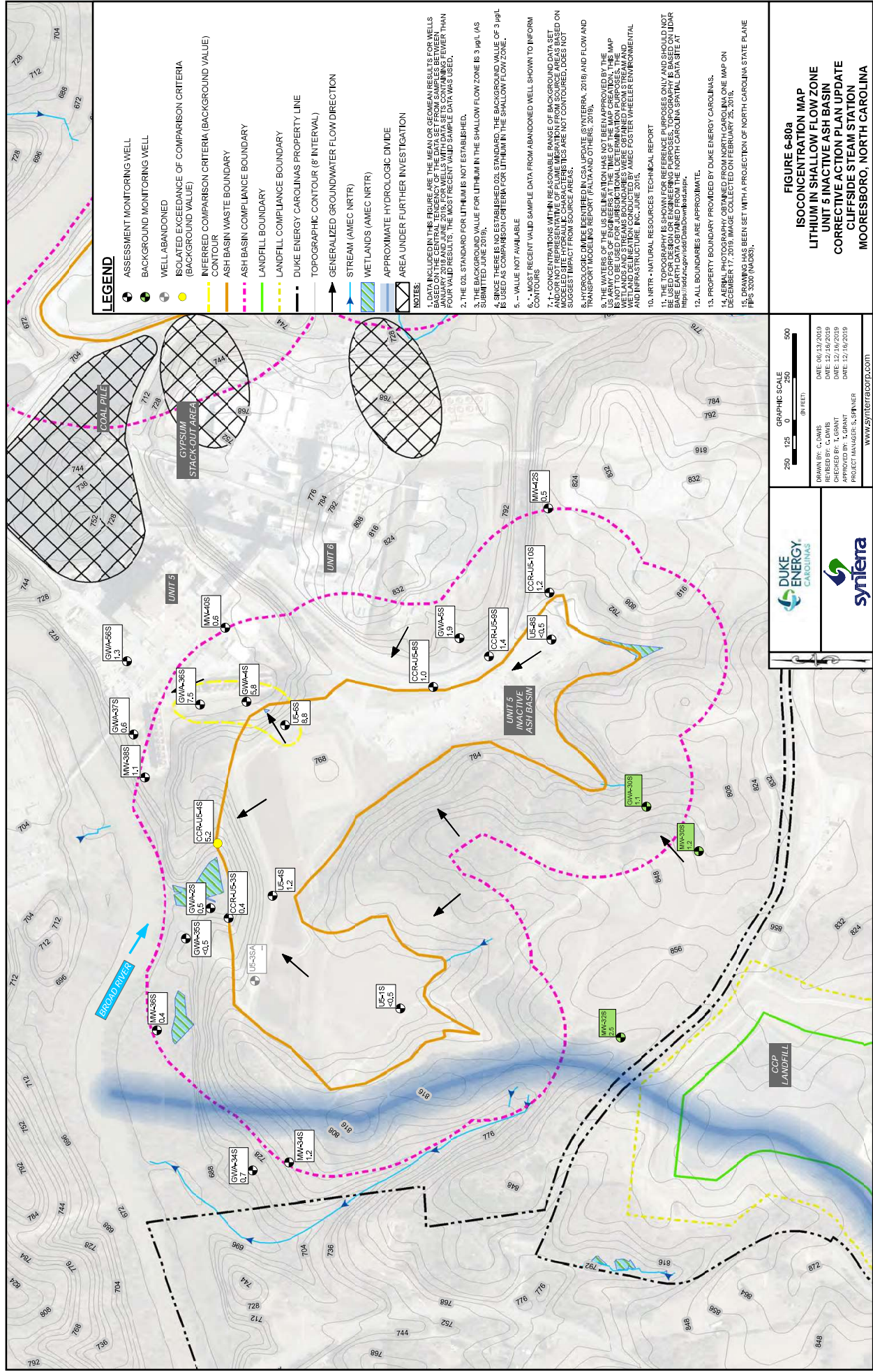


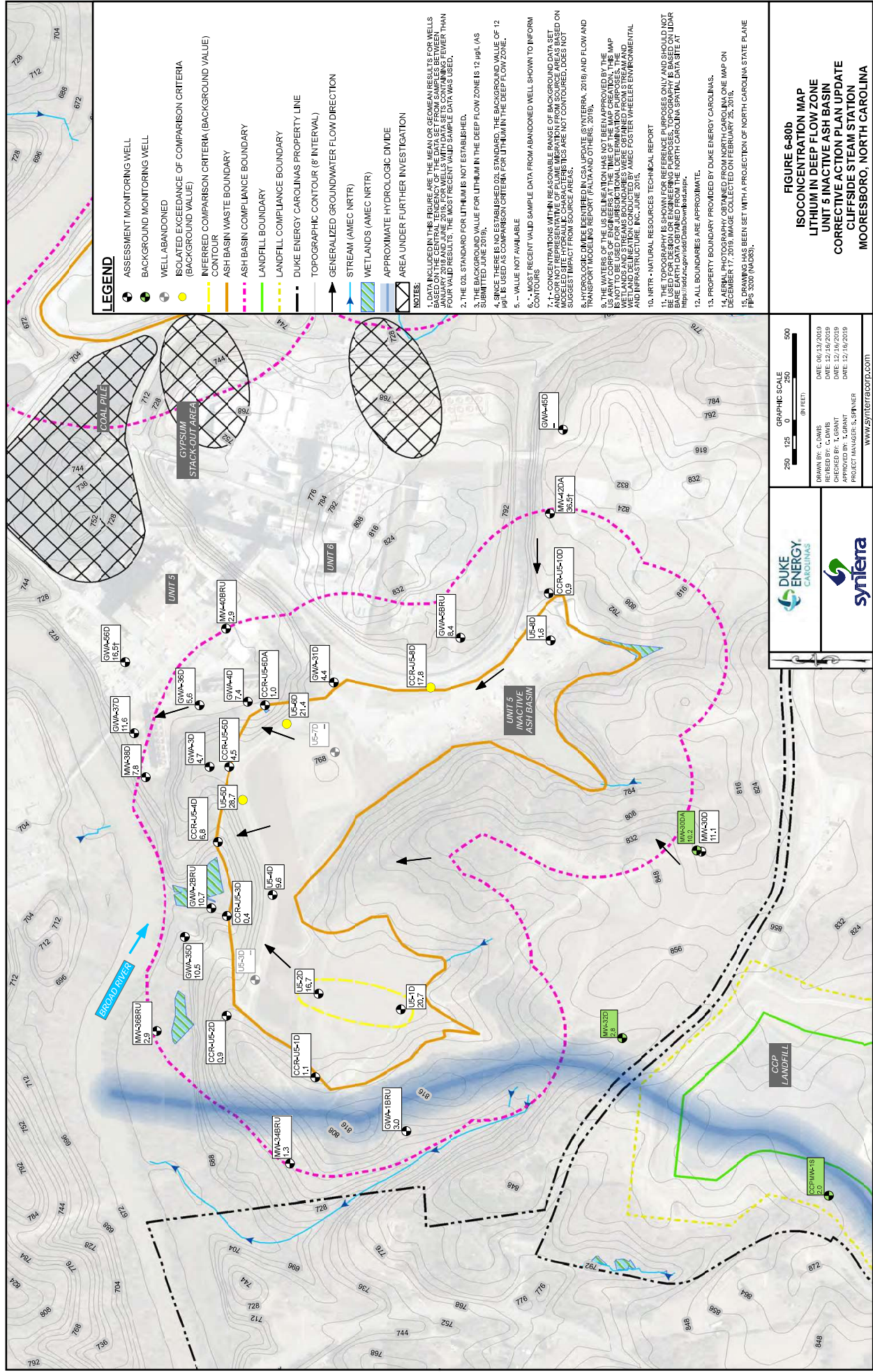


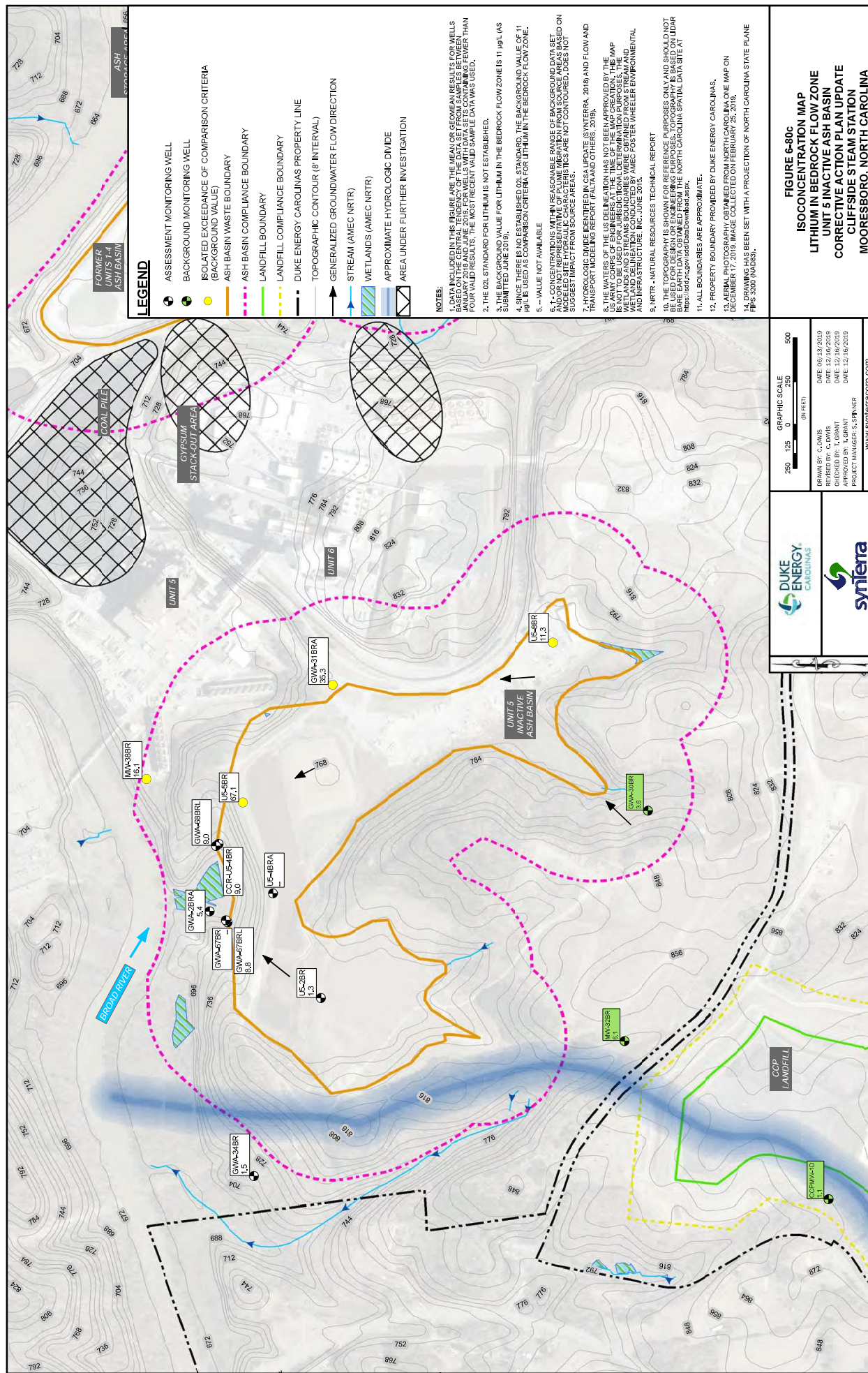


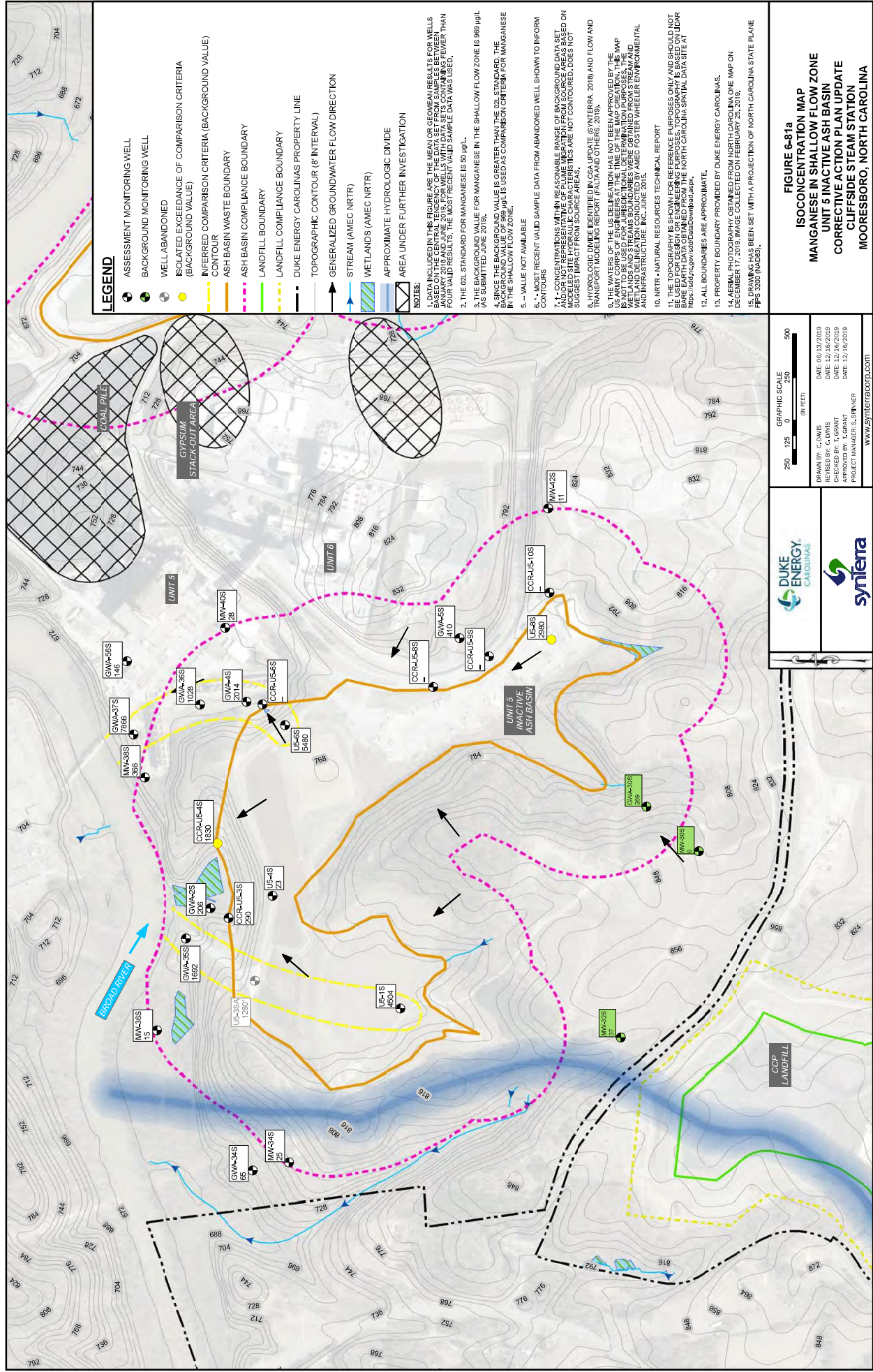


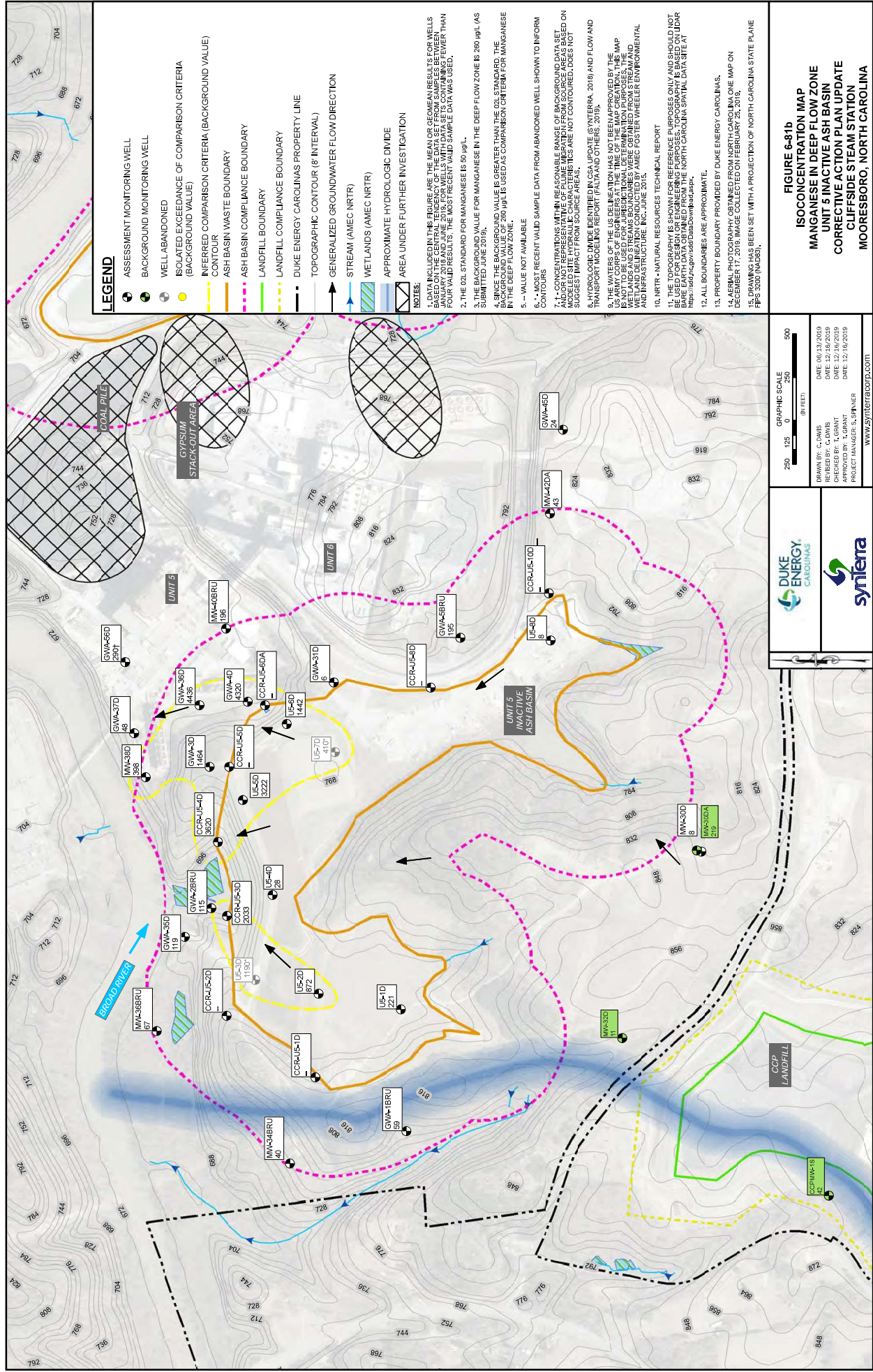


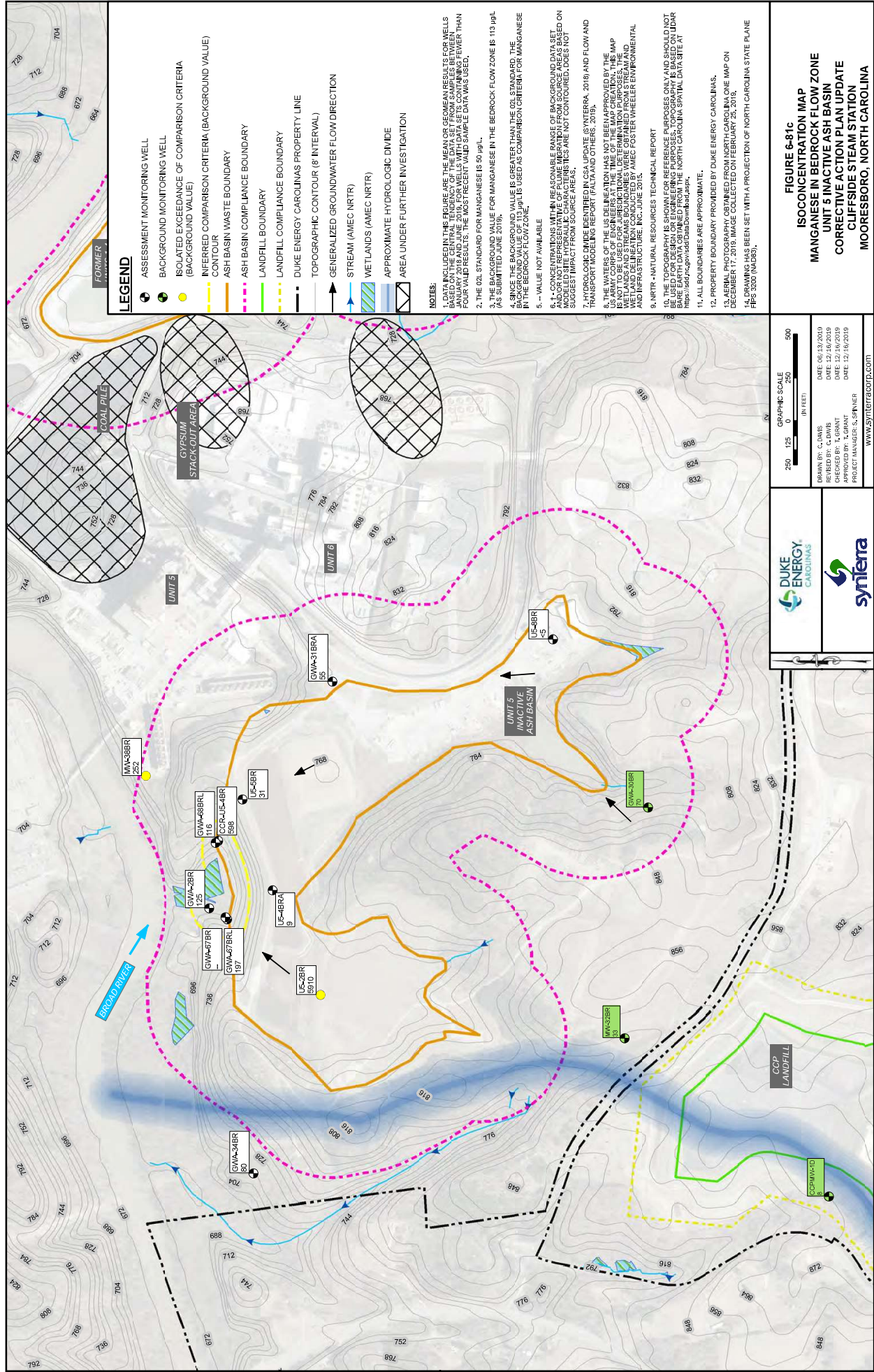


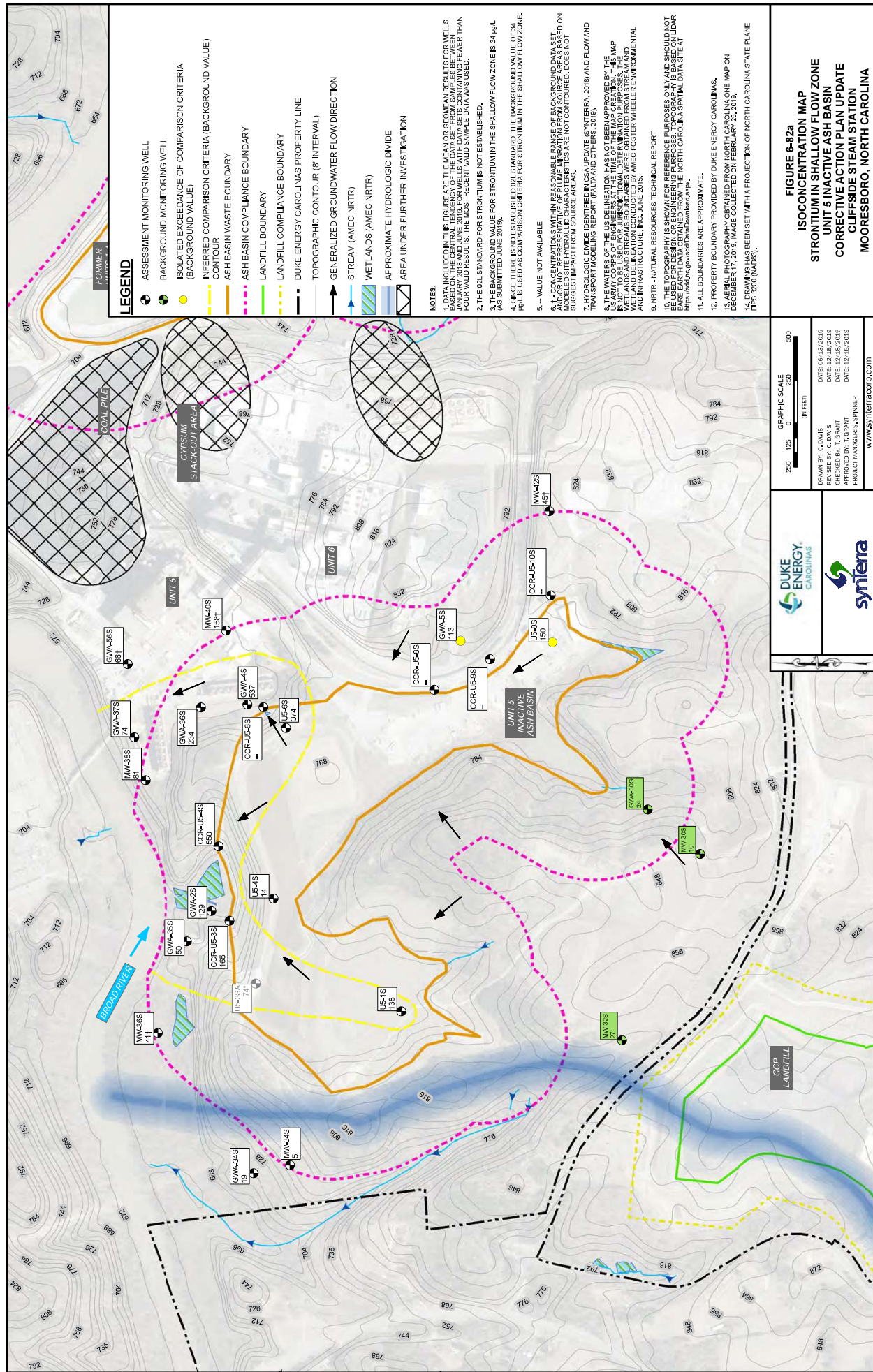


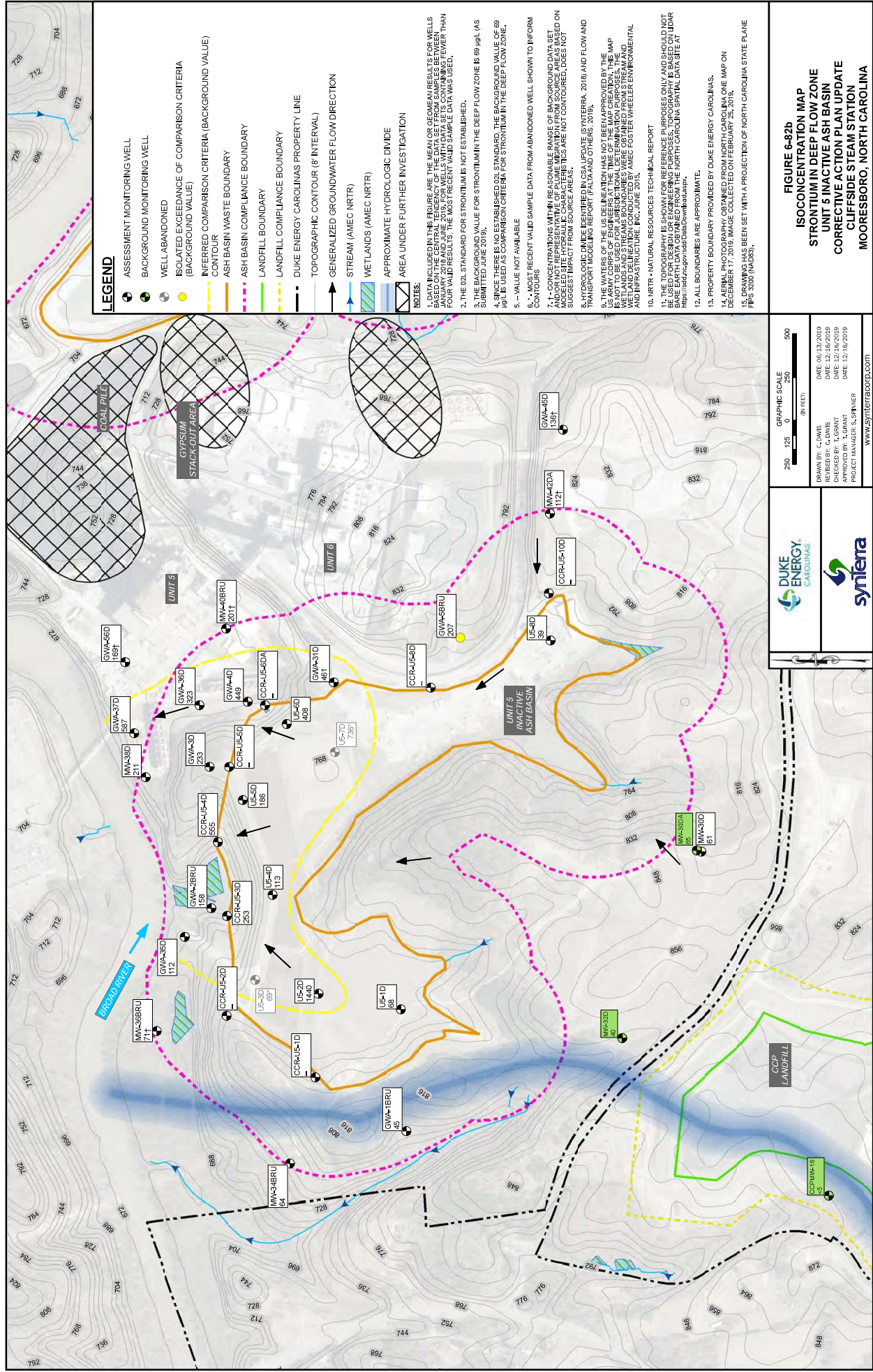


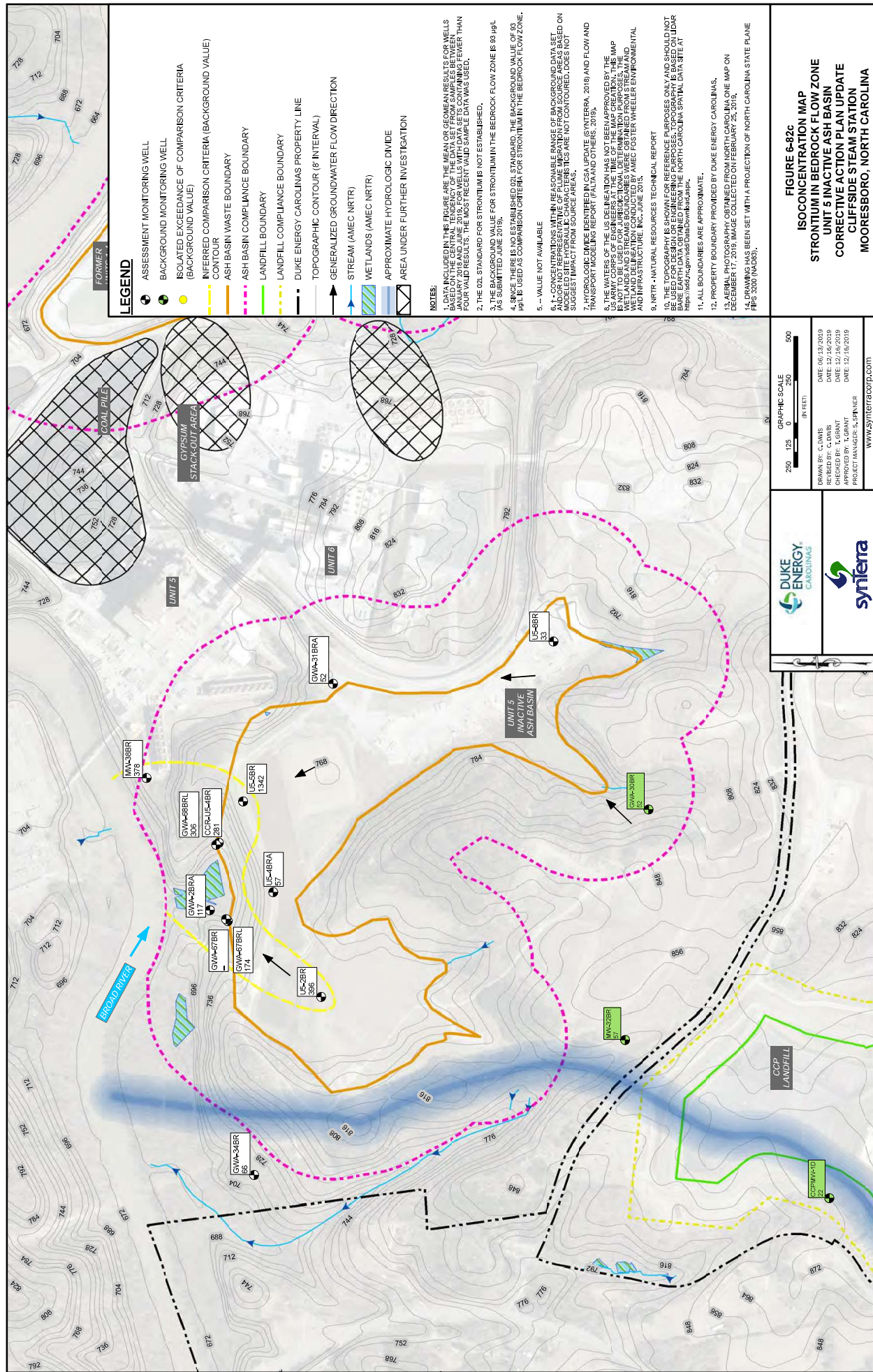


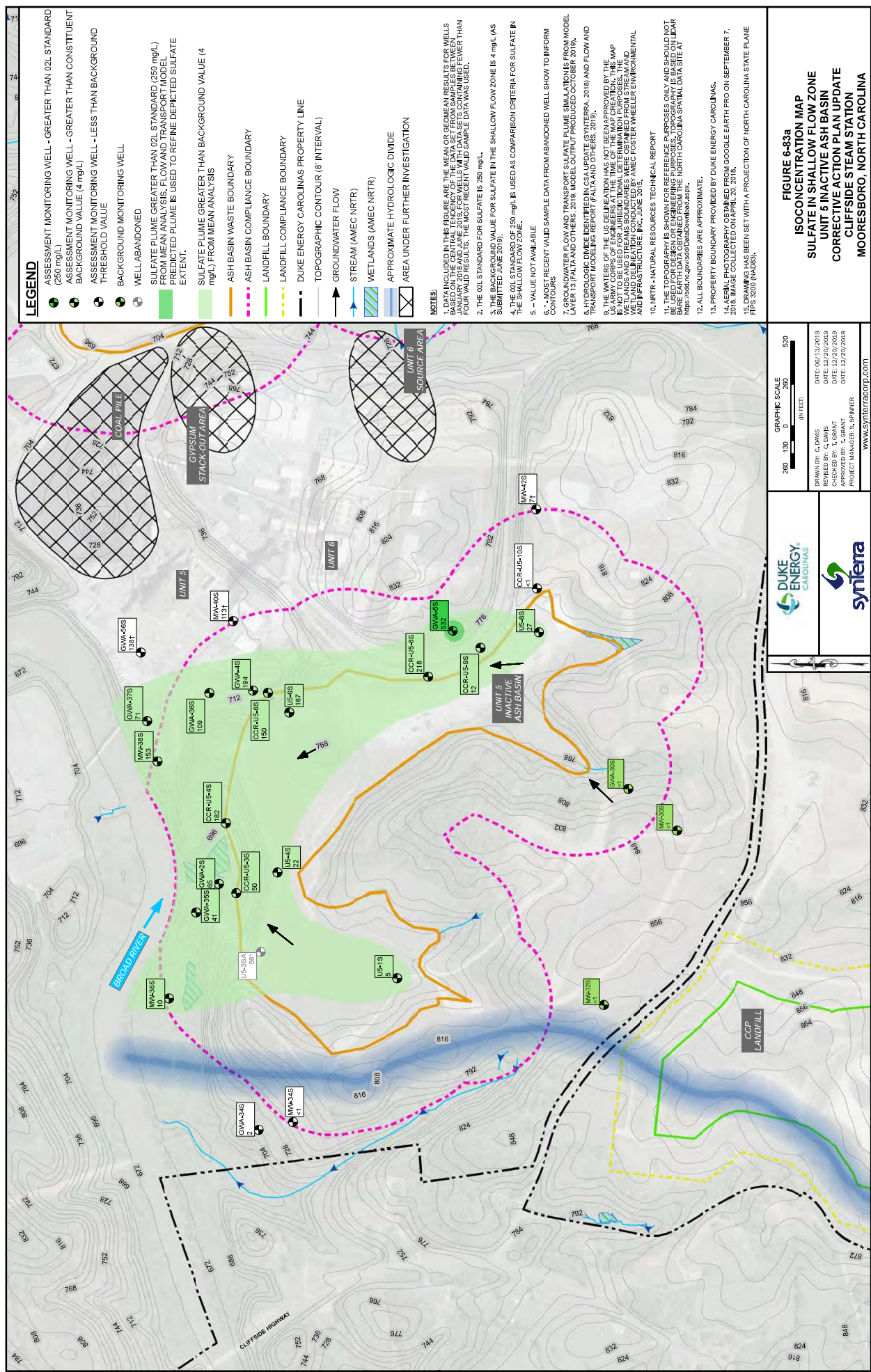


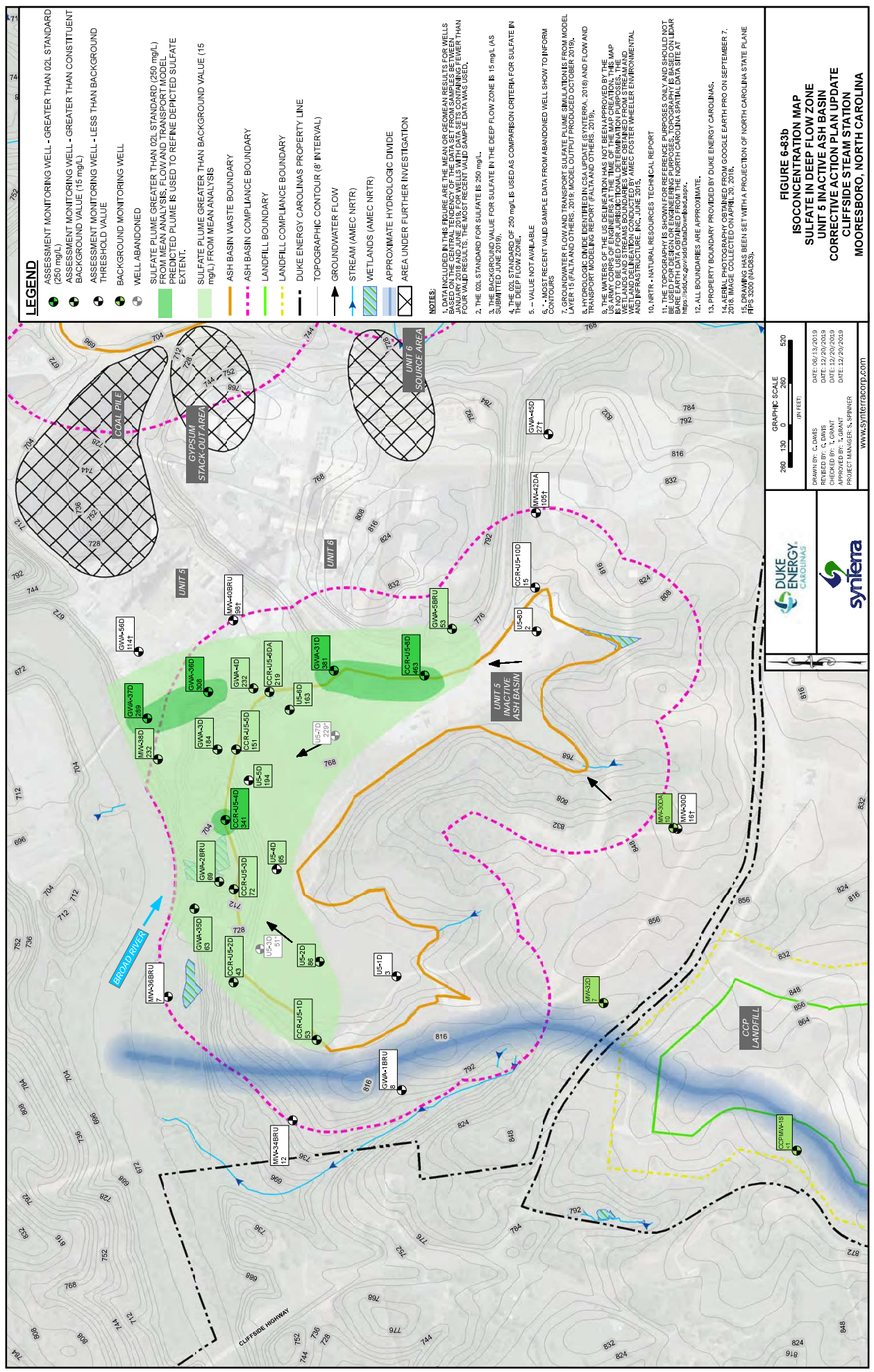












LEGEND

- ASSESSMENT MONITORING WELL - GREATER THAN 0.2L STANDARD (250 mg/L)
- ASSESSMENT MONITORING WELL - GREATER THAN CONSTITUENT BACKGROUND VALUE (15 mg/L)
- ASSESSMENT MONITORING WELL - LESS THAN BACKGROUND THRESHOLD VALUE
- BACKGROUND MONITORING WELL
- WELL ABANDONED
- SULFATE PLUME GREATER THAN 0.2L STANDARD (250 mg/L) FROM MEAN ANALYSIS, FLOW AND TRANSPORT MODEL
- PREDICTED PLUME IS USED TO REFINE DEPICTED SULFATE EXTENT.
- SULFATE PLUME GREATER THAN BACKGROUND VALUE (15 mg/L) FROM MEAN ANALYSIS
- ASH BASIN WASTE BOUNDARY
- ASH BASIN COMPLIANCE BOUNDARY
- LANDFILL BOUNDARY
- LANDFILL COMPLIANCE BOUNDARY
- DUKE ENERGY CAROLINAS PROPERTY LINE
- TOPOGRAPHIC CONTOUR (8' INTERVAL)
- GROUNDWATER FLOW
- STREAM (AMEC NRTR)
- WETLANDS (AMEC NRTR)
- APPROXIMATE HYDROLOGIC DIVIDE
- AREA UNDER FURTHER INVESTIGATION

NOTES:

1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMEAN RESULTS FOR WELLS BASED ON THE CENTRAL TENDENCY OF THE DATA SET FROM SAMPLES BETWEEN FOUR VALID RESULTS. THE MOST RECENT VALID SAMPLE DATA WAS USED.

2. THE 0.2L STANDARD FOR SULFATE IS 250 mg/L.

3. THE BACKGROUND VALUE FOR SULFATE IS 15 mg/L (AS SUBMITTED JUNE 2019).

4. THE 0.2L STANDARD OF 250 mg/L IS USED AS COMPARISON CRITERIA FOR SULFATE IN THE DEEP FLOW ZONE.

5. - VALUE NOT AVAILABLE

6. * MOST RECENT VALID SAMPLE DATA FROM ABANDONED WELL SHOW TO INFORM CONTOURS

7. GROUNDWATER FLOW AND TRANSPORT SULFATE PLUME SIMULATION IS FROM MODEL LAYER 15 (PALM AND OTHERS, 2019; MODEL OUTPUT PRODUCED OCTOBER 2019).

8. HYDROLOGIC DIVIDE IDENTIFIED IN CSA DRAFT (SYNTERRA, 2018) AND FLOW AND TRANSPORT SIMULATION IS BASED ON THIS DIVIDE.

9. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE US ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THE MAP IS NOT BE USED FOR ANY PURPOSES THAT REQUIRE A DETERMINATION OF WATERS OF THE US. THE WATERS OF THE US DELINEATION IS BASED ON AERIAL PHOTOGRAPHY AND WETLAND DELINEATION CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL AND INFRASTRUCTURE, INC. JUNE 2015.

10. NRTR - NATURAL RESOURCES TECHNICAL REPORT

11. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR ANY PURPOSES THAT REQUIRE A DETERMINATION OF WATERS OF THE US. THE TOPOGRAPHY IS BASED ON AERIAL PHOTOGRAPHY OBTAINED FROM THE NORTH CAROLINA SPATIAL DATA SITE AT <https://data.nc.gov/dataDownload.aspx>.

12. ALL BOUNDARIES ARE APPROXIMATE.

13. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.

14. AERIAL PHOTOGRAPHY OBTAINED FROM GOOGLE EARTH PRO ON SEPTEMBER 7, 2018. IMAGE COLLECTED ON APRIL 20, 2018.

15. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE RPS 3200 (NAD83).

FIGURE 6-83B
ISOCONCENTRATION MAP
SULFATE IN DEEP FLOW ZONE
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

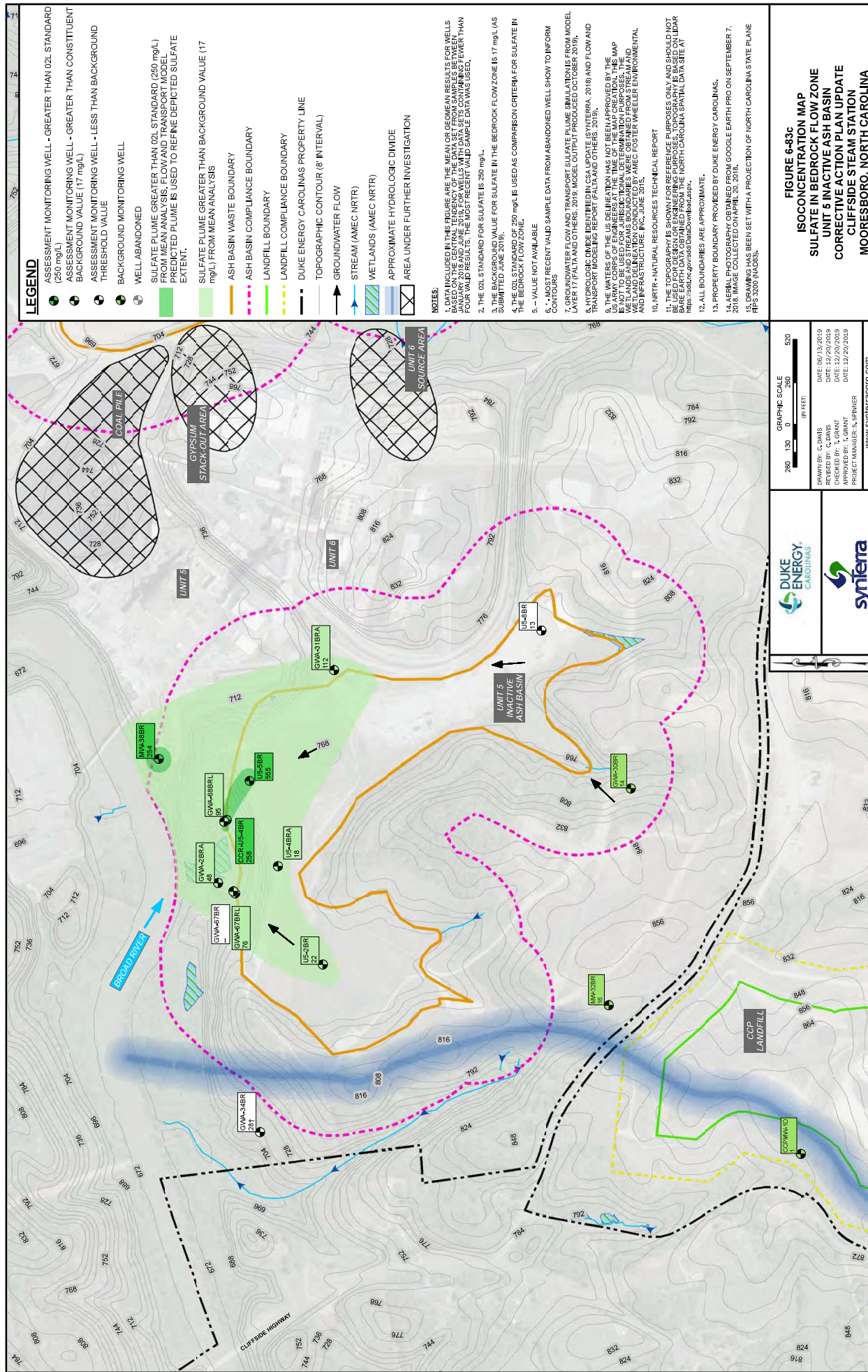
GRAPHIC SCALE
0 200 400 600
(IN FEET)

DATE: 06/12/2019
DRAWN BY: C. DAVIS
DATE: 12/20/2019
CHECKED BY: T. GRANT
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER

DUKE ENERGY
CAROLINAS

synterra

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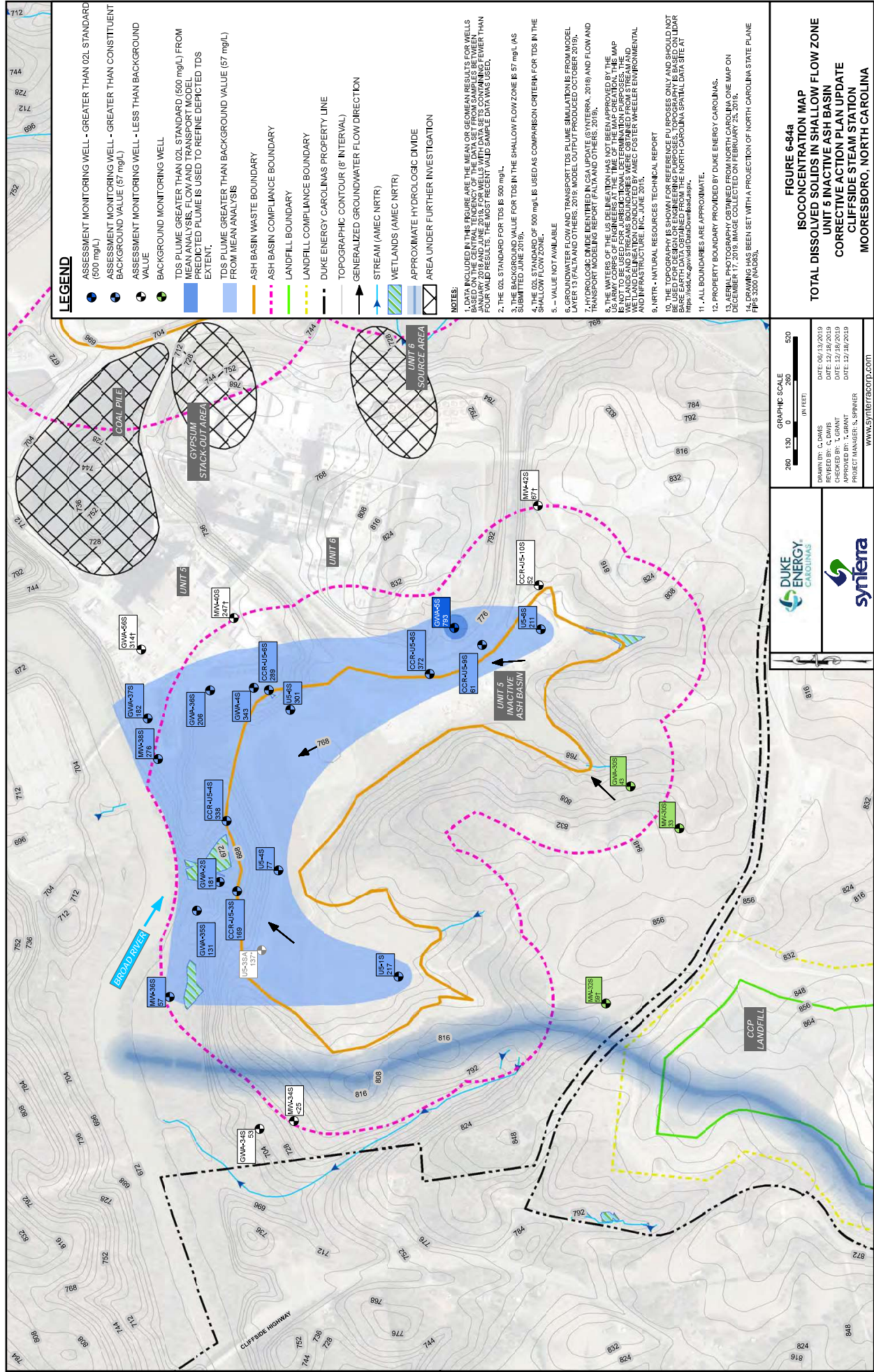


FIGURE 6-84a

TOTAL DISSOLVED SOLIDS IN SHALLOW FLOW ZONE
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

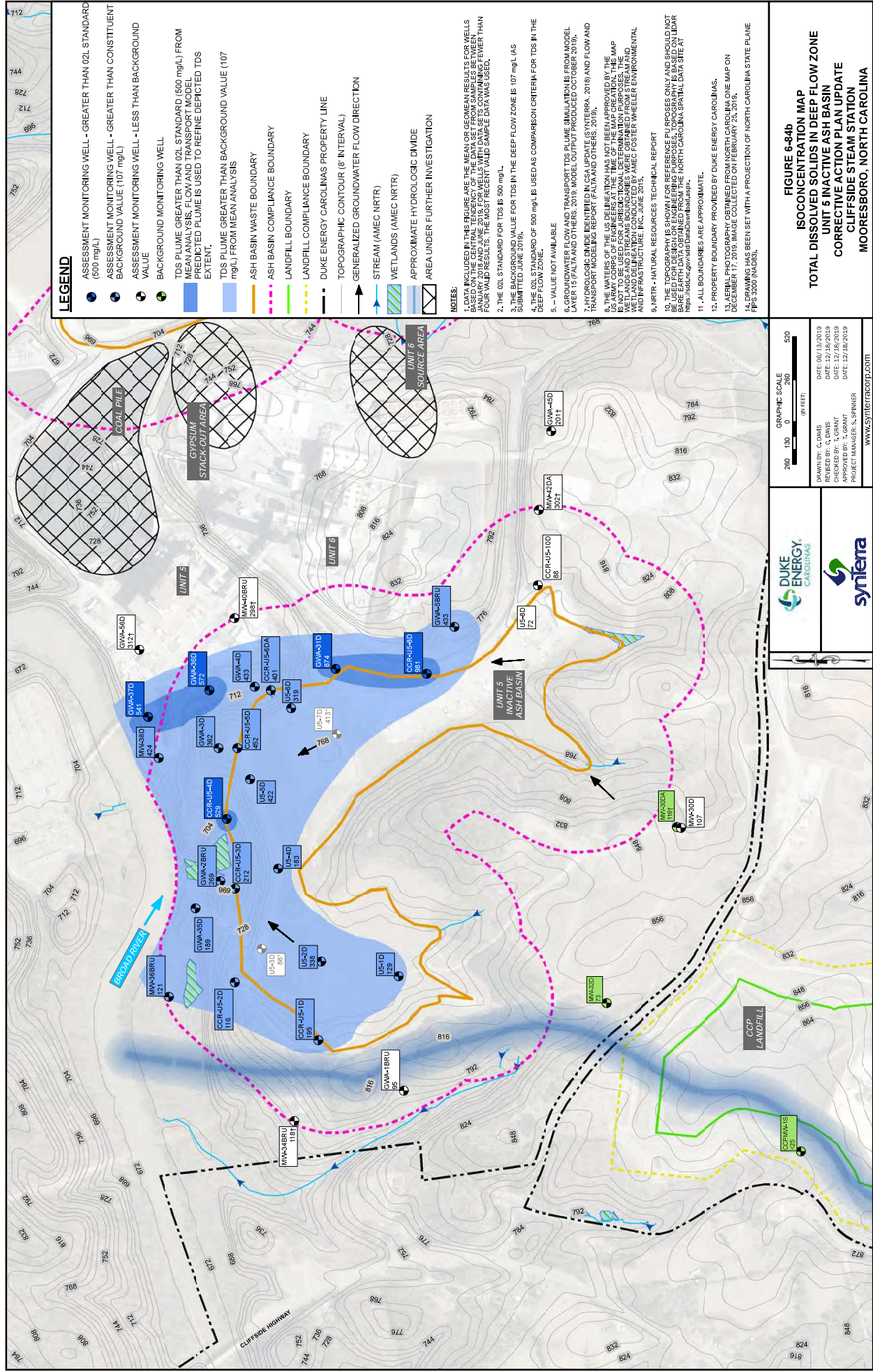
- NOTES:**
1. DATA INCLUDED IN THIS FIGURE ARE THE MEAN OR GEOMETRIC RESULTS FOR WELLS MONITORING TDS IN THE SHALLOW FLOW ZONE OF UNIT 5 INACTIVE ASH BASIN FOR JANUARY 2018 AND JUNE 2018. FOR WELLS WITH DATA SETS CONTAINING FEWER THAN FOUR VALID RESULTS, THE MOST RECENT VALID SAMPLE DATA WAS USED.
 2. THE 02L STANDARD FOR TDS IS 500 mg/L.
 3. THE BACKGROUND VALUE FOR TDS IN THE SHALLOW FLOW ZONE IS 57 mg/L (AS SUBMITTED JUNE 2019).
 4. THE 02L STANDARD OF 500 mg/L IS USED AS COMPARISON CRITERIA FOR TDS IN THE SHALLOW FLOW ZONE.
 5. - VALUE NOT AVAILABLE
 6. GROUNDWATER FLOW AND TRANSPORT TDS PLUME SIMULATION IS FROM MODEL LAYER 12 (PALM) AND OTHERS. 2019 MODEL OUTPUT PRODUCED OCTOBER 2019.
 7. TRANSPORT MODELING RESULTS WERE OBTAINED FROM THE MECHANISTIC TRANSPORT MODELING REPORT FOR THE CLIFFSIDE STEAM STATION, 2019, AND FLOW AND TRANSPORT MODELING REPORT FOR THE CLIFFSIDE STEAM STATION, 2019.
 8. THE WATERS OF THE US DELINEATION HAS NOT BEEN APPROVED BY THE U.S. ARMY CORPS OF ENGINEERS AT THE TIME OF THE MAP CREATION. THE MAP IS NOT A GUARANTEE OF THE ACCURACY OF THE DELINEATION. THE WATERS OF THE US DELINEATION AND STREAM BOUNDARIES WERE OBTAINED FROM STREAM AND WETLAND DELINEATION CONDUCTED BY AMEC FOSTER WHEELER ENVIRONMENTAL AND INFRASTRUCTURE, INC. IN JUNE 2019.
 9. NRTR - NATURAL RESOURCES TECHNICAL REPORT
 10. THE TOPOGRAPHY IS SHOWN FOR REFERENCE PURPOSES ONLY AND SHOULD NOT BE USED FOR ENGINEERING PURPOSES. THE TOPOGRAPHY IS BASED ON THE CLIFFSIDE STEAM STATION AERIAL PHOTOGRAPHY OBTAINED FROM THE NORTH CAROLINA STATE PLANE DATUM, 1983. THE TOPOGRAPHY IS BASED ON THE NORTH CAROLINA STATE PLANE DATUM, 1983. THE TOPOGRAPHY IS BASED ON THE NORTH CAROLINA STATE PLANE DATUM, 1983.
 11. ALL BOUNDARIES ARE APPROXIMATE.
 12. PROPERTY BOUNDARY PROVIDED BY DUKE ENERGY CAROLINAS.
 13. AERIAL PHOTOGRAPHY OBTAINED FROM NORTH CAROLINA ONE MAP ON DECEMBER 17, 2019. IMAGE COLLECTED ON FEBRUARY 25, 2019.
 14. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE FIPS 3200 (NAD83).

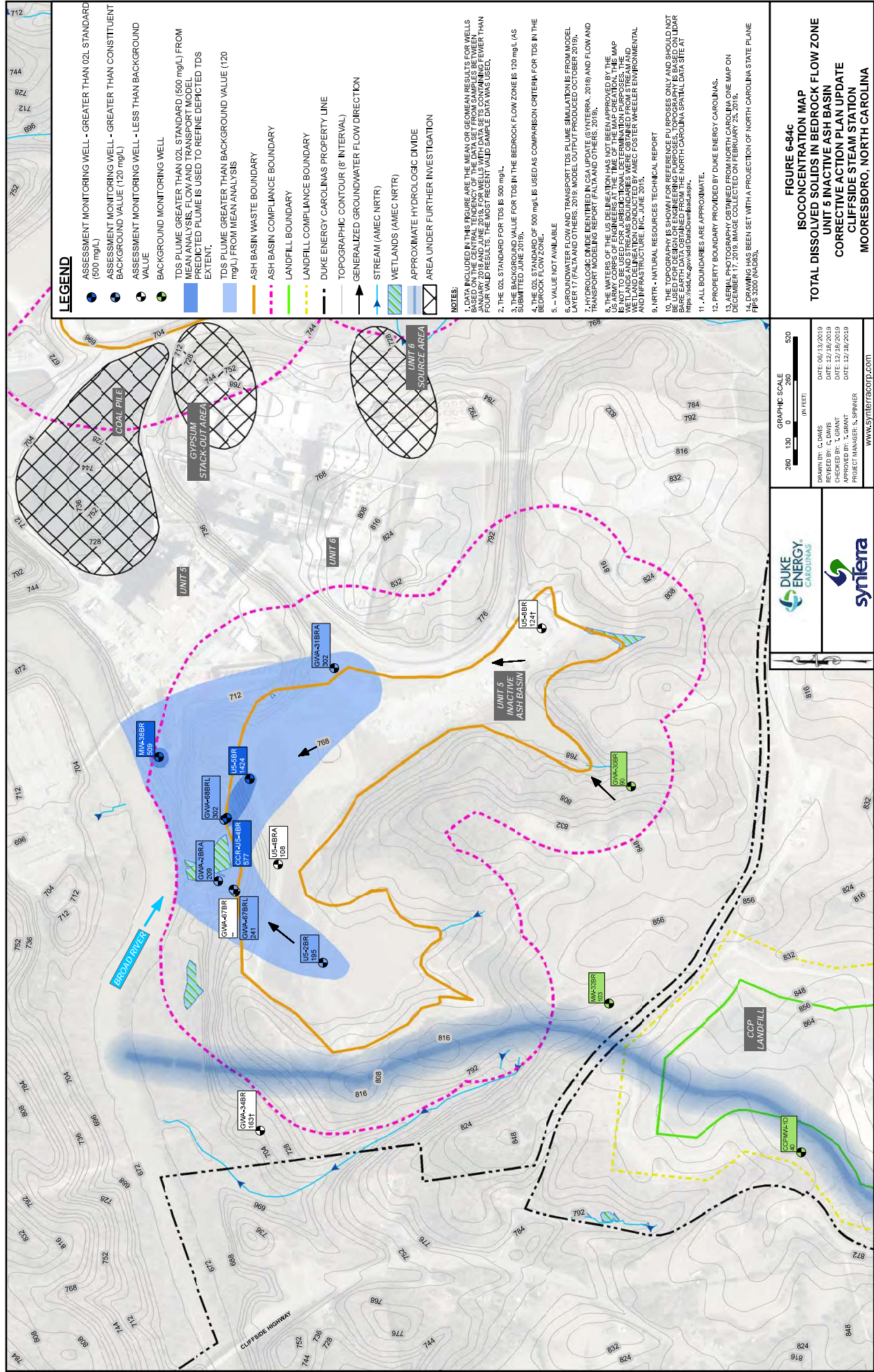


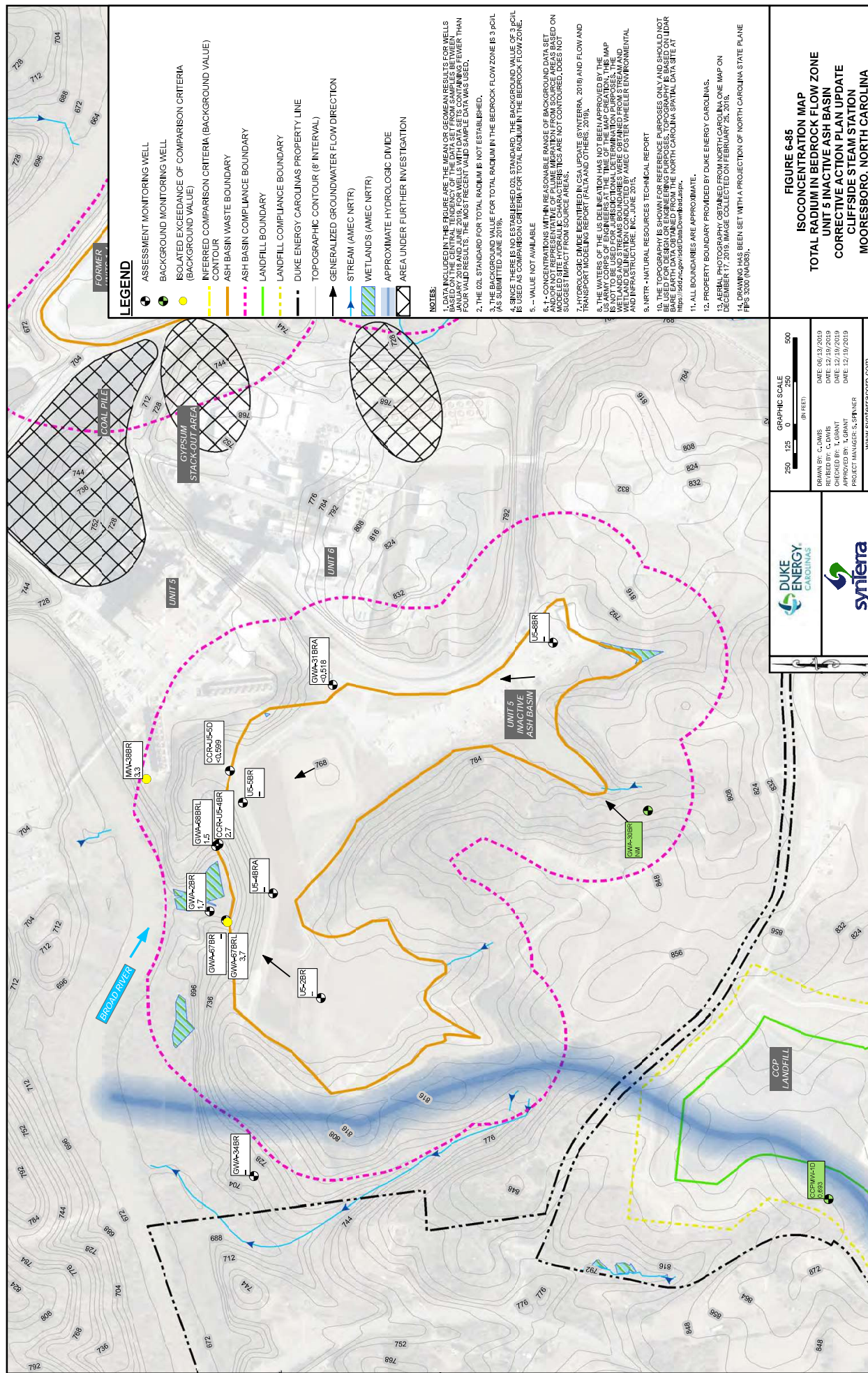
GRAPHIC SCALE
0 200 400 600
(IN FEET)

DATE: 12/18/2019
DRAWN BY: C. DAVIS
CHECKED BY: T. GRANT
APPROVED BY: T. GRANT
PROJECT MANAGER: S. SPRINGER

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Note:

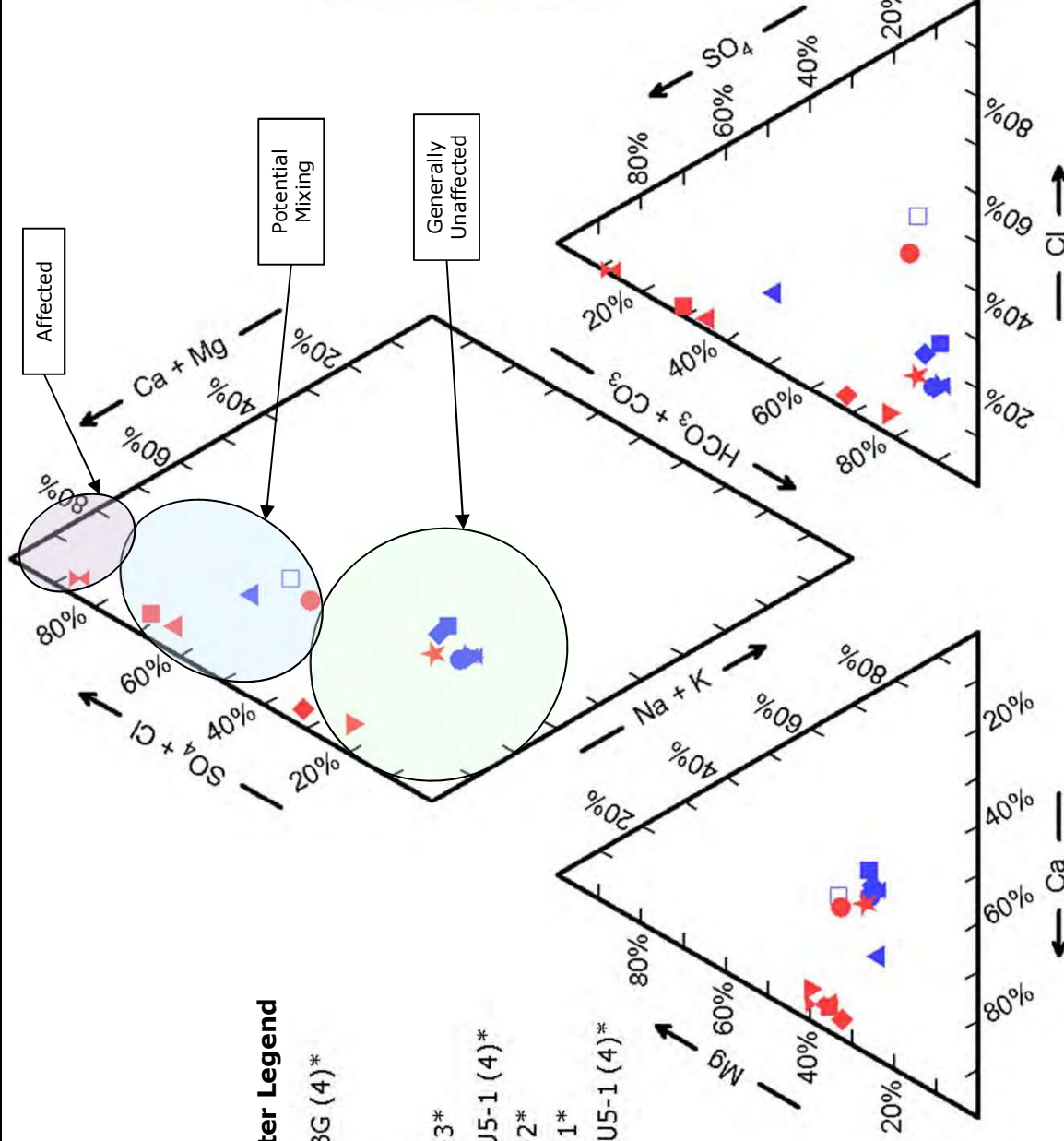
* - Sampling events prior to 1/1/2018

Surface Water Legend

- SW-BRBG (4)*
- SW-9*
- ▲ SW-1*
- ▼ SW-BR-3*
- ◆ SW-BRU5-1 (4)*
- ✕ SW-BR-2*
- ★ SW-BR-1*
- SW-WCU5-1 (4)*

Seeps Legend

- CLFTD-004*
- S-1
- ▲ S-2
- ▼ S-19*
- ◆ S-19A*
- ✕ S-18*
- ★ S-17*



DRAWN BY: R. Badum
 REVISED BY: R. Badum
 CHECKED BY: T. Grant
 APPROVED BY: T. Grant
 PROJECT MANAGER: S. Spinner

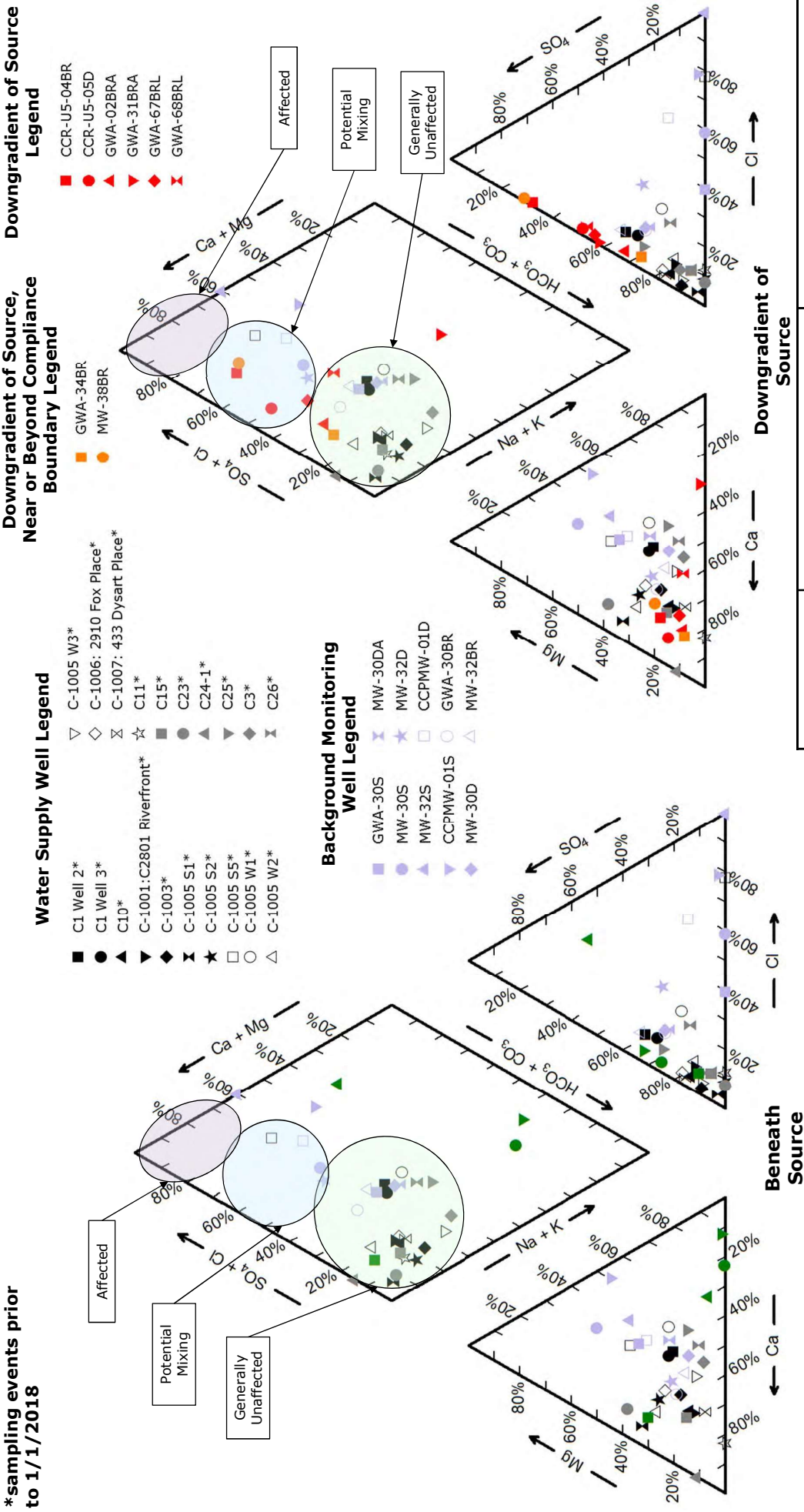
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DATE: 10/18/2019

FIGURE 6-86
SEEP AND SURFACE WATER
QUALITY PIPER DIAGRAMS
UNIT 5 INACTIVE ASH BASIN
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

Note:

*sampling events prior to 1/1/2018



DATE: 11/8/2019

DRAWN BY: R. Badum

REVISED BY: R. Badum

CHECKED BY: T. Grant

APPROVED BY: T. Grant

PROJECT MANAGER: S. Spinner

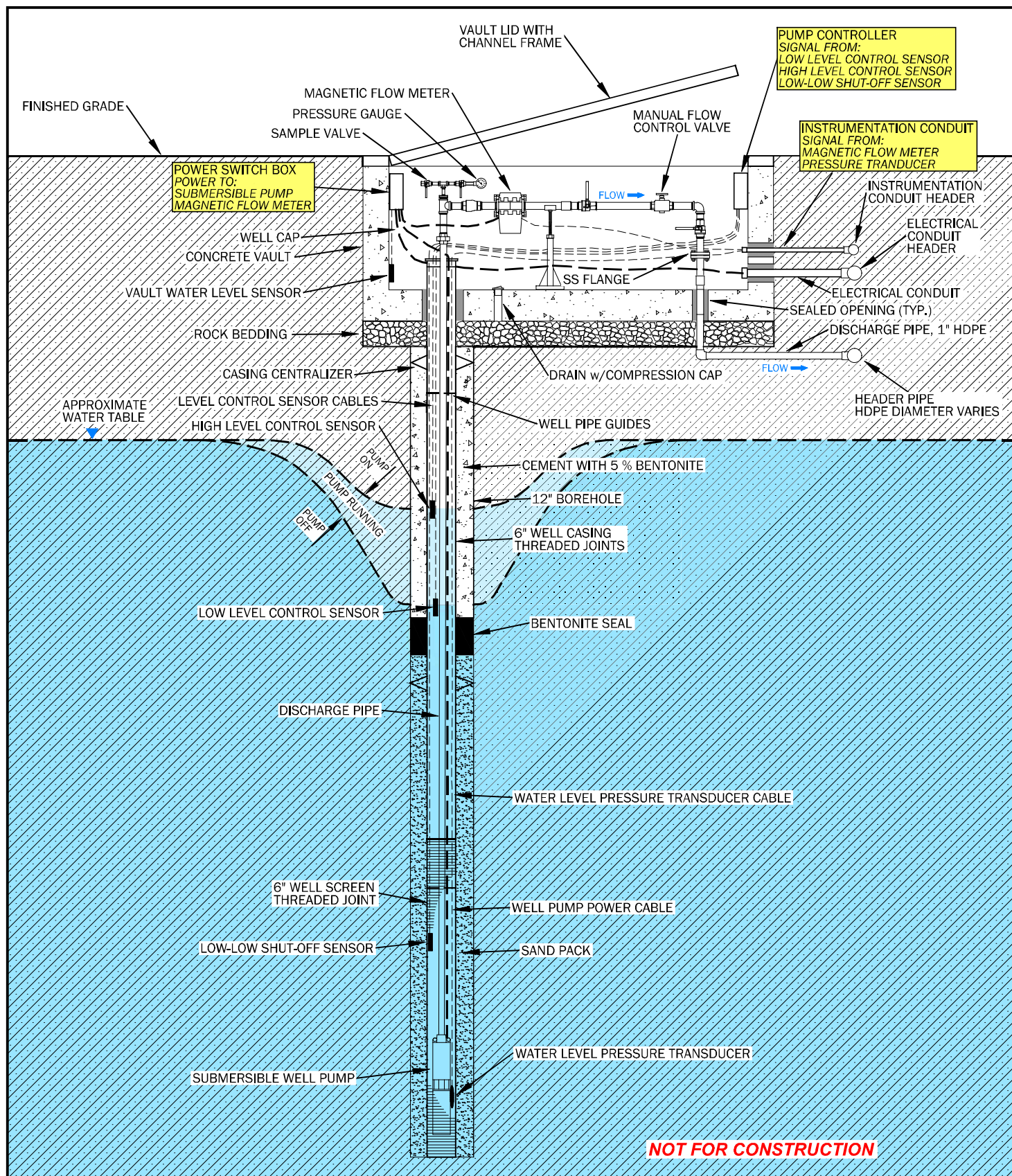
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Figure 6-88a

Remedial Alternative 3 – System Layout – Groundwater Remediation by Extraction

Provided in separate electronic figure file as a
large sheet size

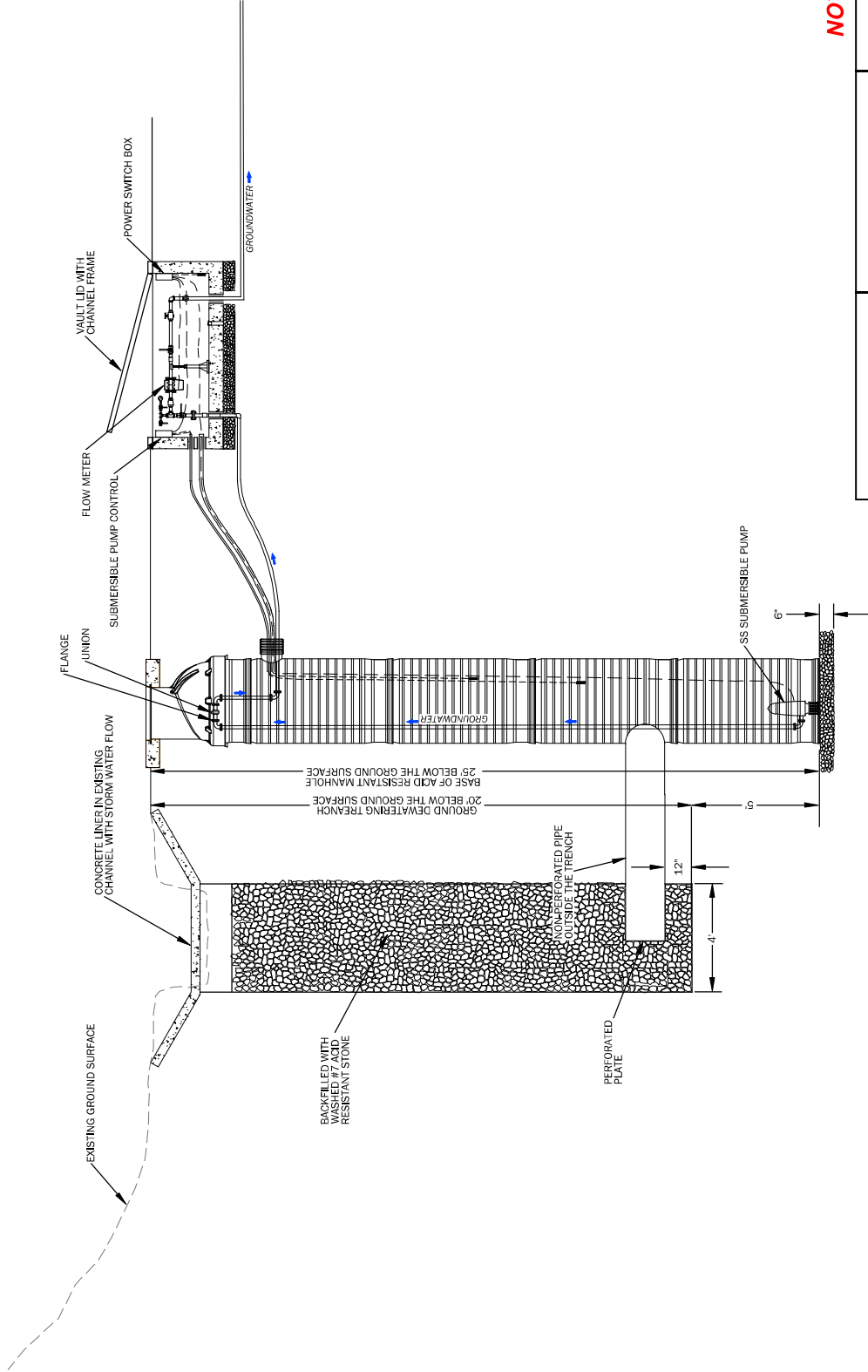


NOT TO SCALE

DRAWN BY: J. CHASTAIN DATE: 12/21/2019
 REVISED BY: DATE: -
 CHECKED BY: J. CLEMMER DATE: 12/21/2019
 APPROVED BY: J. CLEMMER DATE: 12/21/2019
 PROJECT MANAGER: S. SPINNER

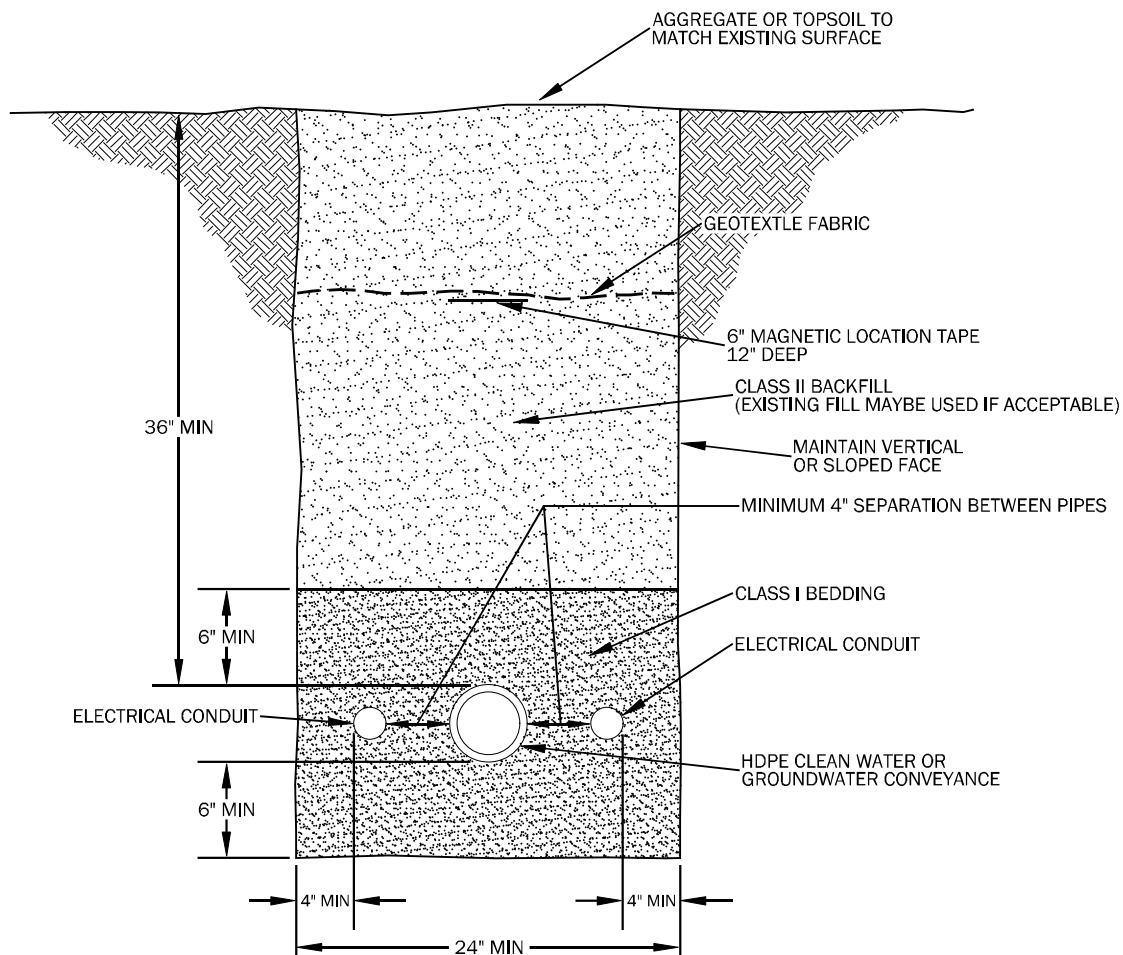
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FIGURE 6-88b
REMEDIAL ALTERNATIVE 3
CONCEPTUAL VERTICAL EXTRACTION WELL
SCHEMATIC
GROUNDWATER REMEDIATION BY EXTRACTION
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA



NOT FOR CONSTRUCTION

	NOT TO SCALE DATE: 12/21/2019 DRAWN BY: J. CHRISTIAN DATE: 12/21/2019 CHECKED BY: J. CLEMMER DATE: 12/21/2019 APPROVED BY: J. CLEMMER DATE: 12/21/2019 PROJECT MANAGER: S. SPINER	FIGURE 6-88C REMEDIAL ALTERNATIVE 3 CONCEPTUAL SOURCE CONTROL TRENCH PUMP STATION GROUNDWATER REMEDIATION BY EXTRACTION UNIT 5 INACTIVE ASH BASIN CORRECTIVE ACTION PLAN UPDATE CLIFFSIDE STEAM STATION MOORESBORO, NORTH CAROLINA
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NOTES:

1. 4" MINIMAL HORIZONTAL SEPARATION BETWEEN ALL PIPE AND CONDUIT.
2. 6" VERTICAL SEPARATION WHEN CROSSING OVER ALL PIPE AND CONDUIT.
3. 36" MINIMUM COVER FOR ALL PIPE AND CONDUIT.
4. PLACE BACKFILL AND FILL SOIL MATERIALS IN LAYERS NOT MORE THAN 8" IN LOOSE DEPTH FOR MATERIAL COMPACTED BY HEAVY COMPACTION EQUIPMENT AND NOT MORE THAN 4 INCHES LOOSE DEPTH FOR MATERIAL COMPACTED BY HAND OPERATED TAMPERS.
5. PLACE BACKFILL AND FILL MATERIALS EVENLY ON ALL SIDES OF STRUCTURES TO REQUIRED ELEVATIONS AND UNIFORMLY ALONG THE FULL LENGTH OF EACH STRUCTURE.
6. COMPACT SOIL MATERIALS TO NOT LESS THAN 95 PERCENT OF MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D 698.

NOT FOR CONSTRUCTION

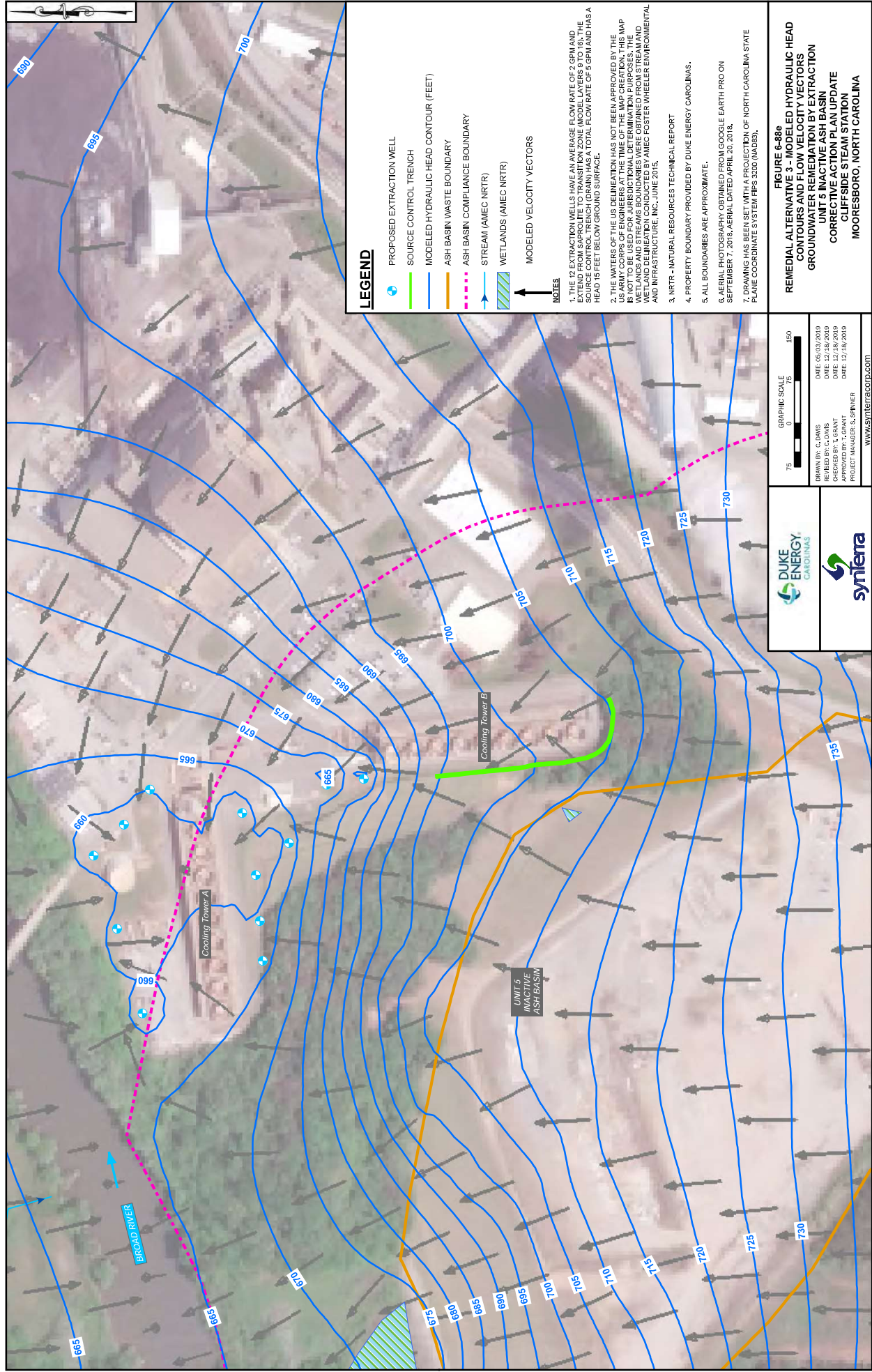


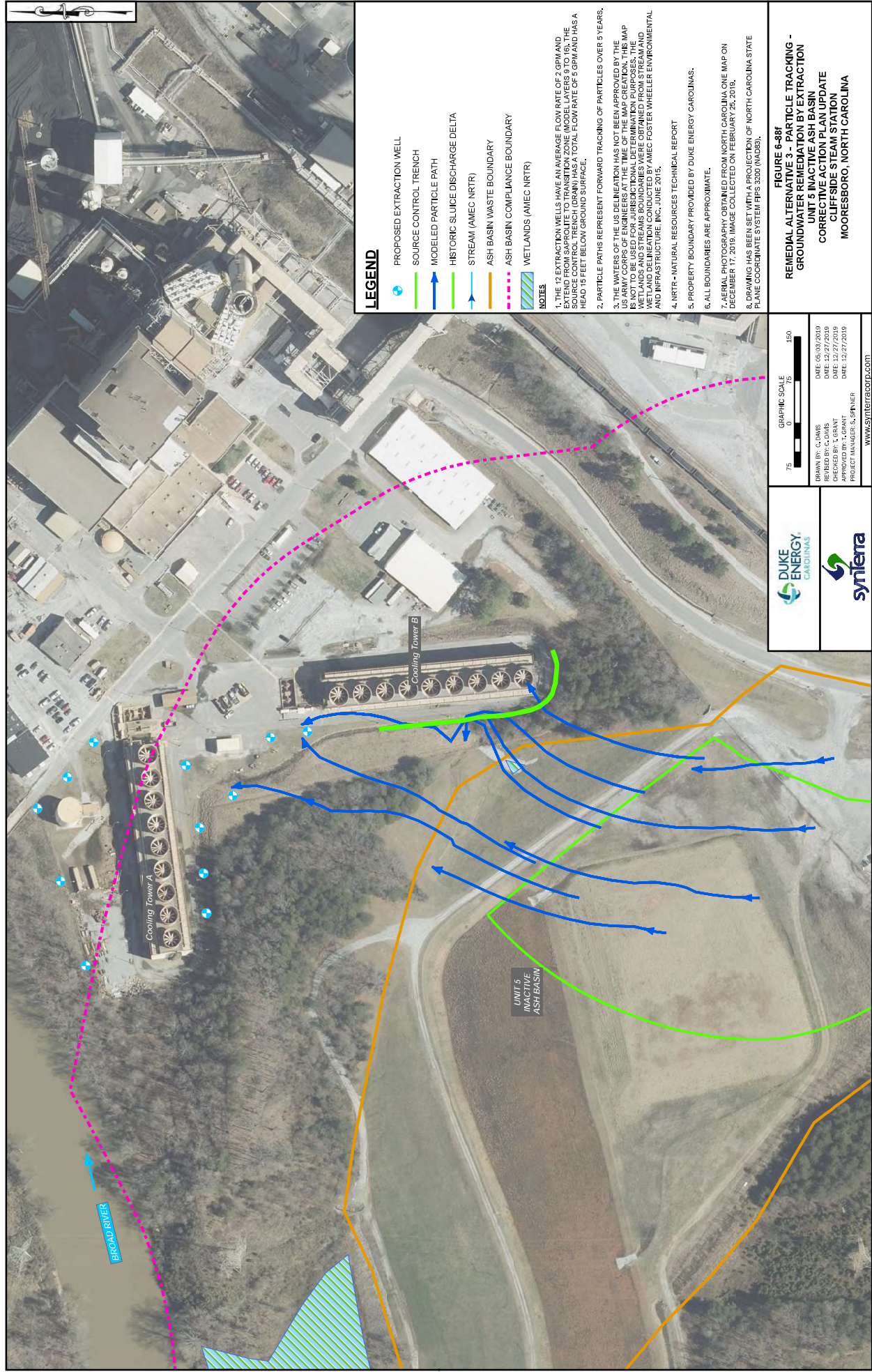
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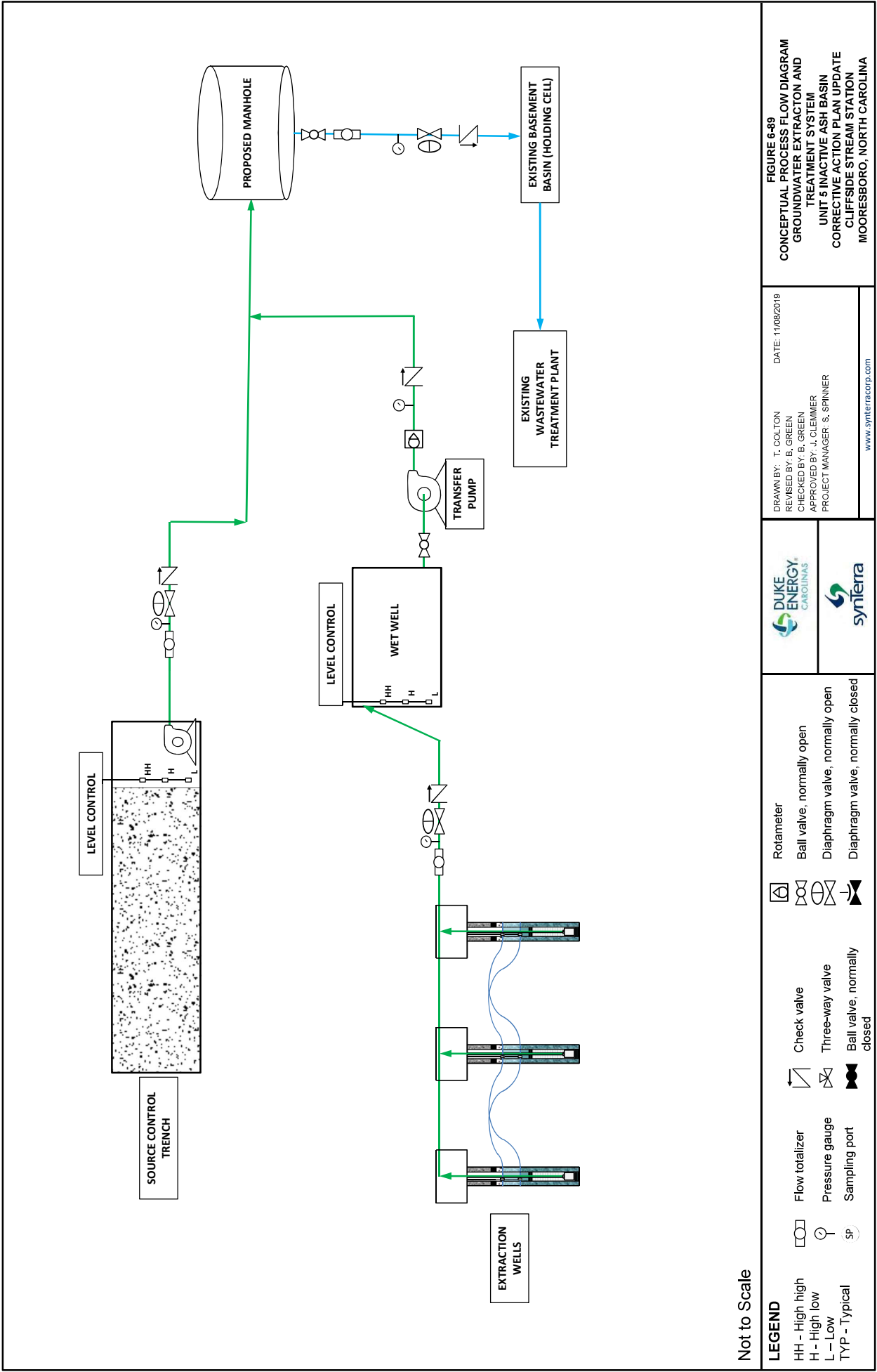
DRAWN BY: J. CHASTAIN DATE: 12/26/2019
 REVISED BY: DATE: -
 CHECKED BY: J. CLEMMER DATE: 12/26/2019
 APPROVED BY: J. CLEMMER DATE: 12/26/2019
 PROJECT MANAGER: S. SPINNER

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**FIGURE 6-88d
 REMEDIAL ALTERNATIVE 3
 CONCEPTUAL PIPELINE TRENCH DETAIL
 GROUNDWATER REMEDIATION BY EXTRACTION
 UNIT 5 INACTIVE ASH BASIN
 CORRECTIVE ACTION PLAN UPDATE
 CLIFFSIDE STEAM STATION
 MOORESBORO, NORTH CAROLINA**







Not to Scale

LEGEND

HH - High high
H - High low
L - Low
TYP - Typical

Flow totalizer
Pressure gauge
Sampling port

Check valve
Three-way valve
Ball valve, normally closed



Rotameter
Ball valve, normally open
Diaphragm valve, normally open
Diaphragm valve, normally closed

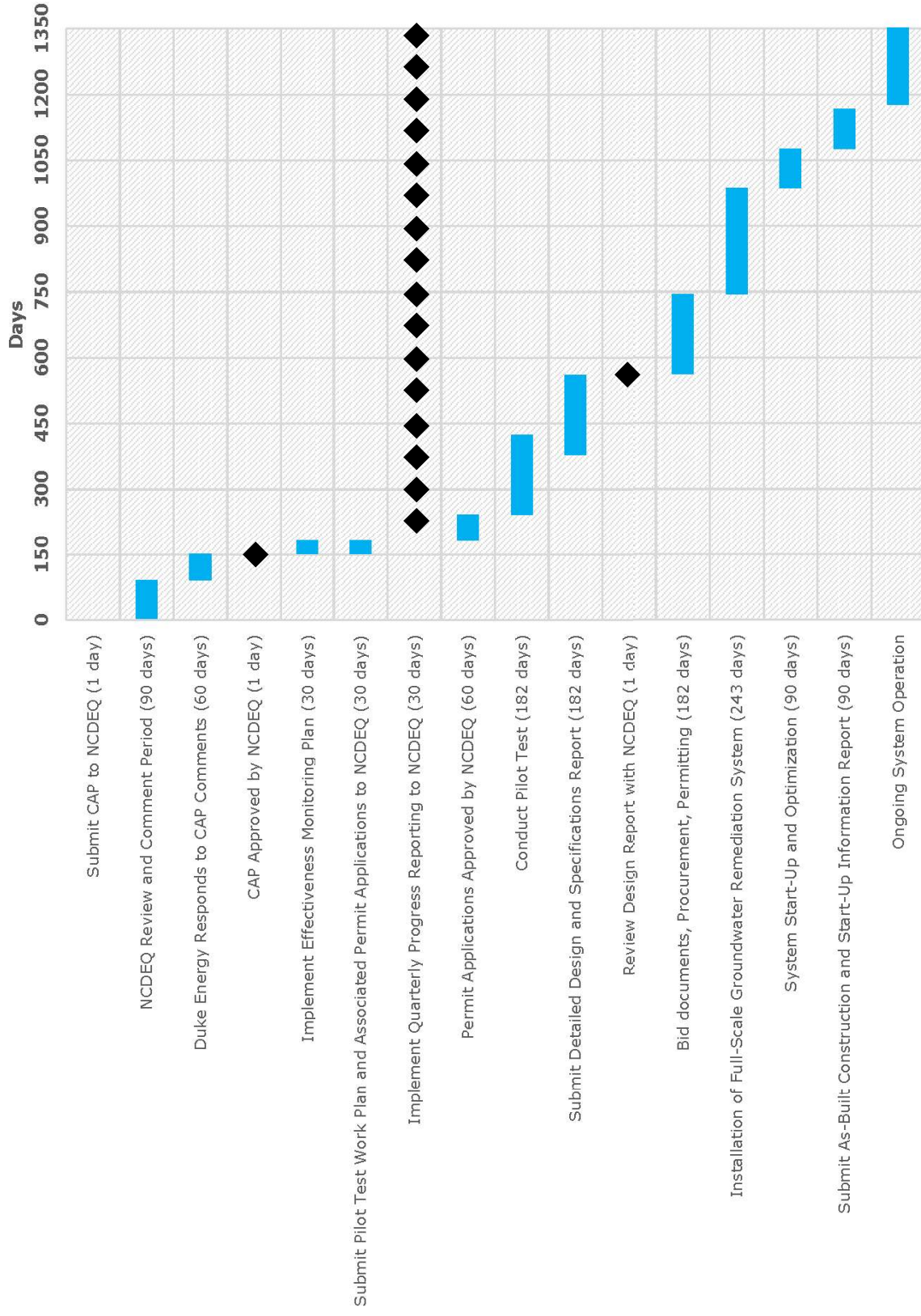


DRAWN BY: T. COLTON
REVISED BY: B. GREEN
CHECKED BY: B. GREEN
APPROVED BY: J. CLEMMER
PROJECT MANAGER: S. SPINNER

DATE: 11/08/2019

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FIGURE 6-49
CONCEPTUAL PROCESS FLOW DIAGRAM
GROUNDWATER EXTRACTION AND
TREATMENT SYSTEM
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STREAM STATION
MOORESBORO, NORTH CAROLINA



Notes:

- * - Either submittal of the Effectiveness Monitoring Plan or the pilot test work plan and permit applications (as applicable) will fulfill section G.S.130A-309.209.(b)(3).
- ** - Actual time may vary due to a variety of factors including agency review and approvals, weather delays, equipment availability, etc.

DRAWN BY: R. ISHAM
REVISOR BY: S. WOOD
CHECKED BY: T. GRANT
APPROVED BY: S. SPINNER
PROJECT MANAGER: S. SPINNER

DATE: 12/5/2019
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FIGURE 6-90
CAP IMPLEMENTATION GANTT CHART
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

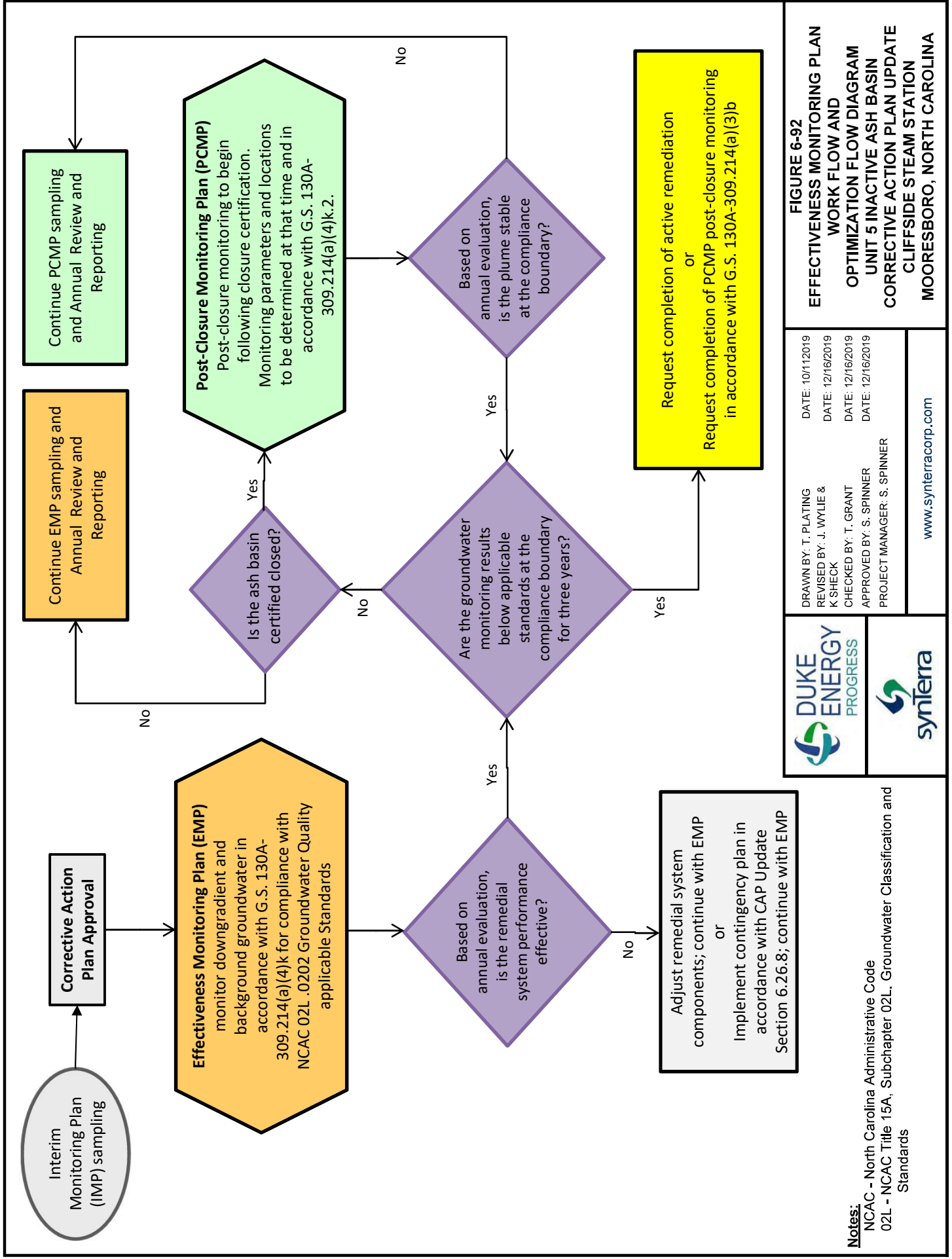




FIGURE 6-92
EFFECTIVENESS MONITORING PLAN
WORK FLOW AND
OPTIMIZATION FLOW DIAGRAM
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

DRAWN BY: T. PLATING REVISED BY: J. WYLIE & K. SHECK CHECKED BY: T. GRANT APPROVED BY: S. SPINNER PROJECT MANAGER: S. SPINNER	DATE: 10/11/2019 DATE: 12/16/2019 DATE: 12/16/2019 DATE: 12/16/2019
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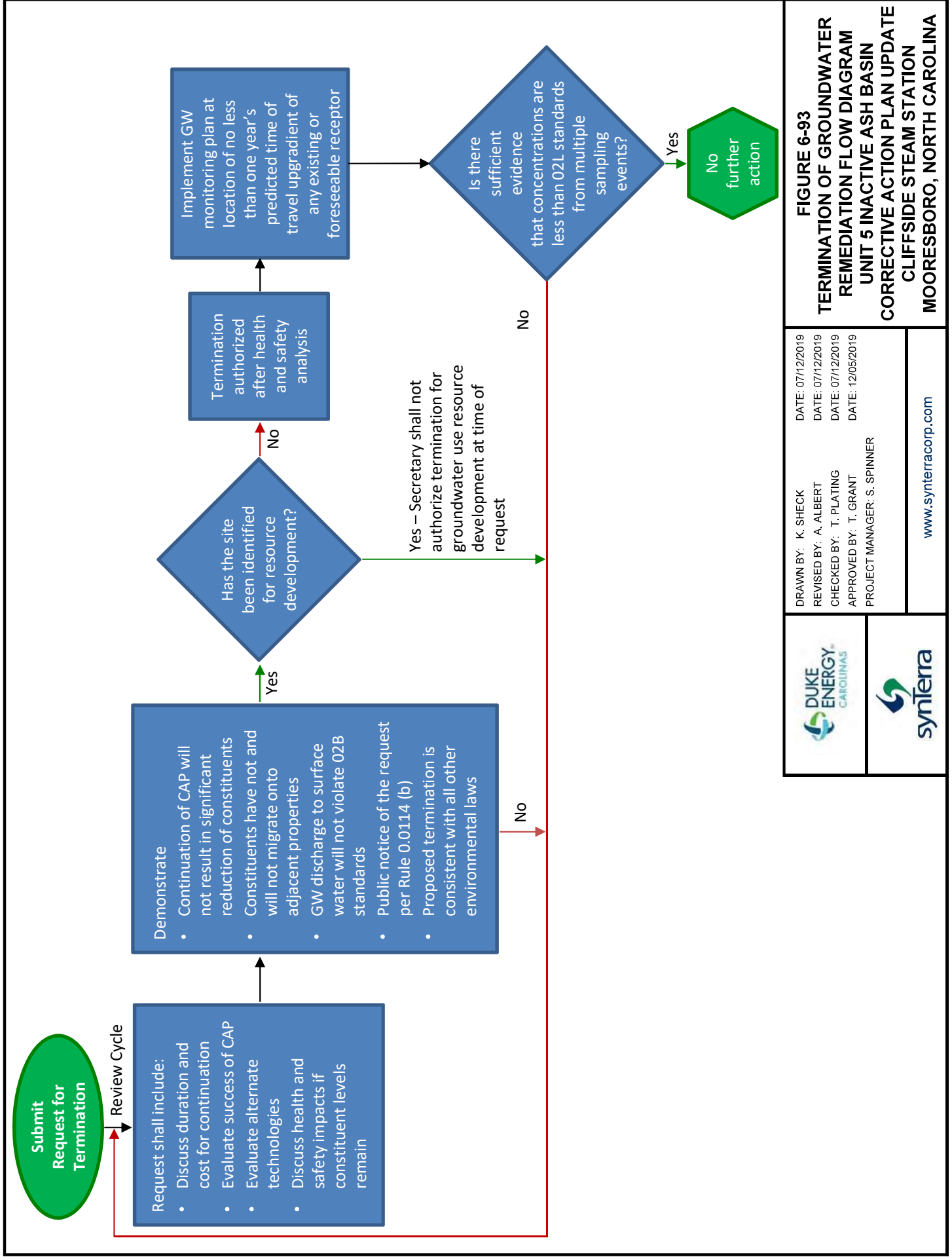


FIGURE 6-93
TERMINATION OF GROUNDWATER
REMEDATION FLOW DIAGRAM
UNIT 5 INACTIVE ASH BASIN
CORRECTIVE ACTION PLAN UPDATE
CLIFFSIDE STEAM STATION
MOORESBORO, NORTH CAROLINA

DRAWN BY: K. SHECK	DATE: 07/12/2019
REVISED BY: A. ALBERT	DATE: 07/12/2019
CHECKED BY: T. PLATING	DATE: 07/12/2019
APPROVED BY: T. GRANT	DATE: 12/05/2019
PROJECT MANAGER: S. SPINNER	
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