UPPER MISSISSIPPI RIVER RESTORATION FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

GREEN ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 13, UPPER MISSISSIPPI RIVER
RIVER MILES 545.9 THROUGH 548.7
JACKSON COUNTY, IOWA

APPENDIX E
ENGINEERING

ATTACHMENT E
SURVEY, MAPPING, AND GEOSPATIAL DATA

UPPER MISSISSIPPI RIVER RESTORATION FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

GREEN ISLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT

APPENDIX E ENGINEERING

ATTACHMENT E SURVEY, MAPPING, AND GEOSPATIAL DATA

TABLE OF CONTENTS

TABLE

ATTACHMENTS

1. SURVEY, MAPPING, AND OTHER GEOSPATIAL REQUIREMENTS

The Tock Island District's Contracting Division, Survey Branch (EC-TS) performed a Topographic Survey and provided precise data for a local elevation conversion of the feasibility area. EC-TG supplemented the topographic data with LiDAR. Survey and other geospatial data requirements for the study area are summarized below.

1.1. Horizontal Datum. NAD83 (2011) State Plane Iowa North

1.2. Vertical Datum. NAVD88

1.3. Geoid. 18 (CONUS)

1.4. Units. US survey feet

1.5. Conversion. Historic datum conversions confirmed by survey crews were used for the Green Island HREP Study. A single study-wide vertical datum conversion of "MSL12 – 0.68 feet = NAVD88" will be used within the study area for surface data processing, plans, and specifications. For hydraulic modeling, the conversions listed in Table 1 (extending from L&D 13 to L&D 12) will be used.

Table E-1. Historic Vertical Datum Conversions for Mississippi River Pool 13, To Be Used for Hydraulic Modeling

Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)	Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)
522.50 (L&D 13)	0.625	539.10	0.662
522.60	0.625	539.90	0.662
522.80	0.629	540.60	0.668
523.10	0.629	541.20	0.672
523.60	0.632	541.80	0.672
524.00	0.635	542.60	0.675
524.50	0.635	543.30	0.675
525.00	0.638	543.70	0.675
526.00	0.635	544.30	0.675
526.60	0.638	544.80	0.678
527.00	0.638	545.40	0.678
528.00	0.645	546.00 (Green Island HREP downstream project boundary)	0.678
528.50	0.645	546.40	0.678
529.00	0.645	547.00	0.681
529.70	0.655	547.50	0.681
530.00	0.655	548.10	0.675
530.90	0.658	548.50 (Green Island HREP upstream project boundary)	0.675
531.70	0.662	549.10	0.675
532.30	0.662	549.70	0.675
532.80	0.662	550.40	0.675
533.50	0.658	551.00	0.675
534.10	0.658	552.00	0.675
535.10	0.658	552.80	0.675
535.50	0.655	553.30	0.675
535.70	0.655	554.00	0.678
535.90	0.655	554.50	0.681
536.40	0.655	555.20	0.685
537.10	0.655	555.70	0.685
537.70	0.655	556.20	0.675
538.10	0.662	556.60	0.675
538.50	0.662	556.70 (L&D 12)	0.675

1.6 Survey

- Agency: MVR, EC-TS, April/May/June 2020
- Agency: MVR, EC-TS, September 2021, Hydrographic survey.
- Agency: MVR, EC-TS, April/May/June 2020
- Agency: MVR, EC-TS, September 2021, LiDAR survey.
- Agency: State of Iowa, November 2007

1.7 Surface Files. The surface files used for computations are titled B5GILDD1202001-CAD_MODEL-2022-02-02-V-ORDT01.dgn, B5GILDD1202001-CAD_MODEL-2022-02-02-V-ORDT01.dtm, and B5GILDD1202001-CAD_MODEL-2022-01-15-C-SP0001.dgn.

2. REFERENCE

USACE, Green Island HREP Vertical And Horizontal Datum: Memorandum for Record. Prepared by the Rock Island District, U.S. Army Corps of Engineers. January 2022

UPPER MISSISSIPPI RIVER RESTORATION FEASIBILITY REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

GREEN ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 13, UPPER MISSISSIPPI RIVER
RIVER MILES 545.9 THROUGH 548.7
JACKSON COUNTY, IOWA

APPENDIX E
ENGINEERING

ATTACHMENT E-A
PROJECT SURFACE DEVELOPMENT

B5GILDD1202001-MEMO-
Green_Island_HREP_Vertical_And_Horizontal_Datum_MFR_011122.docx

MEMORANDUM FOR RECORD 11 JAN 2022

Subject: Green Island HREP Vertical and Horizontal Datums

1. Summary:
Vertical Datum - NAVD88
Vertical Datum Conversion Factor - NAVD88 + 0.68 feet = MSL 1912
Horizontal Datum - NAD83, State Plane Iowa North, GEOID 18

2. In late January 2020, a request to the MVR survey branch (EC-T) for a recommended conversion from MSL 1912 to NAVD88 for the Green Island HREP Project area (RM 546-548.5). MSL1912 to NAVD88 Conversion for Green Island HREP.msg EC-TS provided a conversion recommendation for the HREP Project area of NAVD88 + 0.69 feet = MSL 1912. Pool 13 Green Island conversion to msl 12.msg and Green Island Conversion.msg

3. In November 2020, Lower Pool 13 HREP PDT members met with EC-TS to discuss the appropriate vertical datum conversions (MSL 1912 to NAVD88) to use for the hydraulic analysis reach (entirety of Pool 13-RM 522.5 to 556.7) and for the HREP Project area (RM 522.5 to 529). Historic vertical datum conversions and more recent conversions based on the Eisenbraun survey (2009) were discussed. Due to limitations with the existing Eisenbraun conversions for Pool 13, a decision to use the historic datum conversions for the Lower Pool 13 HREP hydraulic analysis was made. **A Lower Pool 13 HREP Project area vertical datum conversion of "MSL 1912 – 0.64 feet = NAVD88" will be used for the plans and specifications. For Pool 13 HREP hydraulic modeling, the conversions listed in Table 1 will be used.**
B5UMRR131801-MEMO-2020-11-18-Vertical Datum Conversion.pdf

Table 1. Historic Vertical Datum Conversions for Mississippi River Pool 13, To Be Used for Hydraulic Modeling for Lower Pool 13 HREP.

Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)	Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)
522.50 (L&D 13, Lower Pool 13 Project downstream boundary)	0.625	539.10	0.662
522.60	0.625	539.90	0.662
522.80	0.629	540.60	0.668
523.10	0.629	541.20	0.672
523.60	0.632	541.80	0.672
524.00	0.635	542.60	0.675
524.50	0.635	543.30	0.675
525.00	0.638	543.70	0.675
526.00 (Lower Pool 13 Project midpoint)	0.635	544.30	0.675
526.60	0.638	544.80	0.678
527.00	0.638	545.40	0.678
528.00	0.645	546.00	0.678
528.50	0.645	546.40	0.678
529.00 (Lower Pool 13 Project upstream boundary)	0.645	547.00	0.681
529.70	0.655	547.50	0.681
530.00	0.655	548.10	0.675
530.90	0.658	549.10	0.675

531.70	0.662	549.70	0.675
532.30	0.662	550.40	0.675
532.80	0.662	551.00	0.675
533.50	0.658	552.00	0.675
534.10	0.658	552.80	0.675
535.10	0.658	553.30	0.675
535.50	0.655	554.00	0.678
535.70	0.655	554.50	0.681
535.90	0.655	555.20	0.685
536.40	0.655	555.70	0.685
537.10	0.655	556.20	0.675
537.70	0.655	556.60	0.675
538.10	0.662	556.70 (L&D 12)	0.675
538.50	0.662		

4. In March 2021, information was compiled from a survey done in February 2021. Thursday February 4, 2021 a two-man survey crew arrived on site and took GPS measurements on the southernmost Iowa DNR water gauge. The GPS measurement checked very close to the ice surface indicating that the gauge was operating properly. The following week two survey crews returned with a digital level to confirm the measurement and to observe the conversion based on local control from known benchmarks opposed to the calculated historic conversion from MSL 1912 to NAVD88. The results from these level loops gave a conversion value -0.68' from MSL 12 to NAVD88. The result also confirmed that the IA DNR Gage on the south end of the project (featured in the attached field book) holds an elevation of 589.897 (MSL 1912) on the top of the gauge at the 10' mark. The Topo Map of Green Island Wildlife Area by MARKHURO AERIAL SURVEYS INC. 1980 differed from ECTS Survey by 0.29' based on BM 3, the top of the highest bolt on the eastmost manhole of the three located on the flow gate (600.037-599.74=0.29' MSL 1912). Again, using the brass disk labeled IA 13-18 for the conversion to achieve NAVD88 0.68' must be subtracted from the MSL 12 value. 2020-02 Gage Benchmark datum conversion survey

5. In January 2022, Green Island HREP PDT members met with EC-TS to discuss the appropriate vertical datum, vertical datum conversions (MSL 1912 to NAVD88) and horizontal datum to use for the design of the HREP Project. The PDT decision was to design the project in NAVD88 for the vertical datum. Based on the latest survey information from March 2021, the decision was to use NAVD88 + 0.68 feet = MSL 1912 for the vertical datum conversion. The Horizontal Datum was chosen based on the county the project is located in. This datum indicates which state plane zone and UTM zone each county falls in. NAD83 (2011) State Plane Iowa North will be used for the horizontal datum. GIS work was completed thus far in Iowa South and will be updated to reflect the change.

6. Hydraulic modeling in support of the Green Island HREP feasibility study (i.e. floodplain modeling using HEC-RAS and other potential water surface profile modeling to support TSP identification) will utilize the same vertical datum conversions agreed upon for the Lower Pool 13 HREP. B5GILDD1202001-MEMO-Green_Island_HREP_Vertical_And_Horizontal_Datum_MFR_011122.docx **A Green Island HREP Project area vertical datum conversion of "MSL 1912 – 0.68 feet = NAVD88" will be used for the converting historic water level management records and plans and specifications. For Green Island HREP hydraulic modeling on the Mississippi River, the conversions listed in Table 2 will be used.**

Table 2. Historic Vertical Datum Conversions for Mississippi River Pool 13,
To Be Used for Hydraulic Modeling for Lower Pool 13 HREP

Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)	Mississippi River Mile	To convert elevations in MSL 1912 to NAVD88, subtract (feet)
522.50 (L&D 13)	0.625	539.10	0.662
522.60	0.625	539.90	0.662
522.80	0.629	540.60	0.668
523.10	0.629	541.20	0.672
523.60	0.632	541.80	0.672
524.00	0.635	542.60	0.675
524.50	0.635	543.30	0.675
525.00	0.638	543.70	0.675
526.00	0.635	544.30	0.675
526.60	0.638	544.80	0.678
527.00	0.638	545.40	0.678
528.00	0.645	**546.00 (Green Island HREP downstream project boundary)**	0.678
528.50	0.645	546.40	0.678
529.00	0.645	547.00	0.681
529.70	0.655	547.50	0.681
530.00	0.655	548.10	0.675
530.90	0.658	**548.50 (Green Island HREP upstream project boundary)**	0.675
531.70	0.662	549.10	0.675
532.30	0.662	549.70	0.675
532.80	0.662	550.40	0.675
533.50	0.658	551.00	0.675
534.10	0.658	552.00	0.675
535.10	0.658	552.80	0.675
535.50	0.655	553.30	0.675
535.70	0.655	554.00	0.678
535.90	0.655	554.50	0.681
536.40	0.655	555.20	0.685
537.10	0.655	555.70	0.685
537.70	0.655	556.20	0.675
538.10	0.662	556.60	0.675
538.50	0.662	556.70 (L&D 12)	0.675

Submitted by,
Lucie Sawyer, P.E.
CEMVR-EC-HQ

CC:

J'layne Bigelow, EC-T
Brent Skidmore, EC-T
Ed Selfe, EC-T
Nicole Manasco, EC-HQ
Matt Zager, EC-HH
Leo Keller, EC-HQ
Kara Mitvalsky, EC-DN
Chandra Dowda, EC-DN
LaShell Harper, EC-DN
Cody Cutkomp, EC-DN
Anthony Heddlesten, EC-DN

Alden Ross, EC-T EGES
Chuck Gerdes, EC-T EGES
Jesse Ray, PD-C
Nick Thorson, PD-F
John Menard, PM-M
Julie Millhollin, PM-M

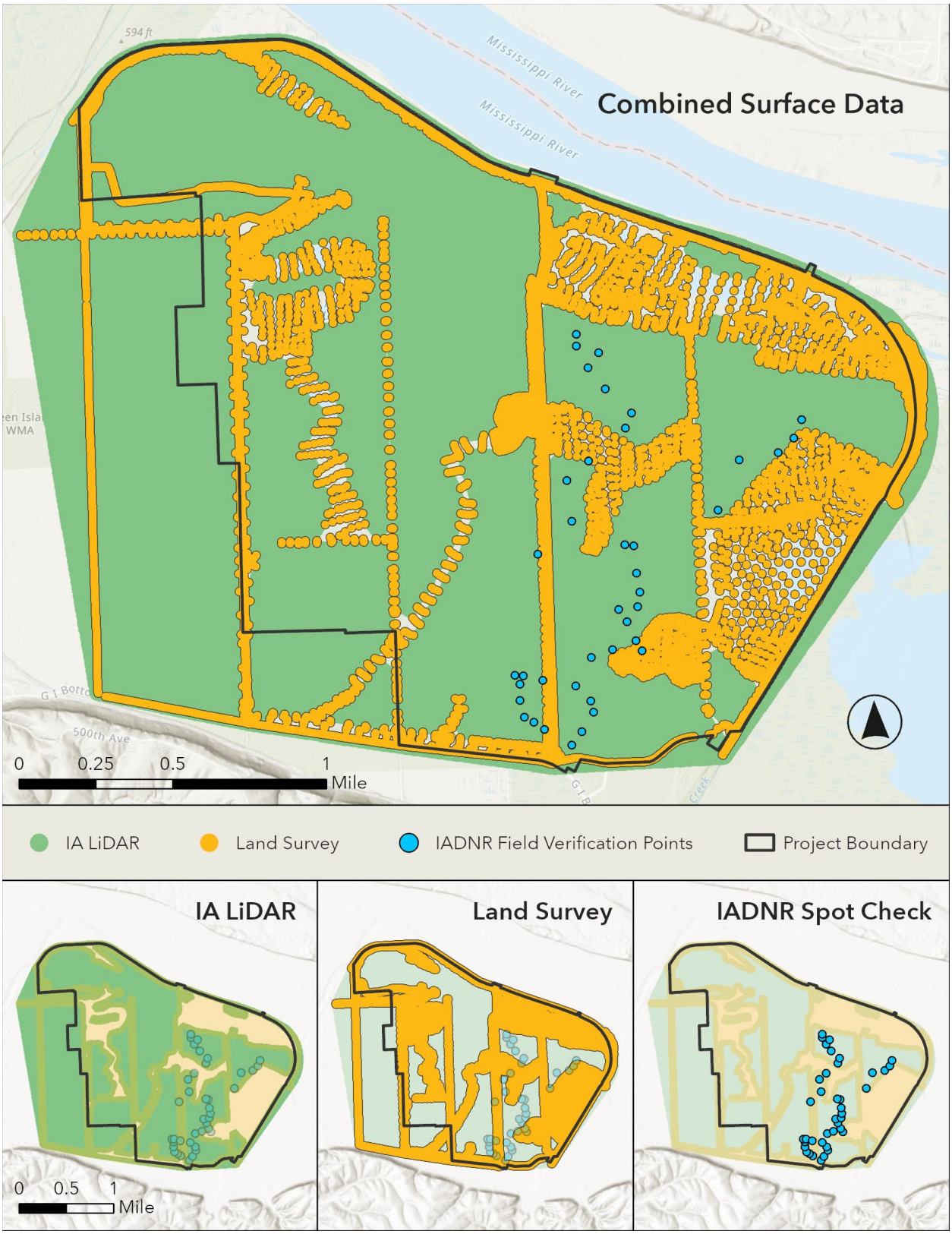
UPPER MISSISSIPPI RIVER RESTORATION FEASIBILITY REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

GREEN ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 13, UPPER MISSISSIPPI RIVER
RIVER MILES 545.9 THROUGH 548.7
JACKSON COUNTY, IOWA

APPENDIX E
ENGINEERING

ATTACHMENT E-B
PROJECT SURFACE DEVELOPMENT


Combined Surface Data
Mississippi River
Mississippi River
500th Ave
0 0.25 0.5 1
Mile
IA LiDAR
Land Survey
IADNR Field Verification Points
Project Boundary
IA LiDAR
Land Survey
IADNR Spot Check
0 0.5 1
Mile

General:

- Vertical Datum - NAVD88
- Vertical Datum Conversion Factor - NAVD88 + 0.68 feet = MSL 1912
- Horizontal Datum - NAD 1983 (2011) StatePlane Iowa North (US Feet)
- Maximum managed water level: 587.72' NAVD88 (588.4' MSL 1912)

Input layers:

\\mvd\mvr\EGIS\Work\EMP\HREP_Projects\GreenIsland\
Data\TopobathySurface\GreenIsland_Topobathy_Surface.gdb

- **EC_TS_Survey_2020**
  - Toposurvey points
  - Source: EC-TS
  - Collection date: 2020
  - Conversion applied:
    - Survey was collected in NAVD88, no conversion applied
  - This dataset is the most recently-collected and highest-accuracy, and therefore was given first priority in the topobathy surface. The datasets below were used to fill in gaps within the area of interest but were clipped to avoid overlapping with this dataset.

- **IA_LiDAR_1m**
  - Point values extracted from 1-meter LiDAR-derived DEM
  - Source: State of Iowa
  - Collection date: 2007
  - Conversion applied:
    - LiDAR was collected in NAVD88, no conversion was applied
    - Manual adjustments were made to elevation values following field verification of elevation by Iowa DNR staff (see IADNR_Field_Verification_Points below)
    - Pool A Adjustment: -2.67'
    - Pool B Adjustment: -1.78'
    - Outside of pools: -1.98'
  - LiDAR points that fell within the EC-TS survey footprint were discarded

- **IADNR_Field_Verification_Points**
  - Field verification measurements ("spot checks") collected by Iowa DNR staff
    - Elevation was measured in depth below water level as recorded on Green Island WMA staff gage. Depths ranged from 6 to 27 inches
    - MSL12 elevation was determined by subtracting the water depth from the pool surface elevation
  - Source: IADNR
  - Collection date: 2021
  - Conversion applied:
    - 0.68 was subtracted from the MSL12 elevation to convert to NAVD88
  - Field verification points that fell within the EC-TS survey footprint were discarded

Outputs:

TIN:

- \\mvd\mvr\EGIS\Work\EMP\HREP_Projects\GreenIsland\Data\TopobathySurface\GreenIsland_Topobathy_Surface

1m raster:

- \\mvd\mvr\EGIS\Work\EMP\HREP_Projects\GreenIsland\Data\TopobathySurface\GreenIsland_Topobathy_Surface_1m.tif

Elevation at levee crown:

- Elevation values extracted at 1 meter intervals along the levee crown and water level management berms that coincide with the outer extent of the project
- \\mvd\mvr\EGIS\Work\EMP\HREP_Projects\GreenIsland\Data\TopobathySurface\GreenIsland_Topobathy_Surface.gdb\ElevationAtLeveeandBermCrown

Input footprints:

- \\mvd\mvr\EGIS\Work\EMP\HREP_Projects\GreenIsland\Data\TopobathySurface\GreenIsland_Topobathy_Surface.gdb
    - EC-TS Survey: “EC_TS_Survey_footprint”
    - IA LiDAR: “IA_LiDAR_1m_footprint”
    - The 39 IADNR field verification points are located primarily in Pool B with 9 located in Pool A. A footprint was not generated due to the low density of the points.