4/25/2025

Mr. Kristopher Keller
City of Dickinson
38 1st Street W
Dickinson, ND 58601

Re: Change Order to Agreement for Dickinson Queen City Dam EAP

Dear Mr. Keller:

This letter sets forth changes to the Agreement dated 2/20/2025 between the City of Dickinson (Client) and Barr Engineering Co., its affiliates and subsidiaries (Barr) regarding engineering assistance for creating Emergency Action Plan (EAP) for the Queen City Dam (Project #202310).

The scope of professional consulting services Barr will provide is modified to include the additional work outlined in the attached scope of work dated 2/21/2025.

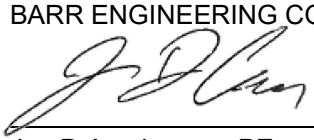
The authorized cost for the revised scope of services is increased by $162,250, as outlined in the table below.

Item	Amount
Original Project Budget	$5,000
Anticipated Extra Work	$162,250
Revised Project Budget including Contract Amendment	$167,250

If this Change Order to our Agreement is satisfactory, please sign the enclosed copy in the space provided, and return it to us.

Sincerely yours,

BARR ENGINEERING CO.



Jon D Ausdemore, PE
Its Vice President

Accepted this _____ day of _____, 20____

CITY OF DICKINSON

By _____

Its _____

Attachments
City of Dickinson – Queen City Dam EAP: Scope, Schedule, and Budget, dated 2/21/2025

2/21/2025

Mr. Kristopher Keller
City of Dickinson
38 1st Street W
Dickinson, ND 58601

Re: City of Dickinson – Queen City Dam EAP: Scope, Schedule, and Budget

Dear Mr. Keller:

This letter outlines the anticipated scope, schedule, and budget for the completion of an Emergency Action Plan (EAP) for the Queen City Dam (Project # 202310), a high hazard dam located on the southwest side of the City of Dickinson. This effort is based on the original scope outlined by the Barr proposal dated 12/31/2024, our subsequent review of available background data for the dam and our experience completing similar work for other high hazard dams. The project will consist of development of the EAP including the model development and completion of the dam breach analysis as well as a risk assessment of the dam.

1 Scope

1.1 Emergency Action Plan

1.1.1 Meetings and Updates

Barr will host a virtual kickoff meeting to introduce team members, discuss the project objectives, define communications methods and frequency and begin discussing project details.

Barr will provide biweekly progress reports via email to the city and assumes up to 12 biweekly updates over the course of the project. The monthly progress meetings will be virtual (Microsoft Teams) and we assume 6 monthly update meetings. Barr's PM will host the meeting and will include key team members relevant to the agenda topics.

Deliverables: meeting agendas and minutes, email updates on project status

1.1.2 Data Collection and Review

Barr has performed an initial data review for reports, models, and background documents shared by the City and NDDWR. The objective of this initial review was to understand what information is currently available, is the information still relevant for current rules and regulations, and what information is missing that will need to be obtained to complete the EAP. However, there may be additional information or files that would be relevant to this scope of work and a more detailed review of the provided information is warranted. This may include past hydraulic modeling, the original plans, past dam inspection reports, photographs, and survey data.

Deliverables: copies of existing data that is collected; list of missing data

1.1.3 Survey

Barr will be subcontracting with Civil Science, a local engineering and survey firm located in Dickinson, to perform survey required for the hydraulic model development of the Heart River to evaluate dam break scenarios. Barr is leveraging survey and modeling data from the City of Dickinson East Broadway Dam project as well as survey (collected by Civil Science) and modeling data (from Barr Engineering) collected in 2023 as part of the NDDOT Statewide Scour Evaluation project that included evaluation of the Highway 22/Main Street bridge over the Heart River. Permission for use of this data was requested and granted from the NDDOT.

This survey request for the EAP hydraulic model development includes the following features:

- Queen City Dam reservoir bathymetry
- Cross sections along the Heart River
- Survey of the State Ave, 6th Ave SE, and 10th Ave SE bridges
- In-river structures and culverts

See attached scope of work for survey services from Civil Science.

The survey data will be merged with the most current LiDAR (2021) data available for Stark County to create a complete model surface.

Deliverables: Updated topographic surface for the model including survey data; PDF of drawing showing survey data collected

1.1.4 Dam Breach Analysis

A dam breach analysis is recommended to complete an EAP as it will identify potential downstream impacted structures and facilities and potential consequences. A thorough dam breach analysis has not been previously completed for the Queen City Dam that would be of the standard for an EAP at a high hazard dam. Simplified dam breach analyses have been completed in the past by Gannett Fleming to determine the hazard classification and recently using DSS-WISE Lite by the state.

1.1.4.1 Hydraulic Model Development

Barr will develop an existing conditions model of the Heart River, extending from the Queen City Dam reservoir at the upstream end, to just east of the Dickinson Wastewater Treatment Plant, as that is critical infrastructure for the City and potential impacts there should be evaluated.

The modeling will use HEC-RAS 2D, per the ND Dam Safety Standards (Section 5.1.1), because overbank flow spreading is likely, and the river winds through the downstream area rather than follows a straight path. Additionally, the industry standard in identifying and quantifying downstream consequences is to use location-specific, depth-velocity-danger relationships, which require a 2D hydraulic model. Although the Heart River is mapped by FEMA, the supporting hydraulic model would have been a 1D model, not suitable for this dam breach analysis.

The model will be based on survey data of the river, 2021 LiDAR data beyond the channel banks and will include hydraulic controls and infrastructure present in and along the Heart River. These are expected to include at least: the Manns Dam, the State Avenue Bridge, the Main Street Bridge, the Broadway Dam (current or future configuration), the 6th Avenue Bridge, and 10th Avenue Bridge.

1.1.4.2 Hydraulic (Dam Breach) Modeling

The HEC-RAS 2D model will be used for dam breach and flood modeling to assess the potential consequences of a dam breach. The modeling methodology and selection of breach parameters will be

established following Federal Energy Regulatory Commission (FERC) guidance (Chapter R21 Dam Breach Analysis, and Chapter II Selecting and Accommodating Inflow Design Floods for Dams). The model will be run for the following scenarios for the Queen City Dam Project:

- Fair Weather ("sunny day") Breach – reservoir level and flow in Heart River at normal conditions.
- Flood Event Breach – dam fails at the peak of the Probable Maximum Flood (PMF) flood event (unless a lower Inflow Design Flood (IDF) is defined and approved), as required by the ND Dam Safety Standards (Section 15.3.1).
    - We will run the dam breach model using the 2016 PMF hydrology (Apex, 2016) first. If this shows that the impact of the probable maximum precipitation (PMP) during dam breach is inconsequential, then we will not do any more effort to update the hydrology. If we find that this is not correct, we will have to develop a more thorough PMF hydrograph. In that case, we will use the 2016 HEC-HMS model (Apex, 2016), updating the PMP depth to reflect the more recent North Dakota statewide PMP study and regenerate the PMF hydrographs for the Queen City Dam.
- Intermediate Flow Breach – reflecting river flow conditions that cause incipient flooding downstream, which ultimately is expected to result in the largest potential for life loss.
    - The flow conditions that cause incipient flooding will be determined using the model, and used to define the high flow conditions that may require notifications and emergency actions.

Cascading failure of the Manns Dam will be considered during the model runs of the Queen City Dam breaching. If there is reasonable potential for failure of the Manns Dam, it will be allowed to fail in the model. Given the most recent inspections and assessments of Manns Dam, we expect that we will be triggering failure of this dam during the Queen City dam breach (cascade failure).

1.1.4.3 Inundation Mapping

Inundation maps will be developed for each of the modeled breach scenarios described above, providing a visual representation of critical elements. The maps will identify and label downstream hazards/structures within the inundation zone. Maps will be prepared showing maximum depth in the inundation zone and showing maximum flood severity (depth x velocity) in the inundation zone (for each scenario). The maps will callout and identify travel times of the flood wave at various meaningful locations (e.g., bridge crossings, critical infrastructure). The maps will highlight identified structures that are impacted by the inundation zone. All of this information is critically important for emergency planning and to facilitate effective decision-making.

Deliverables: include the following items which will be attachments to the EAP (deliverable of Task 2): a full report of the hydraulic model development and dam breach scenarios and inundation mapbooks addressing the asset inventory in PDF format. Final model files will also be delivered for the City's records.

1.1.5 EAP Development

For the Queen City Dam, the EAP format will follow the North Dakota (ND) Dam Safety Standards (Section 15.2) including the listed minimum requirements and may include additional information recommended by FEMA's guidance on preparing EAPs (FEMA 64, July 2013). Barr will prepare the EAPs collaboratively with the City and with other relevant stakeholders, and assume we will hold one virtual working meeting to outline and discuss information that will be needed for the development of the EAP.

The EAP will include attachments, which are the deliverables for the Dam Breach Analysis Task.

Barr will provide a review draft to the City. We will hold one virtual meeting to discuss any comments on the EAP. After addressing City comments, we will finalize a draft for review by the North Dakota Department of Water Resources (NDDWR).

Barr will then continue to work with the City through approval of the EAPs by the NDDWR. We assume the NDDWR will provide one round of comments on the EAP. After all comments from the NDDWR are addressed, Barr will finalize the EAP and deliver to the City for their records.

Deliverables: approved EAP by the NDDWR, including a concurrence sheet with signatures from key emergency response team members.

1.2 Risk Assessment

Barr proposes to complete an abbreviated Potential Failure Mode Analysis (PFMA) workshop as part of the risk assessment task. The objective of the PFMA is for a diverse team consisting of City staff (operations and engineers) and technical experts to review background information and meet to determine the most credible potential failure modes (PFM), their likelihood to occur, and their consequences. The PFMA will allow for the identification of key risks to the dam and City and allow for the development of potential mitigation measures. The mitigation measures will largely be focused on maintenance and monitoring activities to reduce risk vs. making structural changes to the dams.

Barr will obtain relevant data, complete a desktop review by our experts, and develop short summary presentations to explain the key findings to the larger stakeholder team attending the PFMA. We have allotted 2-hours for the presentations and up to 4-hours for the workshop (assumed virtual) identifying the PFMs and understanding their likelihood and consequences. We have assumed attendance by four of our experts (Jon Ausdemore, Brian Becker, Cory Anderson, and Kristin Alstadt).

We have included a site assessment by two of our engineers to better understand the current condition of the outlet structure, embankment, understand the integration with surrounding features, and better understand the operations of the dam for normal and flood conditions. Review of past inspection documents lists the dam in “poor” condition as defined by the National Inventory of Dams and also indicates concerns with the condition of the current outlet structure, concerns with trees and brush on the embankment, and inadequate hydraulic capacity. Both engineers will be mobilized out of our Bismarck office. This work will be completed prior to the risk meeting to allow results and observations to be included in the workshop.

Deliverables: include a presentation of the key findings from the background review, memorandum from the site review, table with the key risks including the PFMs and potential hazard mitigation, and a risk assessment report describing the results of the PFMA.

2 Schedule

We have assumed we will receive Notice to Proceed on this project by June 1, 2025. The anticipated schedule to complete the various Jobs and Tasks identified in Section 1.0 of this document are summarized in Table 1.

Table 1. Anticipated Schedule

Job	Milestone	Estimated Completion Date
Emergency Action Plan	Notice to proceed (assumed)	6/1/2025
	Kickoff meeting	6/8/2025
	Project updates and Monthly Meetings	1/9/2026
	Data Review	6/8/2025
	Survey	7/4/2025
	Hydraulic Model Development - Existing Conditions	8/22/2025
	Dam Breach Modeling	9/12/2025
	Inundation Mapping	9/26/2025
	Draft EAP	11/28/2025
	Meeting to review City Comments on EAP	12/12/2025
	Finalize EAP	12/26/2025
Risk Assessment/ PFMA Workshop	Background Review and Site Reconnaissance	9/5/2025
	PFMA Workshop (virtual)	10/17/2025
	Risk assessment report	11/7/2025

3 Budget

Barr will bill you on a time and expense basis to be invoiced monthly. The budget presented in Table 2 will not be exceeded without prior authorization by you.

Table 2. Estimated Budget

Job	Labor Hours	Sub-Contractor Total	Project Total
Emergency Action Plan			
Kickoff Meeting	7.0	$ -	$1,390
Biweekly progress reports	28.0	$ -	$5,445
Monthly meetings	30.0	$ -	$6,150
Review existing data	12.0	$ -	$2,430
Survey	4.0	$ 42,900	$43,580
Hydraulic Model Development	68.0	$ -	$10,920
Dam Breach Modeling	68.0	$ -	$11,620
Inundation Mapping	84.0	$ -	$12,665
Dam Breach Report	52.0	$ -	$10,580
Meeting (Virtual) - EAP Working meeting	12.0	$ -	$2,270
Draft EAP	90.0	$ -	$13,240
Meeting (Virtual) Draft EAP Comments	10.0	$ -	$2,020
Final EAP	24.0	$ -	$3,710
	497.0	**$ 42,900**	**$126,020**
Risk Assessment			
Review Material	22.0	$ -	$4,770
Develop Presentations/ Meeting Preparation	36.0	$ -	$7,650
Attend Workshop	24.0	$ -	$5,310
Deliverables	66.0	$ -	$13,660
Site Reconnaissance	23.0	$ -	$4,840
	171.0	**$ -**	**$36,230**
Project Totals (Fees)	**$119,200**	**$ 42,900**	**$162,250**
Project Totals (Hours)	**668.0**		

Attachment: Queen City Dam EAP Survey Quote from Civil Science

CivilScience
Engineers | Surveyors | Solutions
531 West Villard Street, Suite 1
Dickinson, ND 58601

2/14/2025

Jennifer Koehler, PE
Barr
via email

RE: Surveying Services – Heart River from Queen City Dam reservoir east to downstream of the city water treatment plant – Stark County - Dickinson, ND

Civil Science is pleased to provide this proposal in response to your request regarding the above-mentioned project. We are committed to delivering surveying services to the highest quality standards in a timely manner. We staff local engineers and surveyors in Dickinson, ND and have had a positive relationship with Barr on previous project work.

Based on the information you provided in your email on February 12, 2025, we understand this project involves surveying the Heart River from Queen City Dam reservoir east to downstream of the city water treatment plant including bathymetric survey of the reservoir, river cross sections including bathymetric survey to top of bank, major bridges, culverts and inline structures. To accomplish the noted scope, we have budgeted a two-man crew during all fieldwork for safety. We estimate three weeks of field work and a day of office time to process the data and provide deliverables.

We understand the approximate timing of the survey fieldwork will be summer 2025. We ask for two weeks' notice for scheduling purposes.

Our price for this work will be completed on a time and materials basis not to exceed $38,840.00.

Should you have any questions, please contact me at (701) 219-4511 or at jeasum@civilscience.com.

Sincerely,

Jeremy Easum, PE & PLS
Project Manager

February 12, 2025

Survey Request – For Civil Science

Barr will be developing a hydraulic model of the Heart River from the Queen City Dam reservoir east to downstream of the city water treatment plant to evaluate dam break scenarios. Barr will need survey of the river bottom, and important features along the river, to complete the model. The following is a list of survey data needed, along with details of the data purpose and need. Attached Figures 1 through 10 support the request as well as KMZ files of the features to be surveyed. You will see that there are areas noted on the figures where we are leveraging past survey data from two different projects (1) NDDOT scour project (NDDOT gave permission, Civil Science collected survey) and (2) City of Dickinson East Broadway Dam Project (Barr did design/modeling and leveraging that information and survey from that project)

All survey data should be in NAD 1983 State Plane North Dakota South, FIPS 3302, feet. Vertical units should be feet, and the datum should be NAVD88. Please provide photos of structures where possible.

1 Cross sections

There are 52 cross sections of the Heart River identified. In Figures 1 through 7, the x and y coordinates of the middle of the cross section line are provided to help locate them. We understand that wading across the Heart River to take cross section points may not be possible. We are open to other proposed means (e.g., small sonar boat, or other) to collect the data, sufficient to develop a bathymetry surface of the river.

Exact location is not critical. We understand that some may be difficult to access due to tree coverage, slopes, or land ownership. Please collect survey data as close to the requested location as possible. If you need to move beyond 150 feet upstream or downstream for a given cross section, please let us know so we can check the new proposed location.

At each cross section, at a minimum, please collect the following (minimum 10- survey shots per cross section, up to 20 shots):

- Thalweg (lowest channel point)
- Toe of each bank
- Top of each bank
- Mid-way up the bank slope on each side
- One point outside of the bank on each side (10 to 30 feet from the top of the bank) to help tie into LiDAR data.
- Any points in the channel that may not interpolate well between points (e.g., sand bars)

Please provide a text file or comma-delimited file of X,Y,Z coordinates and elevation in feet.

2 Bathymetry

We will need bathymetry data of the entire Queen City Dam reservoir. The surface area is approximately 18 acres. Please survey the bottom of the reservoir using cross sections across the reservoir spaced approximately 75 feet (+/- 25 feet) in both a direction parallel to the dam (northwest to southeast), and

perpendicular to the dam (southwest to northeast). We anticipate approximately 16 sections parallel to the dam, and 13 sections perpendicular to the dam.

We understand that surveying along the shore may not be possible where depths are shallow. Please survey in areas that are 2 feet deep or greater, getting as close to the shore as practicable. Capture water surface elevation on date of survey.

Please provide a text file or comma-delimited file of X,Y,Z coordinates and elevation in feet, with points filtered to be no closer to each other than 3 feet in a horizontal direction.

3 Bridges

We will need 3 bridges surveyed to represent them in the model. The bridges are:

- State Avenue
- 6th Ave SE
- 10th Ave SE

Please ensure to survey and/or measure the following information:

- Top of bridge deck (centerline if possible).
- Bridge deck thickness (so that we can estimate the bottom of the bridge deck).
- Bridge deck width.
- Railing height and extent.
- Locations of piers, if applicable, by surveying upstream and downstream points.
- Pier thickness and type.
- Abutment slopes and locations where the abutments tie into the bridge deck or water line.

Please see the attached data collection sheet on bridges and other hydraulic structures. Please fill out the sheet for each of the three bridges in the survey request. Take photos of these structures.

Please provide a text file or comma-delimited file of surveyed X,Y,Z coordinates and elevation in feet.

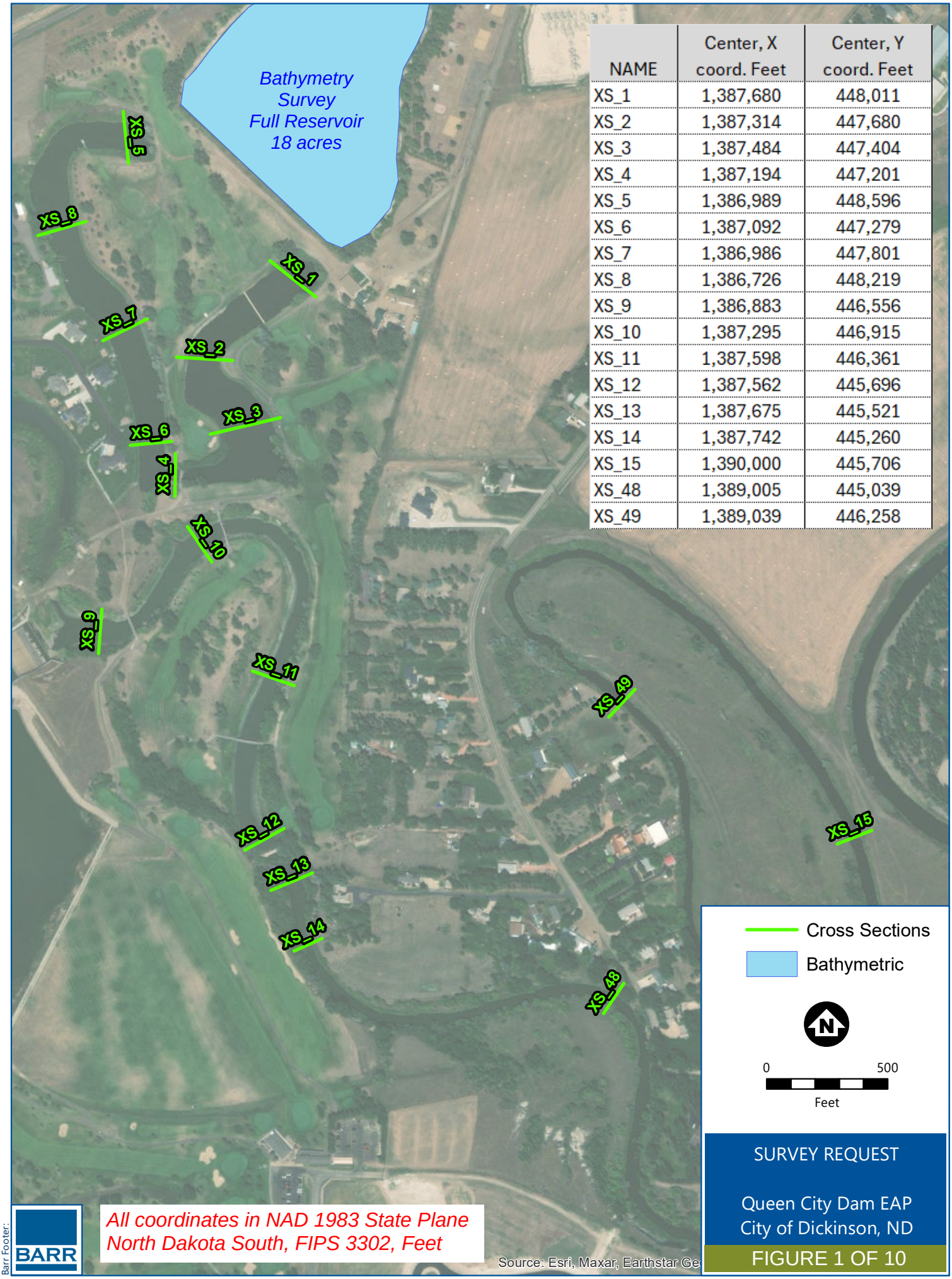
4 In-River Structures and Culverts

There are six locations along the river where there are structures in the river, or high points in the river, or driving lanes that cross through the river. The important aspect of these structures is surveying the centerline of the crest. Plan for a minimum of 3 - 5 survey shots for each inline structure. Take photos of these structures.

- INL_1 is an earth berm feature
- INL_2 is Manns Dam. ***We expect that this dam is too deteriorated to collect survey data along the crest safely; do not attempt if it appears unsafe in any way.*** If unsafe, please simply survey a point on at least one end of the dam crest, or both ends if possible. We will use that information to interpolate in between.
- INL_3 through INL_6 are high spots in the river or driving lanes that cross the river.

- CV_1 is a suspected culvert (or culverts) that goes under INL_1. Please use the attached hydraulic structures form to document the necessary data of the culvert (upstream and downstream end points, inverts, material, size/diameter, etc.).

Please provide a text file or comma-delimited file of surveyed X,Y,Z coordinates and elevation in feet.



NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_1	1,387,680	448,011
XS_2	1,387,314	447,680
XS_3	1,387,484	447,404
XS_4	1,387,194	447,201
XS_5	1,386,989	448,596
XS_6	1,387,092	447,279
XS_7	1,386,986	447,801
XS_8	1,386,726	448,219
XS_9	1,386,883	446,556
XS_10	1,387,295	446,915
XS_11	1,387,598	446,361
XS_12	1,387,562	445,696
XS_13	1,387,675	445,521
XS_14	1,387,742	445,260
XS_15	1,390,000	445,706
XS_48	1,389,005	445,039
XS_49	1,389,039	446,258

All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet

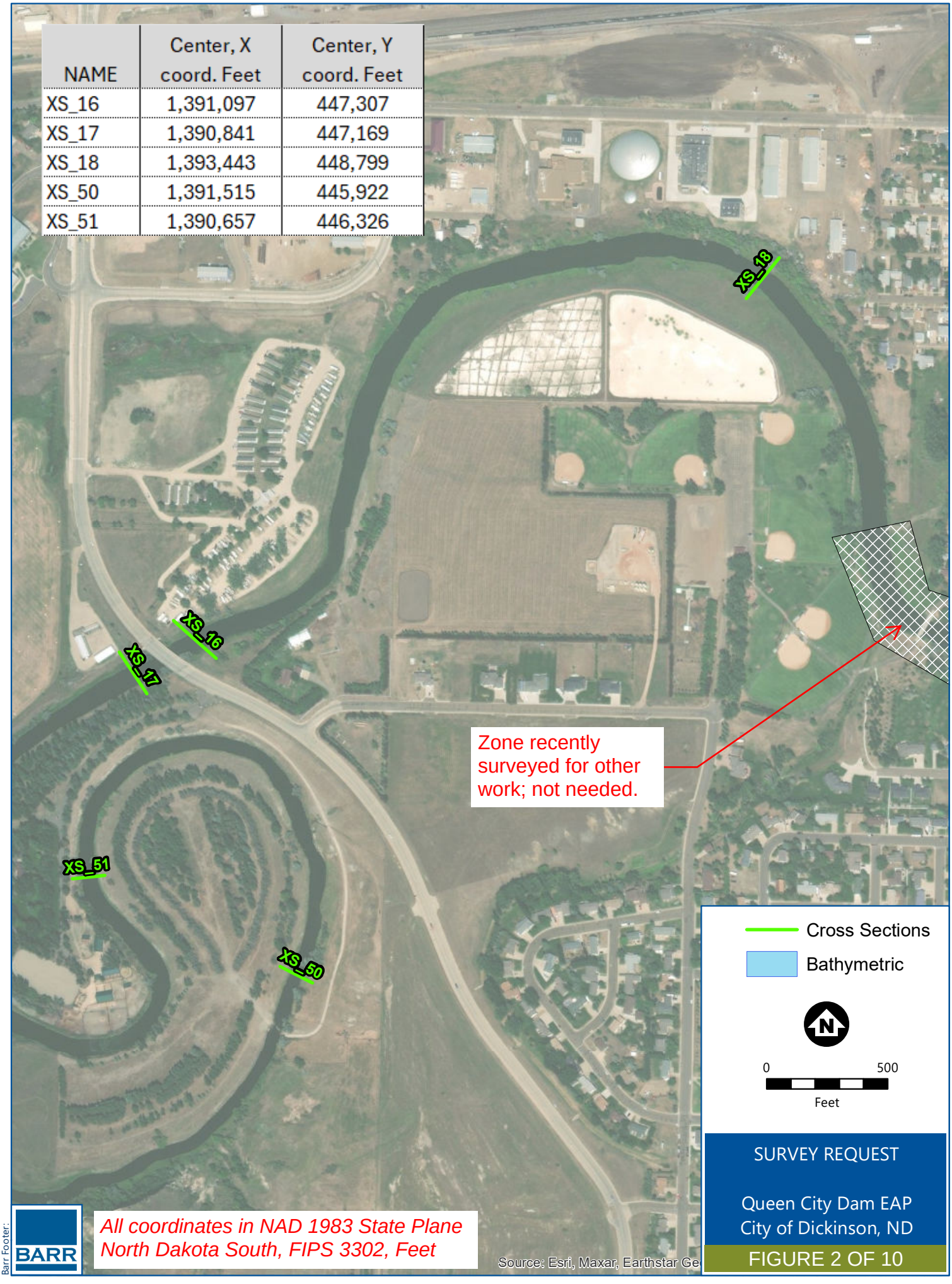
Source: Esri, Maxar, Earthstar Ge

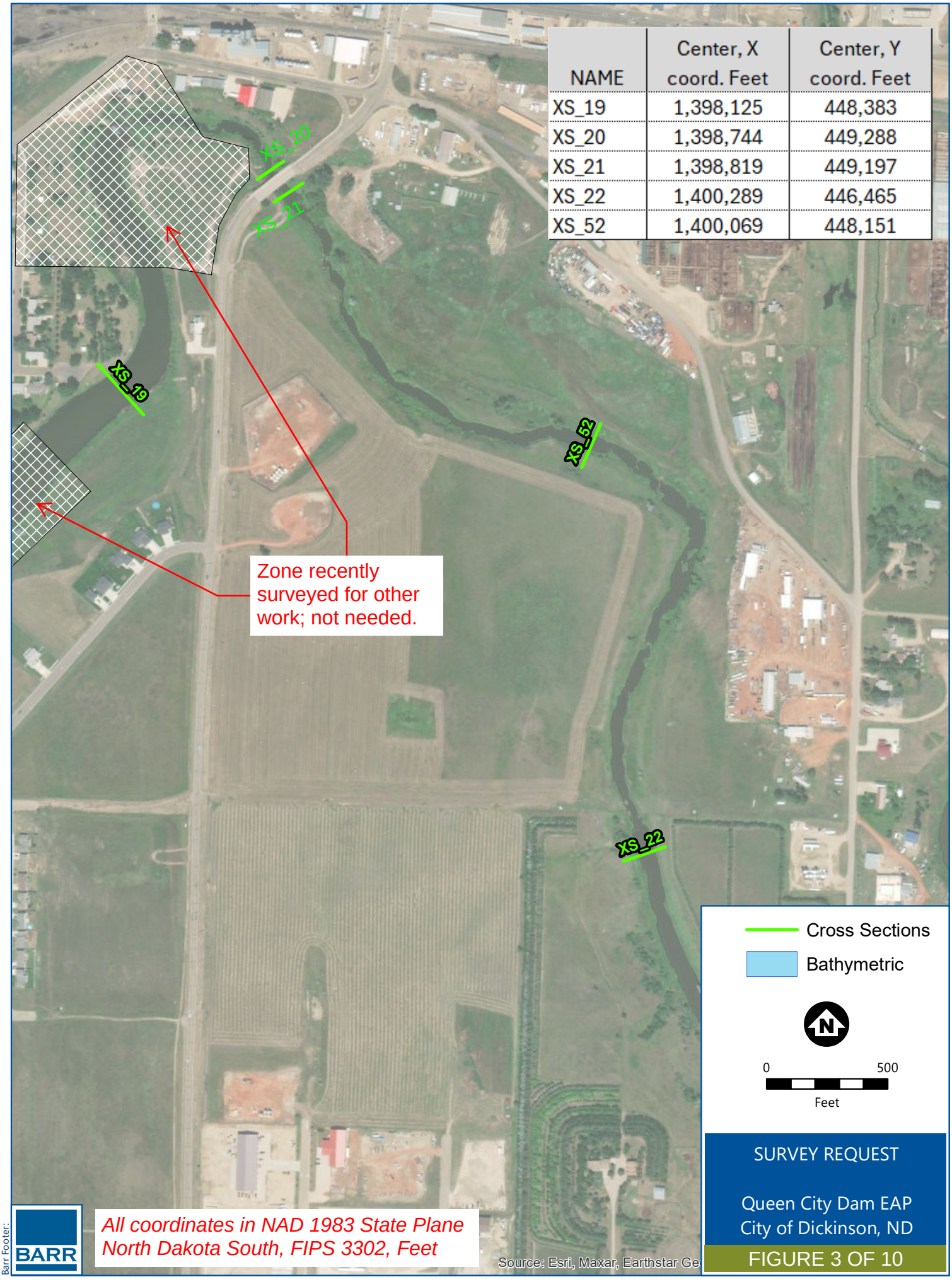
SURVEY REQUEST

Queen City Dam EAP
City of Dickinson, ND

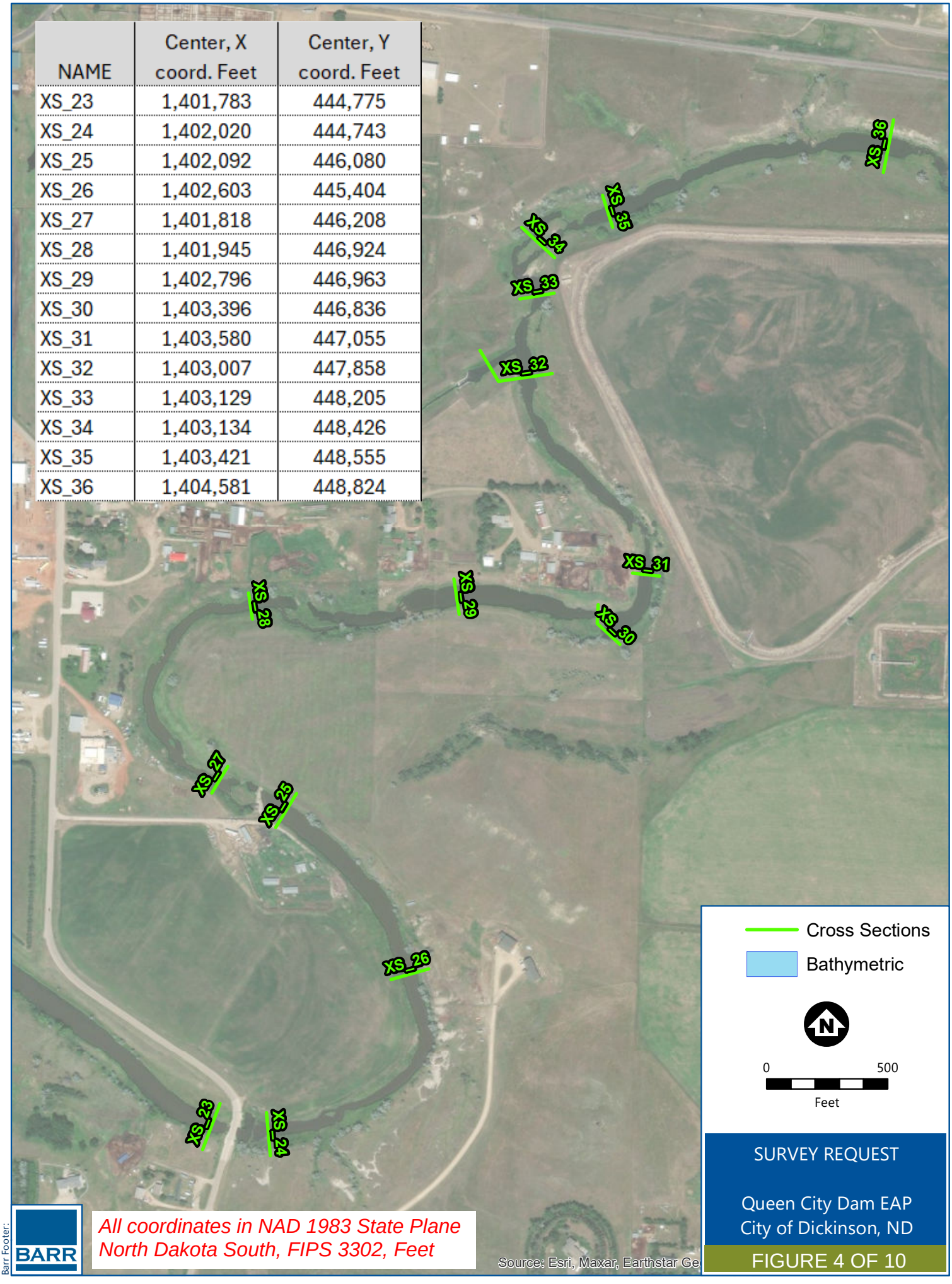
FIGURE 1 OF 10

Barr Footer:


NAME | Center, X coord. Feet | Center, Y coord. Feet
XS_16 | 1,391,097 | 447,307
XS_17 | 1,390,841 | 447,169
XS_18 | 1,393,443 | 448,799
XS_50 | 1,391,515 | 445,922
XS_51 | 1,390,657 | 446,326
XS_18
XS_16
XS_17
XS_51
XS_50
Zone recently surveyed for other work; not needed.
Cross Sections
Bathymetric
N
0
500
Feet
SURVEY REQUEST
Queen City Dam EAP
City of Dickinson, ND
FIGURE 2 OF 10
All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet
Source: Esri, Maxar, Earthstar Ge
BARR
Barr Footer:



NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_19	1,398,125	448,383
XS_20	1,398,744	449,288
XS_21	1,398,819	449,197
XS_22	1,400,289	446,465
XS_52	1,400,069	448,151



NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_23	1,401,783	444,775
XS_24	1,402,020	444,743
XS_25	1,402,092	446,080
XS_26	1,402,603	445,404
XS_27	1,401,818	446,208
XS_28	1,401,945	446,924
XS_29	1,402,796	446,963
XS_30	1,403,396	446,836
XS_31	1,403,580	447,055
XS_32	1,403,007	447,858
XS_33	1,403,129	448,205
XS_34	1,403,134	448,426
XS_35	1,403,421	448,555
XS_36	1,404,581	448,824

NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_37	1,406,458	447,394
XS_38	1,406,311	445,601
XS_39	1,408,505	444,992
XS_40	1,409,532	445,988

All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet

Source: Esri, Maxar, Earthstar Ge

Cross Sections

Bathymetric

N

0 500

Feet

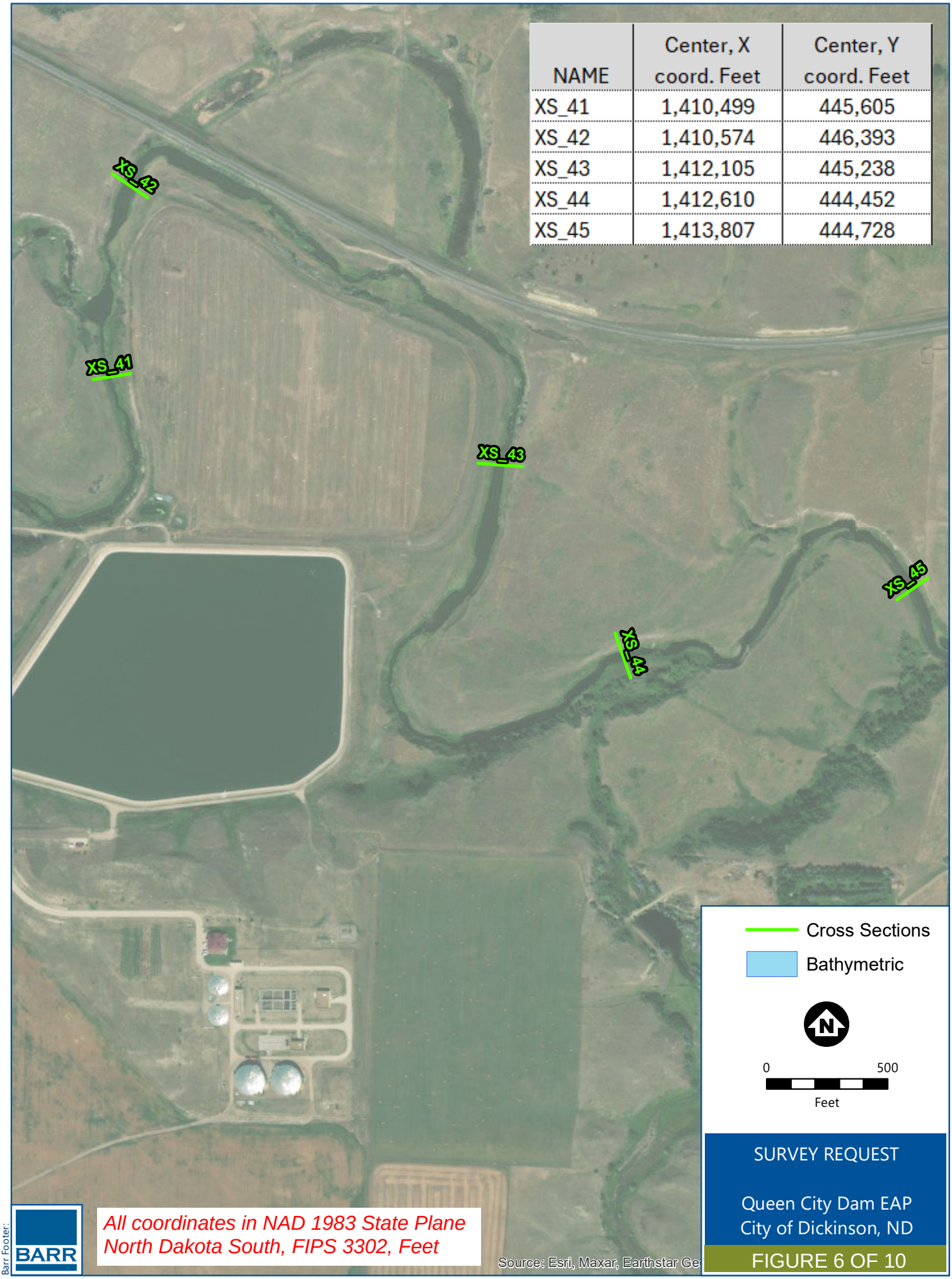
SURVEY REQUEST

Queen City Dam EAP
City of Dickinson, ND

FIGURE 5 OF 10

Barr Footer:

BARR



NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_41	1,410,499	445,605
XS_42	1,410,574	446,393
XS_43	1,412,105	445,238
XS_44	1,412,610	444,452
XS_45	1,413,807	444,728

NAME	Center, X coord. Feet	Center, Y coord. Feet
XS_46	1,415,295	444,613
XS_47	1,416,420	446,129

All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet

Source: Esri, Maxar, Earthstar Ge

SURVEY REQUEST

Queen City Dam EAP
City of Dickinson, ND

FIGURE 7 OF 10

Barr Footer:

Culvert Centroid

NAME	Center, X coord. Feet	Center, Y coord. Feet
CV_1	1,387,136	447,056

In-River Structures

NAME	Center, X coord. Feet	Center, Y coord. Feet
INL_1	1,387,280	447,086
INL_2	1,387,588	445,645

All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet

Source: Esri, Maxar, Earthstar Ge

SURVEY REQUEST

Queen City Dam EAP
City of Dickinson, ND

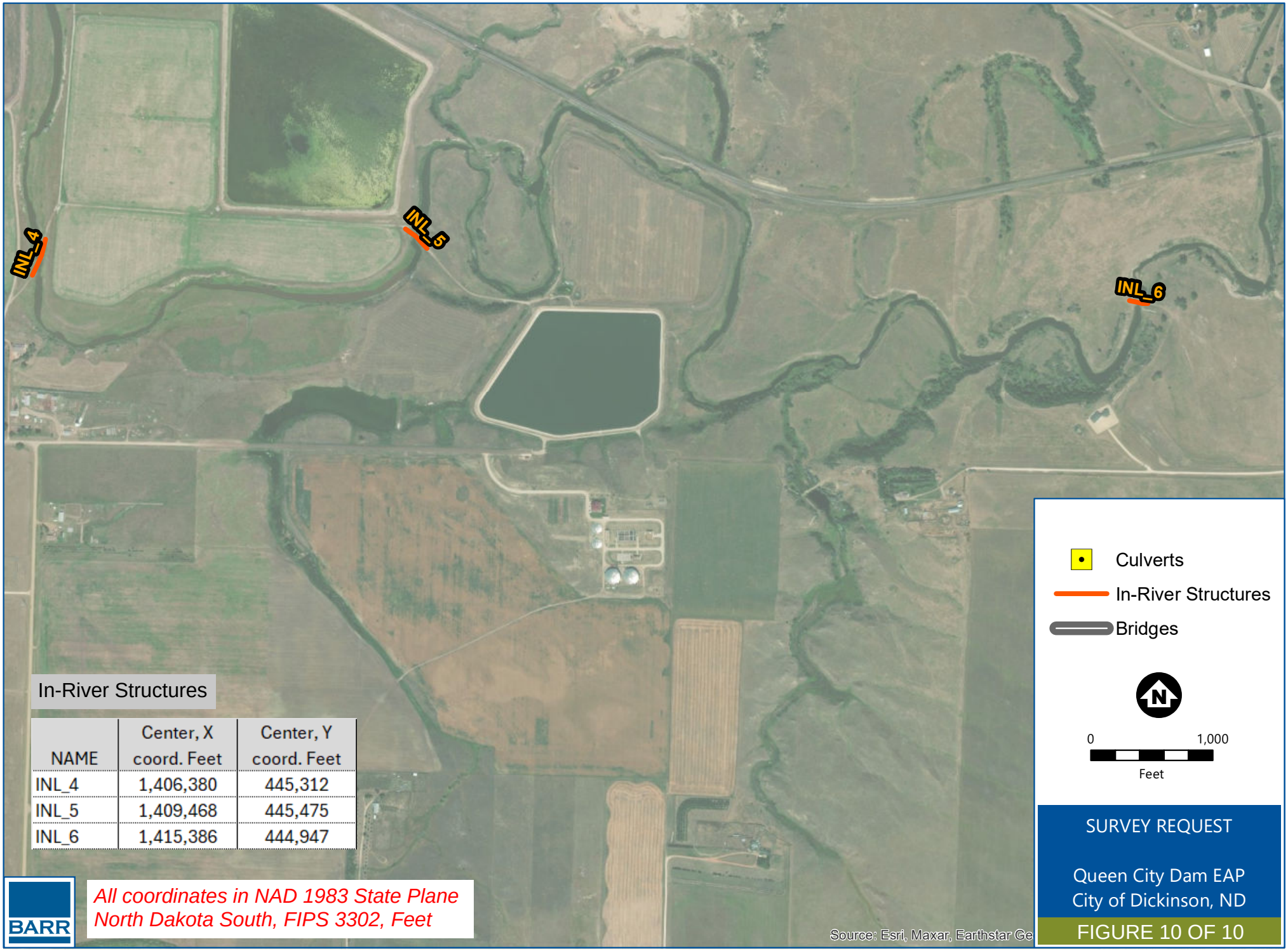
FIGURE 8 OF 10

Barr Footer:


In-River Structures
NAME | Center, X coord. Feet | Center, Y coord. Feet
INL_3 | 1,401,985 | 446,123
6th Ave SE
Zone recently surveyed for other work; not needed.
INL_3
10th Ave SE
Culverts
In-River Structures
Bridges
N
0
1,000
Feet
SURVEY REQUEST
Queen City Dam EAP
City of Dickinson, ND
FIGURE 9 OF 10
All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet
Source: Esri, Maxar, Earthstar Ge

Barr Footer:

Barr Footer:



In-River Structures

NAME	Center, X coord. Feet	Center, Y coord. Feet
INL_4	1,406,380	445,312
INL_5	1,409,468	445,475
INL_6	1,415,386	444,947

All coordinates in NAD 1983 State Plane North Dakota South, FIPS 3302, Feet

BARR

SURVEY REQUEST

Queen City Dam EAP
City of Dickinson, ND

FIGURE 10 OF 10

LIMITED DETAIL STUDY
HYDRAULIC STRUCTURE DATA WORKSHEET

Date		**Stream Name**	
Time		**Road Name**	
Taken By		**Structure Number**	
County		**GPS Point Number**	
Type of Structure	Bridge Culvert Weir Dam Other		
Hydraulic Width (ft)	(Length from US side to DS side of structure)		
Approximate Skew	(Angle btwn structure CL & road CL. 0-90°. 90° = ⊥)		
Railing Height (ft)	(Height of railing on bridge or culvert)		
Deck Thickness (ft)	(Distance from top of road to top of culvert or low chord of bridge)		

Culverts: (See back of sheet for descriptions, diagrams, and sketch space if required)

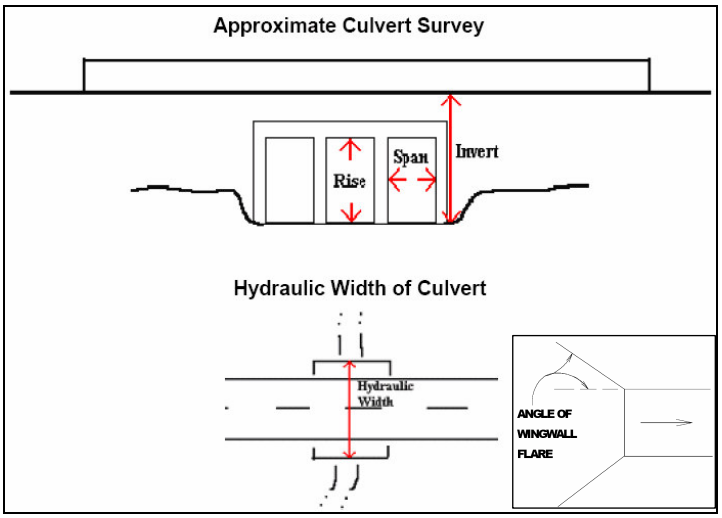
	Barrel #1	**Barrel #2**	**Barrel #3**	**Barrel #4**	**Barrel #5**
Barrel Type					
Inlet Type					
Rise or Diameter (ft)					
Span (ft)					
Invert Elevation (ft) Upstream/Downstream	/	/	/	/	/
% Blocked					

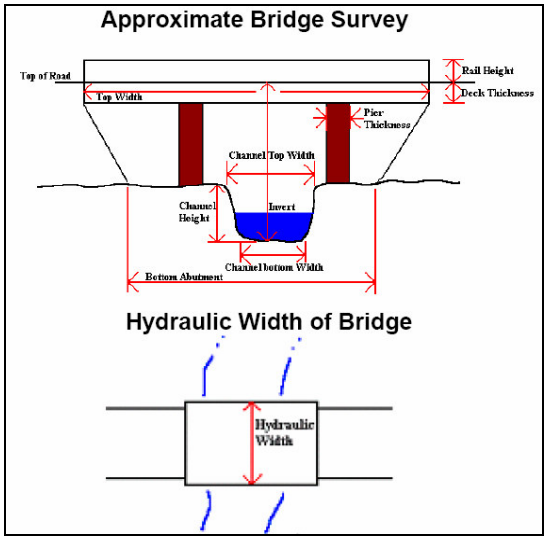
Bridges: (See back of sheet for descriptions, diagrams, and sketch space if required)

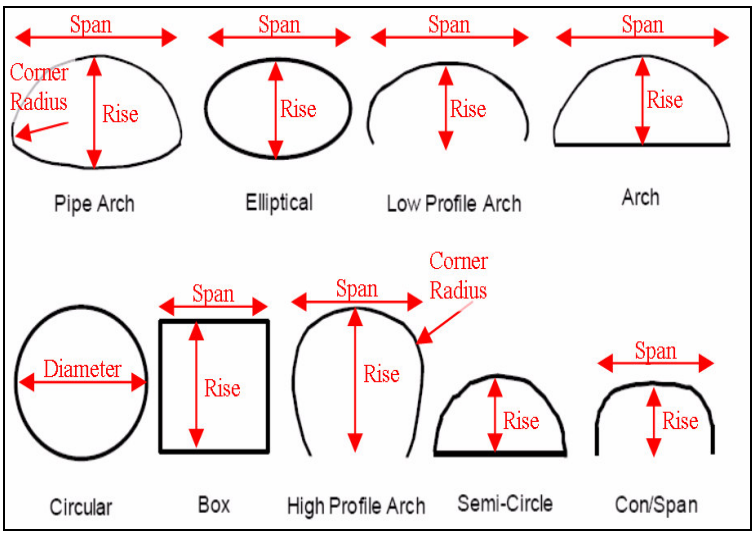
Rail Height (ft)		**Top Width (ft)**	
Deck Thickness (ft)		**Bottom Abutment Width (ft)**	
Number and Type of Piers		**Channel Top Width (ft)**	
Pier Thickness (ft)		**Channel Bottom Width (ft)**	
Invert (ft) (Dist from road to invert)		**Channel Height (ft)**	

Photograph Log

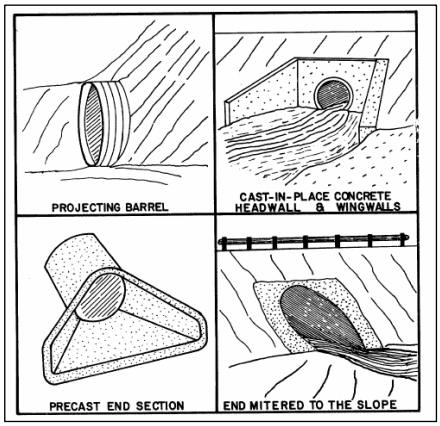
Picture Number	**Description**
	Upstream of structure looking downstream at structure; upstream face (required) rdname_USF.jpg
	From structure looking upstream at channel (required) rdname_USC.jpg
	From structure looking downstream at channel (required) rdname_DSC.jpg
	Downstream of structure looking upstream at structure; downstream face (required) rdname_DSF.jpg







Inlet Types



Pier Shapes

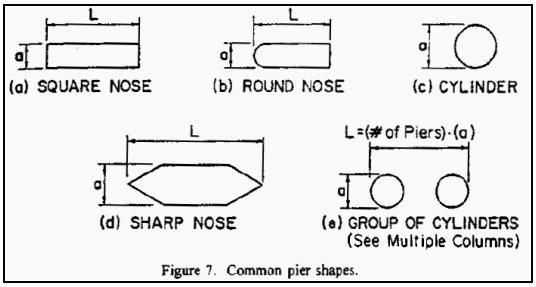


Figure 7. Common pier shapes.

Sketch Area