



# LOUP POWER DISTRICT

"SERVING YOU ELECTRICALLY"

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*Via Electronic Filing*

August 26, 2010

Honorable Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 20426

Subject: Loup River Hydroelectric Project  
FERC Project No. 1256  
Initial Study Report

Dear Secretary Bose:

Loup River Public Power District (Loup Power District or District) herein electronically files its Initial Study Report (ISR) for relicensing the Loup River Hydroelectric Project, FERC Project No. 1256 (Project). The District is the owner, operator, and original licensee of the Project. The existing license was effective on December 1, 1982, for a term ending April 15, 2014. Loup Power District is utilizing the Integrated Licensing Process (ILP) for this relicensing effort. Therefore, pursuant to 18 CFR §5.15, the District is filing its ISR.

Electronic copies of the ISR are available on the District's relicensing website: [www.loup.com/relicense](http://www.loup.com/relicense), as well as on the Commission's eLibrary. Notice of the availability of this document is being provided to all relicensing participants, including federal and state resource agencies, local governments, and Native American tribes. A distribution list of those parties is attached. Additionally, copies of the ISR will be available at the District's office in Columbus, Nebraska.

In accordance with 18 CFR §5.15, the District will present the Initial Study Results to FERC and other relicensing participants during the Initial Study Results Meeting to be held on September 9, 2010, at the New World Inn (265 33rd Street) in Columbus. Following the meeting, the District will prepare the Study Results Meeting Summary and file the summary with FERC on September 24, 2010.

If you have any questions regarding the ISR or any information provided by the District, please contact me at (402) 564-3171 ext. 268.

Respectfully submitted,

Neal D. Suess  
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Attachments: Distribution List  
Initial Study Report

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# LOUP RIVER HYDROELECTRIC PROJECT FERC PROJECT No. 1256

## INITIAL STUDY REPORT



AUGUST 26, 2010





# Loup Power District Hydro Project

**Loup River Hydroelectric Project  
FERC Project No. 1256**

## **Initial Study Report**

**August 26, 2010**

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**Prepared by:**

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**With assistance by:**

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## INTRODUCTION

Loup River Public Power District (Loup Power District or the District) has prepared this Initial Study Report (ISR) for filing with the Federal Energy Regulatory Commission (FERC) as part of relicensing the Loup River Hydroelectric Project (FERC Project No. 1256) and in accordance with the regulations of FERC's Integrated Licensing Process (ILP) (18 Code of Federal Regulations [CFR] 5). As described in the District's Process Plan and Schedule, which was included in the District's Pre-Application Document (PAD) and approved by FERC, this ISR is being filed electronically with FERC and appropriate agencies and stakeholders. In addition, agencies and stakeholders known to have an interest in the proceeding have been notified via email of the availability of the ISR on the District's relicensing website at <http://www.loup.com/relicense>.

### A. PROJECT BACKGROUND

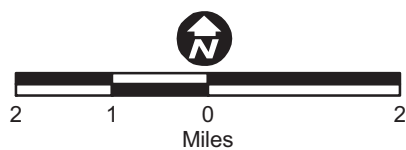
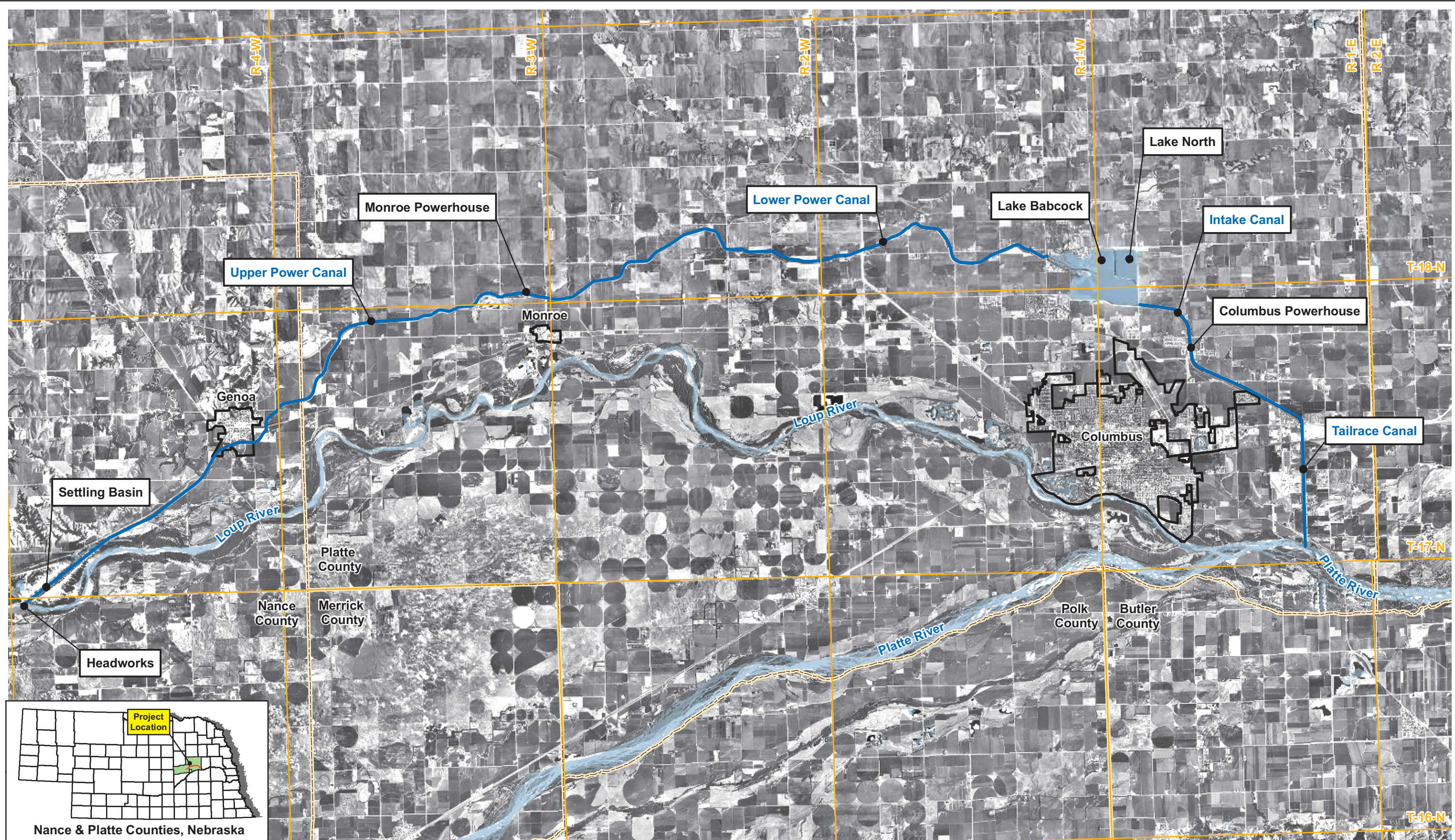
The Loup River Hydroelectric Project (Project) is located in Nance and Platte counties, Nebraska, where water is diverted from the Loup River and routed through the 35-mile-long Loup Power Canal, which empties into the Platte River near Columbus. The Project includes various hydraulic structures, two powerhouses, and two regulating reservoirs, as shown in Figure 1. The current license for the Project expires on April 15, 2014. Therefore, the District is seeking a new license to continue to operate the Project.

### B. PROCESS TO DATE

The District has achieved several major milestones in association with Project relicensing. In addition to these milestones, listed below, the District has solicited extensive public and agency input throughout the relicensing process:

- Notice of Intent and Pre-Application Document – The District initiated Project relicensing when the Notice of Intent (NOI) and PAD were filed with FERC on October 16, 2008. Collectively, the NOI and PAD stated the District's intentions to renew its existing operating license and provided known information relative to Project history, operations, maintenance, and facilities, as well as existing natural and human environments within the Project Boundary. Lastly, the PAD introduced initial issues, concerns, and questions potentially related to operation of the Project that were identified during agency and workgroup meetings and identified potential studies to address these issues.

Z:\Projects\Loup\_Power\_District\37104\_LPD\_FERC\_Relicensing\map\_docs\mxd\Project\_Location\_Study\_Plan\_Fig\_1.mxd\july09\jcm



Aerial Imagery: 2006 National Agricultural Inventory Project, Nance and Platte Counties Mosaic.  
Streams/Lakes: 2000 Tiger Line Files, Platte and Nance Counties.

**Legend**

- Loup Power Canal
- Corporate Limits
- Township/Range
- County Line



**Project Location**

Loup River Hydroelectric Project  
FERC Project No. 1256  
Initial Study Report

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DATE	August 2010
FIGURE	1

- Scoping Document 1 – FERC issued Scoping Document 1 (SD1) on December 12, 2008. The purpose of SD1 was to provide information on the Project and to solicit comments and suggestions on the preliminary list of issues and alternatives to be addressed in FERC’s Environmental Assessment (EA).
- Proposed Study Plan – The District’s Proposed Study Plan (PSP) was prepared in accordance with 18 CFR 5.11 and was filed on March 27, 2009. The PSP detailed 12 studies proposed by the District and agencies. Additionally, the document discussed the District’s position on why additional studies are not warranted.
- Scoping Document 2 – Also on March 27, 2009, FERC issued Scoping Document 2 (SD2) based on the verbal comments received at the scoping meetings and written comments received throughout the scoping process. The purpose of SD2 was to clarify issues identified in SD1 based on information received during the scoping process, to advise all participants about additional issues identified for inclusion in the proposed scope of the EA, and to seek additional information pertinent to these analyses.
- Revised Study Plan – The District’s Revised Study Plan (RSP) was prepared in accordance with 18 CFR 5.13 and was filed on July 27, 2009. The RSP addressed all comments received on the PSP and included updated plans for the 12 studies included in the PSP (these studies are listed in Section D, below). Three studies from the PSP were eliminated in the RSP based on discussions at the study plan meetings, conducted in accordance with 18 CFR 5.11(e): Water Temperature in the Platte River, Fish Sampling, and Creel Survey.
- Study Plan Determination – FERC issued its Study Plan Determination on August 26, 2009, in accordance with 18 CFR 5.13(c). In its Study Plan Determination, FERC: 1) approved three studies as defined in the RSP without modification (Fish Passage, Land Use Inventory, and Section 106 Compliance); 2) approved six studies as defined in the RSP with modification (Sedimentation, Hydrocycling, Water Temperature in the Loup River Bypass Reach, Flow Depletion and Flow Diversion, Recreation Use, and Ice Jam Flooding on the Loup River); and 3) removed three studies consistent with recommendations made in the RSP (Water Temperature in the Platte River, Fish Sampling, and Creel Survey [combined with Recreation Use]).

The modifications recommended by FERC in its Study Plan Determination, which were specific to the six studies listed in the preceding bullet, were adopted by the District and incorporated into the data collection and analysis that has occurred since issuance of the Study Plan Determination. Additionally, the District submitted

Quarterly Progress Reports, which documented study progress in accordance with 18 CFR 5.15(b), on December 1, 2009, February 24, 2010, and May 24, 2010.

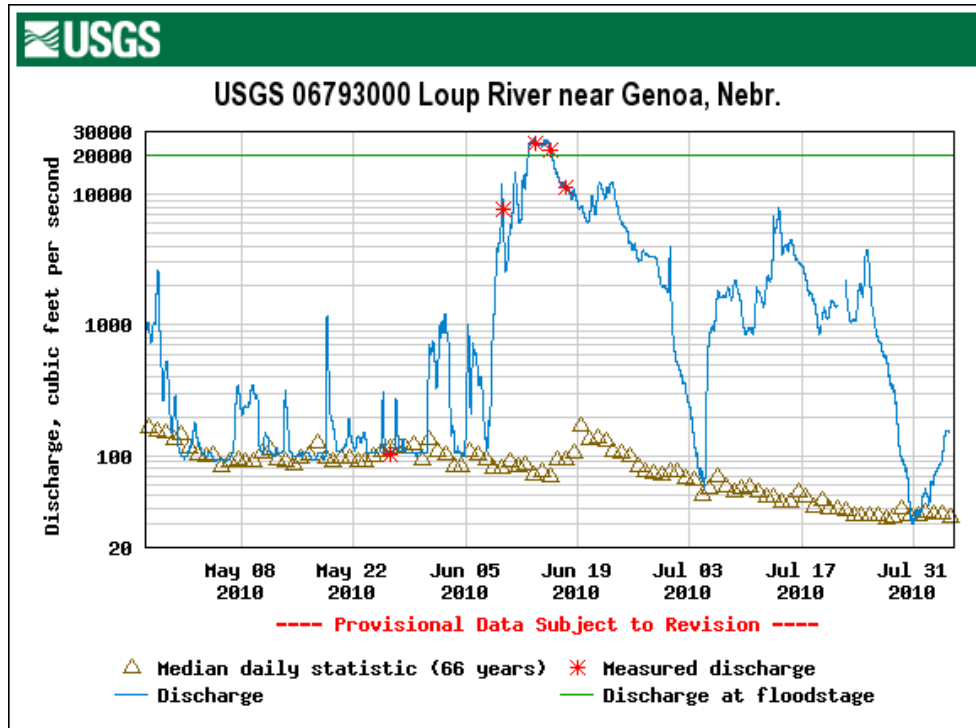
### C. 2010 PRECIPITATION AND RESULTING FLOW CONDITIONS

During the spring of 2010, the majority of Nebraska's 93 counties, including areas within the Loup and Platte River basins, were subjected to heavy precipitation and flooding; these counties, including Nance and Platte counties, have been declared disaster areas by the governor and are expected to apply for federal disaster assistance. In Columbus, the total precipitation for June alone was 12.29 inches. This equates to the second wettest June on record (1893-2010) and the wettest June since 1967, when 12.49 inches were documented (High Plains Regional Climate Center, June 30, 2010). As recorded by the U.S. Geological Survey (USGS) and depicted in Figures 2 and 3, the heavy 2010 precipitation resulted in Loup and Platte river discharges well above mean values for the months of May through July.

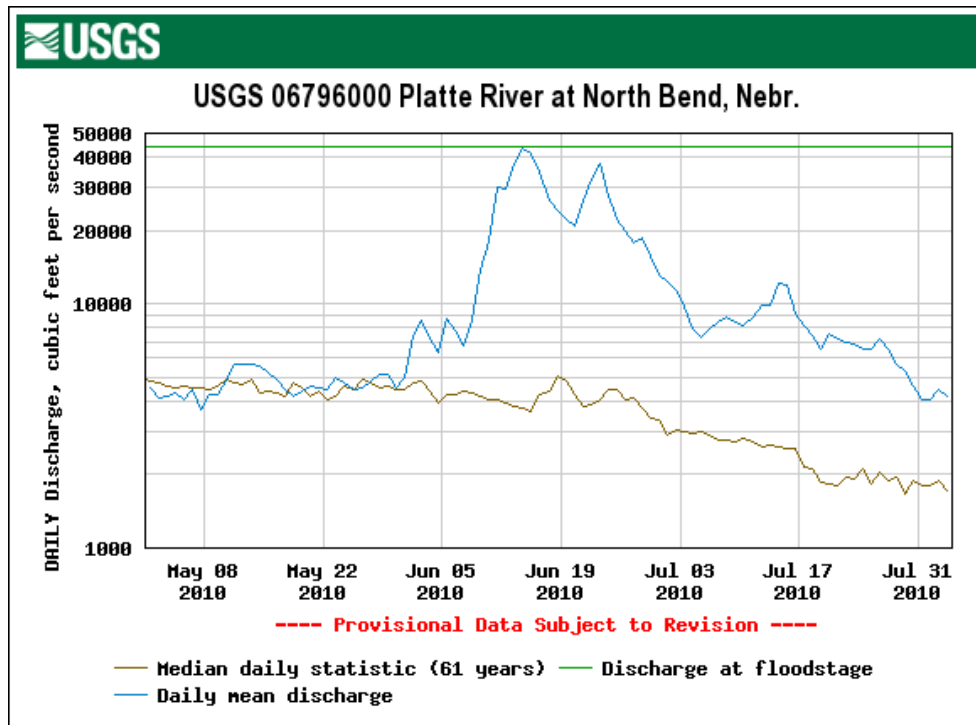
Although the Project area was not subjected to the widespread flooding that occurred throughout much of the state, associated high flows combined with high winds in May resulted in difficult topographic and hydraulic survey conditions along the Loup and Platte rivers, as required by multiple studies being conducted during the relicensing process. Specific ramifications on the topographic and hydraulic surveys and associated studies are as follows:

- Sedimentation Study – Cross section information from three ungaged sites along the Loup and Lower Platte rivers was not obtained in time to complete the necessary hydraulic analysis prior to submittal of this Initial Study Report (see Section 1 and Appendix A).
- Hydrocycling and Flow Depletion and Flow Diversion Studies – Cross section information from three Lower Platte River study sites, which is necessary to facilitate a HEC-RAS 1D steady state back-water model, was unobtainable during the first week of May (as specified in FERC's Study Plan Determination) due to widespread sandbar inundation and high winds (see Sections 2 and 5).

Due to continued high flows and the observation of nesting interior least terns within the study reach, the cross section information that was to be collected during the first week in August for the Hydrocycling and Flow Depletion and Flow Diversion studies was also delayed (see Sections 2 and 5). In addition, high flows have delayed the collection of water temperature data that was to occur in August for the Water Temperature in the Loup River Bypass Reach study (see Section 4). Water temperature data for this study will be collected when near normal flows return in the Loup and Lower Platte rivers.



**Figure 2. Discharge recorded by USGS Gage 06793000, Loup River near Genoa, NE, during May, June, and July 2010**



**Figure 3. Discharge recorded by USGS Gage 06796000, Platte River at North Bend, NE, during May, June, and July 2010**

## D. STATUS OF STUDIES

The status of each FERC-approved study plan is summarized below. More detailed discussions of the studies are provided in subsequent sections of this Initial Study Report and in the appendices, where study reports are provided for those studies for which data collection and analysis are substantially complete.

- Study 1.0, Sedimentation – The sedimentation study is substantially complete with the exception of the analysis of the ungaged study sites, as discussed in Section C, above. The results of the ungaged study site analysis will be presented in the updated Initial Study Report on January 6, 2011. A summary of the goals and objectives, study area, methods, and results to date is provided in Section 1 and the completed Study Report is included as Appendix A.
- Study 2.0, Hydrocycling – Data collection and analysis for the hydrocycling study are ongoing. A summary of the goals and objectives, study area, methods, and progress to date is provided in Section 2. The study report will be provided to FERC in the updated Initial Study Report on January 6, 2011.
- Study 3.0, Water Temperature in the Platte River – The water temperature in the Platte River study was determined unnecessary for relicensing purposes in FERC’s Study Plan Determination.
- Study 4.0, Water Temperature in the Loup River Bypass Reach – Data collection and analysis for the water temperature in the Loup River bypass reach are ongoing. A summary of the goals and objectives, study area, methods, and progress to date is provided in Section 4. The study report will be provided to FERC in the updated Initial Study Report on January 6, 2011.
- Study 5.0, Flow Depletion and Flow Diversion – Data collection and analysis for the flow depletion and flow diversion study are ongoing. A summary of the goals and objectives, study area, methods, and progress to date is provided in Section 5. The study report will be provided to FERC in the updated Initial Study Report on January 6, 2011.
- Study 6.0, Fish Sampling – The fish sampling study was determined unnecessary for relicensing purposes in FERC’s Study Plan Determination.
- Study 7.0, Fish Passage – The fish passage study is complete. A summary of the goals and objectives, study area, methods, and results is provided in Section 7. The completed study report is included as Appendix E.
- Study 8.0, Recreation Use – Data collection and analysis for the recreation use study are ongoing. A summary of the goals and objectives, study area, methods, and progress to date is provided in Section 8. Additionally, an



executive summary report of the results of a telephone survey conducted for this study is included as Appendix F. The study report will be provided to FERC in the updated Initial Study Report on January 6, 2011, and the resulting Recreation Management Plan will be included with the District's license application.

- Study 9.0, Creel Survey – The creel survey was combined with Study 8.0, Recreation Use (see above), consistent with the RSP, agency input, and FERC's Study Plan Determination.
- Study 10.0, Land Use Inventory – The land use inventory is complete. A summary of the goals and objectives, study area, methods, and results is provided in Section 10. The completed study report is included as Appendix G.
- Study 11.0, Section 106 Compliance – The following components of the Section 106 compliance study are complete and have been submitted to the Nebraska State Historic Preservation Office (Nebraska SHPO) and/or Native American tribes for review: Phase IA Archaeological Overview, Phase I/II Archaeological Inventory and Evaluation, and Historic Building Inventory and Evaluation. The Ethnographic Documentation will be completed and submitted after review of the archaeological reports by Native American tribes. The Historic Properties Management Plan and Executed Programmatic Agreement will be developed in consultation with FERC and Nebraska SHPO upon approval of the other Section 106 compliance study reports. An overall study summary of the goals and objectives, study area, methods, and results is provided in Section 11.
- Study 12.0, Ice Jam Flooding on the Loup River – Data collection and analysis for the ice jam flooding on the Loup River study are ongoing. A summary of the goals and objectives, study area, methods, and progress to date is provided in Section 12. The study report will be provided to FERC in the updated Initial Study Report on January 6, 2011.
- PCB Fish Tissue Sampling – Although PCB fish tissue sampling is not a formal study, the Nebraska Department of Environmental Quality (NDEQ) completed fish tissue sampling in 2009, and the U.S. Environmental Protection Agency, Region 7 completed analysis of those samples in 2010, as required by FERC's Study Plan Determination. A summary of the goals and objectives, study area, methods, and results is provided in Section 13. A report that summarizes these activities and the resulting analytical results is included as Appendix J.

The District will present the Initial Study Results to FERC and other relicensing participants during the Initial Study Results Meeting to be held on September 9, 2010, at the New World Inn (265 33<sup>rd</sup> Street) in Columbus. Following the meeting, the

District will prepare the Study Results Meeting Summary. The meeting summary will be filed with FERC on September 24, 2010, and will include any study modifications or new study plans proposed by the District as a result of the Initial Study Results Meeting. Relicensing participants will have 30 days from submittal of the Study Results Meeting Summary to file a disagreement or propose study modifications or new studies.

The District will submit an updated Initial Study Report to FERC on January 6, 2011, for the studies that are ongoing at the submittal of this Initial Study Report. The submittal of the updated Initial Study Report will be followed by an Initial Study Results Meeting to be held on January 20, 2011, at a location to be determined.

## SECTION 1            STUDY 1.0, SEDIMENTATION

### 1.1    GOALS AND OBJECTIVES OF STUDY

The goal of the sedimentation study is to determine the effect, if any, that Project operations have on stream morphology and sediment transport in the Loup River bypass reach and in the lower Platte River<sup>1</sup> because stream morphology relates directly to habitat, and habitat may determine species abundance and success. In addition, the study will compare the availability of sandbar nesting habitat for interior least terns and piping plovers to their respective populations and will compare the general habitat characteristics of the pallid sturgeon in multiple locations.

The objectives of the sedimentation study are as follows:

1. To characterize sediment transport in the Loup River bypass reach and in the lower Platte River through effective discharge and other sediment transport calculations.
2. To characterize stream morphology in the Loup River bypass reach and in the lower Platte River by reviewing existing data and literature on channel aggradation/degradation and cross sectional changes over time.
3. To determine if a relationship can be detected between sediment transport parameters and interior least tern and piping plover nest counts (as provided by the Nebraska Game and Parks Commission [NGPC]) and productivity measures.
4. To determine if sediment transport is a limiting factor for pallid sturgeon habitat in the lower Platte River below the Elkhorn River.

### 1.2    STUDY AREA

The study area includes the Loup River from approximately 5 miles upstream of the Diversion Weir, the Loup River bypass reach, and the lower Platte River. Specific study sites were selected based on the availability of gaged flow data from the USGS and Nebraska Department of Natural Resources (NDNR). The following gage stations were used as study sites:

- USGS Gage 06793000, Loup River near Genoa, NE
- USGS Gage 06794500, Loup River at Columbus, NE
- USGS Gage 06774000, Platte River near Duncan, NE
- USGS Gage 06796000, Platte River at North Bend, NE

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<sup>1</sup> The lower Platte River is defined as the reach between the confluence of the Loup and Platte rivers and the confluence of the Platte and Missouri rivers.

- USGS Gage 06796500, Platte River at Leshara, NE
- USGS Gage 06801000, Platte River near Ashland, NE
- USGS Gage 06805500, Platte River at Louisville, NE

In addition to these study sites, three “ungaged” sites will also be evaluated:

- Loup River upstream of the Diversion Weir
- Lower Platte River downstream of the Loup River confluence and upstream of the Tailrace return confluence
- Lower Platte River within 5 miles downstream of the Tailrace return confluence

The Loup River site was identified in the Revised Study Plan, and the lower Platte River sites were added by FERC in the Study Plan Determination dated August 26, 2009. Due to flood conditions, collection of cross section data at these sites was delayed and results of this analysis are not available at this time.

### 1.3 METHODOLOGY

The methodology for the sedimentation study includes six tasks designed to meet the four objectives presented in Section 1.1, Goals and Objectives of Study. The objectives are repeated below, followed by the tasks that were conducted to meet each objective. Task 1, Literature Review and Data Collection and Evaluation, however, is required prior to initiation of the other tasks and is not associated with one specific objective.

#### **Task 1 Literature Review and Data Collection and Evaluation**

Numerous reports and data sets were available from USGS and others regarding the Loup and Platte rivers. All relevant reports and data were obtained and reviewed. With one exception, appropriate data collection was performed in accordance with the approved Study Plan. Due to summer flood flows and high winds, the cross section information from the three ungaged sites was not obtained until June and July 2010. As a result, there was insufficient time to complete the analysis prior to submittal of this Initial Study Report. The results for the ungaged sites will be provided in the updated Initial Study Report on January 6, 2011. The three ungaged study sites are to be used only in the current year spatial analysis; they minimally affect the spatial analysis and do not affect the temporal analysis at all.

**Objective 1: To characterize sediment transport in the Loup River bypass reach and in the lower Platte River through effective discharge and other sediment transport calculations.**

**Task 2 Sediment Budget**

An updated sediment budget, including sediment yield estimates, was developed based on the sediment budget and sediment yield analysis completed by the Missouri River Basin Commission (MRBC) in September 1975 and the MRBC yields were adjusted based on the District’s dredging records since Project inception.

**Task 3 Effective Discharge and Other Sediment Transport Calculations**

The second task in characterizing sediment transport was to determine the sediment transport capacity at the study sites. The methodology used is based on calculating daily values of the capacity of flows to transport bed material sediments in shaping the river. First, a relationship was calculated between flow and sediment transport, resulting in sediment discharge rating curves. Second, from this relationship, several sediment transport indicators were calculated: total sediment transport capacity, effective discharge, and dominant discharge.

**Objective 2: To characterize stream morphology in the Loup River bypass reach and in the lower Platte River by reviewing existing data and literature on channel aggradation/degradation and cross sectional changes over time.**

**Task 4 Stream Channel Morphology**

The methodology for evaluating the current stream channel morphology included the following:

- Determining sediment transport parameters, including daily calculations of the capacity of discharges to transport bed material sediment
- Grouping daily transport values to determine which discharges are “effective” or “dominant” in shaping the morphologies (and habitat) of the Loup River bypass reach and the lower Platte River by transporting the greatest amount of sediment
- Assessing short- and long-term values of cumulative bed material transport
- Comparing cumulative sediment transport capacities with adjusted MRBC annual sediment yield estimates
- Applying regime theory to the effective discharges to assess whether the morphologies of the Loup River bypass reach and the lower Platte River are in dynamic equilibrium

**Objective 3: To determine if a relationship can be detected between sediment transport parameters and interior least tern and piping plover nest counts (as provided by NGPC) and productivity measures.**

**Task 5 Interior Least Tern and Piping Plover Nesting and Sediment Transport Parameters**

Nest counts for interior least terns and piping plovers on the Loup River and the lower Platte River from the NGPC Nongame Bird Program’s Nebraska Least Tern and Piping Plover database were compared to the following sediment transport and hydrologic parameters to determine if a relationship could be detected between the parameter and the nest counts. Additionally, a linear regression analysis was performed, a graph was developed, and a coefficient of determination ( $R^2$ ) was generated for each analysis:

- Annual effective discharge
- Annual dominant discharge
- Seasonal dominant discharge
- Annual cumulative sediment discharge
- Seasonal cumulative sediment discharge
- Annual cumulative flow
- Seasonal cumulative flow
- Annual peak mean daily flow
- Seasonal peak mean daily flow
- Annual flow width from effective discharge
- Annual flow width from dominant discharge
- Seasonal flow width from dominant discharge
- Annual percent diverted flow
- Seasonal percent diverted flow

**Objective 4: To determine if sediment transport is a limiting factor for pallid sturgeon habitat in the lower Platte River below the Elkhorn River.**

**Task 6 Pallid Sturgeon Habitat**

The sediment transport data were reviewed to determine if the Project is affecting morphology in the lower Platte River. In accordance with the Revised Study Plan and Study Plan Determination, if it is determined that the Project does not affect morphology in this reach, or that the system is in dynamic equilibrium, it will be

inferred that the Project does not affect pallid sturgeon habitat parameters related to sediment transport and that no further analysis is warranted.

If the analysis shows that the Project is affecting morphology, the magnitude of Project effects will be determined using effective discharge calculations and aggradation/degradation and other morphologic change analysis, as detailed in Task 4, Stream Channel Morphology. Additionally, the existing condition, with regard to sediment transport and braided river morphology in the lower Platte River, would be compared to habitat characteristics of other rivers used by the pallid sturgeon to determine if changes in Project operations relative to sediment transport could affect pallid sturgeon use of the lower Platte River.

#### 1.4 RESULTS AND DISCUSSION

***Objective 1: To characterize sediment transport in the Loup River bypass reach and in the lower Platte River through effective discharge and other sediment transport calculations.***

The sedimentation study proves that the sediment availability and yield throughout the study area by far exceed the capacity of the flow to transport sediment as well as greatly exceed the actual measured amounts of suspended sediment being transported.

The supply of sediment throughout the Platte River Basin, including the Loup River, is “virtually unlimited” (U.S. Army Corps of Engineers [USACE], July 1990) and is significantly greater than both the Loup and Platte rivers’ capacities to move the sediment. This means that the Loup River bypass reach and the lower Platte River can be considered to be in an equilibrium condition, with supplies in excess of transport capacity with no evidence of degradation in the channel. USACE came to the same conclusion, noting that an excess of supply over transport capacity exists, as manifested by sand and gravel deposits along banks and in the stream as sand bars (USACE, July 1990).

As noted in the methodology described in Section 1.3, if the capacity for total bed material sediment transport for a given time period is equal to or less than the sediment yield, it could be concluded that the braided river is not supply limited and is currently in dynamic equilibrium. The results of this investigation show that both the Loup River bypass reach and the lower Platte River at all locations studied are clearly not supply limited.

Effective discharge and other sediment transport calculations, combined with river regime theory, show that the channel geometries are “in regime” with the long-term flows shaping them (also known as effective discharges). The current channel hydraulic geometries match the width, depth, and velocity calculations for flow rates matching the effective and dominant discharge rates. Nothing appears to be constraining either river from maintaining the braided river hydraulic geometry associated with the effective discharges.

The Section 1.3 methodology established that if the literature review, sediment transport parameter calculations, and regime analyses indicate that short-term fluctuations in the morphology of the Loup River bypass reach and lower Platte River are not transitioning to another form, it could be further affirmed that the rivers are currently in dynamic equilibrium. The combinations of slopes, sediment sizes, and effective discharges at all of the stations result in all locations being well within braided river morphologies, with none being near any thresholds of transitioning to another morphology.

Finally, the methodology established that if the current condition morphology analysis indicates that the Loup River bypass reach and lower Platte River are in dynamic equilibrium, or are not supply limited based on the adjusted yields and sediment transport capacity calculations, then no alternatives relative to sediment augmentation would be evaluated.

***Objective 2: To characterize stream morphology in the Loup River bypass reach and in the lower Platte River by reviewing existing data and literature on channel aggradation/degradation and cross sectional changes over time.***

Existing literature, including Platte River studies by USACE, U.S. Department of the Interior Bureau of Reclamation (USBR), and USGS; calculations of effective discharges; regime analyses; literature on the channels' profiles; and physical observations indicate that the Loup River bypass reach and the lower Platte River are not experiencing aggradation or degradation. Instead, these analyses, particularly the effective discharge and regime analyses, clearly indicate that both the Loup and lower Platte rivers are well within parameters establishing them as dynamically stable, braided rivers.

***Objective 3: To determine if a relationship can be detected between sediment transport parameters and interior least tern and piping plover nest counts (as provided by the Nebraska Game and Parks Commission [NGPC]) and productivity measures.***

The sedimentation study concluded that a relationship between interior least tern and piping plover nest counts and sediment transport or hydrologic parameters could not be identified.

***Objective 4: To determine if sediment transport is a limiting factor for pallid sturgeon habitat in the lower Platte River below the Elkhorn River.***

When the findings of this sedimentation study, which determined that the lower Platte River geomorphology and corresponding riverine habitat are in dynamic equilibrium, are compared to the numbers of shovelnose and pallid sturgeon collected during ongoing capture efforts, it can be inferred that current Project operations relative to sediment removal from Loup River inflows at the Headworks are not acting to limit sturgeon habitat or the success of these species in the lower Platte River.



## **SECTION 2            STUDY 2.0, HYDROCYCLING**

### **2.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the hydrocycling study is to determine if Project hydrocycling operations benefit or adversely affect the habitat used by interior least terns, piping plovers, and pallid sturgeon in the lower Platte River. The physical effects of hydrocycling will be quantified and compared to alternative conditions.

The objectives of the hydrocycling study are as follows:

1.    To compare the sub-daily Project hydrocycling operation values (maximum and minimum flow and stage) to daily values (mean flow and stage). In addition to same-day comparisons, periods of weeks, months, and specific seasons of interest to protected species will be evaluated to characterize the relative degrees of variance between hydrocycling (actual) and alternative conditions in the study area.
2.    To determine the potential for nest inundation due to both hydrocycling and alternative conditions.
3.    To assess effects, if any, of hydrocycling on sediment transport parameters (see Study 1.0, Sedimentation).
4.    To identify material differences in potential effects on habitat of the interior least tern, piping plover, and pallid sturgeon.

### **2.2    STUDY AREA**

The study area includes the Tailrace Canal, the Platte River bypass reach, and the lower Platte River from the Project Outlet Weir to the USGS gage on the lower Platte River at Louisville. Specific study sites were selected based on the availability of gaged flow data from USGS and NDNR. The following gage stations were used as study sites:

- USGS Gage 06793000, Loup River near Genoa, NE
- USGS Gage 06792500, Loup River Power Canal near Genoa, NE
- NDNR Gage 00082100, Loup River Power Canal Return [Tailrace Canal]
- USGS Gage 06794500, Loup River at Columbus, NE
- USGS Gage 06774000, Platte River near Duncan, NE
- USGS Gage 06796000, Platte River at North Bend, NE
- USGS Gage 06796500, Platte River at Leshara, NE
- USGS Gage 06801000, Platte River near Ashland, NE

- USGS Gage 06805500, Platte River at Louisville, NE

In addition to these study sites, two “ungaged” sites are being evaluated, as selected through consultation with the U.S. Fish and Wildlife Service (USFWS) and NGPC:

- Lower Platte River downstream of the Loup River confluence and upstream of the Tailrace Return confluence
- Lower Platte River within 5 miles downstream of the Tailrace Return confluence

The ungaged lower Platte River sites were added by FERC in its Study Plan Determination dated August 26, 2009.

### **2.3 METHODOLOGY**

The methodology for the hydrocycling study includes six tasks designed to meet the four objectives presented in Section 2.1, Goals and Objectives of Study. The objectives are repeated below, followed by the tasks conducted to meet each objective. Task 1, Data Collection, however, is required prior to initiation of the other tasks and is not associated with one specific objective.

#### **Task 1 Data Collection**

Flow and gage height data have been collected for each study site listed above for the respective periods of record.

Cross section information was obtained for the ungaged study site on the lower Platte River downstream of the Loup River confluence and upstream of the Tailrace Return confluence during the week of May 3, 2010. However, the data collection was very difficult due to high flows and high winds as a result of storm events. Information for the remaining ungaged study site, the lower Platte River within 5 miles downstream of the Tailrace Return confluence, was unobtainable due to continued storm events causing widespread sandbar inundation and high winds. Instead, this survey information was collected during the week of June 29, 2010.. Similarly, the topographic surveys required at the same sites during the first week of August 2010 were also delayed due to continued high flows and the observation of nesting interior least terns and piping plovers within the study reach. Therefore, the data will be collected when interior least tern and piping plover nesting ends and flows return to normal levels.

**Objective 1: To compare the sub-daily Project hydrocycling operation values (maximum and minimum flow and stage) to daily values (mean flow and stage). In addition to same-day comparisons, periods of weeks, months, and specific seasons of interest to protected species will be evaluated to characterize the relative degrees of variance between hydrocycling (actual) and alternative conditions in the study area.**

### **Task 2 Gage Analysis**

A gage analysis was performed using existing USGS and NDNR flow data from the listed gaged study sites to accurately determine the travel time, conveyance losses or gains, and magnitude of sub-daily flow attributable to Project hydrocycling. In addition, wet, dry, and normal flow years were determined for each gaged and ungaged site using methodology outlined in Anderson and Rodney (October 2006). The period of analysis for this task was the period during which the NDNR gage of flows in the Tailrace Canal at the 8<sup>th</sup> Street bridge in Columbus has been in operation (2003 to 2009). The results of this analysis provide basic hydrologic information for use in subsequent tasks.

### **Task 3 Hydrographs for the Project versus Alternative Conditions**

Historical hydrographs for each gaged Platte River study site were plotted for periods of weeks, months, and specific seasons of interest to protected species. Daily maximum, minimum, and mean flows were plotted for each time interval. The overall time period used to create these plots was the period during which the NDNR gage at the 8<sup>th</sup> Street bridge in Columbus has been in operation (2003 to 2009).

Synthetic hydrographs for the ungaged sites were developed and plotted for current Project operations from 2003 to 2009. Conveyance losses or gains were estimated for current operations based on existing gage data (Task 2). Synthetic hydrographs were also developed for a “run-of-river”<sup>1</sup> condition. The conveyance losses or gains determined from current operations were applied for the gaged and ungaged sites to develop the run-of-river synthetic hydrographs. The run-of-river synthetic hydrographs were plotted for periods of weeks, months, and specific seasons of interest to protected species for the period of analysis. Maximum, minimum, and mean flow were plotted. The results of this analysis will be used for subsequent tasks.

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<sup>1</sup> For purposes of this study, run of river is defined as without regulation for hydrocycling.

**Objective 2: To determine the potential for nest inundation due to both hydrocycling and alternative conditions.**

**Task 4 Nesting Season Sandbar Inundation Heights**

Historical flow data and synthetic hydrographs developed in Task 3 will be used along with the USGS rating curves to compare theoretical instances of nest inundation under hydrocycling and run-of-river conditions. This will be accomplished by identifying the theoretical highest flow (benchmark flow) during the time period between theoretical arrival of the species, assumed to be April 25 for piping plovers and May 15 for interior least terns, and when eggs are laid; the benchmark flow will then be compared to subsequent flows during the theoretical initial incubation and fledging period to determine the number of times the benchmark flow was exceeded. The analysis will be completed for historical hydrographs, which include Project hydrocycling, and for synthetic hydrographs developed to represent the run-of-river condition. The number of times theoretical inundation (exceedance of the benchmark flow) occurs under each condition will be compared to determine if Project hydrocycling operations increase or decrease the likelihood of nest inundation.

**Objective 3: To assess effects, if any, of hydrocycling on sediment transport parameters.**

**Task 5 Effects of Hydrocycling on Sediment Transport Parameters**

Effects of hydrocycling on sediment transport parameters, which are a reflection of the river morphology, are being evaluated using methodologies outlined in Study 1.0, Sedimentation. Sediment transport indicators (total sediment transport capacity and dominant discharge) are being determined at the gaged and ungaged sites for Project and run-of-river sub-daily hydrographs (developed in Task 3). The total sediment transport capacity and dominant discharge are being calculated for a series of representative days with hydrocycling. The results will be compared to the run-of-river condition for the same series of representative days.

**Objective 4: To identify material differences in potential effects on habitat of the interior least tern, piping plover, and pallid sturgeon.**

**Task 6 Effects of Hydrocycling on Interior Least Tern, Piping Plover, Pallid Sturgeon, and Isolation of Backwaters and Side Channels**

The effects of hydrocycling/pulsing operations on interior least tern, piping plover, and pallid sturgeon habitat, such as backwaters and side channels, on other rivers outside of the Project Boundary are being examined and compared to conditions on the lower Platte River resulting from Project operations. This comparison will be used to determine if Project operations contribute to habitat conditions outside the spectrum of habitat used by these species on other river systems. River reaches used for comparison will include the Arkansas River below Keystone Dam, the Fort Randall reach of the Missouri River, the Missouri River reach below Gavins Point Dam, the

Niobrara River, the Red River below Denison Dam, and the Yellowstone River below Intake, Montana. These river reaches were chosen based on respective population census numbers and frequency of occurrence for the interior least tern, piping plover, and pallid sturgeon.

Habitat characteristics of the interior least tern, piping plover and pallid sturgeon associated with hydrocycling/pulsing operations on these other rivers will be identified for comparative analysis to identify similarities or differences between Project operations and hydrocycling/pulsing operations on these other rivers to see if the habitat characteristics or species usage resulting from the respective operation are similar or different and if so, why.

A modeling study is being performed to determine the effects of hydrocycling on interior least tern and piping plover nesting habitat using the HEC-RAS 1D steady state backwater model. The study sites are the ungaged sites listed above, as well as the North Bend gaged site. Topographic data collected in May and June/July, as well as data to be collected in late August/early September, will be used to develop the model. The model will be run to model existing and run-of-river operations. Each model run will be conducted for a wet, dry, and normal flow year. The following parameters associated with interior least tern and piping plover nesting habitat will be evaluated by cross section:

- Width of exposed sandbar
- Wetted width of sandbars
- Channel widths

In addition, the following are being tabulated and plotted for one representative wet, dry, and normal flow year: 1) the minimum daily percent suitable pallid sturgeon habitat under existing operations; 2) the maximum daily percent suitable sturgeon habitat under existing operations; and 3) the mean daily percent suitable sturgeon habitat that would be observed under a run-of-river operating scenario. In quantifying the percent suitable sturgeon habitat, the discharge versus percent suitable pallid sturgeon habitat relationship established and presented in Chapter 10 of Peters and Parham (2008) is being applied. This analysis is being performed at the study site located within 5 miles downstream of the tailrace confluence as well as at the previously noted downstream Platte River USGS gage sites.

## **2.4 RESULTS AND DISCUSSION**

No results and discussion are available at this time. Detailed results and discussion will be provided to FERC in the updated Initial Study Report on January 6, 2011.

### **SECTION 3                    STUDY 3.0, WATER TEMPERATURE IN THE PLATTE RIVER**

Consistent with the District’s Revised Study Plan (Loup Power District, July 27, 2009) and FERC’s Study Plan Determination (FERC, August 26, 2009), Study 3.0, Water Temperature in the Platte River, has been removed from the suite of studies that the District is performing in association with Project relicensing.

The study was originally introduced in the District’s Proposed Study Plan to address agency concerns with Project effects on pallid sturgeon related to water temperature. The primary concern was related to how changes in water temperature might affect the spawning and migration cues of the species. However, during the April 21, 2009, Study Plan Meeting, it was decided by attending agencies that the study (as defined in the District’s Proposed Study Plan) could not be successful in isolating Project effects and is not necessary to facilitate Project relicensing.

The discussion at the April 21, 2009, Study Plan Meeting focused on the following variables that would be too great to overcome in attempts to isolate Project effects on water temperature in the lower Platte River:

- **Tributaries**  
Multiple tributaries contribute flow to the Platte River between the Tailrace Canal and U.S. Geological Survey (USGS) Gage 06805500, Platte River at Louisville, NE. These tributaries include the Elkhorn River, Salt Creek, Buffalo Creek, and Shell Creek. These multiple inflows provide significant variability that would complicate the isolation of Project effects on water temperature in the lower Platte River.
  
- **Lag Time**  
Discharge from the Tailrace Canal travels approximately 80 miles before reaching USGS Gage 06805500, Platte River at Louisville, NE. On average, the travel time of flows for this distance is 2 to 3 days. This amount of time allows for significant attenuation of Project effects. The lag time coupled with the inflows of multiple tributaries makes it extremely difficult to isolate Project effects.
  
- **Dominant Atmospheric Effects**  
Preliminary evaluation of temperature data at USGS Gage 06805500, Platte River at Louisville, NE, indicated that the overriding influence on water temperature appears to be related to solar radiation and atmospheric influences, with no obvious influence from the Project.

## **SECTION 4                    STUDY 4.0, WATER TEMPERATURE IN THE LOUP RIVER BYPASS REACH**

### **4.1      GOALS AND OBJECTIVES OF STUDY**

The goal of the study of water temperature in the Loup River bypass reach is to determine if Project operations (flow diversion) materially affect water temperature in the Loup River bypass reach (with particular emphasis on the Loup River bypass reach between the Diversion Weir and the confluence of Beaver Creek with the Loup River) or in the reach of the Platte River between the Loup River confluence and the Tailrace Canal.

The objectives of the study of water temperature in the Loup River bypass reach are as follows:

1.     To estimate the relationship between flow in the Loup River bypass reach, ambient air temperature, water temperature, relative humidity, and solar radiation.
2.     To describe and quantify the relationship, if any, between diversion of water into the Loup Power Canal and water temperature in the Study Reach of the Loup River bypass reach.
3.     To determine if water temperature standard exceedances occur in the reach of the Platte River between the Loup River confluence and the Tailrace Canal.

### **4.2      STUDY AREA**

The study area includes the entire Loup River bypass reach, the entire reach of the Platte River between the Loup River confluence and the Tailrace Canal, and a small reach of the Platte River just upstream of the Loup River confluence.

There are five study sites within the study area where water temperature data will be collected:

- Loup River on the upstream side of the Diversion Weir
- USGS Gage 06793000, Loup River near Genoa, NE
- NDNR Gage 06794500, Loup River at Columbus, NE
- Reach of the Platte River between the Loup River confluence and the Tailrace Canal
- Platte River upstream of the Loup River confluence

In addition, USGS Gage 06792500, Loup River Power Canal near Genoa, NE, will be used to estimate flow in the Loup River just upstream of the Diversion Weir.

### 4.3 METHODOLOGY

The methodology for the study of water temperature in the Loup River bypass reach and the reach of the Platte River between the Loup River confluence and the Tailrace Canal includes three tasks, described below.

#### **Task 1 USGS Coordination**

The District coordinated with USGS on the successful installation of temperature sensors at two locations: 1) Loup River at the Diversion Weir (USGS Gage 06792490, Loup River at Merchiston, NE) and 2) USGS Gage 06793000, Loup River near Genoa, NE. Data logged by both sensors are available online at the following addresses:

- USGS Gage 06792490, Loup River at Merchiston, NE –  
[http://waterdata.usgs.gov/nwis/uv/?site\\_no=06792490](http://waterdata.usgs.gov/nwis/uv/?site_no=06792490)
- USGS Gage 06793000, Loup River near Genoa, NE –  
[http://waterdata.usgs.gov/nwis/uv?cb\\_00060=on&cb\\_00045=on&cb\\_00065=on&cb\\_00010=on&format=gif\\_default&period=60&site\\_no=06793000](http://waterdata.usgs.gov/nwis/uv?cb_00060=on&cb_00045=on&cb_00065=on&cb_00010=on&format=gif_default&period=60&site_no=06793000)

#### **Task 2 Data Collection**

Flow data collection (from the Loup River near Genoa and from the Loup River Power Canal near Genoa) began on May 1, 2010, and will continue through September 2010. Ambient air temperature data collection from the National Weather Station at Genoa is also ongoing. Ultimately, the data will be organized in a database by day, week, and month, and any data gaps will be described. The descriptive statistics add-in available in Microsoft Excel will be used to provide descriptive statistics, such as count, maximum, mean, minimum, and standard deviation, for the grouped data.

As a result of the successful implementation of Task 1 (see above), temperature data collection began at the Loup River at Merchiston on May 3, 2010, and at the Loup River near Genoa on May 5, 2010; data collection will continue through September 30, 2010. It should be noted that the temperature sensor installed at the Loup River near Genoa was washed away by high flows on June 10, 2010. A replacement sensor was installed on July 19, 2010. Consequently, a data gap exists from June 10, 2010 to July 20, 2010, at this location only.

To check the variability of the instrumentation proposed to collect August 2010 temperature data from the Loup River at Columbus and the Platte River, two temperature data loggers were installed at each of the following locations: adjacent to the Loup River near Genoa and adjacent to the newly installed temperature probe at the Diversion Weir. Prior to actual data collection implementation, data were logged via the proposed instrumentation from June 2, 2010 to June 9, 2010, and were compared to USGS data outputs to ensure accuracy.



August temperature data was collected via temperature data loggers from August 13 to August 23 at the following sites:

1. The Loup River at Columbus, coincident with NDNR Gage 06794500, Loup River at Columbus, NE,<sup>1</sup>
2. The reach of the Platte River between the Loup River confluence and the Tailrace Canal
3. The Platte River upstream of the Loup River confluence.

A percent probability of exceedance analysis similar to the Sinokrot and Gulliver method will be used to evaluate whether temperatures measured at these locations exceeded the Nebraska Department of Environmental Quality temperature standard of 90°F (32°C) and, if so, how often and by how much.

### **Task 3 Data Analysis**

Data will be plotted and regressions determined to identify general patterns and to distinguish trends, as outlined in the District’s Revised Study Plan and as necessary to satisfy the goals and objectives of the study. Additionally, applicable plots will be performed relative to temperature exceedances in the reach of the Platte River between the Loup River confluence and the Tailrace Canal.

Once a predictive relationship is established, that relationship can be used to predict during what conditions the water quality temperature standard may be exceeded.

## **4.4 RESULTS AND DISCUSSION**

Pending collection and analysis of August 2010 temperature readings, no discussion or results are available. Detailed results and discussion will be provided to FERC in the updated Initial Study Report on January 6, 2011.

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<sup>1</sup> NDNR reinstated this gage in 2008 at the same location as former USGS Gage 06794500, Loup River at Columbus, NE.

## **SECTION 5                    STUDY 5.0, FLOW DEPLETION AND FLOW DIVERSION**

### **5.1      GOALS AND OBJECTIVES OF STUDY**

The goals of the flow depletion and flow diversion study are to determine if Project operations result in a flow depletion on the lower Platte River and to what extent the magnitude, frequency, duration, and timing of flows affect the Loup River bypass reach. The results will be used to determine if the Project operations relative to flow depletion and flow diversion adversely affect the habitat used by interior least tern and piping plover populations, the fisheries, and the riverine habitat in the Loup River bypass reach and the lower Platte River compared to alternative conditions.

The objectives of the flow depletion and flow diversion study are as follows:

1.     To determine the net consumptive losses associated with Project operations compared to alternative conditions.
2.     To use current and historic USGS gage rating curves to evaluate change in stage in the Loup River bypass reach during Project operations and compare against alternative hydrographs.
3.     To evaluate historic flow trends on the Loup and Platte rivers since Project inception.
4.     To determine the extent of interior least tern and piping plover nesting on the Loup River above and below the Diversion Weir.
5.     To determine Project effects, if any, of consumptive use on fisheries and habitat on the lower Platte River downstream of the Tailrace Canal.
6.     To determine the relative significance of the Loup River bypass reach to the overall fishery habitat for the Loup River.

### **5.2      STUDY AREA**

The study area is the Loup Power Canal and associated regulating reservoirs; the Loup River bypass reach, which begins at the Diversion Weir, located west of Genoa, and ends at the confluence with the Platte River at Columbus; and the lower Platte River from the confluence with the Loup River to the USGS gage at North Bend. Specific study sites were selected based on the availability of gaged flow data from USGS and NDNR. The following gage stations were used as study sites:

- USGS Gage 06793000, Loup River near Genoa, NE
- USGS Gage 06792500, Loup River Power Canal near Genoa, NE
- USGS Gage 06794000, Beaver Creek at Genoa, NE
- NDNR Gage 00082100, Loup River Power Canal Return [Tailrace Canal]

- USGS Gage 06794500, Loup River at Columbus, NE
- USGS Gage 06774000, Platte River near Duncan, NE
- USGS Gage 06796000, Platte River at North Bend, NE

In addition to these study sites, three “ungaged” sites are being evaluated, as selected through consultation with USFWS and NGPC:

- Loup River upstream of the Diversion Weir
- Loup River downstream of the Diversion Weir
- Lower Platte River downstream of the Loup River confluence and upstream of the Tailrace Return confluence

The sites on the Loup River downstream of the Diversion Weir and on the lower Platte River were added by FERC in its Study Plan Determination dated August 26, 2009.

### **5.3 METHODOLOGY**

The methodology for the flow depletion and flow diversion study includes seven tasks designed to meet the six objectives presented in Section 5.1, Goals and Objectives of Study. The objectives are repeated below, followed by the tasks conducted to meet each objective. Task 1, Data Collection, however, is required prior to initiation of the other tasks and is not associated with one specific objective. The period of analysis varies by task.

#### **Task 1 Data Collection**

Flow and stage data were collected for each study site. This included all available flow data for the period of record along with the current and historic rating curves.

As specified in FERC’s Study Plan Determination, cross section information was to be obtained during low flow conditions and at a higher flow. The range of low flow and high flow dates selected for the cross section surveys of the ungaged sites were based on historic hydrographs at the gaged locations and discussions with USFWS and NGPC. It was determined that high flow data would be collected in late April to early May and that low flow data would be collected in late July to early August. Cross section information for the Loup River downstream of the Diversion Weir was obtained on April 15, 2010. Cross section information for the lower Platte River downstream of the Loup River confluence and upstream of the Tailrace Return confluence was obtained during the week of May 3, 2010. However, the data collection was very difficult at the lower Platte River site due to high flows and high winds as a result of storm events. Cross section information for the Loup River upstream of the Diversion Weir was unobtainable during the first week of May due to continued storm events causing widespread sandbar inundation and high winds. Instead, this survey information was collected on June 2 and 3, 2010. Similarly, the

topographic surveys required at the same sites during the first week of August 2010 were also delayed due to continued high flows and the observation of nesting interior least terns and piping plovers within the study reach. Therefore, the data will be collected when interior least tern and piping plover nesting ends and flows return to normal levels.

Available atmospheric data, including pan evaporation, precipitation, and temperature, will be obtained from NWS stations for the years 1980 through 2009. This range of data was selected because it includes a moderate flow period (1980 to 1992), two wet periods (1993 to 1998 and 2007 to 2009), and a dry period (1999 to 2006). In addition, soil survey data and aerial and satellite images of the vegetation along the Loup River bypass reach will be obtained for the years 1980 through 2009.

***Objective 1: To determine the net consumptive losses associated with Project operations compared to alternative conditions***

***Objective 5: To determine Project effects, if any, of consumptive use on fisheries and habitat on the lower Platte River downstream of the Tailrace Canal.***

## ***Task 2 Net Consumptive Use***

Net consumptive use will be calculated for the Loup Power Canal and Loup River bypass reach for current Project operations and no diversion conditions for the years 1980 through 2009. Consumptive use losses will be calculated by adding open water evaporative losses and ET losses from native vegetation and agricultural crops.

### *Consumptive Use in the Loup Power Canal and Associated Regulating Reservoirs*

Consumptive use in the Loup Power Canal and associated regulating reservoirs will be calculated on a monthly and seasonal basis by adding the ET consumptive use losses and the evaporation consumptive use losses.

As directed in FERC's Study Plan Determination, consumptive losses associated with the irrigation withdrawals were determined. This was done by evaluating the District's gage records, soil type, and crop irrigation demand.

### *Consumptive Use in the Loup River Bypass Reach*

Consumptive use in the Loup River bypass reach will be calculated on a monthly and seasonal basis by adding the ET consumptive use losses and the evaporation consumptive use losses.

Consumptive losses due to ET from the trees and other large vegetation bordering the Loup River bypass reach will be calculated by tabulating the length of riparian vegetation bordering the bypass reach (observed from aerial photographs and satellite images) and estimating an ET rate per unit length.

### *Net Consumptive Use*

The net consumptive use will be estimated by taking the difference between the consumptive use losses in the Loup Power Canal and regulating reservoirs and the consumptive use losses in the Loup River bypass reach. Values will be estimated on a monthly, seasonal, and annual basis for the period 1980 through 2009 for current Project conditions and alternative conditions.

***Objective 2: To use current and historic USGS gage rating curves to evaluate change in stage in the Loup River bypass reach during Project operations and compare against alternative hydrographs.***

### **Task 3    *Flow Duration and Flood Frequency Curves***

Existing gage data was used to develop flood frequency and flow duration curves in the Loup River bypass reach for current Project operations. Flood frequency and flow duration curves were created for the gaged locations for the period of record. The USGS gage on the Loup River at Columbus was discontinued in 1978. Therefore, the relationship between the Loup River near Genoa and the Loup River at Columbus that was developed by USFWS (May 15, 2002) was incorporated for this study.

Synthetic hydrographs for the ungaged sites were developed and plotted for current Project operations from 2003 to 2009. Conveyance losses or gains were estimated for current operations based on existing gage data (Task 2). Flood frequency and flow duration curves were developed based on the synthetic hydrographs for the ungaged sites for current Project operations. Synthetic hydrographs will be developed for a no-diversion condition. The conveyance losses or gains determined from current operations will be applied for the gaged and ungaged sites to develop the no-diversion synthetic hydrographs. Flow duration and flood frequency will be determined for the no-diversion condition. The results of this analysis will be used for subsequent tasks. The flood frequency and flow duration curves were developed using the USACE modeling package HEC-SSP.

An analysis was performed to determine wet, dry, and normal flow years for each gaged and ungaged site using methodology outlined in Anderson and Rodney (October 2006). The period of analysis for this task was the period during which the NDNR gage of flows in the Tailrace Canal at the 8<sup>th</sup> Street bridge in Columbus has been in operation (2003 to 2009).

### **Task 4    *Stage***

The stage in the Loup River bypass reach at Genoa and Columbus will be evaluated using current and historic USGS rating curves and the results from Task 3, Flow Duration and Flood Frequency Curves. The stage for Project operations will be compared with the stage for alternative conditions to obtain change in stage for the 25, 50, and 75 percent chance exceedance discharges for the time period of 1980 through 2009.

**Objective 3: To evaluate historic flow trends on the Loup and Platte rivers since Project inception.**

**Task 5 Loup River and Platte River Depletions**

Historic flow records will be evaluated to determine the general flow trend (increasing, decreasing, or relatively constant) in the Loup and Platte rivers. USGS gages on the Loup River at Genoa and Columbus and USGS gages on the Platte River at Duncan and North Bend will be evaluated. A USGS report (Ginting, Zelt, and Linard, 2008) and other similar reports will be used to assess flow depletions in the Platte River. This information will be used as the baseline to evaluate Project-related effects.

**Objective 4: To determine the extent of interior least tern and piping plover nesting on the Loup River above and below the Diversion Weir.**

**Task 6 Interior Least Tern and Piping Plover Nesting on the Loup River Bypass Reach**

Existing information from NGPC on interior least tern and piping plover nesting activities upstream and downstream of the Diversion Weir on the Loup River has been collected. As part of this objective, nest occurrence above the Diversion Weir was compared to nest occurrence below the Diversion Weir to the Tailrace Return to determine if significant differences exist. The review of nesting data was inconclusive; therefore, aerial photography for five randomly selected river miles within the riparian corridors along the bypass reach (approximately 36 river miles downstream of the Diversion Weir) and for five randomly selected river miles within approximately 35 miles upstream of the Diversion Weir are being examined to identify and compare the following habitat parameters using a similar methodology as used by Kirsch (1996):

- number, position, and average size of bare sand areas within the banks of the river
- channel width
- percent un-vegetated sandbars
- percent vegetated sandbars (isolated and non-isolated)
- presence and/or type of vegetation.

The observed conditions for each year for these parameters will be compared to determine to what extent flow diversion and the presence of the Diversion Weir may result in different river and riparian vegetation conditions. Observed habitat parameters (listed above) on the Loup River will be compared to species habitat requirements to determine if any changes in the riparian corridor may have had an effect on the occurrence of these species.

Finally, as directed in FERC’s Study Plan Determination, a modeling study is being conducted to determine the effects of diverted flows on interior least tern and piping plover nesting habitat and whooping crane roosting habitat using the HEC-RAS 1D steady state backwater model. The study sites are the ungaged sites listed in Section 5.2, Study Area, which were selected based on coordination with USFWS and NGPC. Topographic data listed in Task 1 will be used to develop the model. The model will be run to model existing and no-diversion conditions. Each model run will be conducted for a wet, dry, and normal flow year. The following parameters associated with interior least tern and piping plover nesting habitat will be evaluated by cross section:

- Width of exposed sandbar
- Wetted width of sandbars
- Channel widths

**Objective 6: To determine the relative significance of the Loup River bypass reach to the overall fishery habitat for the Loup River.**

**Task 7 Fishery Populations Above and Below the Diversion Weir**

Data collected during 1996 and 1997 NGPC fish sampling efforts on the Loup River will be used to analyze fish populations above and below the Diversion Weir (NGPC, June 1997 and April 1998) and to determine the extent to which flow diversion may or may not result in different species populations upstream and downstream of the Diversion Weir.

**Task 8 Montana Method**

As directed in FERC’s Study Plan Determination, mean annual flows will be determined for the Loup River immediately upstream of the Diversion Weir and for the lower Platte River immediately downstream of the confluence with the Loup River. Based on the computed mean annual flows, the various percentages of mean annual flow will be computed and used to describe fish habitat in the Loup River bypass reach and lower Platte River based on the Montana Method (Tennant, 1976).

Actual mean monthly flows in the Loup River bypass reach and lower Platte River under existing Project operations will be compared to Table 5-1, Resource Benefit Characteristics to describe the existing state of the fishery resources.

**Table 5-1. Resource Benefit Characterizations**

Flow Description	April to September	October to March
Flushing/maximum flow	200 percent from 48 to 72 hours	
Optimum flow range	60-100 percent	60-100 percent
Outstanding habitat	60 percent	40 percent
Excellent habitat	50 percent	30 percent
Good habitat	40 percent	20 percent
Fair or degraded habitat	30 percent	10 percent
Poor or minimum habitat	10 percent	10 percent
Severe degradation	<10 percent	<10 percent

#### 5.4 RESULTS AND DISCUSSION

No results and discussion are available at this time. Detailed results and discussion will be provided to FERC in the updated Initial Study Report on January 6, 2011.



## **SECTION 6                    STUDY 6.0, FISH SAMPLING**

Consistent with the District’s Revised Study Plan (Loup Power District, July 27, 2009) and FERC’s Study Plan Determination (FERC, August 26, 2009), Study 6.0, Fish Sampling, has been removed from the suite of studies that the District is performing in association with Project relicensing.

Study 6.0 Fish Sampling was originally proposed by NGPC during early Project scoping. In its infancy, the study was to consist of the District facilitation of NGPC-performed fish sampling along the Loup Power Canal.

Based on the widely accepted view that the Loup Power Canal is a healthy and important recreational fishery, and due to the lack of scoping-derived issues related to this fishery, the District announced its intention during the May 27-28, 2009, Study Plan Meeting to exclude this study from the Revised Study Plan. All meeting participants, including NGPC, accepted this proposal without objection.

## **SECTION 7            STUDY 7.0, FISH PASSAGE**

### **7.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the fish passage study is to determine if a useable pathway exists for fish movement upstream and downstream of the Diversion Weir.

The objectives of the fish passage study are as follows:

1.    To evaluate the hydraulic flow, velocity, and stage parameters at the Diversion Weir and Sluice Gate Structure.
2.    To determine whether fish pathways exist over the Diversion Weir, through the Sluice Gate Structure, or by other means.

### **7.2    STUDY AREA**

The study area includes the Loup River reach directly upstream and downstream of the Headworks. The following two USGS gage stations were used to obtain data for the analysis:

- USGS Gage 06793000, Loup River near Genoa, NE – Available data for this station includes 15-minute interval discharge data from April 1, 1929, to current and 15-minute interval gage height data from June 12, 1997, to current.
- USGS Gage 06792500, Loup River Power Canal near Genoa, NE – Available data for this station includes 15-minute discharge data from January 1, 1937, to current and 15-minute interval gage height data from August 30, 2000, to current.

### **7.3    METHODOLOGY**

Hydraulic data were analyzed via a hydraulic model to determine if, and how frequently, Loup River stage and resulting flow velocities result in usable fish pathways over or around the Diversion Weir or through the Sluice Gate Structure. This analysis focused on the spawning migration season of representative Loup River fish species (defined as April, May, and June) and compared resulting Loup River flow velocities to both the critical and burst swimming speeds of these fish species.

### **7.4    RESULTS AND DISCUSSION**

The Diversion Weir is submerged and provides a potential pathway for upstream migrating fish during approximately 1 percent of the spawning season (defined as April through June for this analysis). During the 1 percent of the spawning season in which the Diversion Weir is submerged, the resulting flow velocities over the Diversion Weir are higher than the critical swimming speeds of all analyzed fish species. With the exception of the white sucker and walleye, the flow velocities that

result from Diversion Weir submergence are also too great to allow fish passage, even when burst swimming speeds are considered. Findings suggest that white sucker and walleye may be able to pass over the Diversion Weir during the 1 percent of the spawning season when the Diversion Weir is submerged, assuming that these species can maintain the top end of their documented burst swimming speed for 15 seconds.

The Sluice Gate Structure does not provide a fish pathway, due to the lack of time that the Gate Structures are open as well as the high flow velocities that are conveyed through the Gate Structures when they are open.

An alternative fish pathway around the Diversion Weir on the right bank of the Loup River (looking downstream) exists (on average) less than 1 day out of every spawning season. The findings summarized for the Diversion Weir above are also applicable to an alternative fish pathway around the Diversion Weir.

## **SECTION 8            STUDY 8.0, RECREATION USE**

### **8.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the recreation use study is to determine the public awareness, usage, perception, and demand of both the Project’s existing recreation facilities (including fisheries) and the Loup River bypass reach (including the Loup Lands Wildlife Management Area [WMA]), to determine if potential improvements are needed, and to develop a Recreation Management Plan to address existing and future recreation needs.

The objectives of the recreation use study are as follows:

1.    To measure recreation usage of Project recreation facilities (including fisheries) and the Loup River bypass reach (including the Loup Lands WMA).
2.    To document the types of recreation use occurring at Project recreation facilities and along the Loup River bypass reach.
3.    To determine whether Project recreation facilities meet current demand.
4.    To determine the public’s perception and awareness of Project recreation facilities, including fisheries, and to identify the impact of Project operations on recreation experiences.
5.    To determine what species anglers are targeting and catching, including catch rates.
6.    To collect data for use in the preparation of a Recreation Management Plan for the District’s facilities.

### **8.2    STUDY AREA**

Almost all of the 5,200 acres within the Project Boundary are open and accessible for public recreation. Although non-angling recreation use will be documented along the entire Loup Power Canal and Loup River bypass reach, special emphasis will be applied to the following recreation areas:

- Headworks Park – parking areas, camp sites, picnic areas, identified fishing sites, and Headworks OHV Park
- Lake Babcock Park (aka Loup Park) – parking areas, camp sites, picnic areas, shoreline, and in Lake Babcock
- Lake North Park – parking areas, camp sites, picnic shelters, shoreline, and in Lake North
- Columbus Powerhouse Park – parking area, picnic area, and identified fishing sites

- Tailrace Park – parking area, identified fishing sites, and playground
- Loup Lands WMA – all three tracts (Tracts G, H, and D) in accordance with FERC’s Study Plan Determination (August 26, 2009)

The creel survey will span the length of the Loup Power Canal and will include Lake Babcock and Lake North. In addition, a recreation use/creel survey will be conducted on the Loup River bypass reach, which includes the Loup River from the Headworks to the confluence with the Platte River and the Platte River from the confluence to the Outlet Weir.

### 8.3 METHODOLOGY

#### **Task 1 Pre-Survey Activities**

In response to the Study Plan Determination requirement to survey the Loup River bypass reach for recreation use, the District initiated a separate study plan to detail this effort. Following NGPC and National Park Service (NPS) comments and the District’s incorporation of provided comments, the plan was provided to FERC for review. Following incorporation of multiple FERC comments, the study plan was finalized.

District staff and District representatives attended a meeting on February 11, 2010, during which NGPC staff trained attendees as survey proctors. Established NGPC protocols and standard practices for surveying were explained and discussed regarding their incorporation into the recreation survey. Also during this meeting, final survey schedules were established in accordance with NGPC protocols for randomizing survey efforts. All active survey proctors not in attendance during the February 11, 2010 NGPC training were subsequently trained by District representatives present at the formal training.

To encourage participation in the survey, signs notifying users of the recreation survey were posted at multiple entry points to the District’s recreation facilities.

#### **Task 2 Data Collection**

Data collection is ongoing via in-person and windshield mail-back surveys (recreation use and creel surveys) and field observations. Consistent with the NGPC-produced survey schedule, surveys began on May 4, included Memorial Day and Independence Day, and will conclude on October 30, 2010.

Three infrared trail counters were installed and began collecting user data, including data on both pedestrians and bicyclists, on April 30, 2010. One trail counter was installed at an approximate midpoint of each the District’s three trails: 1) Two Lakes Trail, 2) Bob Lake Trail, and 3) Robert White Trail. Trail counts will continue through October 2010.

A telephone survey of residents in Nance and Platte counties was conducted by a professional market research firm between May 26 and June 9, 2010. The survey sampled 400 randomly identified households with zip codes in Nance or Platte County in order to determine the general awareness and perception of the Project’s recreational opportunities. Detailed methods of the phone survey are provided in Appendix F.

### **Task 3 Data Analysis**

Field surveys and observations are ongoing, and data analysis is therefore pending. However, periodic data analysis is underway to ensure that existing survey methods are collecting sufficient data.

Once all data collection is completed, annual usage, average weekday usage, average weekend usage, and peak weekend usage for each recreation facility will be determined. From these numbers, the percent of capacity at which all Project recreation facilities are operating will be estimated. With regard to the creel survey, angler effort, catch, and angler success will be determined. Descriptions of the user experiences with recreation facilities included in survey responses will be used to determine whether Project recreation facilities meet user needs and to what degree. Narrative explanations of findings will accompany quantitative analyses.

### **Task 4 Recreation Management Plan**

Recreation Management Plan development is pending completion of both the data collection and data analysis tasks.

## **8.4 RESULTS AND DISCUSSION**

As most facets of data collection are ongoing, formal results are not provided in this document but will be included in the updated Initial Study Report on January 6, 2011. The following includes summaries of collected data and notable observations to date.

### **8.4.1 In-person Surveys and Field Observations**

Table 8-1 indicates the number of surveys conducted and recreation users observed during data collection activities spanning May 1 to July 31, 2010.

**Table 8-1. Recreation Surveys and User Counts**

	Loup Power Canal			Loup River Bypass Reach		
	May	June	July	May	June	July
Recreation Use Surveys Conducted	190	173	243	17	20	19
Recreation Users Observed	1,293	2,386	4,013	202	340	482
Creel Surveys Conducted	90	67	85	Not Applicable		

The following notable observations have resulted from data collection activities conducted to date:

- Recreation users are generally very receptive to the survey. It is estimated that 95 percent of the users who are invited to complete the survey accept the invitation and do, in fact, complete the survey.
- Headworks Park and Lake North Park experience substantially more recreation use than other developed recreation areas.
- The Nebraska Off Highway Vehicle Association (NOHVA) Spring Jamboree did not occur due to flooding at the Headworks OHV Park.
- A large sandbar exists just upstream of the U.S. Highway 81 bridge crossing of the Loup River bypass reach. The sandbar is frequented by OHV users and people generally recreating. In accordance with FERC guidance, this use is being documented regardless of legality (related to state trespass laws).

#### 8.4.2 Trail Counts

Based on pre-study assumptions regarding trail use, the data collected by the three trail counters appear to be logical and accurate. Table 8-2 quantifies the total trail counts collected during data collection activities spanning May 1 to July 31, 2010. Additional detail and analysis specific to use during specific times of day and weekday as opposed to weekend use will be analyzed and presented in the updated Initial Study Report on January 6, 2011.

**Table 8-2. Trail Counts**

	May	June	July
Two Lakes Trail	2,658	2,345	2,412
Bob Lake Trail	960	863	971
Robert White Trail	640	585	523

#### 8.4.3 Telephone Survey

One of the most notable findings of the recreation telephone survey is the lack of District recreation area use during the winter months. The following data suggest that the existing survey schedule, noted in Study 8.0, Recreation Use, as ending on October 31, 2010, is sufficient to obtain necessary recreation user data for incorporation into the District's pending Recreation Management Plan.

Of the respondents who mentioned that they are aware of the following recreation sites, the percentage ranges provided indicate the percentage of respondents stating that no one from their household visited the specified recreation site between

November 1, 2009 and February 28, 2010 (provided in descending order of non-visitation):

- Lake North Park – 94.8 to 96.7 percent
- Headworks OHV Park – 92.9 to 97.6 percent
- Lake Babcock Park – 92.8 to 96.2 percent
- Tailrace Park – 91.4 to 94.3 percent
- Columbus Powerhouse Park – 90.0 to 96.0 percent
- Headworks Park – 89.9 to 96.6 percent
- Trails – 88.0 to 100.0 percent

To put the above information into context, an average of greater than 50 percent of the respondents who are aware of the District’s recreation areas indicate that they visited the areas during July 2009.

The following summarizes other notable findings of the recreation telephone survey:

- Among the District’s recreation sites, Lake North Park and Lake Babcock Park have the highest awareness, both with more than nine out of ten respondents aware of each.
- Of the respondents who mentioned that they are aware of the following recreation sites, the percentages provided indicate the percentage of respondents stating that someone from their household has visited the site within the last 12 months (provided in descending order of visitation):
  - Lake Babcock Park – 57 percent
  - Lake North Park – 55 percent
  - Headworks Park – 36 percent
  - Bob Lake Trail – 32 percent
  - Columbus Powerhouse Park – 29 percent
  - Two Lake Trail – 27 percent
  - Robert White Trail – 25 percent
  - Tailrace Park – 22 percent
  - Headworks OHV Park – 20 percent
- Respondents most frequently mention location as the reason why they choose to use District recreation sites.



- When respondents who have not visited District recreation sites in the last year are asked why they have not done so, the response most frequently received is that they are “too busy” or “not interested in recreation.”
- Among District recreation facilities inquired about, trails were the highest rated facility, with almost 7 out of 10 respondents rating them as “Above Average” or “Excellent.”
- When respondents who are aware of District sites are asked to rate the importance of recreational opportunities, relaxing/hanging out was rated as most important; conversely, jet skiing was rated as least important.
- When respondents who are not aware of District sites are asked to rate the importance of recreational opportunities, children’s playground is rated as most important; conversely, jet skiing was again rated as least important.
- The following summarizes the demographics of survey respondents:
  - Respondents who reside in Platte County comprise 88.3 percent, and respondents who reside in Nance County comprise 11.8 percent.
  - The vast majority of respondents were above the age of 34 and were evenly distributed between the following age ranges: 35 to 44, 45 to 54, 55 to 64, and 65 or older.
  - 62.5 percent of respondents were female; 37.5 percent were male.

More detailed findings are provided in Appendix F, and further analysis will be provided in the updated Initial Study Report on January 6, 2011.

## **SECTION 9                    STUDY 9.0, CREEL SURVEY**

Consistent with the District’s Revised Study Plan (Loup Power District, July 27, 2009) and FERC’s Study Plan Determination (FERC, August 26, 2009), Study 9.0, Creel Survey, has been incorporated in Study 8.0, Recreation Use, and is no longer a stand-alone study.

The combination of the two studies was based on agency input provided during the May 11, 2009, Recreation, Land Use, and Aesthetics Study Plan Meeting. During this meeting, it was determined that Study 8.0, Recreation User Survey, and Study 9.0, Creel Survey (as defined in the District’s Proposed Study Plan) could be combined into a single study that would allow increased survey efficiency.

## **SECTION 10            STUDY 10.0, LAND USE INVENTORY**

### **10.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the land use inventory is to determine specific land uses of Project lands and adjacent properties to identify potential conflicts and/or opportunities relating to Project operations, public access, recreation, aesthetics, and environmental resource protection.

The objectives of the land use inventory are as follows:

1.     To identify and record current and proposed future land uses of Project lands.
2.     To identify and record current and authorized future land uses of adjacent properties.
3.     To identify and map all existing public access points to the Loup Power Canal, regulating reservoirs, and defined recreation areas on Project lands.
4.     To identify and map any areas on Project lands or adjacent properties having potentially incompatible or conflicting land uses.
5.     To identify and map potential opportunities for improving public access to Project lands and recreation areas.
6.     To identify potential opportunities to improve aesthetics on Project lands and recreation areas.
7.     To identify potential opportunities to enhance public safety on Project lands.
8.     To identify potential solutions for any land use conflicts that may be identified.
9.     To provide information on land use, land use conflicts, and access to be used in conjunction with the results of Study 8.0, Recreation Use, to develop a recreation management plan.

### **10.2    STUDY AREA**

The Project extends approximately 35 miles from the Headworks to the Outlet Weir, and the Project Boundary encompasses approximately 5,200 acres of land. Loup Power District owns all lands within the Project Boundary. A large portion of the Project consists of the Loup Power Canal, with a nominal width of 300 feet. The majority of adjacent land is agricultural and is considered compatible with the Project. Areas that may present conflicts or opportunities relating to Project operations, public access, recreation, aesthetics, and environmental resource protection include urban areas, public access points, the five developed recreation areas, and important

environmental features or habitat. Specific land uses of Project lands and adjacent properties at the following sites were carefully evaluated:

- Headworks Park, including Headworks OHV Park
- Lake Babcock Park (aka Loup Park)
- Lake North Park
- Columbus Powerhouse Park
- Tailrace Park
- Loup Lands WMA (leased to NGPC)
- Lake Babcock Waterfowl Refuge (regulated by NGPC)
- North Sand Management Area
- South Sand Management Area
- Siphons
- Areas with evidence of heavy informal usage
- Urban areas of Genoa and Columbus

### **10.3 METHODOLOGY**

Land use classifications were assigned for Project lands and adjacent properties using District maps, applicable comprehensive plans (Nance County and City of Columbus), and available aerial photography. Field observations were also completed to gather detailed land use information for developed areas and for any other areas for which review of aerial photographs provided insufficient information. Land use maps were developed to display the determined land uses and other relevant information.

Based on determined land uses, areas of current land use conflicts and potential future land use conflicts were identified and possible mitigation measures were determined. Additionally, opportunities for improving Project operations, public access, recreation, aesthetics, and environmental resource protection were evaluated.

### **10.4 RESULTS AND DISCUSSION**

The Project has operated for more than 70 years in rural Nance and Platte counties. The Project is a complementary land use to the surrounding area, providing irrigation and recreation opportunities. Despite its 35-mile footprint, the Project's impact on surrounding land is minimal. The Loup Power Canal is a passive presence, running adjacent to private agricultural land for the majority of its length. Public interaction with the Project is concentrated at improved recreation areas, siphons, and major roadway intersections.

The following conclusions have been reached regarding the land use inventory:

- In general, Project land use and operations were found to be compatible with adjacent properties.
- Future land use plans for Nance County and the City of Columbus do not indicate future land use conflicts.
- Restricted Operations Areas are safely separated from publicly accessible areas and do not conflict with recreation opportunities. Restricted Operations Areas total approximately 556 acres.
- Approximately 90 percent of the Project lands are accessible to the public from numerous locations—improved recreation areas, land classified as Wildlife Management Areas, the Loup Power Canal, and siphons.

## **SECTION 11            STUDY 11.0, SECTION 106 COMPLIANCE**

### **11.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the Section 106 compliance study is to achieve National Historic Preservation Act (NHPA) Section 106 (16 USC 470f) compliance through a programmatic, ongoing consultation relationship between the District and the Nebraska SHPO.

The objectives of the Section 106 compliance study are as follows:

1.    To review existing information with FERC and the Interested Parties (Nebraska SHPO, the Pawnee Tribe, the Iowa Tribe of Kansas and Nebraska, the Omaha Tribe, the Santee Sioux Tribe, and the Ponca Tribe of Nebraska) to identify consultation needs and additional archival and field data collection requirements.
2.    To gather sufficient information to identify any historic properties that may be affected by the Project.
3.    To conduct field studies to identify and evaluate historic properties, including archaeological properties and elements of the standing structure/built environment as well as properties of traditional religious and cultural value important to Native American tribes.
4.    To document the historic properties in the Area of Potential Effects (APE) and, as applicable, to present management recommendations in technical reports, an ethnographic memorandum, and a historic district documentation package.
5.    To develop, in consultation with Nebraska SHPO, Native American tribes, and the Advisory Council on Historic Preservation (ACHP), a Historic Properties Management Plan (HPMP) in accordance with FERC guidelines (FERC, May 20, 2002).
6.    To develop a Programmatic Agreement (PA) to complete the Section 106 compliance process and to incorporate in the Project license (this is a standard procedure carried out by FERC).

### **11.2    STUDY AREA**

The study area is the APE, or Project Boundary, which encompasses the entirety of the District's holdings that are subject to the relicensing effort described in the PAD (Loup Power District, October 16, 2008). On January 23, 2009, Nebraska SHPO concurred that the Project Boundary, as defined in the PAD, is the APE.

## 11.3 METHODOLOGY

### **Task 1 Phase IA Archaeological Overview**

Prior to the field studies, the District prepared an archaeological resources overview, also referred to as a Phase IA investigation, of the APE for the Project. The Phase IA investigation documented the known archaeological resources in the vicinity of the Project and identified areas where intact archaeological resources may exist.

### **Task 2 Phase I/II Archaeological Inventory and Evaluation**

In the spring of 2010, the District conducted archaeological field studies of areas identified in the Phase IA investigation as having the potential for intact archaeological resources. The field studies identified and evaluated historic properties, including prehistoric and historic archaeological sites.

### **Task 3 Ethnographic Documentation**

The District, in consultation with Native American tribes, will document any known places within the APE that are of traditional religious and cultural importance to the tribes. If locations of traditional religious and cultural importance are identified, the District will consult with FERC, Nebraska SHPO, and the tribes to ascertain the eligibility of these locations for listing on the National Register of Historic Places (NRHP) and the nature of any adverse effects. If necessary, the District will address these findings in its HPMP, discussed under Task 5.

### **Task 4 Historic Building Inventory and Evaluation**

The District inventoried and evaluated the potential historic district identified during early coordination with Nebraska SHPO. The review included standing structures and other engineering features within the APE. This was done in accordance with Federal standards and state guidelines for documentation and provides a documentation package for the property.

### **Task 5 Historic Properties Management Plan**

Based on the results of the studies and documentation efforts discussed in Tasks 1 through 4, the District will prepare an HPMP to summarize the existing conditions of historic properties within the APE; assess reasonably foreseeable adverse effects of operations or maintenance on the historic properties; and establish notification, consultation, and reporting procedures that take into account these effects throughout the licensing period.

**Task 6 Executed Programmatic Agreement**

The executed PA will include signatures from FERC, Nebraska SHPO, Native American tribes, and possibly ACHP to complete Section 106 requirements. The PA is the legal mechanism that implements the HPMP and provides documentary evidence of compliance with Section 106.

**11.4 RESULTS AND DISCUSSION**

**Task 1 Phase IA Archaeological Overview**

The Phase IA Archaeological Overview determined that field studies were necessary for eight areas within the Project Boundary that appear to be undisturbed since the 1930s, or to be within or near documented archaeological sites. These areas retain the greatest potential to illustrate the nature and condition of any archaeological remains within the Project Boundary. Nebraska SHPO concurred with the recommendations in the Phase IA Archaeological Overview on November 11, 2009. The eight sites recommended for field work will be documented in the Phase I/II Archaeological Inventory and Evaluation.

The Phase IA Archaeological Overview contains privileged information and has been filed with FERC as privileged information. As such, detailed results of the study are not included here.

**Task 2 Phase I/II Archaeological Inventory and Evaluation**

The study area included eight study sites, as identified and described in detail in the Phase IA Archaeological Overview. In addition, the perimeter of the entire Loup Power Canal corridor was examined for potential archaeological resources that had not been previously identified. Pedestrian surveys performed in these areas verified surface evidence for six previously recorded sites and one new site.

Eighty-three shovel tests were completed at the study sites and along the canal corridor to examine subsurface soil deposits and to determine if subsurface archaeological materials were present. Archaeological material was recovered from dry-screened fill removed from seven (8.43 percent) of these shovel tests. Prehistoric archaeological material was found in three of these shovel tests, and historic artifacts were recovered from the remaining four shovel tests.

Based on this evaluation, it is recommended that one of the tested sites is eligible for listing on the NRHP; however, further investigation of this site would likely be required. Other, sensitive areas of the canal corridor were identified and should be managed through consultation with Nebraska SHPO and possibly monitored by a professional archaeologist during ground-disturbing activities.

The Phase I/II Archaeological Inventory and Evaluation has been submitted to the Nebraska SHPO and Native American Tribes for review and comment and will be filed with FERC upon resolution of comments. Since the Phase I/II Archaeological



Inventory and Evaluation contains privileged information it will be filed with FERC as privileged information and detailed results of the study are not included here.

**Task 3    *Ethnographic Documentation***

The following tribes were contacted regarding potential input to the ethnographic investigation:

- Ponca Tribe of Oklahoma
- Ponca Tribe of Nebraska
- Omaha Tribe
- Pawnee Tribe
- Winnebago Tribe
- Santee Sioux Nation

None of the contacted tribes responded with information related to places that are of traditional religious and cultural importance. The apparent lack of interest by the tribes regarding the Project may represent reluctance, by some, to divulge sensitive information. The District will continue to coordinate with applicable tribes to provide notice of availability of the Phase IA Archeological Overview and corresponding tribal comments. The Phase I/II Archeological Inventory and Evaluation will also be provided to tribes and concurrently to Nebraska SHPO.

**Task 4    *Historic Building Inventory and Evaluation***

The Historic Building Inventory and Evaluation determined that the Project is a historic district consisting of property eligible for listing on the NRHP. The Project consists of 16 properties that exhibit individual eligibility and 21 properties that lack individual eligibility but contribute to the historic district. The historic district also includes non-contributing properties that are not eligible for listing on the NRHP. The LPD historic district's eligibility is based on Criteria A, B, and C, as set forth in 36 CFR 60.4 and reprinted in National Park Service Bulletin 15, "How to Apply the National Register Criteria for Evaluation" (2002). The Project does not appear to meet the requirements for eligibility under Criterion D. The LPD historic district is significant because it is a potential example with extraordinary historic integrity of a vital national program of rural electrification from the 1930s.

**Task 5    *Historic Properties Management Plan***

Development of the HPMP is pending ultimate review and approval of the studies and documentation efforts discussed in Tasks 1 through 4.

**Task 6 Executed Programmatic Agreement**

Development and execution of the PA is pending ultimate review and approval of the studies and documentation efforts discussed in Tasks 1 through 4 and the HPMP discussed in Task 5.

## **SECTION 12            STUDY 12.0, ICE JAM FLOODING ON THE LOUP RIVER**

### **12.1    GOALS AND OBJECTIVES OF STUDY**

The goal of the study of ice jam flooding on the Loup River is to evaluate the impact of Project operations on ice jam flooding on the Loup and Platte rivers between Fullerton, Nebraska, and North Bend, Nebraska. The study will also develop an ice jam and/or breakup predictive model (limited to examination of Project effects), as well as identify operational or structural measures to mitigate or minimize Project effects on ice jam formation and subsequent flooding, if it is demonstrated that operation of the Project materially impacts ice jam formation on the Loup and Platte rivers.

The objectives of the study of ice jam flooding on the Loup River are as follows:

1.    To evaluate the effect of Project operations on hydrology, sediment transport, and channel hydraulics on ice processes in the Loup and lower Platte rivers
2.    To develop an ice jam and/or breakup predictive model to evaluate Project effects
3.    To identify structural and nonstructural methods for the prevention and mitigation of ice jams, should it be demonstrated that operation of the Project materially impacts ice jam formation on the Loup and Platte Rivers.

### **12.2    STUDY AREA**

The study area includes the Loup River from Fullerton (approximately 12 miles upstream of the Loup Power Canal Headworks) to the confluence with the Platte River (the Loup River bypass reach), the Platte River from just upstream of the confluence of the Loup and Platte rivers to North Bend, and the Loup Power Canal from the Headworks to the Tailrace Canal confluence with the Platte River below the Loup-Platte confluence.

### **12.3    METHODOLOGY**

The District has contracted with USACE to perform the ice jam study as outlined in FERC’s Study Plan Determination. The study includes the following tasks.

#### ***Task 1    History of Ice Jams***

Available records of ice jam flood events, from before and after Project construction, will be analyzed and compared to determine if any statistical basis exists to indicate that Project operations may have a significant incremental effect on the occurrence or severity of these events.

**Task 2 Hydrology and Sedimentation**

Relevant components of hydrology and sedimentation information developed for the Sedimentation, Hydrocycling, and Flow Depletion and Flow Diversion studies will be used by USACE in the ice formation, ice transport, and ice-affected hydraulics analyses being performed for this study.

**Task 3 Ice Formation**

Hydrometeorologic and discharge data have been collected and synthesized from various stations within and near the study area. The correlation between formation of frazil ice and hydrometeorologic conditions and discharge was determined using statistical methods. This analysis will be correlated with actual field observations and power canal shutdowns during periods of frazil ice production. The total volume of frazil ice produced and the growth in ice cover thickness will be estimated. The values for ice production and thickness will be used in Task 5, Ice-Affected Hydraulics.

**Task 4 Ice Transport**

A DynaRICE hydraulic model will be developed for key locations to estimate differences in ice cover formation and/or jam formation that will be utilized in the ice-affected hydraulics analysis as appropriate.

**Task 5 Ice-Affected Hydraulics**

River cross section surveys have been completed although they had been delayed by heavy rains and high water. A HEC-RAS model is being developed to compute the ice-affected hydraulics of the study area and to determine whether Loup Power Canal operations increase or decrease flood risk to overbank infrastructure.

**Task 6 Identification of Methods for Prevention and Mitigation of Ice Jams**

If it is demonstrated that Project operations increase flood risk to overbank infrastructure, structural and nonstructural means will be investigated that may prevent and/or mitigate impacts.

**12.4 RESULTS AND DISCUSSION**

No results or discussion are available at this time. Detailed results and discussion will be provided in the updated Initial Study Report on January 6, 2011.

## **SECTION 13          PCB FISH TISSUE SAMPLING**

### **13.1    BACKGROUND**

In response to the District's Pre-Application Document (Loup Power District, October 16, 2008) and FERC's Scoping Document 1 (FERC, December 12, 2008), USFWS requested that the District perform studies to evaluate total polychlorinated biphenyls (PCBs) within the Project area and immediately downstream (USFWS, February 9, 2009).

As a result of USFWS comments related to PCBs, FERC identified the following issue related to Project operations that could potentially mobilize PCBs (if they are present within the Project Boundary) (FERC, March 27, 2009):

The potential exists for dredging operations to mobilize PCB-laden sediments if present in the settling basin. In addition, small fish discharged onto the North Sand Management Area with sediments during dredging activities could potentially contain PCBs. Such fish could be ingested by federally listed least terns nesting and feeding in the North Sand Management Area. Therefore, we have modified [Scoping Document 2] SD2 to show that we will assess the effects of project operations on PCB transport within the project area.

#### **13.1.1 Revised Study Plan**

The District's Revised Study Plan (Loup Power District, July 27, 2009) included Response 3.0, in which, the District proposed to cooperate with NDEQ to conduct additional fish tissue sampling using existing PCB sampling protocols developed by NDEQ under the U.S. Environmental Protection Agency (EPA) Region VII Ambient Fish Tissue Monitoring Program (RAFTMP). More specifically, Response 3.0 states that NDEQ will perform additional fish tissue sampling in Lake Babcock in association with its regularly scheduled 2009 fish tissue sampling in the Tailrace Canal at the U.S. Highway 30 Bridge. Consistent with current procedures, the additional samples will be provided to the EPA Region VII laboratory in Kansas City, Kansas, for PCB analysis.

#### **13.1.2 Study Plan Determination**

In its Study Plan Determination issued on August 26, 2009, FERC determined that the District's sampling protocol specified in the Revised Study Plan and in combination with the fish tissue sampling results presented in the Pre-Application Document for the Project would be sufficient for the necessary analysis. In addition, FERC stated the following:

The relevant issue for any licensing decision is whether any PCB mobilization caused by project operations affects fishery resources. To

answer that question, it is most appropriate to first sample fish tissue for PCB's in the potentially affected reach (i.e., Lake Babcock) to determine if PCB's are presently affecting fish, regardless of the source.... Should elevated PCB levels be found in the fish tissues, we [FERC] may consider additional PCB monitoring in year 2.

### 13.2 GOALS AND OBJECTIVES OF STUDY

The goal of this study is to determine if Project operations affect PCB transport, and subsequently fishery resources, in the vicinity of the Project.

The objective of this study is to determine if the tissue of bottom-feeding fish collected from two locations in the vicinity of the Project contain PCBs.

### 13.3 STUDY AREA

The study area includes the entire Loup Power Canal. Specifically, fish tissue samples were collected at the following two locations:

- Lake Babcock
- Tailrace Canal at the U.S. Highway 30 Bridge

### 13.4 METHODOLOGY

The District facilitated NDEQ PCB fish tissue sampling in Lake Babcock on August 11, 2009, in association with NDEQ's regularly scheduled 2009 PCB fish tissue sampling in the Tailrace Canal at the U.S. Highway 30 bridge, which occurred on August 12, 2009. Five common carp were collected at each location, in accordance with existing PCB sampling protocols developed by NDEQ under the EPA RAFTMP. The fillets from each collected sample were composited into a single sample and were provided to the EPA Region VII laboratory in Kansas City, Kansas, for PCB analysis.

### 13.5 RESULTS AND DISCUSSION

Analytical results for PCB (Aroclor 1248, 1254, and 1260) concentrations at each sample/site were below the reporting limit for each contaminant<sup>1</sup> (coded "U" in the attached data, see Attachment 13A). For parameters where analytical results were above the reporting limit, NDEQ ran the data through its risk assessment<sup>2</sup> calculation

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<sup>1</sup> Reporting limits are as follows: Aroclor 1248 = 0.04 mg/kg; Aroclor 1254 = 0.03 mg/kg; and Aroclor 1260 = 0.02 mg/kg.

<sup>2</sup> NDEQ's risk assessment methods are used to calculate cancer risks and hazard indices (non-carcinogenic risks) and ultimately assess human health risks associated with consuming fish.

tables. Neither sample/site exceeded current state risk criteria.<sup>3</sup> The summarized results, and those provided in Attachment 13A, have not been officially reported by NDEQ; however, it is anticipated that the data, as provided, will be included in NDEQ's 2009 Fish Tissue Report once all of the statewide data have been received and assessed. Considering the 2009 sample results, NDEQ has indicated that the current fish consumption advisory for the Loup Power Canal will likely be removed following completion of the 2009 Fish Tissue Report in late 2010 or early 2011.<sup>4</sup>

Based on the analytical study results, it is inferred that Project operations are not mobilizing PCBs that could affect fishery resources. Considering these results, it is the District's understanding that no further study is warranted concerning PCBs.

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<sup>3</sup> The risk criteria established by the Nebraska Fish Tissue Advisory Committee include fish tissue that 1) are found to have mercury concentrations equal to or greater than 0.215 mg/kg, 2) have contaminant concentrations that may be associated with adverse health effects (Hazard Quotient greater than 1.0), or 3) may be associated with an excess cancer risk greater than or equal to 1 in 10,000 when ingested.

<sup>4</sup> NDEQ notes that even after the 2009 Fish Tissue Report is finalized, the Loup Power Canal would not be removed from the Clean Water Act Section 303(d) list of impaired water bodies until NDEQ's 2012 Integrated Report (the final product resulting from the October 12, 2006, EPA-issued guidance for 2008 water body assessments and reporting requirements for Sections 303(d), 305(b), and 314 of the Clean Water Act) is finalized.

**ATTACHMENT 13A**

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**NDEQ FISH TISSUE SAMPLING DATA**



ASR_Number	Sample_Number	Analysis_Name	Analyte_Name	Units	Final_Result	Detection_ID	Start_Date	End_Date	Location_Desc	Latitude	Longitude
<b>Loup Power Canal</b>											
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1248	mg/kg	0.04	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1254	mg/kg	0.03	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1260	mg/kg	0.02	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	G-BHC	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	cis-Chlordane	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Chlordane, technical	mg/kg	0.03	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	trans-Chlordane	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDD	mg/kg	0.004	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDE	mg/kg	0.005	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDT	mg/kg	0.005	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Dieldrin	mg/kg	0.003	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Heptachlor	mg/kg	0.003	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Heptachlor Epoxide	mg/kg	0.003	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Hexachlorobenzene	mg/kg	0.001	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	cis-Nonachlor	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	trans-Nonachlor	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Oxychlordane	mg/kg	0.002	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Pentachloroanisole	mg/kg	0.001	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Followup Fish Pesticides, Fillet, by GC/EC	Trifluralin	mg/kg	0.003	U	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Mercury in Tissue	Mercury	mg/kg	0.0755		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Metals in Fish by ICP-AES	Cadmium	mg/kg	0.02	UJ	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Metals in Fish by ICP-AES	Lead	mg/kg	0.14	UJ	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Metals in Fish by ICP-AES	Selenium	mg/kg	0.45	UJ	08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	Percent Lipid in Tissue	Lipid	%	2.1		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Average Length	mm	429.80		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Average Weight	Grams	1158.2		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	County	N/A	Platte		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Fish Species	I.D.	12		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Fish Species Name	N/A	CmmnCarp		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Fish Type	N/A	BtmFeedr		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Latitude	Dec. Deg.	41.43848		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Longitude	Dec. Deg.	97.28248		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Number of Specimens	#	5		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Sample Type	N/A	Followup		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	State	N/A	NE		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Targeting Rationale	N/A	Targeted		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Tissue Analyzed	N/A	Fillet		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Waterbody Name	N/A	LoupRvrCnl		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Waterbody Type	N/A	NonWade		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248
4647	105	RAFT Fish Field Parameters	Year	N/A	2009		08/12/2009	08/12/2009	Loup Power Canal, Columbus	41.43848	97.28248

ASR_Number	Sample_Number	Analysis_Name	Analyte_Name	Units	Final_Result	Detection_ID	Start_Date	End_Date	Location_Desc	Latitude	Longitude
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1248	mg/kg	0.04	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1254	mg/kg	0.03	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Aroclor 1260	mg/kg	0.02	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	G-BHC	mg/kg	0.002	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	cis-Chlordane	mg/kg	0.002	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Chlordane, technical	mg/kg	0.03	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	trans-Chlordane	mg/kg	0.002	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDD	mg/kg	0.004	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDE	mg/kg	0.0078		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	p,p'-DDT	mg/kg	0.005	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Dieldrin	mg/kg	0.003	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Heptachlor	mg/kg	0.003	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Heptachlor Epoxide	mg/kg	0.003	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Hexachlorobenzene	mg/kg	0.001	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	cis-Nonachlor	mg/kg	0.002	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	trans-Nonachlor	mg/kg	0.0020		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Oxychlordane	mg/kg	0.002	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Pentachloroanisole	mg/kg	0.001	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Followup Fish Pesticides, Fillet, by GC/EC	Trifluralin	mg/kg	0.003	U	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Mercury in Tissue	Mercury	mg/kg	0.143		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Metals in Fish by ICP-AES	Cadmium	mg/kg	0.02	UJ	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Metals in Fish by ICP-AES	Lead	mg/kg	0.19	J	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Metals in Fish by ICP-AES	Selenium	mg/kg	0.45	UJ	08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	Percent Lipid in Tissue	Lipid	%	3.1		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Average Length	mm	499.40		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Average Weight	Grams	1881.2		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	County	N/A	Platte		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Fish Species	I.D.	12		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Fish Species Name	N/A	CmmnCarp		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Fish Type	N/A	BtmFeedr		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Latitude	Dec. Deg.	41.48772		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Longitude	Dec. Deg.	97.36406		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Number of Specimens	#	5		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Sample Type	N/A	Status		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	State	N/A	NE		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Targeting Rationale	N/A	Targeted		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Tissue Analyzed	N/A	Fillet		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Waterbody Name	N/A	LkBabcock		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Waterbody Type	N/A	Lake B		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406
4648	114	RAFT Fish Field Parameters	Year	N/A	2009		08/11/2009	08/11/2009	Lake Babcock, Columbus	41.48772	97.36406

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**SECTION 14            REFERENCES**

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