



TO: FINANCE COMMITTEE
FROM: EXECUTIVE DIRECTOR'S OFFICE
SUBJECT: CARDNO ENTRIX MANUSCRIPT PREPARATION TASK ORDER
DATE: MAY 27, 2014

The Executive Director's Office (EDO) is requesting Finance Committee (FC) approval to execute Task Order NCF-PLV-2014-01 under the 2012 Master Agreement with Cardno Entrix. The task order would approve expenditure of \$24,606 to prepare two manuscripts for publication based on vegetation scour research performed for the Program under two previous task orders. The funds would be expended from approved 2014 budget line item PD-3, AMP and IMRP Peer Review. A total of \$31,050 has been budgeted in that line item for peer review of lateral erosion research performed under Task Order NCF-2012-02. Manuscript preparation and publication would be pursued in lieu of peer review.

Task Order NCP-PLV-2014-01 is included as Attachment 1. The two previously executed task orders (NCF-2012-02 and NCF-2012-01) are included in Attachment 2. The Master Agreement is included as Attachment 3.

Attachment 1 – Task Order NCP-PLV-2014-01

Attachment 2 – Task Orders NCF-2012-01 and NCF-2012-02

Attachment 3 – 2012 Master Agreement with Cardno Entrix



- 1 **Attachment 1 - Task Order NCP-PLV-2014-01**
- 2

Master Professional Services Agreement

TASK ORDER

Cardno Project ID: TBD

Client: Nebraska Community Foundation

Task Order No. NCF-PLV-2014-01

Date: May 13, 2014

Client Purchase Order No. _____

PROJECT: Platte River Recovery Implementation Program – Directed Vegetation Research

This order is issued pursuant to our Agreement dated June 14, 2012 and unless otherwise specified herein, the performance of services hereunder and the payment thereof shall be subject to the terms and conditions of said Agreement. The services authorized hereunder are described below.

DESCRIPTION OF SERVICES: Cardno shall perform the following Services (hereafter "Services"):

Prepare two manuscripts for journal publication as described in the attached SOW, Exhibit A.

ESTIMATED TOTAL COST: \$24,606.00

Schedule: Commencement Date: May 13, 2014

Estimated Completion Date: December 31, 2014

Contract Price: Subject to the terms below, Client will compensate Cardno as follows:

Time and materials, as per agreement.

Unless otherwise noted, the fees in this agreement do not include any value added, sales, or other taxes that may be applied by any government entity on fees for services. Such taxes will be added to all invoices as required.

Where the Services or services conditions change, Cardno shall submit to the Client in a timely manner, documentation of the revisions to Exhibit "A" adjusting the Contract Services Time and Price as required.

Master Professional Services Agreement

TASK ORDER

Unless otherwise specified, charges for services are based on Cardno's 2012-13 Schedule of Fees ("Rate Schedule"). The Rate Schedule is subject to escalation from time to time.

Cost Estimate: Any opinion of costs of construction prepared by Cardno is supplied only for the general guidance of the Client. Cardno has no control over the cost of labor, materials, equipment or services furnished by others, or over contractors' methods of determining prices, or other competitive bidding or market conditions. Cardno's preparation of Cost Estimates are made on the basis of Cardno's experience and judgment and are Cardno's opinion of the cost of construction and not a guarantee of the accuracy of such opinion as compared to contract bids or actual costs to Client. Cardno does not warrant that bids or ultimate construction costs will not vary from its opinion of cost estimates.

Reimbursable Expenses: As contemplated throughout this Agreement, Reimbursable Expenses are an obligation of the Client and such Reimbursable Expenses will be included on the invoices issued to Client per the Cardno fee schedule.

CARDNO'S REPRESENTATIVE: Natasha Bankhead

CLIENT'S REPRESENTATIVE: Jason Farnsworth

ACCEPTED:

Cardno ENTRIX

Nebraska Community Foundation

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

Exhibit A

Directed Vegetation Research – Manuscript Preparation



Prepared for Platte River Recovery
Program (PRRIP)
February 2014

Directed Vegetation Research

Proposal to prepare two manuscripts for
journal publication

Prepared for
Platte River Recovery Implementation Program
4111 4th Avenue, Suite 6
Kearney, NE 68845
(308) 237-5728

Prepared by
Cardno ENTRIX
PO Box 1236, Oxford, MS 38655
Toll-free 800 368 7511
www.cardnoentrix.com

Table of Contents

Overview.....	1
Task 1: Field Data Collection.....	1
Proposed Project Schedule:	1
Proposed Budget and Fees:	2

Overview

This proposal outlines a budget for Cardno ENTRIX to prepare, submit and follow two manuscripts through the review/acceptance process, to publication in relevant journals. The papers will be based on the research previously carried out by Cardno ENTRIX staff, to quantify the resisting and driving forces acting on channel bank and bar vegetation, and implications for lateral erosion of bars, and management of vegetation and sediment within the Central Platte River.

Task 1: Manuscript Preparation, Submittal and Response to Reviews

Suitable avenues for publication will be selected in conjunction with PRRIP and their TAC, for two journal articles:

- 1) Quantifying the driving and resisting forces acting on bank and bar vegetation in the Central Platte River, and implications for management
- 2) Quantifying the effects vegetation on lateral bank and bar erosion rates in the Central Platte River

Possible journals include Water Resources Research, Earth Surface Processes and Landforms, Geomorphology, and Ecological Engineering

Total Fee for Task 1: \$24,606

Deliverables:

- Two peer-reviewed, published articles in well respected journals in the field of fluvial geomorphology.

Proposed Project Schedule:

Task	Start	Comments
Prepare manuscripts	Spring 2014	1 week of preparation per manuscript
Get manuscripts into review	Early Summer 2014	Length of review process depends on journal selected
Respond to reviewers comments, and move to publication	Fall 2014**	** Depends on review process of journal

Proposed Budget and Fees:

	Cardno ENTRIX			TOTAL CARDNO ENTRIX LABOR	TOTAL REIMBURSABLE EXPENSES (w/markup)	TOTALS
	Bankhead, Natasha Sr. Project Scientist	Simon, Andrew Senior Consultant	Maline, Wendy Project Coordinator			
Platte River Manuscript Prep						
Hourly Billing Rate, Markup, or Unit Cost:	\$ 170	\$ 230	\$ 95			
Phase 1 -						
1.1 Manuscript submittal						
Prepare two manuscripts for journal submission	80	8		\$ 15,440	\$ -	\$ 15,440
Response to review comments	38	6		\$ 7,840	\$ -	\$ 7,840
Project management			4	\$ 380	\$ -	\$ 380
TOTAL - Phase 1	118	14	4	\$ 23,660	\$ -	\$ 23,660
Total Hours or Amounts	118	14	4	136.0	\$ -	
Communication Fee					\$ 946	
TOTAL PROJECT COST				\$ 23,660	\$ 946	\$ 24,606

About Cardno ENTRIX

Cardno ENTRIX is an environmental and natural resource management consulting firm specializing in water resources management, natural resources management, environmental permitting & compliance, and environmental liability management. We serve a wide range of private and public clients, including industry and government agencies, who are faced with challenges that demand environmental experience, strategic planning, and practical sustainable solutions.

About Cardno

Cardno is a professional infrastructure and environmental services company, with specialist expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASK:CDD].

Contact

1223 Jackson Ave East, Suite 103, Oxford, MS 38655

p: 662 236 6983

f: 662 281 9942

1 800 368 7511
www.cardnoentrix.com
www.cardno.com





1 **Attachment 2 – Task Orders NCF-2012-01 and NCF-2012-02**

2

RECEIVED
JUL 09 2012
Cardno ENTRIX / Concord
FRONT DESK



TASK ORDER

Task Order No.: NCF-2012-01
Date: June 21, 2012
ENTRIX Project No.: TBD

Nebraska Community Foundation
PO Box 83107
Lincoln, Nebraska 68501

Attn: Diane M. Wilson

Platte River Recovery Implementation Program (PRRIP)

This Task Order No. NCF-2012-01 is issued pursuant to our Agreement dated June 14, 2012 and unless otherwise specified herein, the performance of services hereunder and the payment therefore shall be subject to the terms and conditions of said Agreement. The services authorized hereunder are described below.

DESCRIPTION OF SERVICES:	<u>"Task 1: Revisions to Original Report" as outlined in proposal dated June 2012 (copy attached).</u>
BILLING PROCEDURES:	<u>Time and Materials, as per Agreement</u>
ESTIMATED TOTAL COST:	<u>\$20,467.00</u>
ESTIMATE OF TIME SCHEDULE:	Starting Date: <u>07/01/12</u> Completion Date: <u>08/31/12</u>
CLIENT'S REPRESENTATIVE:	<u>Jason Farnsworth</u>
CARDNO ENTRIX'S REPRESENTATIVE:	<u>Natasha Bankhead</u>

ACCEPTED:

Cardno ENTRIX

Nebraska Community Foundation

By: <u><i>[Signature]</i></u>	By: <u><i>[Signature]</i></u>
Title: <u>Business Manager</u>	Title: <u>DIANE M. WILSON</u>
Date: <u>7-9-12</u>	Date: <u>CHIEF OPERATING OFFICER / CHIEF FINANCIAL OFFICER</u>

Directed Vegetation Research

A proposal to investigate the potential for Short Duration High Flow events to erode bar and bank edges with and without vegetation, along select reaches of the Platte River, Nebraska.



Prepared for Platte River Recovery
Program (PRRIP)
June 2012



Directed Vegetation Research

A proposal to investigate the potential for Short Duration High Flow events to erode bar and bank edges with and without vegetation, along select reaches of the Platte River, Nebraska.

Prepared for
Platte River Recovery Implementation Program
4111 4th Avenue, Suite 6
Kearney, NE 68845
(308) 237-5728

Prepared by
Cardno ENTRIX
1223 Jackson Avenue East, Suite 301, Oxford, MS 38655
Toll-free 800 368 7511
www.cardnoentrix.com

Table of Contents

Overview.....	1
Task 1: Revisions to Original Report.....	1
1.1 Assumptions:.....	1
1.2 Deliverables:.....	1
Task 2: Lateral bar and bank erosion study	2
2.1 Background.....	2
2.2 Overall Objective.....	3
2.2.1 Sub-Objectives.....	3
2.3 Approach.....	3
2.3.1 Option 1: Without fieldwork	4
2.3.2 Option 2: With fieldwork	5
2.4 Assumptions:.....	5
2.5 Deliverables:.....	5
Task 3: Report Writing.....	7
3.1 Assumptions:.....	7
3.2 Deliverables:.....	7
Proposed Project Schedule:.....	7
Project Budget Totals:	7

Overview

This proposal outlines potential work to improve the current Directed Vegetation Report provided to PRRIP by Drs Bankhead and Simon during their tenure at USDA, and an additional new study to investigate lateral bank and bar erosion with and without vegetation. This work will aim to link the original field and modeling results provided to PRRIP, with additional data from the Elm Creek Reach, to provide more detailed predictions for potential plant removal during Short Duration High Flow events (SDHFs), and the impact of vegetation management, such as mechanical plant removal, on sediment delivery from bar and bank edges. This work involves the following tasks:

1. Read and respond to review comments provided by PRRIP reviewers to original directed vegetation report;
2. Investigate the potential effects of vegetation management strategies on lateral erosion rates of bar and bank edges along the Platte River.
3. Provide new version of original Directed Vegetation Report and an additional report containing the results of the lateral erosion investigation;

Task 1: Revisions to Original Report

The first task that would be performed would be to respond to additional reviews of the original Directed Vegetation Report that have now been delivered to PRRIP. Revision of the report would include:

1. A response to editorial comments and addition of further statistical analyses;
2. Work with EDO to develop explicit velocity scour thresholds for individual plants and plant patches – to include depth-drag relations and velocity-drag relations;
3. Use 2-D stage-velocity model provided by PRRIP to *discuss* in more detail likely patterns of plant removal and scour with reference to the field and modeled results for plant pullout forces provided in the original report, and the depth-drag and velocity-drag relations developed in 2.

1.1 Assumptions:

- PRRIP delivers 2-D stage-velocity model for Elm Creek Complex.

1.2 Deliverables:

- Depth-drag relations and velocity-drag relations
- Discussion of likely patterns of plant removal based on 2D model

Total Fee for Task 1: \$ 20,467

Task 2: Lateral bar and bank erosion study

2.1 Background

The establishment of vegetation on bars, and the presence of a riparian corridor commonly populated with established cottonwood forests have produced a change in the relative resisting forces of the bed, banks and bar edges compared to when the Platte River freely braided across its floodplain. The root networks of plants add resistance to the materials they grow in, affecting both the geotechnical resistance of bank and bar edges to mass wasting processes (Simon and Collison, 2002; Pollen-Bankhead et al., 2009), and also the resistance of bank and bar materials to hydraulic erosion from flow in the channel (Simon et al., 2011). In materials that have lower cohesions (such as the sands that dominate the Platte River system) the addition of roots can have a particularly significant effect on the balance between resisting and driving forces acting on the bed and banks; for sand, typically having < 1 kPa of effective cohesion, even the addition of a few sparse cottonwood seedlings providing additional root-cohesion of roughly 3 kPa (BSTEM; Simon et al., 2011) would increase the geotechnical resistance of the banks by ~300 %, a change that can lead to preferential erosion of the bed compared to root-reinforced bars and banks.

Plant roots can also have a significant influence on the resistance of streambank and bar materials to hydraulic scour. In recent years, a significant amount of work has been conducted on the hydraulic effects of vegetation on geomorphic processes. Several laboratory flume and field studies have examined the effects of plant roots on erosion in upland concentrated flows (Mamo and Bubenzer, 2001a; 2001b; Gyssels and Poesen, 2003; Gyssels *et al.*, 2005; Zhou and Shangguan, 2005; De Baets *et al.*, 2006; 2007), and have shown an exponential decline in rill erodibility and soil detachment rates with increasing root-length densities and root biomass. Flume studies have shown that root architecture can play an important role in reducing soil erosion, with fine-rooted grasses being particularly effective at preventing soil detachment (De Baets *et al.*, 2006). The results of these studies are also relevant for streambanks and bars with exposed root zones near to the water surface, because the root zone of vegetation growing on the top of streambanks and bars, rather than the plant canopy, interacts with flowing water.

Braided channels are characterized by abundant bedload and mobile bank/bar sediments with little if any cohesive strength. Removal of vegetation from bars and near-bank zones could alter the morphology of the Central Platte River, by reducing the resistance of the bar and bank materials to hydraulic and geotechnical erosion, thus re-mobilizing bank and/or bar sediments, and increasing the sediment load of the system. A previous study by Bankhead et al. (2010) showed that drag forces alone only have the potential to remove the youngest and weakest cottonwood and sandbar willow seedlings, and that once either of these species, or phragmites and Reed canarygrass are established, removal of these plants through drag forces alone is very unlikely even during Short Duration High Flow events (SDHFs). In the same study the potential for vertical scour around plant stems to increase the potential for plant removal during these SDHFs was also examined, but calculations suggested that this process was not significant enough to increase the likelihood of plant removal. The authors concluded that the effects of vegetation on lateral erosion of bar and bank materials should also be investigated to examine:

1. The potential for SDHFs to remove bar and bank vegetation through the mechanisms of lateral hydraulic erosion of bank and bar edges, followed by subsequent geotechnical erosion of these surfaces, and

2. The volume of sediment eroded by SDHF events with and without bar and bank vegetation being present.

A study to examine these questions would allow PRRIP to develop a more detailed idea of the locations and plants that could potentially be removed by SDHF events. In addition this study would allow PRRIP to better understand the potential effects of vegetation removal and management, on channel morphology and sediment dynamics within a given reach.

2.2 Overall Objective

To assess PRRIP's Flow-Sediment-Mechanical (FSM) management strategy for removal and management of vegetation, through a series of Bank Stability and Toe Erosion Model (BSTEM) runs.

2.2.1 Sub-Objectives

1. Quantify resisting forces provided by bed and bank materials, with and without vegetation, to include at a minimum, cottonwood, phragmites, and Reed canarygrass. Existing data and data collected as part of this work will be used in the models RipRoot and BSTEM.
2. Quantify lateral erosion rates and volumes at bank and bar edges, with and without vegetation, under various SDHF scenarios, up to 8,000 cfs, using BSTEM Static 5.4.
3. Quantify lateral erosion rates and volumes at bank and bar edges, for various longer term flow records. The use of BSTEM Dynamic 1.0 will allow for additional analysis of the importance of prolonged low to medium flows on bar and bank edge erosion.

2.3 Approach

To model the effect of potential vegetation management strategies on bank and bar erosion and thus bar sediment mobility, both geotechnical and hydraulic processes must be modeled. The Bank Stability and Toe Erosion Model (BSTEM) developed by Simon et al. (2000) incorporates not only geotechnical stability and hydraulic erosion algorithms, but also the root-reinforcement algorithm, RipRoot (Pollen and Simon, 2005; Pollen, 2007; Thomas and Pollen-Bankhead, 2009). It is thus the perfect modeling tool to investigate the effects of riparian vegetation on lateral erosion of bar and bank edges along the Platte River.

As bar and bank edge stability is a function of the strength of the material to resist collapse under gravity, measurements of the components of shearing resistance (or shear strength) of both the soil and the roots are required. In addition, tests of the resistance of the bank and bar materials to erosion by flowing water are required so that scour and undercutting can be calculated. In the previous study the following data were collected:

1. Root tensile strength for phragmites, Reed canarygrass and cottonwood;
2. Plant pullout resistances;
3. Stem density ranges;
4. Particle size distributions for bar materials.

In addition to the previously collected data, to model lateral erosion of the bar and bank edges within BSTEM, the following data must either be collected in the field, or estimated in some way:

1. Root density and diameter distributions for phragmites, Reed canarygrass and cottonwood, with associated stem densities, at each cross section to be modeled;
2. Bar material shear strength (obtained through *in situ* Borehole Shear Tests (BSTs));
3. Surface erodibility of bar material with and without roots (obtained *in situ* using a jet test device).

A series of cross sections will be selected throughout the Elm Creek complex, to model bank and bar geotechnical and hydraulic lateral erosion rates. These sites will be selected based on the availability of existing repeat cross sections and monitoring data detailing vegetation characteristics before and after flow events of known magnitude and duration. The Cardno ENTRIX team will coordinate with PRRIP and Tetra Tech to select cross sections to model. This flow and cross section data will allow for calibration (of Manning's *n* and hydraulic erodibility) and validation of the combined RipRoot/BSTEM predictions of lateral erosion rates.

Lateral retreat rates will be modeled for both 3-day SDHFs using BSTEM Static 5.4 and for longer, more complex hydrographs (for example an annual hydrograph) using BSTEM Dynamic 1.0. In each model, runs will be performed with and without bar vegetation so that the effect of vegetation on current erosion rates can be compared with management options that involve removal of bar vegetation. There are two possible approaches for modelling the bar and bank sites in BSTEM. These are outlined below.

2.3.1 Option 1: Without fieldwork

In this option we will use RipRoot to calculate minimum and maximum root-reinforcement using the range of stem densities previously collected for the first study, and a range of root densities to be estimated based on the team's database of values for other riparian species. In this approach, existing and newly estimated data will be used in the RipRoot model to provide upper and lower bounds of root-reinforcement for each species, over the typical range of stem densities for that species.

To populate BSTEM Static 5.4 and BSTEM Dynamic 1.0, geotechnical and hydraulic data are required. If no further fieldwork is carried out default values can be selected based on particle size information collected for the previous study, and additional particle size data provided by PRRIP. If default values are used for geotechnical and hydraulic properties, we propose that minimum and maximum values be input to BSTEM so that the potential range of erosion rates and volumes with and without vegetation can be estimated (1) with vegetation, minimum root strength and soil resistances 2) with vegetation, maximum root strength and soil resistance 3) without vegetation, minimum soil resistance, and 4) without vegetation, maximum soil resistance).

Total Fee for Task 2: Without fieldwork \$ 38,355

2.3.2 Option 2: With fieldwork

In this option RipRoot will be populated with actual root reinforcement and stem density collected at each cross section to be modeled. In this approach, Cardno ENTRIX staff will perform fieldwork to measure stem and root densities at each bar/bank edge to be modeled in BSTEM.

To populate BSTEM fieldwork can also be carried out to measure the geotechnical and hydraulic properties of the bar and bank sites *in situ*. BSTs would be used to measure bar and bank material shear strength, and jet tests would be used to measure resistance to hydraulic erosion of bar and bank materials. If field values are collected then these values will be input to BSTEM and only two sets of runs will be necessary per site (with and without vegetation).

Total Fee for Task 2: With fieldwork \$56,892

In both cases, Cardno ENTRIX staff will concentrate on the age ranges of species previously studied in the original report (young 1-2 yr old cottonwood seedlings and young to well developed stands of Phragmites and RCG).

The benefit of measuring the root data, geotechnical and hydraulic material properties in the field is the ability to model each cross section with site specific data. This obviously provides the best chance of the model results providing accurate predictions of lateral erosion of bar and bank edges, with and without vegetation. Without in-field data collection model output will provide a range of potential values for each site modeled, which will make it harder to validate results against the repeat cross sections to be provided by PRRIP/Tetra Tech. Modeling results obtained using field data will be more reliable, given the potential range of conditions within a reach.

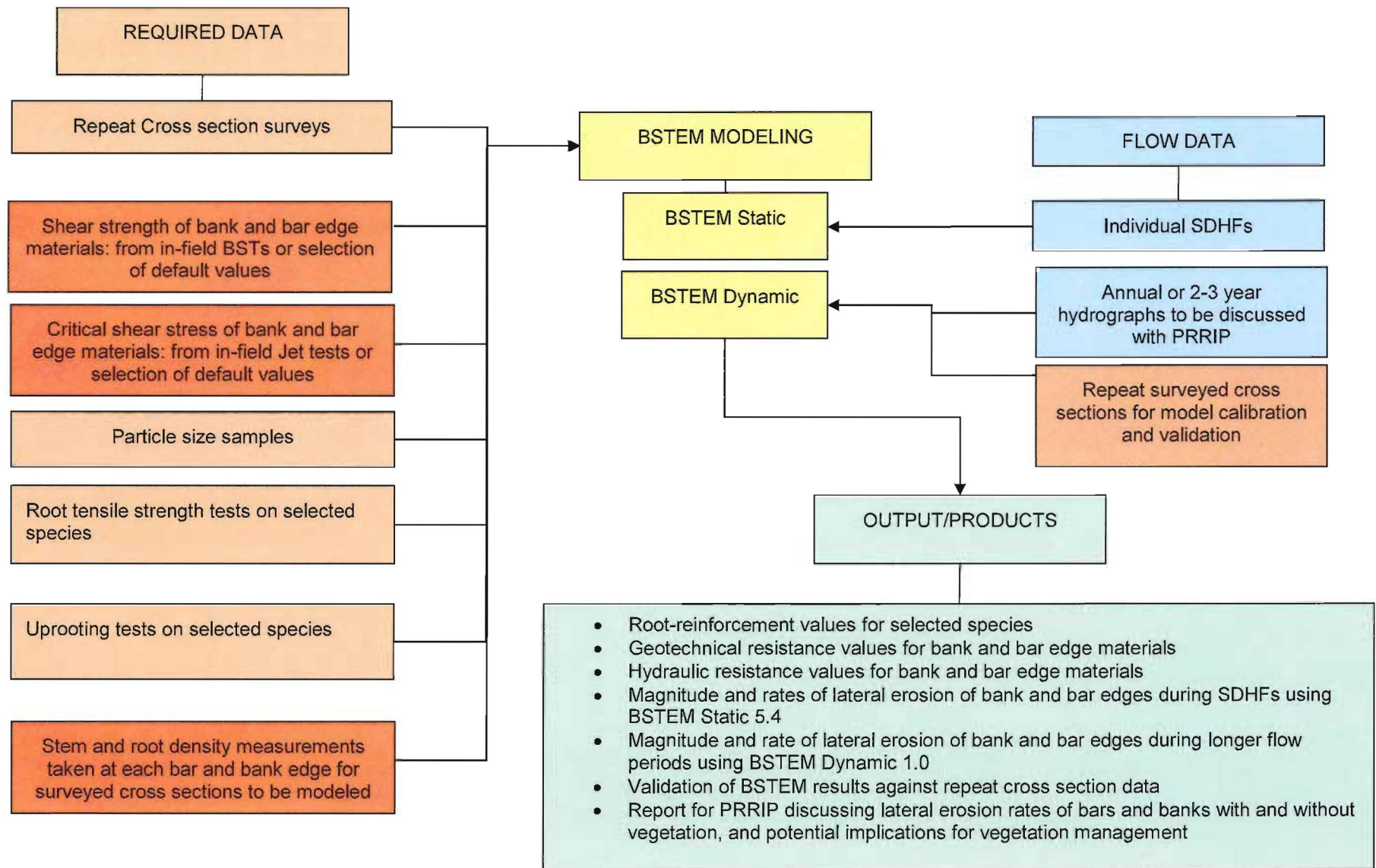
Required data and expected output are shown in the flow chart on the next page (pale orange boxes represent data that was either collected in the previous vegetation study, or is available from PRRIP for use in this study; dark orange boxes represent data that require further data collection or estimation).

2.4 Assumptions:

- Repeat cross sections and flow data will be provided by PRRIP
- If the default values option is selected PRRIP will also provide vegetation data accompanying the selected cross sections to model
- PRRIP will provide any available particle size data to assist in BSTEM model setup

2.5 Deliverables:

- Root-reinforcement values for selected species
- Geotechnical resistance dataset for bank and bar edge materials (if measured in field)
- Hydraulic resistance dataset for bank and bar edge materials (if measured in field)
- Magnitude and rates of lateral erosion of bank and bar edges during SDHFs using BSTEM Static 5.4
- Magnitude and rate of lateral erosion of bank and bar edges during annual hydrographs using BSTEM Dynamic 1.0
- Validation of BSTEM results against repeat cross section data
- Report for PRRIP discussing lateral erosion rates of bars and banks with and without vegetation, and potential implications for vegetation management



Task 3: Report Writing

The final task for Cardno ENTRIX staff will be to provide PRRIP with:

1. A modified version of the original Directed Vegetation Report containing the additional work detailed in Task 1;
2. A new report detailing the additional work outlined in Task 2, investigating the effects of SDHFs and vegetation management practices on lateral bar and bank erosion rates.

3.1 Assumptions:

- Data required from PRRIP are received in a timely manner
- Field data is collected according to schedule below and is not affected by high flows/weather

3.2 Deliverables:

- Modified version of original Directed Vegetation Report
- New report detailing lateral bar and bank erosion study

Total Fee for Task 3: \$ 26,770

Proposed Project Schedule:

Task	Start	End	Comments
Revisions to original report	7/1/12	9/1/12	Can begin as soon as contract received
Fieldwork	8/1/12	10/1/12	1 week of fieldwork to be carried out between these dates
BSTEM Modeling	8/1/12	11/30/12	Model set up can begin before field data collection if PRRIP provide repeat cross sections
Report Writing		12/31/12	Project close out by end 2012

**Project Budget Totals: \$85,592 without fieldwork;
 \$103,609 with fieldwork.**

About Cardno ENTRIX

Cardno ENTRIX is an environmental and natural resource management consulting firm specializing in water resources management, natural resources management, environmental permitting & compliance, and environmental liability management. We serve a wide range of private and public clients, including industry and government agencies, who are faced with challenges that demand environmental experience, strategic planning, and practical sustainable solutions.

About Cardno

Cardno is a professional infrastructure and environmental services company, with specialist expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASK:CDD].

Contact

1223 Jackson Ave East, Suite 103, Oxford, MS 38655

p: 662 236 6983

f: 662 281 9942

1 800 368 7511
www.cardnoentrix.com
www.cardno.com



RECEIVED

AUG 08 2012

Cardno ENTRIX / Concord
FRONT DESK



TASK ORDER

Task Order No.: NCF-2012-02
Date: July 26, 2012
ENTRIX Project No.: 33870001.00

Nebraska Community Foundation
PO Box 83107
Lincoln, Nebraska 68501

Attn: Diane M. Wilson

Platte River Recovery Implementation Program (PRRIP)

This Task Order No. NCF-2012-02 is issued pursuant to our Agreement dated June 14, 2012 and unless otherwise specified herein, the performance of services hereunder and the payment therefore shall be subject to the terms and conditions of said Agreement. The services authorized hereunder are described below.

DESCRIPTION OF SERVICES:

"Task 2: Lateral Bar and Bank Erosion Study (with fieldwork) and Report Writing" as outlined in proposal dated June 2012 (copy attached).

BILLING PROCEDURES:

Time and Materials, as per Agreement

ESTIMATED TOTAL COST:

\$83,662.00

ESTIMATE OF TIME SCHEDULE:

Starting Date: 08/15/12

Completion Date: 12/31/12

CLIENT'S REPRESENTATIVE:

Jason Farnsworth

CARDNO ENTRIX'S REPRESENTATIVE:

Natasha Bankhead

ACCEPTED:

Cardno ENTRIX

Nebraska Community Foundation

By: *Delia*

By: *ALL*

Title: *Business Manager*

Title: *Chief Operating Officer / Chief Financial Officer*

Date: *8-9-12*

Date: *8/06/2012*

Directed Vegetation Research

A proposal to investigate the potential for Short Duration High Flow events to erode bar and bank edges with and without vegetation, along select reaches of the Platte River, Nebraska.



Directed Vegetation Research

A proposal to investigate the potential for Short Duration High Flow events to erode bar and bank edges with and without vegetation, along select reaches of the Platte River, Nebraska.

Prepared for

Platte River Recovery Implementation Program

4111 4th Avenue, Suite 6
Kearney, NE 68845
(308) 237-5728

Prepared by

Cardno ENTRIX

1223 Jackson Avenue East, Suite 301, Oxford, MS 38655
Toll-free 800 368 7511
www.cardnoentrix.com

Table of Contents

Overview	1
Task 1: Lateral bar and bank erosion study	1
1.1 Background	1
1.2 Overall Objective	2
1.2.1 Sub-Objectives	2
1.3 Approach	3
1.3.1 Option 1: Without fieldwork	3
1.3.2 Option 2: With fieldwork	4
1.4 Assumptions:	5
1.5 Deliverables:	5

.....	6
Task 2: Report Writing	7
3.1 Assumptions:.....	7
3.2 Deliverables:.....	7
Proposed Project Schedule:	7
Project Budget Totals: \$65,125 without fieldwork;.....	7
\$83,662 with fieldwork.	7



Overview

This proposal outlines a potential study to be carried out by Bankhead and Simon (the authors of the original Directed Vegetation Report), to investigate lateral bank and bar erosion with and without vegetation. This work will aim to link the original field and modeling results provided to PRRIP, with additional data from the Elm Creek Reach, to provide more detailed predictions for potential plant removal during Short Duration High Flow events (SDHFs), and the impact of vegetation management, such as mechanical plant removal, on sediment delivery from bar and bank edges. This work involves the following tasks:

1. Investigate the potential effects of vegetation management strategies on lateral erosion rates of bar and bank edges along the Platte River.
2. Provide a new report containing the results of the lateral erosion investigation.

Task 1: Lateral bar and bank erosion study

1.1 Background

The establishment of vegetation on bars, and the presence of a riparian corridor commonly populated with established cottonwood forests have produced a change in the relative resisting forces of the bed, banks and bar edges compared to when the Platte River freely braided across its floodplain. The root networks of plants add resistance to the materials they grow in, affecting both the geotechnical resistance of bank and bar edges to mass wasting processes (Simon and Collison, 2002; Pollen-Bankhead *et al.*, 2009), and also the resistance of bank and bar materials to hydraulic erosion from flow in the channel (Simon *et al.*, 2011). In materials that have lower cohesions (such as the sands that dominate the Platte River system) the addition of roots can have a particularly significant effect on the balance between resisting and driving forces acting on the bed and banks; for sand, typically having < 1 kPa of effective cohesion, even the addition of a few sparse cottonwood seedlings providing additional root-cohesion of roughly 3 kPa (BSTEM; Simon *et al.*, 2011) would increase the geotechnical resistance of the banks by ~300 %, a change that can lead to preferential erosion of the bed compared to root-reinforced bars and banks.

Plant roots can also have a significant influence on the resistance of streambank and bar materials to hydraulic scour. In recent years, a significant amount of work has been conducted on the hydraulic effects of vegetation on geomorphic processes. Several laboratory flume and field studies have examined the effects of plant roots on erosion in upland concentrated flows (Mamo and Bubenzer, 2001a; 2001b; Gyssels and Poesen, 2003; Gyssels *et al.*, 2005; Zhou and Shangguan, 2005; De Baets *et al.*, 2006; 2007), and have shown an exponential decline in rill erodibility and soil detachment rates with increasing root-length densities and root biomass. Flume studies have shown that root architecture can play an important role in reducing soil erosion, with fine-rooted grasses being particularly effective at preventing soil detachment (De Baets *et al.*, 2006). The results of these studies are also relevant for streambanks

and bars with exposed root zones near to the water surface, because the root zone of vegetation growing on the top of streambanks and bars, rather than the plant canopy, interacts with flowing water.

Braided channels are characterized by abundant bedload and mobile bank/bar sediments with little if any cohesive strength. Removal of vegetation from bars and near-bank zones could alter the morphology of the Central Platte River, by reducing the resistance of the bar and bank materials to hydraulic and geotechnical erosion, thus re-mobilizing bank and/or bar sediments, and increasing the sediment load of the system. The previous study of vegetation removal mechanisms by Bankhead et al. (2010) showed that drag forces alone, have only the potential to remove the youngest and weakest cottonwood and sandbar willow seedlings; once either of these species, or phragmites and Reed canarygrass are established, removal of these plants through drag forces alone is very unlikely even during Short Duration High Flow events (SDHFs). In the same study, the potential for vertical scour around plant stems to increase the potential for plant removal during these SDHFs was also examined, but calculations suggested that this process was not significant enough to increase the likelihood of plant removal. The authors concluded that the effects of vegetation on lateral erosion of bar and bank materials should also be investigated to examine:

1. The potential for SDHFs to remove bar and bank vegetation through the mechanisms of lateral hydraulic erosion of bank and bar edges, followed by subsequent geotechnical erosion of these surfaces, and
2. The volume of sediment eroded by SDHF events with and without bar and bank vegetation being present.

A study to examine these questions would allow PRRIP to develop a more detailed idea of the locations and plants that could potentially be removed by SDHF events. In addition this study would allow PRRIP to better understand the potential effects of vegetation removal and management, on channel morphology and sediment dynamics within a given reach.

1.2 Overall Objective

To assess PRRIP's Flow-Sediment-Mechanical (FSM) management strategy for removal and management of vegetation, through a series of Bank Stability and Toe Erosion Model (BSTEM) runs.

1.2.1 Sub-Objectives

1. Quantify resisting forces provided by bed and bank materials, with and without vegetation, to include at a minimum, cottonwood, phragmites, and Reed canarygrass. Existing data and data collected as part of this work will be used in the models RipRoot and BSTEM.
2. Quantify lateral erosion rates and volumes at bank and bar edges, with and without vegetation, under various SDHF scenarios, up to 8,000 cfs, using BSTEM Static 5.4.
3. Quantify lateral erosion rates and volumes at bank and bar edges, for various longer term flow records. The use of BSTEM Dynamic 1.0 will allow for additional analysis of the importance of prolonged low to medium flows on bar and bank edge erosion.

1.3 Approach

To model the effect of potential vegetation management strategies on bank and bar erosion and thus bar sediment mobility, both geotechnical and hydraulic processes must be modeled. The Bank Stability and Toe Erosion Model (BSTEM) developed by Simon et al. (2000) incorporates not only geotechnical stability and hydraulic erosion algorithms, but also the root-reinforcement algorithm, RipRoot (Pollen and Simon, 2005; Pollen, 2007; Thomas and Pollen-Bankhead, 2009). It is thus the perfect modeling tool to investigate the effects of riparian vegetation on lateral erosion of bar and bank edges along the Platte River.

As bar and bank edge stability is a function of the strength of the material to resist collapse under gravity, measurements of the components of shearing resistance (or shear strength) of both the soil and the roots are required. In addition, tests of the resistance of the bank and bar materials to erosion by flowing water are required so that scour and undercutting can be calculated. In the previous study the following data were collected:

1. Root tensile strength for phragmites, Reed canarygrass and cottonwood;
2. Plant pullout resistances;
3. Stem density ranges;
4. Particle size distributions for bar materials.

In addition to the previously collected data, to model lateral erosion of the bar and bank edges within BSTEM, the following data must either be collected in the field, or estimated in some way:

1. Root density and diameter distributions for phragmites, Reed canarygrass and cottonwood, with associated stem densities, at each cross section to be modeled;
2. Bar material shear strength (obtained through *in situ* Borehole Shear Tests (BSTs));
3. Surface erodibility of bar material with and without roots (obtained *in situ* using a jet test device).

A series of cross sections will be selected throughout the Elm Creek complex, to model bank and bar geotechnical and hydraulic lateral erosion rates. These sites will be selected based on the availability of existing repeat cross sections and monitoring data detailing vegetation characteristics before and after flow events of known magnitude and duration. The Cardno ENTRIX team will coordinate with PRRIP and Tetra Tech to select cross sections to model. This flow and cross section data will allow for calibration (of Manning's *n* and hydraulic erodibility) and validation of the combined RipRoot/BSTEM predictions of lateral erosion rates.

Lateral retreat rates will be modeled for both 3-day SDHFs using BSTEM Static 5.4 and for longer, more complex hydrographs (for example an annual hydrograph) using BSTEM Dynamic 1.0. In each model, runs will be performed with and without bar vegetation so that the effect of vegetation on current erosion rates can be compared with management options that involve removal of bar vegetation. There are two possible approaches for modelling the bar and bank sites in BSTEM. These are outlined below.

1.3.1 Option 1: Without fieldwork

In this option we will use RipRoot to calculate minimum and maximum root-reinforcement using the range of stem densities previously collected for the first study, and a range of root densities to be estimated

based on the team's database of values for other riparian species. In this approach, existing and newly estimated data will be used in the RipRoot model to provide upper and lower bounds of root-reinforcement for each species, over the typical range of stem densities for that species.

To populate BSTEM Static 5.4 and BSTEM Dynamic 1.0, geotechnical and hydraulic data are required. If no further fieldwork is carried out default values can be selected based on particle size information collected for the previous study, and additional particle size data provided by PRRIP. If default values are used for geotechnical and hydraulic properties, we propose that minimum and maximum values be input to BSTEM so that the potential range of erosion rates and volumes with and without vegetation can be estimated (1) with vegetation, minimum root strength and soil resistances 2) with vegetation, maximum root strength and soil resistance 3) without vegetation, minimum soil resistance, and 4) without vegetation, maximum soil resistance).

Total Fee for Task 2: Without fieldwork \$ 38,355

1.3.2 Option 2: With fieldwork

In this option RipRoot will be populated with actual root reinforcement and stem density collected at each cross section to be modeled. In this approach, Cardno ENTRIX staff will perform fieldwork to measure stem and root densities at each bar/bank edge to be modeled in BSTEM.

To populate BSTEM fieldwork can also be carried out to measure the geotechnical and hydraulic properties of the bar and bank sites *in situ*. BSTs would be used to measure bar and bank material shear strength, and jet tests would be used to measure resistance to hydraulic erosion of bar and bank materials. If field values are collected then these values will be input to BSTEM and only two sets of runs will be necessary per site (with and without vegetation).

Total Fee for Task 2: With fieldwork \$56,892

In both cases, Cardno ENTRIX staff will concentrate on the age ranges of species previously studied in the original report (young 1-2 yr old cottonwood seedlings and young to well developed stands of Phragmites and RCG).

The benefit of measuring the root data, geotechnical and hydraulic material properties in the field is the ability to model each cross section with site specific data. This obviously provides the best chance of the model results providing accurate predictions of lateral erosion of bar and bank edges, with and without vegetation. Without in-field data collection model output will provide a range of potential values for each site modeled, which will make it harder to validate results against the repeat cross sections to be provided by PRRIP/Tetra Tech. Modeling results obtained using field data will be more reliable, given the potential range of conditions within a reach.

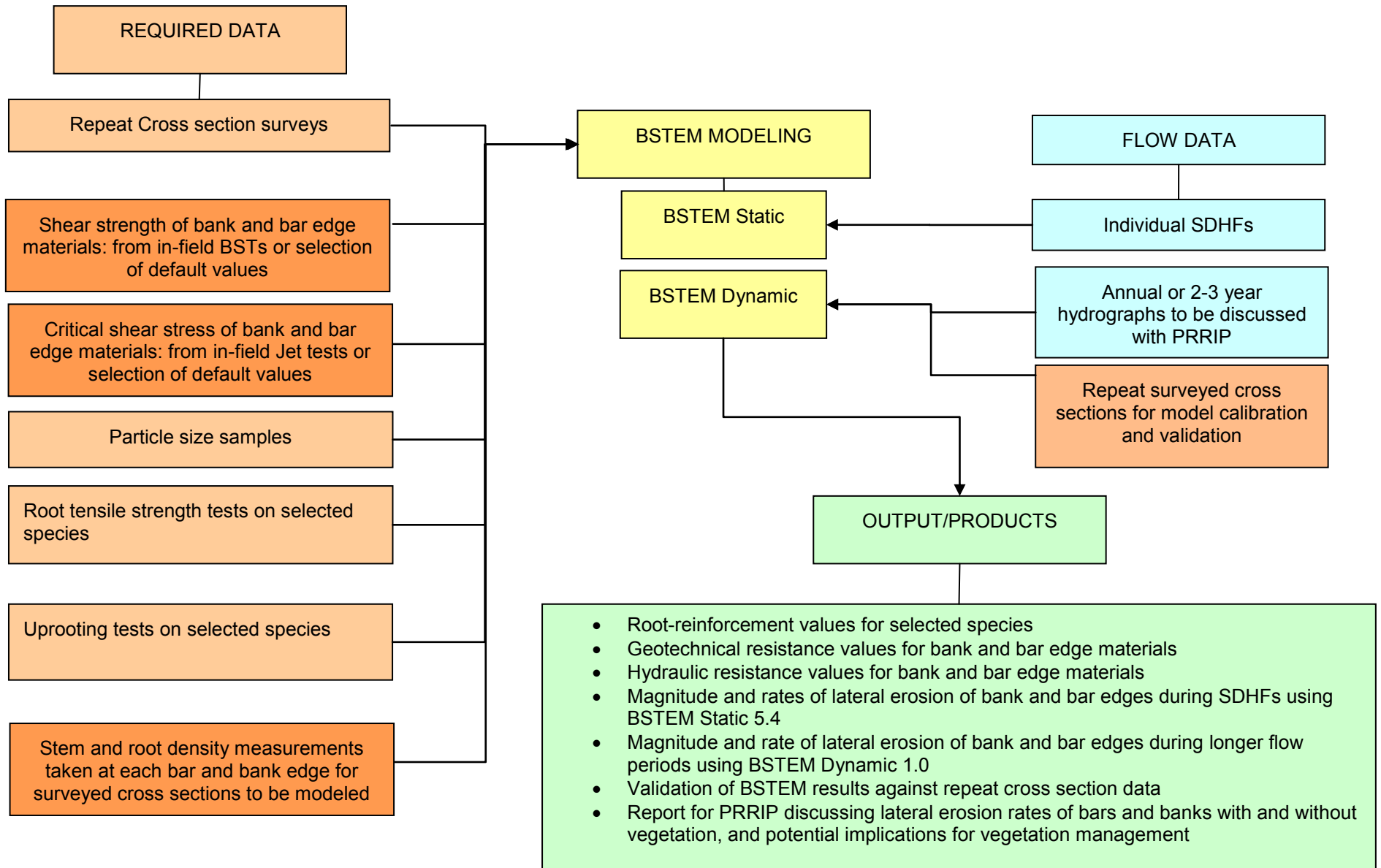
Required data and expected output are shown in the flow chart on the next page (pale orange boxes represent data that was either collected in the previous vegetation study, or is available from PRRIP for use in this study; dark orange boxes represent data that require further data collection or estimation).

1.4 Assumptions:

- Repeat cross sections and flow data will be provided by PRRIP
- If the default values option is selected PRRIP will also provide vegetation data accompanying the selected cross sections to model
- PRRIP will provide any available particle size data to assist in BSTEM model setup

1.5 Deliverables:

- Root-reinforcement values for selected species
- Geotechnical resistance dataset for bank and bar edge materials (if measured in field)
- Hydraulic resistance dataset for bank and bar edge materials (if measured in field)
- Magnitude and rates of lateral erosion of bank and bar edges during SDHFs using BSTEM Static 5.4
- Magnitude and rate of lateral erosion of bank and bar edges during annual hydrographs using BSTEM Dynamic 1.0
- Validation of BSTEM results against repeat cross section data
- Report for PRRIP discussing lateral erosion rates of bars and banks with and without vegetation, and potential implications for vegetation management



Task 2: Report Writing

The final task for Cardno ENTRIX staff will be to provide PRRIP with a new report detailing the additional work outlined in Task 1, investigating the effects of SDHFs and vegetation management practices on lateral bar and bank erosion rates.

3.1 Assumptions:

- Data required from PRRIP are received in a timely manner
- Field data is collected according to schedule below and is not affected by high flows/weather

3.2 Deliverables:

- New report detailing lateral bar and bank erosion study

Total Fee for Task 2: \$ 26,770

Proposed Project Schedule:

Task	Start	End	Comments
Revisions to original report	7/1/12	9/1/12	Can begin as soon as contract received
Fieldwork	8/1/12	10/1/12	1 week of fieldwork to be carried out between these dates
BSTEM Modeling	8/1/12	11/30/12	Model set up can begin before field data collection if PRRIP provide repeat cross sections
Report Writing		12/31/12	Project close out by end 2012

**Project Budget Totals: \$65,125 without fieldwork;
\$83,662 with fieldwork.**

About Cardno ENTRIX

Cardno ENTRIX is an environmental and natural resource management consulting firm specializing in water resources management, natural resources management, environmental permitting & compliance, and environmental liability management. We serve a wide range of private and public clients, including industry and government agencies, who are faced with challenges that demand environmental experience, strategic planning, and practical sustainable solutions.

About Cardno

Cardno is a professional infrastructure and environmental services company, with specialist expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASK:CDD].

Contact

1223 Jackson Ave East, Suite 103, Oxford, MS 38655

p: 662 236 6983

f: 662 281 9942

1 800 368 7511
www.cardnoentrix.com
www.cardno.com





1 **Attachment 3 – 2012 Master Agreement with Cardno Entrix**

RECEIVED

JUL 09 2012

Cardno ENTRIX / Concord
FRONT DESK

CLIENT MASTER AGREEMENT

THIS AGREEMENT, made as of June 14, 2012, by and between Cardno ENTRIX whose mailing address is 2300 Clayton Road, Suite 200, Concord, California 94520, and Nebraska Community Foundation (Foundation) representing all signatories to the Platte River Recovery Implementation Program (Program) (hereinafter referred to as "Client"), whose mailing address is PO Box 83107, Lincoln, Nebraska 68501.

WITNESSETH THAT the parties hereto agree as follows:

ARTICLE I: SCOPE OF SERVICES

- 1.1 The field of this Agreement will consist of the fields of the individual projects defined by Task Orders entered into by the parties hereto during the term of and pursuant to this Agreement. Each Task Order will be numbered sequentially and will be similar in format to Exhibit A, entitled "Sample Task Order Format," attached hereto and made a part hereof. Each Task Order will briefly define the specific project on which Client desires to retain Cardno ENTRIX's services. Each Task Order will also specify (1) the date on which the work covered by the Task Order is to begin; (2) the date on which the work is to be completed; (3) the estimated charges that Client will be required to pay to Cardno ENTRIX for Cardno ENTRIX's services pursuant to such Task Order; and (4) the names of the persons who will be Client's and Cardno ENTRIX's respective principal representatives for the specific services covered by said Task Order.
- 1.2 The specific services covered by each separate Task Order will be undertaken by Cardno ENTRIX only upon receipt of a Task Order signed by an authorized representative of Client and accepted by an authorized representative of Cardno ENTRIX.
- 1.3 Cardno ENTRIX will perform its services in accordance with the standards generally applied by the professional consulting community in the same industry as Cardno ENTRIX and under similar conditions and locations. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY, FITNESS, NON-INFRINGEMENT, TITLE OR ABSENCE OF DEFECTS.**

ARTICLE II: SCHEDULE AND COST LIMITS

- 2.1 Cardno ENTRIX will commence performing the services specified by each Task Order on the commencement date specified in the Task Order, and will complete such services within the time and monetary limitations specified in the Task Order. If Cardno ENTRIX, in the course of performing its services under any given Task Order, determines it will be unable to complete the services within the time schedule or authorized limit of charges specified in the Task Order, it will promptly so notify Client of such determination.

ARTICLE III: BILLING PROCEDURES

- 3.1 Unless otherwise specified in the Task Orders, Cardno ENTRIX will submit invoices to Client at the end of each month in which Cardno ENTRIX has performed services pursuant to such Task Orders. Each invoice will identify the number of its particular Task Order, as well as the extent and cost of the services covered by the invoice. Exhibit B, attached hereto and made a part hereof, is a schedule of Cardno ENTRIX's standard rates which are applicable to the work covered by this Agreement. Cardno ENTRIX's standard rates are subject to increase annually.
- 3.2 Within thirty (30) days following Client's receipt of each invoice rendered by Cardno ENTRIX pursuant to this Agreement, Client will pay the amount thereof. If Client disputes any portion of an invoice, Client will notify Cardno ENTRIX of such disputed items within 10 days of invoice date. All past-due payments shall bear interest at a rate of one and one-half percent (1½%) per month (eighteen percent (18%) per year) or at the highest rate of interest allowed by the applicable laws, whichever is lower, from the date the invoice first becomes past due until date of receipt of payment by Cardno ENTRIX. Notwithstanding the provisions of Article X, in the event any invoice has not been paid in full within ninety (90) days of the invoice date, Cardno ENTRIX may immediately suspend all or any portion of the Services hereunder indefinitely pending payment in full of such invoice(s).

ARTICLE IV: ACCESS TO RECORDS

- 4.1 Client, or its duly authorized representatives, will have access at all reasonable times, during the performance of any Task Order and for a period of two (2) years thereafter, to Cardno ENTRIX's books, records and all other documentation pertaining to Cardno ENTRIX's services under said Task Order for the purpose of auditing and verifying the cost of such services or for any other reasonable purpose.
- 4.2 Cardno ENTRIX will preserve for a period of two (2) years after completion or termination of any given Task Order all the documents mentioned in Paragraph 4.1 above.

ARTICLE V: INDEPENDENT CONTRACTOR

- 5.1 Cardno ENTRIX's relationship to Client under this Agreement, as well as all Task Orders issued pursuant hereto, will be that of an independent Contractor. Cardno ENTRIX will use its own methods in performing its services, free from any supervision or direction by Client. Client is retaining Cardno ENTRIX in view of Cardno ENTRIX's skills and expertise, and is interested only in the results obtained by Cardno ENTRIX in performing its services for Client. Personnel retained or assigned by Cardno ENTRIX to perform services covered by this Agreement will at all times hereunder be considered as agents or employees of Cardno ENTRIX and not as agents or employees of Client.

ARTICLE VI: CONFIDENTIALITY

- 6.1 Cardno ENTRIX will disclose promptly to Client all inventions, discoveries and improvements conceived or made by Cardno ENTRIX's personnel, either alone or jointly with others, during the course of Cardno ENTRIX's services hereunder and as a result of such services or as a result of information made available by Client to Cardno ENTRIX hereunder.
- 6.2 Cardno ENTRIX will maintain in confidence the nature of its services hereunder, as well as all information made available to Cardno ENTRIX by Client during the term of this Agreement or resulting from services performed by Cardno ENTRIX under this Agreement. The confidential obligation imposed on Cardno ENTRIX by Paragraph 6.2, however, will not extend to any such information insofar as, and from such time as Cardno ENTRIX may disclose (i) as required by law, (ii) pursuant to court order, (iii) to its subcontractors, agents or other representatives as may be reasonably necessary to perform its services hereunder (iv) for the purpose of prosecuting or defending any litigation, or (v) Cardno ENTRIX can show by reasonable proof has been in the public domain. Cardno ENTRIX agrees to use information to be kept confidential under this Paragraph 6.2 solely for the benefit of Client.
- 6.3 Cardno ENTRIX will require each person it retains to perform services for Client under this Agreement to comply with Cardno ENTRIX's confidential obligations under Paragraph 6.2 above, and also with Cardno ENTRIX's obligations under Paragraph 6.1 to disclose and assign inventions.

ARTICLE VII: INSURANCE

- 7.1 Cardno ENTRIX represents that it now carries and will continue during the terms of this Agreement to carry at its sole cost Worker's Compensation, Comprehensive General and Contractual Liability, Comprehensive Automobile Liability, Maritime, Professional Liability and Pollution.
- 7.2 Certificates of all insurance required of Cardno ENTRIX under this Agreement will be furnished to Client upon request. Such copies of certificates shall state that the insurance carrier will give Client thirty (30) days prior written notice of any cancellation of or material change in such policies.

ARTICLE VIII: INDEMNIFICATION

- 8.1 Cardno ENTRIX shall perform the services, specified within the "Scope of Services," to be furnished by it hereunder in accordance with customarily accepted good and sound professional practices and procedures.
- 8.2 Cardno ENTRIX shall indemnify and hold harmless Client from and against all claims and actions, and all expenses, including but not limited to reasonable attorney fees, incidental to such claims or actions, based upon or arising out of damages or injuries to persons or property caused by the negligence, gross negligence, willful misconduct or breach of any provision of this Agreement by

Cardno ENTRIX or anyone acting under its direction or control or in its behalf in the course of its performance under this Agreement; provided that Cardno ENTRIX's aforesaid indemnity and hold harmless agreement shall not be applicable to any liability based upon willful acts or active negligence of Client and upon use of or reliance on information supplied by Client or on behalf of Client to Cardno ENTRIX in preparation of any report, study or other written document and further provided, however, in no event shall Cardno ENTRIX be responsible for any form of consequential damages, including, but not limited to loss of sales, loss of profits, and attorney fees thereon.

- 8.3 Client shall indemnify and hold harmless Cardno ENTRIX from and against all claims and actions, and all expenses, including but not limited to reasonable attorney fees, incidental to such claims or actions, based upon or arising out of (i) damages or injuries to persons or property caused by or attributable to the negligence, gross negligence, willful misconduct or breach of any provision of this Agreement by Client or anyone acting under its direction or control or on its behalf in the course of its performance under this Agreement and (ii) claims, actions or demands for environmental liability arising from, or in relation to, any condition (not caused by the negligence of Cardno ENTRIX or anyone acting under its authority) on, under or in connection with Owner's real property or relating to Operations conducted by Client; provided that Client's aforesaid indemnity and hold harmless agreement shall not be applicable to any liability based upon the willful acts or active negligence of Cardno ENTRIX and further provided, however, in no event shall Client be responsible for any form of consequential damages, including, but not limited to loss of sales, loss of profits and attorney fees thereon.
- 8.4 Where any claim results from the joint negligence, gross negligence, willful misconduct or breach of any provision of this Agreement by Client and Cardno ENTRIX, the amount of such claim for which Client or Cardno ENTRIX is liable as indemnitor under this Article VIII shall equal (i) the proportionate part that the amount of such claim attributable to such indemnitor's negligence, gross negligence, willful misconduct or breach of any provision of this Agreement bears to (ii) the amount of the total claim attributable to the joint negligence, gross negligence, willful misconduct or breach of any provision of this Agreement at issue.

ARTICLE IX: NON-ASSIGNMENT

- 9.1 Cardno ENTRIX will not assign its rights or obligations under this Agreement without Client's prior written consent.

ARTICLE X: TERMINATION

- 10.1 Subject to Section 3.2, this Agreement will continue in effect until terminated by either party upon thirty (30) days written notice to the other party. Any such termination, however, will not terminate Cardno ENTRIX's obligations under Paragraphs 6.1 and 6.2 hereof nor either party's obligations under Paragraphs 8.2 and 8.3 hereof.

- 10.2 Client will have the right to terminate Cardno ENTRIX's services under any specific Task Order at any time by giving notice in writing to Cardno ENTRIX. Cardno ENTRIX will not be entitled to payment for any cost related to the terminated part of services covered by the Task Order and incurred after the effective date of termination except for costs directly related to work performed by Cardno ENTRIX in terminating; provided that such work is authorized in advance by Client's representatives under such Task Order.
- 10.3 In the event Client terminates this Agreement or any Task Order, Client will reimburse Cardno ENTRIX for all expenses incurred by Cardno ENTRIX in satisfying commitments for materials, equipment and services for use in the terminated work which were made by Cardno ENTRIX prior to such termination. Such expenses may include the cost of returning or disposing of unused materials and equipment and terminating agreements for services by third parties. Cardno ENTRIX, however, will use its best efforts to minimize such costs.

ARTICLE XI: FORCE MAJEURE

- 11.1 Any delays in or failure of performance by either party under this Agreement (except payment of compensation under Article III) shall not constitute default hereunder and neither party shall be liable to the other for failure to perform its obligations hereunder if and to the extent that such failure to perform is caused by or results from force majeure which shall be defined to be causes or occurrences beyond the control of the party affected, including, but not limited to, acts of governmental authority, acts of God, strikes or other concerted acts of workmen, unavailability of labor or materials and operating equipment, fires, floods, explosions, riots, war, rebellion, insurrection and sabotage; provided, however, that the party whose performance is delayed shall have given notice and full description of the cause of the delay in writing to the other party as soon as possible after the occurrence of the cause relied on by it.

ARTICLE XII: OFFICIAL ADDRESS

- 12.1 The address of each party hereto, until further notice to the other party, is as follows:

Cardno ENTRIX
2300 Clayton Road, Suite 200
Concord, California 94520
Attn: Debra Alioto, Business Manager

Nebraska Community Foundation
PO Box 83107
Lincoln, Nebraska 68501
Attn: Diane M. Wilson, ~~Chief Financial and~~
~~Administrative Officer~~
~~CHIEF OPERATING OFFICER/CHIEF FINANCIAL OFFICER~~

Notice, written statements and payments hereunder shall be deemed to have been given when mailed postage prepaid by certified or registered mail to the party entitled thereto at its above address or at such other latest address as it may designate in writing to the other party for this purpose.

ARTICLE XIII: GOVERNING LAW

- 13.1 The construction, interpretation and enforcement of this Contract shall be governed by the laws of the State of Nebraska. The Courts of the State of Nebraska shall have jurisdiction over this Contract and the parties.

ARTICLE XIV: AFFIRMATIVE ACTION COMPLIANCE

- 14.1 Client shall comply, where and as applicable with Executive Order 11246, as amended, and the following sections and parts of Title 41 of the Code of Federal Regulations: Sections 60-1.4 (Equal Opportunity), 60-1.7 (Reports and other required information), 60-1.8 (Non-segregated facilities), 60-1.40 (Affirmative action programs), 60-1.42 (Notices to be posted); Parts 60-2 (Affirmative action programs), 60-250 (Affirmative action obligations of contractors and subcontractors for disabled veterans and veterans of the Vietnam era); Sections 1-1.710 (Utilization of small business and disadvantaged small business concerns), 1-1.805 (Utilization of labor surplus area concerns), 1-1.1310 (Utilization of minority business enterprises); Sections 60-250.4 (Employment of veterans), and 60-741.4 (Employment of disabled workers). All of the foregoing are hereby incorporated by reference to the extent applicable.

ARTICLE XV: LIMITATION OF LIABILITY

- 15.1 In no event will Cardno ENTRIX, its Affiliates or their officers, directors, employees, agents, or stockholders be liable to Client for any incidental, indirect, special, consequential or punitive damages or lost profits of Client. The aggregate total liability of Cardno ENTRIX, its Affiliates and their officers, directors, employees, agents, and stockholders to Client arising from or related to Client's engagement of Cardno ENTRIX, whether in contract, breach of warranty, tort, or otherwise, shall not exceed the recoveries from insurance provided or, if none, an amount equivalent to the fee paid by the Client to Cardno ENTRIX in connection with the project giving rise to the dispute.

ARTICLE XVI: NON-SOLICITATION

- 16.1 Neither party shall knowingly solicit, recruit, hire or otherwise employ or retain the employees of the other working under Task Order which is the subject of this Agreement during the Term of this Agreement and for one (1) year following the termination or expiration of this Agreement without the prior written consent of the other party.

However, notwithstanding the above, this Paragraph shall not restrict the right of either party to solicit or recruit generally in the media, and shall not prohibit either party from hiring, without prior written consent, the other party's employee who

answers any advertisement or who otherwise voluntarily applies for hire without having been personally solicited by the hiring party.

ARTICLE XVII: WAIVER OF BREACH

- 17.1 Failure by one Party to notify the other Party of a breach of any provision of this Agreement shall not constitute a waiver of any continuing breach. Failure by one Party to enforce any of its rights under this Agreement shall not constitute a waiver of those rights. The waiver by either Party of a breach or violation of any provision of this Agreement shall not operate as, or be construed to be, a waiver of any subsequent breach of the same or any other provision hereof.

ARTICLE XVIII: DOCUMENTS OWNERSHIP AND BENEFIT

- 18.1 All report documents produced by Cardno ENTRIX under this Agreement shall be made available to Client upon receipt of full payment for services rendered. Cardno ENTRIX shall retain ownership of all field notes, computer files, and project files used to produce the work products and may make copies of all products.

ARTICLE XIX: ENTIRE AGREEMENT

- 19.1 This Agreement, including any exhibits or schedules attached hereto, constitutes the entire understanding between the parties hereto with respect to the subject matter hereof and cancels and supersedes all prior negotiations, representations and agreements, either written or oral. No changes, alterations or modifications to this Agreement will be effective unless in writing and signed by the parties hereto.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed in their respective names by their duly authorized representatives.

Cardno ENTRIX

By: Debra

Title: Business Manager

Nebraska Community Foundation

By: AM

Title: CHIEF OPERATING OFFICER /
CHIEF FINANCIAL OFFICER

EXHIBIT A

SAMPLE TASK ORDER FORMAT

Task Order No. _____

Date: _____

Cardno ENTRIX Project No. _____

Attn: _____

(Brief Project Title)

This Task Order No. _ is issued pursuant to our Agreement dated ___, 2010 and unless otherwise specified herein, the performance of services hereunder and the payment therefore shall be subject to the terms and conditions of said Agreement. The services authorized hereunder are described below.

DESCRIPTION OF SERVICES:

BILLING PROCEDURES:

PAYMENT TERMS:

ESTIMATED TOTAL COST:

ESTIMATED SCHEDULE:

Starting Date: _____

Completion Date: _____

CONSULTANT'S REPRESENTATIVE:

CLIENT'S REPRESENTATIVE:

Yours very truly,

ACCEPTED:

Cardno ENTRIX

(CLIENT)

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

EXHIBIT B

2012-13 Schedule of Fees Professional Services Nebraska Community Foundation

Personnel

Field Technician/Specialist	\$60/hr
Project Assistant	75
Project Coordinator	95
Computer/Production Specialist	100
Technical Editor	110
GIS, CADD, or Drafting Consultant	110
Assistant Staff Consultant	80
Staff Consultant	100
Senior Staff Consultant	115
Project Consultant	130
Senior Project Consultant	170
Senior Consultant	230
Director	275

Consultant and Director positions include professional Scientist, Ecologist, Economist, Engineer, Hydrogeologist, Geologist and Planner staff. Consultant hours spent providing expert witness, deposition, or preparation for deposition will be charged at 1½ times normal billing rate.

Expenses

Communication costs of four percent (4%) of total professional labor billings will be charged in lieu of the actual cost of long distance and cellular telephone costs, pager costs, postage costs, facsimile costs, routine black-and-white copying (less than 500 pages), incidental office supplies, and personal computer usage. Use of a personal vehicle will be at the current IRS allowable rate plus ten percent (10%) markup. Subconsultant fees and all other costs identifiable to an assignment will be charged at cost plus ten percent (10%).

Payment

Cardno ENTRIX invoices will be submitted monthly. Payment is due on or before the thirtieth (30th) day following the date of the invoice. Invoices paid more than thirty (30) days after the invoice date are subject to a finance charge of one percent (1%) per month.

Conditions

Cardno ENTRIX specifies that our services are performed, within the limits prescribed by our clients, with the usual thoroughness and competence of the environmental consulting profession. No other warranty or representation, either expressed or implied, is included or intended in our proposals, contracts, or reports.