



City of Grand Island

Tuesday, August 09, 2005

Council Session

Item G12

#2005-223 - Approving Agreement with USGS and the City of Grand Island for Platte River Well Field River Channel Analysis

Staff Contact: Gary R. Mader

Council Agenda Memo

From: Gary R. Mader, Utilities Director

Meeting: August 9, 2005

Subject: Platte River Well Field River Channel Flow Analysis

Item #'s: G-12

Presenter(s): Gary R. Mader, Utilities Director

Background

South of the City, at the municipal Well Field, the Platte River is comprised of four separate channels over a mile and a half in total width. The City Well Field is on the east end of Indian Island which is bordered by the two northern most channels of the four. Previous computer hydraulic modeling of the Well Field, its interaction with surface streams, and its interaction with adjacent groundwater deposits, shows that the maintenance of flows in the adjacent river channels is very important to the maintenance of water quality in the aquifer waters underlying the Well Field. The modeling also shows that during periods of dry river conditions, the continued operation of the Well Field can, after several months, begin to draw adjacent groundwater, contaminated with nitrate levels well above the drinking water standards, toward the City's facilities. Thus the maintenance of flows to the greatest extent possible in the north river channels is important to protecting the Well Field, and particularly maintaining flow in the far north channel.

During the last few years, Utility staff has noted that the north channel does not appear to be maintaining its proportional flow when compared to the other three. Two years ago, Utility and NRD staff flew the river during low flow conditions and noted that there had been substantial modifications made in the river channels at a dividing point upstream of the Well Field. After consultations with the landowner and the Corps of Engineers, a 404 Permit was obtained and a local contractor was hired to do some major restoration in the river to redistribute the flows to return more water to the north channel. That project was successful. However, continued observations indicated that the flow proportions in the channels adjacent to the Well Field were still less than historical levels. The river was again flown last fall, just as the flows were returning to the river. The north channel was the last to see return of surface flow, lagging the south channel by several weeks. It appears that there may be additional channel modifications upstream of the first location corrected, but we are lacking accurate historical data by which to judge changes that have

been made, and to document what modifications need to be made, to restore historical balance.

Discussion

The Utilities Department has been working with the U.S. Geological Survey Division (USGS) and the Central Platte NRD to attempt to develop a program to document the historical and current proportional channel flows in the reach of the river affecting the City Well Field. USGS is the lead agency. The initial proposal from USGS put the cost of the project at just under \$160,000. USGS would cost share about \$40,000 but having the Water Department responsible for \$120,000 was more than its current financial condition would allow. In April, Department staff met with the USGS and the CPNRD. It was decided to modify the research project to place maximum focus on the two most critical division points in the river, to reduce the number of field measurements required in the first data set, and to spread the project over two years. CPNRD also agreed to cost share if the project was done over two years.

USGS subsequently revised the project proposal to reflect a two year time line for completion with a corresponding payment schedule. The proposed project cost is tabulated below.

	Fiscal 2005-2006	Fiscal 2006-2007	
USGS	\$20,000	\$20,000	
CPNRD	\$20,000	\$20,000	
City of Grand Island	\$17,500	\$52,150	
Total	\$57,500	\$92,150	\$149,650

The first year payment by the Water Department is included in the '05-'06 Water Department Budget, as currently proposed.

As the Platte River becomes increasingly regulated and as the river channels continue to be modified by private and public entities for specific beneficial purposes, having sound, complete data on channel water distribution will be very important in maintaining the river to the benefit of the City's Well Field.

Alternatives

It appears that the Council has the following alternatives concerning the issue at hand. The Council may:

1. Move to approve
2. Refer the issue to a Committee
3. Postpone the issue to future date
4. Take no action on the issue

Recommendation

City Administration recommends that the U.S. Geological Survey proposal for *Geomorphic Assessment of Selected Channels of the Platte River near Grand Island, Nebraska* be approved by the City Council.

Sample Motion

Motion to approve the *Geomorphic Assessment of Selected Channels of the Platte River near Grand Island, Nebraska* proposed from U.S. Geological Survey.

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement

Customer #: NE009
Agreement #: 05C4NE009039000
Project #: 8826
TIN #: 47-6006205
Fixed Cost Agreement Yes

FOR
WATER RESOURCES INVESTIGATIONS

THIS AGREEMENT is entered into as of the 1st day of August 2005, by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the CITY OF GRAND ISLAND, party of the second part.

1. The parties hereto agree that subject to availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation the survey of selected channels of the Platte River, herein called the program.
2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program
 - (a) \$20,000.00 by the party of the first part during the period August 1, 2005 to October 31, 2006
 - (b) \$69,650.00 by the party of the second part during the period August 1, 2005 to October 31, 2006 (\$20,000 repay, \$49,650 unmatched)
 - (c) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.
4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.
5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.
6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.
7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.
8. The maps, records, or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records, or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program and, if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at costs, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records, or reports published by either party shall contain a statement of the cooperative relations between the parties.
9. Billing for this agreement will be rendered annually. Payments of bills are due within 60 days after the billing date. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983).

U.S. GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE INTERIOR

By: 

Robert B. Swanson, NWSC Director

By: _____

By: _____

By: _____

(USE REVERSE SIDE IF ADDITIONAL SIGNATURES ARE REQUIRED)

**U.S. GEOLOGICAL SURVEY
PROJECT PROPOSAL**

**Geomorphic Assessment of Selected Channels of the Platte River
near Grand Island, Nebraska**

by

Richard Wilson, PE

Brenda Woodward

July 28, 2005

SUMMARY

An understanding of the Platte River channel characteristics, hydrologic flow patterns, and geomorphic conditions near Grand Island, Nebraska is important for the operation and management of the water resources of the City of Grand Island. The North Channel of the Platte River flows within one mile of the well field and the surface water flow recharges the underlying aquifer which serves as a source of water supply to the City. This project will research and analyze historical aerial photography and data sets obtained from previous topographic and bathymetric surveys to explain significant changes in the channels over the years. A topographic survey of three specific locations on the Platte River will be conducted to supplement a LIDAR (Light Detection And Ranging) survey covering the three locations plus all other channels and the area between study sites.

BACKGROUND AND PROBLEM

The Platte River is the major watercourse flowing through the State of Nebraska. The river supplies water for irrigation, domestic and industrial use, fish and wildlife, and provides recreational opportunities for the state. The Platte is a braided shallow river at many locations throughout Nebraska including the area in Central Nebraska near Grand Island. The City of Grand Island, with a population of 45,000, is located in Hall County in central Nebraska.

The North Channel of the Platte River flows within one mile of the City of Grand Island's well field. The North Channel of the Platte River is considered by the City (Gary Mader, verbal communication) to be the significant source of recharge to the ground water in the vicinity of the well field. Historically, during July, August, and September the mean average flow of the River declines to 500-1,000 ft³/s (USGS Gaging Station 06770500 at the Platte River near Grand Island). It is suspected that the low flows reduce the amount of recharge to the ground water and therefore the ground water levels continue to decline. The current drought has accelerated the problem of water level declines. At low flow conditions, even minor river channel modifications including limited grading operations of excavation equipment within the channel can redirect flow. Therefore, the current geomorphic conditions of the river and the historical channel disposition, scourer, and meander are important in the evaluation of the potential ground water recharge available to the City of Grand Island well field.

The study area reach extends along the Platte River (figure 1) beginning upstream of the Wood River I-80 interchange (approximately 7 miles west of Hwy 281) and proceeding downstream to the city of Grand Island well field two miles east and one mile north of the Interstate 80 and US Hwy 281 interchange. There are two specific areas of concern:

- Site 1, located on the North Channel of the Platte River two miles west of the intersection of Interstate 80 and US Hwy 281, latitude 40.81612 longitude 98.41684 (figure 2).
- Site 2, located upstream, seven miles west of Hwy 281 and 0.75 miles south of Interstate 80 where all channels flow as one, latitude 40.73697 longitude 98.62475 (figure 3).

FIGURE 1. STUDY AREA

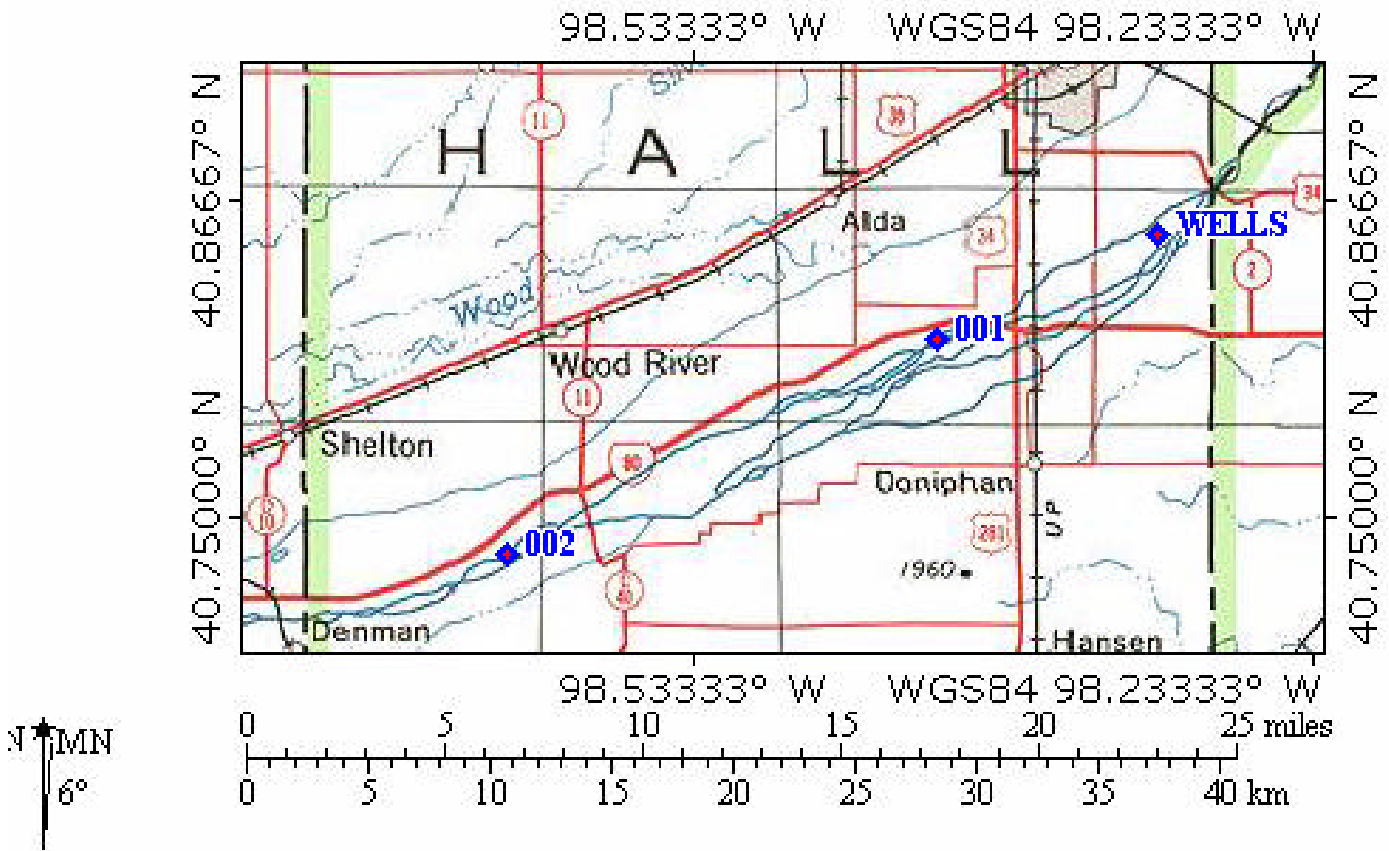


FIGURE 2. SITE 1

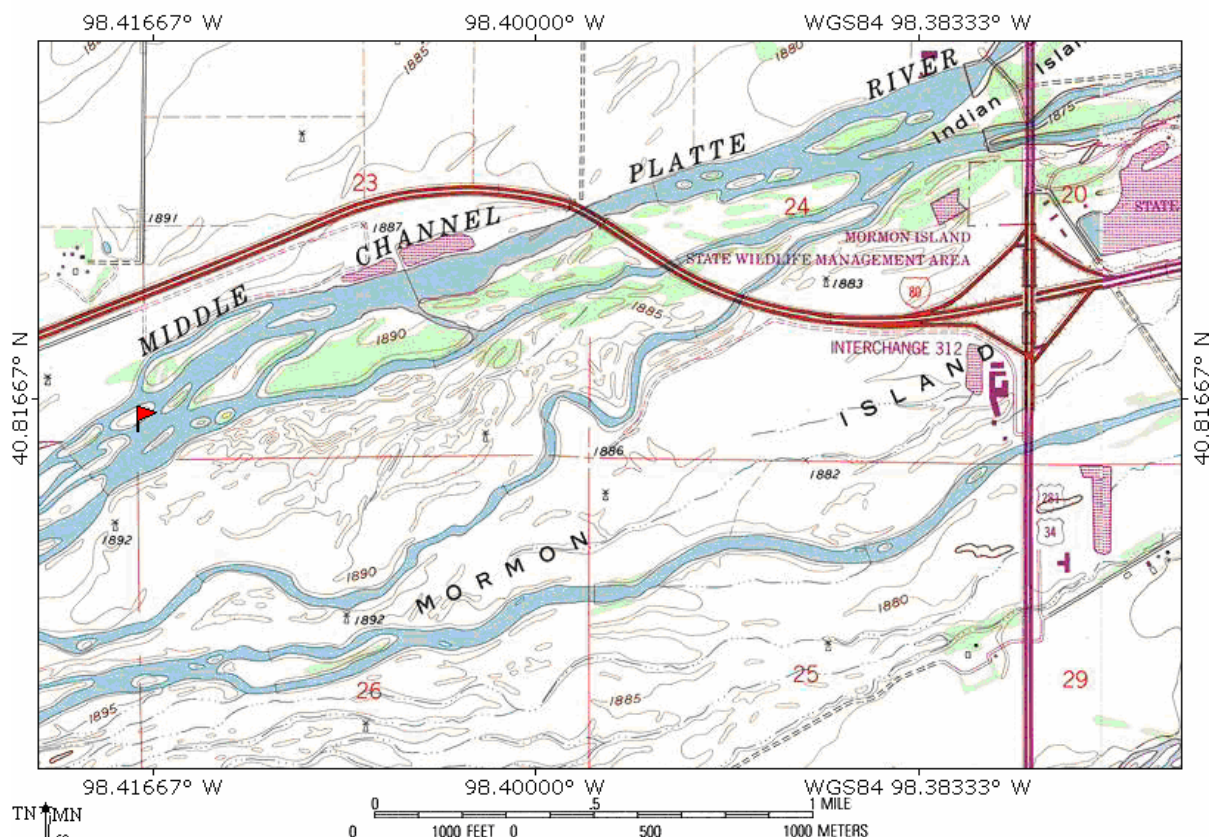
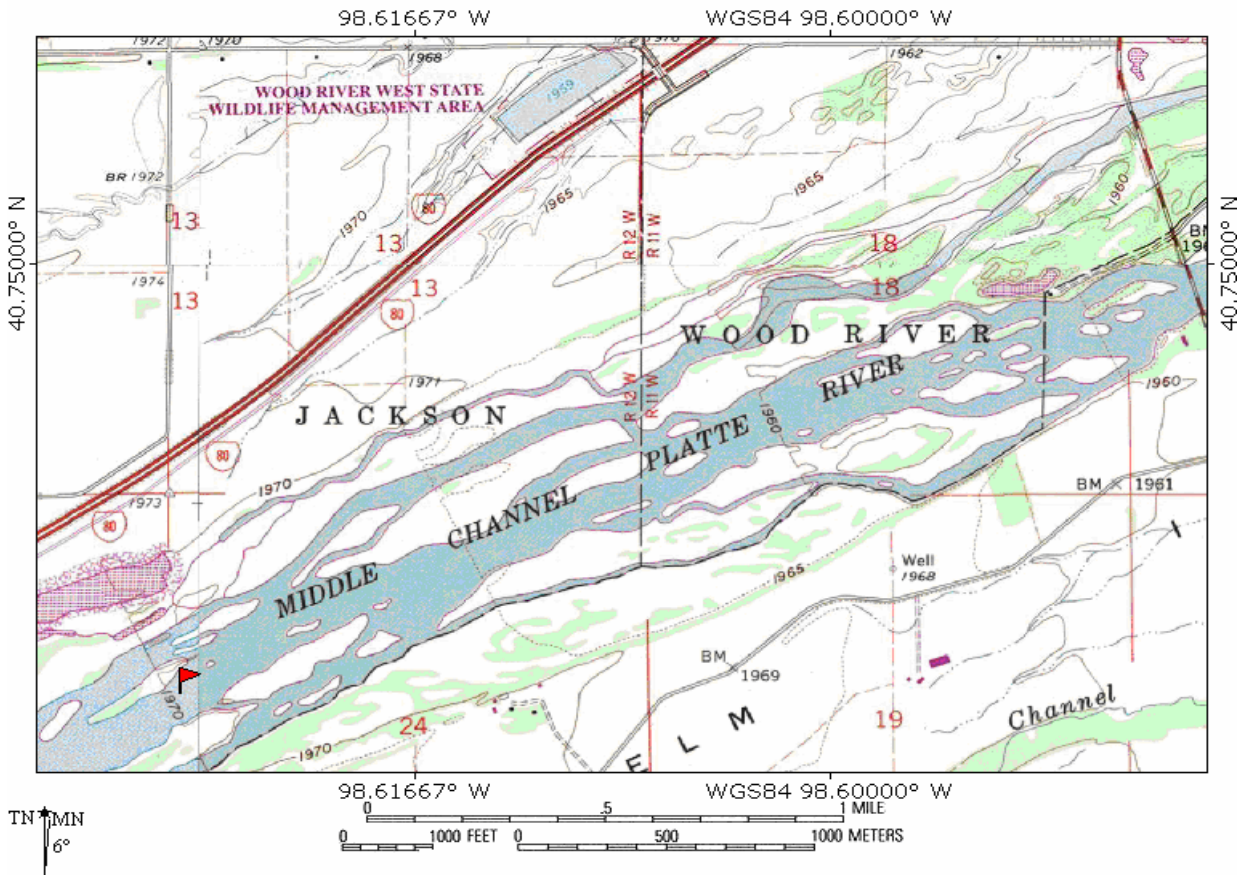


FIGURE 3. SITE 2



Above maps created in TOPO! 2001 National Geographic

OBJECTIVES

The U.S. Geological Survey (USGS) in cooperation with the City of Grand Island and the Central Platte Natural Resources District (CPNRD) proposes to study the geomorphic changes of the channel in the Platte River at two discrete locations. Specifically, the study objectives are:

1. Compare and review historical aerial photography, hydrologic studies, topographic and bathymetric surveys and other data sets to determine historical Platte River channel and floodplain changes.
2. Conduct topographic surveys of sites 1 and 2 within the study area to determine geomorphic changes and map channel physical characteristics using Real Time Kinematic (RTK) Global Positioning System (GPS). Also, conduct a LIDAR (Light Detection And Ranging) survey which will be supplemented by the RTK-GPS surveys. The results of the combined LIDAR surveys will produce a one foot topographic map of the 33 square mile study area for areas unsubmerged. The RTK GPS survey will produce 37 channel cross sections on the upstream site and 23 on the downstream site including both submerged and unsubmerged areas.

3. Determine expected flows in individual channels of the braided system from surveys and concurrent stream discharge measurements of the Platte River at several locations during stable flows. Correlate seven of these sites with those surveyed by Quang M. Nguyen and Martha W. Gilliland in 1985 (Nguyen and Gilliland 1985).
4. Investigate changes in the Platte River study site determined from comparison of survey methods and historical analysis to determine if changes are from human channel modifications or natural channel shifting.

APPROACH

Inventory and Analysis of Historical Watershed Surveys

Historical information, including maps and documentation of field surveys and aerial photography, will be compiled and analyzed. Channel characteristics (bank slope, high bank elevation, bed elevations, and channel width) will be compared between old survey locations and current surveys of approximately the same locations. Available aerial photography will be evaluated through time to identify laterally migrating channels and the apex of the meanders. Analysis of aerial photography will not be used for measures of specific changes in the channel, but will give a general idea of the variability of these braids. Analysis of old surveys compared with current surveys will give more detailed information about the rate of change in these braided channels.

Survey Preparation

USGS will obtain digital orthophoto quadrangles (DOQs) of the project reaches in tagged-image-file format. These will be loaded into Environmental Systems Research Institute Geographic Information System (GIS) software and determine preliminary endpoints for hydrographic-survey cross sections. For each of the two project reaches, the cross sections will be:

1. High-bank to high-bank straight line;
2. Generally perpendicular to the flow of the Platte River; and
3. Spaced at 50 meter intervals (cross-section midchannel point to cross-section midchannel point), the main channel splits of concern, this area will be referred to as the core study site (Figure 5 and 6). A total of 37 or 23 survey lines will be located within this core study site with the capability to survey an additional 15 lines per site in areas where the initial data collection shows more data is needed.

The preliminary cross-section endpoints will provide initial starting points for field operations, and will be confirmed with City of Grand Island and CPNRD prior to initiation of field activities. Final cross-section endpoints will be determined in the field based on evaluation of the high bank locations and evaluation of obstructions that hinder data-collection activities. USGS will communicate with City of Grand Island and CPNRD concerning revisions to cross-section locations that occur during field data-collection activities.

Field reconnaissance of the project reaches will occur prior to the onset of data-collection activities. Project reaches will be evaluated for land-based access to aid in data-collection activities. Positional control points will be established at accessible locations within or near the project reaches for daily quality control and for base station setup. These control points will be surveyed from US National Geodetic benchmarks of high order and stability.

GPS Survey

The data above water surface, or topographic land survey, will be collected using a RTK GPS. Bases will be set on newly established positional control points as described above. Roving units will be in backpacks with the GPS antenna mounted to the pack frame. Data points including northing, easting, and elevation will be continuously collected as the surveyor walks along established transects displayed in handheld data collectors. Data coordinates will be collected in Nebraska state plan meters and elevations will be in North America Vertical Datum 88 meters using a Geoid model. Correction factors received from the base station are continuously applied to each data point as well as antenna height offsets, so that all data stored is correct and accurate. Survey points will generally be collected in less than two foot increments along the transects where vegetation cover does not block satellite communication. Each transect will run from top of bank to top of bank and will include points with descriptions that designate bankful, right and left edge of water, sand bars, and islands. This method of surveying will be used for all land and wadable areas of the cross-section. GPS data will determine thalweg elevation, channel width, and bed slope. Additional information will be recorded for each transect including bed material, bank soil type, near bank vegetation cover, other noticeable details about the transect line, and noticeable details about areas between transect lines. This data will be collected along a total of 38-52 lines per site (37 or 23 original lines and 15 extra lines if necessary) plus additional lines where discharge measurements are made and where old survey information was collected.

LIDAR Survey

The US Geological Survey Rolla, Missouri Geographic Science Center will conduct a LIDAR survey of the study area. The LIDAR data will be acquired over an area of approximately 33 square miles or 85 square kilometers. LIDAR data will be acquired (with a nominal post spacing of 1-2 meters) and processed to include bare-earth with vertical RMS error to support one foot contours. Contours will not be hydrologically enforced (may be places where contours cut off portions of streams depending on obstructions in the water). A one foot or 0.314 meter contour map will be generated of the area. It is possible that USGS may fly the area twice to ensure that the vertical accuracy is met.

Discharge Measurements

Discharge measurements will be collected using standard USGS stream measurement protocol. The measurements will be taken at selected locations within the study area. The purpose of the discharge measurements is to determine the distribution of flow within the study area.

GIS Data Processing

Water surface elevations will be collected by GPS at the time of the survey. The GPS survey data and the LIDAR survey data will be merged into one data set. From these base transects a triangulated irregular network (TIN) will be extracted and contoured to represent the topography of the study area. This information will be correlated with the discharge measurements to gain an understanding of geomorphic system dynamics and flow patterns within the study area.

A second database will be created containing current survey data, historical survey data (when available), historical and current digital images, soil classification maps, land cover, and other relative data bases. This database will be created to support interpretations of historical data and for future uses.

Report Preparation

A web published interpretive report will be the result of this study. Contour maps of each of the two study sites created with GPS data will be included in the report along with a one ft contour map created with the LIDAR data. A fourth contour map will merge the two data sets into one for a highly accuracy representation of the Platte channels in the study area. The report will include data collection methods along with interpretation of historical data, current survey data, and discharge data.

QUALITY ASSURANCE

Accuracy of horizontal-position and elevation data will be documented by occupying points of known horizontal position and elevation, including both permanent markers and several stakes along the shoreline of the survey area. At the start and end of each surveying session GPS roving units will be checked against permanent markers. Checks on surveyed stakes will occur periodically through out the survey as these stakes are encountered along the shoreline (a minimum of once a day). In addition, ten percent of lines will be resurveyed for quality assurance. Resurveying will be conducted with a different GPS rover than the unit that collected the initial data. Resurveying will occur on the same day as the initial survey to eliminate bed movement interference.

All data will be reviewed and checked in the field for completeness. Accuracy of the elevation of GPS surveyed points will have a final check by comparing elevation data to topographic maps and comparing cross sections of those lines next to each other.

PRODUCTS

USGS will provide an interpretive web report that documents data-collection and analysis methods, and both the raw and processed horizontal-position and elevation data. Cross-sectional profiles will be presented in both tabular and graphical form. Comparisons of past and present conditions will be summarized.

RELEVANCE AND BENEFITS

The proposed work is consistent with the USGS's Strategic Direction for the Water Resources Division (WRD) falling under several issues, primarily issue #3 drinking water availability and

quality, as well as under issue #9 hydrologic-system management, including optimization of ground-water and surface-water use and issue #8 surface-water and ground-water interactions as related to water-resource management. The proposed study will assist the cooperator by providing current and historical information about how the river channels are changing. These changes potentially affect the City of Grand Islands water supply since the North Channel is considered to supply a large part of the recharge to the water table in the area.

PERSONNEL and SCHEDULE

The project will start in fall of 2005 and require two weeks of preparation time to set benchmarks, prepare survey line files and other pre-survey activities. The project will require two weeks to conduct the RTK-GPS topographic survey utilizing a four person crew. A four person crew will also be utilized for three days to collect discharge measurements and additional GPS line surveys. The LIDAR Survey will be conducted by personnel from the USGS Geographic Science Center in Rolla, MO during low or no flow conditions in 2005. Initial analysis of historical data and development of a GIS database will also begin in 2005. Surveying of the two core study sites will be conducted in late fall (early FY 2006) or in early spring (FY 2006). The finished GIS database and the web report will be available by November 2006.

BUDGET

<i>Estimated Expenditure by Object Class</i>	Total	2005/2006	2006/2007
Salaries	\$91,400	\$6,200	\$85,200
Travel	\$6,450	\$0	\$6,450
Supplies and Equipment	\$1,000	\$500	\$500
Contracts	\$50,800	\$50,800	--
Project Total Cost	\$149,650	\$57,500	\$92,150
USGS Contribution	\$40,000	\$20,000	\$20,000
City of Grand Island	\$69,650	\$17,500	\$52,150
Central Platte Natural Resource District	40,000	20,000	20,000

REFERENCES

Nguyen, Q.M. and M.W. Gilliland, 1985, Soil, surface water, and groundwater characteristics of the Platte River and its aquifer in the vicinity of Grand Island's Platte River well field. Department of Civil Engineering University of Nebraska-Lincoln, March 1985.

R E S O L U T I O N 2005-223

WHEREAS, south of the City, at the municipal Well Field, the Platte River is comprised of four separate channels over a mile and a half in total width; and

WHEREAS, the City Well Field is on the east end of Indian Island which is bordered by the two northern most channels of the four; and

WHEREAS, maintenance of flows in the adjacent river channels is very important to the maintenance of water quality in the aquifer waters underlying the Well Field; and

WHEREAS, previous computer hydraulic modeling shows that during periods of dry river conditions, the continued operation of the Well Field can, after several months, begin to draw adjacent groundwater, contaminated with nitrate levels well above drinking water standards, toward the City's facilities; and

WHEREAS, the maintenance of flows in the north river channels is important to protecting the Well Field, and

WHEREAS, the City Utilities Department has been working with the U.S. Geological Survey Division (USGS) and the Central Platte Natural Resources District (NRD) to attempt to develop a program to document the historical and current proportional channel flows in the reach of the Platte River affecting the City Well Field; and

WHEREAS, in the past few years, Utility staff has noted that the north channel does not appear to be maintaining its proportional flow when compared to the other three; and

WHEREAS, it is important to obtain accurate historical data by which to judge changes that have been made, and to document what modifications need to be made, to restore historical balance; and

WHEREAS, USGS and Central Platte NRD have agreed to cost share the research program; and

WHEREAS, the research program is proposed to be completed over a two year period, with the City's share of such project is anticipated to be \$17,500 from fiscal year 2005-2006, and \$52,150 from fiscal year 2006-2007; and

WHEREAS, as the Platte River becomes increasingly regulated and as the river channels continue to be modified by private and public entities for specific beneficial purposes, having sound, complete data on channel water distribution will be very important in maintaining the river to the benefit of the City's Well Field.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE CITY OF GRAND ISLAND, NEBRASKA, that the proposal of the U.S. Geological Survey for *Geomorphic Assessment of Selected Channels of the Platte River near Grand Island, Nebraska*, is hereby approved.

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Adopted by the City Council of the City of Grand Island, Nebraska, August 9, 2005.

RaNae Edwards, City Clerk