Agenda Item 7

Memorandum

To: PPO Subcommittee

Re: Wetland Mitigation Bank Site Study

Date: September 8, 2006

From: Paul Woodward, Water Resources Engineer

In February 2006, the Board postponed their consideration of purchasing property from Horgan Development Company near 132nd and State Street until a study could be completed to identify other comparable, privately-owned, unimproved properties in the Papillion Creek Watershed that might provide similar wetland and channel mitigation banking opportunities.

During the interim, District staff has retained Jacobsen Helgoth Consultants (JHC) to perform an evaluation of potential sites using existing geographic data. This study has resulted in the identification of 5 alternative sites which may provide similar wetland and channel mitigation opportunities. These five sites are shown on Figure 4 and listed in Table 4 along with the Horgan Site in the enclosed Wetland Bank Site Selection Report dated August 2006. Most of the sites would be able to produce at least 20 acres of Wetland Mitigation and 1000 ft of channel mitigation.

After identifying these locations, the District retained Midwest Right-of-Way (Midwest ROW) to contact the landowner of each site to determine their interest in selling property for use as a Wetland Bank Site. Midwest ROW also consulted Tom Stevens, MAI, to provide an estimate of each site's existing market value. Most landowners were potentially interested in selling the District either fee title or an easement. However, almost all landowners said that they would need additional information regarding each proposed site and would have to negotiate land costs.

Based on the findings of these studies, the site southwest of 132nd and State Street provides the most potential wetland and channel mitigation at the lowest land cost. In staff's opinion, previous concerns with potential contamination on this site have been adequately addressed by Douglas County and JHC. Therefore, it is the staff's recommendation that the prior Purchase Agreement with Horgan Development Company be reconsidered.

Management recommends that the Subcommittee recommend to the Board that the Wetland Bank Site Selection report and the Purchase Agreement with Horgan Development Company be considered at the October 2006 Subcommittee and Board meetings.

Wetland Bank Site Selection Report

For

Papio-Missouri River Natural Resources District

JHC Project No. 119-15

August 2006

Rev. 0

Prepared by:

Andrew A. Miller

Andrew A. Miller, Scientist
Jacobson Helgoth Consultants, Inc.

Accepted by:

Paul Woodward

Paul Woodward, P.E.
Papio-Missouri River Natural Resources District

Jacobson Helgoth
CONSULTANTS

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SECTION 1.0
INTRODUCTION

Jacobson Helgoth Consultants, Inc. (JHC) was retained by the Papio-Missouri River Natural Resources District (PMRNRD) to identify suitable locations to develop wetlands and waterways within Hydrologic Unit Code (HUC) 10230006. The U.S. Army Corps of Engineers (COE) use HUCs as the basic service area boundary for wetland banks. Suitable sites would have the potential to be developed and added to the PMRNRD's existing wetland bank. The purpose of the evaluation was to compare potential wetland bank sites to an existing site identified by the PMRNRD in 2005. This site is located near 132nd and State Streets in Omaha. This site will be included in the final evaluation for a wetland bank site.

JHC initiated the project by identifying site selection criteria necessary to develop wetlands and waterways. Next, the PMRNRD provided specific site selection criteria and screening information. Using a Geographic Information System (GIS), sites with all of the specified criteria were identified, screened, and then ranked. Five potential sites were provided to the PMRNRD for further evaluation. Next, an engineering feasibility evaluation of each site was conducted.

HUC 10230006 is located in eastern Nebraska and includes portions of Washington, Douglas and Sarpy Counties. The investigation area is bounded by the Elkhorn River to the west, the Missouri River to the east and the Platte River to the south. This HUC is essentially defined by the Papillion Creek Drainage Basin. A Site Vicinity Map of HUC 10230006 is shown as Figure 1 in Appendix A.

SECTION 2.0
GIS RESULTS

JHC and its subconsultant, GIS Workshop, used available GIS data in a McHargian style GRID analysis to determine suitable sites incorporating the site selection criteria specified for this project. Site selection criteria are as follows:

- Within 0.25 mile of existing wetlands (National Wetland Inventory Map)
- Within 500 feet of a stream/waterway with > 500 acre drainage area
- Contains hydric soils
- Within 100 year floodplain

The analysis assigned a value, "0" or "1" to each polygon (1 acre) in HUC 10230006 for the above criteria. Each polygon received a total score between 0 and 4. For example, if it was located in the 100-year floodplain it received 1, if it had hydric soil it received a 1, etc. The data were summed using ArcINFO GRID. Areas that met all four criteria were given a score of 4, areas meeting three criteria were a score of 3 and so forth.

A total of 59 sites meeting all four criteria were identified. A map showing these sites is presented in Figure 2 of Appendix A.

SECTION 3.0
CANDIDATE SITE EVALUATION

3.1 Screening

JHC screened potential sites by eliminating sites that were not suitable for development of wetlands or waterways. Screening parameters for elimination were as follows:

- Completely forested
- Located on Missouri River Floodplain (PMRNRD prefers sites to be in Papillion Creek watershed)
- Lakes, ponds, etc.
- Golf course sites
- Within one mile of airports
- Adjacent to residential, commercial areas

The screening process reduced the site list from 59 to 16. Figure 3 shows potential sites after screening.

3.2 Ranking

Next, each of the remaining sites were given values for the following characteristics in order to rank them. The top ranked sites were selected for further evaluation. Table 1 provides ranking characteristics and values. Table 2 provides a list of sites and their scores.

Table 1
Wetland Site Ranking Criteria Values

Land Use 0 = urban 1 = agriculture 2 = undeveloped/natural	**No. of Criteria** 0 = one criteria 0.5 = two criteria 1 = three criteria 2 = four criteria	**Waterways** 0 = No waterways 1 = one waterway 2 = two waterways 3 = three waterways	**Potential to Reshape** 0=No 1=Yes
Roads 0 = major 1 = minor (county)	**Distance to Structures** 0 = less than 500 ft. 1 = greater than 500 ft.	**Wetland subclass** 0 = Floodplain 1 = Riverine Floodplain 2 = Riverine Channel	

Table 2
PMRNRD Wetland Bank Siting – Site Ranking 6/28/08

Site #	1	Rank	2	Rank	3	Rank	4	Rank
County	WA		WA		WA		WA	
Legal (T,R,S)	181027SE		181035SE		171014S		171116SW	
Size (ac.)	40		40		80		320	
Land use (	AG	1	AG	1	AG	1	AG	1
# of criteria	4,3	2	4,3	2	3	1	4,3	2
Waterway (Y/N)	Y		Y		Y		Y	
# of Waterways	2	2	2	2	2	2	2	2
Shaping	Y	1	Y	1	Y	1	Y	1
Roads	MI	1	MI	1	MI	1	MI	1
Bldgs App Distance (FT)	1500	1	600	1	2500N	1	0	0
Wetland Subclass	RF, R	1	RF, R	1	RF, R	1	RF, R	1
OTHER								
Rank		9		9		8		8

Site #	5	Rank	6	Rank	7	Rank	8	Rank
County	WA		DO		SA		WA	
Legal (T,R,S)	17,11,21SW		15,12,8,NW		14,12,24SE		17,13,21SE	
Size (ac.)	160		40		40		160	
Land use (	AG	1	VA	0	VA	0	AG	1
# of criteria	4,3	2	4,3	2	4,3	2	4,	2
Waterway (Y/N)	Y		Y		Y		Y	
# of Waterways	2	2	2	2	1	1	1	1
Shaping	Y	1	N	0	N	0	Y	1
Roads	MI	1	MAJOR(120TH & MAPLE)	0	MAJ	0	MI	1
Bldgs App Distance (FT.)	0	0	0	0	0	0	3000S	1
Wetland Subclass	RF,R	1	RF,R	1	RF,R	1	RF,R	1
OTHER			URBAN LOCATION		URBAN/AG		WENNINHOFF	
Rank		8		5		4		8

Table 2
PMRNRD Wetland Bank Siting – Site Ranking 6/28/08 *(continued)*

Site #	9	Rank	10	Rank	*11	Rank	12*	Rank
County	WA		DO		SA		SA	
Legal (T,R,S)	17,13,08N		16,12,10S		14,13,24		13,13,23(24)	
Size (ac.)	80		100		640		160	
Land use (	AG	1	AG	1	AG,WA	1	AG	1
# of criteria	4,3	2	4,3	2	4,3	2	4,3	2
Waterway (Y/N)	N		Y		N	0	Y	
# of Waterways	0	0	2	2	0	0	2	2
Shaping	NA	0	Y	1	N	0	Y	1
Roads	NO	1	MAJ	0	MI	1	MAJ	0
Bldgs App Distance (FT)	2,300S	1	1200W	1	5000E	1	6000E	1
Wetland Subclass	RF, F	1	RF, R	1	RF,	1	RF, R	1
OTHER	OXBOW		CUNNINGHAM		GIFFORD FARMS-SITES		PAPIO SOUTH OF OFFUTT	
Rank		6		8		6		8

Site #	13*	Rank	14	Rank
County	SA		SA	
Legal (T,R,S)	13,14,17SW		14,12,29SW	
Size (ac.)	160		40	
Land use (	AG	1	AG	1
# of criteria	4,3	2	4,3	2
Waterway (Y/N)	Y	1	Y	
# of Waterways	1	1	1	1
Shaping	Y	1	Y	1
Roads	MI	1	MA	1
Bldgs App Distance (FT)	4000SW	1	500	1
Wetland Subclass	RF,R	1	RF,R	1
OTHER	M. RIVER			
Rank		8		8

SECTION 4.0
INITIAL SITE RECOMMENDATION

JHC recommended eight sites to the PMRNRD for field and land evaluation. Proposed sites were displayed electronically and discussed between JHC and PMRNRD staff. The initial site list was then revised. Sites 1 and 3 were eliminated because they did not have adequate distance from roadways. Sites 4 and 5 were eliminated because they were located in a proposed dam site area. Site 6 was eliminated because it was platted for development. Sites 8 and 9 were eliminated because they were located on Missouri River Floodplain. Site 10 was eliminated because it is owned by the COE and Sites 11, 12 and 13 were eliminated because they are within five miles of Offutt Air Force Base.

The PMNRD added two potential sites, Site 15 and Site 18. A total of five sites were recommended for further evaluation, plus the 132nd and State Streets site. See Table 3 for the final site list. A final map showing these locations is presented in Figure 4.

Table 3
PMRNRD Wetland Bank Site Information

Site No.	2	7(17)	14	15	18	132nd & State
County	WA	SA	SA	DO	DO	DO
Legal (T,R,S)	18,10,35SE	14,12,24SE	14,12,29SW	16,12,31SE	16,11,29NE	16,11,25NE
Size (ac.)	40	40	40	80	80	60
Land Use	AG	AG	AG	UB	AG	AG
No. of Criteria	4,3	4,3	4,3	3,2	3,2	NA
Waterway (Y/N)	Y	Y	Y	Y	Y	Y
No. of Waterways	2	1	1	2	2	2
Stream Shaping	Y	N	Y	Y	Y	Y
Roads	Min.	Maj.	Maj.	Maj.	Maj.	Maj.
Distance to Structure	600	0	500	1,100	1,500	2,000
Wetland Subclass	RF,R	RF,R	RF,R	RF,R	RF,R	RF, R
Other		Urban/AG Fricke		Mulhull's stream	Dam Site 15A	
Parcel/ Information		Lot TL7A1	Parcel 010983	Parcel 141440	Parcel 012344	NA

RF = Riverine Floodplain
R = Riverine Channel
AG = Agriculture
UB = Urban

WA = Washington
SA = Sarpy
DO = Douglas

SECTION 5.0
LAND EVALUATION

The five sites recommended for the potential development of a wetland bank were evaluated by Midwest Right of Way Services, Inc. to determine the availability and approximate cost. In summary, of the five sites evaluated, Midwest Right of Way recommended the PMRNRD pursue Sites 2 and 18. Both landowners are willing to discuss a potential easement or acquisition. Other sites recommended (in order) were Site 15, which was interested in easement; Site 7, landowner was not willing to sell at the time, but would listen to a future proposal; and Site 14, which has two owners of which one is interested and one is not.

Site 2 is the best value with an approximate acquisition price of $4,500 to $6,000 per acre. Site 18 had an estimated acquisition price of $20,000 to $25,000 per acre.

SECTION 6.0
FEASIBILITY ENGINEERING EVALUATION

JHC further evaluated sites to determine if it was technically feasible to develop a wetland, and/or to create a waterway (stream channel). A wetlands biologist and civil engineer visited each site. Access was not arranged, so all sites were viewed from public road right-of-way. The purpose of the site visit was to evaluate sites for potential wetland and waterway development and to develop concepts for development.

In addition, hydrology, soil data and development obstacles were noted for each site. This information is presented for each site on the following pages.

Site # 2
Washington County
Southeast Quarter of Section 35, Township 18 N., Range 10 E

Mitigation Potential-
Wetland- Develop 40 acres of wetland on floodplain by impounding tributary or excavating to allow more frequent over the bank flooding and influence from ground water.

Stream- Stream channel could be created by diverting water from tributary and creating a new channel that would also drain to NW Branch. The diversion point would require a small structure as the channel is not very deep at this point. Stream channel could also be created by adding meanders back into tributary. It appears this channel has been straightened.

There also may be a possibility to restore a channel adjacent to NW Branch. This channel appears to have been cut off or farmed through.

Wetland/Waterway size and lengths-
Wetland-40 ac.
New stream channel (diversion) 1,500 feet. Adding meanders.

Site conditions-
Floodplain-very little relief
Land use- agriculture
Waterway- Tributary of Northwest Branch of Big Papillion Creek
Watershed size- 960 ac.
Water budget- Good water supply
Soils-Kennebec (Ke). Not hydric. However, inclusions are hydric when ponded or when water is 0-1 ft from surface. Permeability 0.6-2.0 in/hr.

Constraints-Farmstead on 1/4 Section, center pivot

Feasibility-Water supply is good; ratio of proposed wetland area to watershed area is 1:24. Low relief on floodplain will allow construction of wetlands and diversion structure with minimal earthwork.


26
25
Stream Restoration
Mitigation Wetlands
2
New Channel
35
36
Weir
02
02
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ARLINGTON QUADRANGLE
NEBRASKA
7.5 MINUTE SERIES (TOPOGRAPHIC)

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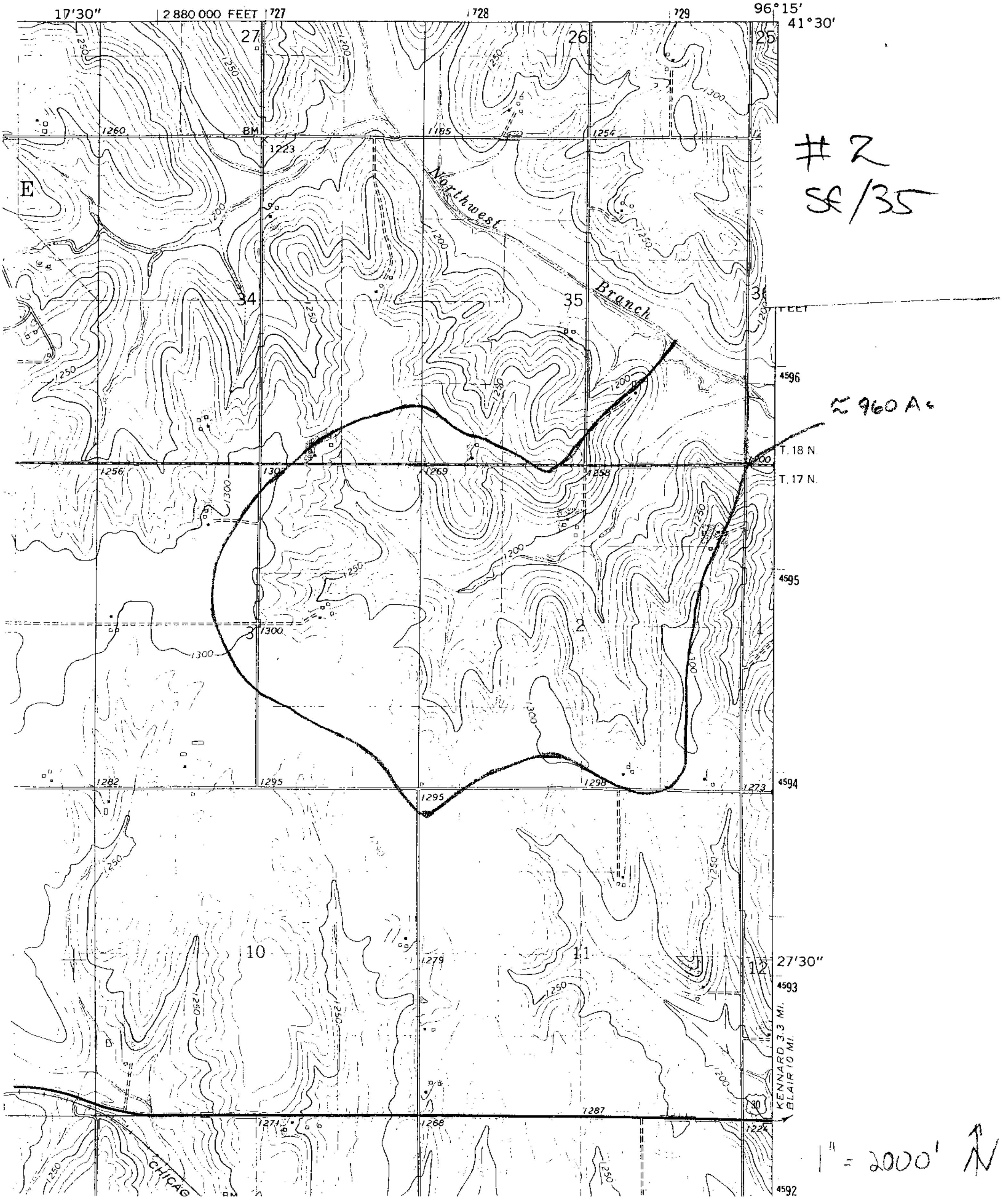

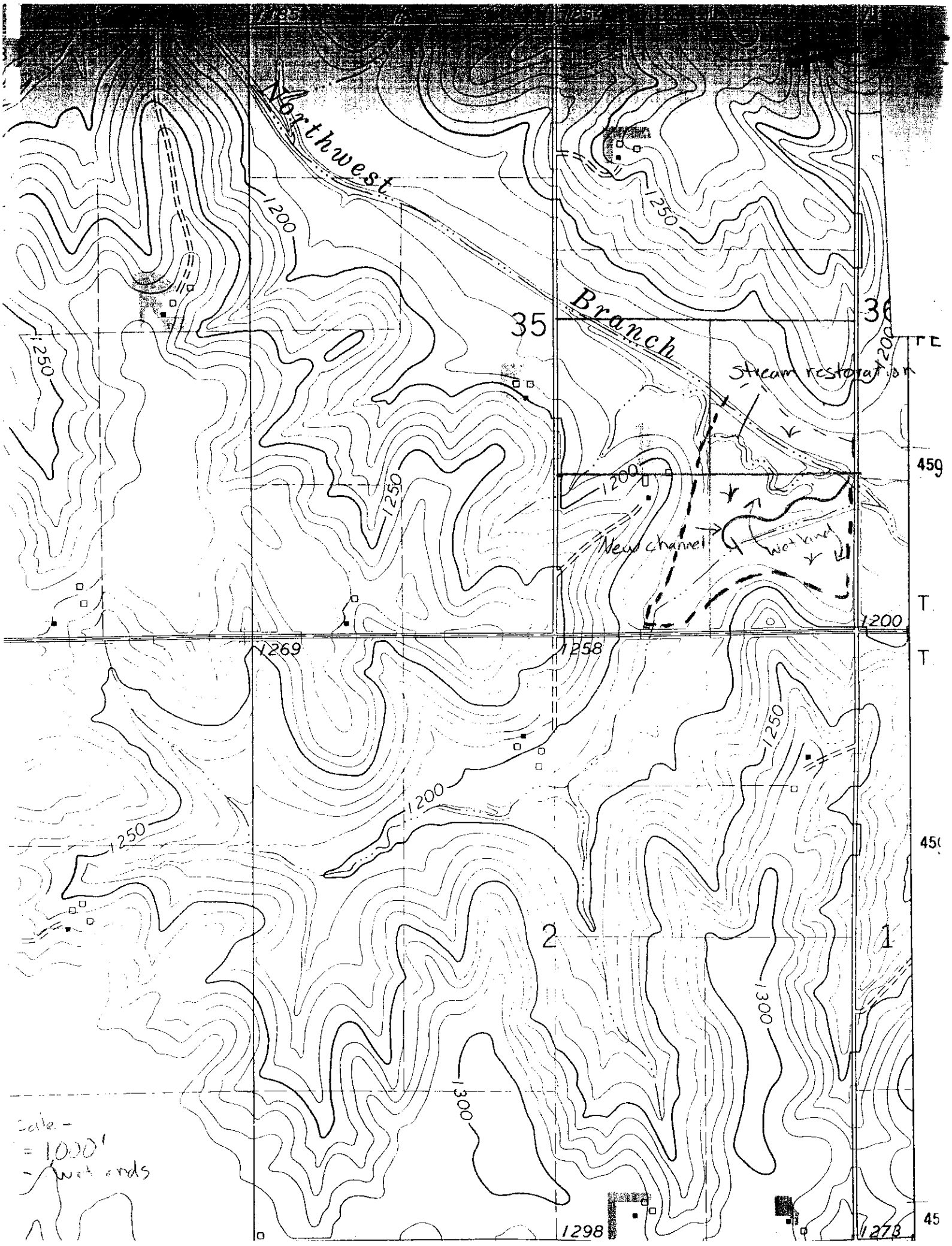
Northwest
Branch
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Stream restoration
New channel
Wetland
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1258
1298
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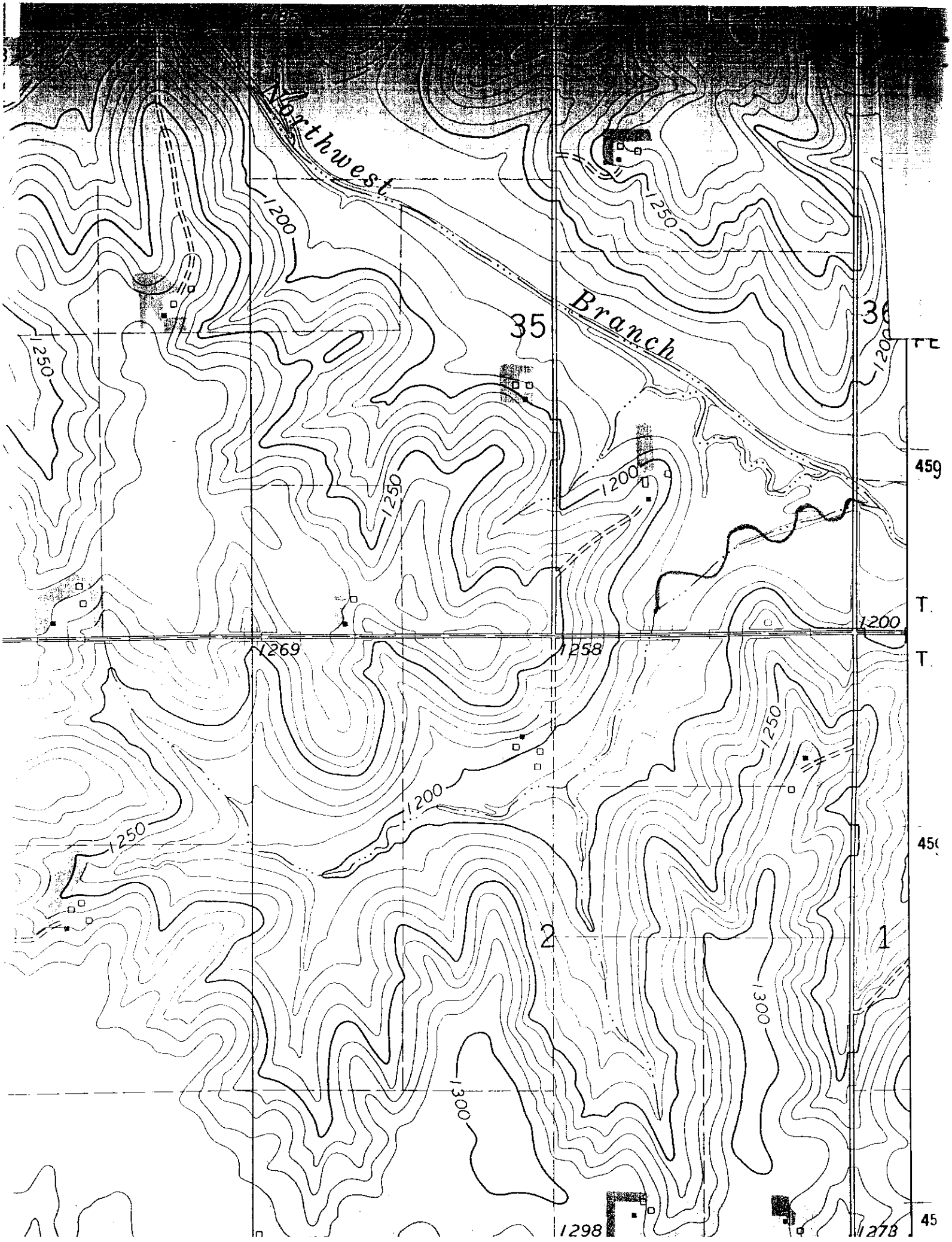
- wetlands


Northwest
Branch
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Site # 7
Sarpy County
Southeast Quarter of Section 24, Township 14 N., Range 12 E

Mitigation Potential-
Wetland- Develop approximately 20-40 acres of wetland on floodplain by modifying existing levee to allow more frequent flooding. Excavation would also be required. If necessary a structure could be placed in tributary to increase flood events. and restoring hydrology. Potential to restore existing Fricke pond or remove.

Stream- Two tributaries to Big Papillion Creek appear to have been channelized. Both could be restored to add additional channel length.

Wetland/Waterway size and lengths-
Wetland-20-40 ac.
New stream channel (meander) 2,700 feet.

Site conditions-
Topography- floodplain, little relief
Land use- Agriculture,
Waterway- Tributary to Big Papillion Creek
Watershed size- 850 ac.
Water budget- Good water supply
Soils- Colo-Kennebec (CK). Hydric. Permeability 0.2-0.6 in/hr, Texture- silty clay loam. Seasonal high water table 3-8 feet.

Constraints-High wire lines, native prairie

Feasibility-Water supply is good; ratio of proposed wetland area to watershed area is 1:21. Low relief on floodplain will allow construction of wetlands and diversion channels with minimal earthwork. Existing dam is located upstream from floodplain area and cold be incorporated into diversion plan.


Mitigation Wetlands
Reshaped Channel
Existing Dam
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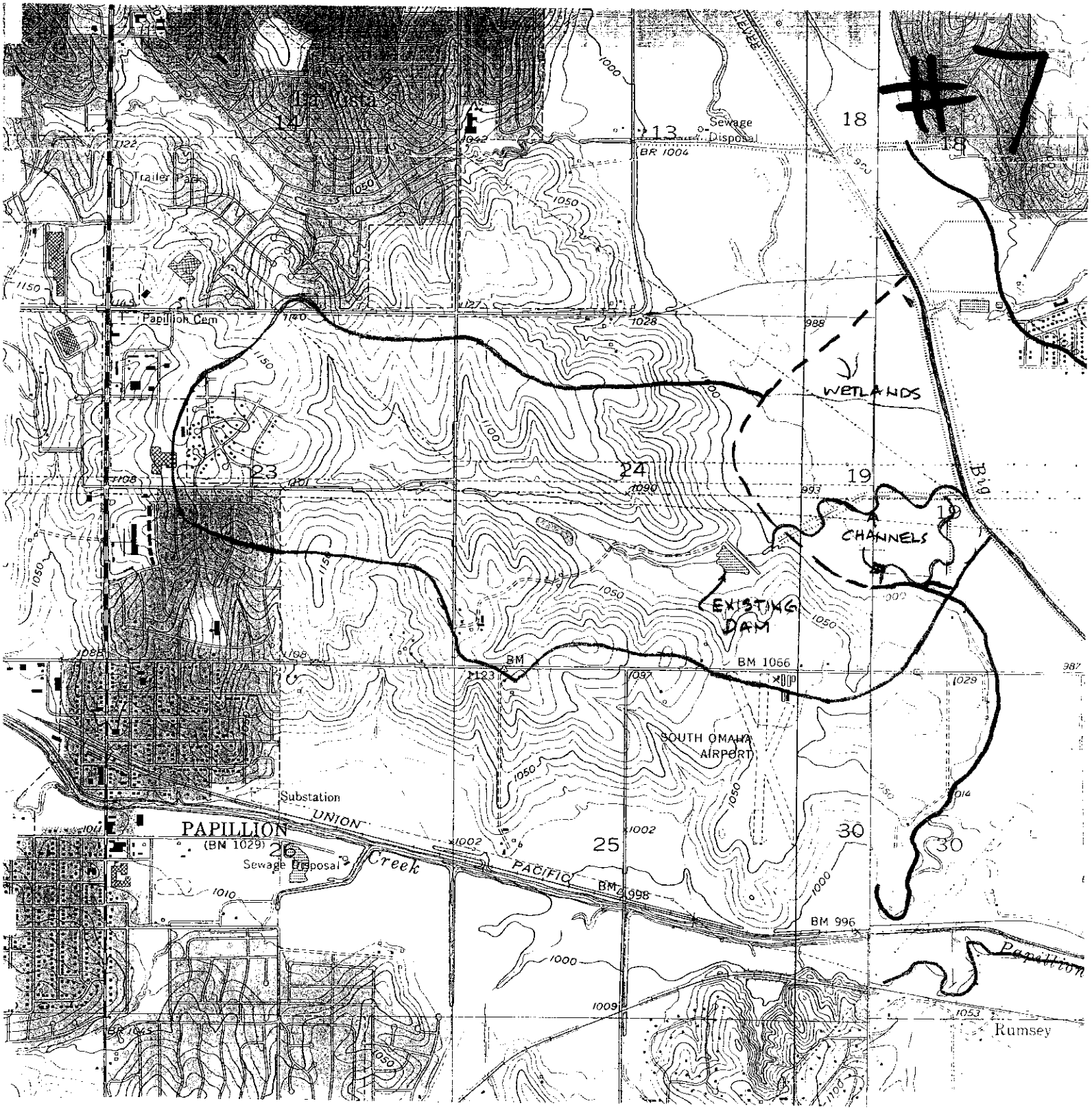
#7
WETLANDS
CHANNELS
EXISTING DAM
BM 1066
BM
SOUTH OMAHA AIRPORT
PAPILLION
(BM 1029)
Substation
Sewage Disposal
UNION PACIFIC
Creek
BM 998
BM 996
Papillion
Rumsey
Trailer Park
Papillion Cem
Sewage Disposal
BR 1004
13
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Site # 14
Sarpy County
Southwest Quarter of Section 29, Township 14 N., Range 12 E

Mitigation Potential-
Wetland- Develop approximately 20 acres of riparian wetlands by increasing riparian area on tributary to on floodplain. This would require excavation. Wetlands could also be created on adjacent floodplain if tributary was impounded, however a large structure would be required.

Stream- Little potential for adding new stream channel or restoration of existing.

Wetland/Waterway size and lengths-
Wetland-20 ac.

Site conditions-
Topography- 50 feet of drop on stream from Hwy 370 to Cornhusker Road. Adjacent area has small floodplain and then 50-70 feet to uplands.
Land use- Agriculture
Waterway- Tributary to Big Papillion Creek
Watershed size-1,330 ac.
Water budget- Good water supply
Soils- Kennebec (Ke). Not hydric. However, inclusions are hydric when ponded or when water is 0-1 ft from surface. Permeability 0.6-2.0 in/hr.

Constraints-Tributary is forested.

Feasibility-Water supply is good; ratio of proposed wetland area to watershed area is 1:66. Deep and narrow channel will require tall diversion structure to lift water to wetland elevation.


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Mitigation Wetlands
New Channel
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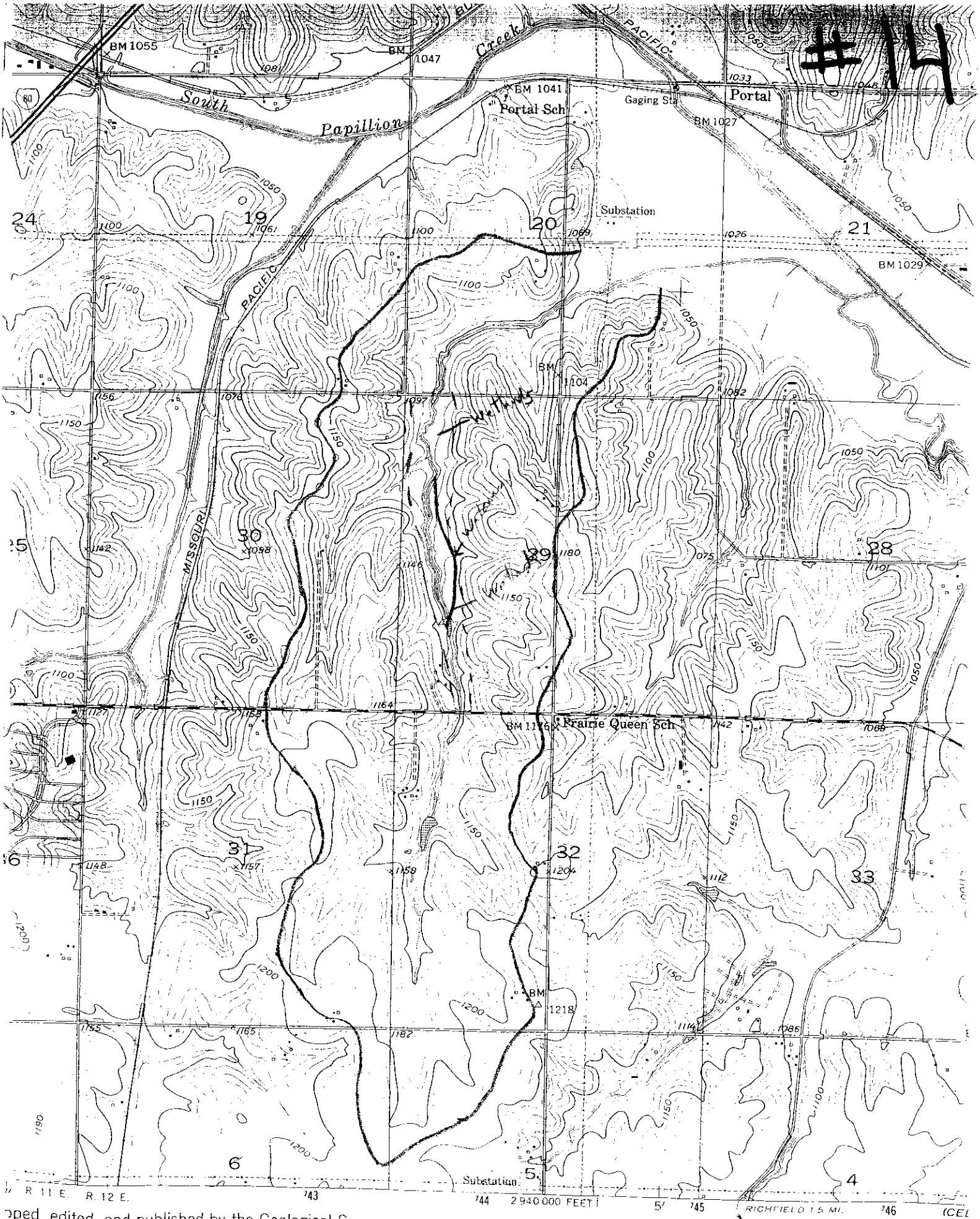

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Site # 15

Douglas County
Southeast Quarter of Section 31, Township 16 N., Range 12 E

Mitigation Potential-
Wetland- Develop approximately 30 acres of wetland on floodplain by excavating and restoring hydrology. Reconnecting hydrology to old channel of Big Papillion Creek via tributary to Big Papillion Creek north of channel. It may be necessary to excavate of area between Big Papillion Creek and former channel to allow flooding to occur. A structure would be required in the tributary to divert water into former channel.

Stream- The tributary to Big Papillion creek appears to have been channelized. Potential to add meanders. Reconnecting disconnected channel to Big Papillion Creek may also count for stream credit.

Wetland/Waterway size and lengths-
Wetland-20 ac.
New stream channel (meander) 700 feet, stream restoration 1,500 feet

Site conditions-
Topography- floodplain, little relief
Land use- Agriculture, tree nursery, park
Waterway- Big Papillion Creek and tributary to Big Papillion Creek
Watershed size- 640 ac.
Water budget- Good water supply
Soils- Kennebec (Ke). Hydric when ponded or when water is 0-1 ft from surface. Permeability 0.6-2.0 in/hr. Texture-silt loam. Seasonal high water table 8-10 feet.

Constraints-School nearby

Feasibility-Water supply is good; ratio of proposed wetland area to watershed area is 1:21. Low relief on floodplain will allow construction of wetlands and diversion structure with minimal earthwork. Potential for separate structure for diversion to old channel.


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New Channel
Mitigation Wetlands
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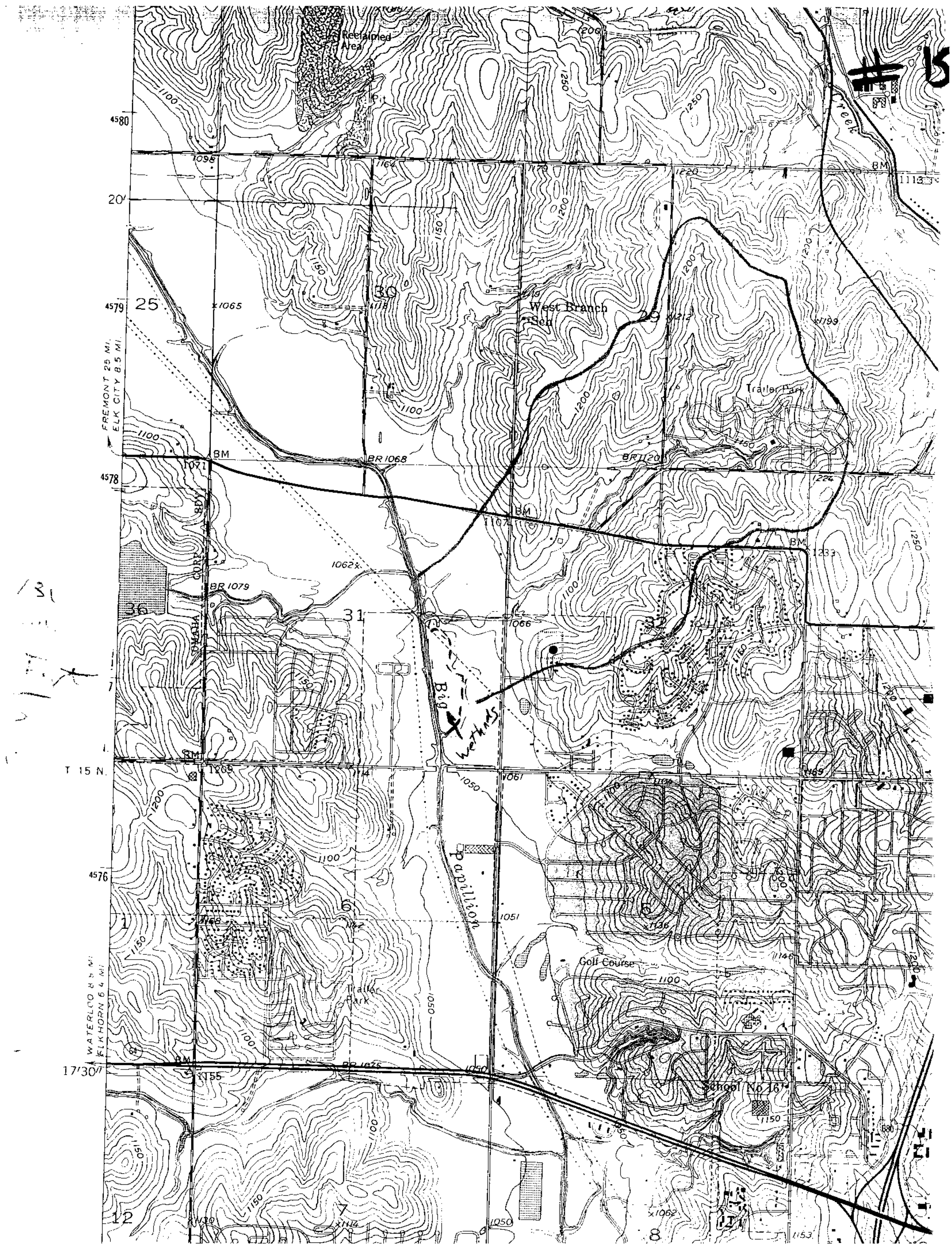
#15
Reclaimed Area
West Branch
Sch
Trailer Park
Big
X
wetlands
Papillion
Golf Course
School No 16
Trailer Park
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FREMONT 25 MI.
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WATERLOO 8.5 MI.
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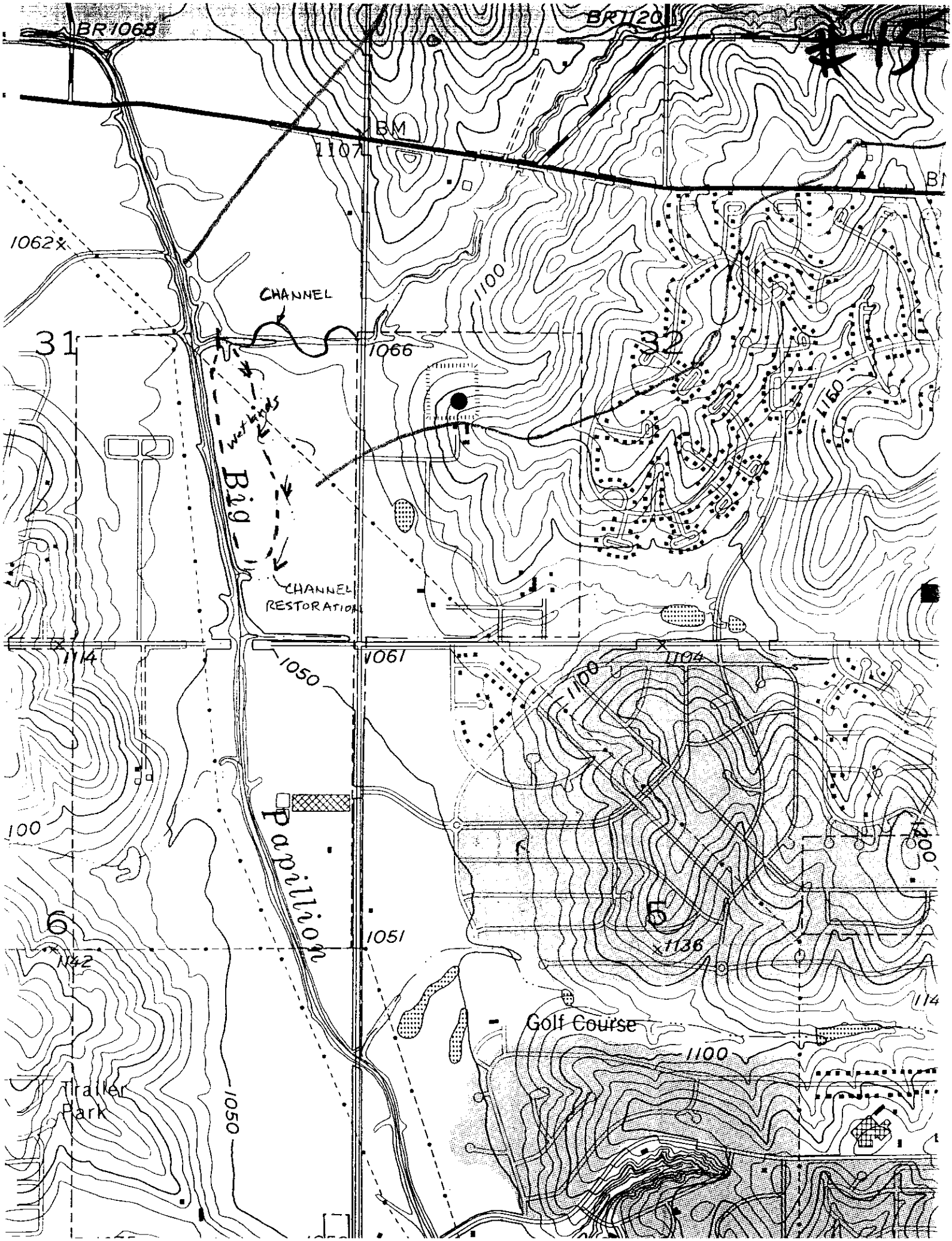
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1100
100
Papillion
1200
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1051
1142
x1136
114
Golf Course
1100
Trailer
Park
1050

Site # 18
Douglas County
Northeast Quarter of Section 29, Township 16 N., Range 11 E

Mitigation Potential-
Wetland- Develop approximately 20 acres of wetland on floodplain by impounding tributary to North Branch or excavating are north of tributary to allow more frequent over the bank flooding and influence from groundwater.

Stream- Stream channel could be created by diverting water from tributary and creating a new channel that would drain to North Branch. The diversion point would require a small structure as the channel is not very deep at this point.

Wetland/Waterway size and lengths-
Wetland-20 ac.
New stream channel (diversion) 1,200 feet.

Site conditions-
Floodplain, very little relief
Land use- Agriculture
Waterway- Tributary of North Branch of West Papillion Creek
Watershed size-2,560 ac.
Water budget- Good water supply
Soils-Colo-Kennebec (CK), hydric when ponded or when water is 0-1 ft from surface. Permeability 0.2-0.6 in/hr, Texture- silty clay loam. Seasonal high water table 3-8 feet.

Constraints-School nearby

Feasibility-Water supply is good; ratio of proposed wetland area to watershed area is 1:28. Low relief on floodplain will allow construction of wetlands and diversion structures with minimal earthwork.


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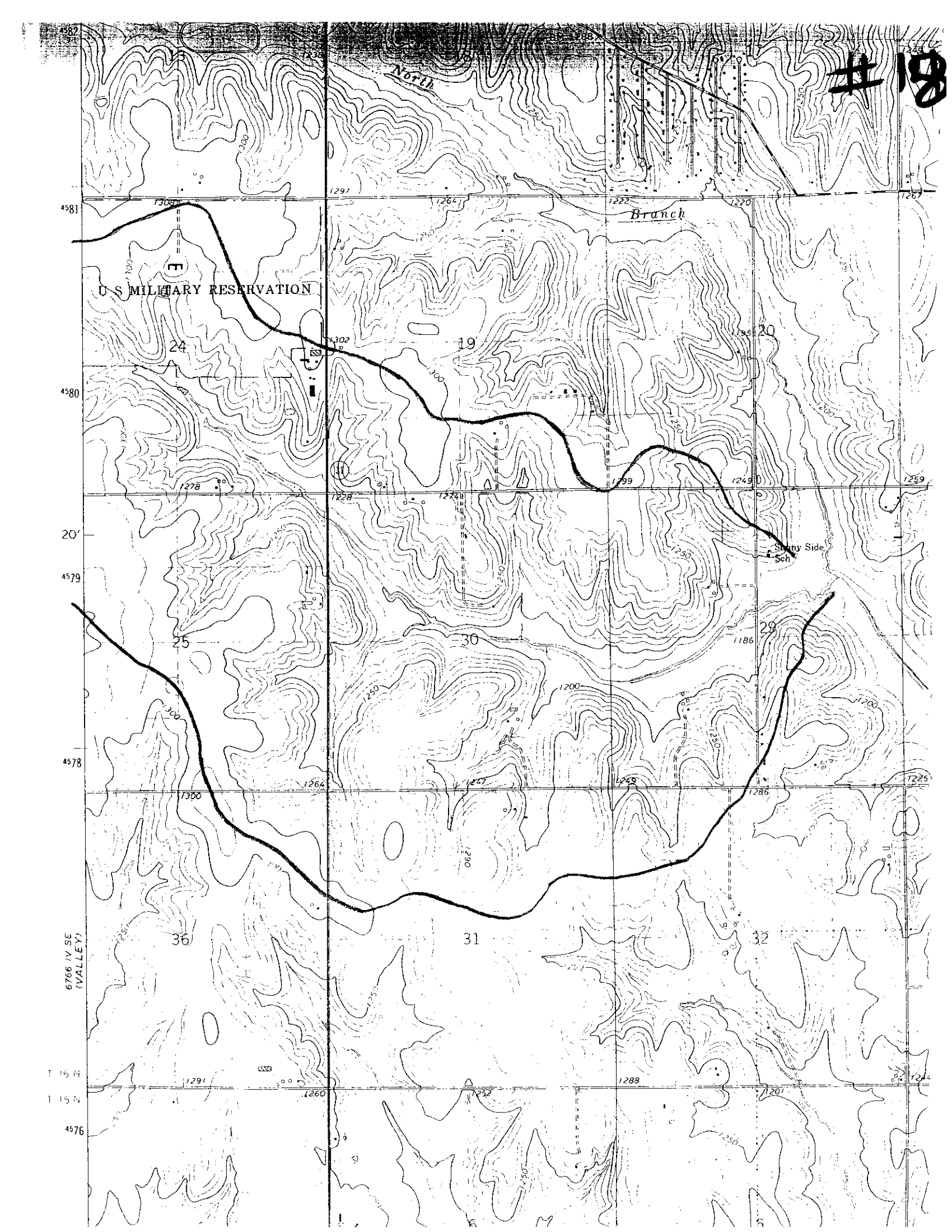
21
Mitigation Wetland
18
New Channel
29
28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North
Branch
U S MILITARY RESERVATION
Sunny Side Sch
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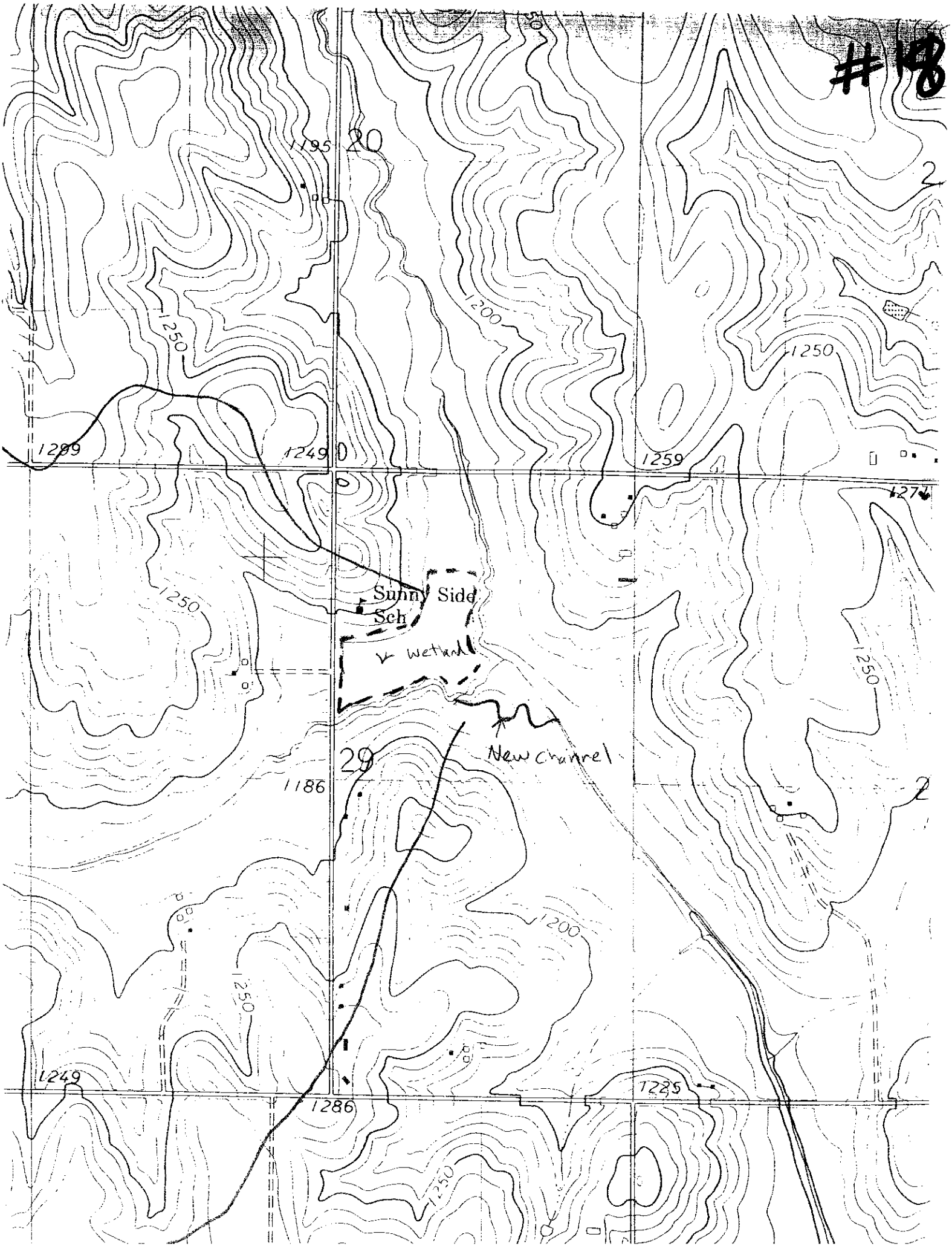
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Sunny Side
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wetland
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New channel
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1186
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1250
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1286
1225
1250

SECTION 7
FINAL SITE RECOMMENDATION

After reviewing the feasibility engineering evaluation for each site, JHC confirmed that it is technically feasible to develop wetlands and waterways at Sites 2, 7, 15 and 18. Site 14 would be difficult to create wetlands because the depth of the stream bed compared to the adjacent floodplain. Creation of a stream or wetlands would require a significant amount of excavation. In addition, the adjacent floodplain is narrow, which would not allow a larger wetland to be constructed in one area, but rather a long and linear wetland would be necessary. Creating a waterway is possible, but again would require a large diversion structure or significant excavation.

JHC recommends Sites 2, 7 and 15 as the best locations to develop a wetland/waterway bank because Sites 2, 7 and 15 both allow for development of wetlands, have suitable existing waterways to create additional waterways and have existing waterways that are strong candidates for stream restoration. Site 7 has the most area for wetlands development and stream channel creation.

Based on the land evaluation conclusions and considering the existing site at 132nd and State Streets, JHC recommends pursuing the existing site at 132nd Street and Site 2 because they both are technically feasible to build a bank and have the lowest acquisition cost. Site 15 would also be worth pursuing if an easement could be obtained for the area east of creek.

Table 4 provides a comparison of property size, potential wetland acres, potential mitigation channel feet, estimated cost of the land and the landowner's interest.

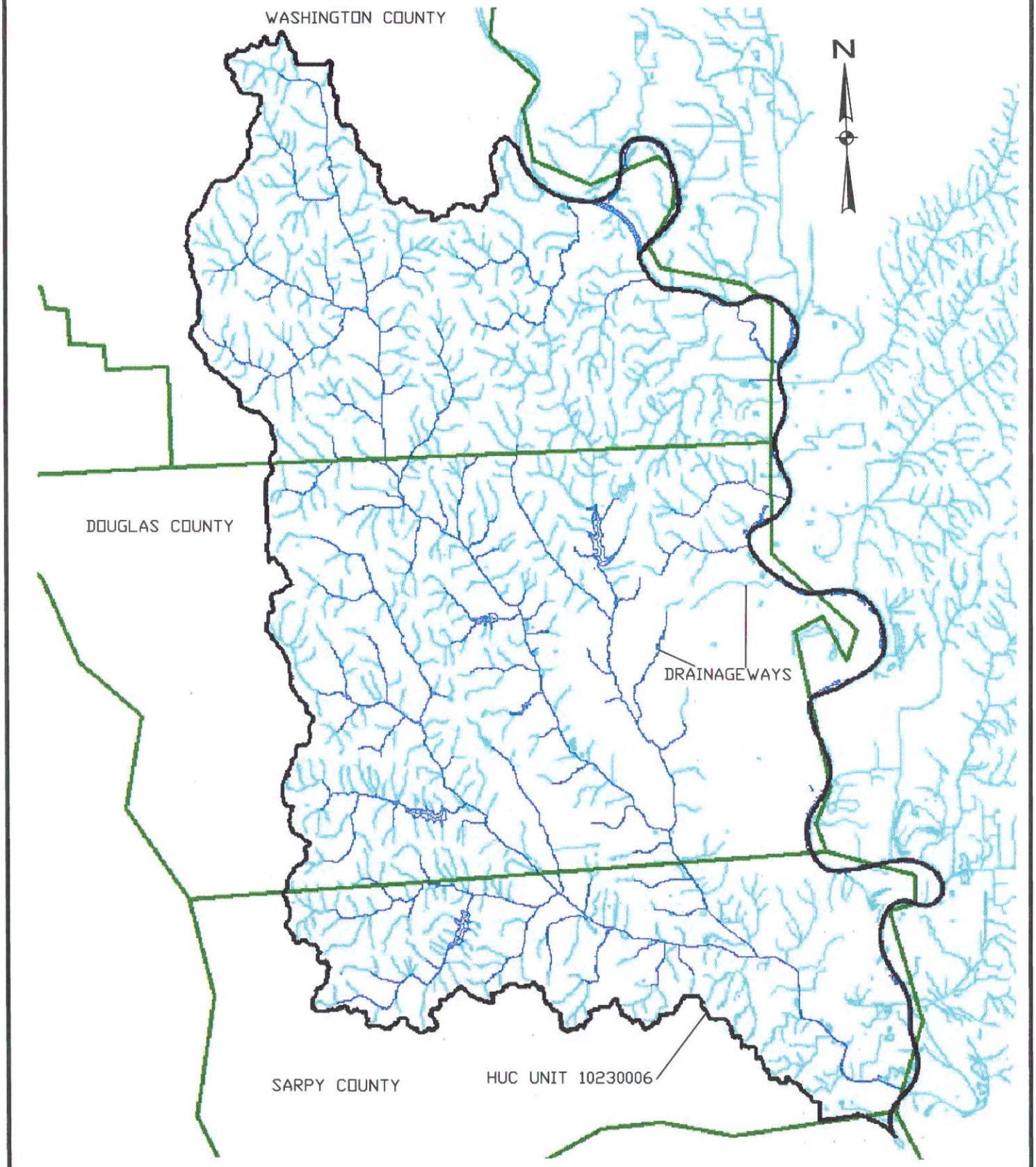
Table 4
PMRNRD Wetland Bank Site Information Comparison

Site No.	2	7(17)	14	15	18	132nd & State
Property Size (ac)	200	261.98 (52.47)	72.6	49.41	114.58	66.2
Potential Wetland (ac)	40	20-40	20	20	20	30-50
Potential Mitigation Channel (ft)	2,200 (700'meanders plus restoration potential)	2,700	NA	2,200 (1500 from restoration)	1,200	1,000-2,000
Estimated Cost of Land	$1,200,000	$9,433,500	$2,398,200	$1,976,400	$2,864,500	$582,800
Landowner's Interest	Potential (Acquisition)	Potential (Easement)	*Potential (Easement)	Potential (Easement)	Potential (Easement & Acquisition)	Yes (Acquisition)

* Landowner on south side of Site not interested.

APPENDIX A

MAPS

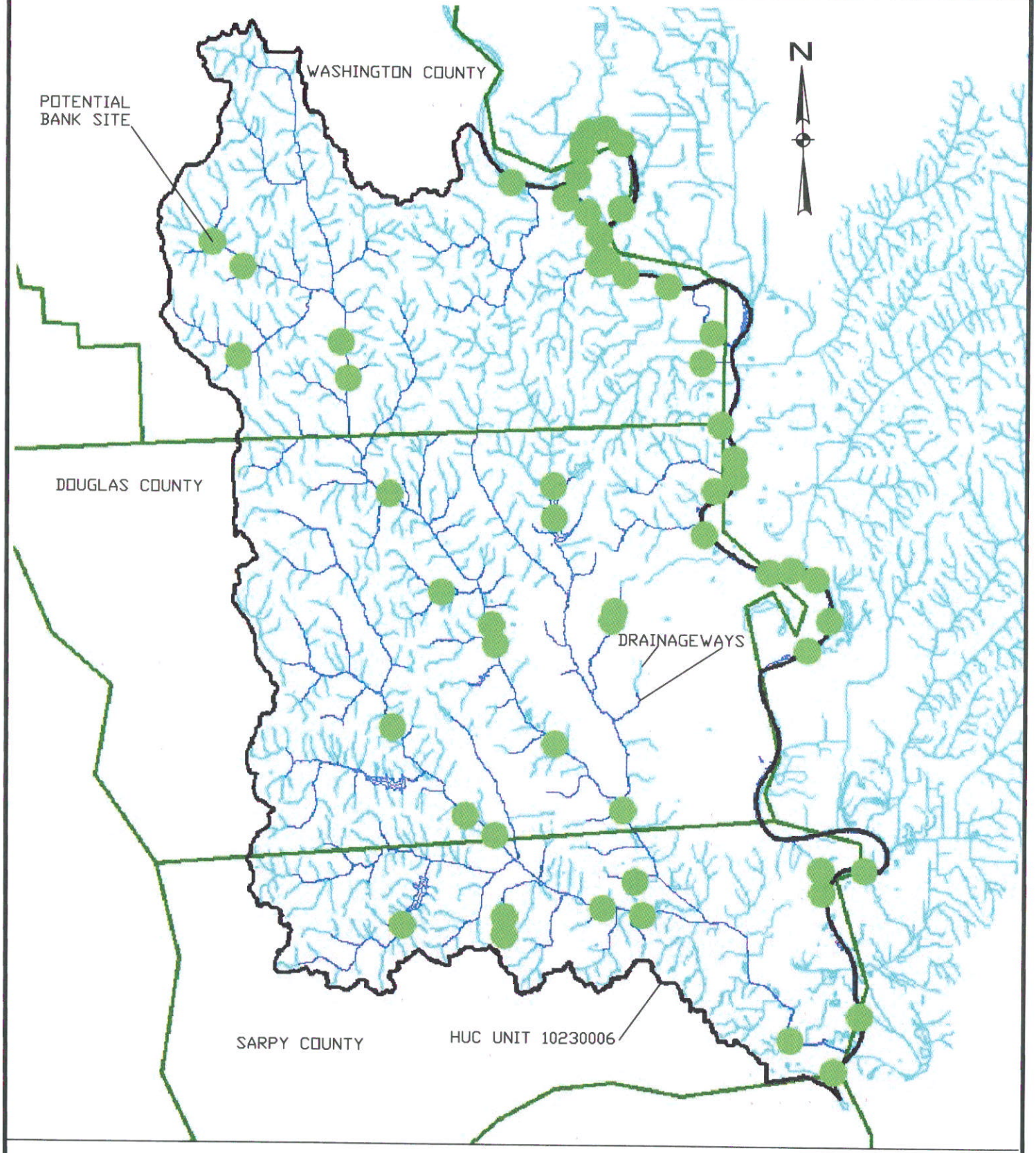


Jacobson Helgoth
CONSULTANTS

FILE NO.: 11915R(A)

DATE: 07/10/06
SCALE: NOT TO SCALE
PROJ. NO.: 119-15
DRAWN: JAS
CHECKED: AAM
FIG 1

SITE VICINITY MAP
PAPIO MISSOURI RIVER
NATURAL RESOURCES DISTRICT
WETLAND BANK SITE SELECTION PROJECT
NEBRASKA

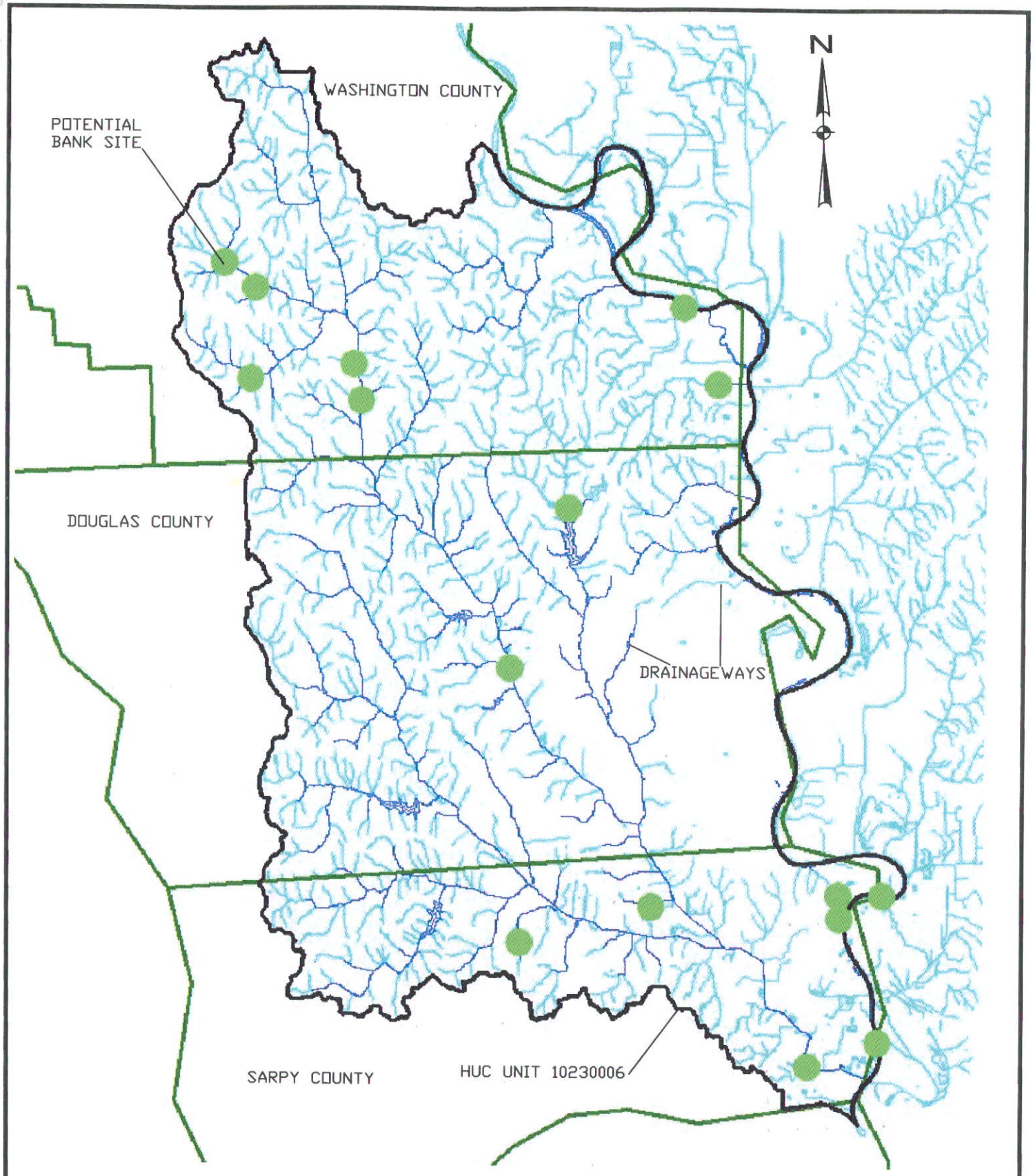


Jacobson Helgoth
CONSULTANTS

FILE NO.: 11915R(A)

DATE: 07/10/06
SCALE: NOT TO SCALE
PROJ. NO.: 119-15
DRAWN: JAS
CHECKED: AAM
FIG 2

INITIAL SITE LOCATION MAP
PAPIO MISSOURI RIVER
NATURAL RESOURCES DISTRICT
WETLAND BANK SITE SELECTION PROJECT
NEBRASKA

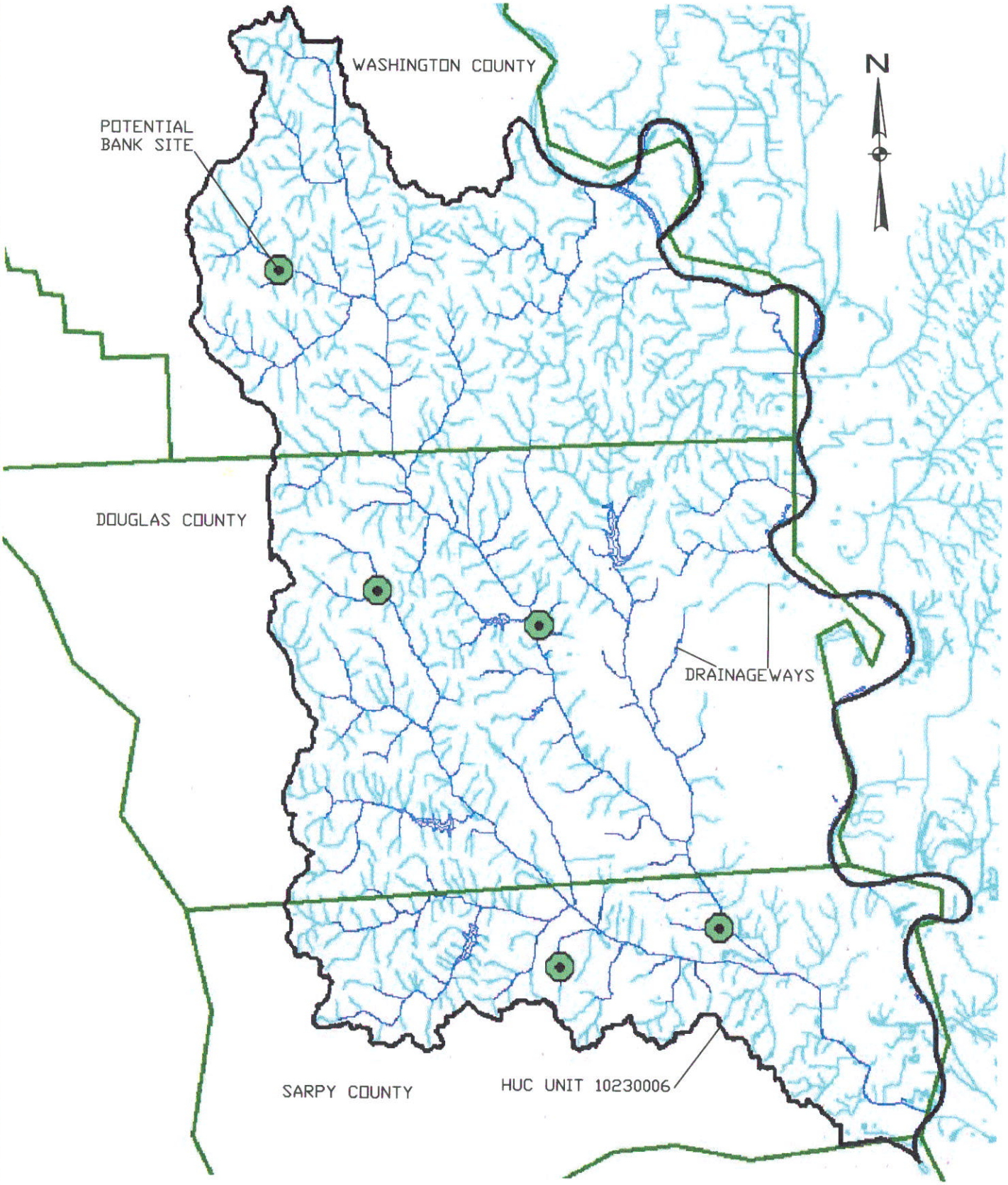


Jacobson Helgoth
CONSULTANTS

FILE NO.: 11915R(A)

DATE: 07/10/06
SCALE: NOT TO SCALE
PROJ. NO.: 119-15
DRAWN: JAS
CHECKED: AAM
FIG 3

SCREENED SITE LOCATION MAP
PAPIO MISSOURI RIVER
NATURAL RESOURCES DISTRICT
WETLAND BANK SITE SELECTION PROJECT
NEBRASKA



Jacobson Helgoth
CONSULTANTS

FILE NO.: 11915R(A)

DATE: 07/10/06
SCALE: NOT TO SCALE
PROJ. NO.: 119-15
DRAWN: JAS
CHECKED: AAM
FIG 4

FINAL SITE LOCATION MAP
PAPIO MISSOURI RIVER
NATURAL RESOURCES DISTRICT
WETLAND BANK SITE SELECTION PROJECT
NEBRASKA

APPENDIX B

GIS REPORT

GIS Workshop

ESRI Technology
AUTHORIZED BUSINESS PARTNER

WETLAND BANK CRITERIA PRELIMINARY GIS ANALYSIS

Scope of Services

06.20.06

Organizational Description

Introduction

GIS Workshop has been providing quality GIS data and analysis solutions to a wide array of corporations and local, state and federal government agencies. GIS Workshop has worked extensively with many clients to provide customized spatial information management and analysis solutions. GIS Workshop staff has over 30 years combined experience in GIS analysis in a wide variety of vertical markets (municipal government, environmental engineering, civil engineering, satellite imagery analysis, agriculture, defense and telecommunications).

We are committed to total client satisfaction through delivery of complete GIS solution packages. GIS Workshop pledges to work closely with the Winnebago Tribe staff to create and deliver the pesticide base map GIS system, training and post-delivery support. Our locale enables us to provide timely, on-site support and training to ensure that Winnebago Tribe will achieve maximum benefit from this technology.

Home Office Contact Information

GIS Workshop, Inc.
415 N 66th Street, Suite 7
Lincoln, NE
Ph: (402) 436 2150
Fax: (402) 436 2152
Email: mtooze@gisworkshop.com

Contact: Marcus Tooze

All work will be performed at this location.

Organizational Structure

Project Manager: Marcus Tooze

Mr. Tooze has over 12 years experience in GIS applications for all levels of government and corporate America. He moved to the United States to obtain his M.S. in Geography and was recruited by the US Army Corps of Engineers in Champaign, IL to implement GIS for US Department of Defense installations around the world. He serves as past-president of the Nebraska GIS/LIS Association. Mr. Tooze has extensive experience in GIS applications for all levels of government, and is sensitive to the needs of staff and public alike. Mr. Tooze will act as project manager for the Jacobson Helgoth Wetlands GIS Analysis project and provide the interface between GIS Workshop, Inc. technicians and Jacobson Helgoth staff. In addition, Mr. Tooze will provide QA/QC oversight. Mr. Tooze is available 100% for this project.

Senior GIS Technician: Luke Zakrzewski

Mr. Zakrzewski is a University of Nebraska-Kearney graduate and has extensive experience in GIS mapping applications. Mr. Zakrzewski is the senior technician in charge of the data entry team and will be responsible for the data entry technicians and adherence to the strict QA/QC schema that we will be using. Mr. Zakrzewski is available 100% for this project.

Senior GIS Developer: Andrew Rutledge

Mr. Rutledge is the lead programmer at GIS Workshop, Inc. and will act as the IT integration expert. He has extensive experience in both Microsoft and UNIX environments. He is an accomplished programmer in C, C++ (MFC), Visual Basic, Map Objects, PERL, TKL/TCL, SQL (Oracle and SQL), Motif, JavaScript, HTML, DHTML, etc. Mr. Rutledge's skills will be utilized periodically throughout the life of the project and will be available on an as needed basis for particular application development and

customization needs. In addition, Mr. Rutledge will be made available for GIS hardware and software installation.

ESRI Certified Training Specialist: Claire Brown
Ms. Brown is an ESRI certified trainer in ArcView9.x. Ms. Brown will be available on as needed basis for training purposes. Ms. Brown has over 6 years of GIS experience in government applications. Ms. Brown is a graduate of the University of Nebraska-Lincoln and has worked for several agencies helping them start up their GIS sections. She has been trained in the use of ESRI Arc/Info database design and advanced applications.

Affirmative Action Statement
GIS Workshop, Inc. is an Affirmative Action/Equal Opportunity Institution. No person will be denied opportunity for employment or education or be subject to discrimination in any project, program or activity because of race, color, religion, sex, sexual orientation, national origin, age, handicap or disability, disabled veteran or Vietnam era veteran status.

Insurance/Litigation History
GIS Workshop, Inc. or its officers have never been involved in professional litigation concerning any service or product. GIS Workshop carries full professional errors and omissions liability, general liability, software development liability and workers comprehensive insurance. Insurance certificates are available upon request.

Project Approach: Preliminary Wetland Site Suitability

Project Understanding

Jacobson Helgoth Consultants has been retained by the local NRD to locate potential sites for a wetlands in the greater Omaha region. Jacobson Helgoth staff has identified a number of criteria that will determine suitability of an area for the wetlands bank:

- Within 0.25 miles of existing wetlands (NWI)
- Within 100 feet of a stream/waterway (>500 ac. drainage area)
- Have hydric soils
- Within 100 yr floodplain
- Within HUC 10230006
- 50 to 160 acres in size

GIS Workshop will utilize available GIS data and McHargian style GRID analysis to determine potential sites using the above criteria.

Required and Derived GIS Data, Sources and Limitations

All data will be supplied in ESRI shapefile or GRID format in Nebraska State Plane Feet, NAD83, unless otherwise specified. The data will be collected, QA/Qc'ed, reprojected and processed as necessary.

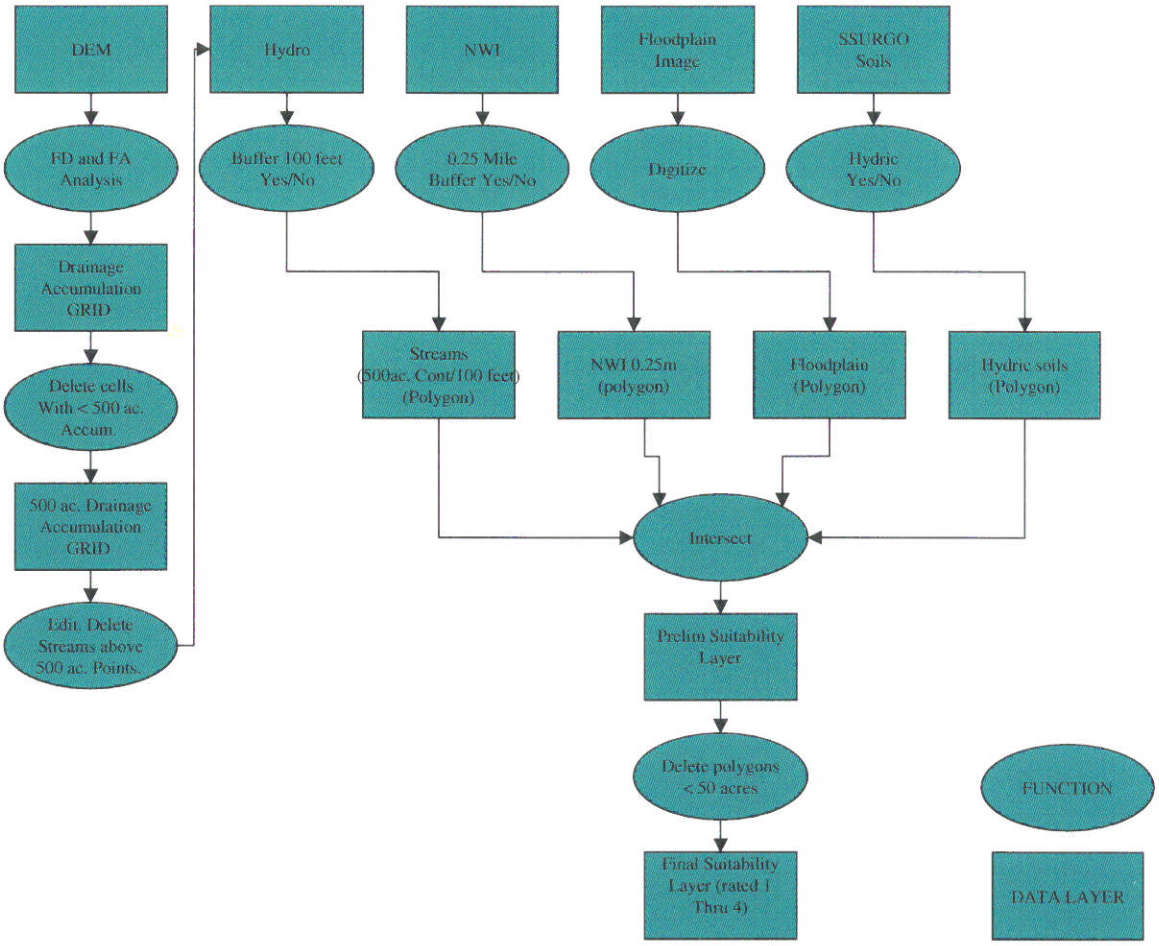
1. 2005 USDA FSA imagery layer. From the USDA FSA. Imagery is 2-meter resolution and 1:12000 accuracy. Some shifting between imagery and other GIS layers may be evident. Imagery covering the NE side HUC boundary will be provided.
2. USFW NWI layer. From the NE Department of Natural Resources. NWI GIS data are incomplete for the State of Nebraska. Not all wetlands may be shown. Some wetlands shown may not exist any longer.
    a. All NWI polygons (not linear or point features) will be buffered by 0.25 miles within the NE side HUC boundary.
3. Digital Elevation Model. From the NE Department of Natural Resources and USGS. 10m-resolution dataset, which equates to approximately $1/6^{th}$ of an acre. The DEM is generated from Tagged Vector Contours (TVCs) generated a number of years ago and may not reflect the actual topography in existence today. The DEM will be cut to the NE side HUC Boundary.
4. Streams and waterways. From the NE Department of Natural Resources National Hydrologic Dataset. Not all streams and waterways may be shown. Positional accuracy is only good to 1:24000 accuracy standards.
    a. Streams drained by 500-acre drainage area or larger will be determined by using the FLOWDIRECTION (FD) and FLOWACCUMALATION (FA) analysis in ArcInfo Workstation GRID on the USGS 10m DEM layer. The FD and FA analysis will approximate the location along the stream/waterway where drainage area of greater than 500 acres exists. The NHD dataset will be edited to delete streams/waterways that do not meet these drainage criteria.
    b. The streams/waterway layer will be buffered by 100 feet and cut to the NE side HUC boundary.
5. Hydric Soils. From the NE Department of Natural Resources NRCS SSURGO dataset. Not all hydric soils may shown. Some soil polygons may be misclassified as hydric due to the age of the SSURGO soil data. The SSURGO dataset will be cut to the NE side HUC boundary.
6. 100 yr Floodplain. From the NE Department of Natural Resources FEMA FIRM maps. Floodplain boundary accuracy is questionable around built up areas due to changes in grade and surface composition. FEMA paper maps were rectified by DNR staff and accuracy of the rectification process is unknown.

a. GIS Workshop, Inc. will digitize the 100 yr floodplain boundary from the FEMA rectified maps. The dataset will be digitized to the NE side HUC boundary.

7. HUC boundary. NE Department of Natural Resources.

Model Construction and Execution

Each data layer will be downloaded and processed per the criteria. Resultant layer will consist of polygons rated 1 through 4, 4 being the most suitable areas.



Proposed Technology - Software

GIS Workshop, Inc. will utilize ESRI technology for this project.

Project Schedule

The GIS Workshop team will be ready to start the Wetland Bank Site Analysis on July 1, 2006.

Deliverable and Pricing Information

Project Products and Services: Deliverables	Cost ($)
1. 2005 FSA Imagery layer. Download, reproject and assemble imagery	(4h) $480
2. NWI layer. Download, reproject, clip and assemble	(8h) $960
3. DEM. Download, reproject, clip and assemble. Calculate FD and FA layers.	(12h) $1440
4. Hydro. Download, reproject, clip and assemble. Apply FA layer and delete non-conforming waterways. Buffer.	(16h) $1920
5. Hydric soils. Download, reproject, clip and assemble	(2h) $240
6. Floodplain. Digitize floodplains. Reproject and assemble	(24h) $2880
7. Final model compilation	(8h) $960
8. Meeting/management/travel time	(8h) $960
TOTAL FEE	$9840

NOTE: Additional analysis beyond specified scope and criteria (for example, recalculation of model due to change in criteria [200 foot stream buffer instead of 100 foot buffer]) is NOT included. Criteria/scope changes will result in additional billing at $120 p/h.