

# FARGO FLOOD CONTROL SOUTHSIDE FLOOD PROTECTION

RED RIVER BASIN COMMISSION  
25<sup>th</sup> ANNUAL CONFERENCE

JANUARY 22-24, 2008

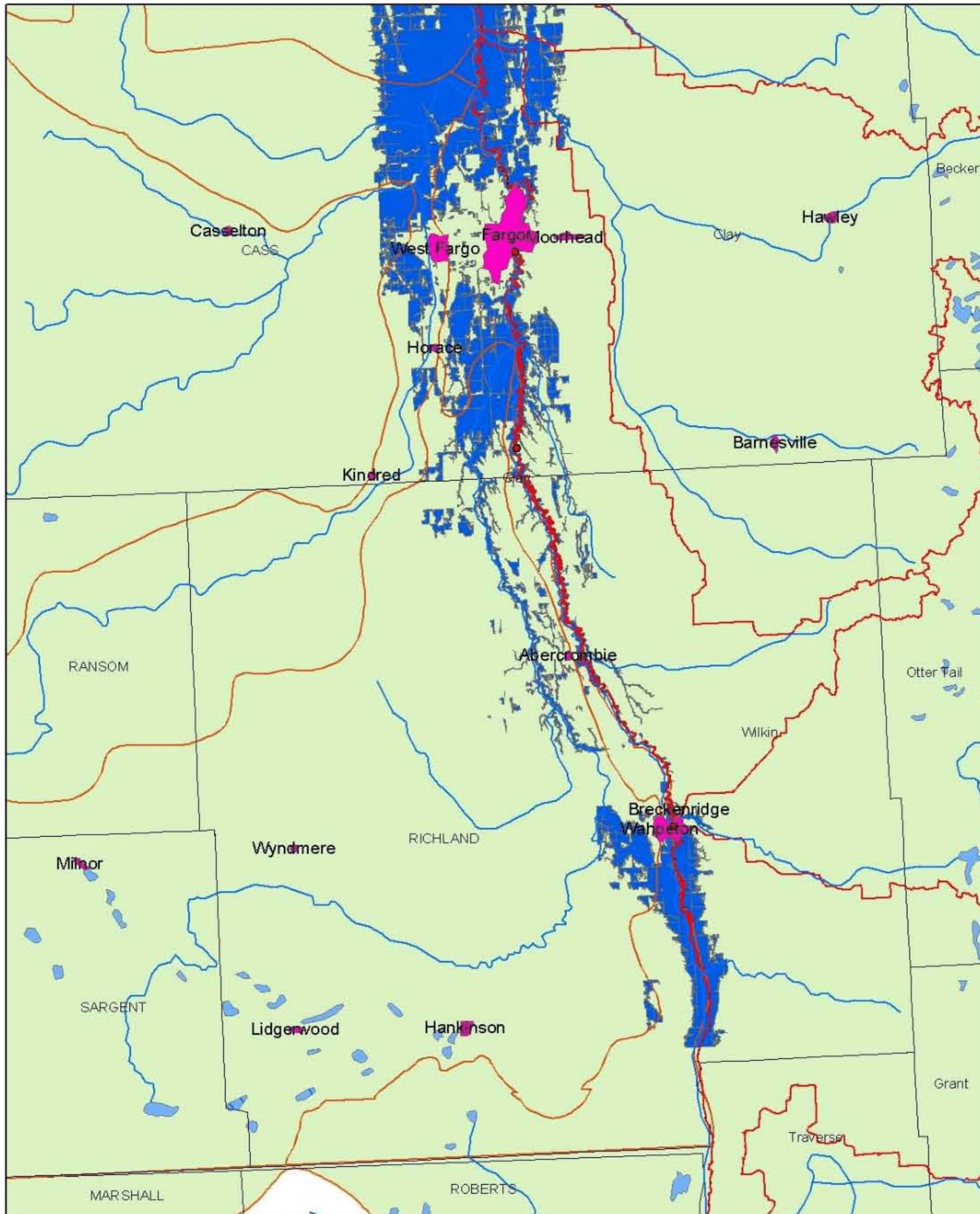
Presentation by:  
Jeffrey J. Volk, PE & RLS  
Moore Engineering, Inc.,  
West Fargo, North Dakota



moore  
engineering, inc.

West Fargo • Fergus Falls



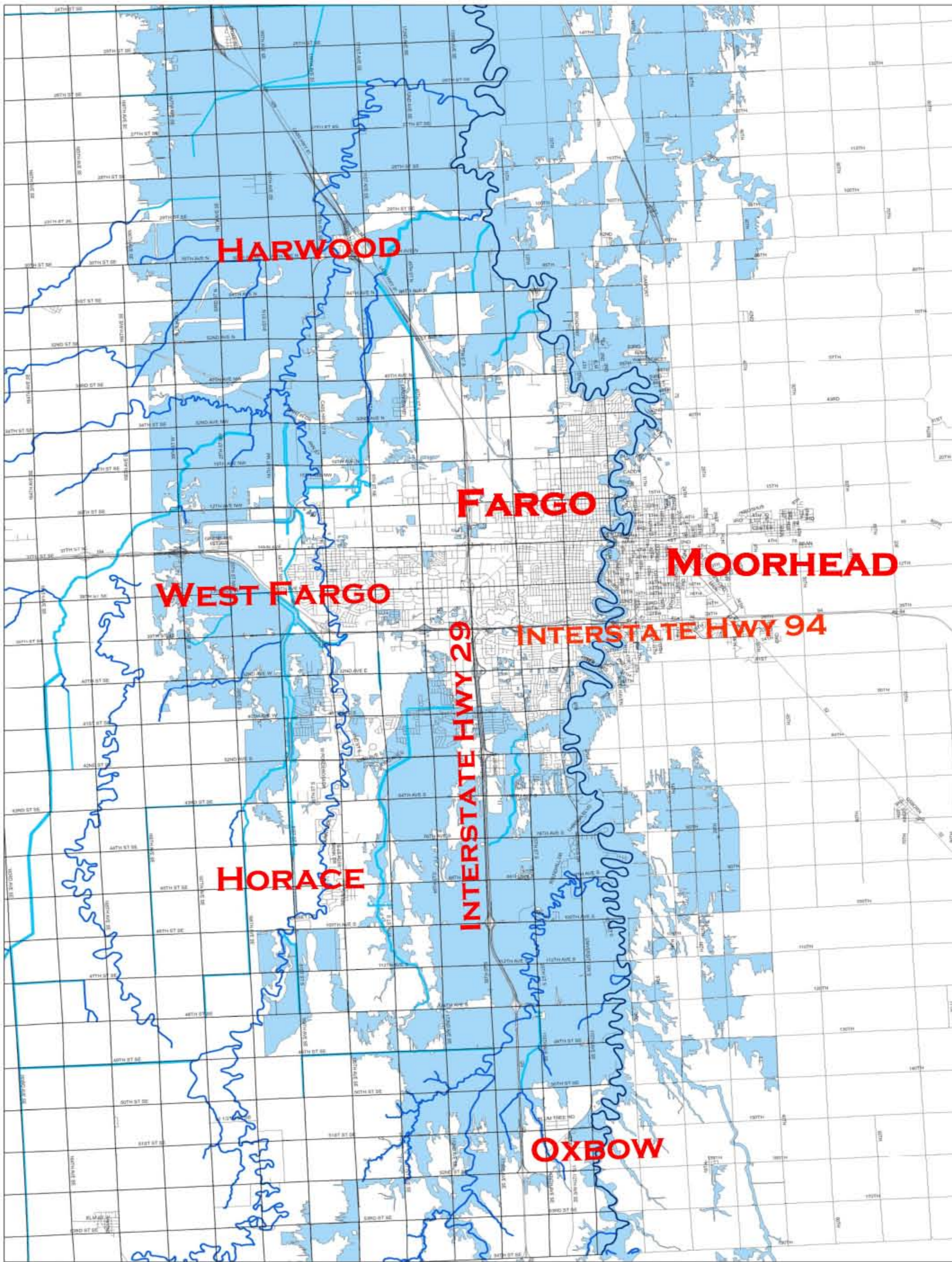


# SOUTHSIDE FLOOD CONTROL

1997 FLOOD OUTLINE  
ALONG THE  
RED RIVER







Legend  
 05 Estimated 1997 Flood Outline

Southside Flood Protection Study

moore engineering, inc.

# SOUTHSIDE FLOOD CONTROL

## 1997 SPRING FLOOD



West Fargo • Fergus Falls





## 1997 Spring Flood – South of Fargo







## 1997 Spring Flood – South of Fargo















ST. BENEDICT

25TH STREET SOUTH

CASS CO HWY 16

WILD RICE RIVER

INTERSTATE 29



1997 Spring Flood – South of Fargo







ST. BENEDICT

INTERSTATE 29

CASS Co HWY 16

CASS Co DRAIN 47

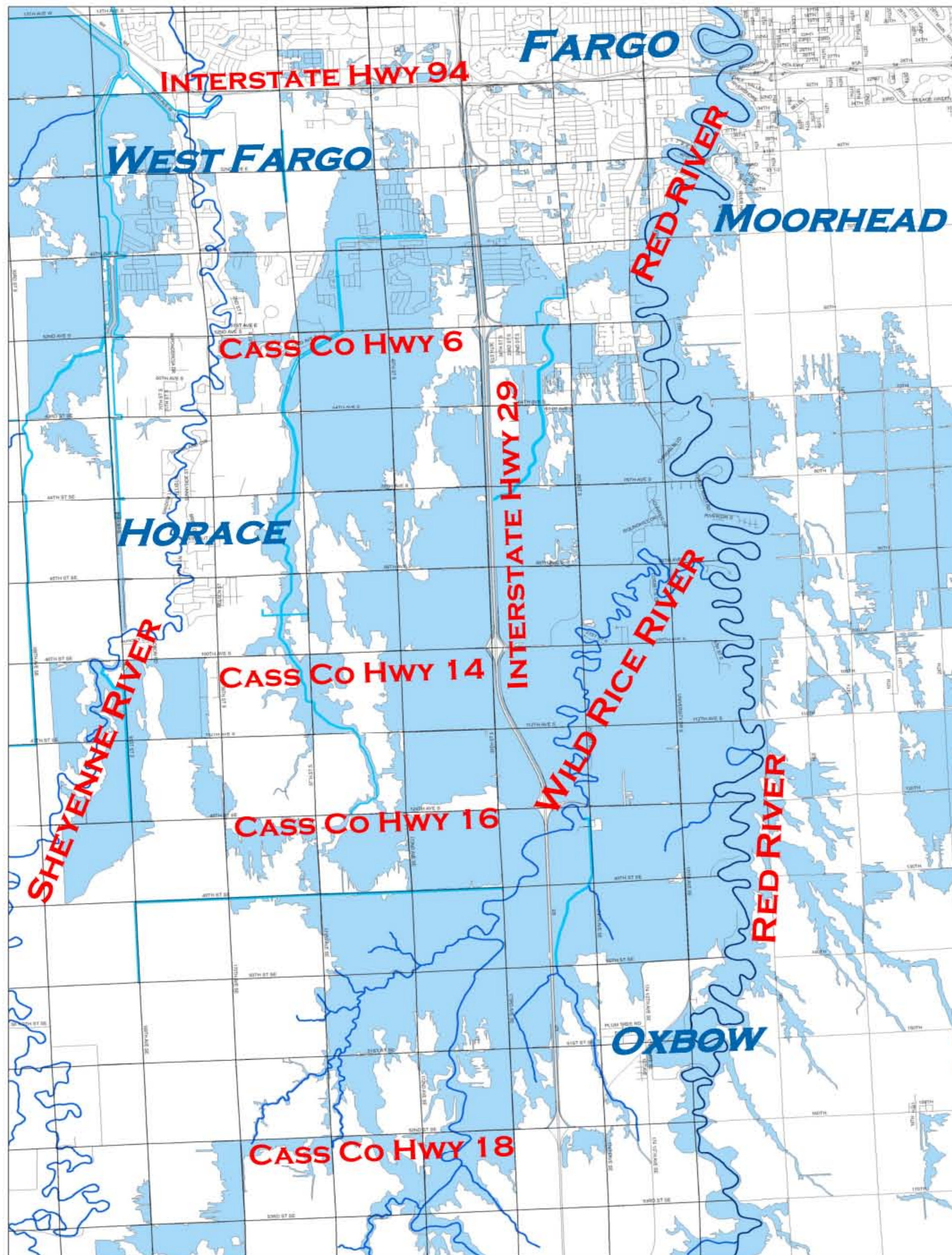
WILD RICE RIVER



1997 Spring Flood – South of Fargo







Legend  
 (B) Estimated 1997 Flood Outline

Southside Flood Protection Study

moore engineering, inc.

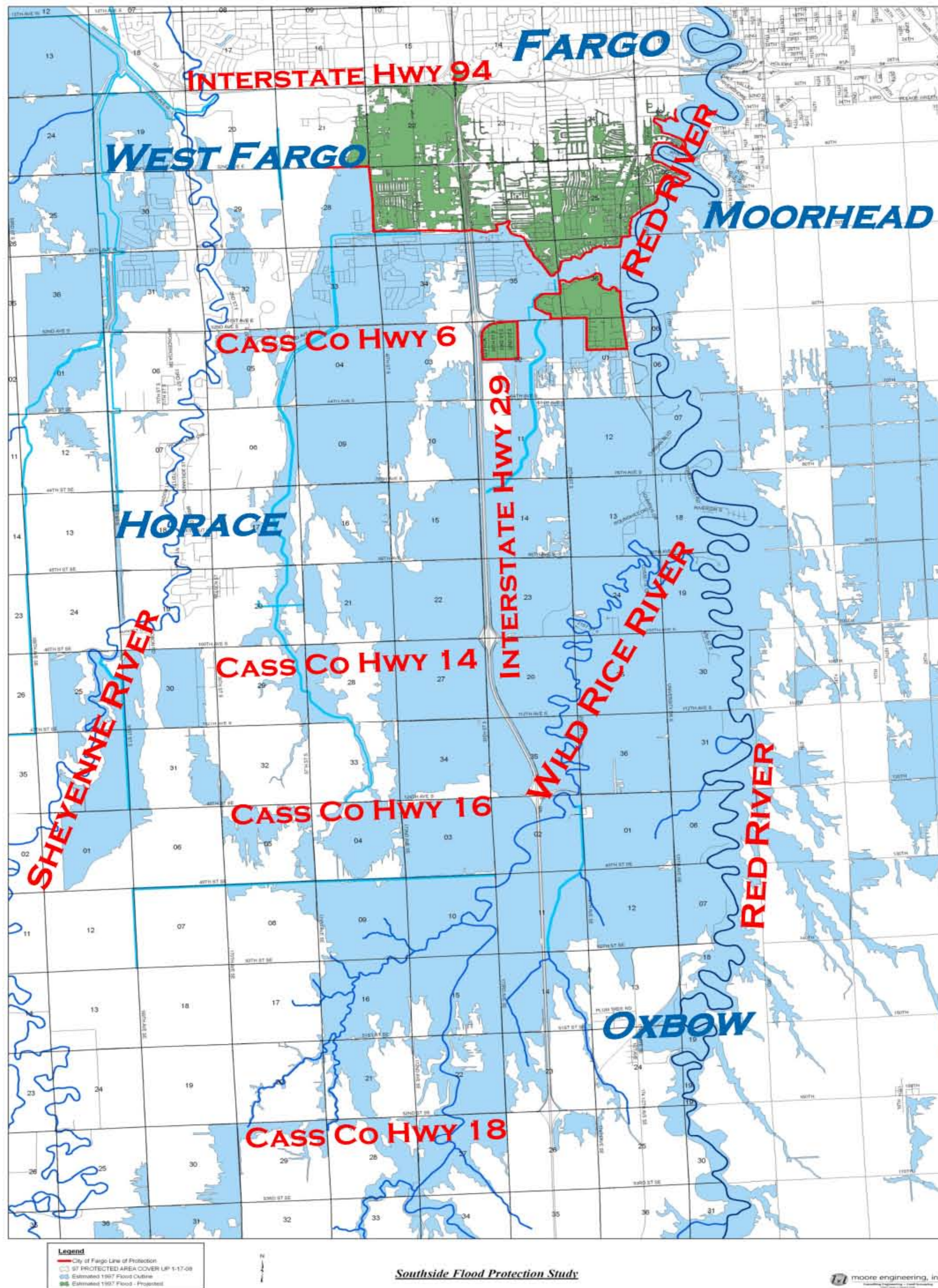
# SOUTHSIDE FLOOD CONTROL

1997 SPRING FLOOD  
 AREAS INUNDATED  
 WITH FLOOD WATER



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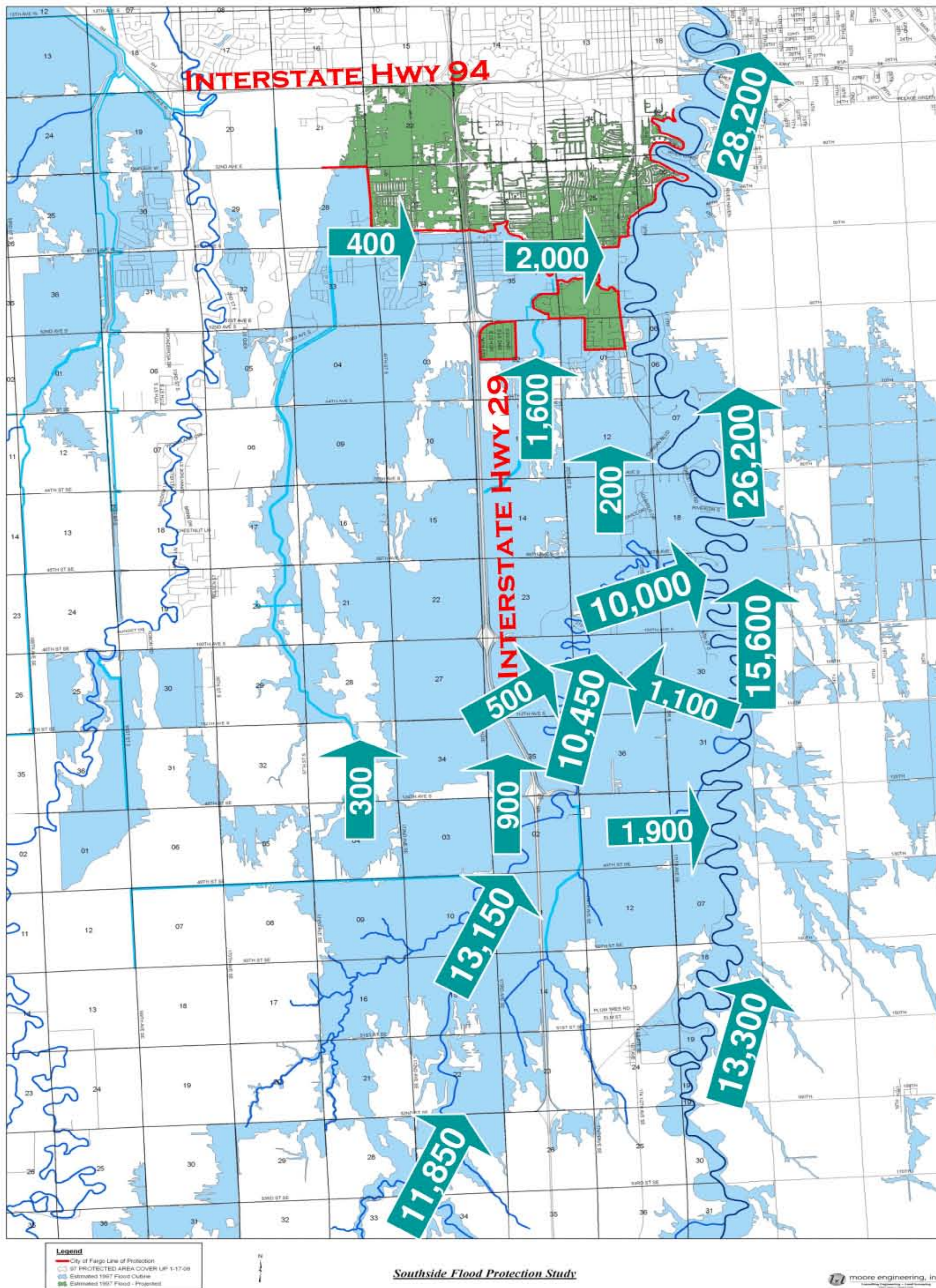


# SOUTHSIDE FLOOD CONTROL

1997 SPRING FLOOD  
AREAS INUNDATED  
WITH FLOOD WATER  
With  
ESTIMATE OF AREAS  
PROTECTED BY  
EMERGENCY  
MEASURES



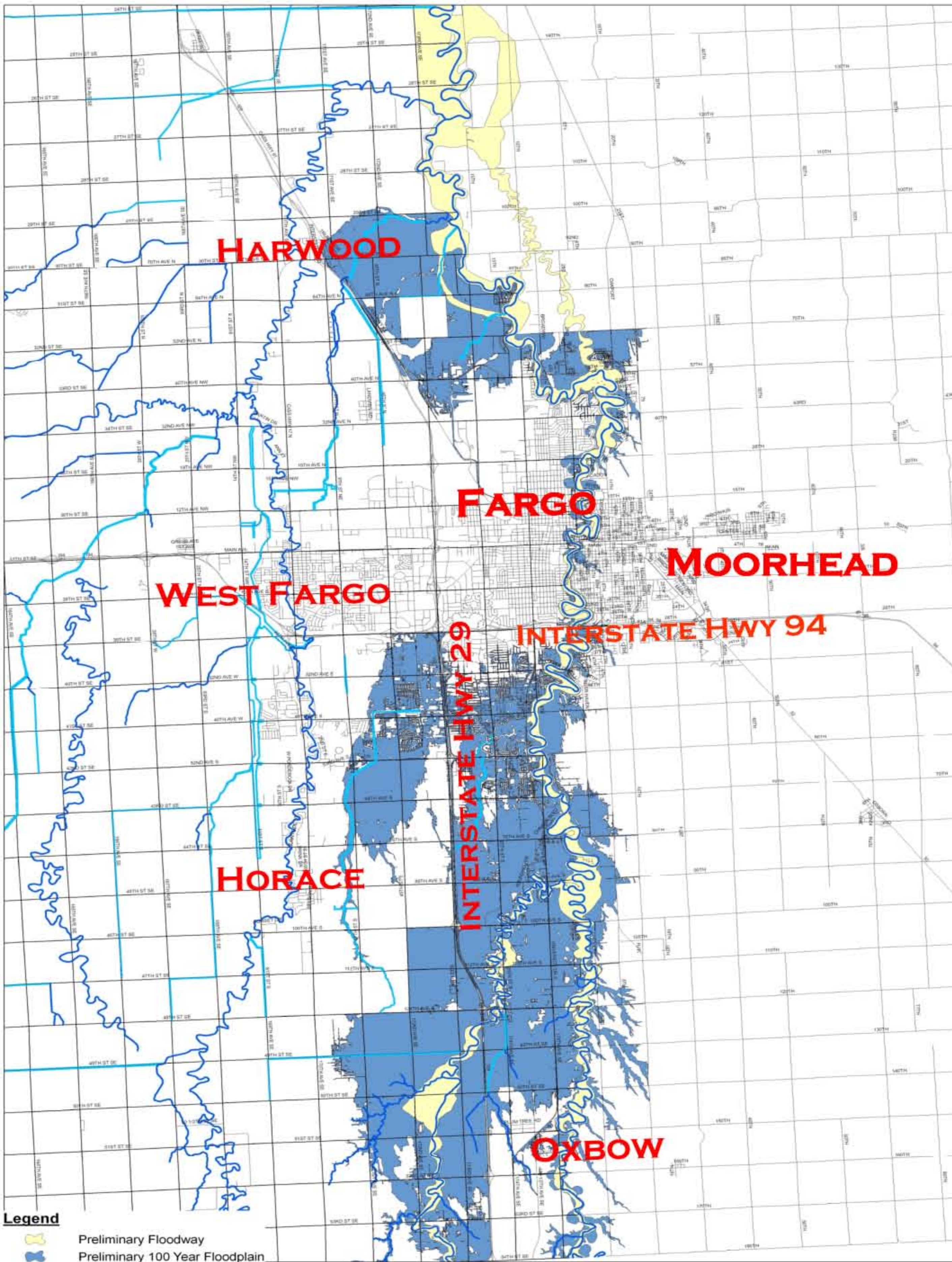






# SOUTHSIDE FLOOD CONTROL


1997 SPRING FLOOD  
Estimate of Flood Flows  
(Flow in CFS)





**Legend**  
 Preliminary Floodway  
 Preliminary 100 Year Floodplain

*Southside Flood Protection Study*

 moore engineering, inc.  
Engineering • Planning • Construction

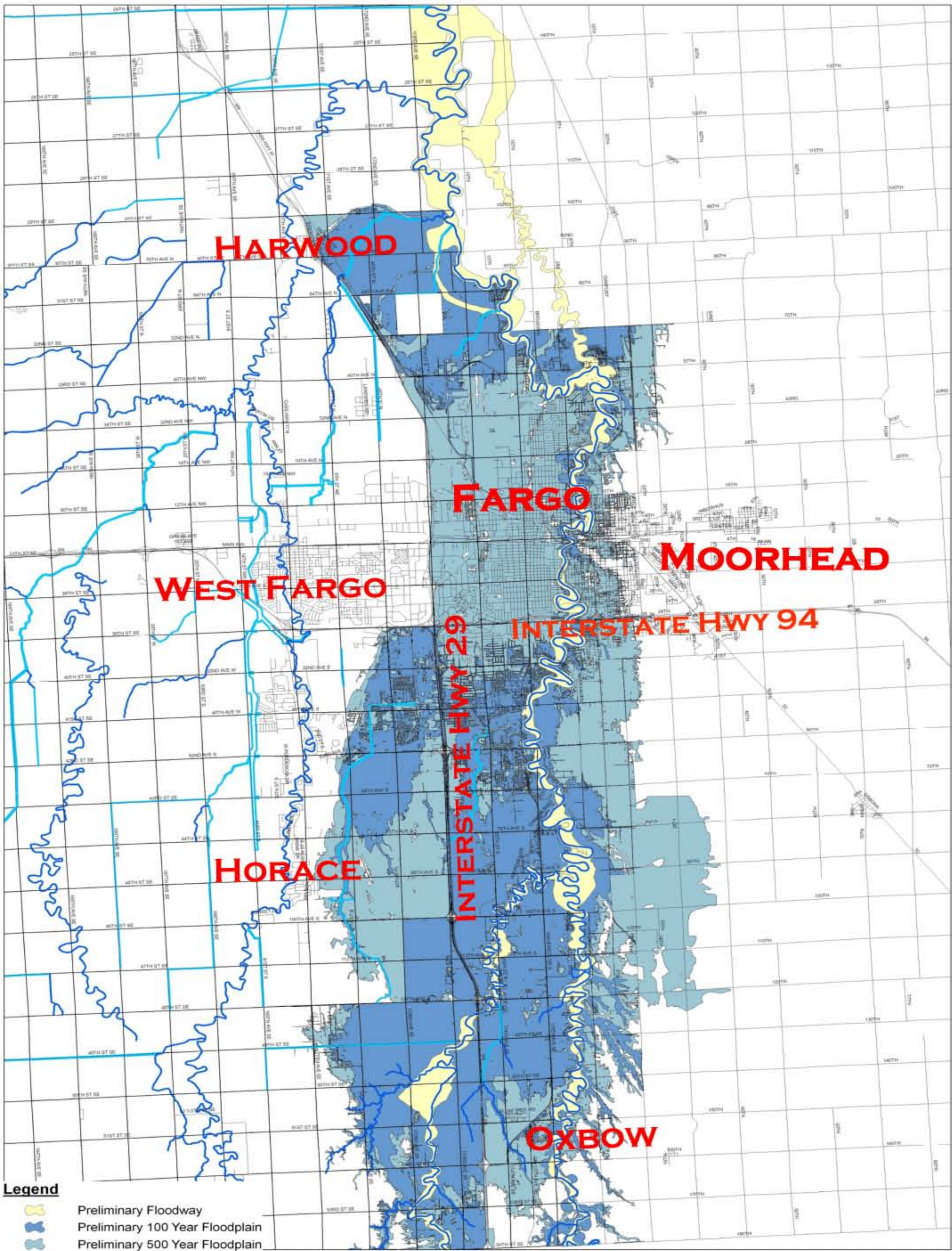
# SOUTHSIDE FLOOD CONTROL

## PRELIMINARY 100 YEAR FLOODPLAIN



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Southside Flood Protection Study

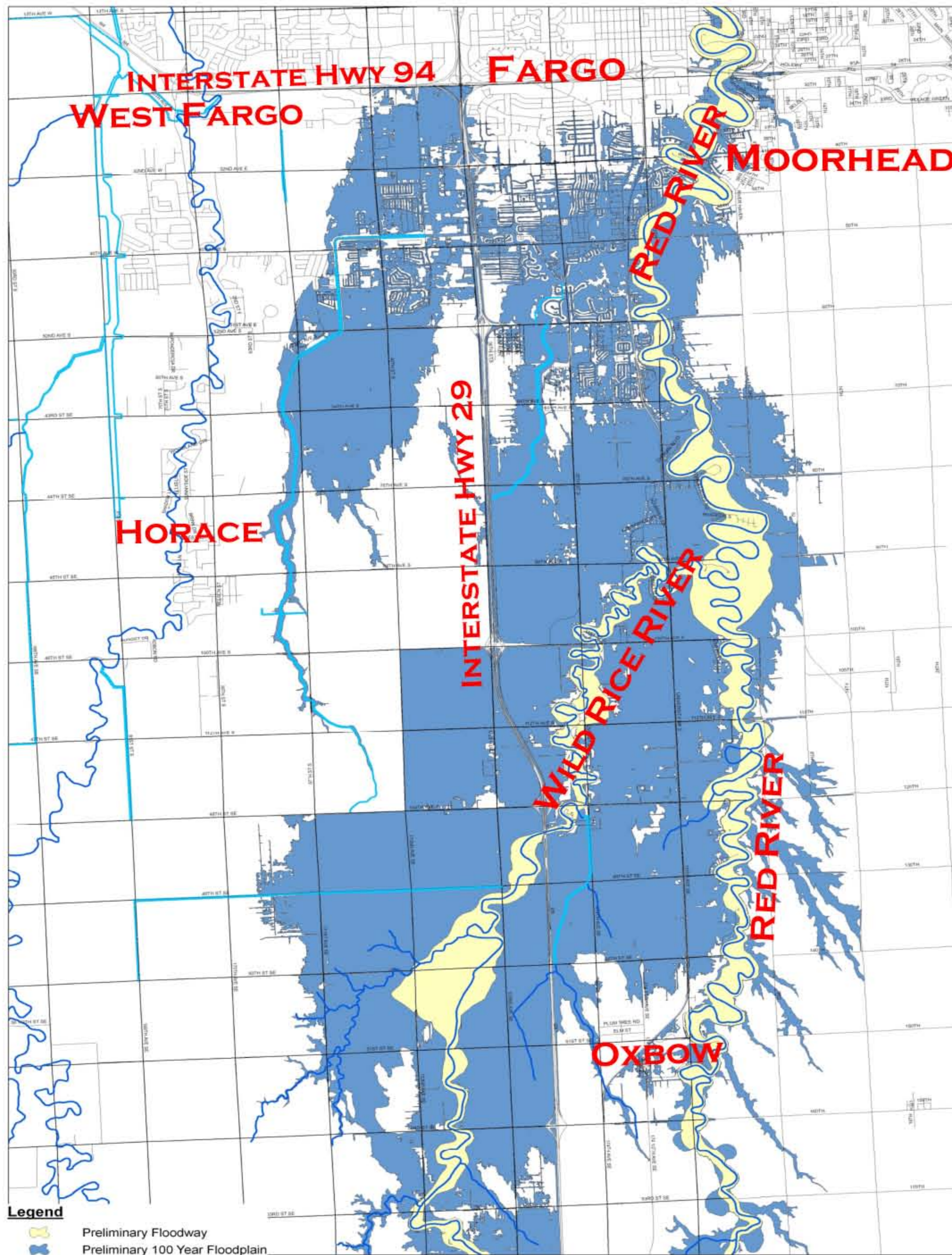
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# SOUTHSIDE FLOOD CONTROL

## PRELIMINARY 100 & 500 YEAR FLOODPLAINS







Southside Flood Protection Study

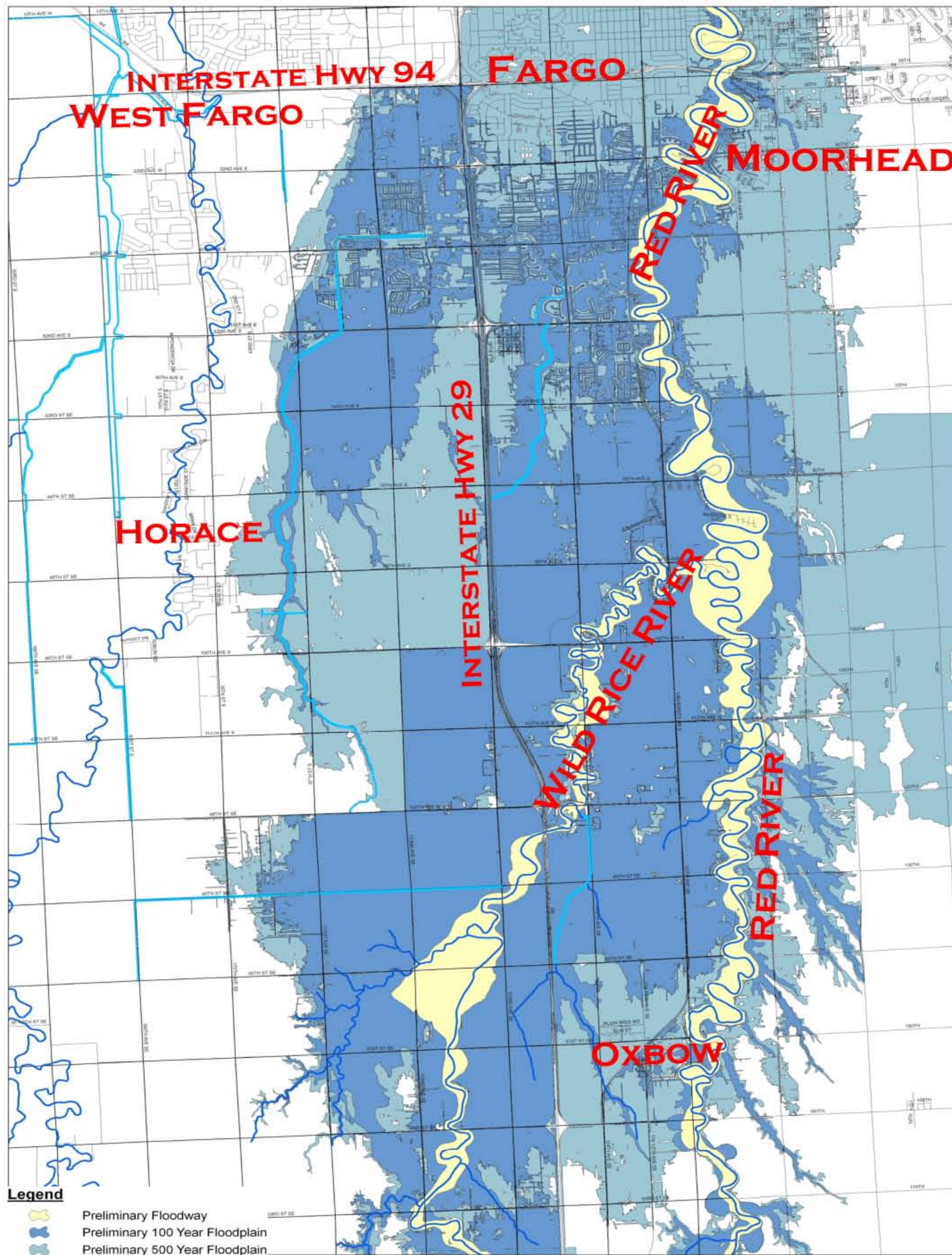
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# SOUTHSIDE FLOOD CONTROL

## PRELIMINARY 100 YEAR FLOODPLAIN







- Legend**
-  Preliminary Floodway
  -  Preliminary 100 Year Floodplain
  -  Preliminary 500 Year Floodplain

Southside Flood Protection Study

moore engineering, inc.

# SOUTHSIDE FLOOD CONTROL

## PRELIMINARY 100 & 500 YEAR FLOODPLAINS

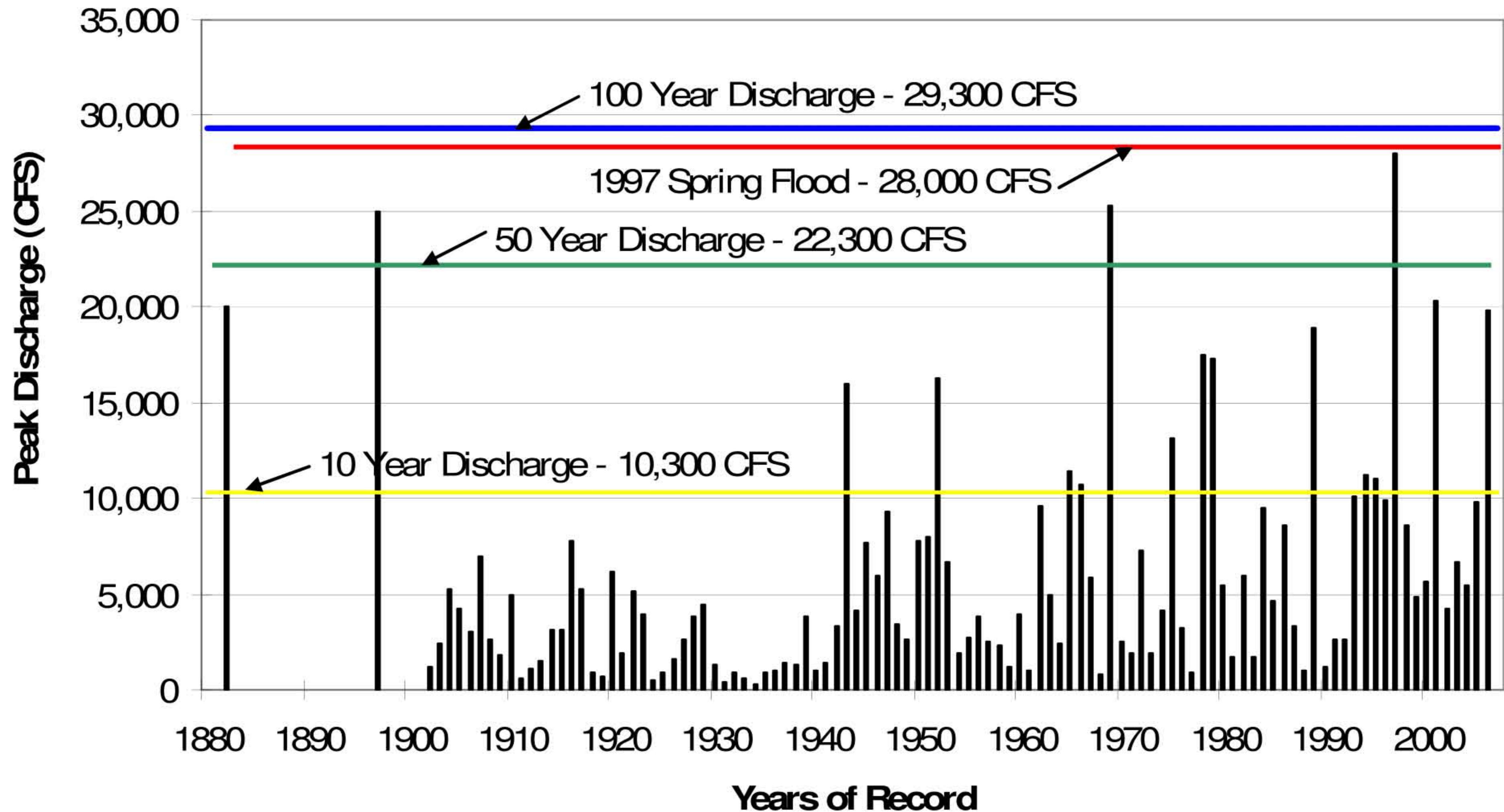


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# SOUTHSIDE FLOOD CONTROL

## RED RIVER AT FARGO - USGS GAGING STATION HISTORICAL FLOOD DATA





# SOUTHSIDE FLOOD CONTROL

## Alternatives Under Consideration

Wild Rice River Levees

70<sup>th</sup> Avenue South Outlet

Rose Coulee Outlet

Wild Rice River Diversion

Wild Rice River Bypass



# SOUTHSIDE FLOOD CONTROL

## All Alternatives Have the Following

Protects from Wild Rice River Breakouts

Designed with FEMA Standards

Use Hwy 81 for Base Line of Protection  
North of Wild Rice River

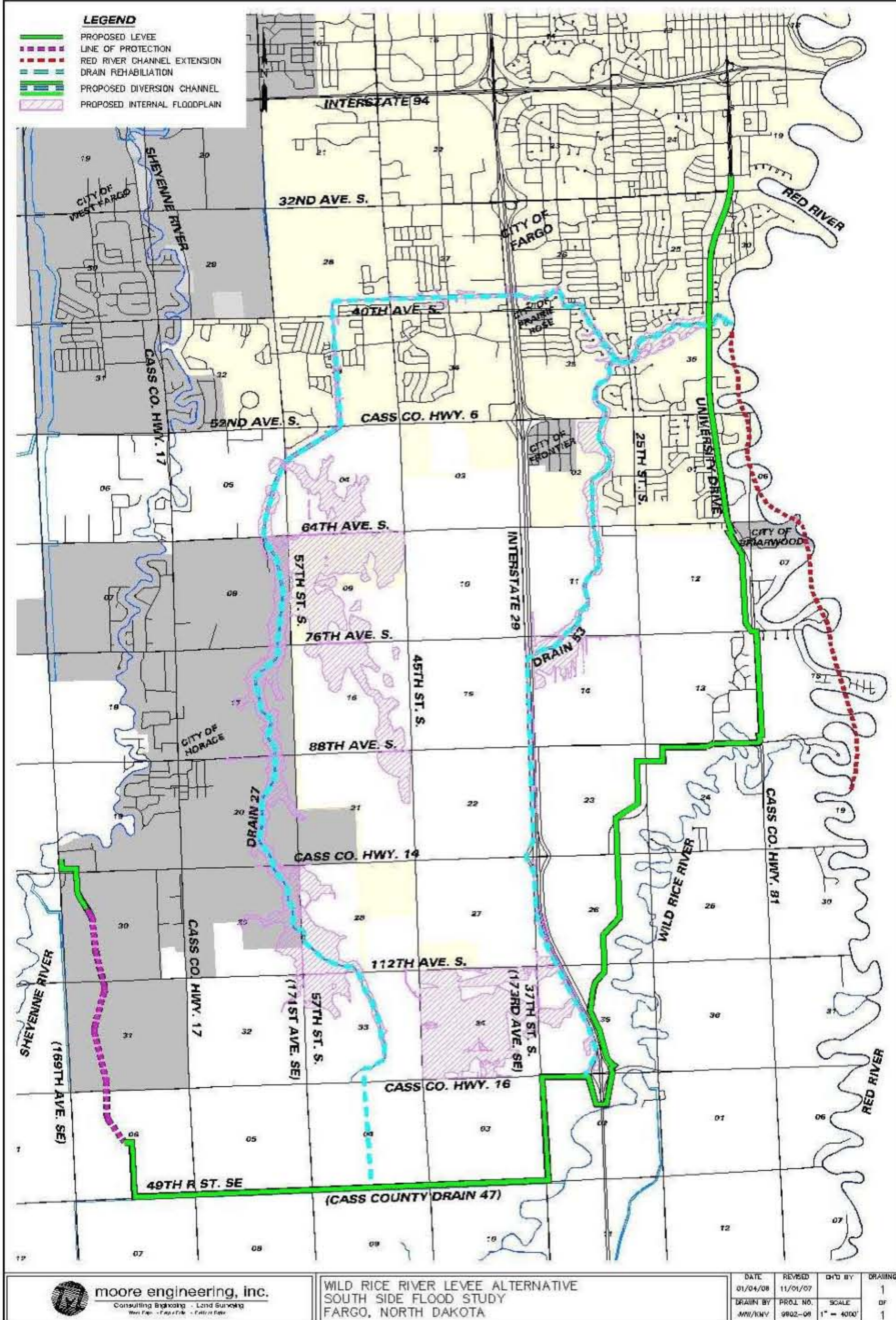
Include a Large Pump Station  
& Closure at Rose Coulee

Include Money for Additional Flood Protection  
East of Hwy 81 &/or Ringdikes

Include \$20.0 Million for Floodwater Retention



**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

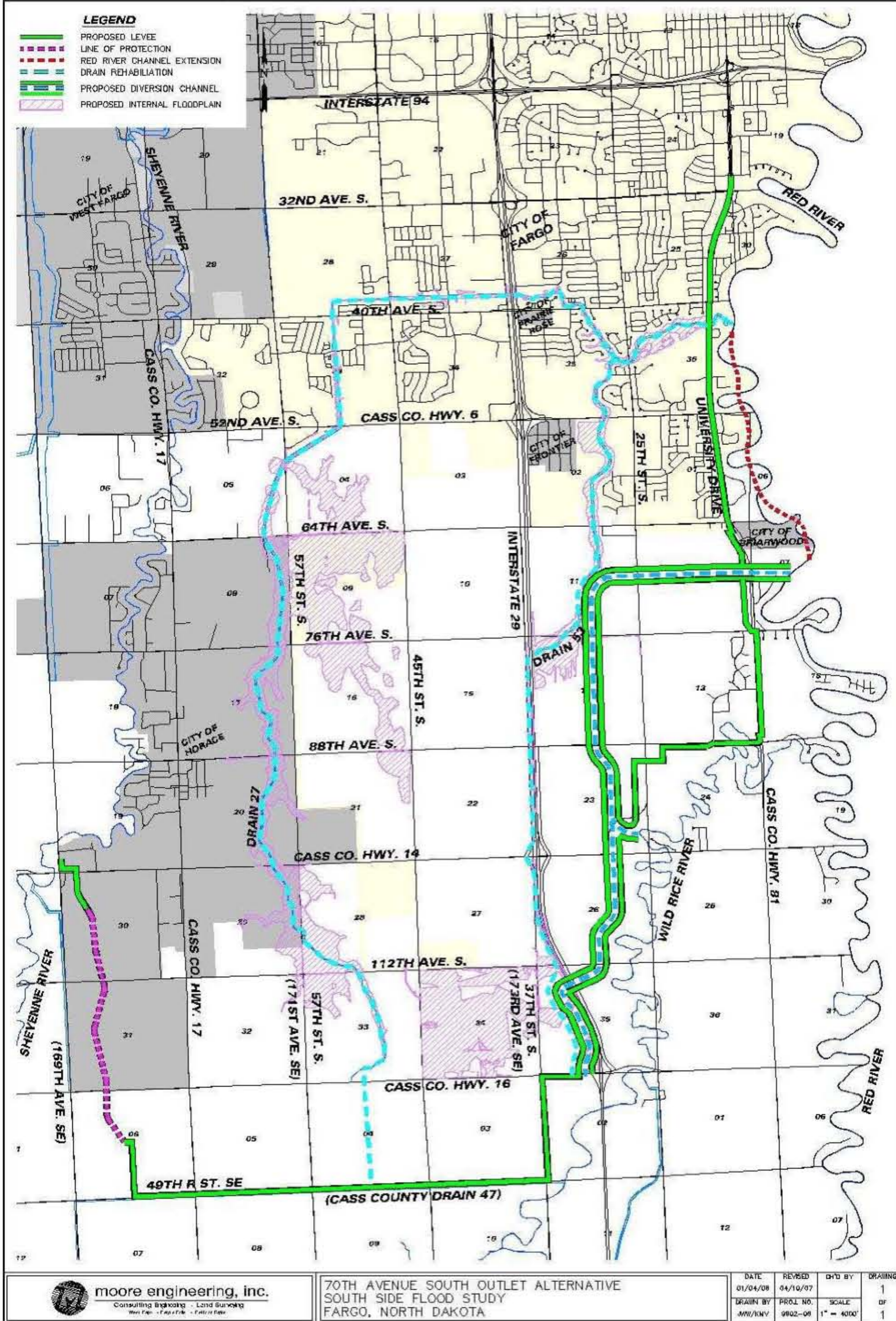
## WILD RICE RIVER LEVEE ALTERNATIVE

ESTIMATED COST  
\$100 MILLION





70TH AVENUE SOUTH OUTLET ALTERNATIVE



# SOUTHSIDE FLOOD CONTROL

## 70<sup>TH</sup> AVENUE SOUTH OUTLET ALTERNATIVE

ESTIMATED COST  
\$120 MILLION



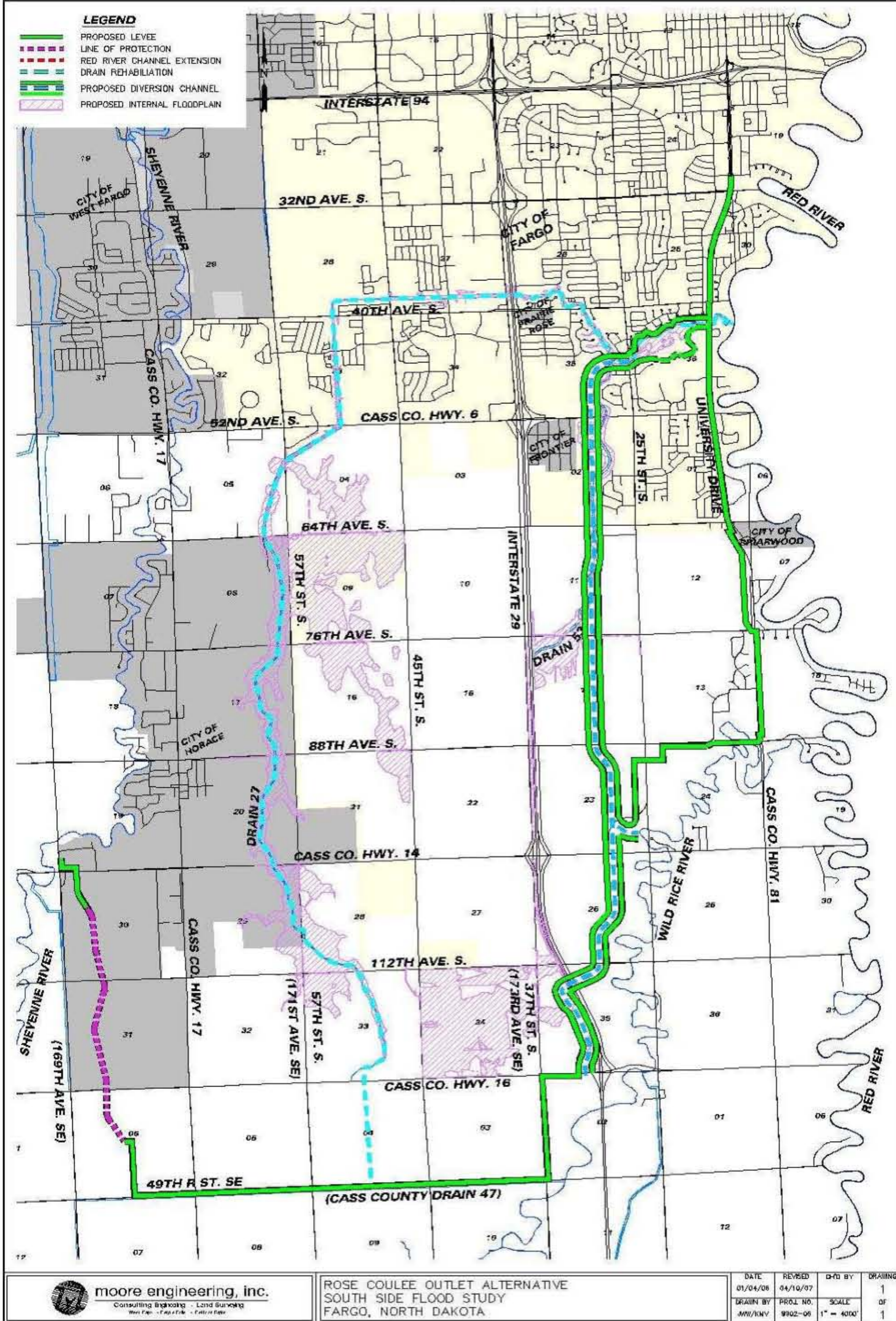
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West Fargo • Fargo • Grand Forks • Minot

70TH AVENUE SOUTH OUTLET ALTERNATIVE  
SOUTH SIDE FLOOD STUDY  
FARGO, NORTH DAKOTA

DATE	REVISED	DWG BY	DRAWING
01/04/08	04/10/07		1
DRAWN BY	PROJ. NO.	SCALE	OF
JMW/ENV	9902-08	1" = 4000'	1



**ROSE COULEE OUTLET ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

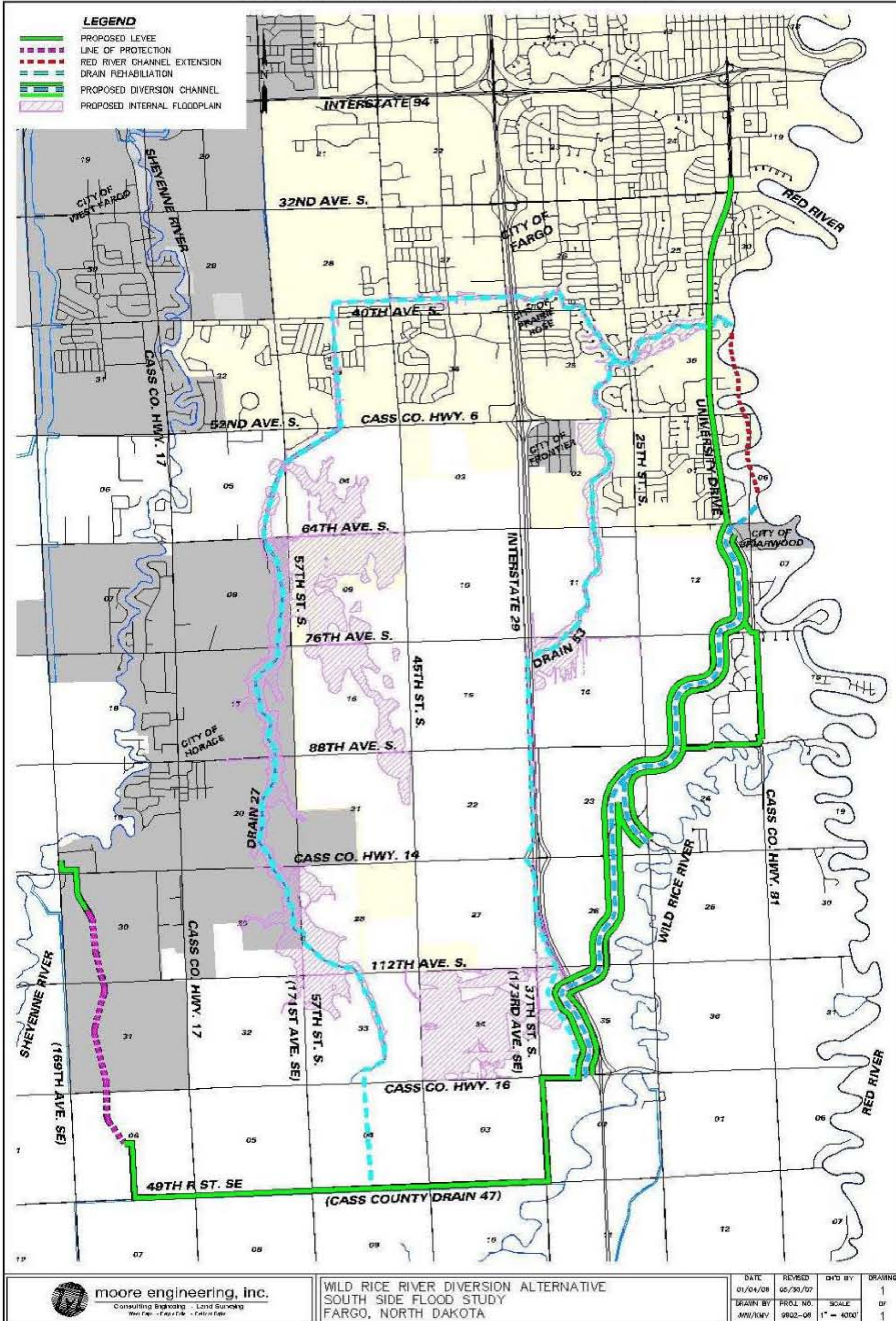
## ROSE COULEE OUTLET ALTERNATIVE

ESTIMATED COST  
\$135 MILLION





**WILD RICE RIVER DIVERSION ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

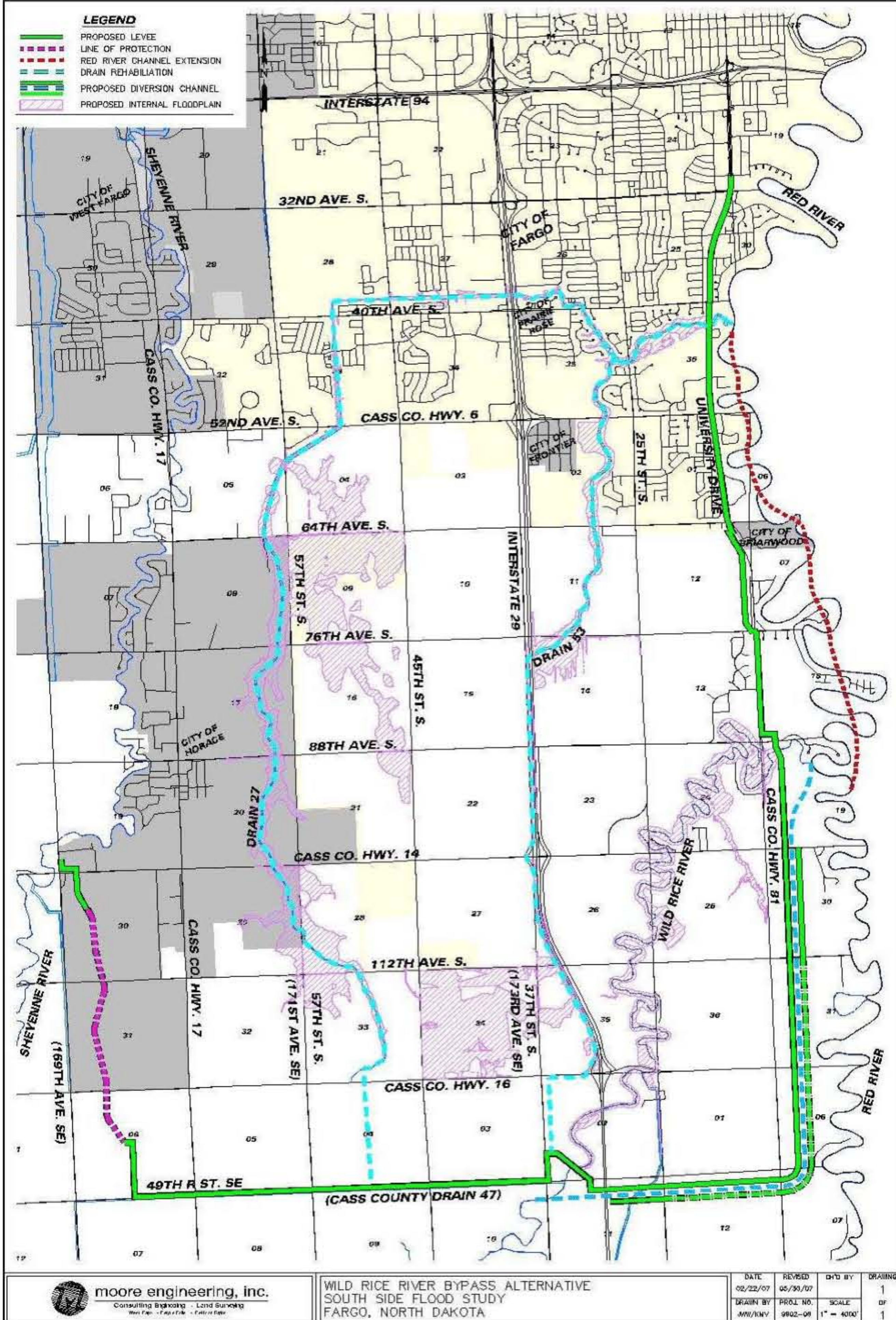
## WILD RICE RIVER DIVERSION ALTERNATIVE

ESTIMATED COST  
\$125 MILLION





**WILD RICE RIVER BYPASS ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

## WILD RICE RIVER BYPASS ALTERNATIVE

ESTIMATED COST  
\$150 MILLION





# SOUTHSIDE FLOOD CONTROL

## Issues Raised With Base Alternatives

Red River & Wild Rice River Impacts  
Higher Flood Levels

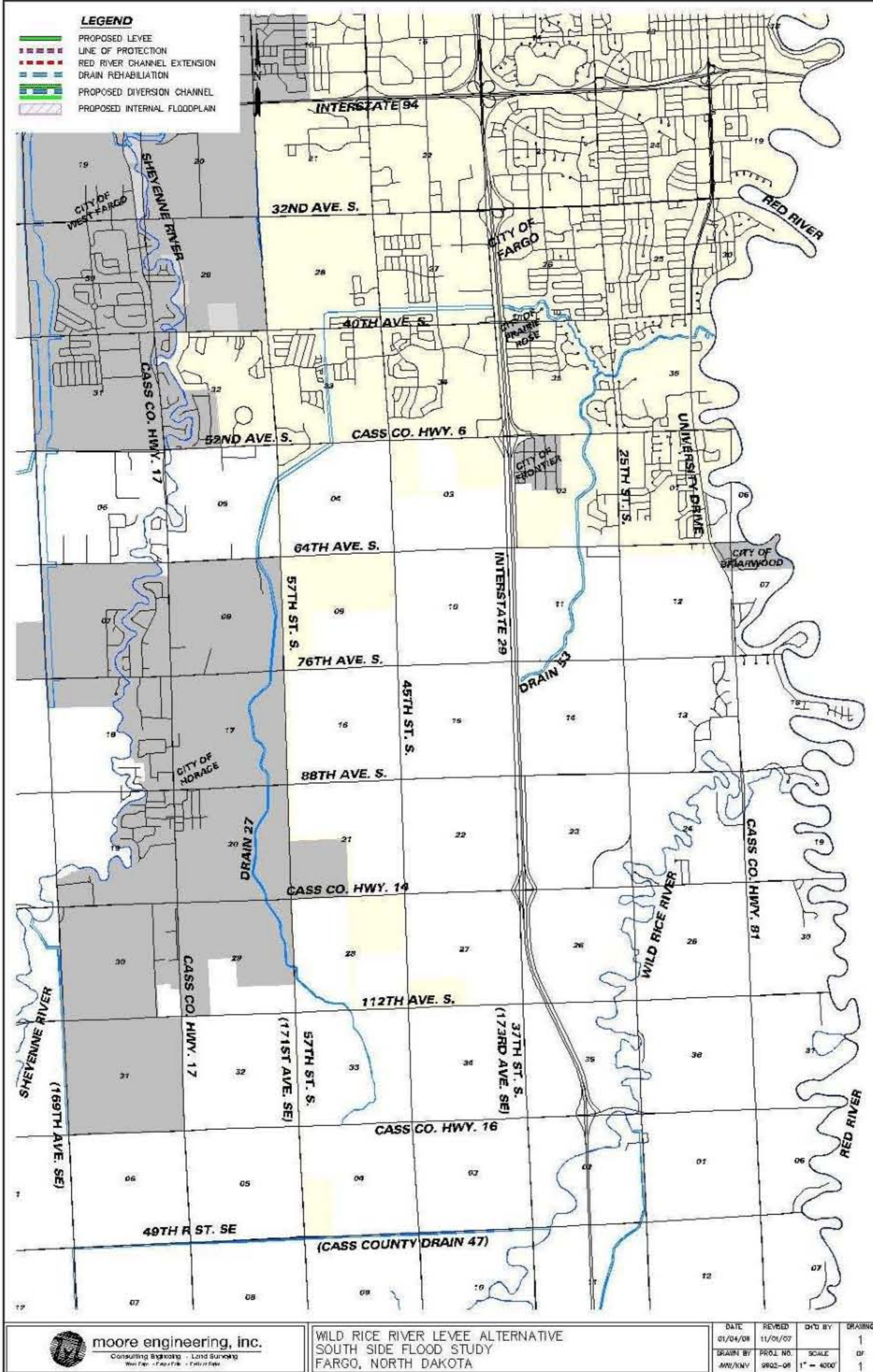
Lost Storage

Concern Storage Impact Will  
Simply Move Impacts Upstream

Properties East of Hwy 81 Receive  
No Protection



**WILD RICE RIVER LEVEE ALTERNATIVE**



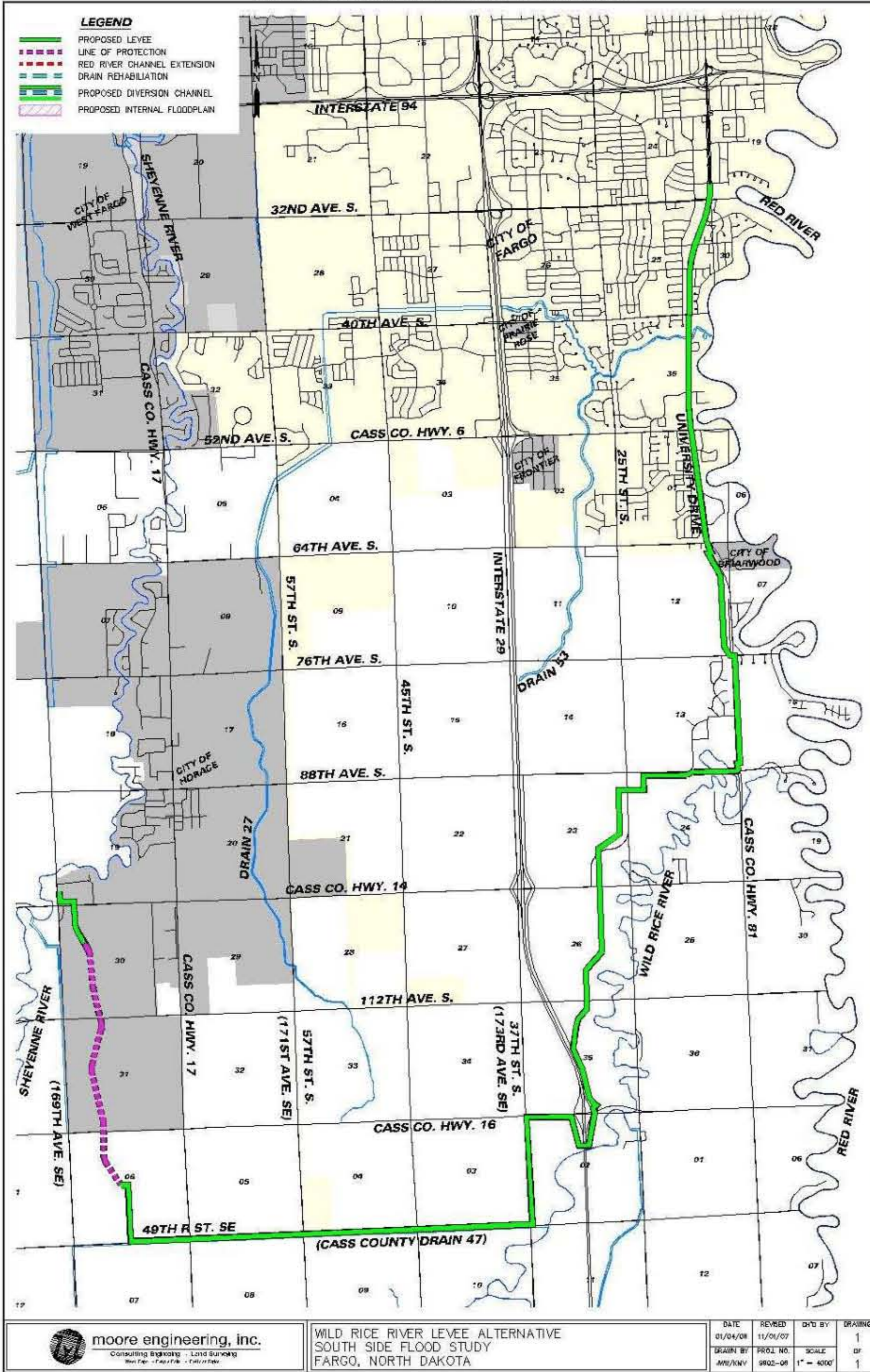
# SOUTHSIDE FLOOD CONTROL

## WILD RICE RIVER LEVEE ALTERNATIVE





**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project





# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

100 Year Frequency - Red River Stage Changes in Inches

Base Project

Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Interstate 94	3.0	3.0	3.0	3.0	3.0
Rose Coulee	3.0	3.0	3.0	3.0	3.0
Briarwood	9.0	9.0	2.0	7.0	-1.0
76th Avenue	9.0	6.0	2.0	6.0	-3.0
Wild Rice River	9.0	4.0	2.0	4.0	-4.0
Cass Hwy 16	6.0	3.0	2.0	3.0	-2.0
Oxbow	2.0	1.0	0.0	1.0	-1.0
Cass Hwy 18	2.0	1.0	0.0	1.0	0.0



# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

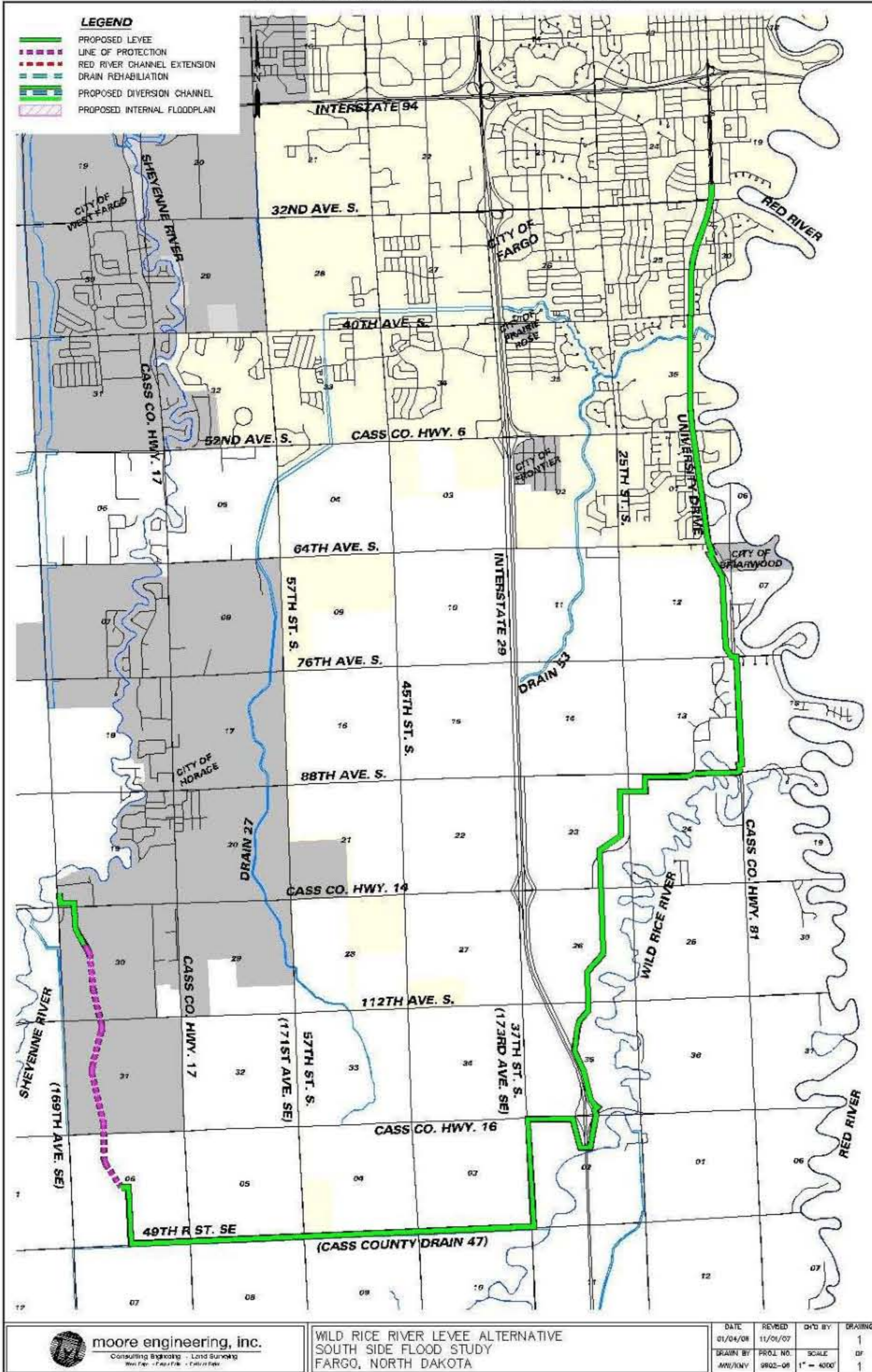
100 Year Frequency - Wild Rice River Stage Changes in Inches

Base Project

Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Cass Hwy 81	9.0	4.0	2.0	4.0	---
Cass Hwy 14	9.0	4.0	2.0	4.0	---
Cass Hwy 16	0.0	-3.0	-3.0	-3.0	---
Interstate 29	1.0	-2.0	-2.0	-2.0	---
Cass Drain 47	1.0	-1.0	-1.0	-1.0	---
Cass Hwy 18	0.0	0.0	0.0	0.0	0
State Hwy 46	0.0	0.0	0.0	0.0	0



**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

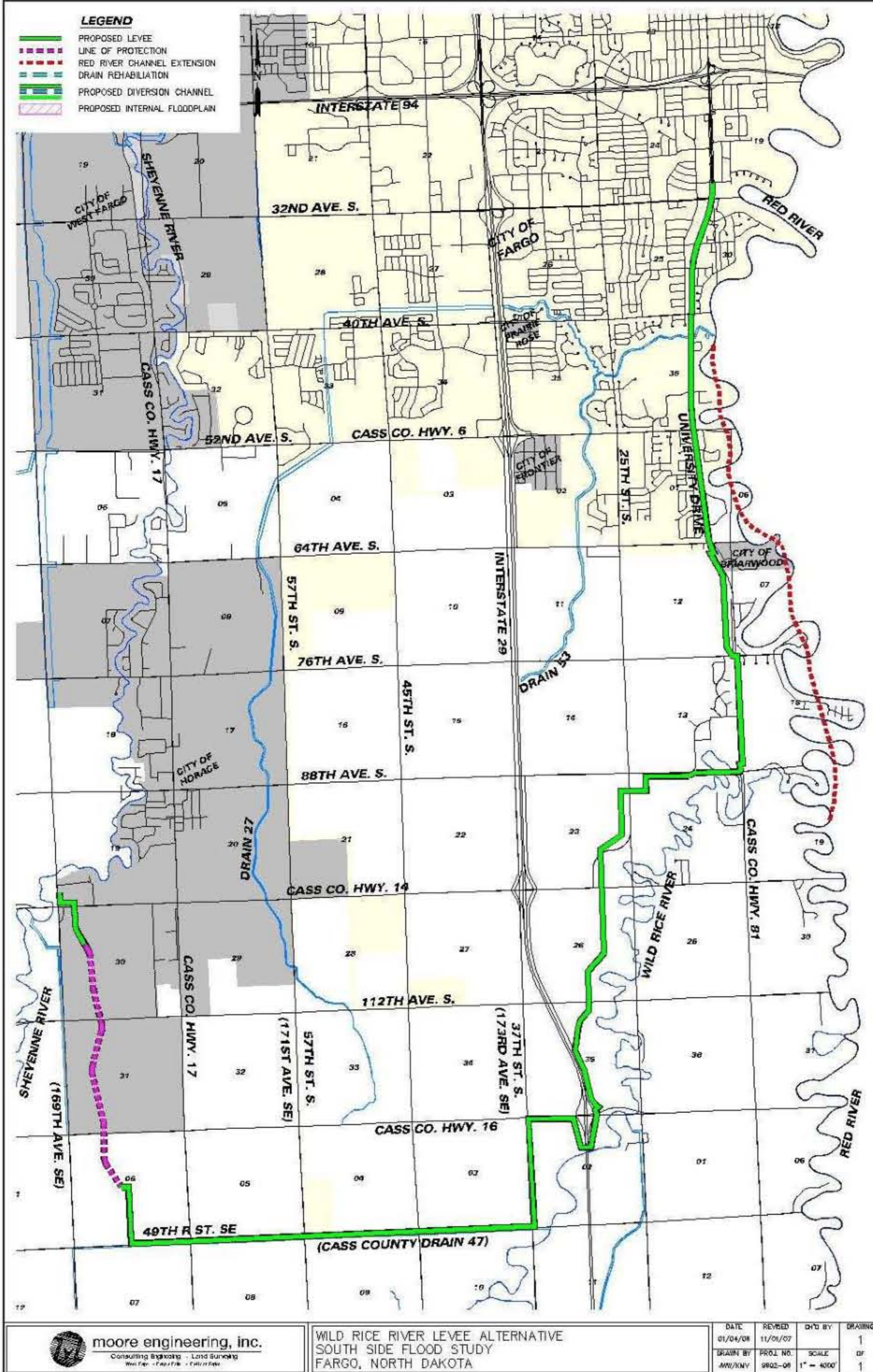
## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project





**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project  
w/ Red River  
Channel Extension





# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

100 Year Frequency - Red River Stage Changes in Inches

Base Project with Red River Channel Extension

Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Interstate 94	3.0	2.0	---	2.0	3.0
Rose Coulee	3.0	2.0	---	2.0	3.0
Briarwood	-1.0	-3.0	---	-1.0	-1.0
76th Avenue	-3.0	-4.0	---	-1.0	-3.0
Wild Rice River	-4.0	-2.0	---	0.0	-4.0
Cass Hwy 16	-1.0	-2.0	---	0.0	-2.0
Oxbow	0.0	0.0	---	0.0	-1.0
Cass Hwy 18	0.0	0.0	---	0.0	0.0



# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

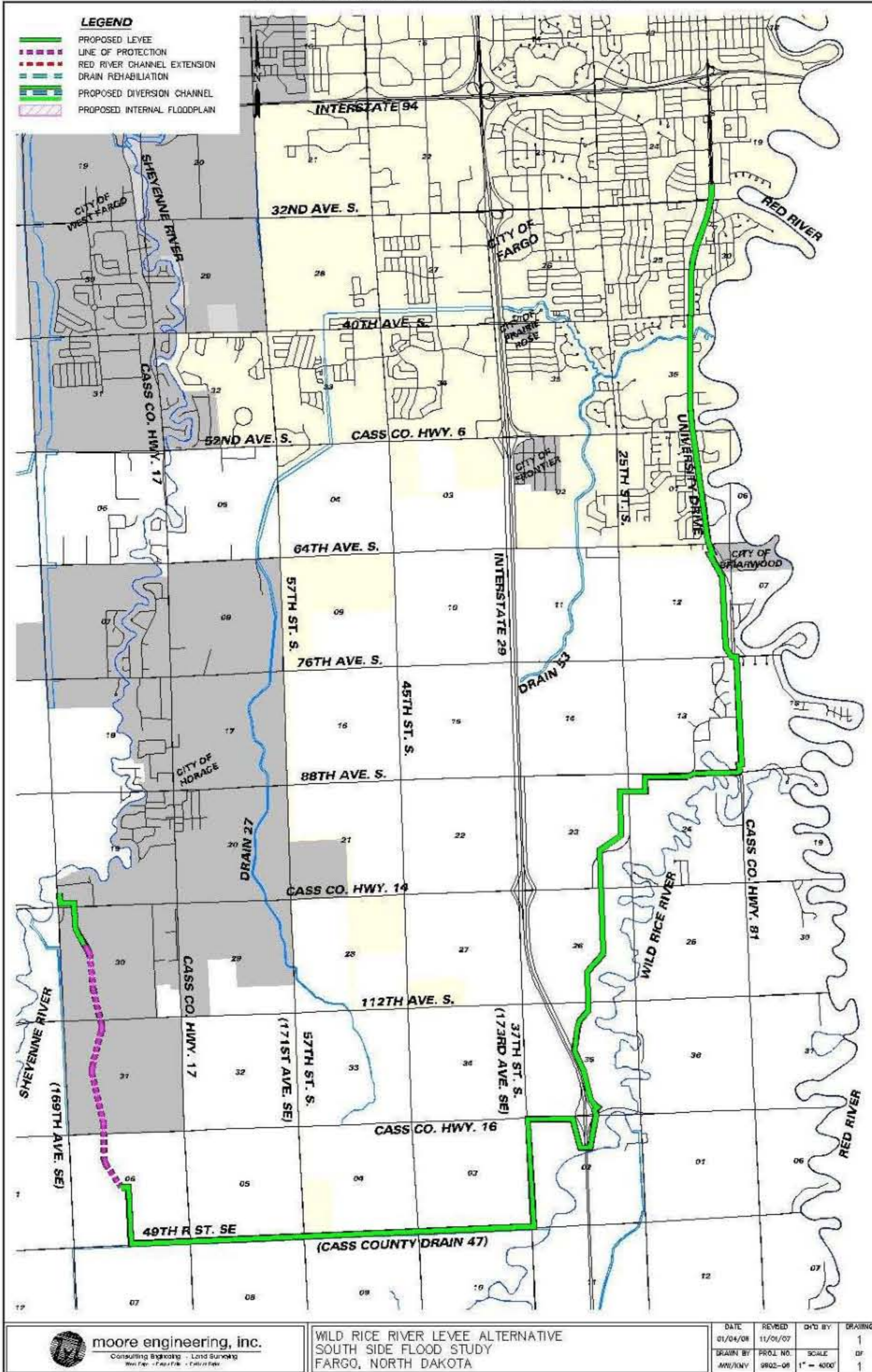
100 Year Frequency - Wild Rice River Stage Changes in Inches

Base Project with Red River Channel Extension

Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Cass Hwy 81	-4.0	-2.0	---	0.0	---
Cass Hwy 14	-4.0	-2.0	---	0.0	---
Cass Hwy 16	0.0	-3.0	---	-3.0	---
Interstate 29	1.0	-3.0	---	-2.0	---
Cass Drain 47	1.0	-1.0	---	-1.0	---
Cass Hwy 18	0.0	0.0	---	0.0	0.0
State Hwy 46	0.0	0.0	---	0.0	0.0



**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

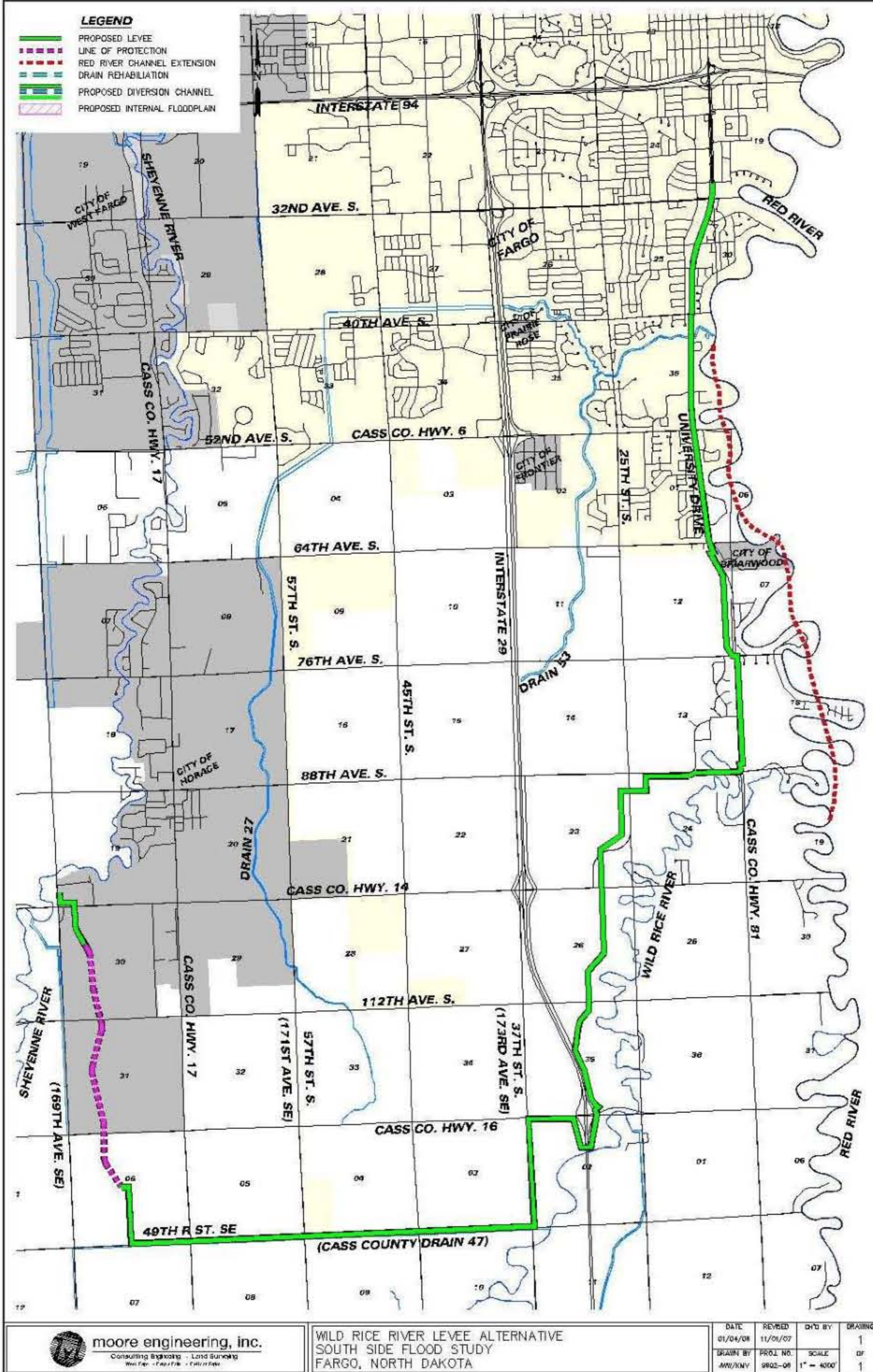
## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project





**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

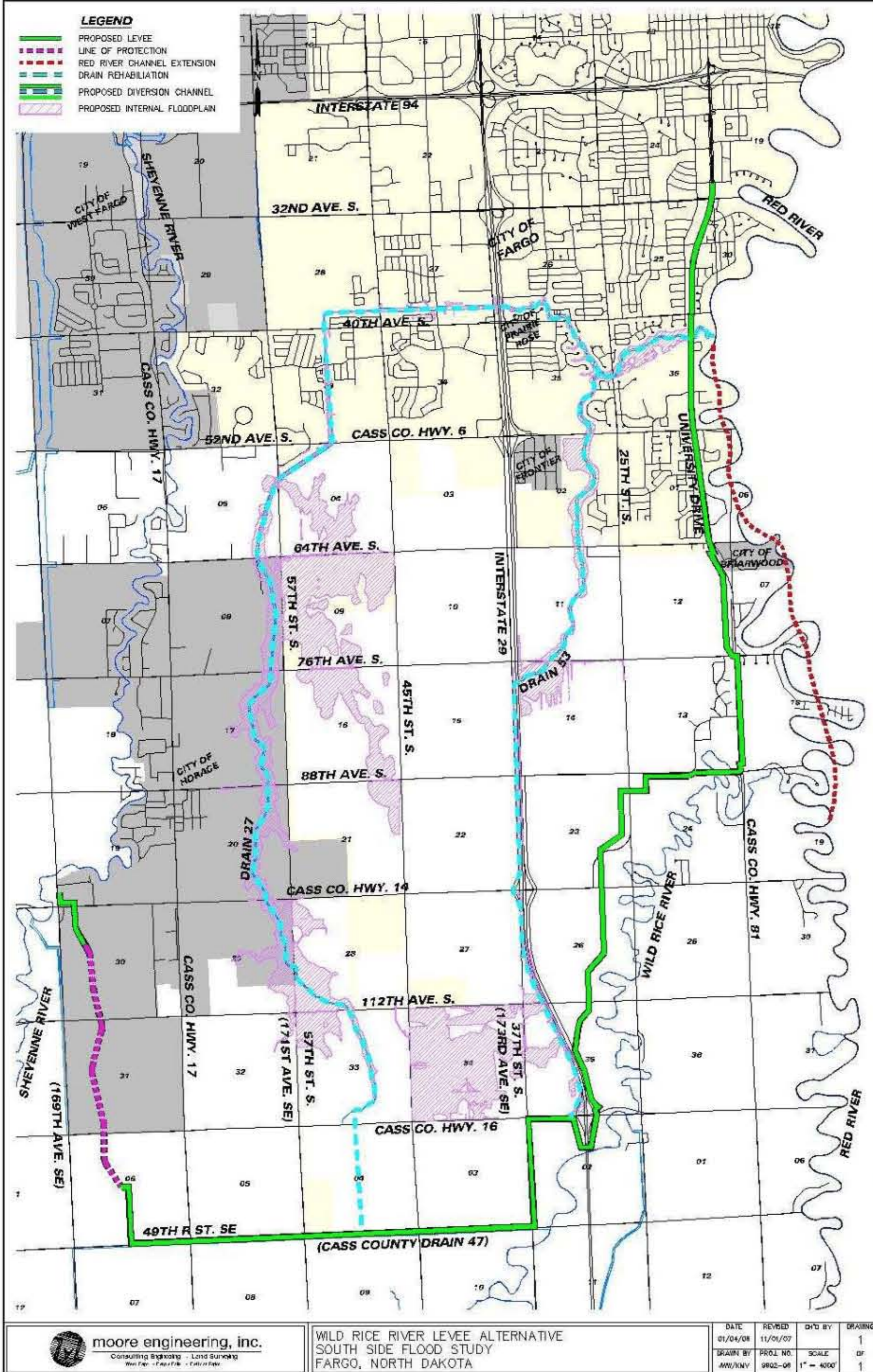
## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project  
w/ Red River  
Channel Extension





**WILD RICE RIVER LEVEE ALTERNATIVE**



# SOUTHSIDE FLOOD CONTROL

## WILD RICE RIVER LEVEE ALTERNATIVE

Base Project  
w/ Red River  
Channel Extension





# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

100 Year Frequency - Red River Stage Changes in Inches

Base Project w/ Red River Channel Extension  
and w/ Drain Extension & Storage

Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Interstate 94	0.0	0.0	0.0	0.0	0.0
Rose Coulee	0.0	0.0	0.0	0.0	0.0
Briarwood	-6.0	-6.0	0.0	-4.0	-6.0
76th Avenue	-7.0	-7.0	0.0	-3.0	-7.0
Wild Rice River	-8.0	-5.0	0.0	-2.0	-8.0
Cass Hwy 16	-4.0	-4.0	0.0	-2.0	-5.0
Oxbow	-1.0	-1.0	0.0	0.0	-2.0
Cass Hwy 18	-1.0	-1.0	0.0	0.0	-1.0



# SOUTHSIDE FLOOD CONTROL

## SUMMARY OF ALL ALTERNATIVES

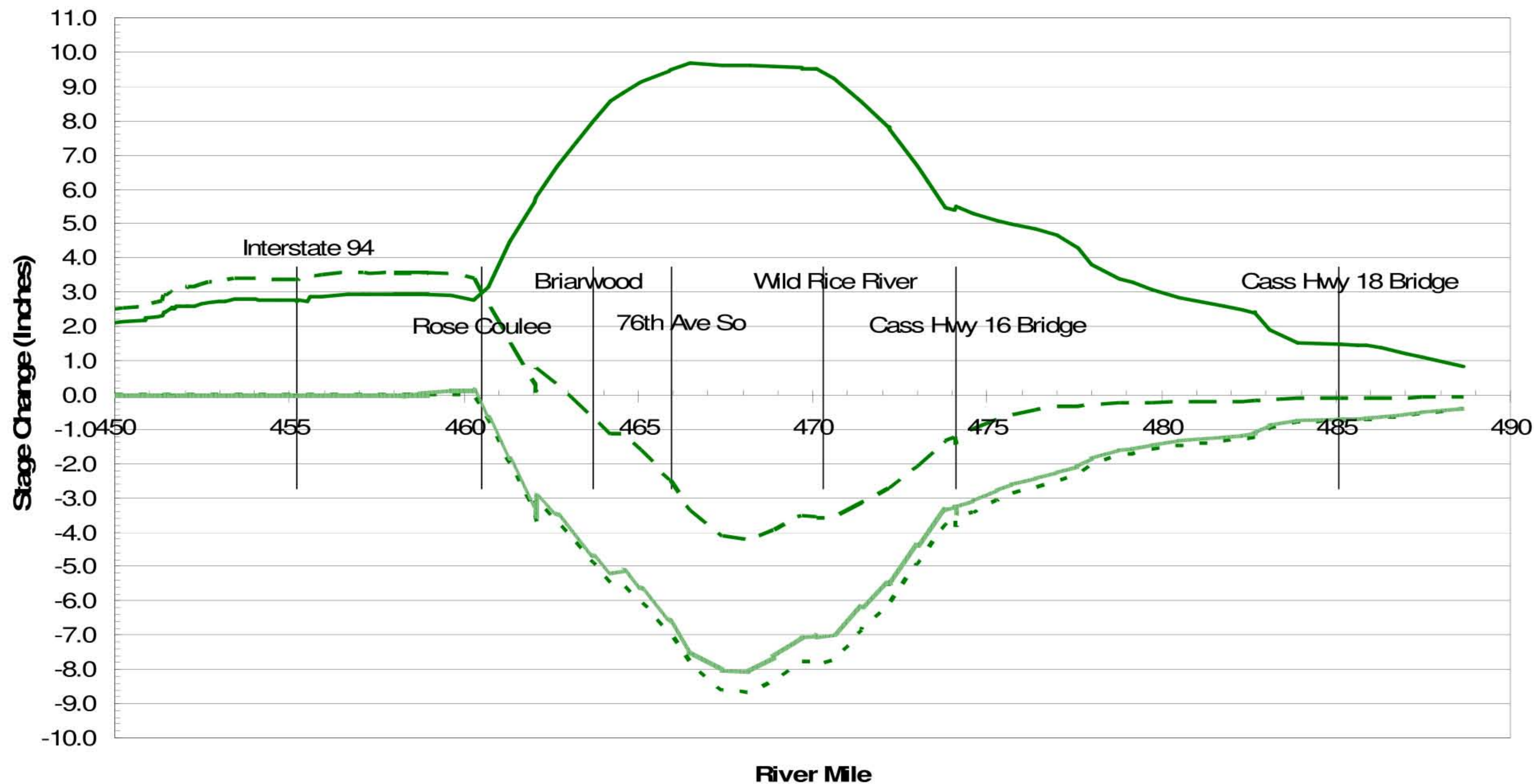
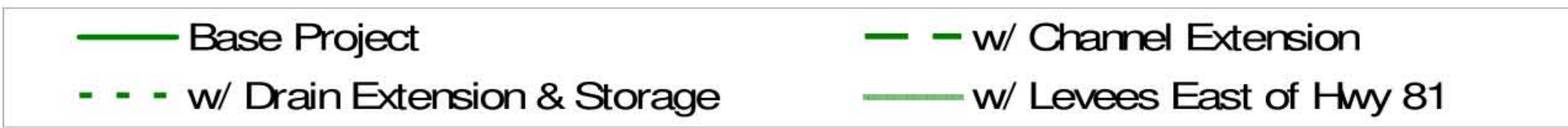
100 Year Frequency - Wild Rice River Stage Changes in Inches

Base Project w/ Red River Channel Extension  
and w/ Drain Extension & Storage

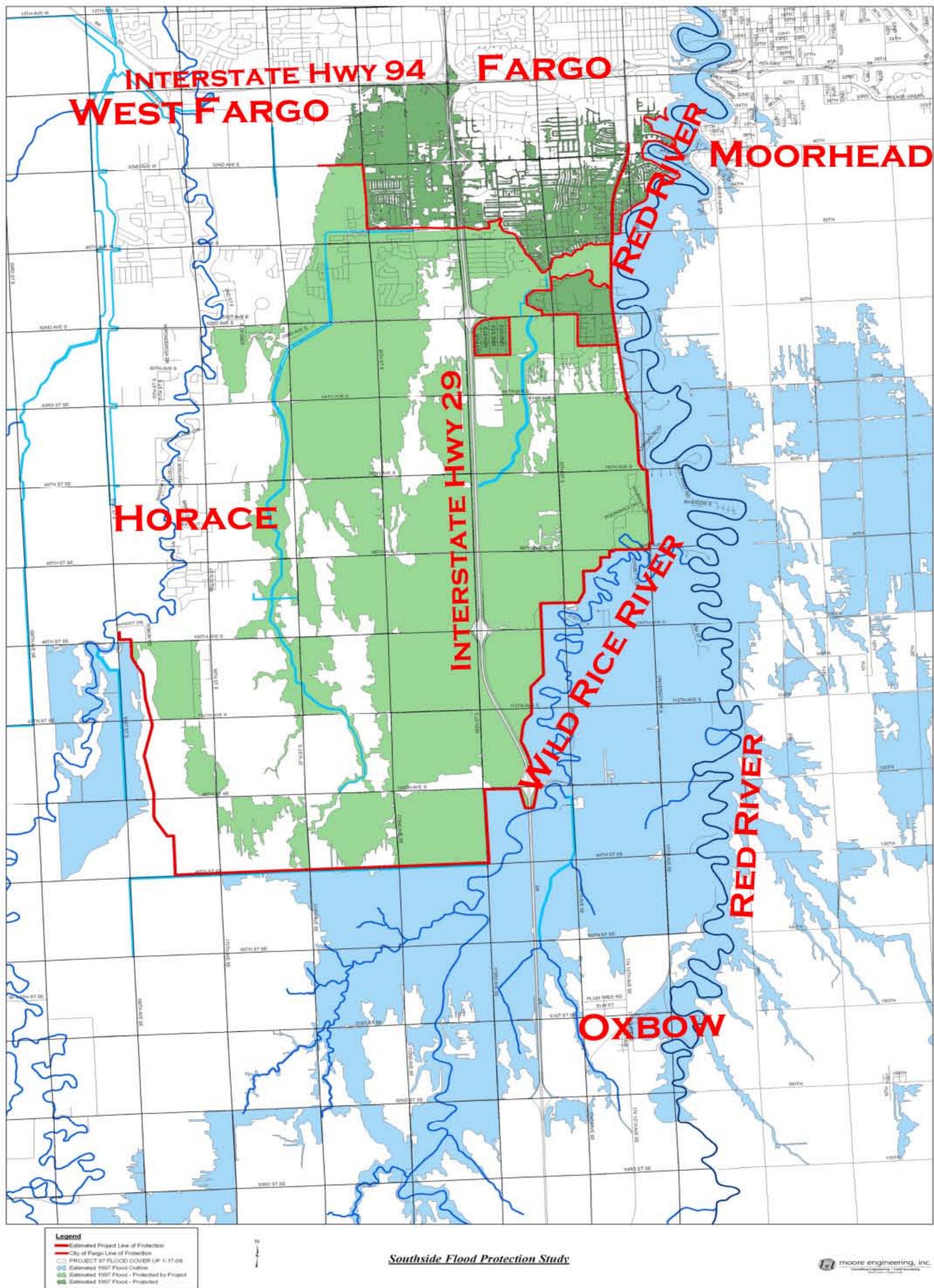
Location	Wild Rice River Levees	70th Ave So Outlet	Rose Coulee Outlet	Wild Rice River Diversion	Wild Rice River Bypass
Cass Hwy 81	-8.0	-5.0	0.0	-2.0	---
Cass Hwy 14	-8.0	-5.0	0.0	-2.0	---
Cass Hwy 16	-2.0	-4.0	-4.0	-4.0	---
Interstate 29	-3.0	-6.0	-5.0	-5.0	---
Cass Drain 47	0.0	0.0	-1.0	0.0	---
Cass Hwy 18	0.0	0.0	0.0	0.0	-1.0
State Hwy 46	0.0	0.0	0.0	0.0	0.0



### City of Fargo - Southside Flood Control Stage Change on 100 Year Red River Event Wild Rice River Levees Alternative







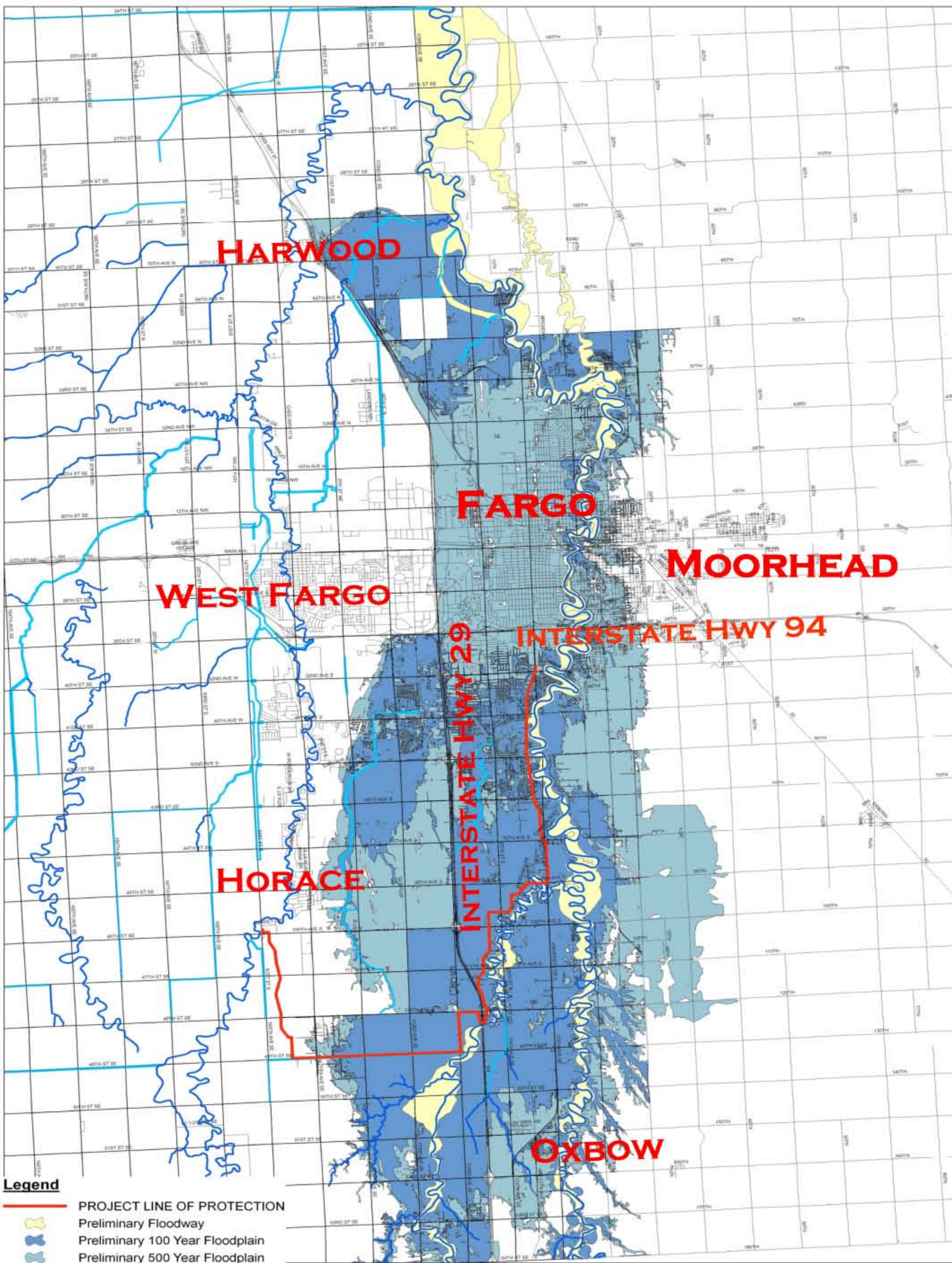
# SOUTHSIDE FLOOD CONTROL

1997 SPRING FLOOD  
AREA PROTECTED  
WITH PROJECT



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Southside Flood Protection Study

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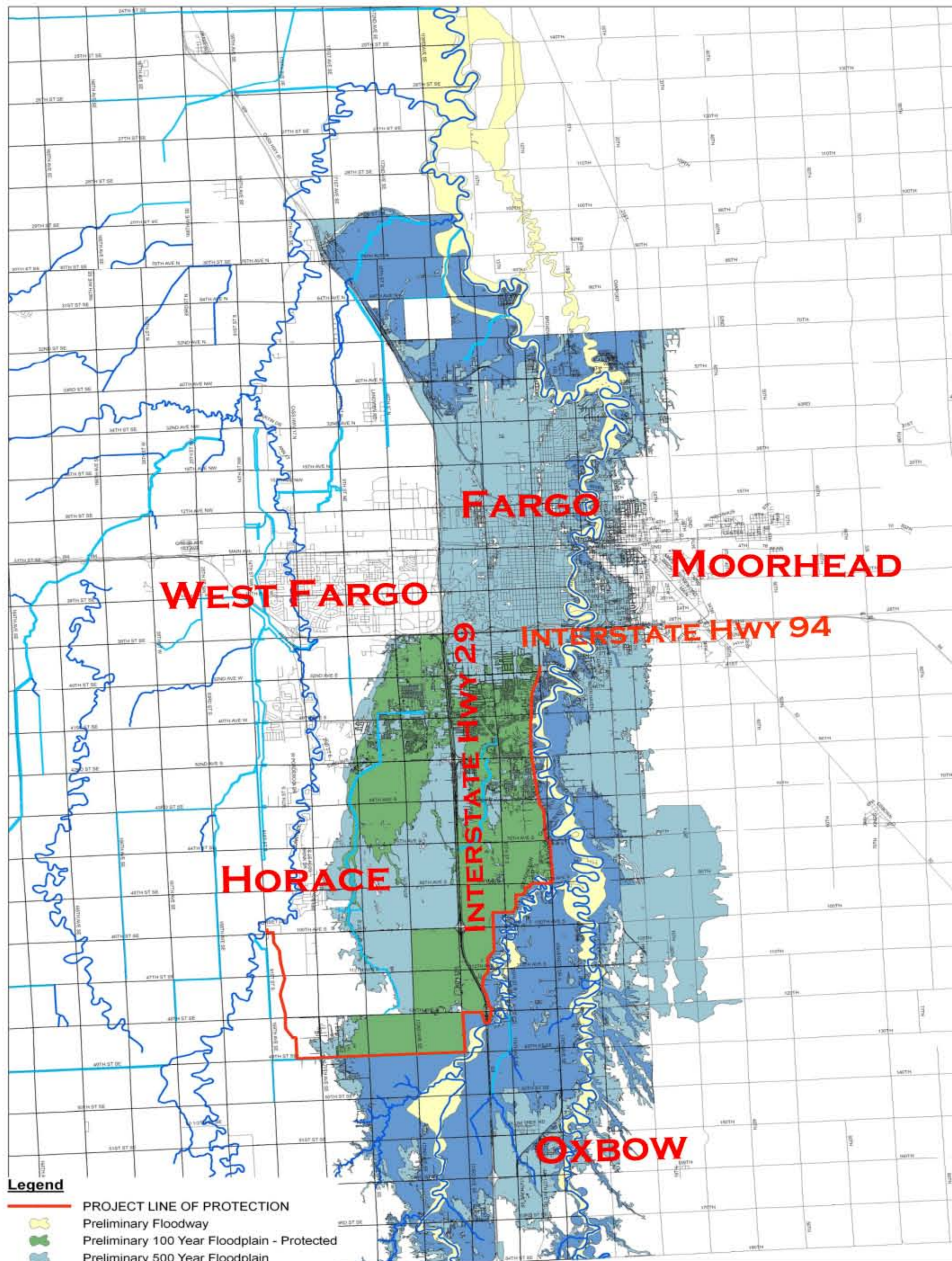
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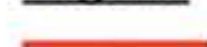



## PRELIMINARY 100 & 500 YEAR FLOODPLAINS



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- Legend**
-  PROJECT LINE OF PROTECTION
  -  Preliminary Floodway
  -  Preliminary 100 Year Floodplain - Protected
  -  Preliminary 500 Year Floodplain

Southside Flood Protection Study

moore engineering, inc.

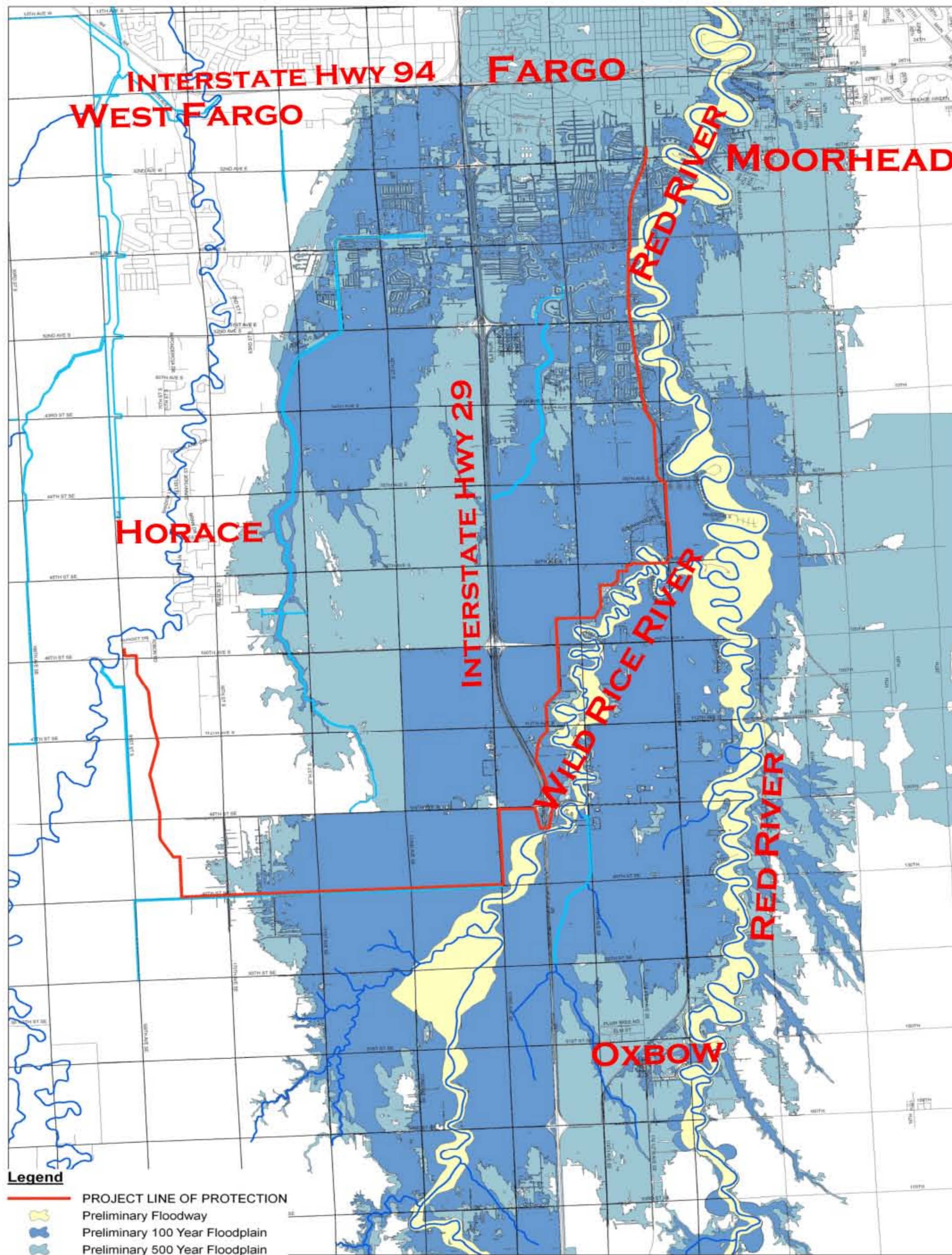
# SOUTHSIDE FLOOD CONTROL

PRELIMINARY  
100 & 500 YEAR  
FLOODPLAINS  
WITH LINE OF  
PROTECTION & AREA  
PROTECTED



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Southside Flood Protection Study

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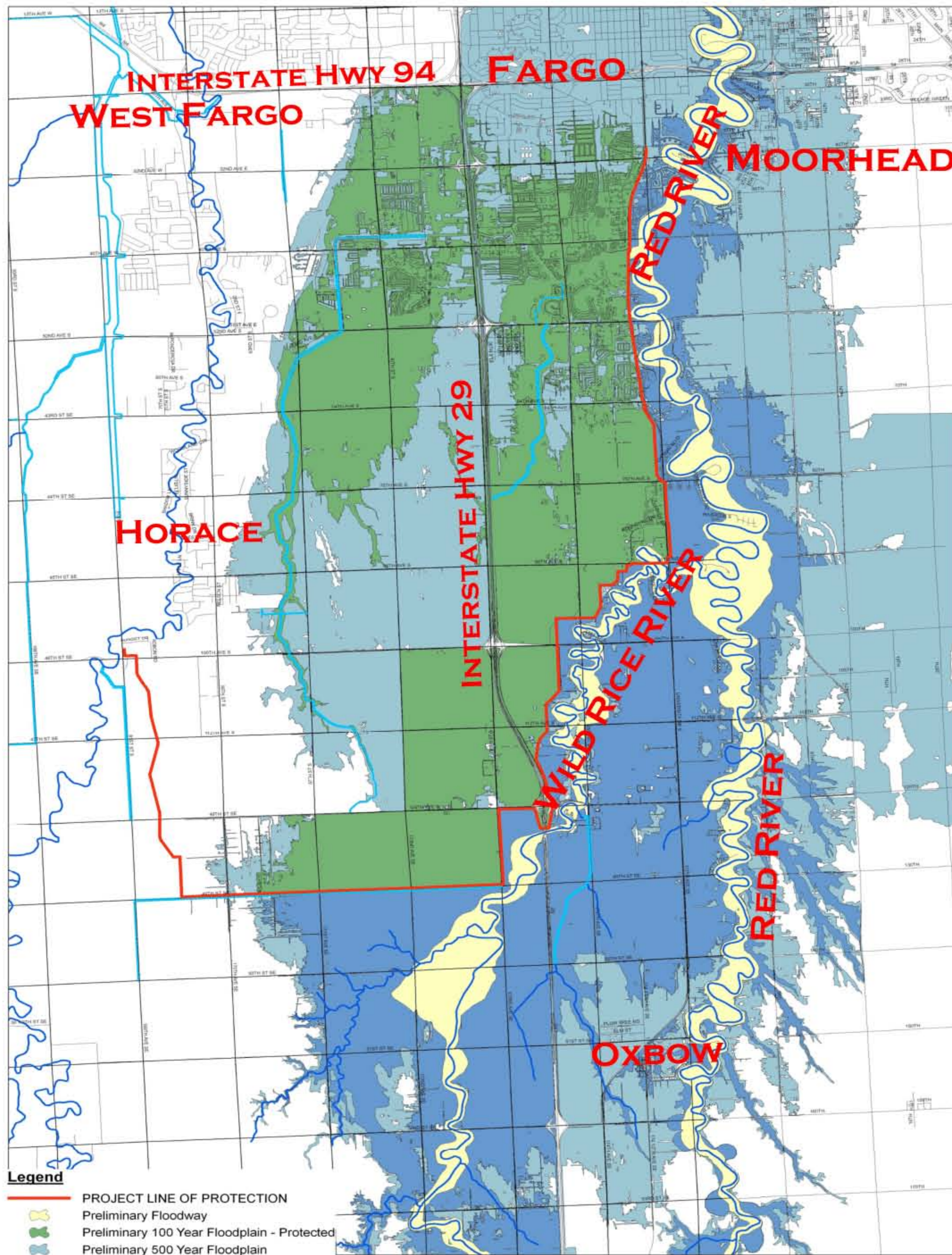
# SOUTHSIDE FLOOD CONTROL





## PRELIMINARY 100 & 500 YEAR FLOODPLAINS



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- Legend**
-  PROJECT LINE OF PROTECTION
  -  Preliminary Floodway
  -  Preliminary 100 Year Floodplain - Protected
  -  Preliminary 500 Year Floodplain

Southside Flood Protection Study

moore engineering, inc.

# SOUTHSIDE FLOOD CONTROL

PRELIMINARY  
100 & 500 YEAR  
FLOODPLAINS  
WITH LINE OF  
PROTECTION & AREA  
PROTECTED



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# SOUTHSIDE FLOOD CONTROL

## Summary of Alternative Costs

Alternative		Funding Summary - \$ Millions		
		Base Project	w/ Pilot Channel	w/ Drain Extension & Storage
1	Wild Rice River Levee	\$50.0	\$70.0	\$100.0
2	70th Avenue Outlet	\$80.0	\$90.0	\$120.0
3	Rose Coulee Outlet	\$105.0	\$105.0	\$135.0
4	Wild Rice River Diversion	\$85.0	\$95.0	\$125.0
5	Wild Rice River Bypass	\$110.0	\$130.0	\$150.0



# SOUTHSIDE FLOOD CONTROL

## Preliminary Assessment Analysis Residential Property

Parcel Value	Parcel Area in Acres			
	0.15 50' X 125'	0.25 75' X 150'	0.50 125' X 175'	1.00 200' X 215'
\$25,000	\$1,026	\$1,332	\$2,097	\$3,626
\$100,000	\$1,583	\$1,889	\$2,653	\$4,182
\$150,000	\$1,954	\$2,259	\$3,024	\$4,553
\$200,000	\$2,324	\$2,630	\$3,395	\$4,924
\$350,000	\$3,437	\$3,743	\$4,508	\$6,037
\$500,000	\$4,550	\$4,856	\$5,620	\$7,149

Total Number of Residential Parcels 9,033  
 Average Residential Assessment \$2,155  
 Median Residential Assessment \$1,866





# SOUTHSIDE FLOOD CONTROL

## Preliminary Assessment Analysis Commercial Property

Parcel Value	Parcel Area in Acres			
	0.50 125' X 175'	1.00 200' X 215'	2.50 330' X 330'	10.00 500' X 875'
\$100,000	\$2,653	\$4,182	\$8,770	\$31,706
\$250,000	\$3,766	\$5,295	\$9,882	\$32,819
\$500,000	\$5,620	\$7,149	\$11,737	\$34,673
\$1,000,000	\$9,329	\$10,858	\$15,445	\$38,382
\$5,000,000	\$38,999	\$40,528	\$45,116	\$68,052
\$10,000,000	\$76,087	\$77,616	\$82,204	\$105,140

Total Number of Commercial Parcels                    1,071  
 Average Commercial Assessment                    \$14,202  
 Median Commercial Assessment                    \$6,196





# SOUTHSIDE FLOOD CONTROL

## Project Schedule

February 7, 2008	Public Hearing on Alternatives
February 7, 2008	Advisory Committee
	Reviews Alternatives
Feb – March 2008	Public Input Meetings
April 2008	Fargo City Commission
	Selects Preferred Alternative
April 2008 – Feb 2009	Project Design
June 2008 – May 2009	Right-of Way Acquisition
May 2009	Bid Opening
June 2009 – August 2011	Construct Project
April 2011	Project Operational





# SOUTHSIDE FLOOD PROTECTION

## Questions / Discussion

Presentation by:  
Jeffrey J. Volk, PE & RLS  
Moore Engineering, Inc.,  
West Fargo, North Dakota



moore  
engineering, inc.

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# SOUTHSIDE FLOOD CONTROL

## REGIONAL FLOOD CONTROL

### Retention Projects

Maple River Dam – complete

Baldhill Dam – complete

North Ottawa - under construction

### Ongoing Studies

COE – Upstream of FM Retention

SE Cass WRD – Retention Study

Antelope Creek Watershed





# SOUTHSIDE FLOOD CONTROL

OPTIONS FOR  
FLOOD PROTECTION  
EAST OF HWY 81

ESTIMATED COST  
\$20-\$70 MILLION



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LEVEES EAST OF CASS COUNTY HIGHWAY 81  
SOUTH SIDE FLOOD STUDY  
FARGO, NORTH DAKOTA

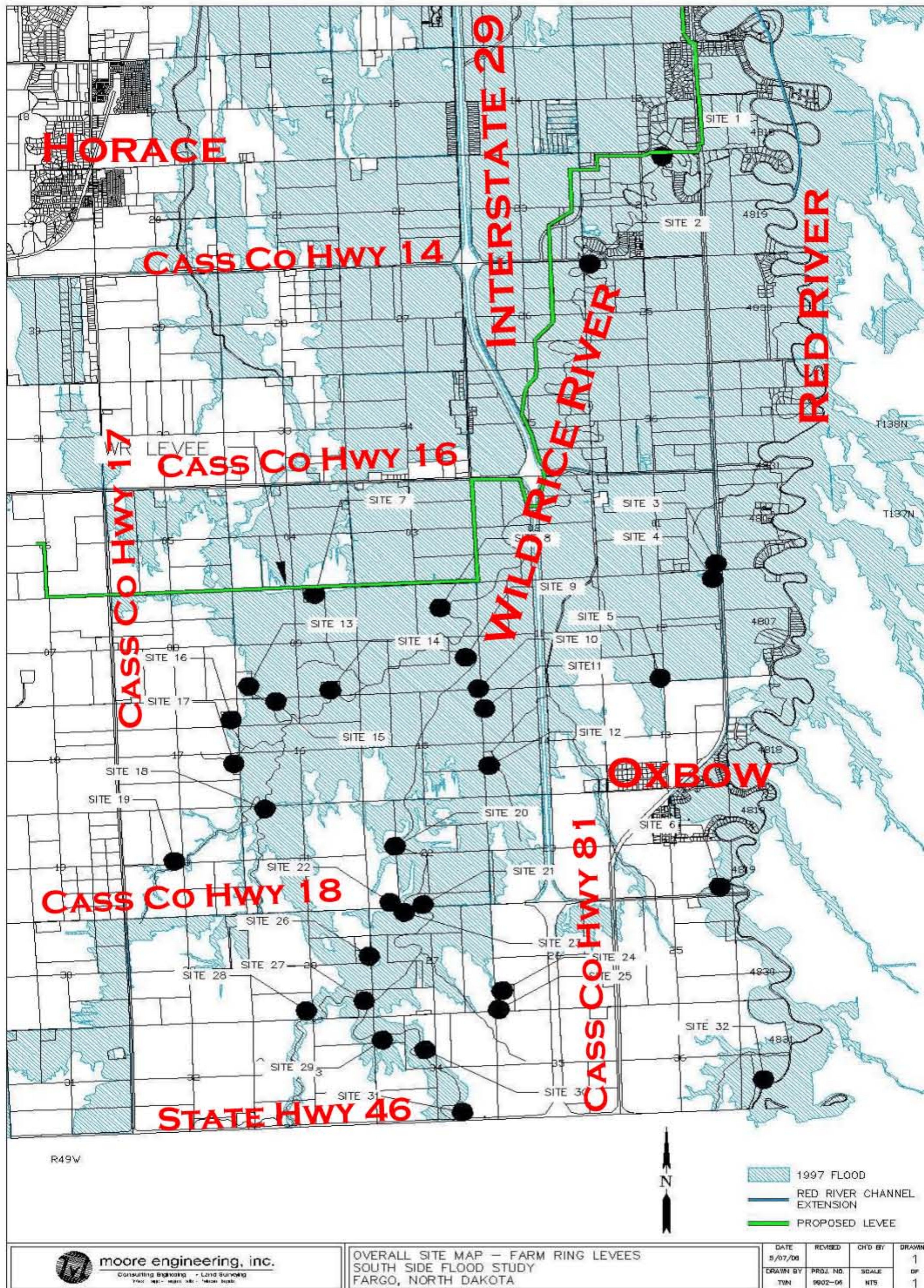
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# SOUTHSIDE FLOOD CONTROL

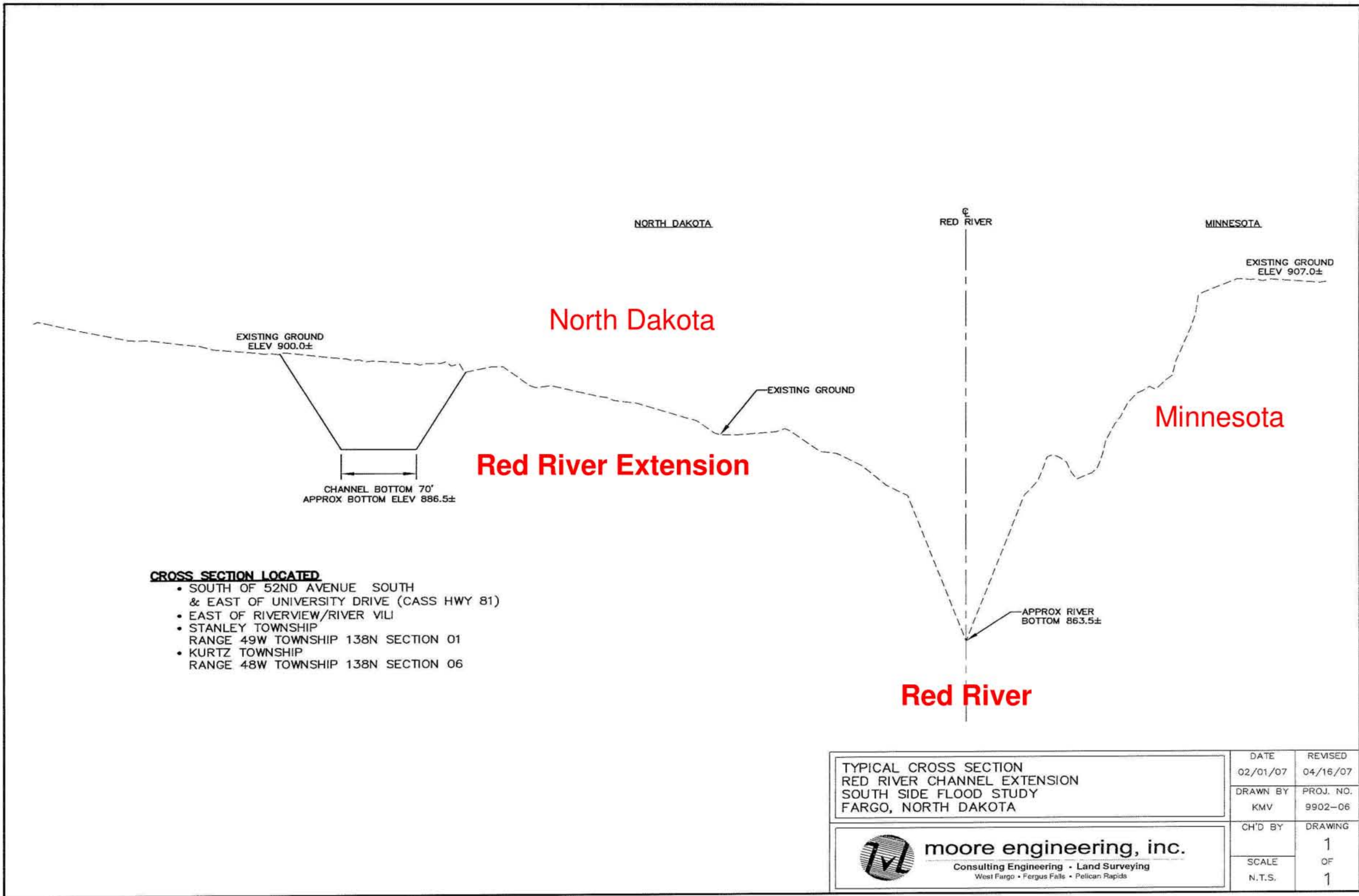
OPTIONS FOR  
FARMSTEAD  
RINGDIKES

ESTIMATED COST  
UNDER STUDY



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# Typical Red River Cross-Section







# SOUTHSIDE FLOOD CONTROL

WILD RICE RIVER  
LEVEE ALTERNATIVE  
WITH RED RIVER  
EXTENSION



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RED RIVER CHANNEL EXTENSION  
WILD RICE RIVER LEVEE ALTERNATIVE  
SOUTH SIDE FLOOD STUDY  
FARGO, NORTH DAKOTA

DATE	REVISED	CHD BY	DRAWING
04/19/07			1
DRAWN BY	PROJ. NO.	SCALE	OF
02/10/07	0002 08	1" = 400'	2





# SOUTHSIDE FLOOD CONTROL

WILD RICE RIVER  
LEVEE ALTERNATIVE  
WITH RED RIVER  
EXTENSION

**moore engineering, inc.**  
Consulting Engineering • Land Surveying  
West Fargo • Fergus Falls • Presho Rapids

RED RIVER CHANNEL EXTENSION  
WILD RICE RIVER LEVEE ALTERNATIVE  
SOUTH SIDE FLOOD STUDY  
FARGO, NORTH DAKOTA

DATE	REVISED	QTD BY	DRAWING
04/19/07			2
DRAWN BY	PROJ. NO.	SCALE	OF
GL/RMY	9902-06	1" = 400'	2

