

Fargo-Moorhead Metropolitan Area Flood Risk Management
FM Diversion Project

Fargo-Moorhead Diversion

**Water Related Topics
Committee**



US Army Corps of Engineers
BUILDING STRONG®



Presentation Outline

- Study area
- Background
- Future without project
- Alternatives considered
- FMM Diversion Project
- Current Design Efforts
- Moving forward
- Schedule



BUILDING STRONG®

Project Location



- Fargo-Moorhead Metropolitan Area
 - ▶ 600 square miles
 - ▶ Along the Red River of the North
 - ▶ 150 miles from Emerson, Manitoba
 - ▶ Largest urban area in North Dakota and western Minnesota, principal regional economic center
 - ▶ 200,000 people in the metropolitan area
- Red River of the North Basin
 - ▶ Drainage area of 6,800 square miles upstream of Fargo-Moorhead



3

BUILDING STRONG®

Background

- Red River Flood Stage = 18 feet on the Fargo gage
 - ▶ Exceeded in 48 of the past 109 years
 - ▶ Exceeded every year from 1993 through 2011
- Catastrophic damages have been prevented by emergency measures
 - ▶ 11 disaster declarations since 1989
- 2009 was the flood of record
 - ▶ Stage of 40.8 feet
 - ▶ 2-percent chance (50 year) event
 - ▶ Emergency measures cost approximately \$70M



4

BUILDING STRONG®

Future Without Project Conditions

- Metro area will continue to be subject to flooding and rely on emergency responses
- Failure of emergency levees would be catastrophic
- Expected average annual flood damages greater than **\$194.8 million** and will continue to increase
- **\$10 billion** estimated damages from a 500-year flood



5

BUILDING STRONG®

Future Without Project Conditions

- Study updated hydrology and hydraulics
- Expert panel (EOE) met to discuss climate variability – recommended non-traditional hydrologic analysis.
- Flows

	<u>1% Chance</u>	<u>0.2% Chance</u>
▶ EOE (wet cycle):	34,700 cfs	61,700 cfs
▶ Traditional Period of Record:	33,000 cfs	66,000 cfs
▶ Existing FEMA regulated:	29,300 cfs	



6

BUILDING STRONG®

Evaluating & Screening Alternatives

- Phase 1
 - ▶ September 2008 – May 2009
 - ▶ Extension of reconnaissance effort
 - ▶ Diversion alternative and levee/floodwall alternative considered
- Phase 2
 - ▶ May 2009 – March 2010
 - ▶ Full range of alternatives considered
 - ▶ First iteration: no action and diversion channels to be carried forward
 - ▶ Second iteration: developed an array of diversion plans with capacities ranging from 10,000 to 35,000 cfs in North Dakota and Minnesota
 - ▶ Local sponsors requested the ND35K (North Dakota alignment with 35,000 cfs diversion) be pursued as the locally preferred plan (LPP)



7

BUILDING STRONG®

Evaluating & Screening Alternatives

- Phase 3
 - ▶ March 2010 – September 2010
 - ▶ Refined plans and identified National Economic Development (NED) as the MN40K (Minnesota alignment with 40,000 cfs diversion) , LPP as the ND35K and Federally Comparable Plan (FCP) as the MN35K (Minnesota alignment with 35,000 cfs diversion)
 - ▶ Released DEIS in May 2010 for public review
- Phase 4
 - ▶ September 2010 – July 2011
 - ▶ Refined hydraulic models to define downstream and upstream impacts
 - ▶ Optimized LPP channel size—ND20K (North Dakota alignment with 20,000 cfs diversion)
 - ▶ Added upstream staging and storage to reduce downstream impacts
 - ▶ Released SDEIS in April 2011 for public review



8

BUILDING STRONG®

FCP Defined in Phase 3

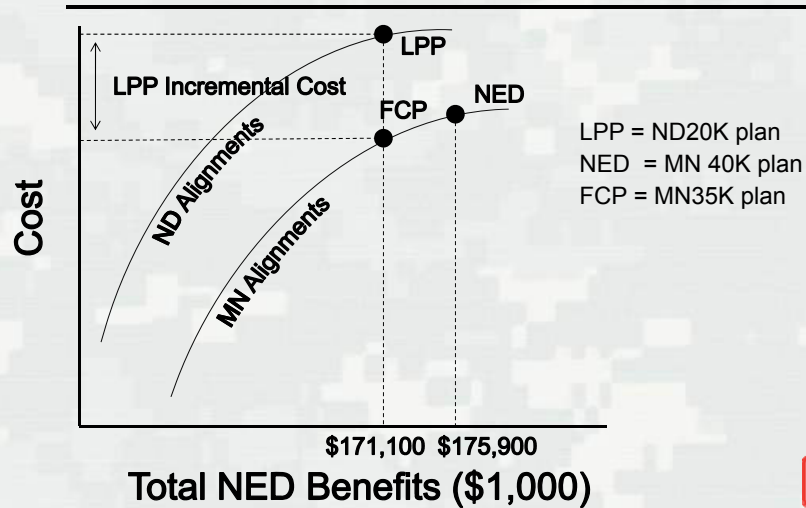
- OASA(CW) approved the LPP using the FCP as the basis for cost-sharing
- NED maximized net benefits—MN 40K plan
- LPP is the ND20K plan
- FCP is a smaller version of the NED plan that matches the LPP total benefits
- Federal share of the LPP is capped at the Federal share of the FCP



9

BUILDING STRONG®

FCP Defined in Phase 3



10

BUILDING STRONG®

Phase 4 Array of Alternatives

- No Action
- Three Diversion channels:
 - ▶ Federally Comparable Plan (FCP)
 - MN35K diversion with moderate downstream impacts
 - ▶ Locally Preferred Plan (LPP)
 - ND20K diversion with upstream staging and storage and negligible downstream impacts
 - ▶ North Dakota 35,000 cfs (ND35K)
 - Diversion with downstream impacts to Canada



11

BUILDING STRONG®

Levees were Considered:

- 50-year level (2009) - \$900 million
- No high ground on ND side
- Need to completely ring around Fargo and West Fargo
- Once exceeded, entire community floods
- Impacts not considered



FMM Levee Alternative



12

BUILDING STRONG®

Storage was Considered:

- 400,000 Acre Feet provides 1.6 feet of benefit in Fargo-Moorhead
 - ▶ 400,000 Acre Feet = 40,000 acres covered with 10 feet of water.
 - ▶ Lake Traverse, Traverse County, MN – is approx. 100,000 Acre Feet. (10,848 acres x est 10 feet deep)
- Cost per acre foot average \$1,000 - \$1,500
- \$400-600 million for 1.6 feet of benefits to Fargo-Moorhead (goal is 12.4 feet).
- Limited Reliability



Aerial photo of Homme Dam



Aerial photo of Baldhill Dam and Lake Ashtabula, looking north.



BUILDING STRONG®

13

Alternatives Considered

- Non-structural
- Levees/floodwalls
- Upper basin storage
- Retention/controlled field runoff
- Diversion channels
- Combinations
 - ▶ Diversions and Levees
- Various levels considered
 - ▶ 10,000 to 45,000 cfs capacity diversions
 - ▶ Up to 1-percent chance levees
 - Levees unable to achieve 1-percent level of risk reduction



BUILDING STRONG®

14

FM Diversion Project



- Plan components
 - ▶ 20,000 cfs ND diversion channel
 - ▶ 50,000 acre feet storage area
 - ▶ 150,000 acre feet staging area
 - ▶ 36-mile diversion
 - ▶ 10 miles of tie-back levees
 - ▶ Control structures on the Red & Wild Rice rivers
 - ▶ Aqueduct & spillway structures on the Sheyenne & Maple rivers
 - ▶ Drop structure on the Lower Rush & Rush rivers
 - ▶ Non-structural mitigation for impacts in the storage & staging areas



15

BUILDING STRONG®

FMM Diversion Project



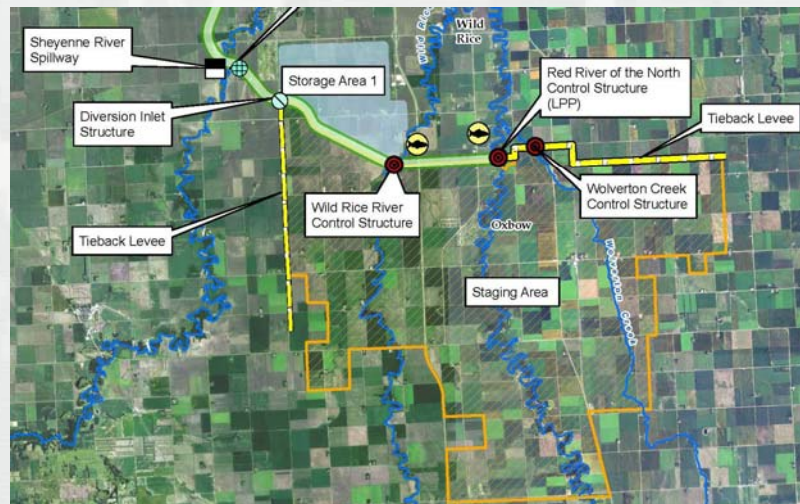
- 1.74 Benefit-Cost ratio
- \$1,745,033,000 Flood Risk Management first costs
- \$74,219,000 annual net Flood Risk Management benefit
- Negligible downstream impacts
- \$32 million average annual residual damages



16

BUILDING STRONG®

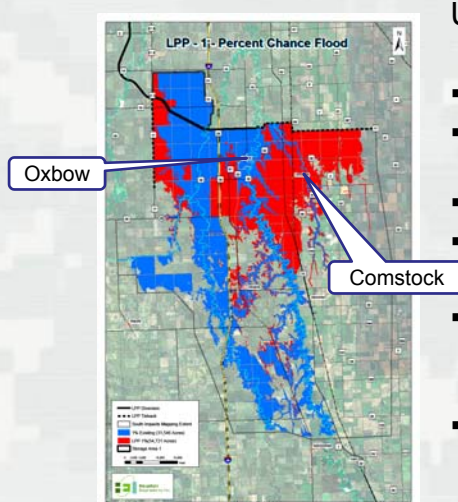
Staging Area



17

BUILDING STRONG®

FM Diversion Project



Upstream Storage and Staging

- To offset downstream impacts
- Nearly eliminates downstream impacts
- Blue = existing 100-yr flood plain
- Red = 100-yr flood plain with project
- 33,930 Acres affected
- Number of structures
 - ▶ 387 residences
 - ▶ 424 non-residences
- Mitigation for impacts included in project



18

BUILDING STRONG®

Upstream Mitigation

- ▶ Upstream staging/storage area necessary to operate the project.
- ▶ Mitigation measures based on total depth of water, with Project:
 - Farmland: Flowage Easements on property in staging area
 - ▷ Entire area can still be farmed
 - Structures:
 - ▷ 0 to 1 foot – Flowage Easement only
 - ▷ 1 to 3 feet – Ring Dike or Buyout (depends on access/duration)
 - ▷ Greater than 3 feet – Buyout. No habitable structures allowed.
- ▶ Impacts outside Staging Area mitigated if Takings analysis requires

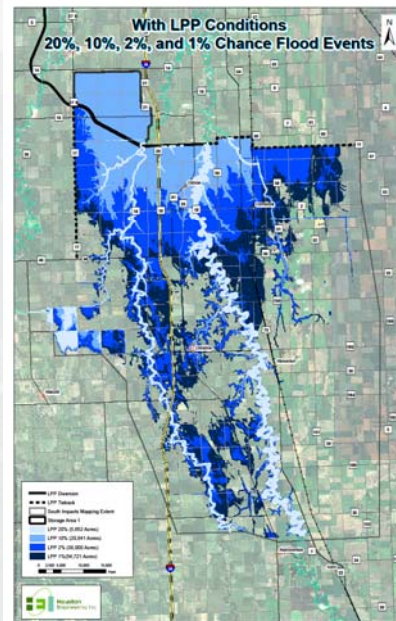


19

BUILDING STRONG®

Project Operation:

EVENT	FLOWS (cfs)
20% - Chance (5-yr)	12,150
2007 Summer	13,500
10% - Chance (10-yr)	17,000
2% - Chance (50-yr)	29,300
2009 Flood of Record	29,500
1% - Chance (100-yr)	34,700
0.2% - Chance (500-yr)	61,700

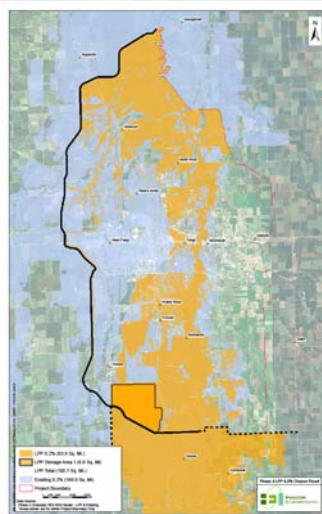


20

BUILDING STRONG®

Level of Risk Reduction

- Project does not target specific level of flood risk reduction
- Project formulated on economic, social, and environmental criteria
- Project provides 1-percent (100-year) chance level of risk reduction to Fargo-Moorhead
- Project does **NOT** provide 0.2-percent (500-year) level of risk reduction to Fargo-Moorhead
- Project formulated similar to projects developed for Grand Forks/East Grand Forks (250-year) and Roseau (100-year)
- Map indicates anticipated flooding during 500-year flood event with project

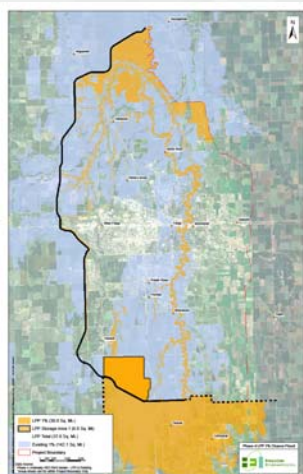


21

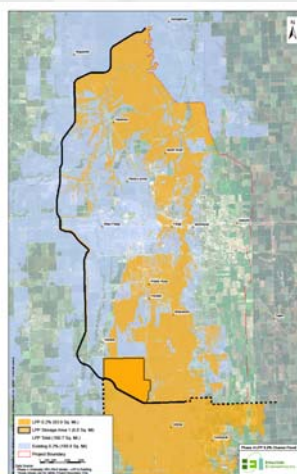
BUILDING STRONG®

With-Project Conditions

1% Chance Flood Event



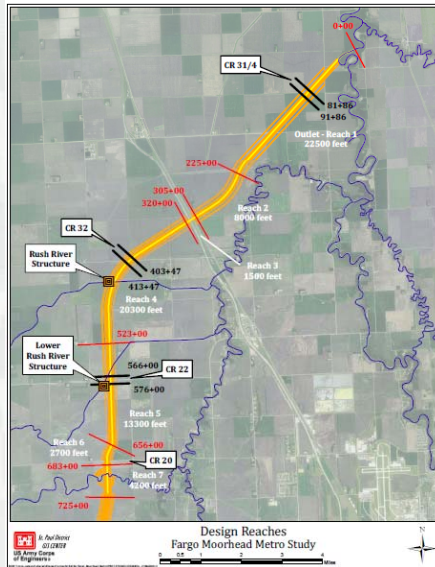
0.2% Chance Flood Event



22

BUILDING STRONG®

Current Design Efforts



- Have started design activities for:
 - Outlet/Reach1
 - Reach 2
 - Reach 3
 - Reach 4
 - Rush River structure
 - Reach 5
 - Lower Rush River structure
 - Reach 7 (Maple River aqueduct)
 - Environmental mitigation projects
- The bridges will be designed by the sponsors
 - CR 31/4
 - CR 32
 - CR 22
 - CR 20



BUILDING STRONG®

23

Moving Forward

Continued analysis to improve overall project by increasing value and decreasing future risks:

- Continue to work on technical information
- Value Engineering Studies
- Examine cost saving measures identified in feasibility study



BUILDING STRONG®

24

Mitigation Efforts – In-Town Levees

- Assessed levees that could protect up to approximately 21,000 cfs through town (compared to 9,600 cfs).
- In-Town Levees not included in feasibility study.
- Would increase project cost.
- If viable, could be one of first construction projects.
- Effects on Project Operation:
 - operate less frequently
 - reduce duration of operation
 - reduce frequency and duration of operation during summer crop-damaging events

Event (Year)	5-yr event	15-year event	Month	Last date flows above 9,600 cfs
	Days >= 9600	Days >= 20,000 cfs		
1943	8	--	April	4/11/1943
1952	11	--	April	4/22/1952
1965	3	--	April	4/16/1965
1966	2	--	March	3/22/1966
1969	13	4	March	4/24/1969
1975	7	--	July	7/8/1975
1978	10	--	March/April	4/9/1978
1979	10	--	April	4/25/1979
1989	7	--	April	4/13/1989
1993	2	--	April	4/6/1993
1994	7	--	March/April	4/6/1994
1995	4	--	March	3/23/1995
1995	3	--	March/April	4/2/1995
1996	2	--	April	4/16/1996
1997	29	14	April/May	5/5/1997
2001	15	1	April	4/23/2001
2005	2	--	June	6/18/2005
2006	12	--	April	4/12/2006
2007	7	--	June	6/12/2007
2009	36	8	March/April	4/28/2009
2009	5	--	June	6/24/2009
2010	20	3	March/April	4/4/2010
2011	30	8	April/May	5/4/2011
Total	195			
Number of Events	23	6		
Avg. days >= event	10.7	6.3		
Median days/evt	7.0	6.0		
Events <= 7 Days	12	3		

25

Project Schedule

- 3 Apr 2012 Record of Decision (ROD) signed by ASA(CW) and transmitted to Congress
- Fall 2012 Sign Project Partnership Agreement*
- Spring 2013 Begin Construction*
- Spring 2021 Project Operable*

** Requires authorization and funding from Congress*



26

BUILDING STRONG®

Diversion Authority Website

Fargo Moorhead Diversion

Search for:

[SITE MAP](#) | [CONTACT US](#) | [HOME](#)

[PROJECT STATUS](#) | [ABOUT THE PROJECT](#) | [ABOUT THE AUTHORITY](#) | [NEWS](#) | [VIEWPOINTS](#) | [CALENDAR](#) | [LIBRARY](#) | [LINKS](#) | [COMMENTS](#)

About the Project

This description of the diversion plan focuses on the recommended Federal plan (also known as the Locality Preferred Plan). For full details, read the [Final Feasibility Report and Environmental Impact Statement, July 2011](#).

THE DIVERSION IN DEPTH

Flooding in the Red River Valley has become increasingly severe and frequent. It threatens our viability and quality of life for the entire region. In fact, during times of severe flooding, the potential damages alone to the Fargo-Moorhead area are estimated at more than \$194 million a year without a flood diversion that includes upstream staging and storage.

A three-year study led by the Corps of Engineers, and also involving local engineering firms, looked at many options, including levees, floodwalls, retention, etc.; and found the current diversion plan is the only concept that would significantly reduce flood risk in the Fargo-Moorhead area from flood events larger than the flood of 2009.

The alignment of the 20,000 cfs diversion channel with upstream staging and storage would start approximately four miles south of the confluence of the Red and Wild Rice Rivers and extend west and north around the cities of Horace, Fargo, West Fargo and Harwood. It ultimately would re-enter the Red River south of the confluence of the Red and Sheyenne Rivers, near the city of Georgetown, MN. Along the 36 mile path it would cross the Wild Rice, Sheyenne, Maple, Lower Rush and Rush rivers and incorporate the existing Horace to West Fargo Sheyenne River diversion channel.

The basic North Dakota alignment remained the same as in the earlier screening phase, except where it was adjusted northwest of Harwood, ND to avoid Drain 13. Some significant design changes were made for the recommended Federal plan, including the addition of staging and storage, along with optimization of the channel cross section. The plan includes 19 highway bridges and 4 railroad bridges that cross the diversion channel.

The channel capacity was modified from previous phases to account for the storage and staging areas that were included. The inclusion of these areas allowed for the capacity of the diversion channel to be reduced to approximately 20,000 cfs. The diversion channel was designed to keep the 1 percent chance event flood flows below existing ground in the diversion channel as much as possible to limit impacts to drainage outside the channel.

The Need for the Project

Learn why the Fargo Moorhead Diversion is critically needed. [Click Here](#)

Project History

Learn about how this project came about. [Click Here](#)

Project Timeline

View a timeline for the project. [Click Here](#)

Mitigation

Learn about Project Mitigation. [Click Here](#)

Frequently Asked Questions

Find answers to commonly asked questions and learn about common misconceptions about the project. [Click Here](#)

<http://www.FMDiversion.com>

27

BUILDING STRONG®