



Red River and Devils Lake Basin - 2019 Spring Flood Outlook

Discussion Points 3/15/2019 (updated from 3/7/2019 outlook)

prepared by

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This outlook is for the U.S. portion of the basin and is based on conditions through Thursday, 3/14/19. All graphics, probabilities, and related discussions are available at weather.gov/fgf. Further risk updates not expected this spring.

Bottom Line up Front!

- First half of March has been Merciless!

Two recent wet and snowy storms have markedly increased overall basin moisture loading, especially in the far south and southeastern sub-basins.

- Top 10 runoff year is now expected.

Significant overland runoff and rural flooding is now considered likely, in most all areas. Less so in northeast ND.

- Moderate to Major riverine flooding is nearly guaranteed... especially along or near the main-stem Red River.

- **Some Good News:** The next two weeks could bring pleasant thaw weather. The next two weeks could see temperatures slowly trending to near normal and a more favorable melt-cycle, with precipitation near to slightly below normal.

- **Less Favorable News:** No guarantee that the end of March and beginning of April will cooperate. Experimental Week 3-4 Outlook, issued 8 March 2019, indicated another cold snap to start April. Storminess factor is uncertain.

Long Story Short: Significant snowmelt flooding is likely, and runs from above to much above long-term historical averages across the Red River and Devils Lake Basins (U.S. portions).

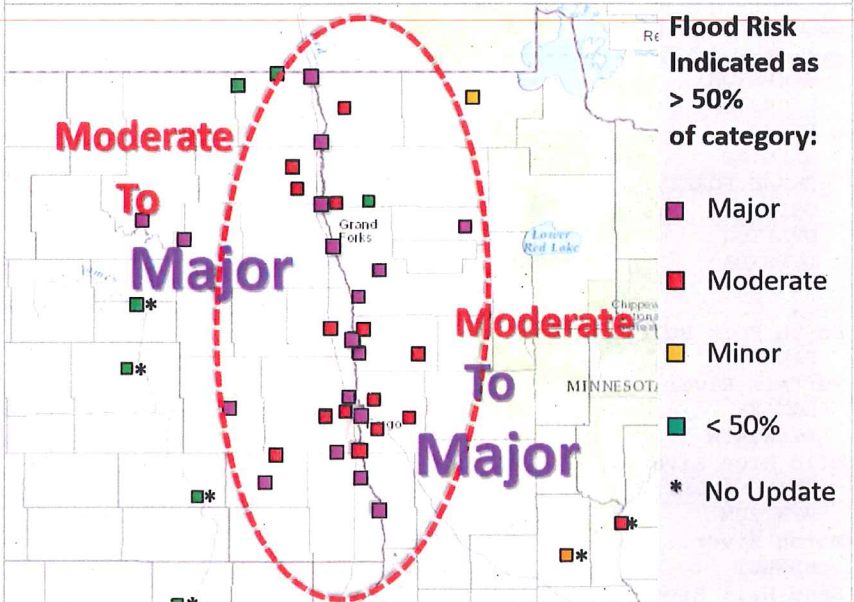
Key Snowmelt Flood Components:

- 1. Base Streamflow:** Still frozen, with near normal flow north, slightly above normal flow south. Note that base streamflows remain much below the record flood years of 1997, 2009, 2010, and 2011.
- 2. Soil Moisture at Freeze-up:** Above normal south, near normal central, below normal far north. Soil moisture is also much below that which preceded the record flood years of 1997, 2009, 2010, and 2011.
- 3. Frost Depth:** Deeper than normal everywhere. Frost is quite deep, from 36 to 48 inches, with river-ice and lake-ice thicknesses above seasonal normal ranges. Ice Jams should be more of a risk on tributaries, less on the mainstem Red.
- 4. Winter Snowpack/SWE:** above/much above normal. Since Dec 1st, snowfall has run from 100-200 percent of normal - least in northeast ND and most from northcentral MN into the central and southern RRV. The water content (SWE) ranges from 1.5 to 3.5 inches above normal in the central and southern Red River Basin.
- 5. Total Precipitation, Oct 1st to Mar 15th is Very High.** Total precipitation (rain and snow-water) from Oct 1st through Mar 15th ranged from 2-4 inches above the long-term normal for most of the central and southern Red River Basin.

New! Along with our flood partners, we've developed a display graphic which relates the current flood outlook to our historical flood levels (for now, just along the mainstem Red River). **Check it out at:** <https://www.weather.gov/fgf/PFOS>

New! There is an updated CRED web-based app, for citizen flood-related reporting. **Check it out at:** <https://cred.wq.io>

Heavy Snow (Feb) then Heavy/Wet Snows (Mar) make for top 10 runoff potential!



DEVILS LAKE & STUMP LAKE...
[not updated]

Long-Range Probabilistic Outlook
Valid March 4, 2019 - September 30, 2019

LOCATION	95%	90%	75%	50%	25%	10%	05%
CREEL BAY	1449.1	1449.2	1449.5	1449.8	1450.3	1450.7	1451.4
EAST STUMP LAKE	1449.1	1449.2	1449.5	1449.8	1450.3	1450.7	1451.4

The current heights of Devils Lake and Stump Lake are ~1448.3 ft. MSL.

Color code: Below Minor Moderate Major Flood of Record

RED RIVER AND TRIBUTARIES...

Long-Range Probabilistic Outlook
Valid March 18, 2019 - June 16, 2019

LOCATION	95%	90%	75%	50%	25%	10%	05%
WAHPETON	13.9	14.1	14.8	15.7	17.0	18.2	19.0
HICKSON	32.1	32.8	33.9	35.1	36.1	37.6	38.6
FARGO	33.8	34.9	36.5	37.9	38.9	40.3	41.4
HALSTAD	38.0	38.5	39.0	39.5	40.0	40.6	41.2
GRAND FORKS	45.8	47.5	49.0	50.6	52.7	54.6	56.7
OSLO	37.2	37.5	37.8	37.9	38.0	38.1	38.1
DRAYTON	41.8	42.4	43.0	43.7	44.6	45.3	46.0
PEMBINA	51.0	51.7	52.2	53.0	53.7	54.5	54.7

Minnesota Tributaries:

South Fork Buffalo River.....							
SABIN	14.6	15.0	15.8	17.2	18.6	20.3	21.7
Buffalo River.....							
HAWLEY	9.5	9.8	10.0	10.4	11.2	11.9	13.0
DILWORTH	21.2	21.8	22.7	23.9	25.1	26.7	28.1
Wild Rice River.....							
TWIN VALLEY	10.9	12.0	12.8	13.9	15.6	17.1	18.0
HENDRUM	31.6	32.0	32.6	33.3	34.0	35.0	35.6
Marsh River.....							
SHELLY	17.0	18.0	20.3	22.0	23.9	24.7	25.7
Sand Hill River.....							
CLIMAX	26.6	27.9	29.4	31.2	34.4	37.0	39.1
Red Lake River.....							
HIGH LANDING	12.4	12.7	13.1	13.3	13.5	13.6	13.7
CROOKSTON	21.6	22.5	24.3	26.9	28.5	30.4	32.9
Snake River.....							
ABOVE WARREN	65.0	65.2	65.7	66.8	68.3	72.0	73.1
ALVARADO	104.5	105.0	106.1	108.0	109.1	110.3	110.8
Two Rivers River.....							
HALLOCK	807.4	807.7	808.4	809.5	809.9	811.5	812.0
Roseau River.....							
ROSEAU	14.1	14.8	15.6	16.4	17.7	18.8	19.4

North Dakota Tributaries:

Wild Rice River.....							
ABERCROMBIE	20.0	21.9	23.4	24.5	25.6	26.9	27.5
Sheyenne River.....							
VALLEY CITY	13.2	15.2	16.6	18.0	19.8	21.7	22.7
LISBON	15.6	16.4	18.3	20.5	22.4	25.0	28.2
KINDRED	20.2	20.5	21.1	21.2	21.2	21.2	21.2
WEST FARGO DVRSN	21.2	21.2	21.3	21.3	21.3	21.3	21.3
HARWOOD	91.8	91.9	92.1	92.1	92.2	92.3	92.4
Maple River.....							
ENDERLIN	11.8	12.1	12.8	13.3	13.6	14.4	15.0
MAPLETON	22.0	22.2	22.5	22.8	23.2	24.0	24.1
Goose River.....							
HILLSBORO	9.3	9.8	12.1	13.3	14.6	16.5	17.9
Forest River.....							
MINTO	7.3	7.5	8.0	8.5	9.6	9.9	10.2
Park River.....							
GRAFTON	10.5	11.0	12.1	14.1	16.1	17.9	19.4
Pembina River.....							
WALHALLA	5.9	6.1	6.8	7.5	8.7	11.8	12.9
NECHE	10.3	10.6	11.7	13.6	16.6	20.5	21.2

Notes

1. Devils Lake Basin Runoff Risk has not changed much since February. A somewhat above normal rise is expected, from 1 to 2 ft. No update since 7 Mar 2019.

Note: Devils Lake is currently about 1.5 feet lower than this time last year.

2. Red River Basin Runoff Risk has jumped markedly. All Red River main-stem points will see significantly higher flows,

- due to significant snow/SWE loads from 9 Mar and 14 Mar storms, over damp and deep frozen antecedent conditions, especially in the far southern Red River Basin, south of Fargo;

- coupled with much increased runoff potential from the MN tributaries, and Red Lake River Basin,

3. Snowpack/SWE and runoff potential has increased in most all MN tributaries.

Central and South tribs have seen the highest increase in snow and SWE this past week, including the Red Lake River.

Roseau River Basin now has a slight increase to just above normal for runoff risk.

4. ND Wild Rice has a quite High Runoff Risk, with much above normal snowpack.

Mid to Lower Sheyenne has gained appreciably in snow and SWE. High Red River levels lead to sig. backwater at Harwood.

Some snow/SWE increases on Maple and Rush Rivers as well.

Slight increase on Park River, else northeast ND saw least overall gains in SWE.

Incident Action Plan

Flood Flight 2019: Cass County, ND

Date: March 18th, 2019

IAP #: CassFlood2019-001

Approved by the Incident Commander: Jason Benson

1. Situation:

a. River Flood Stage Forecast:

- i. February was extremely snowy and the March 7th flood forecast listed 25% chance of hitting 36.6' in Fargo with major flooding on the Sheyenne River.
- ii. The snow storm precipitation totals on March 9-10 and March 13-15 were much higher than predicted.
- iii. On March 15th the NWS put out an updated forecast as result of the additional snow and significantly increase the chance of a significant major flood.
- iv. Key Take Away: Red River now 50% chance to hit nearly 38' and a 5% chance of being more than 0.5' higher than the 2009 flood of record. The Sheyenne and Maple Rivers are now expected to be near or above record levels.

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b. Long Range Weather Forecast

- i. Short term weather - includes highs in the 30's and lows in the 20's over the next five days from March 18-22.
- ii. Mid-range weather - from March 23-25 there is a chance of rain, highs near the mid-40's and lows staying above freezing
- iii. Long-range weather - from March 26-30 it is questionable, but there is a chance of rain and more clouding days where the low temperatures won't drop below freezing

c. Weather and Flood Forecast Planning Considerations

- i. Bottom line, the next two weeks will determine how fast the melt is and how high the flood gets. More days in the 40's with lows above freezing will trigger a faster melt. More rain will also hasten the melt and add to the crest.
 - ii. We must be ready to fight at least to 35' on the Red River at Hickson, 38' on the Red River near Fargo, 21.2' on the Sheyenne at Kindred, 892.0' on the Sheyenne at Harwood, and 23.0' on the Maple River at Mapleton.
 - iii. Consideration should be made for a the 10% chance, 40.3' flood on the Red River near Fargo
- d. Residential Property Protection Levels:
- i. Red River. There are roughly 209 homes along the Red River that are impacted at 38'. This increases to 375 homes at 40' and over 600 homes at 41.5'.
 - ii. Sheyenne River. In the area north of West Fargo along the Sheyenne River there are around 50 homes impacted by a 892.0' flood and just over 200 homes affected by a 892.5' flood. For many of the homes along the Sheyenne River they will lose access around 891.0' or lower.
 - iii. Sandbags Needed.
 1. Since 2009 there have been 175 homes bought out along the Red and Sheyenne Rivers. Of these, nearly 160 homes were along the Red River. These 175 homes previously used from 300,000-600,000 sandbags to be protected during each of the floods years of 2009-2011.
 2. Better mapping tools by the County along with better understanding of flood impacts by rural residents has also reduced some of the sandbag needs. This is especially true when compared to 2009 where some people requested large amounts of sandbags and only use about half.
 3. Based on a 38' flood on the Red River and 892' on the Sheyenne River, we can expect to use 100,000 filled sandbags and distribute more than 200,000-300,000 empty sandbags with loads of sand delivered to homes.
 4. Based on a 40' flood on the Red River and 892.2' on the Sheyenne River, we can expect to use 230,000 filled sandbags and distribute more than 400,000 empty sandbags.
2. **Mission:** The mission of Cass County during Flood Fight 2019 is to complete 90% of flood preparations by April 5th in order to ensure life safety and rural property damage reduction through the following key tasks: Protect key infrastructure and large rural subdivisions; Provide flood fighting materials and expertise to rural residents; and Posture law enforcement for traffic control and rescue operations.
3. **Incident Commander's (IC) Guidance:** Cass County will conduct flood response throughout the rural areas of the county outside of city limits. This will be through the collaboration of Operations Sections to include Operational Planning, Engineering (including construction), Law Enforcement, Volunteer Operations, and Logistics/Finance, as well as through Public Information Operations (PIO), Intergovernmental Liaison, and Legal. For rural cities we will collaborate, provide technical assistance, and law enforcement response, but rural cities will be responsible for providing flood protection for their residents and communities. We will start sandbag operations the week of March 25-29, levee construction starting at the end of March and into the first week of April, with 90% of protection complete by April 5th.

- a. Key Tasks/Objectives:
 - i. Protect key infrastructure and large rural subdivisions.
 - ii. Providing flood fighting materials and expertise to rural residents.
 - iii. Inform the rural population regarding County preparations, flood conditions, and road closures.
 - iv. Conduct law enforcement operations to include traffic control and search and rescue operations.
- b. Flood Crest Levels to Build Protection:
 - i. Red River: It is too soon to decide what flood elevation to build to. Home owners should build to a minimum of 38' plus freeboard. With levees protected to 40' plus freeboard. However, since we don't expect to begin levee construction until the last week of March, the levee elevation won't be set until around March 25th.
 - ii. Sheyenne and Maple Rivers. It is expected these rivers will be near or at record flood stage. Residents should plan to build sandbag dikes to 892' plus freeboard on the Sheyenne River and 23.5' plus freeboard on the Maple River.
- c. Safety: During flood fighting operations County Staff, interagency partners, volunteers, and residents must be aware of the potential for unsafe environments. Flood waters can rapidly rise, roads can wash out, flooded basements with electricity still on, chemical or sewage in the flood waters, risk of hypothermia and drowning, and fatigue are all potential when fighting a flood. Be safe and assess risks prior to conducting flood fighting activities.

4. **Operation Phases:** This flood operation will be complete in four phases.

- a. Phase 1 - Planning: This phase began after the March 7th National Weather Service (NWS) flood forecast update and accelerated following the March 15th NWS update. This phase is ongoing as planning activities change based on the flood and weather conditions. This phase includes the County Commission making an Emergency Declaration and the IC determining the flood elevation that we will build protection to. Engineering will develop estimates for the needed flood materials, requests for quotes for the materials, and contracts for construction services. Law enforcement will coordinate and plan for supporting security and rescue operations. PIO will plan local media coordination, public meetings, and get information out regarding flood planning. Volunteer Operations will plan and prepare volunteer activities.
- b. Phase 2 – Prepare: This phase will begin on or about March 25th with the acquisition of flood fighting materials and beginning of construction of protections and ends as we complete preparations for the flood crest. Engineering and construction efforts begin to prepare flood materials and build flood protection with 90% of protection complete by April 5th. Volunteer Operations will coordinate volunteers for filling sandbags and assisting rural residents in placing sandbags. Public information activities, events, and meetings will be dynamic in providing information to rural residents and Townships. Law Enforcement will continue to plan, patrol, and support the preparation phase. During this phase the TOC will open at approximately 33'-35' on the Fargo gage and EOC will open at approximately 35'-37' (opening will be dependent on the predicted crest).
- c. Phase 3 – Flood Fight: This phase begins as preparations culminate, the crest nears, and residents become isolated due to flood waters and this phase ends after the flood has subsided without threat of a second crest. During this phase Engineering will monitor and maintain flood

protections and provide emergency response with materials or sandbags where needed. Volunteer operations will most likely cease during this operation as flood preparations are complete. Law Enforcement will ramp up patrols to identify washed out roads and isolated residents, enforce road closures, and conduct rescues. The PIO will continue local media coordination, plan public meetings when necessary, and provide updates on rural areas and roads.

- d. Phase 4 – Clean Up and Recovery: This Phase begins at different times as the flood waters go down throughout the various regions of the county and ends once all protection/materials are cleaned up, and roads and infrastructure are repaired. This phase could last well into the summer. This phase will include shutting down much of the flood related Law Enforcement and Volunteer Operations. PIO will continue to coordinate with local media and provide information on recovery operations. The main effort in this phase is with Engineering to include contracts to remove temporary flood protections, rebuilding washed out roads and infrastructure, and other clean-up operations.

5. Tasks to Command Staff:

a. Public Information Operations (Robert Wilson):

- i. Coordinate for Interagency Meetings and Public Meetings.
 1. Meetings with the City of Fargo and other surrounding Cities.
 2. Meetings with Townships.
 3. Public Meeting for residents – one meeting for residents south of I-94 along the Red, Wild Rice, and Sheyenne Rivers (potentially at Bennett Elementary) and one meeting for north of I-94 along the Red, Sheyenne, Maple, and Rush Rivers at the Harwood Community Center.
 4. Develop a media campaign plan to get information out regarding County Flood Operations and meetings.
 5. Coordinate with IT, GIS, and Ben Prather to update the County Website with a special “Flood” banner to have the following data:
 - a. County Interactive Flood Map.
 - b. Links to NWS Flood Forecast Site.
 - c. Detailed contour maps of rural subdivisions.
 - d. Sandbag Policy and procedures.
 - e. Link to ND Extension Service – How to Build a Sandbag Dike
<https://www.ag.ndsu.edu/extension/features/building-a-sandbag-dike>.
 - f. Other?

b. Emergency Manager/Liaison (Jim Prochniak):

- i. Prepare, open, and manage the EOC – Open at around 35’-37’ on the Fargo gage.
- ii. Liaison with NDDES and coordinate additional resources and interagency response in case of extreme flooding.
- iii. Manage and maintain the County Web EOC.

c. Legal Officer (Birch Burdick):

- i. Review contracts and legal documents
- ii. Provide County Commission and IC legal advice regarding flood fighting actions, resourcing, interagency activities, etc.

2. Tasks to County Operation Sections:

a. Engineering Operations and Construction (Tom Soucy):

- i. Priorities: Throughout our flood preparation we will have priorities of effort based on engineering/survey, levees, and sandbags.
 1. Engineering/Surveying:
 - a. Levees protecting the area south of 76th Ave S.
 - b. Highland Park and Stockman's Subdivision.
 - c. Sheyenne River area from north of West Fargo to north of Harwood.
 2. Levee Construction:
 - a. Area south of 76th Ave S to include: 76th Ave S, Forest River Road, Cass 81, Round Hill Levee, 88th Ave S, and 25th St S.
 - b. Highland Park.
 3. Filled Sandbags:
 - a. Production of 300,000 of filled sandbags. This may include setting up our own "Sandbag Central" at the Cass County Highway Department to include staffing, supplying, and maintaining the facility.
 - b. Distribution of filled sandbags for homes immediately behind the levees south of 76th Ave.
 - c. Distribution of filled sandbags for homes along the river in Highland Park.
 - d. In addition, filled sandbags maybe staged in various locations for emergency response based on flood conditions.
 4. Empty Sandbags: Distribution of empty sandbags to anyone in need county wide (purchased by home owners from Cass County at \$100 per 1000 bags with Cass County delivering sand to their home, for residential use only).
 - a. Homes along the Red and Wild Rice Rivers south of Fargo.
 - b. Homes along the Sheyenne and Maple Rivers south of I-94.
 - c. Homes along the Red River north of Fargo.
 - d. Homes along Sheyenne, Maple, and Rush Rivers north of I-94.
- ii. Contracting: Highway Department staff will draft and send out Requests for Quotes (RFQO for materials, supplies, and construction work. They will then draft contracts to be signed by the County Engineer and/or County Commission.
- iii. Support public meetings with staff to assist in providing flood fighting information to residents.

b. Law Enforcement (Sheriff Jesse Jahner):

- i. Open and manage the TOC at the LEC – Open at around 33'-35' on the Fargo gage.
- ii. Plan and coordinate traffic control operations.
- iii. Provide staff for public meetings.
- iv. Plan and execute search and rescue (SAR) operations.
- v. Coordinate with NDARNG, Customs & Border Protection (CPP), US Fish and Wildlife (USFWS) for additional security and SAR capabilities if needed.
- vi. Plan for extreme flood event contingencies to include evacuation of the Jail.

c. Volunteer Operations (Chip Ammerman): Coordinate for volunteer operations for various functions to include

- i. Sandbag Central for filling sandbags if the County opens our own site at the Highway Dept.

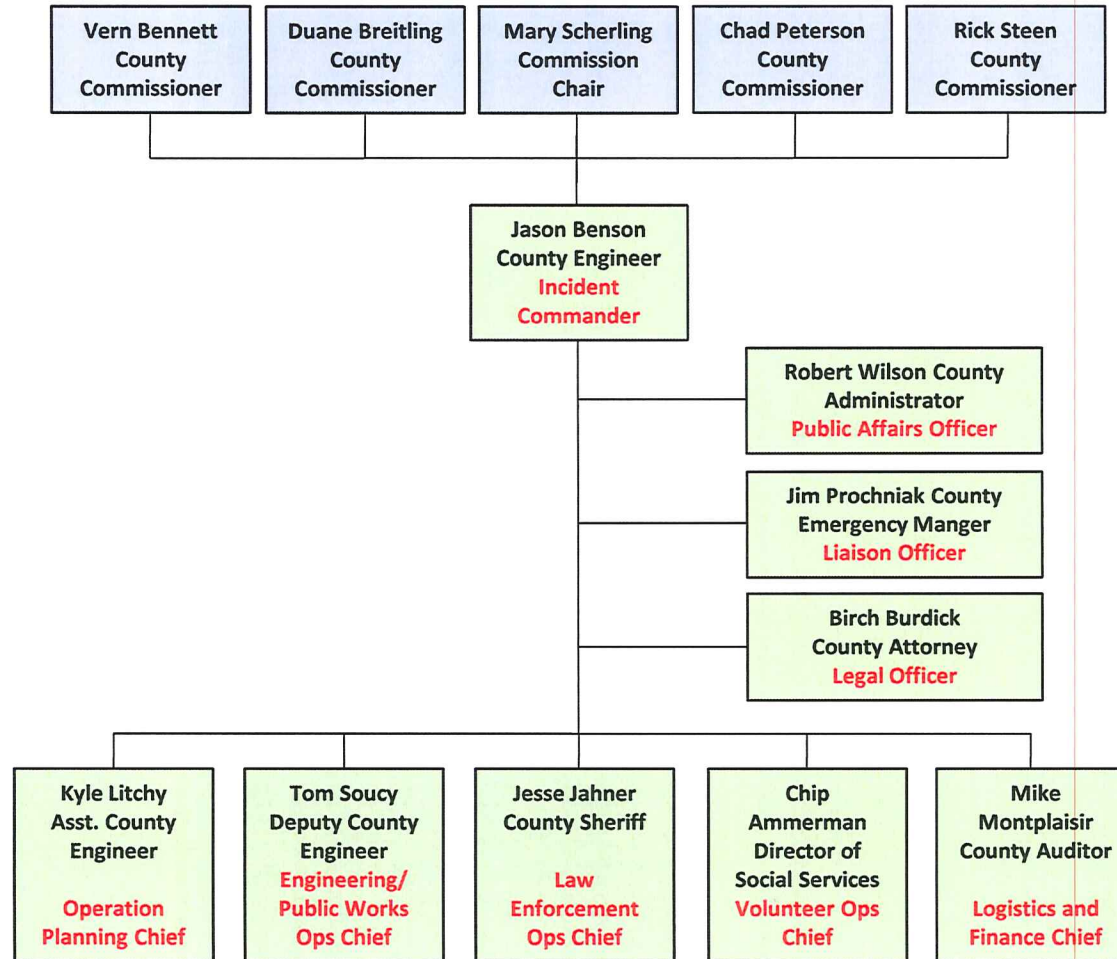
- ii. Support for rural homes in the Chrisan and Chrisan Way Subdivisions south of Fargo and Highland Park Subdivision north of Fargo.
- iii. As needed to support other rural homes. Do to the buyouts over the last 10 years there are not as many homes or rural subdivisions that need volunteer support.
- d. Logistics and Finance (Mike Montplaisir):
 - i. Support the Operation Chiefs in procuring supplies, facilities, and ground support (fuel, equipment, buses, etc.).
 - ii. Maintain budgetary controls and track expenditures of Emergency Funds.
 - iii. Assist when activities require finance and other administrative support services.
 - iv. Handles claims related to property damage, injuries, or fatalities at the incident.
- e. Operational Planning (Kyle Litchy):
 - i. Support the Engineering Operations Chief in planning flood protection, RFQs, and contracts.
 - ii. Coordinate with other Operations Chiefs to plan for resources, support, and other interagency response requirements.
 - iii. Maintaining status of flood protection measures and resources
 - iv. Maintaining and displaying situation status.
 - v. Assist the IC in preparing updates to the Incident Action Plan (IAP).
 - vi. Developing alternative strategies or resources
 - vii. Preparing the plans for demobilization, cleanup, and road/infrastructure repair.

Cass County

Special Organizational Chart for Flood Fight 2019

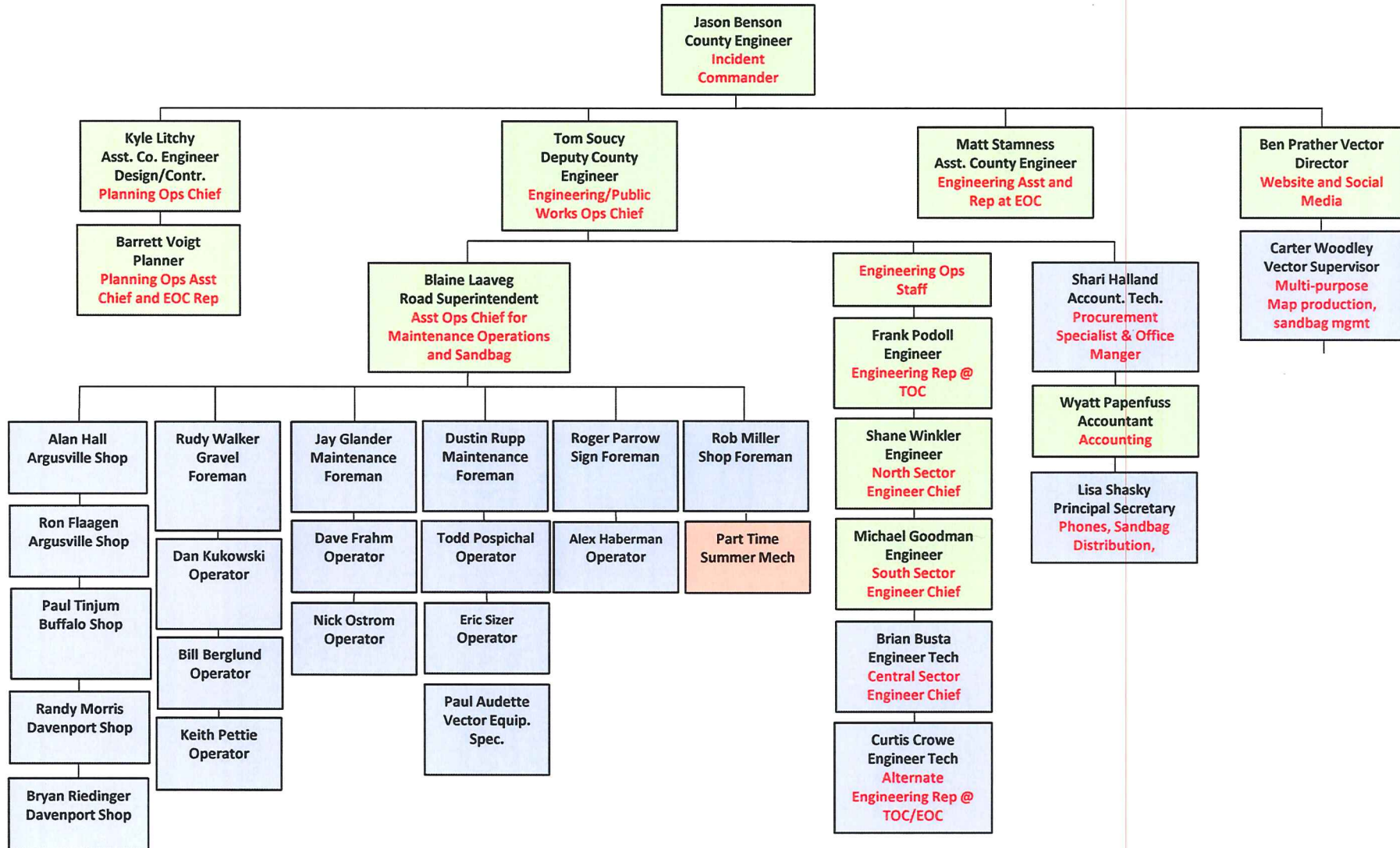
(as of 03-18-2019)

Cass County Commission



Cass County Highway Department Special Organizational Chart for Flood Fight 2019

(as of 03-18-2019)



Cass County Highway Department Flood Operations Plan

Flood Background Information

Cass County, North Dakota lies within the watershed boundary of the Red River of the North. The Red River of the North is a unique river system for the United States in that it flows north into Canada rather than south to the Mississippi River System as most basins in the Country. This unique reality presents an often difficult situation during the spring thaw. Cass County's continental climate with long cold winters presents a spring thaw that often results in both the melting of a season's worth of snow and the thaw of a layer of frost in the soil. A wet fall and/or a wet spring can exacerbate the situation by adding additional moisture to the spring melt in a river system that is flowing north into colder climate conditions. These factors among others result in the frequency of spring flooding in Cass County.

In addition to the Red River of the North, Cass County has within its boundaries four tributaries contributing to the Red. The Sheyenne River flows directly into the Red north of the City of Harwood and has a watershed of 8800 square miles. The Maple River flows into the Sheyenne River south of Harwood and north of the City of West Fargo and contributes a watershed of 1480 square miles. The Rush River and Lower Branch of the Rush River also flow into the Sheyenne just north of Harwood and have a combined watershed of 220 square miles. The Wild Rice flows directly into the Red just south of the City of Fargo and drains a watershed of over 2000 square miles. These tributaries along with a large number of legal drains and other drainage structures leave the County and the cities within its border a very complex flood fight.

This plan is designed as a response to this unique situation and assists the Cass County Highway Department and its agents to prepare when flooding is forecasted. The plan includes department procedures for staff deployment along with an organization of responsibilities within the department. These procedures include the handling of distributing sandbags, building earthen levees, and closing County Highways. It includes an outline of what impacts occur at different river stage levels as reported by United States Geological Survey (USGS) gages. It outlines what action steps are taken as a result of flooding at different river levels and breaks these out by township and subsets of residential developments to organize our response. In this outline the plan identifies residential developments by displaying contour elevations and river stage levels as they associate to the Fargo USGS gage. The plan also includes maps that identify critical stages at which homes are in danger of flooding, and maps identifying addresses of homes that assist staff in emergency response and recovery procedures. These maps are provided to the plan and are updated from year to year (see Appendix 1). The plan also provides an outline for public information highlighting the importance of an open dialogue with the public. Finally, the plan seeks to identify recovery procedures as the water recedes.

A great deal of the preparation of this plan comes from the experience of fighting spring flooding. Most recently the County Highway Department has assisted residents in 1997, 2001, 2006, and record Red River flooding in 2009, 2010, and 2011. Along with lessons learned from these experiences this plan uses data from a number of studies. Flood insurance studies are

ongoing and data is used and cited throughout the document. Light Detection and Ranging (LiDAR) technology and the use of GIS software from the Economic and Social Research Institute (ESRI) has allowed this plan to incorporate an amount of elevation data that before was nearly impossible. This data has been used to prepare maps that assist both engineers and staff in the field and office as well as the general public. Cass County also utilizes its home website to display interactive mapping technology as well as pre-produced maps to assist the public and various agencies operating within the County.

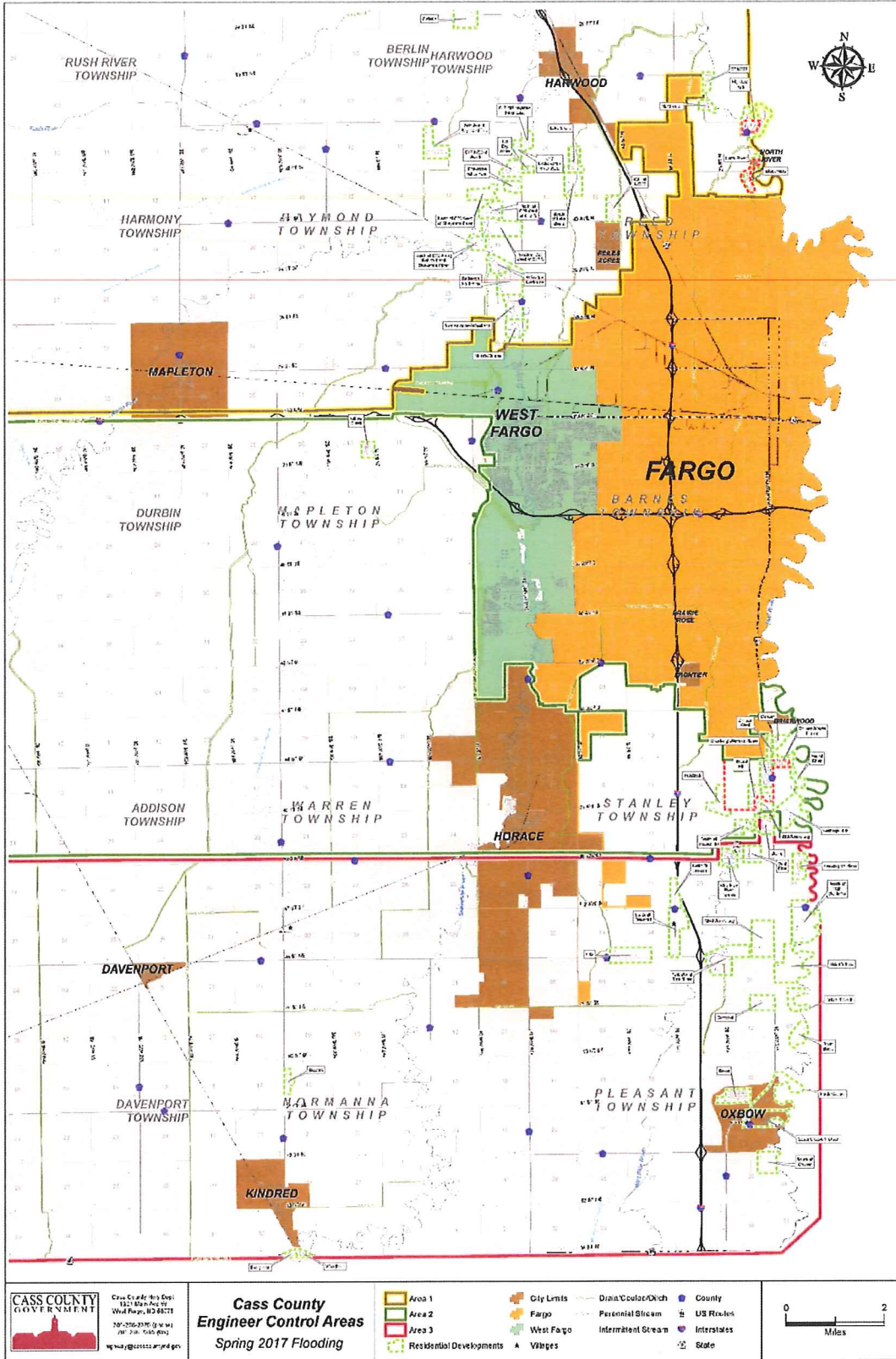
Mission of Cass County Flood Operations

The mission of Cass County is to conduct necessary planning, preparation, and execution of flood operations to provide the citizens of rural Cass County (outside of incorporated city limits) effective flood protection to prevent loss of life, protect public infrastructure, and where feasible, protect individual homes. The County will accomplish this through the use of County employees, National Guard and other Governmental Agencies, Contracted Staff, and Volunteers to build levees, provide sandbags, and provide safety and evacuation assistance. Flood operations are coordinated by the Cass County EOC (Emergency Operations Center) located at the Fargo/Cass Emergency Management Building. (Tactical Ops Center) located at the Sheriff's Law Enforcement Center at 1612 23rd Ave N in Fargo, (Sandbags, and Volunteers) All other flood related missions will be organized from the Highway Department complex on Main Avenue in West Fargo.

Department Procedures

The Cass County Highway Department consists of Highway Maintenance, Highway Construction and Design, the Planning Office, and the Vector Control Department. The County Engineer oversees all operations acting as Department Head. In addition to being Department Head for the Highway Department, the County Engineer acts as Incident Commander of the County during emergency operations. The Highway Department has historically been charged with certain responsibilities during spring flooding due to the expertise of staff engineers and duties and job responsibilities of its staff. Preparations include mapping, levee construction, and distribution of sandbags. During flooding events staff assists residents in identifying their risk, distributing sandbags, assisting in building and assessing protection measures such as sandbag levees and water pumps, they oversee earthen levee construction, close and repair flooded roads, and generally do what is needed to assist County residents any way they are able to in flood fighting efforts. During Spring Flooding the County is split into three zones for engineering assistance. Each zone is assigned a Project Manager from the Engineering Department that manages the operations for those areas coordinating with all involved in the response (see Appendix 6). Map 1 displays these zones.

Map 1: Engineer Control Areas



Sandbag Distribution (see Appendix 5)

The Cass County Board of Commissioners sets the policy for distributing sandbags. Each event presents a unique situation and County staff monitors forecasts to set priorities for distributing sandbags so that County resources can best be distributed. When forecasts indicate the need to set into motion flood fighting efforts, the County Engineer will seek guidance from the Board of Commissioners in setting policy for distribution. At that point the County Engineer will direct staff to prioritize distribution, and staff will then assist residents accordingly. Maps of developments indicate the critical elevations of homes and the tables assist to easily identify homes most in danger. Staff will use these maps in the field and at the office to identify the priorities as outlined by the County Engineer to ensure those residents most in need receive the limited assistance the County can provide.

During Spring Flooding Cass County Government will organize and distribute sandbags to flood prone areas outside of the municipal jurisdictions. As stipulated by Commission policy; a fee of \$0.10 (\$100/1000 bags) will be collected from residents requesting sandbags. This fee will be collected at the time the request is made in person at the County sandbag operation facility located in West Fargo.

Residents are directed to the Cass County website for direction on who is eligible to receive sandbags at this discounted rate. Residences not threatened by floodwater will not be eligible to receive sandbags from the County. Residents who purchase sandbags from private vendors will not be reimbursed.

In addition, the County will also distribute filled sandbags on pallets (roughly 80 sandbags per pallet) to subdivisions and rural residences. The filled sandbags will be provided in the following priority: First, homes in front (wet side) of county built levees and Second, homes where members of subdivisions or rural residents provide volunteer support at the County Sandbag Operation (at the Cass County Highway Department Facility or when combined with the City of Fargo). The availability of sandbags will initially allow for only 1000 filled bags per home. Distribution of filled sandbags will start in the areas south of Fargo and then shift to areas north of Fargo. Priority will also be given to those who have not supported volunteer operations, but are in need of emergency sandbags due to significant changes in river forecast or conditions. The County will provide transportation and unloading of sandbag pallets within close proximity of homes. However, site conditions, water levels, and risk of damaging property may preclude the County from delivering the sandbags directly to a home site or where the home owner would like the bags placed.

Sandbags purchased or delivered on pallets are intended to be used on the home of residence and not for protecting outbuildings or other non-inhabitable structures.

Public Outreach**Public Information Officer**

The County Administrator acts as the Public Information Officer (PIO). All media requests and press releases are coordinated through the PIO.

Community Meetings

As a part of the preparations and ongoing efforts through the event, Cass County engineering staff will participate in community meetings to discuss preliminary plans and ongoing efforts as needed. Being the large geographic area that is Cass County, the County will generally participate in local neighborhood/community meetings and not hold one large County coordinated meeting.

Levee Construction (see Appendixes 2, 3, and 4)

The County Engineer carefully considers earthen levee construction or alternative levee products in consultation with the City of Fargo and area experts. In considering construction of levees the County Engineer seeks to protect public infrastructure while leaving the least impact possible to adjacent properties. When forecasts indicate potential flooding, construction plans will begin along the south side of the metropolitan area where public infrastructure is present. County staff has identified alignments of levees that offer the most protection along with levels at which they will need to be closed.

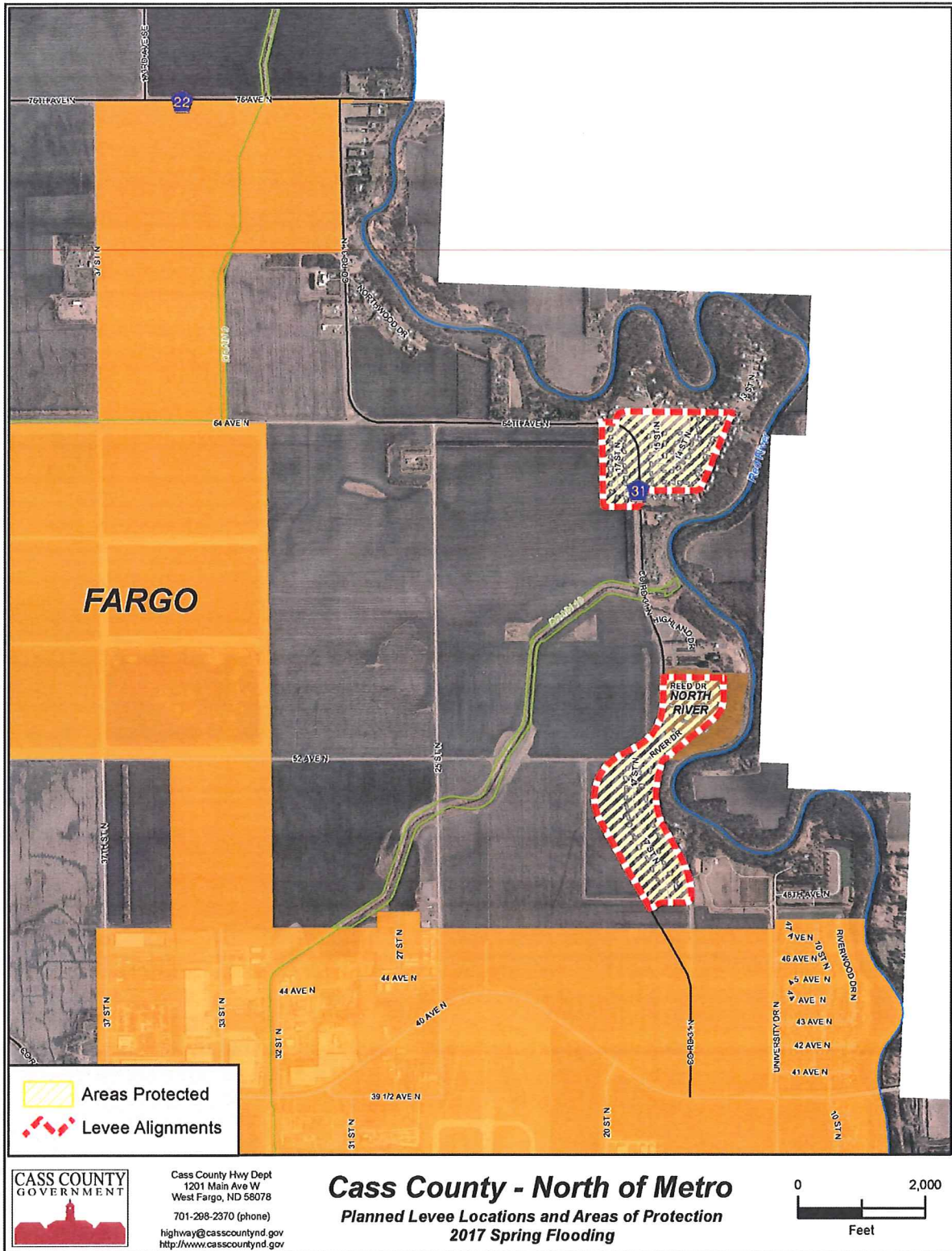
The net effect of this form of protection is that some homes may be protected, while others may not. County staff directed by the County Engineer will prioritize those who are on the outside of these levees for sandbag distribution to ensure an opportunity for protection. As needed and upon request, the Army Corps of Engineers will assist in construction of earthen levees. As in previous flood events; levee construction will occur where necessary on public roads and on land purchased by Cass County for flood protection. In addition to clay levees placed on public land, Cass County engineering staff secures Right of Entry permits (ROE) to gain access to private lands in order to construct levees in those areas. If necessary, secondary alignments are considered if ROE's are not secured from land owners at the time of construction. Additionally, borrow sites for clay are negotiated with land owners.

Residences that are not protected by earthen levees and are adjacent to a river will receive priority in sandbag distribution to aid in the protection of their property. Residents who are protected from flood waters by earthen levees are encouraged to aid in securing their neighbors property.

County staff will locate contractors, equipment, and material essential in the flood efforts as needed. Contracted labor includes surveying crews, crews to monitor water pumps, heavy equipment operators, and additional support staff. Contracted equipment and materials include sandbags, water pumps, and heavy equipment.

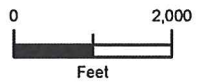
The following two maps depict planned alignments for levees to be constructed for the 2017 Spring Flooding Event. The alignments include levee portions that are in place and levees to be constructed. Generally, the levees are constructed to account for the anticipated crest with at least two feet of freeboard. Map 2 shows planned levees on the north side of the Metropolitan Area, Map 3 shows planned levees on the south side of the Metropolitan Area.

Map 2: Cass County Levees North of Metropolitan Area

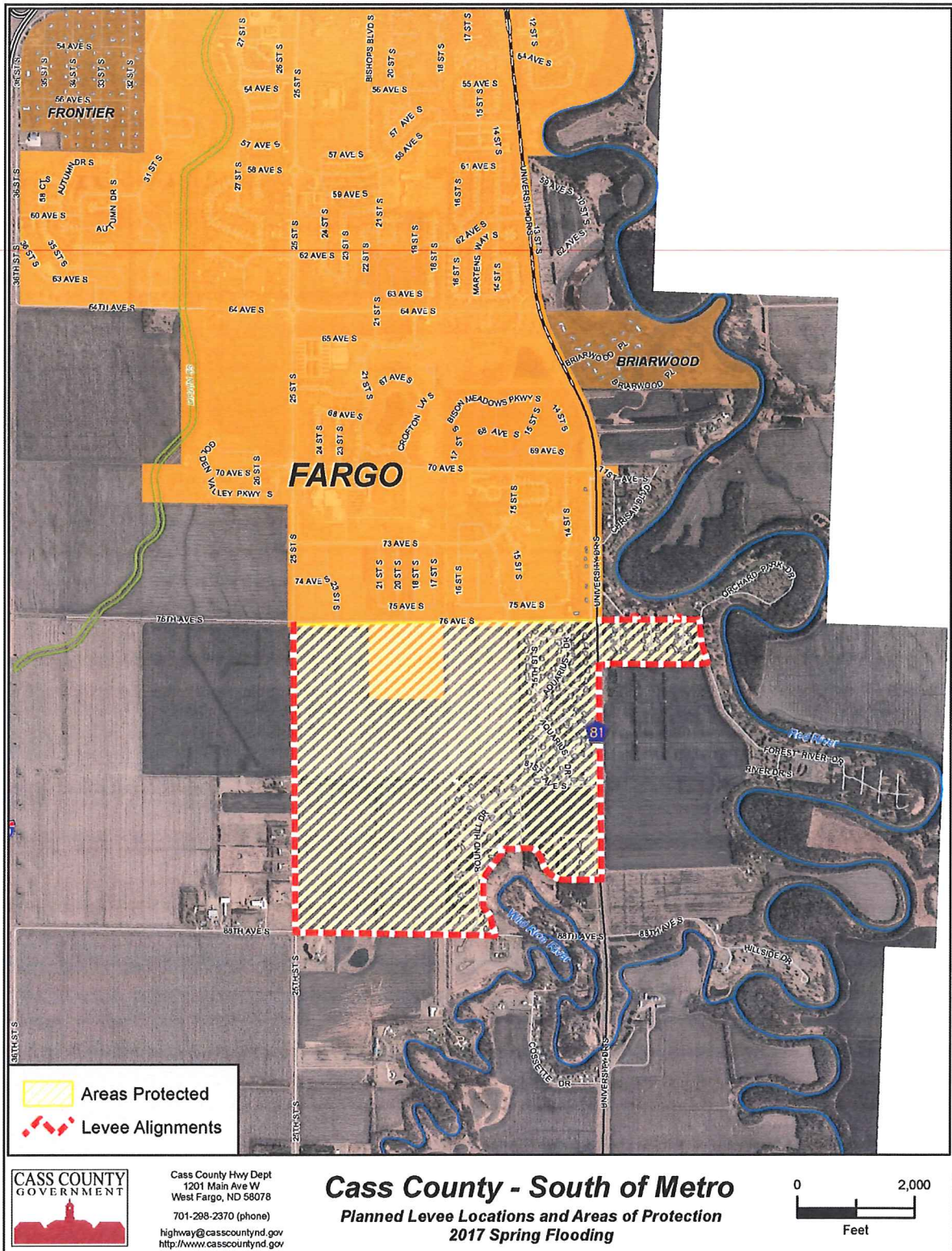


Cass County Hwy Dept
 1201 Main Ave W
 West Fargo, ND 58078
 701-238-2370 (phone)
highway@casscountynd.gov
<http://www.casscountynd.gov>

Cass County - North of Metro
 Planned Levee Locations and Areas of Protection
 2017 Spring Flooding

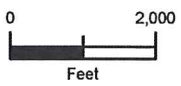


Map 3. Cass County Levees South of Metropolitan Area



Cass County Hwy Dept
1201 Main Ave W
West Fargo, ND 58078
701-298-2370 (phone)
highway@casscountync.gov
http://www.casscountync.gov

Cass County - South of Metro
Planned Levee Locations and Areas of Protection
2017 Spring Flooding



Road Closures

Roads are generally closed during times of high water; however, Cass County understands the need for emergency personnel to reach their destination. Cass County staff will place barricades and warning signs at locations on roads that have water on them, and advise Sheriff or National Guard personnel to monitor these roads. On gravel roads that potentially have washout conditions County staff will completely close the road to prevent serious injury or fatality. It should be noted that Cass County strongly advises no travel on roads with water and supports the motto "when in doubt: turn around, don't drown". Road closure maps are updated continuously during times of flooding and a notification system is used to notify persons who have selected to be informed when any changes to the map occur. Road closures are submitted by the County Highway Superintendent in coordination with the County Engineer and Sheriff. The procedural guidelines for road closures and signing are as follows:

Emergency Road Closure and Signing Procedures

Roadway Closure

A minimum of two Type III Barricades shall be installed at each side of a hazard. At least one barricade on each side shall have a Road Closed sign attached. Additional barricades should be installed if deemed necessary by the operator to adequately close the road.

Advanced warning shall be placed at the nearest intersection each way from the closure, and shall consist of Road Closed Ahead signs or Type III Barricades with Road Closed signs attached. Sound judgment and site conditions shall dictate the type and placement of all signs.

Water over Road or Other Conditions not Requiring Closure

If conditions indicate that traffic can safely pass through the area, a combination of warning signs shall be installed to alert the public and guide them through the segment of road. Signs used shall include, but are not limited to Barricades, Water Over Road, Cones, Tubular Markers, and Reduced Speed Limits. If an unsafe condition becomes apparent that cannot be repaired or marked to alert traffic, the roadway shall be closed to traffic. Sound judgment and site conditions shall dictate the type and placement of all signs.

As soon as practical after a closure or install of signs, the appropriate Field Log shall be completed and sent to the TOC (abbreviation stands for or is it EOC) to update internet maps. This step can be accomplished by the Sign Foreman, shift supervisor, or the person installing the signs.

To track locations of signs, the Barricade and Sign Location Log shall be completed and turned in to the designated supervisor at the end of each shift.

HIGHWAY CLOSED TO TRAFFIC



HWY. NO.	INSTALLED DATE/ TIME	BEGINNING LOCATION (911 STREET OR AVENUE)	ENDING LOCATION (911 STREET OR AVENUE)	OPENED DATE/ TIME

Turn in to TOC immediately after closure and when road is re-opened

WATER OVER HIGHWAY CAUTION ADVISED



HWY. NO.	INSTALLED DATE/ TIME	BEGINNING LOCATION (911 STREET OR AVENUE)	ENDING LOCATION (911 STREET OR AVENUE)	OPENED DATE/ TIME

Turn in to TOC immediately after installation and when road is re-opened

Flood Impacts and Action

Red River of the North - Fargo Gauge Station

28' - County Highway 18 and Red River Bridge south of Oxbow closes (Hickson Gauge)

32' - Various culvert screw gates must be closed both along C81 and 88th Ave south of Fargo and along C31 near Stockman's Subdivision

34' - Subdivision roads along Red River in Stanley and Pleasant Townships become flooded. Homes not elevated become in danger of flooding.

34.5' - Cass County Highway 81 S begins to top at points south from 88th Ave S to Oxbow. Cass County Highway 16 East and Red River bridge close. Cass County Highway 16 West closes from I-29 East to Cass County Highway 81 S. Cass County Highway 14 closes from I-29 to Cass County Highway 81 S. Cass County Hwy 31 N closes from Cass County Highway 22 north to Cass County Highway 2. Cass County Highways 4 and 34 close between Cass County Highways 81 N and 31 N.

35' - All culverts in South Metro need to be monitored and closed as needed - Culverts along Roadway Levees will be ring diked in as constructed - "Sluice gates closed as needed"

36' - Cass County Highway 31 closes south of Highland Park Subdivision at Drain 10

36' - Water will over top roadways at Chrisan Blvd., Chrisan Way and Forest River Road at 36', monitor and close gates along Chrisan Blvd.

38' - Dike must be in place on west side of C31 north of 52nd Ave N or water will cross into North River. Cass County Highway 22 closes from Harwood to Cass County Highway 31 N. Highland Park and adjacent residents are isolated.

42.5' - Stockman's Subdivision is protected to 42.5'

39.5' - Water on Bridge Deck, 81 S over Wild Rice River.

42.5' - City of North River is protected to 42.5'

40' - Levees need to be constructed prior to 40' or water will overtop 88th Ave. between Round Hill and 25th Street at 40'

40' - Levees need to be constructed prior to 40' on University Drive S. between Chrisan Blvd. and Chrisan Way and from Maple Prairie South 4,420' to a Levee located on the West side of Cass 81

Sheyenne River – Harwood Gauge Station

890' - Water on the shoulder of Cass County Highway 17 N near Cass County Highway 20 intersection. Water tops Cass County Highway 20 on the curve ½ half mile west of Cass County Highway 17. Bridge to the east of Lake Shure is overtopped

891' - Water tops Cass County Highway 17 N from Cass County Highway 20 and south for 800' and on Cass County Highway 20 west of Cass County Highway 17 N for 400'. Cass County Highway 22 closes from Cass County Highway 17 N west to Cass County Highway 13. Water tops 19th Ave N just west of Cass County Highway 17 N.

892' - All properties under 892' elevation in vicinity of Sheyenne between Diversion inlet and Red River at risk of flooding.

Township Inventory Sheets

Stanley

City of Briarwood
Granberg's/Amber Plains Neighborhood
Chrisan North Neighborhoods
Chrisan South Neighborhoods
Chrisan/Maple Prairie Neighborhoods
Orchard Park/Forest River Rd Neighborhoods
Round Hill Neighborhood
South of Round Hill Neighborhood
88th/University Neighborhood
88th/25th Neighborhood
Ulphie/Cossette Drive Neighborhood
Wild Rice
Wild Rice River Estates Neighborhood
Kensington Place Neighborhood
124th/University
124th/Wild Rice River
North St. Benedict
South St. Benedict
C-14 Homes (1,2,3)
C-16 Homes (1,2,3)

Reed

Northwood Neighborhood
Highland Park Neighborhood
Stockmans Neighborhood
City of North River: (2009) Worked with mayor and Houston Engineering to identify low areas and develop a sandbagging plan
C31/C22 Neighborhood
Lake Shure Estates
South of Lake Shure Neighborhood
Reile's Acres
45th St N/C20 Neighborhood
C17 N/Sheyenne River Neighborhood
C17 N/ 52nd Ave N Neighborhood
High-Dry Acres: (2009) Assisted 6714 53rd Ave and 6811 52nd Ave with sand bagging and questions
North of C20/West of C17N Neighborhood
Selberg Neighborhood: (2009) Worked with residents to reinforce the existing dike and plug a culvert with a broken flap gate, they have since rebuilt the dike and fixed the flap gate
Sunrise Acres/Woodland Neighborhoods

Harwood

Brooktree Neighborhood
Seibel Neighborhood
City of Argusville

Appendix 1: Township Inventory Sheets

City of Harwood
Scattered farmsteads/residences

Raymond
Village of Prosper
56th Ave N residences
Residences along Cass Hwy 10: (2011) Several homes on Cass Hwy 10 just west of West Fargo enhanced their ring dikes
Scattered farmsteads/residences

Pleasant
Robin's Nest Neighborhood
Butch R Block Neighborhood
River Shore Neighborhood
Bakke Neighborhood
Campbell Estates
Hickson
City of Oxbow

Normanna
Braaten Neighborhood and adjacent commercial
Woodlawn Neighborhood
Evergreen Neighborhood
Scattered farmsteads/residences
City of Kindred

Mapleton
Willow Creek Neighborhood
City of Mapleton
Scattered farmsteads/residences

Wiser
Scattered farmsteads/residences

Noble
Scattered farmsteads/residences

Kinyon
City of Grandin
Scattered farmsteads/residences

Gardner
City of Gardner
Scattered farmsteads/residences

Berlin
Scattered farmsteads/residences

Appendix 1: Township Inventory Sheets

Warren

Scattered farmsteads/residences

Davenport

City of Davenport

Scattered farmsteads/residences

Addison

Scattered farmsteads/residences

Durbin

Village of Durbin

Scattered farmsteads/residences

Harmony

Scattered farmsteads/residences

Rush River

Scattered farmsteads/residences

Gunkel

Scattered farmsteads/residences

Bell

Scattered farmsteads/residences

Hunter

City of Hunter

Scattered farmsteads/residences

Arthur

City of Arthur

Scattered farmsteads/residences

Amenia

City of Amenia

Scattered farmsteads/residences

Casselton

City of Casselton

Ethanol Plant

Scattered farmsteads/residences

Everest

City of Casselton

Scattered farmsteads/residences

Maple River

Appendix 1: Township Inventory Sheets

Village of Lynchburg
Scattered farmsteads/residences

Leonard
City of Leonard
Scattered farmsteads/residences

Watson
Scattered farmsteads/residences

Walburg
Village of Chafee
Scattered farmsteads/residences

Gill
Scattered farmsteads/residences

Wheatland
Village of Wheatland
Scattered farmsteads/residences

Empire
Village of Absaraka
Scattered farmsteads/residences

Erie
Village of Erie
Erie Dam
Scattered farmsteads/residences

Dows
Scattered farmsteads/residences

Page
City of Page
Scattered farmsteads/residences

Rich
Scattered farmsteads/residences

Ayr
City of Ayr
Scattered farmsteads/residences

Buffalo
City of Buffalo
Scattered farmsteads/residences

Appendix 1: Township Inventory Sheets

Howes

Scattered farmsteads/residences

Eldred

Village of Embden

City of Alice

Scattered farmsteads/residences

Highland

Maple River Dam

Scattered farmsteads/residences

Pontiac

City of Enderlin

Scattered farmsteads/residences

Clifton

Scattered farmsteads/residences

Hill

Scattered farmsteads/residences

Tower

City of Tower

Scattered farmsteads/residences

Cornell

Scattered farmsteads/residences

Lake

Scattered farmsteads/residences

Rochester

Scattered farmsteads/residences

Cass County Emergency Flood Protection Plan
Chrisan, Maple Prairie/Forest River, Cass Hwy 81, Roundhill, 25th St, & 88th Ave S

CHRISAN

- 1) Chrisan Blvd.
 - a) Culverts – close culverts under Chrisan Blvd before **36'**.
 - b) Road elevation – the centerline low point of this road is at 907.9 or approximately **38'**.
- 2) Chrisan way
 - a) Culverts – construct a ring dike on the east end of the culvert under Chrisan way just north of 76th Ave S before **35'**.
 - b) Road elevation – the centerline low point of this road is at 908.3 or approximately **38'**.

Maple Prairie/Forest River

- 1) 76th Ave S – East Of Cass Hwy 81
 - a) Culverts – there are two centerline culverts under 76th Ave S the first is located approximately 100 ft east of the intersection of Chrisan way and 76th Ave S, this culvert will need a ringdike on the north side and closed before **35'**. The second culvert is located 75 ft before the entrance of the last cul de sac, this culvert will need a ringdike on the north side and closed before 35'. Place a pump on each ringdike, pull water through the culverts to keep the internal water low in maple prairie. The west culvert also drains the internal water west of Cass Hwy 81 in the Grandbergs Subdivision.
 - b) Road elevation – the centerline low point of this road is at 908.7 or approximately **39'**.
- 2) Forest River Dr – From 76th Ave S – Approximately 800 Ft
 - a) Culverts – leave all centerline culverts open under Forest River Drive.
 - b) Road elevation – the centerline low point of this road is at 908.3 or approximately **37.5'**.

Cass Hwy 81

- 1) 64th Ave S To Chrisan Blvd.
 - a) Culverts – close the two 36 in centerline culverts under Cass Hwy 81 before **35'**. These culverts are located approximately 2,100 ft south of the intersection of Cass Hwy 81 and 64th Ave south.
 - b) Road elevation – the centerline low point of this road is at 909.3 or approximately **39'**.
- 2) Chrisan Blvd. To Chrisan Way
 - a) Culverts – there is one centerline culvert under Cass Hwy 81, close this culvert with a ring dike on the west side of Cass Hwy 81 before **34'**. There is double hinge flapgate on the east end of the culvert, but there is also a beehive inlet located between Cass Hwy 81 and the bikeway, so once the red river gets to **37'** the bikeway goes under and water enters the beehive.
 - b) Road elevation – the centerline low point of this road is at 909.6 or approximately **39.5'**.
- 3) 76th Ave S To Libra Lane
 - a) Culverts – there is a centerline culvert under Cass Hwy 81 just south of 76th Ave south. This culvert has a double hinge flapgate on the east side. Do nothing to this culvert it drains the water from the west side of Cass Hwy 81 from the Grandberg Subdivision.
 - b) Road Elevation – the centerline low point of this road is at 911.2 or approximately **40.5'**.

4) Libria Lane To 1,600 Ft South

- a) Culverts – close the screwgate on the culvert located in the west ditch of Cass Hwy 81 before **34'**. This culvert is located 1,600 ft south of the intersection of Cass Hwy 81 and Libria Lane.
- b) Road elevation – the centerline low point of this road is at 911.7 or approximately **41'**.

Levee Between Cass Hwy 81 And Round Hill Subdivision

- 1) There is a culvert under the levee located in the SW corner of the property currently owned by Rob Sonders. This culvert is located approximately 600 Ft West of Cass Hwy 81. Close the screw gate located on the south side Before **35'**. The next culvert that will need to be closed is located in the NE corner of the property currently owned by Jeff Haug. Close the screw gate located on the south side before **36'**.
- 2) Levee Elevation – the centerline low point of this levee is at 912.2 or approximately **44'**.

Roundhill

1) Riverview Road

- a) Culverts – there are two culverts located in the SE corner of the Roundhill Subdivision. The first is located 150' north of the SE corner of Riverview Road. There is a screw gate on the south end of the culvert that needs to be closed before **35'**. The second is a north-south culvert located in the SE corner of Riverview Road. This culvert is needs to be closed before **35'**.
- b) Road elevation – the centerline low point of this road is at 910.3 or approximately **39'**.

2) Roundhill Drive

- a) Culverts – there is a culvert located on Roundhill Drive just south of Riverview Road. This culvert is an east-west culvert with the screw gate located on the east side. This culvert is needs to be closed before **35'**.
- b) Road elevation – the centerline low point of this road is at 911.0 or approximately **39'**.

25th St S

1) 76th Ave To 88th Ave S

- a) Culverts – there is a culvert located just south of 76th Ave under 25th St. This culvert needs to be ringdiked on the west end so water can be pumped to the west of the ring dike and allowed to flow west into Drain 53. This culvert is an east-west culvert with the gate located on the west end. This culvert is needs to be closed before **35'**. The next culvert under 25th St is located 1,850 ft north of 88th Ave s. This culvert is an east-west culvert that has a screwgate on the east side. This culvert is needs to be closed before **35'**.
- b) Road Elevation – the centerline low point of this road is at 910.2 or approximately **42'**.

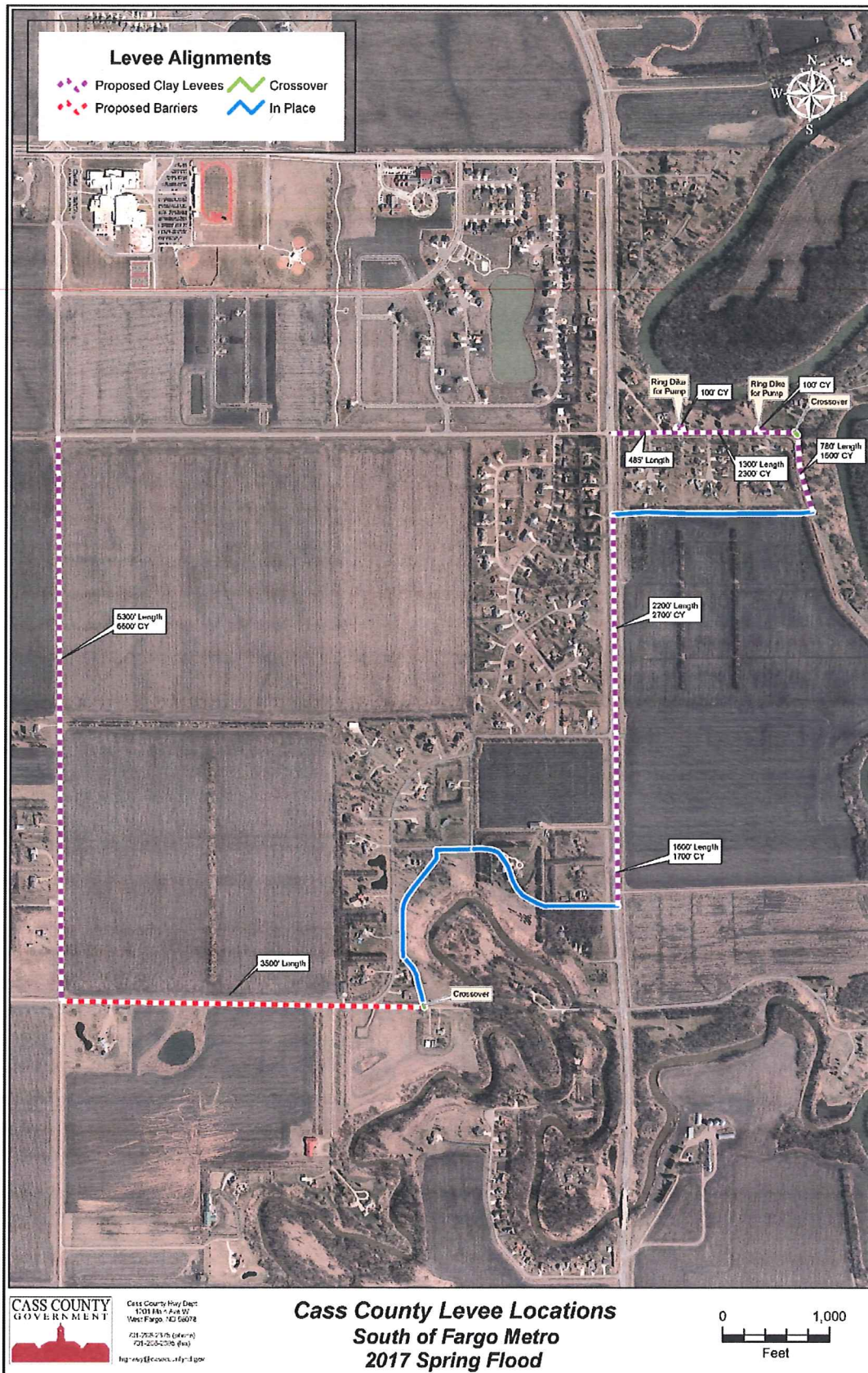
2) 88th Ave S To Wildrice River

- a) Culverts – there is a culvert located under 25th St just south of 88th Ave. This culvert is an east-west culvert with no gates on either end. This culvert is needs to be ring diked on the SW & SE corners of the intersection before **35'**.
- b) Road elevation – the centerline low point of this road is at 910.9 or approximately **40'**.

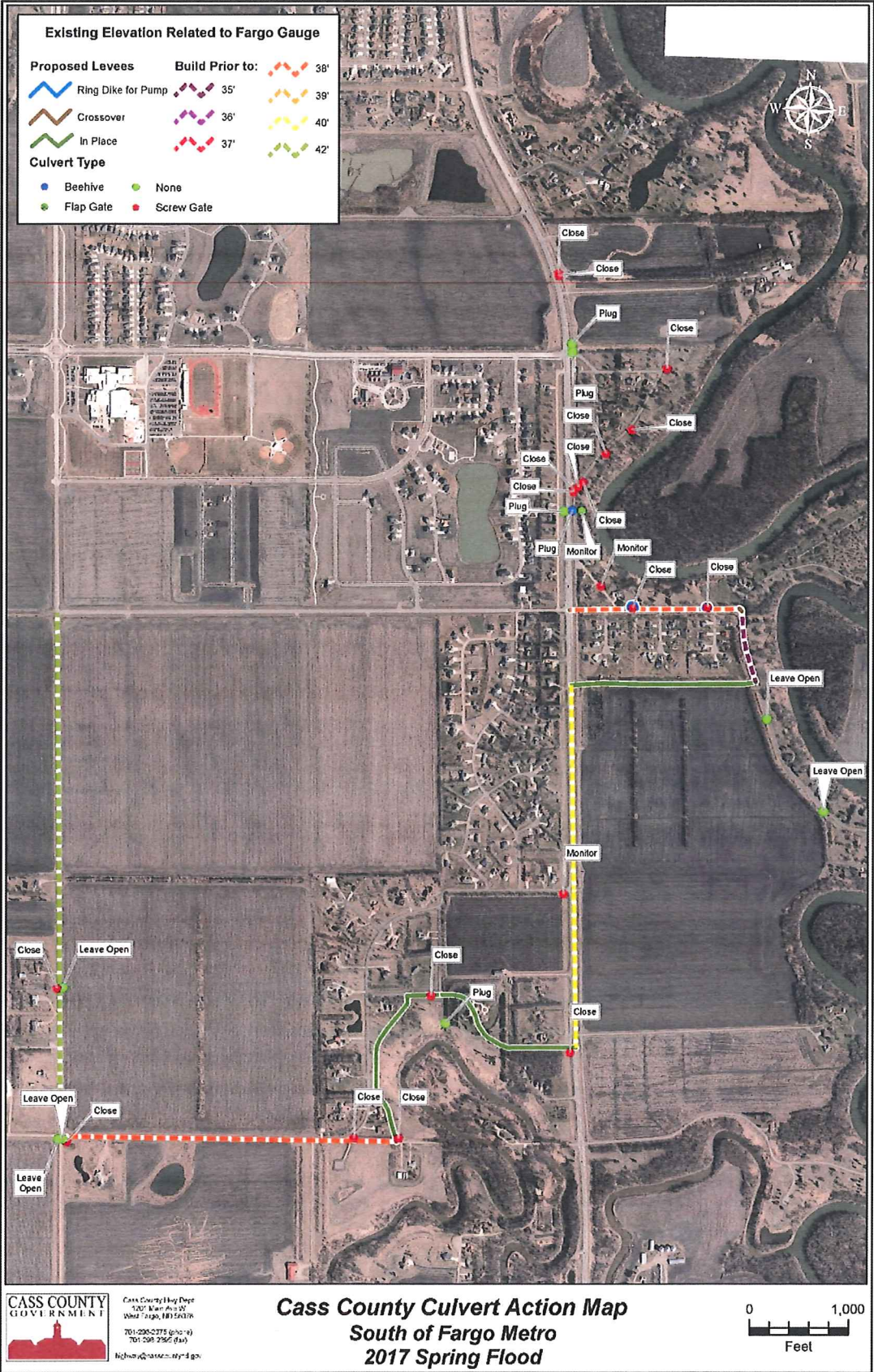
88th Ave S

1) 25th St To Roundhill Drive

- a) Culverts – there is a culvert located just east of the curve of Round Hill Drive and 88th Ave s. (400 ft east on 88th Ave S starting from where the pavement starts on Round Hill Drive). This is located in the north ditch of 88th Ave S. and has a screwgate on the east end. This culvert is needs to be closed before **35'**.
 - b) Road elevation – the centerline low point of this road is at 910.4 or approximately **39'**.
-



Appendix 2: Levee Plan South of Fargo (Chrisan/76th Ave/Cass Hwy 81/Round Hill/88th Ave)



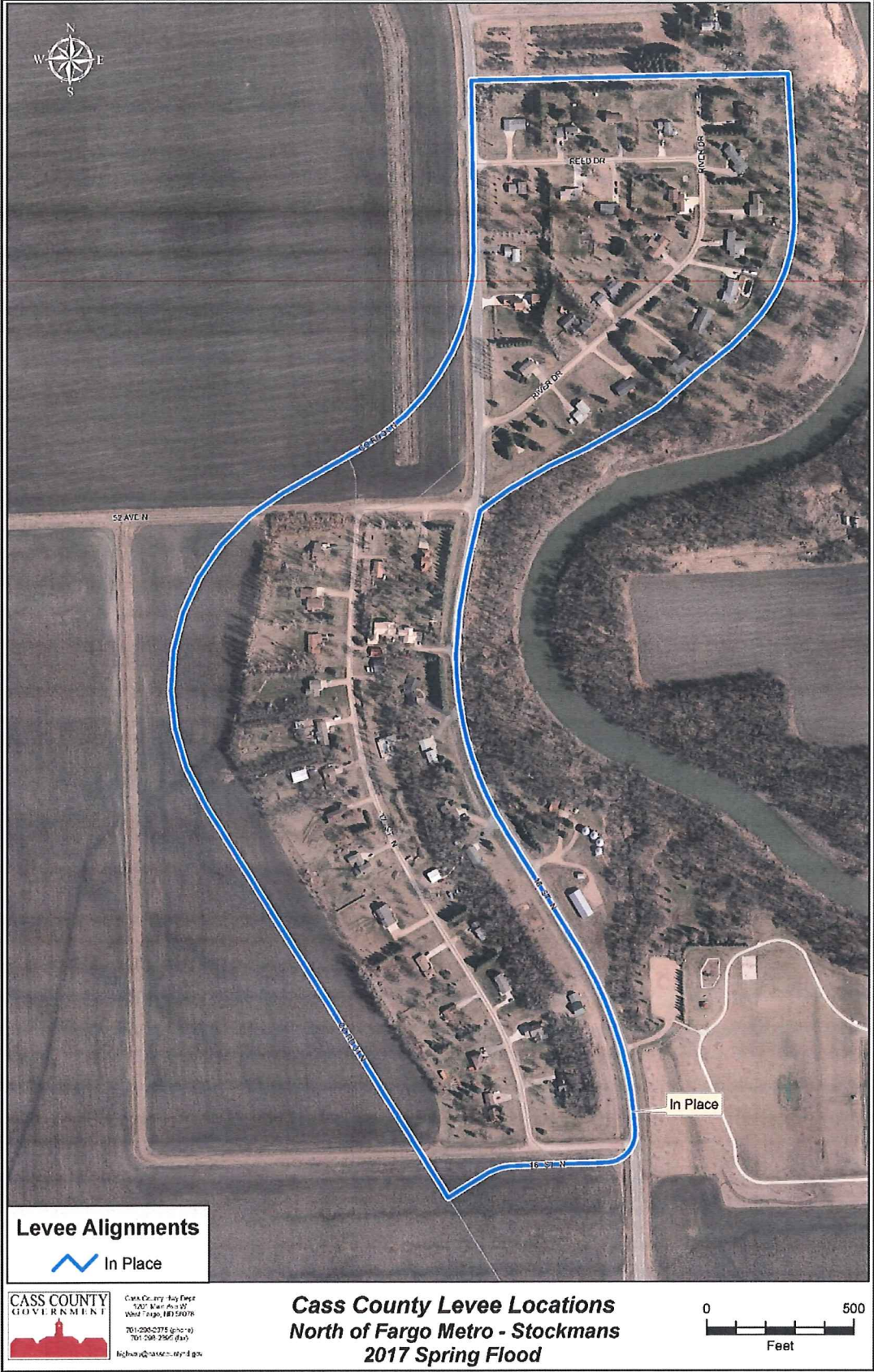
Cass County Emergency Flood Protection Plan Stockman's Addition Subdivision

1. Overview: The Cass County Highway Department in conjunction with the residents of Stockman's Addition have worked cooperatively to develop an integrated flood protection plan that is responsive to the overall needs of the Stockman's Addition Subdivision during major flood events.
2. Flood Conditions and Impacts: Recent spring floods have had numerous effects on the flood potential, access, and safety of the residents of Stockman's Addition. After reviewing the 2009 flood data there have been several critical events that have been identified based on the Fargo Flood Gage elevation. When utilizing actual ground elevations based on the 1988 datum it has been found that a one foot rise on the Fargo Flood Gage (i.e. from 39' to 40') will have an approximate water elevation increase of 0.5' or 6 inches in Stockman's Addition. Listed below are the critical elevations and events:
 - a. 32.0': Centerline 24" culvert with screw gate on C31 just south of 52nd Ave N needs to be closed on the east side (east invert 885.56').
 - b. 33.0': Centerline 30" culvert with screw gate on C31 just north of the 17th St entrance to Stockman's Addition needs to be closed on the east side.
 - c. 32.0': 36" culvert with screw gate on 17th St N just west of C31 needs to be closed on the south side.
 - d. 33.0': 24" culvert with screw gate on 52nd Ave N just west of C31 needs to be closed on the north side.
 - e. 36.5': Cass County Highway 31 closes north of Stockman's Addition Subdivision at Drain 10.
 - f. 39.0': At the intersection of C31 and 52nd Ave N water will begin to flow over 52nd Ave N from the north side and over C31 from the east side.
 - g. 40.0': Water will flow from the south over 17th St from the intersection with C31 to a point 370 feet west.
 - h. 41.0': Water will flow from the north over 52nd Ave N for the first 400 feet west of C31 and flow from the east over C31 from the intersection with 52nd Ave south for 350 feet. In addition, water flows east to west over C31 approximately 500' south of the C31/17th St intersection.
 - i. 43.0': Water overtops the most of length of C31 from 17th St north to 52nd Ave N.
 - j. 44.0': Water overtops the west and north sections of the Stockman's ring levee
 - k. 44.0': Water overtops the south section of the Stockman's ring levee
3. Concept of Implementation: As the flood predictions increase there are several critical factors that impact the timing of when to build the clay levees and to what elevation. The first is at 39.0' when the intersection of C31 and 52nd Ave N is overtopped. The second is at 40.0' when a portion of C31 and 52nd Ave are overtopped. Then at 43.0' when the whole length of C31 is overtopped. Finally, at 44.0' when the north and west sections of the levee overtop and the south side of the levee is overtopped. These factors will serve as triggers for implementing flood protection. The flood protection will be constructed in four phases based on the predicted flood elevations:
 - a. Phase I:

- 1) Conditions: When flood predictions indicate a flood crest up to 39.0'.
 - 2) Flood Protection Measure: Build a temporary sandbag levee on the west side of the intersection of C31 and 52nd Ave N to protect flood waters from overtopping 52nd Ave from the north. This is a very short levee and should only require about 700 sandbags and one load of sand. In addition, a temporary sandbag levee will be built on the south side of 17th St from C31 running west for 375'. This sandbag levee will require approximately 4000 sandbags and four loads of sand be constructed to a minimum height of one and a half feet.
 - 3) Construction Trigger: Construction of these sandbag levees should begin when the water levels reach 30.0' and the flood predictions indicate a flood crest between 37.0' and 39.0'.
- b. Phase II:
- 1) Conditions: When flood predictions indicate a flood crest between 39.0' and 41.0'.
 - 2) Flood Protection Measure: Build a temporary levee on the west side of the intersection of C31 and 52nd Ave N to protect flood waters from overtopping 52nd Ave from the north. In addition, a temporary levee will be built on the east side of C31 running from 52nd Ave to the south for 725'. The temporary levee will be constructed to a minimum height of three feet. Construction of the levee will be on the river side of the road to allow one way traffic flow.
 - 3) Construction Trigger: Construction of this clay levee should begin when the water levels reach 30.0' and the flood predictions indicate a flood crest between 38.0' and 41.0'.
- c. Phase III:
- 1) Conditions: When flood predictions indicate a flood crest above 43.0'.
 - 2) Flood Protection Measure: A temporary levee shall be constructed along the length of C31. This levee shall be constructed to a minimum height of two feet, width of 10 feet, and a length of approximately 1900'. The temporary levee will be constructed to a height of one foot above the expected crest (2.0' City of Fargo Gage Feet). Construction of the levee will be on the river side of the road to allow one way traffic flow.
 - 3) Construction Trigger: Construction of this clay levee should begin when the water levels reach 35' and the flood predictions indicate a flood crest above 41.0'.
 - 4) Construction Trigger: Construction of this clay levee should begin when the water levels reach 34' and the flood predictions indicate a flood crest above 42.0'.
- d. Phase IV:
- 1) Conditions: When flood predictions indicate a flood crest over 43.0'.
 - 2) Flood Protection Measure: A temporary clay levee shall be constructed along the length of the whole Stockman's Addition ring levee. This levee shall be constructed to a minimum height of two feet, width of 10 feet, and a length of approximately 5000'. The temporary levee will be constructed to a height of one foot above the expected crest (2.0' City of Fargo Gage Feet).

4. **Notice of Construction:** Attempts will be made to notify the residents of Stockman's Addition and the City of North River three days prior to construction of temporary clay levees. While a three day notice will be attempted construction may begin with no noticed based on conditions.
5. **Construction Agreements and Contracting:** Cass County will coordinate all construction bids and contracting for the construction of the temporary clay levee. These contracts may or may not involve contracting through the US Army Corps of Engineers.
6. **Levee Type:** Rapid Deployable Flood Barriers filled with gravel will be the first option for levees on 52nd Ave, Cass Hwy 31, and 17th St N. When this type of barrier is not available, we will use clay levees.
7. **Borrow Source for Clay:** The Airport Authority prefers to have the clay borrow to be removed from other sites. However, in an emergency, clay for the temporary levee may be borrowed from the Municipal Airport Authority land located west of Stockman's Addition. For the use of borrow Cass County shall coordinate and acquire signed agreements for its use. Cass County will then contract to have the borrow site stripped of black dirt and to have a temporary dike built around the perimeter of the borrow site prior to the river reaching a major flood stage of 30.0'. When flooding is no longer a threat to Stockman's Addition homes and infrastructure, the clay material shall be replaced and compacted to original density. Topsoil shall then be respread over the borrow site and restored to original condition.
8. **Traffic Control:**
 - a. **Signing:** "One Lane Road Ahead", "25 MPH", and "Reduce Speed Ahead" signs will direct traffic to flow around clay levees on C31 at the following locations:
 - 1) 500 ft north of 52nd Ave N
 - 2) 1000 ft south of 52nd Ave N
 - b. **Tubular Markers or Cones:** At least three tubular markers or cones will delineate the beginning and end of the temporary clay levee built on the road.
9. **Funding of Construction:** Funding for construction of temporary clay levees and traffic control measures will be provided by Cass County
10. **References:**
 - a. Flood predictions will be based off of the National Weather Service Flood Forecast.
 - b. Additional flood elevation data based on the Cass County Flood Stage and Sandbag Calculator found on the Cass County website at <http://gisweb.casscountynynd.gov/sandbag/sandbag.html>.

Appendix 3: Levee Plan for Stockman's Subdivision



Cass County Emergency Flood Protection Plan Highland Park Subdivision

1. Overview: The Cass County Highway Department in conjunction with the Highland Park Association (HPA) and Houston Engineering (HE) have worked cooperatively to develop an integrated flood protection plan that is responsive to the overall needs of the Highland Park Subdivision during major flood events.
2. Flood Conditions and Impacts: Recent spring floods have had numerous effects on the flood potential, access, and safety of the residents of Highland Park. After reviewing the 2009 and 2010 flood there have been several critical events that have been identified based on the Fargo Flood Gage elevation. When utilizing actual ground elevations based on the 1988 datum it has been found that a one foot rise on the Fargo Flood Gage (i.e. from 39' to 40') will have an approximate water elevation increase of 0.5' or 6 inches in Highland Park. Listed below are the critical elevations and events:
 - a. 36.5': Cass County Highway 31 closes south of Highland Park Subdivision at Drain 10.
 - b. 37.0' to 39.0': Cass County Highway 22 closes from Harwood to Cass County Highway 31. Highland Park and adjacent residents are isolated. This occurs as low as 37' or as high as 39'.
 - c. 38.5': Northwest corner of HPA ring road is overtopped (approximately 400' section).
 - d. 40.0': Several sections along the north side of the HPA ring road is overtopped (approximately 3 sections totaling 850').
 - e. 41.0': The whole north side and the north half of the east side of the HPA ring road is overtopped (total length of 2600').
 - f. 43.0': The whole HPA ring road is overtopped (approximate length of 4100').
 - g. 44.0': Portions of the earth levee is overtopped in West HPA on the west levee (one section totaling approximately 450') and the south levee (two sections totaling approximately 400').
3. Concept of Implementation: As the flood predictions increase there are two critical factors that impact the timing of when to build the clay levees and to what elevation. The first is at 38.5' when the northwest corner of the HPA ring road is overtopped. The second is at between 37.0' and 39.0' when Cass County Highway 22 closes from Harwood to Cass County Highway 31 and HPA is isolated. Due to safety factors it can be expected that local contractors will not drive over flooded roadways in order to construct flood protection measures. Therefore, all contracted flood protection (specifically clay levees) must be constructed prior to the flood elevation reaching 39.0'. These two factors will serve as triggers for implementing flood protection. The flood protection will be constructed in two phases based on the predicted flood elevations:
 - a. Phase I:
 - 1) Conditions: When flood predictions indicate a flood crest between 38.5' and 40.0'.
 - 2) Flood Protection Measure: Build a temporary sandbag levee along the northwest corner of HPA ring road (as indicated in the HPA Flood Mitigation plan sheet). This levee should be constructed to a height of one and a half feet and a length of

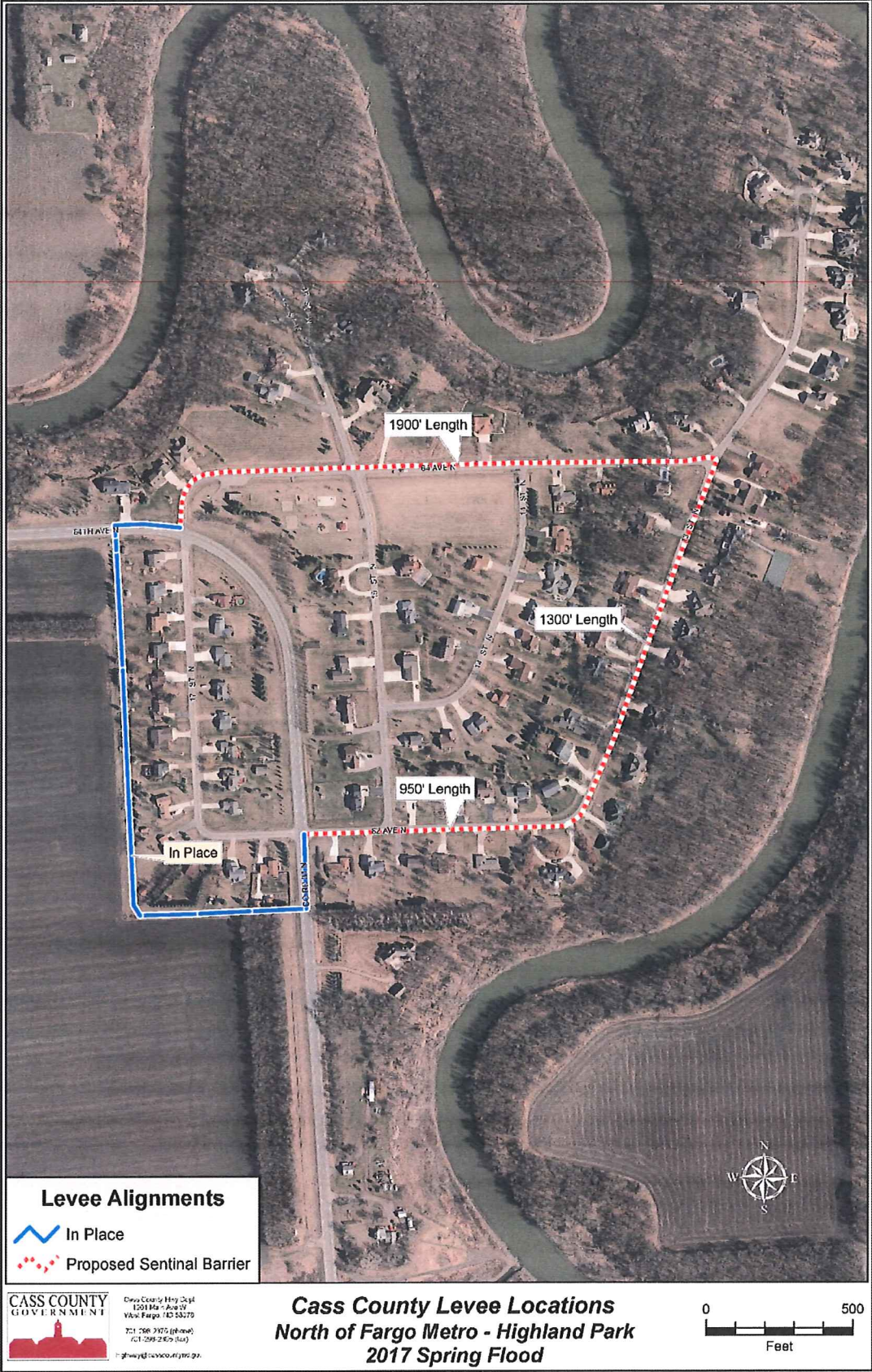
approximately 400'. The sandbag levee will be constructed by HPA residents with sandbags and sand provided by Cass County.

- 3) Construction Trigger: Construction of this sandbag levee should begin when the water levels reach 35' and the flood predictions indicate a flood crest between 37.5' and 40.0'.
- b. Phase II:
- 1) Conditions: When flood predictions indicate a flood crest above 40.0'.
 - 2) Flood Protection Measure: A temporary levee shall be constructed along the entire length of the ring road (as indicated in the HPA Flood Mitigation plan sheet). If clay is used, this levee shall be constructed to a minimum height of two feet, width of 10 feet, and a length of approximately 4100'. The temporary levee will be constructed to a height of one foot above the expected crest (2.0' City of Fargo Gage Feet). Construction of the levee will be on the river side of the road to allow one way traffic flow. Attempts will be made using crushed concrete to provide a vehicle crossing over the temporary levee for the north and north east branches of the development.
 - 3) Construction Trigger: Construction of this clay levee should begin when the water levels reach 35' and the flood predictions indicate a flood crest above 40.0'.
4. Levee Type: Rapid Deployable Flood Barriers filled with gravel will be the first option for levees. When this type of barrier is not available, we will use clay levees.
 5. Notice of Construction: Attempts will be made to notify the residents of Highland Park three days prior to construction of temporary clay levees. This notice will allow residents living on the river side of the loop road to acquired flood protection materials prior to being blocked by the levee. While a three day notice will be attempted construction may begin with no noticed based on conditions.
 6. Construction Agreements and Contracting: Cass County will coordinate all construction bids and contracting for the construction of the temporary clay levee. These contracts may or may not involve contracting through the US Army Corps of Engineers.
 7. Borrow Source for Clay: Clay for the temporary levee may be borrowed from the Municipal Airport Authority land. The Municipal Airport Authority prefers to use other borrow sources. The other optional borrow pit located west of HPA and south of Cass County Hwy 31. If this area is to be used for borrow Cass County shall coordinate and acquire signed agreements for its use. Cass County will then contract to have the borrow site stripped of black dirt and to have a temporary dike built around the perimeter of the borrow site prior to the river reaching a major flood stage of 30.0'. When flooding is no longer a threat to HPA homes and infrastructure, the clay material shall be replaced and compacted to original density. Topsoil shall then be respread over the borrow site and restored to original condition.
 8. Traffic Control:
 - a. Signing: "One Way" signs will direct traffic to flow around the ring road in a clockwise direction. A total of five "One Way" signs will be utilized with a sign posted at the following locations:
 - 1) Intersection of Cass Hwy 31 and 62nd Ave.

Appendix 4: Levee Plan for Highland Park Subdivision

- 2) Intersection of Cass Hwy 31 and 64th Ave.
 - 3) Intersection of Cass Hwy 13th St and 62nd Ave.
 - 4) Intersection of Cass Hwy 13th St and 64th Ave.
 - 5) Intersection of Cass Hwy 314th St and 64th Ave.
- b. Tubular Markers or Cones: At least three tubular markers or cones will delineate the beginning and end of the temporary clay levee built on the road.
 - c. Traffic will not be allowed to cross over the temporary levee at anytime.
9. Funding of Construction:
- a. Phase I: Sandbags and sand will be provided by Cass County.
 - b. Phase II: Funding for construction of temporary clay levees and traffic control measures will be provided by Cass County
10. References:
- a. Flood predictions will be based off of the National Weather Service Flood Forecast.
 - b. Highland Park elevations and survey data developed by Houston Engineering, Fargo, ND and found on the Highland Park Flood Mitigation plan sheet pg 1 of 1.
 - c. Additional flood elevation data based on the Cass County Flood Stage and Sandbag Calculator found on the Cass County website at <http://gisweb.casscountynynd.gov/sandbag/sandbag.html>.

Appendix 4: Levee Plan for Highland Park Subdivision



Sand and Sandbag Ordering Procedure

- 1.) Determine residence eligibility: Only residences in rural Cass County are eligible. See 'General Information' page for list of incorporated cities that are not eligible. Residents from these communities will need to contact their city for assistance. Look up residence on main 2011 Flood Intranet site in 'Address List' as well to verify eligibility.
- 2.) Complete sandbag/sand order form: Sandbag order form located on Intranet 2011 Flood Site. "Empty Sandbag Tracking".

Select "Add new item" at the bottom of list. Fill out information on form completely. Be sure to include detailed information about how to get to location etc. for sand delivery contractors. Save and print 2 copies of form. Authorized representative signature required. Verify that all information is correct. Give signed form to resident and direct them to drive up to door "2+4" and to give signed form to staff at that entrance for empty sandbags.

- 3.) Collect payment for sandbags: We accept cash or check payments only. No credit cards accepted. Complete receipt of payment and give resident the customer copy. Retain copy in receipt book for our records.
- 4.) Place sand order with contractor: When demand is low, hold orders until the top of the hour, group by location when possible, and fax forms to contractor(s). When demand increases or when time is a factor orders may be submitted as often as necessary.

Fax order to contractor through computer. Select order you wish to fax. Right click and select "Print". Choose FAX option under printers. Select "Print." Enter contractor fax number. Must dial 9 to fax out. Select "Next" through following options. Finally, select "Finish" to send fax.

- 5.) File order form: File copy of order form by last name in A-Z accordion folder once the order has been submitted to contractor.

General Sand and Sandbag Information:

1. Sandbag Costs and Sand Distribution:
 - a. Bags are \$.10/bag. This price includes sand and sand delivery.
 - b. Bags are still \$.10/bag even if resident does not want sand.
 - c. Bags sold in bundles of 1,000 only. Bundles will not be broken up for smaller quantities.
 - d. 10 cubic yards of sand/bundle of bags will be delivered (this will fill 1,000 bags)
 - e. If residents have bags from previous years they may order sand at no charge.
 - f. A new form is required for each order even if resident has previously ordered sand/bags.
2. For volunteer assistance residents may call the Cass County Flood Emergency Hotline 297-6000 for information.

Appendix 5: Sand and Sandbag Ordering Procedure

3. Do not contact sand contractors directly. Contact County Highway Department with any questions or issues you may have.
4. Utilize Flood Mapping Application if resident requires assistance in determining the number of sandbags needed to build sandbag dike. Application may be found on Cass County Flood Page: "Cass County GIS Flood Mapping Application"
5. Incorporated Cities: Residents from these communities should contact city offices for assistance.

Alice	Casselton	Harwood	Oxbow
Amenia	Davenport	Horace	Page
Argusville	Enderlin	Hunter	Prairie Rose
Arthur	Fargo	Kindred	Reiles Acres
Ayr	Frontier	Leonard	Tower City
Briarwood	Gardner	Mapleton	West Fargo
Buffalo	Grandin	North River	

North - Shane

Harwood Township

Brooktree
Siebel's
Raymond Township
56th Ave N Raymond Twp
North of C20 West of
Sheyenne River
South of C20 Along Railroad
and Sheyenne River

Reed Township

45th St N/C20
C17/52nd Ave N
C17/Sheyenne River
C31/C22
Highland Park
Lake Shure
Miller's/Quams
North of C20 West of C17
North River
Reile's Acres
Selberg's Northside
Selberg's Southside
Sheyenne Valley Farm
South of Lake Shure
Stockmans
Sunrise Acres/Woodland

South/Center - Brian

Stanley Township

88th/25th
88th/University
City of Briarwood
Chrisan North
Chrisan South
Chrisan/Maple Prairie
Forest River
Granberg's/Amber Plains
Heritage Hills
Orchard Park/Forest River
Round Hill
Selkirk Mobile Home Park
South of Round Hill
Ulphie
Wild Rice
Wild Rice River Estates
Mapleton Township
Willow Creek

South - Mike

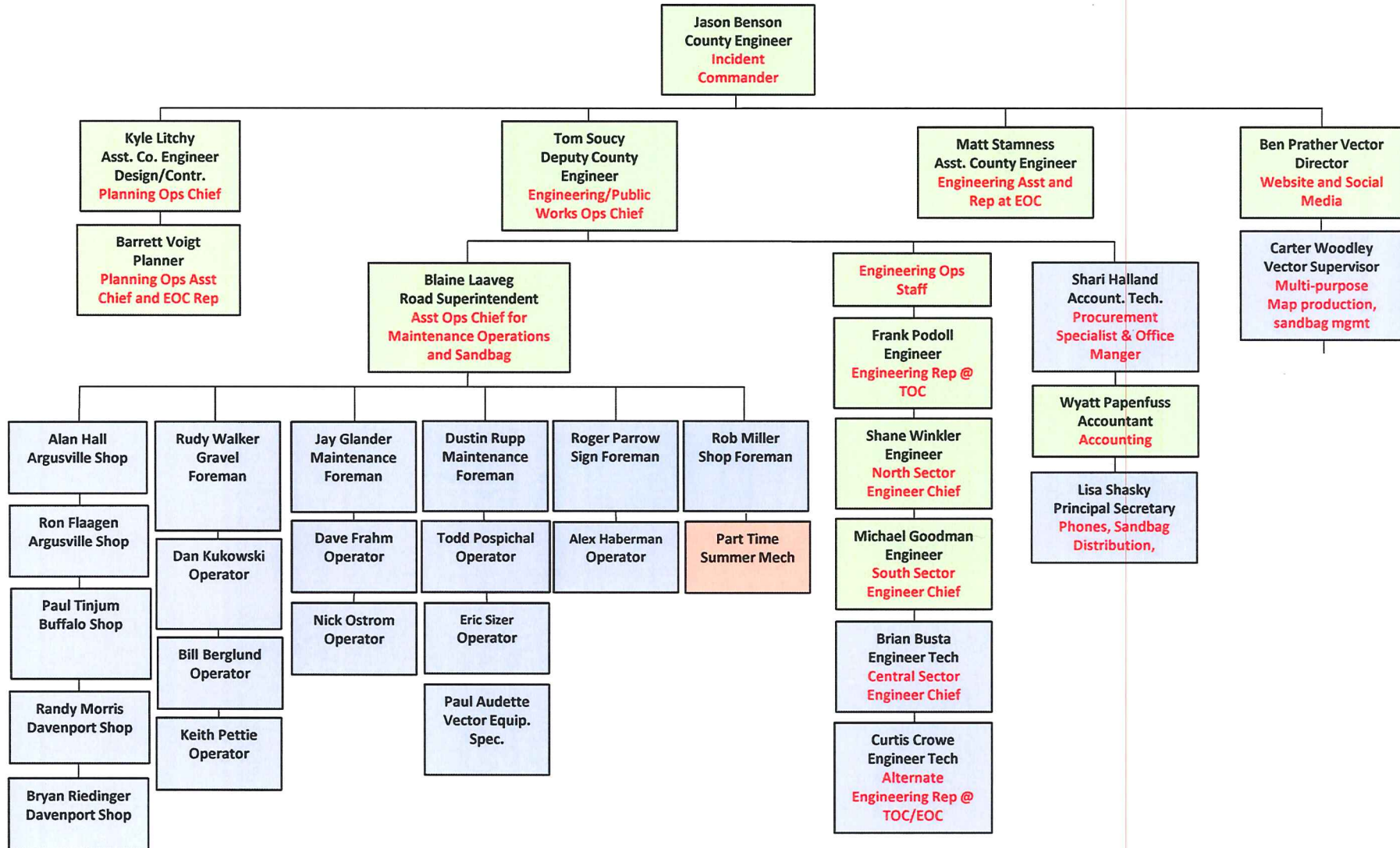
Stanley Township

124th/University
124th/Wild Rice River
C14-1
C14-2
C16-1
Country Acres
Kensington Place
North St. Benedict
South of 112th (Keller's)
South St. Benedict
Pleasant Township
Bakke
Butch R Block
C16-2
C16-3
Campbell
North Oxbow
River Shore
Robin's Nest
South of Oxbow
South Oxbow/Hickson
Normanna Township
Braaten
West of Woodlawn
Woodlawn

Appendix 7: Cass County Highway Department Organizational Chart for Major Flood Operations

Cass County Highway Department Special Organizational Chart for Flood Fight 2019

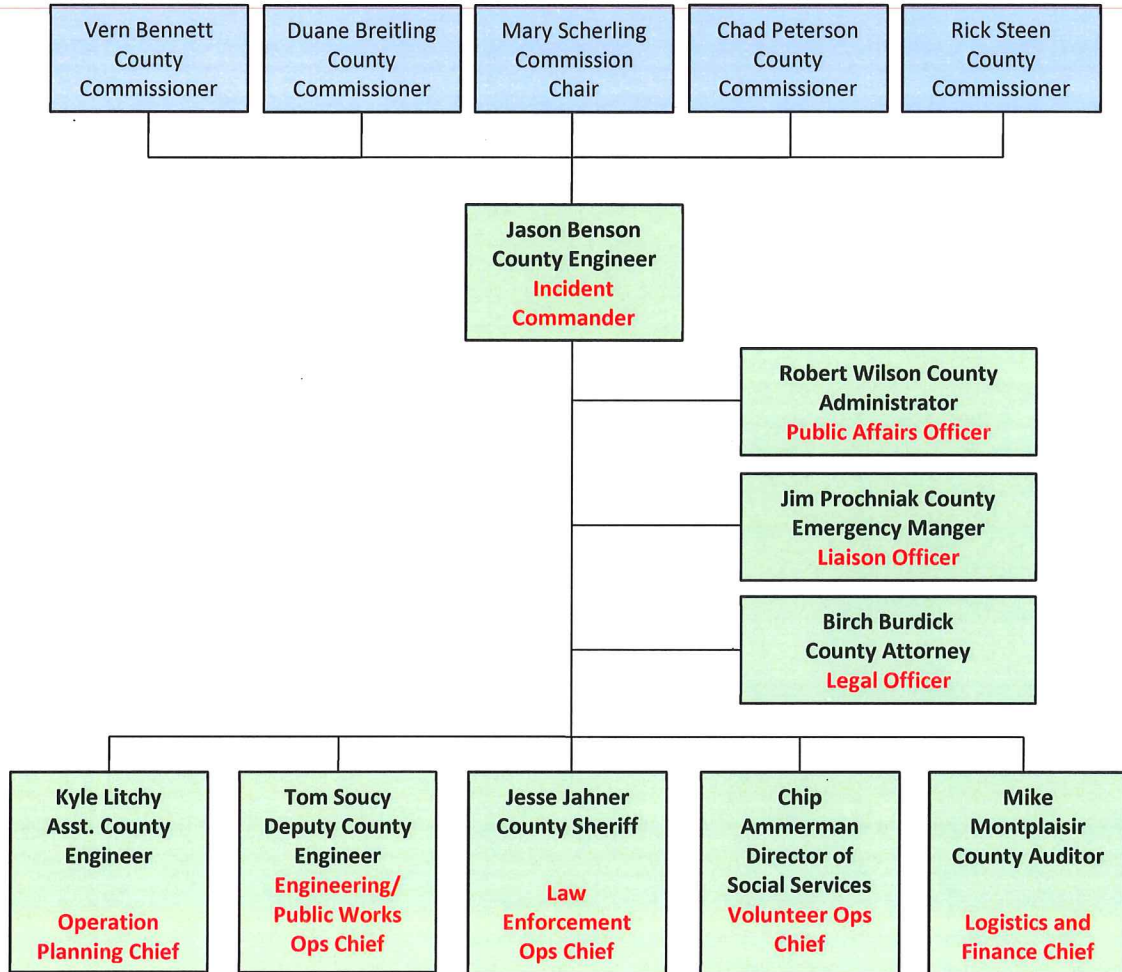
(as of 03-18-2019)



Appendix 1: Organizational Chart

Cass County Special Organizational Chart for Flood Fight 2019 (as of 03-18-2019)

Cass County Commission



Appendix 2: Communications Plan

To be developed