

# Emergency Flood Protection

November 24, 2020



**Mackenzie County**

# Overview

- ▶ Different Solutions for Flood Protection in 2021
  - ▶ Relocation
  - ▶ Demolition
  - ▶ Dry Flood Proofing
  - ▶ Floodwalls - Barriers
  - ▶ Elevation
- ▶ Floodwall - Barrier Options
  - ▶ Sand Bags
  - ▶ Bulk Bags
  - ▶ Trap Bags
  - ▶ Tiger Dam
  - ▶ Aqua-Barrier
  - ▶ Grain Bags



# Overview Continued

- ▶ Values at Risk
  - ▶ Airport
  - ▶ Water Treatment Plant
  - ▶ Old Bay House
  - ▶ Atlas Wells
  - ▶ Residential Properties
  - ▶ Business/Commercial Properties
  - ▶ Others...
- ▶ How to Move Forward...



# Relocation

1. Moving your home, business or structure out of the floodplain to higher ground where it is not at risk of flooding.
  - ▶ While this is the best long term solution, it does not provide immediate results for everyone for the 2021 spring flood risk.
2. Demolishing your home business or structure and building or purchasing another home or structure outside of the flood plain.



# Dry Flood Proofing

Sealing your structure to prevent floodwaters from entering. Some examples of dry flood proofing include the installation of watertight shields for windows and doors; use of sealants and membranes to reduce seepage of floodwaters through walls; reinforcement of walls to withstand the pressures from floodwaters.

- ▶ Cost effective
- ▶ Low resource demand once installed
- ▶ Not effective for all applications



# Floodwalls - Barriers

Building a wall around your structure to hold back floodwaters. This can consist of many options from Sand Bags to Water Filled Dam approaches.

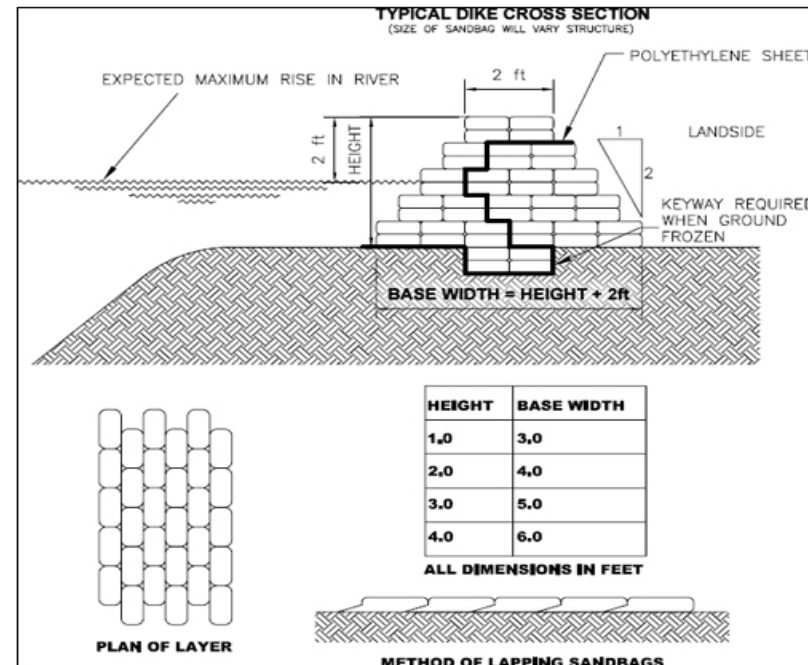
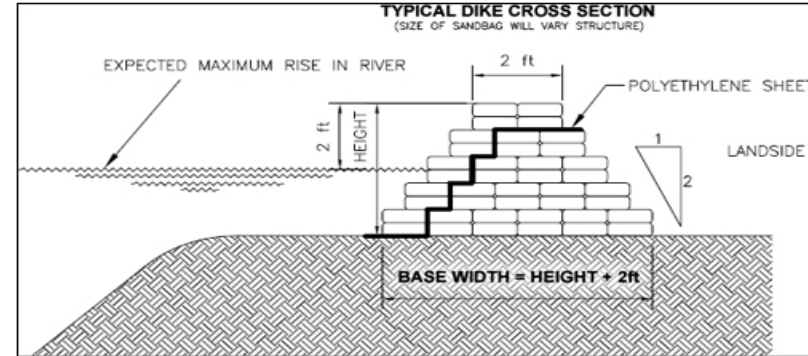


# Floodwalls - Barriers

## Sandbags

- ▶ Labour intensive
- ▶ A lot of room for error if not following directions
- ▶ Time consuming
- ▶ Heavy resource requirement
- ▶ Lower cost than most alternatives
- ▶ Requires monitoring throughout flood event

### Required Procedures for Sandbag Dike Construction



# Floodwalls - Barriers

## Water Filled Dams

### Tiger Dams

- ▶ Requires stacking and strapping
- ▶ Costly
- ▶ Reusable
- ▶ Proven



### Aqua Barrier

- ▶ Doesn't require stacking.
- ▶ Cost effective
- ▶ Proven
- ▶ Large water requirement
- ▶ Reusable





# Floodwalls - Barriers

## Sand Filled Barriers

- ▶ Trap Bags
  - ▶ Low man power requirement
  - ▶ Quick set up
  - ▶ Very feasible
  - ▶ Not reusable
- ▶ Bulk Bags
  - ▶ \$18.00 - \$25.00
  - ▶ Not rated for sand 4ft x 4ft Bag (Maximum weight 2000 lbs) Sand is 6464 lbs
  - ▶ Unproven
  - ▶ Less labour than conventional sand bags



### CIRCULAR FIBC

The circular design is ideal as a liner less option for fine materials. Circular construction eliminates side seams resulting in improved sift and moisture protection. The spread loop design allows for easy fork lift access.



### BAFFLED FIBC

Baffle Bags are constructed with corner baffles to maintain their rectangular or square shape once they are filled and during transportation, and in storage. The corner baffles are made to allow the material flow smoothly into all the corners, yet preventing the bag from expanding in the process.



### POTATO FIBC

Potato bags are produced from a unique ventilated woven fabric that provides optimum airflow through the bag, during storage. Black fabric is also available for maximum light protection.



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# Floodwalls - Barriers

## Grain Bags

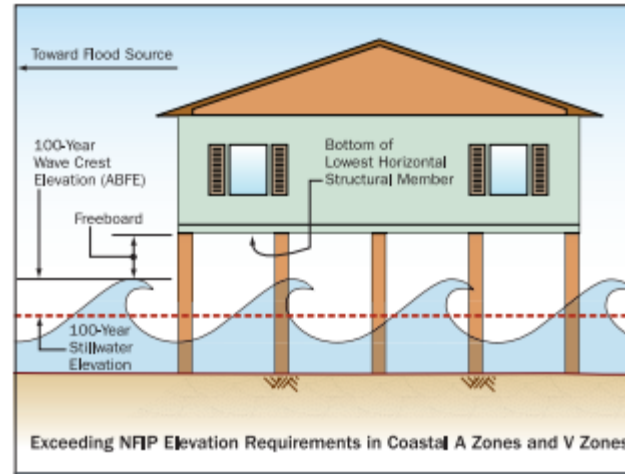
- ▶ Great size to protect against higher flood waters
- ▶ Quick to deploy
- ▶ Bag is low cost but fill material and machinery is costly
- ▶ Unproven (would grain float or be heavy enough? Would the machinery/bags handle sand? How tough are the bags, would ice or debris break it?)



# Elevation

Elevating structures above the expected flood levels is another solution to protecting infrastructure. Mechanical equipment will also have to be elevated.

- ▶ At the proper height, it requires no preparation
- ▶ One time fix with no response required to protect
- ▶ Usually more costly than the annual flood protection methods



# Values at Risk - Airport Control Building

## Options to Protect

- ▶ Option 1 New skid mounted building and equipment - basically replace existing with new no changes,
- ▶ Option 2 New mobile skid or wheeled building with external wiring connections,
- ▶ Option 3 New skid mounted building relocated to above the 2020 Ice jam elevation,
- ▶ Option 4 County Terminal Building - convert existing second floor space,
- ▶ Option 5 County Terminal Building - new mezzanine structure.



# Values at Risk - Airport

## Cost Estimates

Option	Description	Building	Infrastructure	Electrical	Total
1	New building same location	\$20,500.00	\$15,000.00	\$5,000.00	\$40,500.00
2a	New Mobile Building (skids)	\$20,500.00	\$15,000.00	\$15,000.00	\$50,500.00
2b	New Mobile Building (wheeled)	\$30,500.00	\$15,000.00	\$15,000.00	\$60,500.00
3	New Permanent Building	\$20,500.00	\$100,000.00	\$50,000.00	\$170,500.00
4	New Room 2 <sup>nd</sup> Floor Terminal	\$0.00	\$70,000.00	\$25,000.00	\$95,000.00
5	New Exterior Mezzanine	\$60,500.00	\$25,000.00	\$25,000.00	\$110,500.00



# Values at Risk - Water Treatment Plant

- ▶ Experienced aprox. 60" (5 feet) in front of WTP
- ▶ 12" of water inside WTP
- ▶ ~400' perimeter
- ▶ Uneven ground makes any solution more difficult



# Values at Risk - Water Treatment Plant

Cost Estimates (based on 400 lineal feet)

Option	Description	\$/Lin. Ft.	Material Cost	Other	Total
1	Dry Floodproofing				
2	Trap Bags	\$25/ft - 4' H \$12.5/ft - 2'H(200')	\$12,500	\$5,000.00*	\$17,500.00
3	Aqua Barrier	\$340.00	\$136,000.00	\$5,000.00*	\$141,000.00
4	Tiger Dam	Trailer with 24" x 3000ft incl. fittings	N/A	\$5000.00*	\$199,500.00
5	Grain Bag System	\$3.55/ft 9'x200' bag \$264/ft(44 bushels/ft)	\$1420.00 \$105,600	\$25,000.00** \$25,000.00*** 5000.00*	\$162,020.00
6	Conventional Sandbags (45,600)	\$60/ft - 6' H \$10,000 Sand Master	\$24,168	\$5,000.00	\$39,168.00

\*Pumps, poly, straps ect.

\*\*Grain bagger (used)

\*\*\*Grain extractor (used)



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# Values at Risk - Old Bay House

- ▶ Experienced aprox. 36" of water
- ▶ ~300' perimeter
- ▶ Uneven ground





# Values at Risk - Old Bay House

Cost Estimates (based on 300 lineal feet, 3' high protection)

Option	Description	\$/Lin. Ft.	Material Cost	Other	Total
1	Trap Bags	\$25/ft - 4' H	\$7,500	\$5,000.00*	\$12,500.00
2	Aqua Barrier	\$183.00 (36")	\$54,900.00	\$5,000.00*	\$59,900.00
3	Tiger Dam	Trailer with 24" x 3000ft incl. fittings	N/A	\$5000.00*	\$199,500.00
4	Grain Bag System	\$3.55/ft 9' x 200' bag \$228/ft (\$6/bushel) (38 bushels/ft)	\$1,065.00 \$68,400.00	<del>\$25,000.00</del> ** <del>\$25,000.00</del> *** 5000.00*	\$74,465.00
5	Conventional Sandbags (15,000)	\$26.50/ft - 3' H \$10,000 Sand Master	\$7,950.00	\$5,000.00	\$22,950.00

\*Pumps, poly, straps ect.

\*\*Grain bagger (used)

\*\*\*Grain extractor (used)



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# Values at Risk - Key Stakeholders

Notify following key stakeholders for them to prepare flood protection measures.

- ▶ Telus
- ▶ Atco
- ▶ NLG Co-op
- ▶ CIAM
- ▶ Churches
- ▶ ????



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# Residents

The recommendation would be to have a sand bag filling procedure. This would involve the following:

- ▶ Staff and/or volunteers filling sandbags
- ▶ Residents & volunteers can pick up filled sandbags to protect their home
- ▶ County to release instructions on how to build sand bag dikes
- ▶ This would need to be completed well in advance of evacuation



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# Residents

- ▶ ~200 feet around one house
- ▶ \$53/bundle of 100 bags
- ▶ \$2,438 in bags for one house to protect against 2 feet of water.

Height of dike	Number of Sandbags Required for the following Lengths of dike (Lengths in Feet)													
	50	100	150	200	250	300	350	400	450	500	550	600	650	700
0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	210	430	640	850	1070	1280	1500	1710	1920	2140	2350	2560	2780	2990
1.0	470	950	1420	1900	2370	2850	3320	3800	4270	4750	5220	5700	6170	6650
1.5	780	1570	2350	3130	3920	4700	5480	6270	7050	7830	8620	9400	10190	10970
2.0	1100	2300	3400	4600	5700	6800	8000	9100	10300	11400	12500	13700	14800	16000
2.5	1500	3100	4600	6200	7700	9300	10800	12300	13900	15400	17000	18500	20100	21600
3.0	2000	4000	6000	8000	10000	12000	14000	16000	17900	19900	21900	23900	25900	27900
3.5	2500	5000	7500	10000	12500	15000	17500	19900	22400	24900	27400	29900	32400	34900
4.0	3000	6100	9100	12200	15200	18200	21300	24300	27400	30400	33400	36500	39500	42500
4.5	3600	7300	10900	14500	18200	21800	25400	29100	32700	36300	40000	43600	47200	50900
5.0	4300	8500	12800	17100	21400	25600	29900	34200	38500	42700	47000	51300	55600	59800
5.5	5000	9900	14900	19800	24800	29800	34700	39700	44700	49600	54600	59500	64500	69500
6.0	5700	11400	17100	22800	28500	34200	39900	45600	51300	57000	62700	68400	74100	79800



# What's Next?

- ▶ Administration to follow up on discussions and questions from this presentation and recommend a budget for flood protection options.
- ▶ Upon approval of flood protection supplies & materials, it be ordered in order to receive prior to 2021 spring run-off.
- ▶ Prepare a plan of who will be responsible for what and provide training on how flood protection to be deployed.
- ▶ Continue to work on long term flood mitigation...

