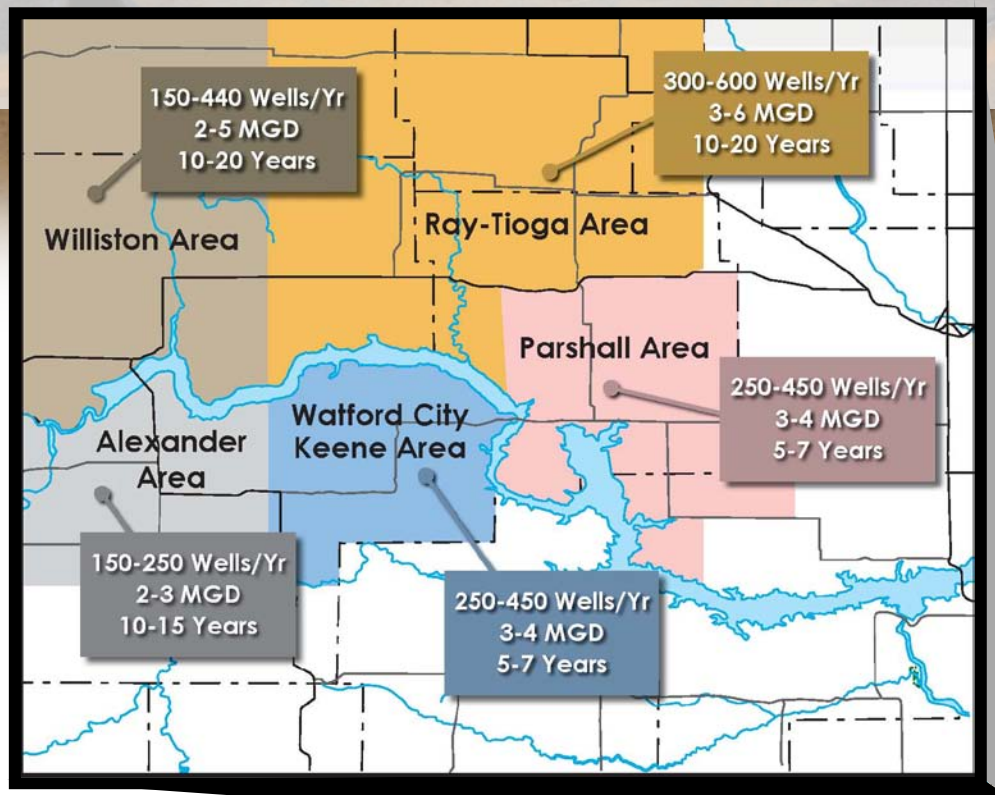
Oil Impact Creates

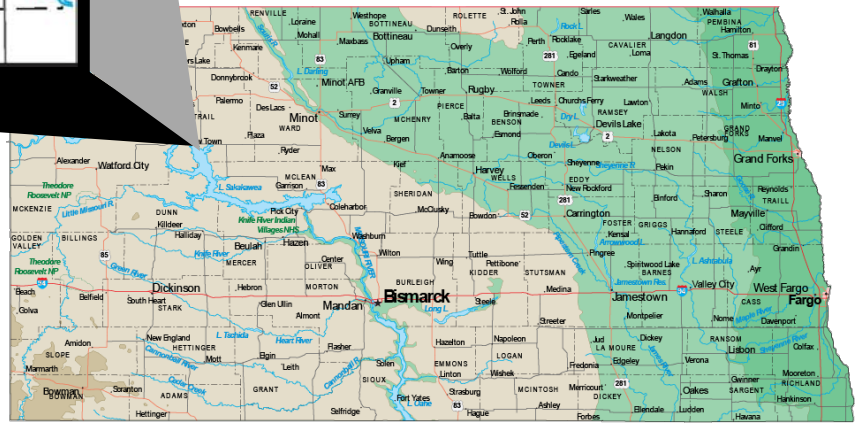
Wastewater Infrastructure Needs

Presented by:
Jason Benson, PE
Jessica Wagner, PE

October 2011

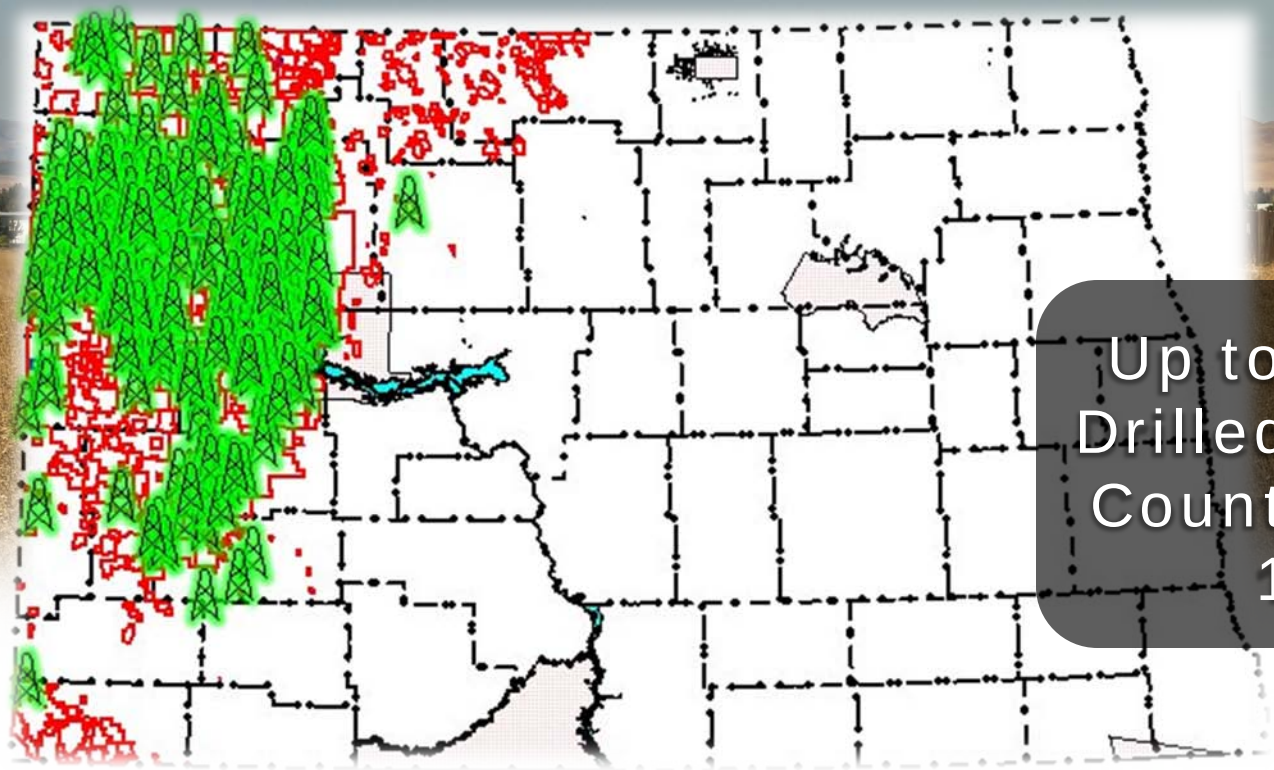
Oil Country





AES2

Drilling IMPACT



Up to 7,800 Wells Drilled in McKenzie County in the next 15 years

Wells drilled in area: 90-99% Successful

Economic Boom

Oil-field companies are expected to invest

$220 billion over the next two decades in North Dakota

31.5%

Economic Sales Increases

North Dakota's Second Quarter Retail Sales Grow by $1 Billion

Population & Growth

Growth rates for communities most impacted by the oil investment are approaching

20% annually

Dickinson's Planning Department expects the city's 2010 population of 17,787 to grow to 25,000 by 2015

an increase of 40%!

Population & Growth

Too Many People!

Not Enough Infrastructure!!!

Stress on Infrastructure

$904 M

For Oil-Related Road Infrastructure Needs

Trucks Transporting Water for Fracing =

40%

Total Truck Traffic/Rig

Trucks Hauling Wastewater???

Stress on Infrastructure

- Collection Systems
- Treatment Systems

Legislature Passes
Oil Impact Act

1st Round

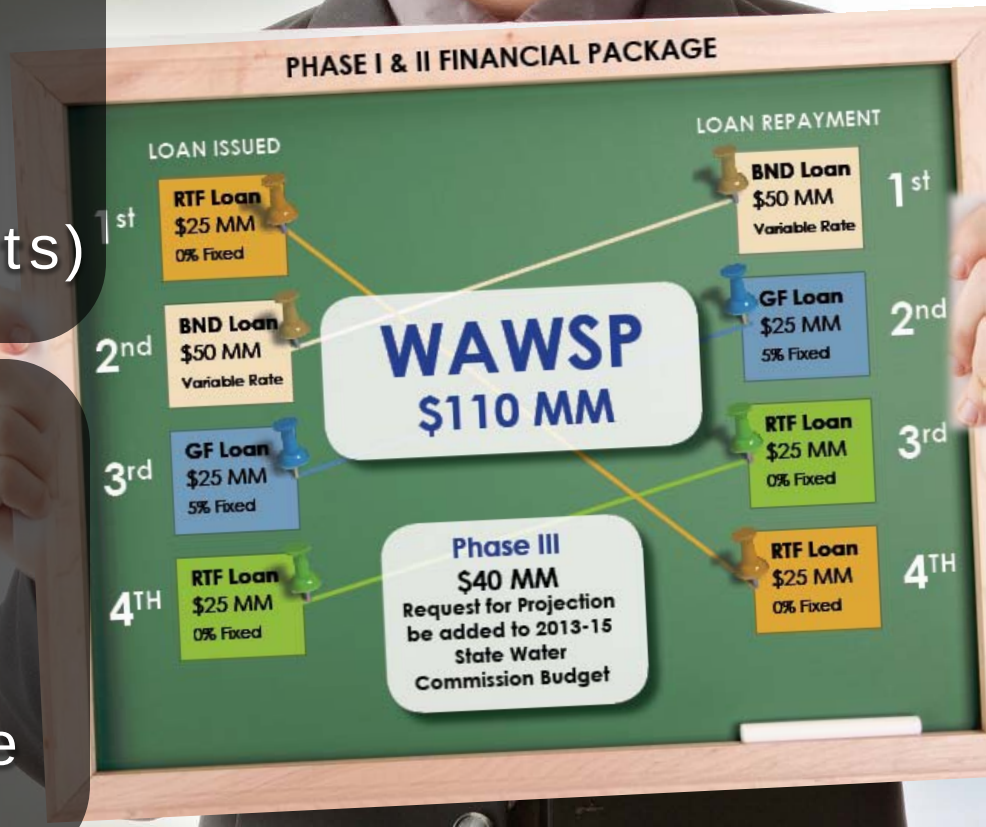
$39 M

(Use for Water and Wastewater Improvements)

2nd Round

$22.3 M

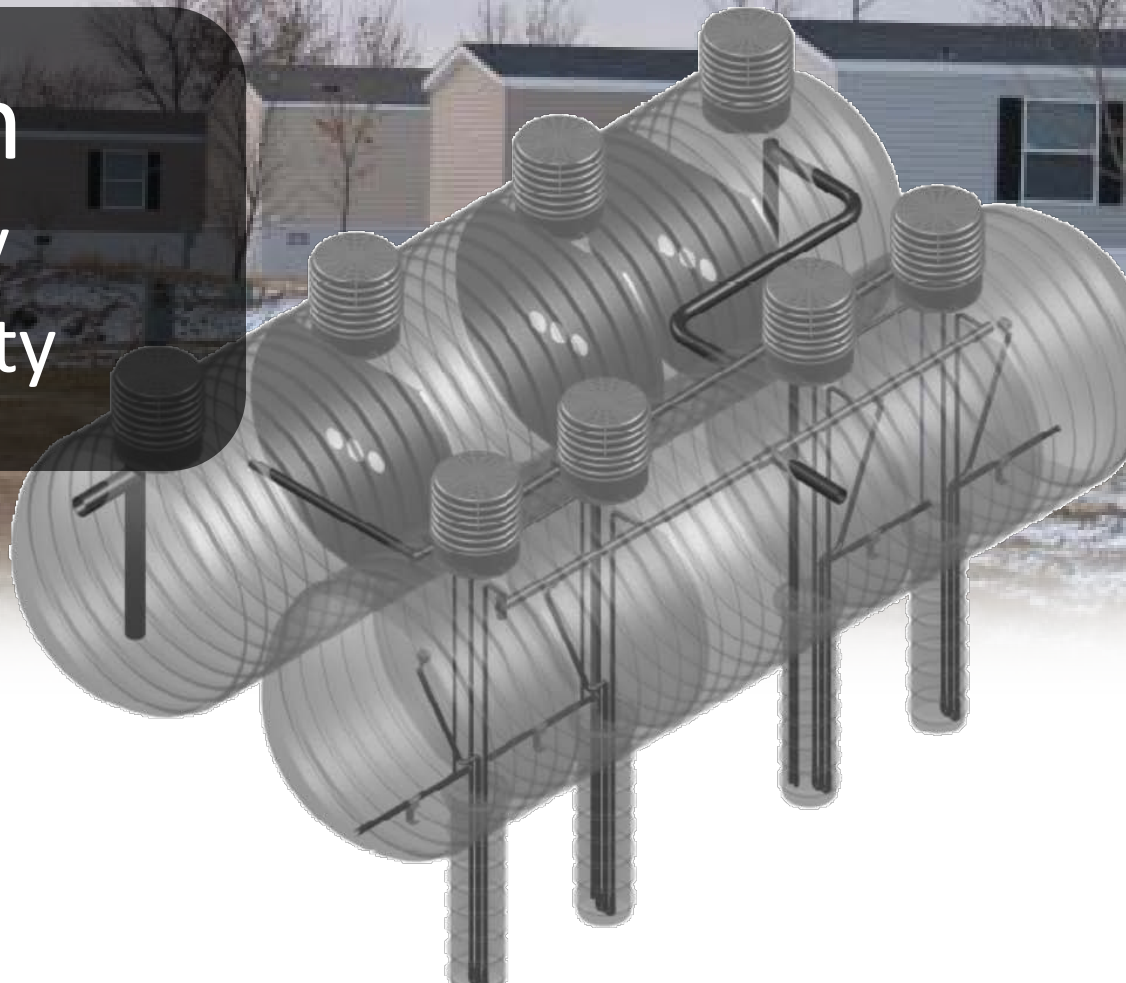
(Use for streets and additional infrastructure improvements)



Mancamp Overload

Moratorium

- Williams County
- Mountrail County



Mancamps Control

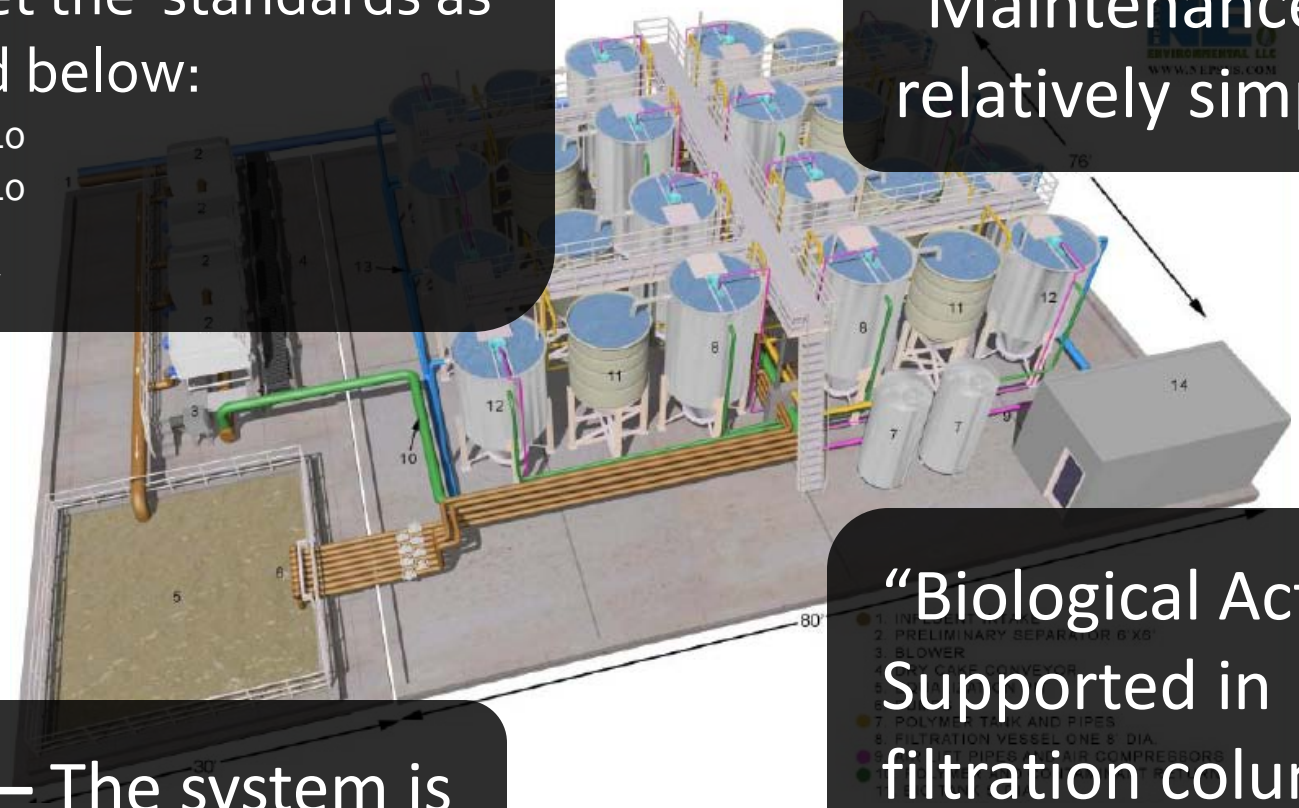
- Out of Control
- Tough to Regulate
- Pressure for Economic Development
- Easy Way Out

Primary + Tertiary = Secondary

"Performance –The system will meet the standards as outlined below:

- BOD 10
- TSS 10
- Phosphate
- Ammonia"

"Maintenance is a relatively simple issue"



"Biological Activity Supported in filtration columns"

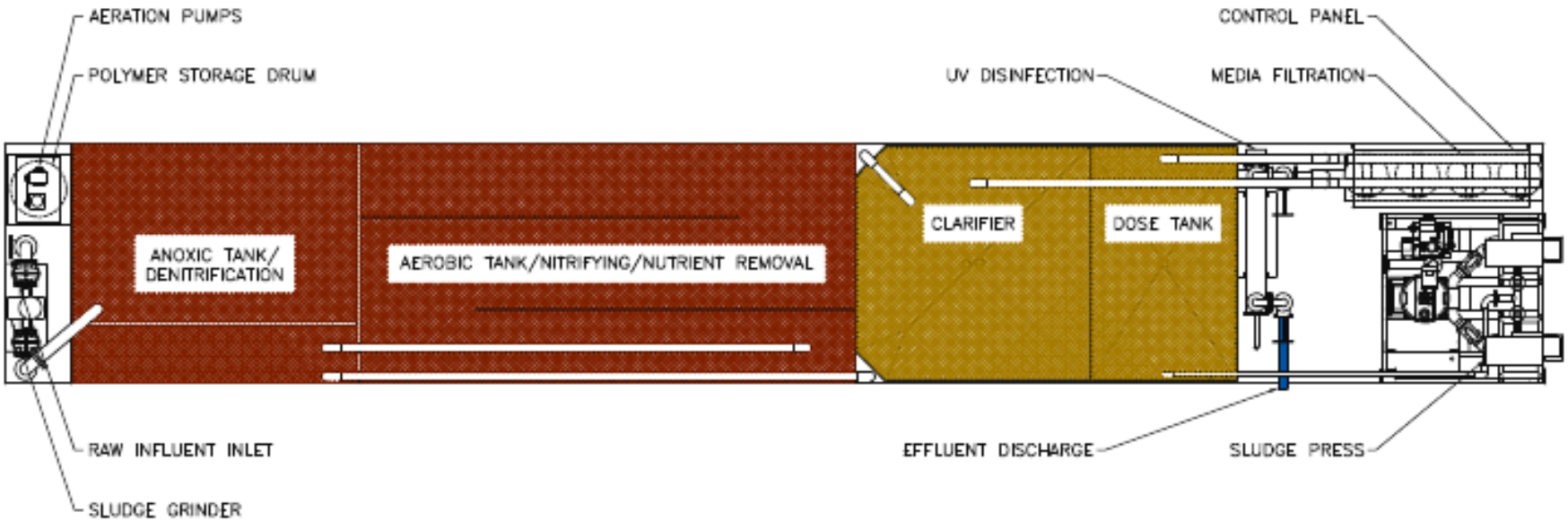
"**Odor –** The system is virtually odorless"

“A Pond”

“Thanks for taking a look at this for me. I need a pond. Our truck holds 1800 gallons. We would dump 3-5 times a week. I need a pond design which I could build myself.”

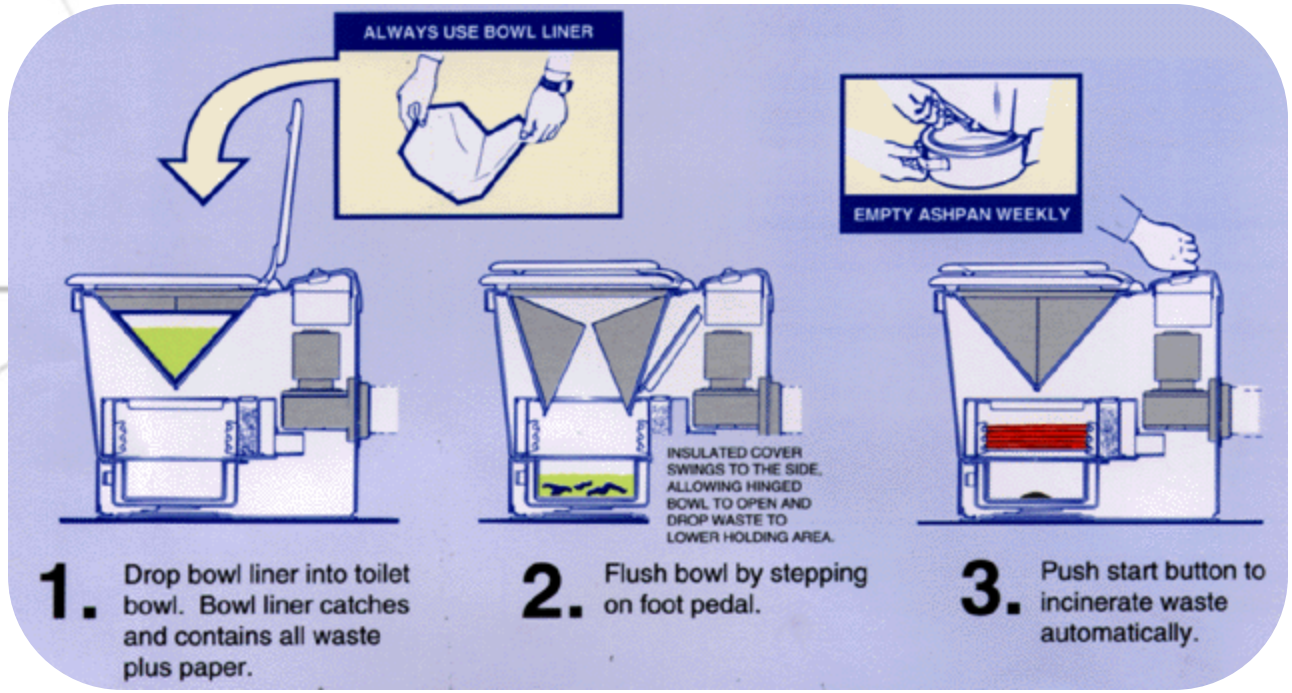
Mancamp - Frac -Reuse

Package BNR Activated Sludge with Filtration



The Silver Bullet

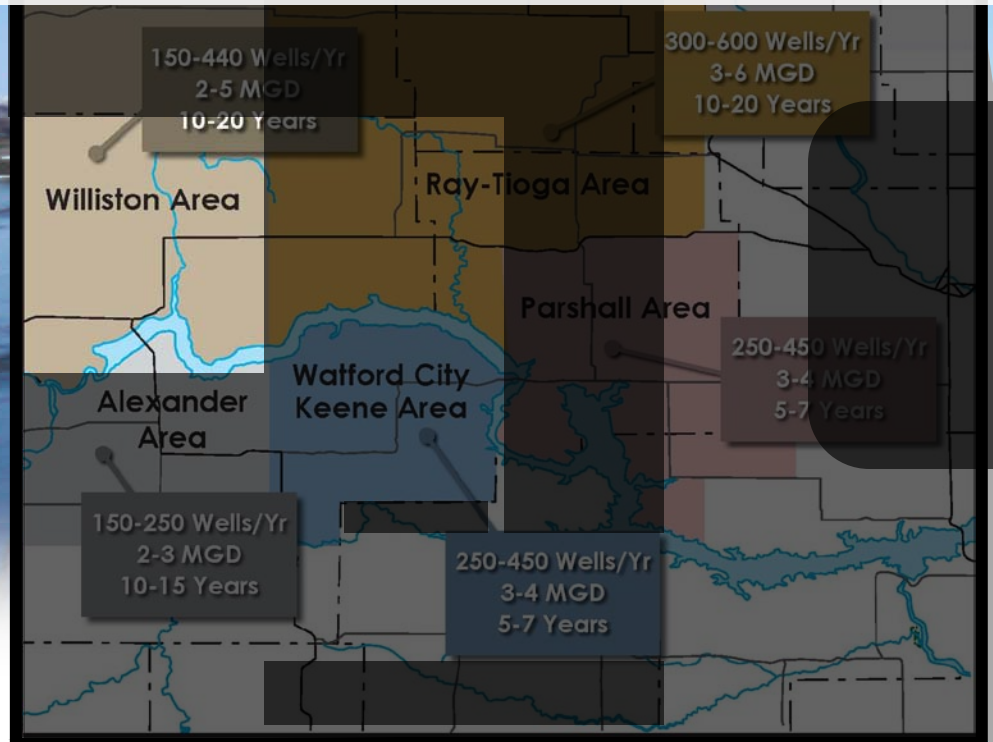
Incinerating Toilet



Mancamps Summary

- Support regulations
- Control What Systems are Put In
- Beware of the Silver Bullet
- THEY WILL PAY

City of Williston
Wastewater Needs



Plans

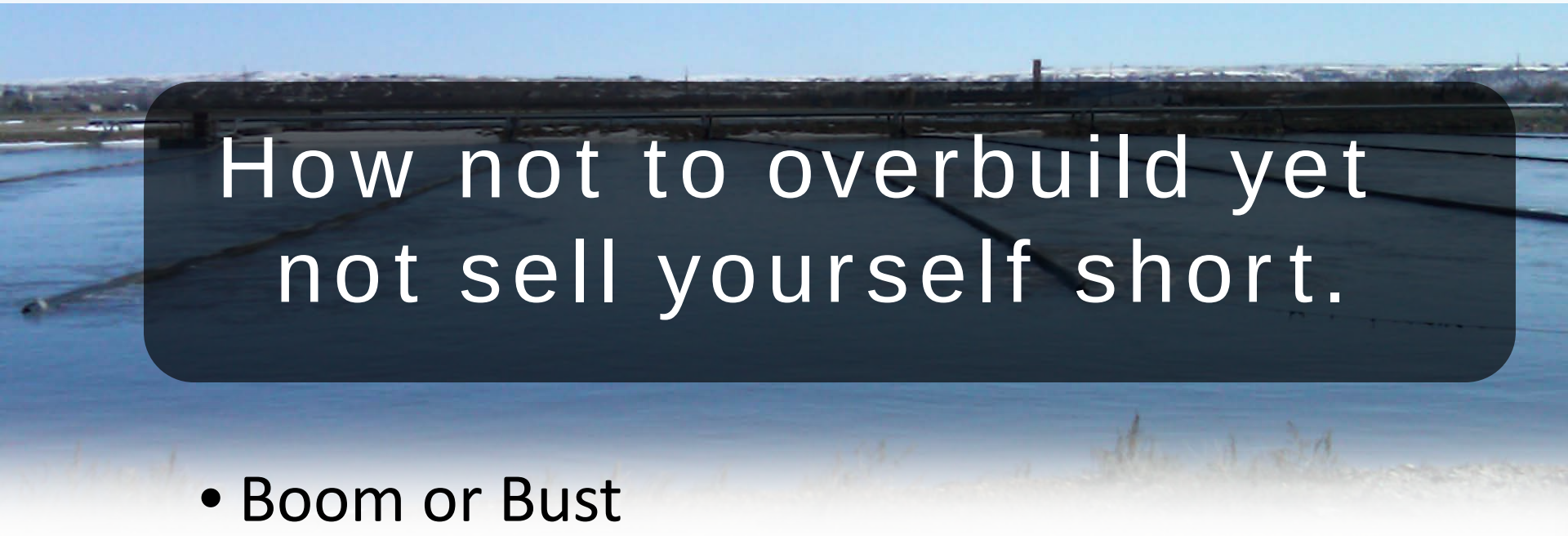
CHANGE!

City of Williston
Wastewater Needs

Planning BADLY Needed

- Population Explosion
- Commercial Development
- Exceeding capacity of WWTF

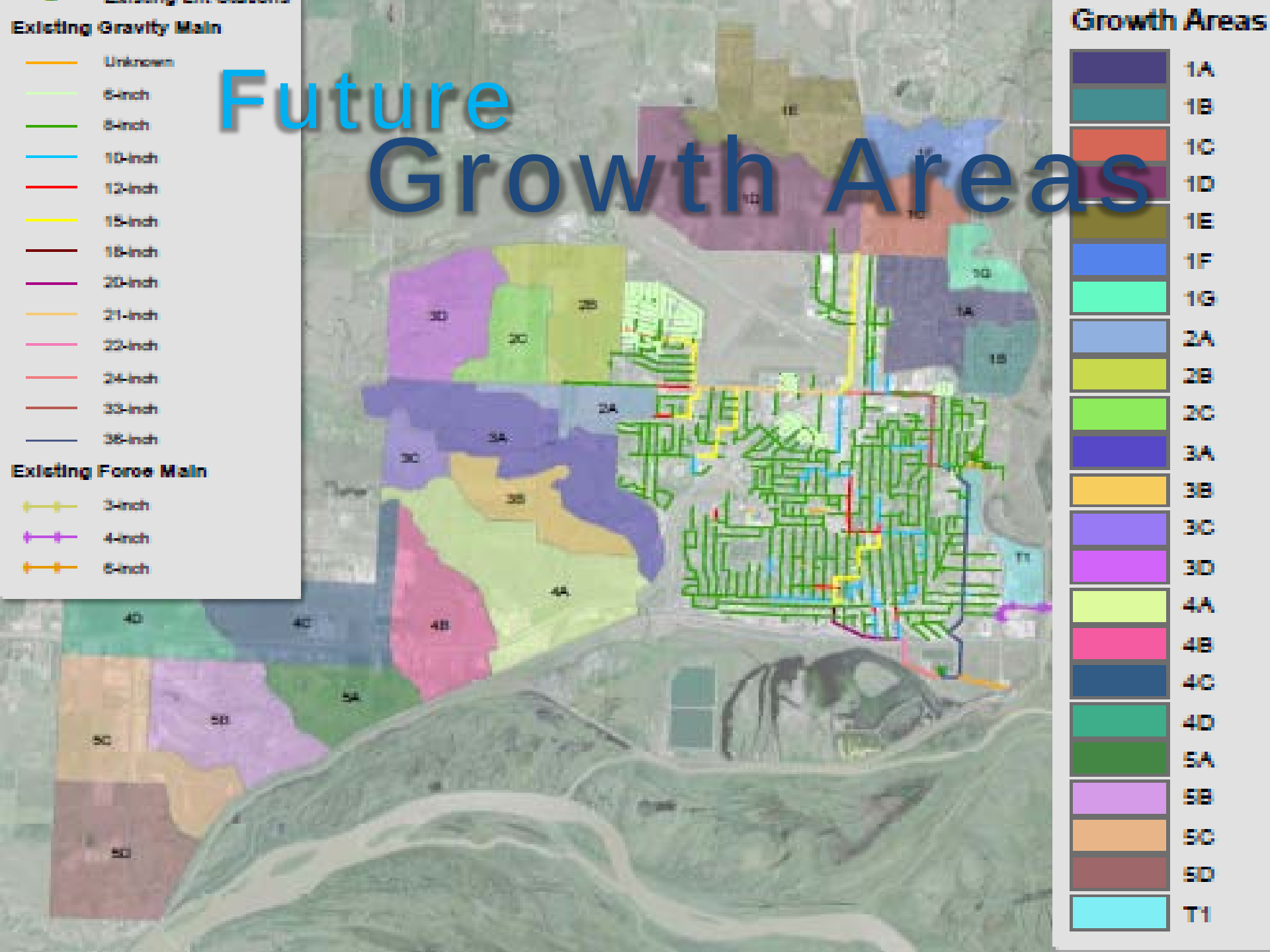
Comprehensive Plan Concerns



How not to overbuild yet not sell yourself short.

- Boom or Bust
- Widely Variable Growth Projections
- Short Term/Long Term Vision

Future Growth Areas



Growth Projections

Growth Area	Acreage		Population Equivalent	Flow, MGD	
	Residential	Commercial		Average	Peak
Area 1	1,540	454	12,872	1.29	3.66
Area 2	653	0	3,918	0.39	1.31
Area 3	859	20	5,314	0.53	1.71
Area 4	843	626	10,060	1.01	2.97
Area 5	1,026	340	8,876	0.89	2.67
Tofte	0	110	880	0.09	0.34
Total	4,920	1,550	41,921	4.19	9.80

Trunk Sewer System

Area		Construction Cost	Engineering (20%), Legal, and Administrative (5%)	Contingency (20%)	Total Cost
Area 1		$2,774,000	$695,000	$557,000	$4,026,000
Area 2		$572,000	$144,000	$115,000	$831,000
Area 3		$3,072,000	$769,000	$617,000	$4,458,000
Area 4		$4,645,000	$1,163,000	$930,000	$6,738,000
Area 5		$5,112,000	$1,280,000	$1,024,000	$7,416,000
Tofte		$0	$0	$0	$0
Grand Total					$23,469,000

Needed it… Yesterday!

- Sanitary Sewer Extensions
- Granite Peaks North
- Hotels
- Menards
- Countless Others

Lift Stations

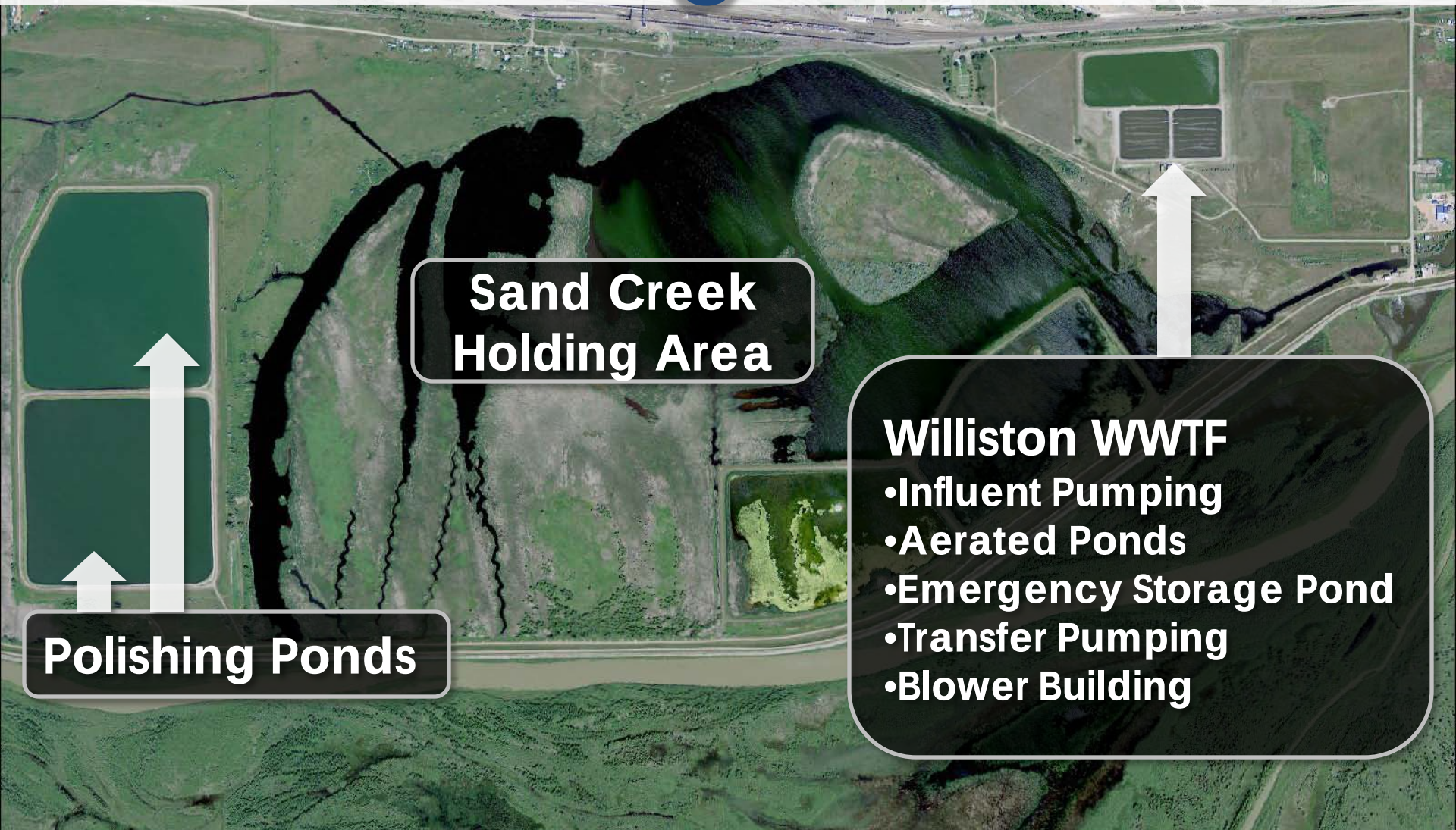
Williston West

- 9,900 ft Trunk Sewer
- 300 gpm Lift Station Expandable to 2,800 gpm
- 6,000 ft 16-inch Forcemain

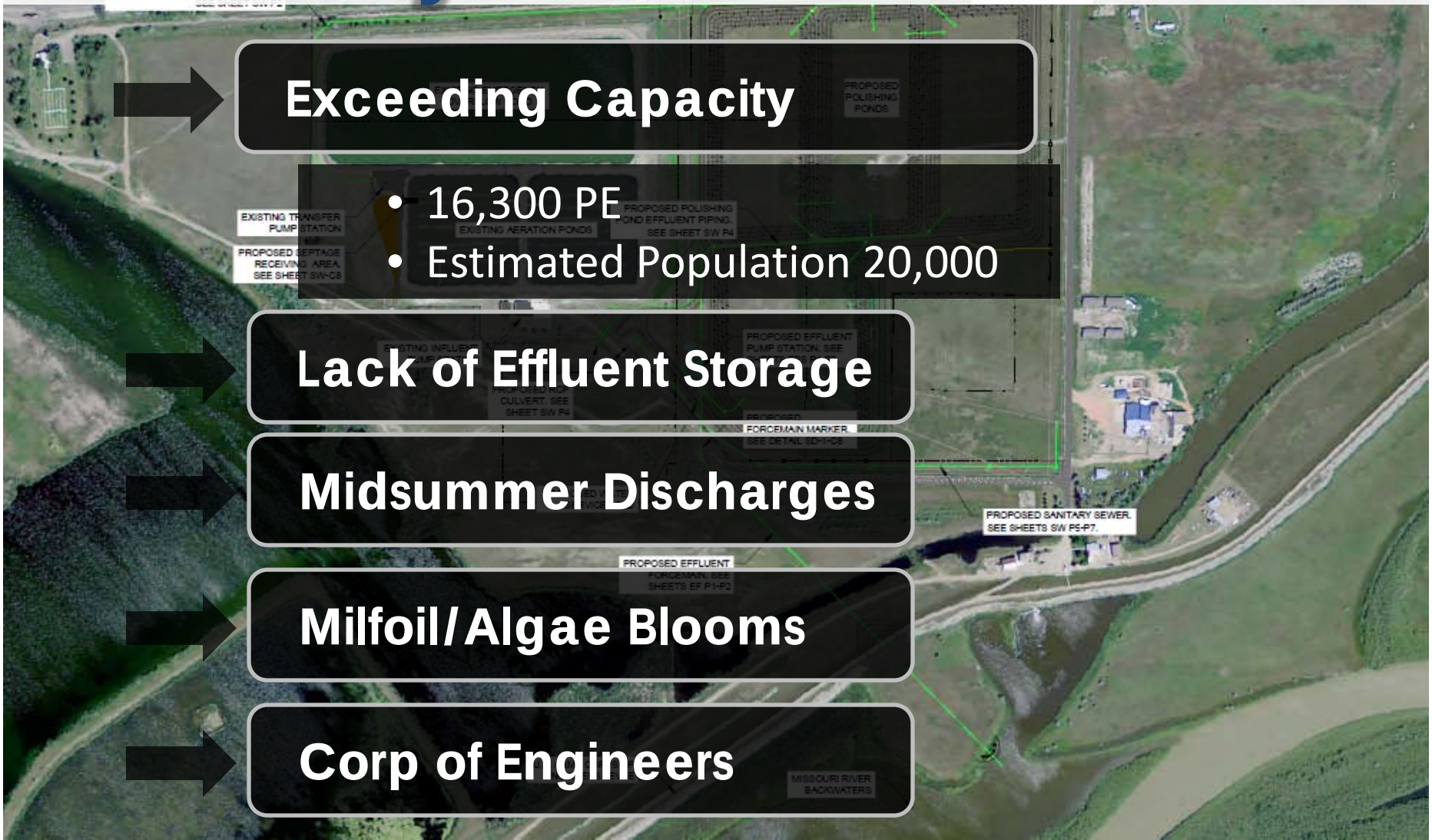
Granite Peaks North (2 Lift Stations)

- Structures Sized for Future
- Pumping Sized for Near Term
- Design/Build Delivery

WWTF
Existing Facilities



WWTF
Project Drivers



- **Exceeding Capacity**
  - 16,300 PE
  - Estimated Population 20,000
- **Lack of Effluent Storage**
- **Midsummer Discharges**
- **Milfoil/Algae Blooms**
- **Corp of Engineers**

Facility Planning

Avoid Risk but Long Term Planning Needed

- Last Shot at Permanent Easements
- Absolutely No Additional Flow to Sand Creek Holding Area

Four Phase Approach

		Flow, MGD					Storage, MG	
Project Phase	Population Equivalent	Average	Max Month	ADWF	Peak Day	Peak Hour	Peak 180-day	Winter 210-day
Phase I	21,700	2.17	2.56	1.87	3.37	5.68	414.5	419.7
Phase II	24,300	2.43	2.87	2.09	3.72	6.25	-	-
Phase III	36,100	3.62	4.27	3.11	5.1	8.67	-	-
Phase IV	48,000	4.8	5.66	4.13	6.19	10.95	-	-

The Plan

Phase I (21,700 PE)

- Additional Storage (4 ponds - 80 MG)
- Increase Pumping Capacity

Phase II (24,300 PE)

- Convert One Storage to Aerated Pond
- New Preliminary Treatment
- Tertiary Treatment
- Change to Continuous Discharge

Phase III & IV (36,100 & 48,000 PE)

- Convert Next Storage Pond to Aerated
- Expand unit processes

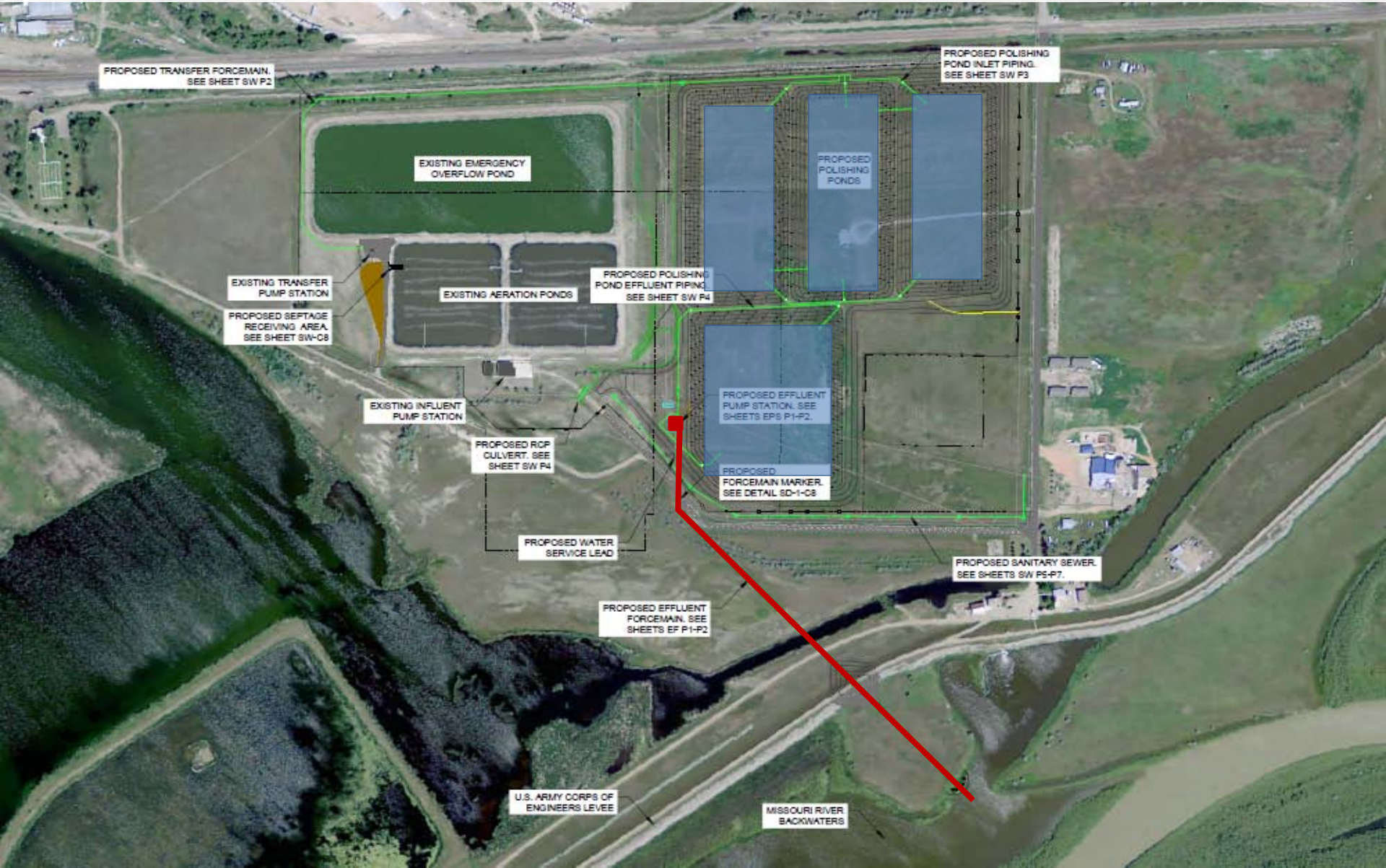
Addressing Immediate Needs

Phase I Improvements Project

- Additional Storage Ponds
- Increased Transfer Pumping Capacity
- Increased Influent Pumping Capacity
- Additional Aeration
- New Effluent Pump Station

Easements Swap With Corps

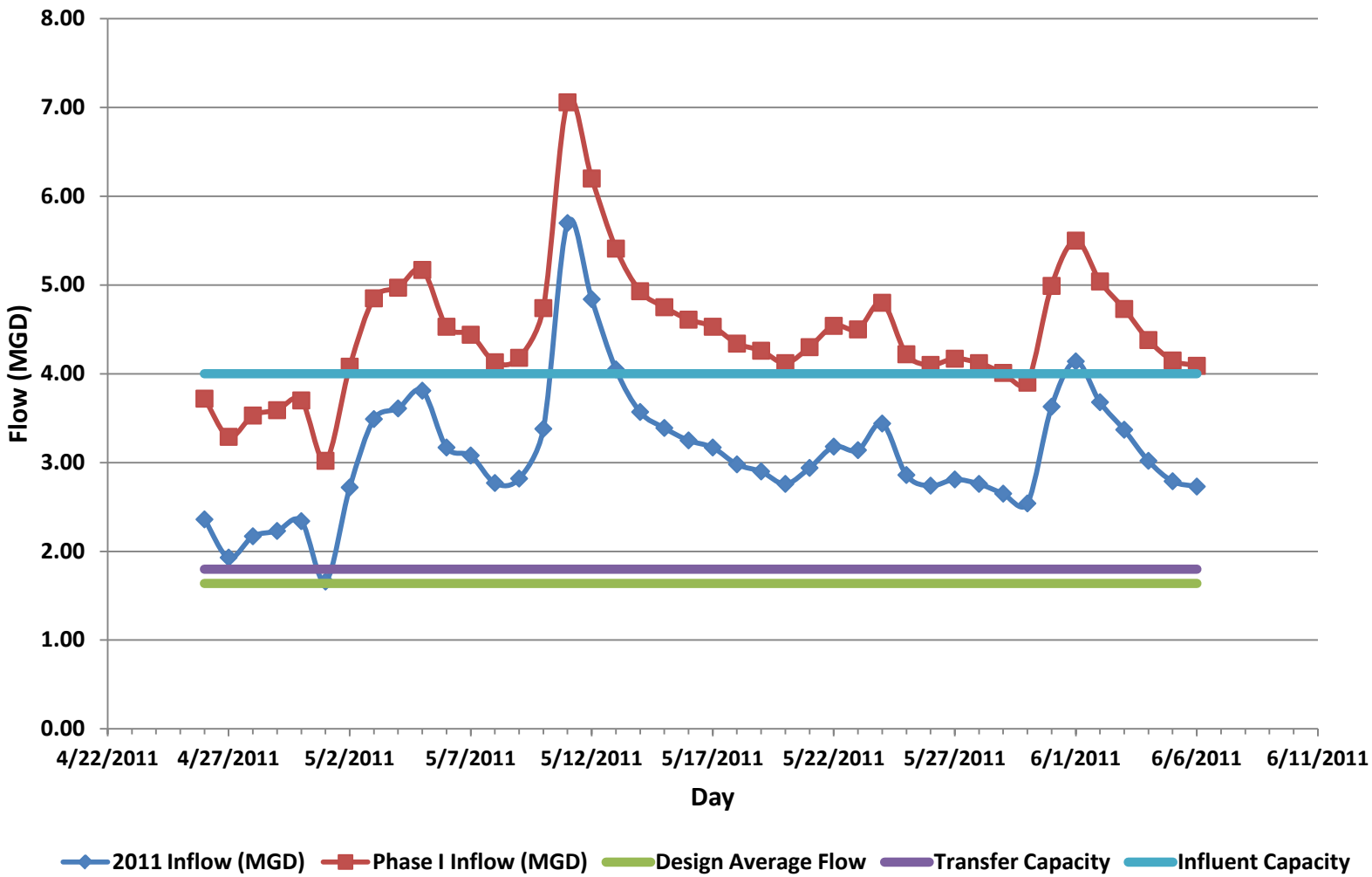
Phase I Improvements



The Flood

- Record Flows and Loads
- Influent Bypassing
- Effluent Storage Bypassing
- Power Outages
- River to within ½ foot of topping levee

The Flood


8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Flow (MGD)
4/22/2011
4/27/2011
5/2/2011
5/7/2011
5/12/2011
5/17/2011
5/22/2011
5/27/2011
6/1/2011
6/6/2011
6/11/2011
Day
2011 Inflow (MGD)
Phase I Inflow (MGD)
Design Average Flow
Transfer Capacity
Influent Capacity

Corps Panics
Under Pressure

- Levee Seepage
- Provided Notice that Levee is Not Certified
- You Can Not Pump Effluent Over Levee
- You Can Not Discharge Any More Sewage
- No Easement Swap
- Want Entire Treatment Plant Moved

Between a Rock and a Hard Place

Flows Too High

Installed one of two transfer pumps to increase transfer capacity to storage ponds

Limited Storage

- Midsummer discharges will have to continue
- Not acceptable to Corps

No Easement

- No Storage Expansion
- No Effluent Line Over Levee

Land Easement

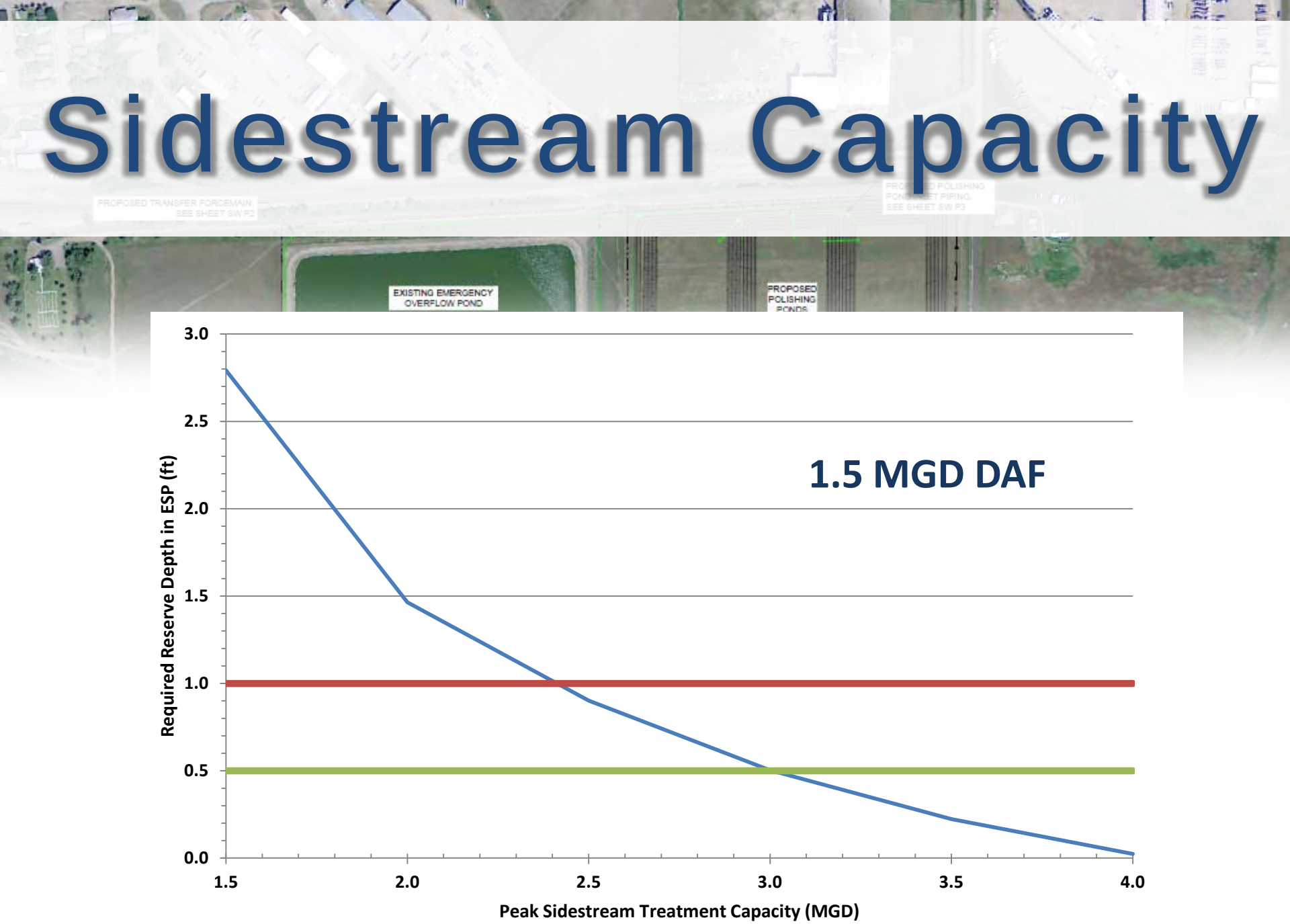
What Now ??????

- Resolve Immediate Needs
- Remain in Compliance
- Satisfy Corps Concerns
- Planning Effort Begins For Alternate Site Evaluations
  - Cost Share With Corps

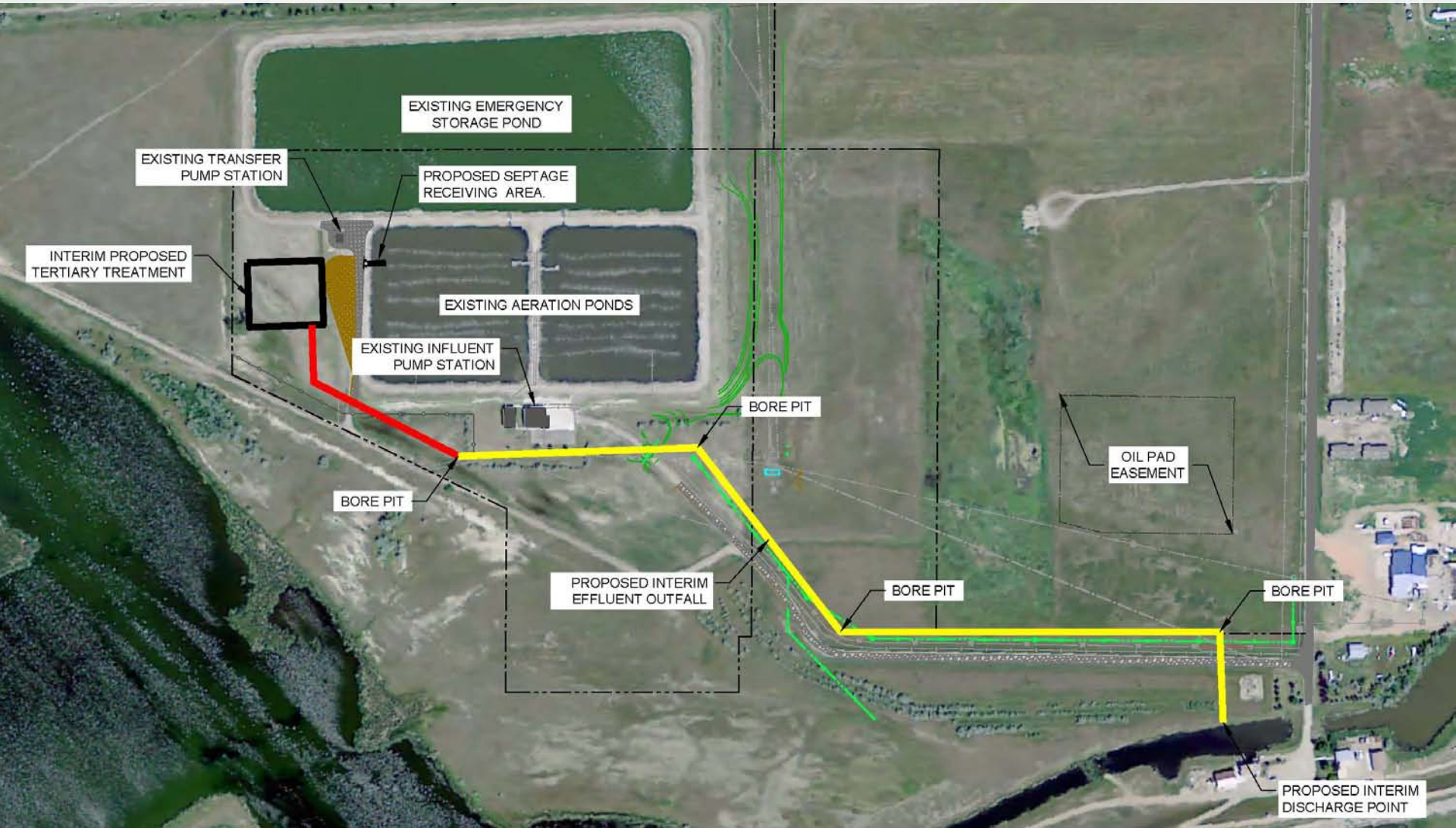
Temporary Improvements

- Sidestream Tertiary Treatment
  - Cloth Media Filters
  - Disinfection
  - Provisions for Algae Removal
- Semi-Continuous Discharge to Corps Channel
- Maximize Use of Existing Storage
- 5-Year Temporary Easement
- Interim Limits with Compliance Schedule

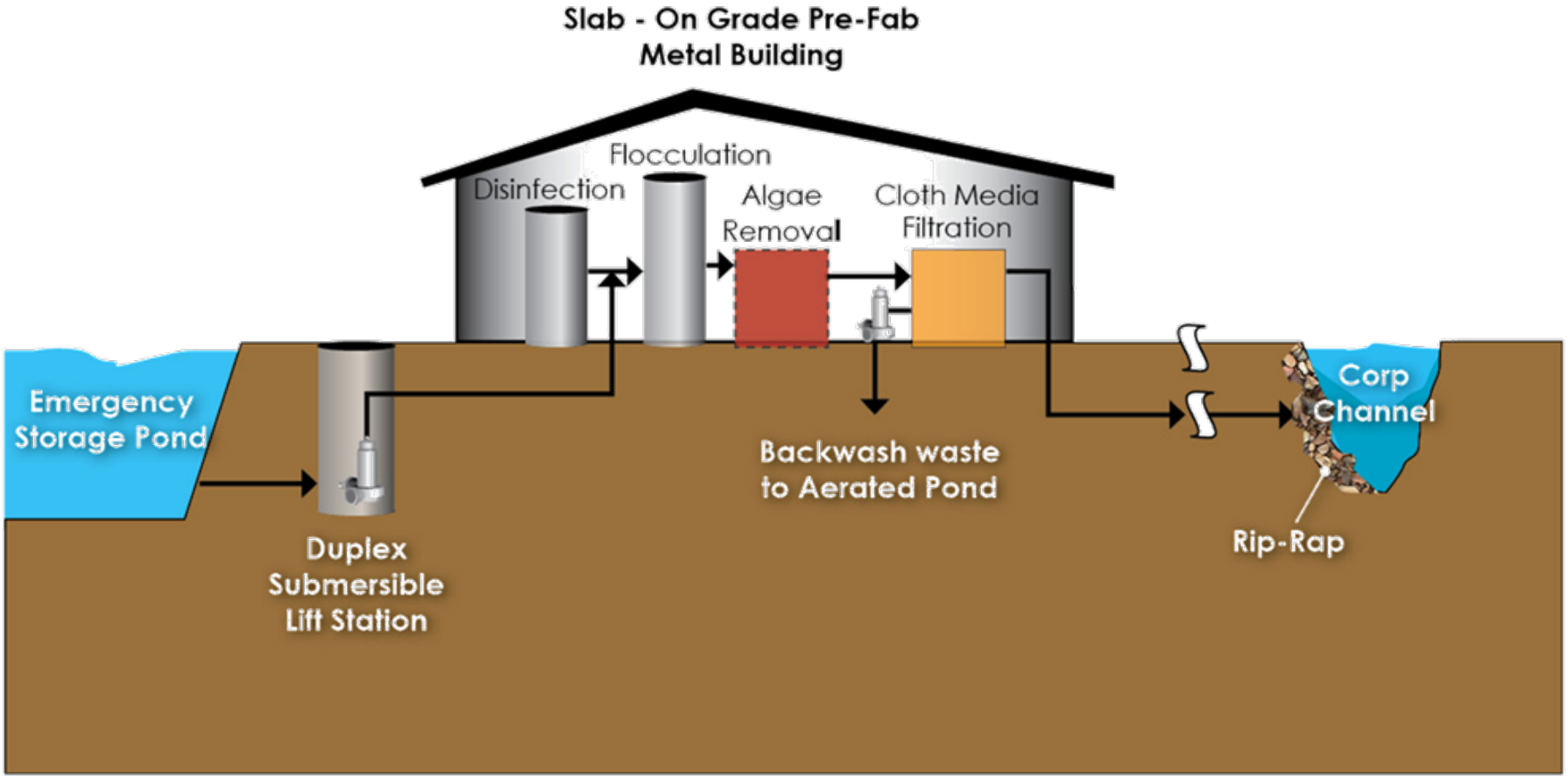
Sidestream Capacity



Site Plan


EXISTING EMERGENCY STORAGE POND
EXISTING TRANSFER PUMP STATION
PROPOSED SEPTAGE RECEIVING AREA.
INTERIM PROPOSED TERTIARY TREATMENT
EXISTING AERATION PONDS
EXISTING INFLUENT PUMP STATION
BORE PIT
BORE PIT
OIL PAD EASEMENT
PROPOSED INTERIM EFFLUENT OUTFALL
BORE PIT
BORE PIT
PROPOSED INTERIM DISCHARGE POINT

Sidestream Continuous Discharge Schematic



Challenges

Challenges

Minimizing Environmental Hurdles

- Interim Temporary Effluent Limits and Compliance Schedule - **NDDH**
- Temporary Easement Preparation – **Corps**
- CATEX Environmental Review – **Corps**
- Memorandum of Understanding – **Corps**
- Protection for Pallid Sturgeon – **US Fish and Wildlife**

Challenges

Time!!!

- Expedite Construction Schedule by All Means Possible
- Emergency Pump Procurement
- Major Equipment Pre-Procurement
- Pre-Procure Tertiary Building
- Construct Underground and Building Slab Separately

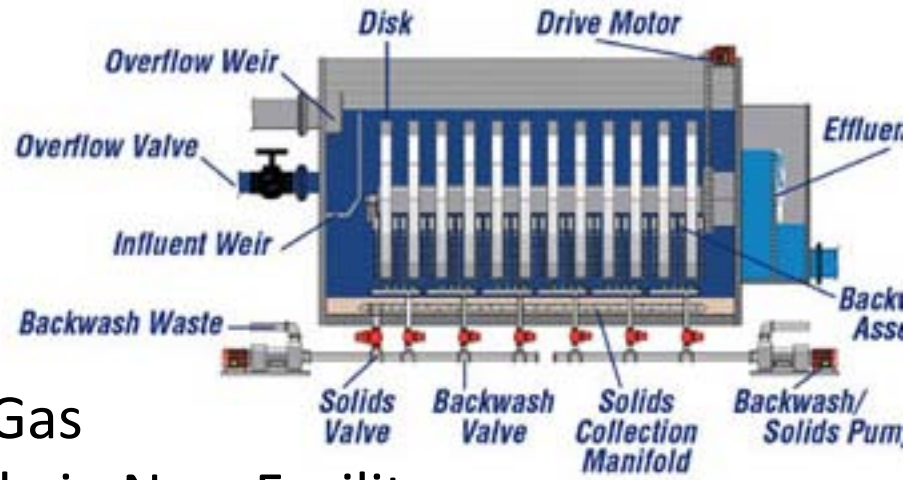
Challenges

Remaining In Compliance

- Temporary Improvements
  - Temporary Pumping Operational Winter 2011
  - Sidestream Tertiary Treatment System Operational by Late Spring
  - Project Completion Late Summer/Early Fall
- Long Term Improvements
  - Draft Site Evaluation – Jan 2012
  - Feasibility Study – Jan 2013
  - Long Term Facility Operation – Winter 2016

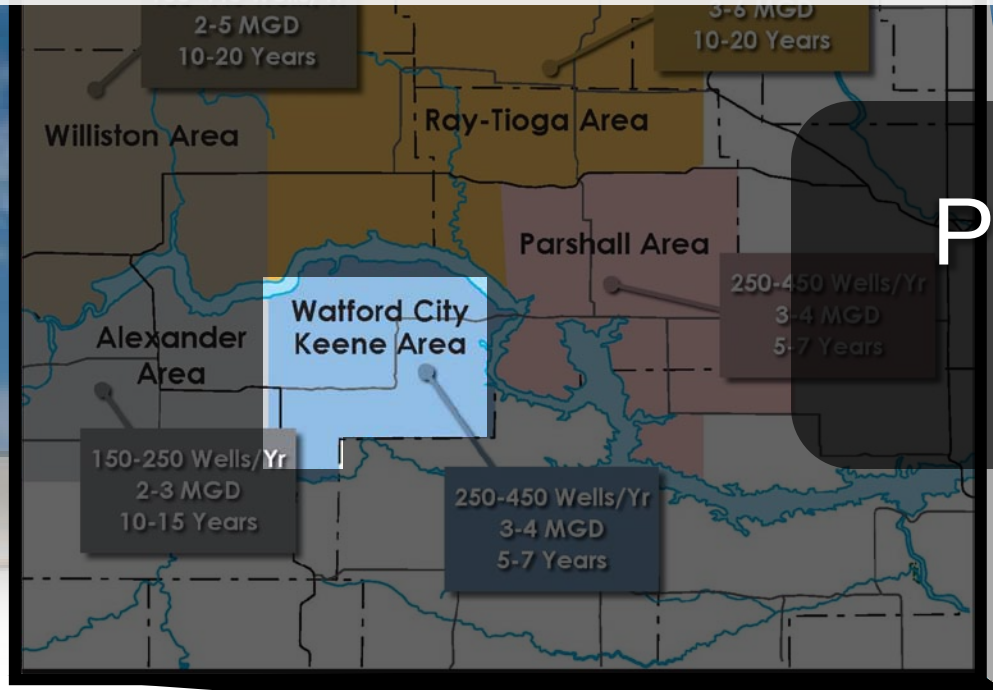
Challenges

Waste as Little Money as Possible

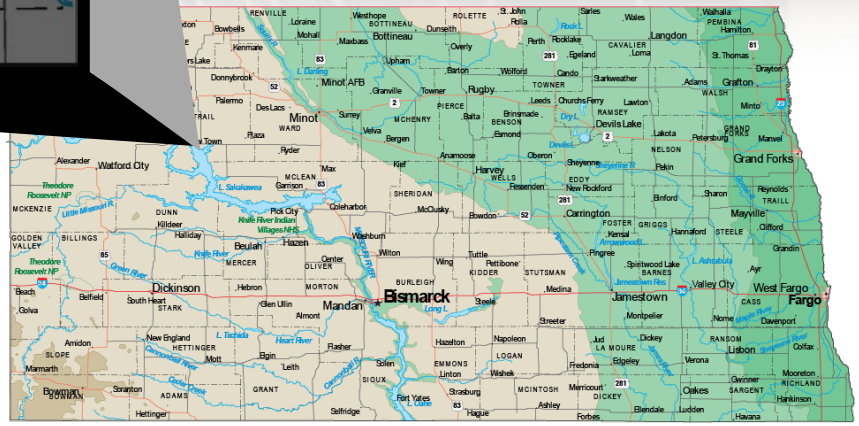


- Filter Selection and Sizing
  - Moveable
  - Size to Fit Future Flows
- Disinfection
  - Hypochlorite or Chlorine Gas
  - Equipment/Tankage Usable in New Facility
- Building
  - Movable – Pole Barn Type Structure
  - Public Works Storage in Future
- Space Only for Algae Removal Equipment

Watford City
Wastewater Needs



Planning For Growth!



Watford City Wastewater Collection System

Phasing Approach

- Based on development of areas

New Lift Stations

- Design
  - ✓Structures sized for ultimate capacity
  - ✓Pumps sized for interim flowrates

Improvements to Existing Lift Stations

- Replacement of equipment, piping, structures, etc.
- Temporary pump installation
  - ✓Future forcemain to reroute new areas flow around City

Watford City Wastewater
Collection System
Growth Areas
1A
1B
2A
2B
3
4A
4B
5A
5B
5C
LS1
LS2
LS3
0
0.25
0.5
0.75
1
Miles

Watford City Wastewater Facility Plan

Design Capacity

- Assumed Current Population: 2,100
- Design Population: 5,000
- New Design Population: 7,500

Flow and Load Projections

- Design flow and loading rates
- Adjusted design flow and loading rate

Phasing Approach for WWTP Improvements

- Based on population and storage needs

Watford City Wastewater
Facility Plan

Watford City Wastewater Treatment Facility

Working with Existing Infrastructure

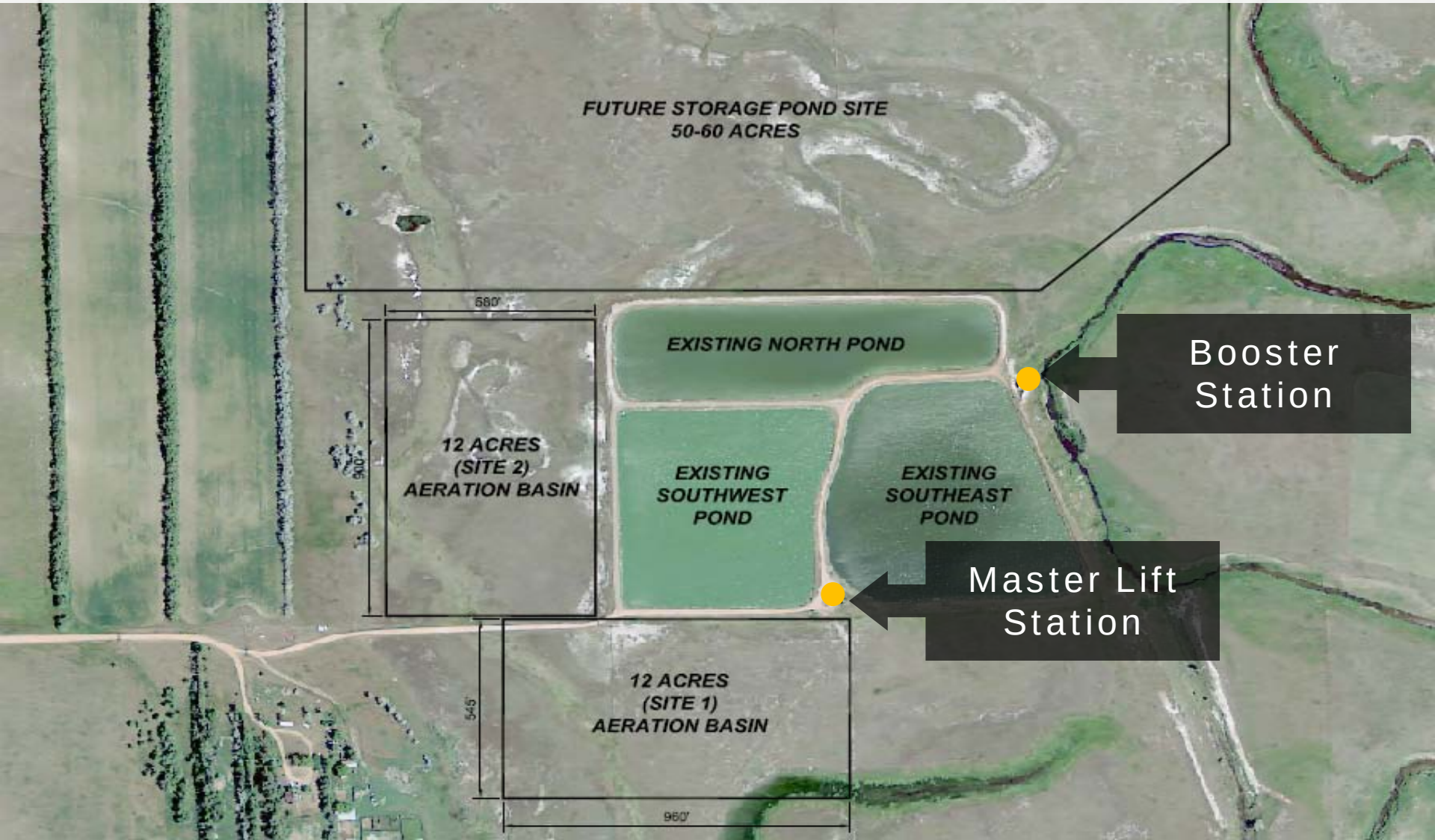
- 2-miles of forcemain between Primary and Secondary Ponds

Acquiring Additional Land for WWTP Expansion

Reuse of WWTP Treated Effluent

- Golf course irrigation.
  - ✓Expanding golf course to 18 holes

Watford City Wastewater
Facility Plan



Summary

- Crystal Ball Would Be Helpful for Population Projections
- Moving Trucks are Faster Than Backhoes
- There's Only One Silver Bullet

Questions?

Presented by:
Jason Benson, PE
Jessica Wagner, PE

October 2011