

# Iowa Nutrient Reduction Strategy Permitting Approach

Adam Schnieders

Water Quality Resource Coordinator

Iowa Department of Natural Resources

December 5<sup>th</sup>, 2017

# Why this strategy?

- 2006
- Excessive nutrients can cause water quality problems
  - In state , downstream
- Numeric nutrient criteria development presents challenging problems
  - Difficult to pin down cause & effect relationship
  - Difficult to comply with permit limits and costly to try
  - Possibly every water body impaired
- A different approach needed

# PS and NPS Common Threads

- Acknowledgement of the problem
- Recognition that traditional approaches are not workable (e.g. cost, technically)
- Willingness to want to do something now to make progress
- Needs to be practical in its implementation

# Iowa Strategy General Approach

- 1) Achieve nutrient load reductions through performance-based actions, while
- 2) Continuing to assess and evaluate the nutrient water quality standards

# PS/NPS Collaboration

- PS account for 8% of the TN and 20% of the TP annually
- NPS account for 92% of the TN and 80% of the TP annually
- **Both NPS and PS play important roles on an annual and seasonal basis for Iowa water quality**

# Point Source Strategy

- Point sources can have greater impacts at low flows and certain watersheds
- Working closely with CWA regulated community
- Use existing rules (Chapter 567 IAC Chapter 62)
- Use performance-based limits in lieu of nutrient criteria
  - Limits based on the effect of the pollutant in the water and feasibility and reasonableness of treating such pollutant

# Point Source Strategy

Focus on:

- **100** major municipal wastewater treatment plants
- **31** major industries
- **18** minor industries with biological treatment for process waste
- **Total of 149**

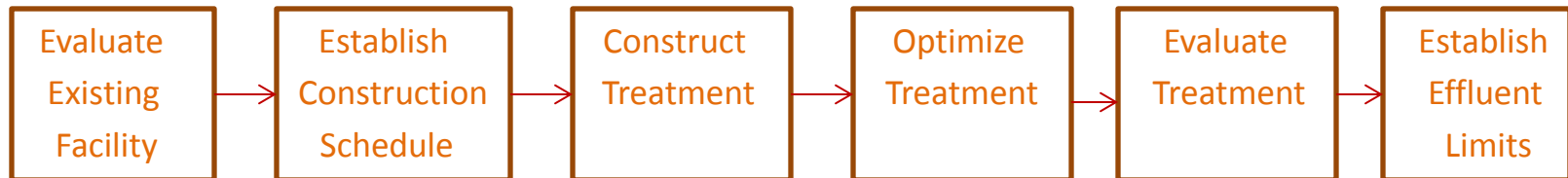
For major POTWs:

- Treat more than 1 million gallons of wastewater a day
- Handle **80 percent** of all municipal permitted wastewater
- Provide wastewater treatment for **55-60 percent of Iowa's population**

## Normal Permitting Process



## Nutrient Permitting Process





# Implementation Details

- Submit feasibility and planning study within two years
- DNR reviews study
- Negotiate Construction schedule
- Amend permit to incorporate the schedule
- Limits incorporated in permit following one year performance evaluation
- **Implementation Flexibilities for Point Sources**
  - **Regulatory certainty – 10 year assurance**
  - **Economic Considerations**
  - **Ability to fine tune**
  - **Annual average permit limits**

# Potential Results (estimated 2012)

## At the 130 wastewater treatment plants included in the strategy:

- Assume 25 mg/L total nitrogen (TN) and 4 mg/L total phosphorus (TP) discharge concentrations
- Use annual average flows
- Use Biological Nutrient Removal technology limits (10 mg/L TN and 1 mg/L TP)

### Currently Point Source Facility Loading

18,300 tons/yr TN

2,900 tons/yr TP

### After implementation

7,300 tons/yr TN

730 tons/yr TP

**2/3 to 3/4 nutrient  
reduction possible**

# Cost and Affordability

**Estimated Costs for BNR Improvements for Municipal Majors (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)**

Treatment Type	# of Facilities	Combined Design AWW Flow (MGD)	Combined Annual Average Flow <sup>1</sup> (MGD)	Total Capital Cost (\$M)	Total Annual O&M Cost (\$M)	Total Present Worth Cost (\$M) <sup>2</sup>	Total Annual Cost (\$M)	\$/1,000 gallons Treated <sup>3</sup>	Weighted Monthly Cost/Household <sup>4</sup>	Weighted % of MHI <sup>4</sup>
Activated Sludge	56	533	355	348	25	686	51	0.39	7.75	0.18%
Fixed Film	37	101	67	430	7	524	39	1.59	25.83	0.73%
Aerated Lagoon	9	11	8	110	3	147	11	3.92	85.16	2.13%
<b>Totals</b>	<b>102</b>	<b>645</b>	<b>430</b>	<b>887</b>	<b>35</b>	<b>1,358</b>	<b>101</b>	<b>0.64</b>	<b>11.85<sup>5</sup></b>	<b>0.29%<sup>5</sup></b>

**Estimated Costs for BNR Improvements for all Industries with Biological Treatment (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L)**

Treatment Type	# of Facilities	Combined Design Flow (MGD)	Total Capital Cost (\$M)	Total Annual O&M Cost (\$M)	Total Present Worth Cost (\$M) <sup>1</sup>	Total Annual Cost (\$M)	\$/1,000 gallons Treated <sup>2</sup>
Activated Sludge	20	44.2	29.3	2.0	56.1	4.2	0.26
Fixed Film	1	0.6	2.7	0.04	3.3	0.2	1.06
Aerated Lagoon	7	5.8	86.5	2.20	116.0	8.6	4.05
<b>Totals</b>	<b>28</b>	<b>50.7</b>	<b>118.5</b>	<b>4.2</b>	<b>175.5</b>	<b>13.1</b>	<b>0.71</b>

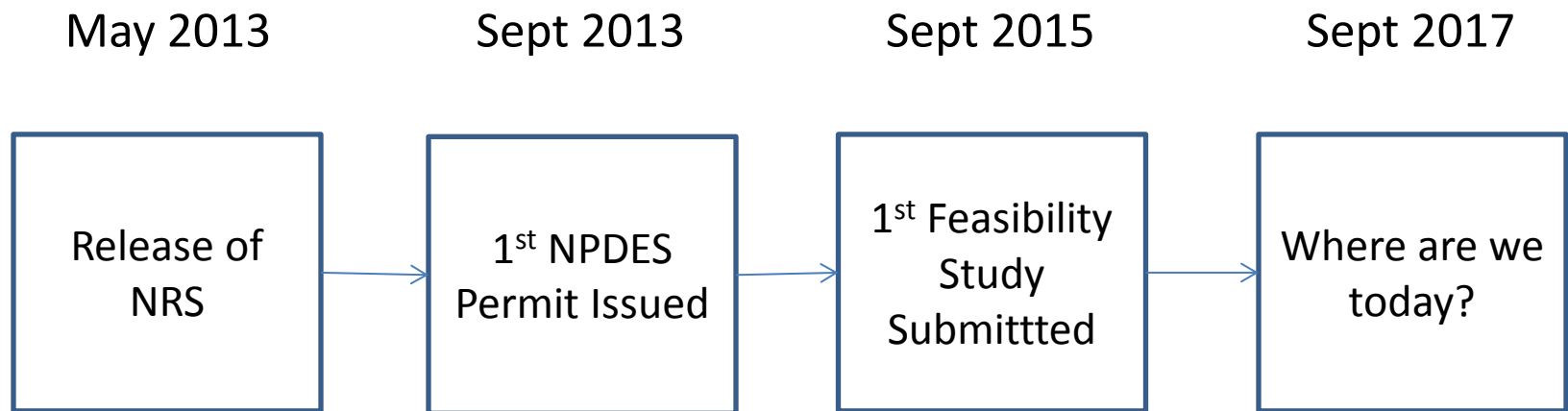
Total Present Worth Cost

= 1.53 (\$B)

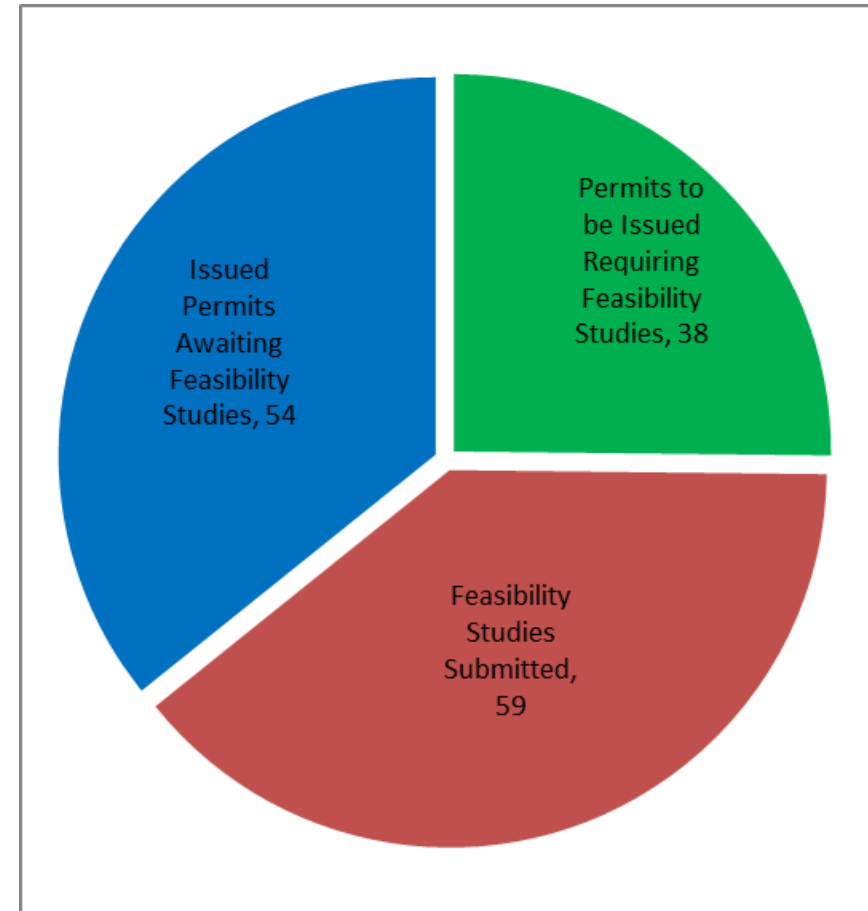
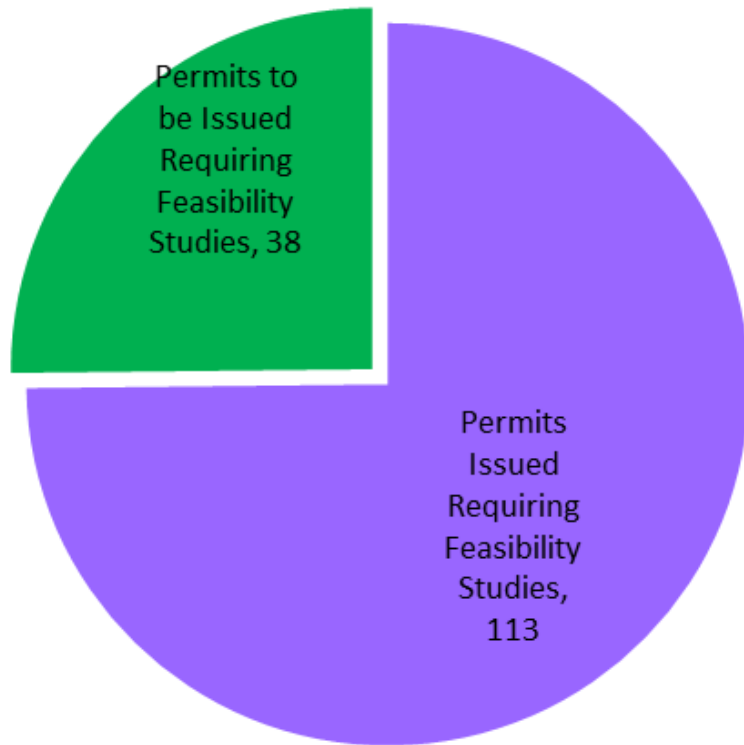
Total Capital Cost

= 1.00 (\$B)

# Iowa NRS Point Source Progression



# Iowa Progress to Date on Point Sources



\*79 of 103 Major POTWs, 34 of 48 Industries; 86% of the wastewater permitted

# Iowa Point Source Monitoring

September 2013

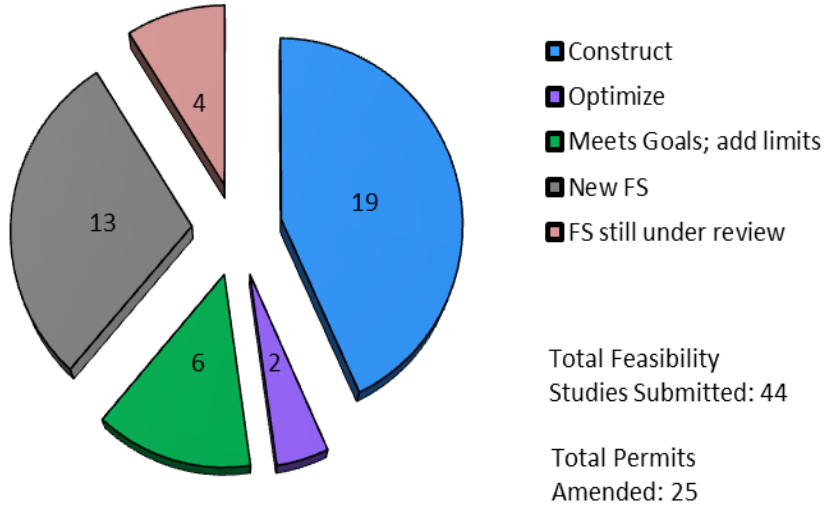
September 2017

**ZERO facilities sampling,**  
NRS based off of  
engineering assumptions

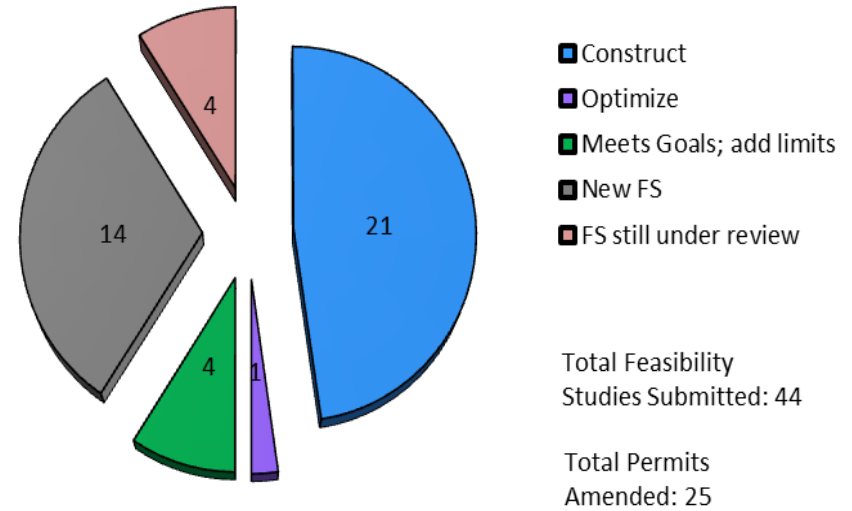
4 years

113 facilities X 4 samples/wk X 52 weeks  
=  
**23,500 samples annually**  
**(approximately \$350,000 annually)**

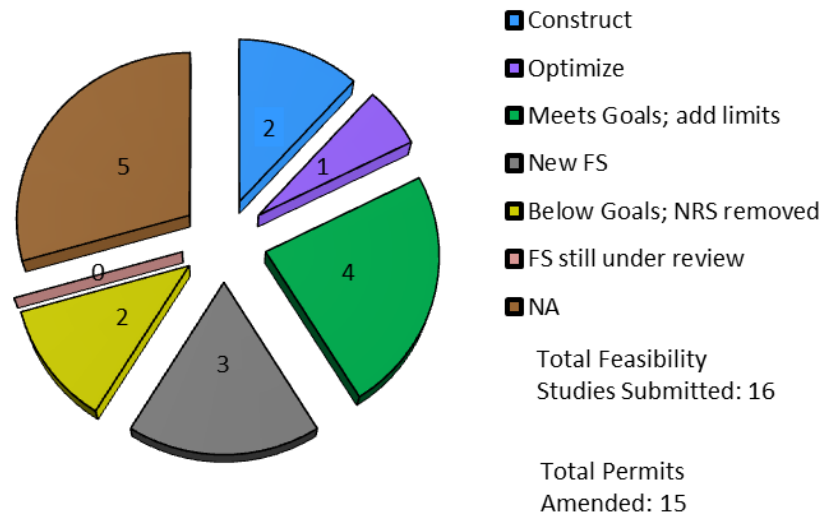
## Nitrogen Municipal Commitments From Feasibility Studies



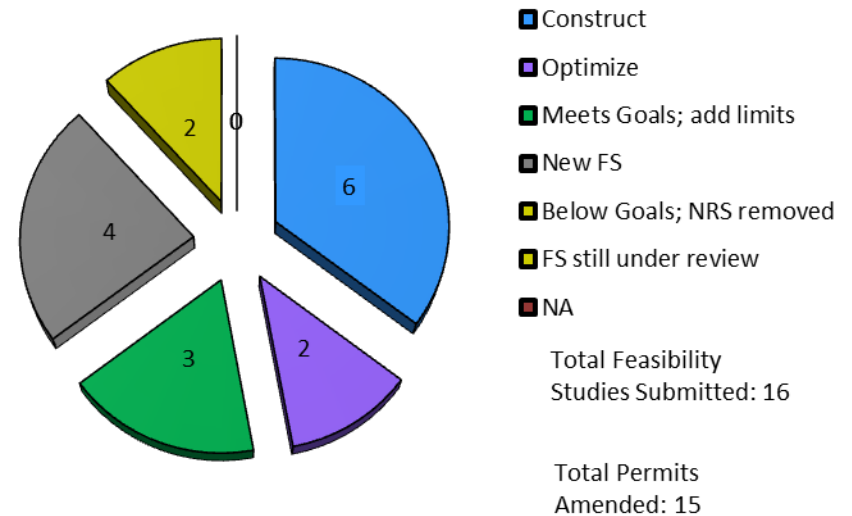
## Phosphorus Municipal Commitments From Feasibility Studies



## Nitrogen Industrial Commitments From Feasibility Studies



## Phosphorus Industrial Commitments From Feasibility Studies



# 2017 reporting year (5/1/2016-4/30/2017)

## percent removal (concentration)

	Facility	%		Facility	%
<b>Municipal</b>			<b>Industrial</b>		
<b>Nitrogen</b>	ATLANTIC CITY OF STP	78.1	<b>Nitrogen</b>	ARCHER DANIELS MIDLAND CORN	66.1
	CLEAR LAKE SANITARY DISTRICT	72.2		ASSOCIATED MILK PRODUCERS	78.8
	ELDRIDGE, CITY OF SOUTH SLOPE	68.3		GRAIN PROCESSING CORP.	88.5
	ESTHERVILLE CITY OF STP	72.0		MANILDRA MILLING CORPORATION	73.3
	IOWA CITY, CITY OF (SOUTH) STP	73.5		OSI INDUSTRIES (OAKLAND FOODS)	89.3
	MOUNT PLEASANT CITY OF STP (MAIN)	85.8		REMBRANDT ENTERPRISES, INC.	74.6
	OELWEIN CITY OF STP	91.9		SWISS VALLEY FARMS	66.0
	SIOUX CITY CITY OF STP	75.2		<b>Phosphorus</b>	DAIRICONCEPTS
	WASHINGTON CITY OF STP	73.9	MANILDRA MILLING CORPORATION		80.4
	WEST BURLINGTON CITY OF STP	72.6	REMBRANDT ENTERPRISES, INC.		83.6
	WEST LIBERTY CITY OF STP	79.3			
<b>Phosphorus</b>	CORALVILLE CITY OF STP	80.9			
	IOWA CITY, CITY OF (SOUTH) STP	82.8			
	MOUNT VERNON CITY OF STP	80.9			
	SIOUX CITY CITY OF STP	75.2			
	WEST LIBERTY CITY OF STP	79.3			



Performance by all facilities with 10 or more months of data

	Estimate (Target)	POTW	Industry
<b>Total Nitrogen (average)</b>			
number of facilities		63	9
raw waste (mg/L)	25	29.7 (range 11.9 – 83.6)	79.6 (range 16.5 – 314.6)
final effluent (mg/L)	10	16.6 (range 2.1 – 58.3)	21.7 (range 4.5 – 79.9)
% removal	66%	41.8% (range -10.0% - 91.9%)	69.0% (range 20.9% - 89.3%)
<b>Total Phosphorus (average)</b>			
		63	14
raw waste (mg/L)	4	5.1 (range 1.9 – 31.8)	20.6 (range 2.5 – 51.5)
final effluent (mg/L)	1	3.1 (range 0.7 – 24.9)	12.8 (range 0.8 – 73.0)
% removal	75%	40.5% (range -14.7% - 82.8%)	48.8% (range -41.9% - 84.8%)
<b>Annual Load Reduction (2015-2016)</b>			
Total nitrogen (tons)	-	5,069	517
Total phosphorus (tons)	-	937	273

Note: Up from 43 POTWs and 9 industries in December 2016

Performance by treatment type for facilities with 10 months or more of data for 2016-2017 reporting cycle.

Treatment Type	No.	Total Nitrogen			Total Phosphorus		
		Raw (mg/L)	Final (mg/L)	%R	Raw (mg/l)	Final (mg/L)	%R
<b>POTW</b>	63						
Aerated Lagoon	3	22.5	10.6	53.8%	3.9	2.2	44.3%
Activated Sludge	25	33.6	20.0	39.1%	6.0	3.4	45.0%
Rotating Biological Contactor	6	21.3	12.3	40.3%	3.2	2.3	29.8%
Sequencing Batch Reactor	9	28.4	9.5	69.0%	5.2	2.4	55.3%
Trickling Filter	20	29.2	17.6	31.6%	4.9	3.4	30.8%
<b>Industry</b>	9						
Aerated Lagoon	2	167.9	42.2	76.7%	19.8	3.9	78.2%
Activated Sludge	6	52.4	17.2	63.1%	18.9	9	55.6%
Rotating Biological Contactor	0	-	-	-	-	-	-
Sequencing Batch Reactor	1	66.8	7.2	89.3%	51.5	73.0	-41.9%
Trickling Filter	0	-	-	-	-	-	-

# Examples of point source progress

- Cedar Rapids
- Des Moines WRA
- Sioux City
- Tyson Fresh Meats
- Clinton

## Looking forward...

- Continue to update the list of affected facilities in the INRS
- Issue permits to the remaining facilities listed in the INRS
- Review nutrient feasibility studies as they are submitted and amend NPDES permits to include construction schedules for installing nutrient reduction treatment technologies.
- Continue to analyze raw waste and final effluent data for nutrients as data from more facilities becomes available
- Incorporate baseline efforts, recalculate load reduction based on actual data
- Year 5 Refresh

# What questions do you have?



Adam Schnieders

515.725.8403

[adam.schnieders@dnr.iowa.gov](mailto:adam.schnieders@dnr.iowa.gov)