IDDE Sampling: Do single grab samples tell the story?

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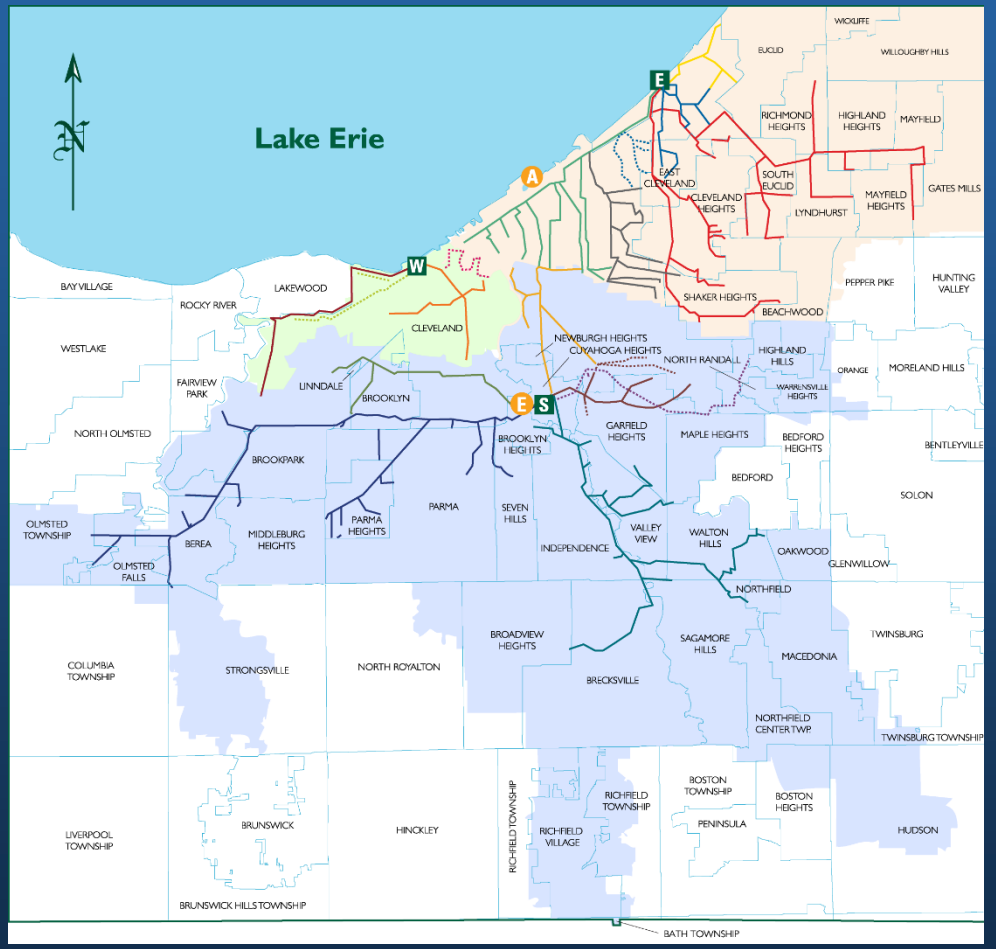
Northeast Ohio Regional Sewer District

NEORSD- What we do…

- Collection and treatment of wastewater for all or part of 62 communities, >1 million customers



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Illicit Discharge Detection and Elimination (IDDE)

- Required for community MS4 permits for storm sewer systems
- NEORSD assists local communities in tracing efforts for sewage based IDDE investigations
- Communities are responsible for residential dye testing confirmation and remediation of illicit discharges
- NEORSD may provide financial assistance through our stormwater program

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IDDE Methods

- *E. coli* sampling and flow measurements at storm sewer outfall
- Upstream *E. coli* sampling in storm sewer collection system to bracket source
- Video monitoring and/or dye testing confirmation of illicit discharge
- Remediation… (slow process: multi-agency involvement)
- Follow-up *E. coli* sampling to confirm remediation

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Background

- IDDE Program currently relies on *E. coli* samples and flow measurements to determine level of concern.
- *E. coli* samples are also used to determine the effectiveness of remediation efforts.
- Single-sample grab samples are collected during dry-weather flow.

Table 2. Loading scores for selected flows and *E. coli* densities

	E. coli Density (cfu/100mL)																		
Flow (GPD)	0	100	500	501	1000	1001	2000	2500	2501	3000	3500	4000	4500	5000	5001	6000	7000	8000	9000	10000	>10000
0	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
100	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
200	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
300	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
400	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
500	1	1	1	2	2	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6
501	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
600	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
700	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
800	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
900	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
1,000	2	2	2	4	4	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	12
1,001	3	3	3	6	6	9	9	9	12	12	12	12	12	12	15	15	15	15	15	15	18
2,000	3	3	3	6	6	9	9	9	12	12	12	12	12	12	15	15	15	15	15	15	18
2,500	3	3	3	6	6	9	9	9	12	12	12	12	12	12	15	15	15	15	15	15	18
2,501	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
3,000	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
3,500	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
4,000	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
4,500	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
5,000	4	4	4	8	8	12	12	12	16	16	16	16	16	16	20	20	20	20	20	20	24
5,001	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
6,000	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
7,000	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
8,000	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
9,000	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
10,000	5	5	5	10	10	15	15	15	20	20	20	20	20	20	25	25	25	25	25	25	30
10,001	6	6	6	12	12	18	18	18	24	24	24	24	24	24	30	30	30	30	30	30	36
15,000	6	6	6	12	12	18	18	18	24	24	24	24	24	24	30	30	30	30	30	30	36
20,000	6	6	6	12	12	18	18	18	24	24	24	24	24	24	30	30	30	30	30	30	36
25,000	6	6	6	12	12	18	18	18	24	24	24	24	24	24	30	30	30	30	30	30	36
>25,000	Highest Priority																				

Priority Level 1 | Priority Level 2 | Priority Level 3 | Priority Level 4 | Priority Level 5 | Priority Level 6

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Purpose of Study

- Determine variation of pollutants and flow over the course of a day.
  - Flow and pollutant density most likely vary greatly throughout the day due to the intermittent nature of most illicit discharges.
  - Data from single-sample grabs may lead to improper conclusions if the level of variation throughout the day is unknown.
- Determine downstream impact.

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Sampling Sites

AMH10030

Small Collection System

Limited Sources

BGMB0600

Large Collection System

Multiple Sources

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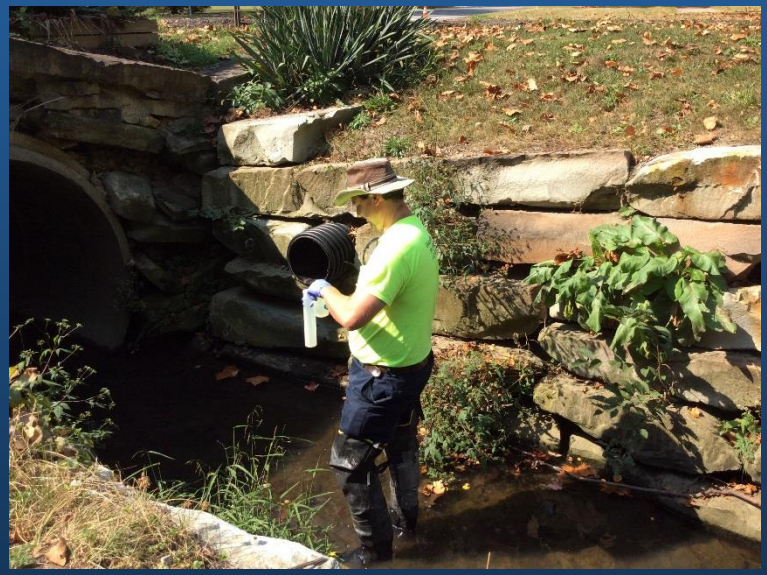
Sampling Sites Continued…

ACMB0530

Small Collection System

Limited Sources



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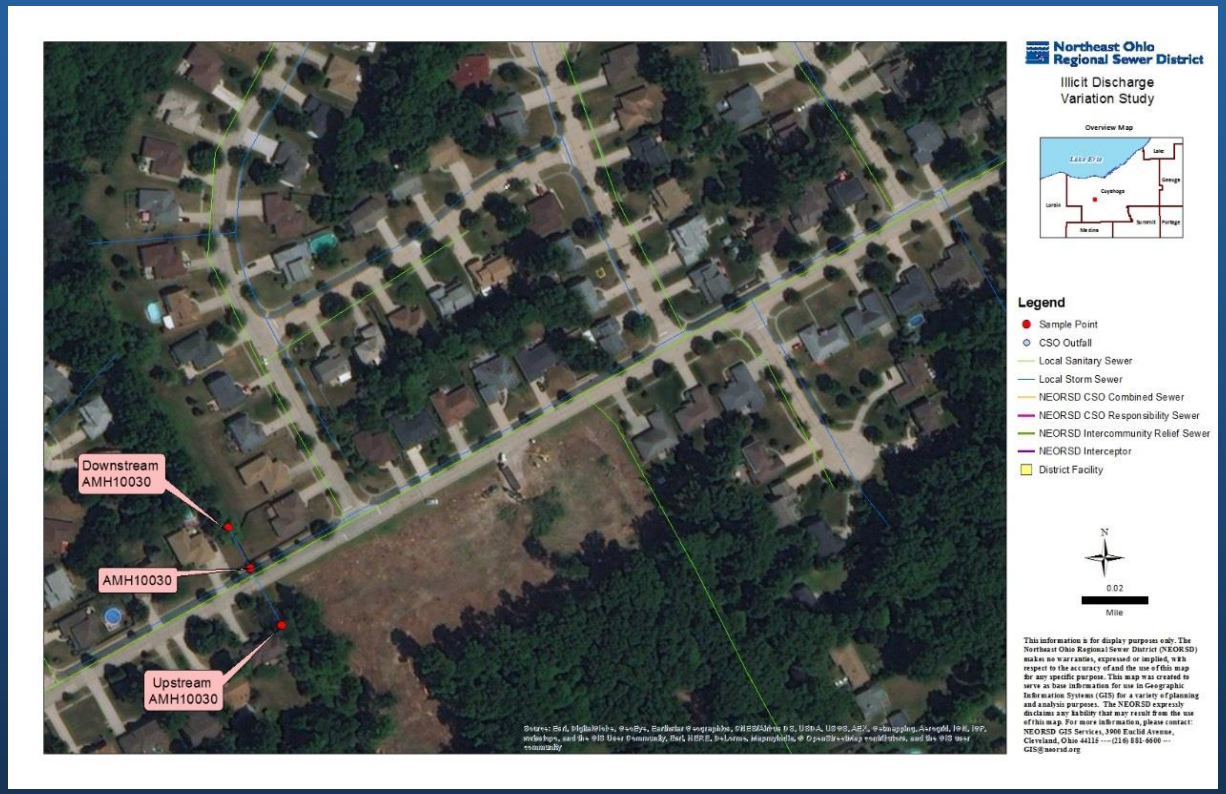
Sampling Site Maps



- AMH10030
- Abram Creek Tributary
- Middleburg Hts.
- Under Newton Road

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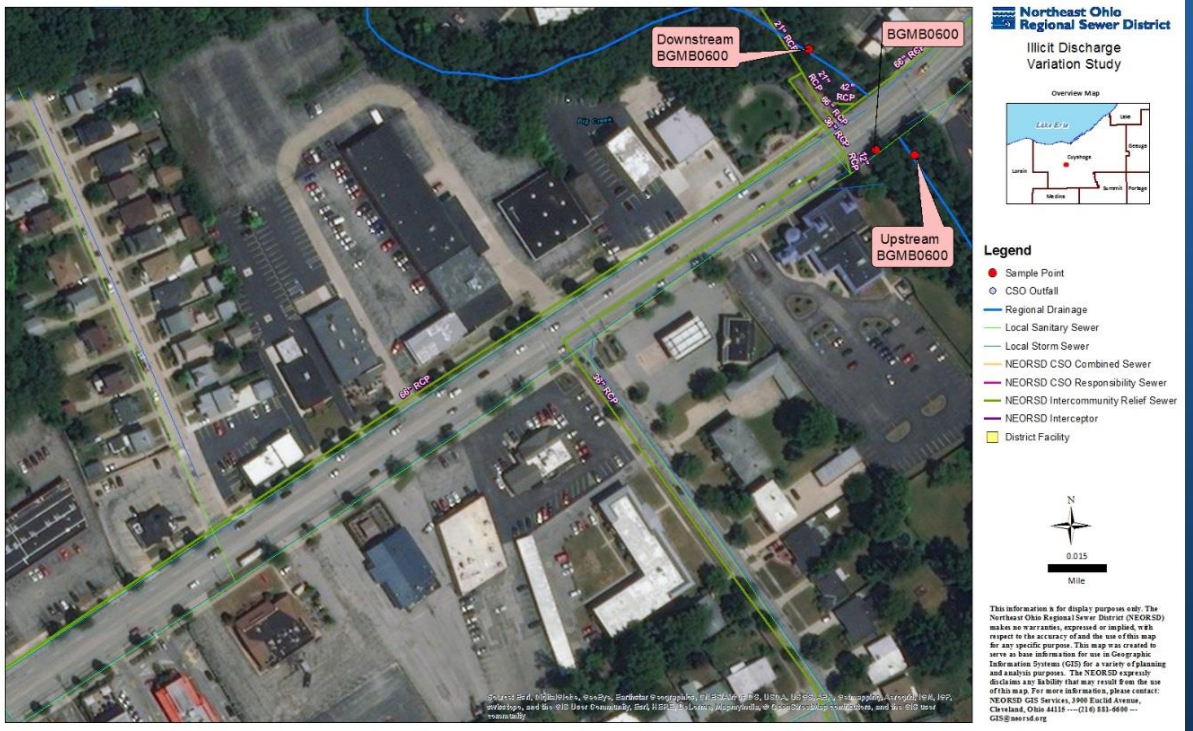
Sampling Site Maps



- BGMB0600
- Big Creek
- Parma Heights
- Under Pearl Road Bridge

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Sampling Site Maps

- ACMB0530
- Abram Creek Main Branch
- Middleburg Heights
- Big Creek Parkway and Hickox Blvd.

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Methods

- Grab samples for *E. coli* and Total Phosphorus
- Data sonde measurements for dissolved oxygen, pH, conductivity, and temperature with YSI EXO1
- Turbidity samples ran in the field with HACH 2100Q
- Flow taken with bucket and stopwatch

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Sampling Schedule

- Collected grab samples from the outfall every 30 minutes
- Collected grab samples from upstream and downstream and field parameters every hour
- 1 dry-weather event at each outfall (6/30/2016, 9/1/2016)
- 1 wet-weather event at AMH10030 (10/20/16)

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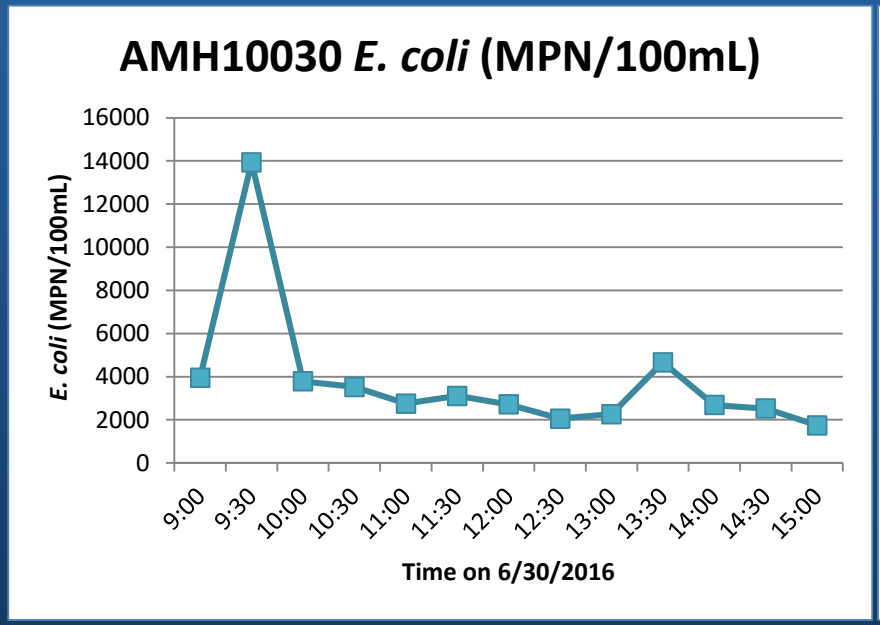
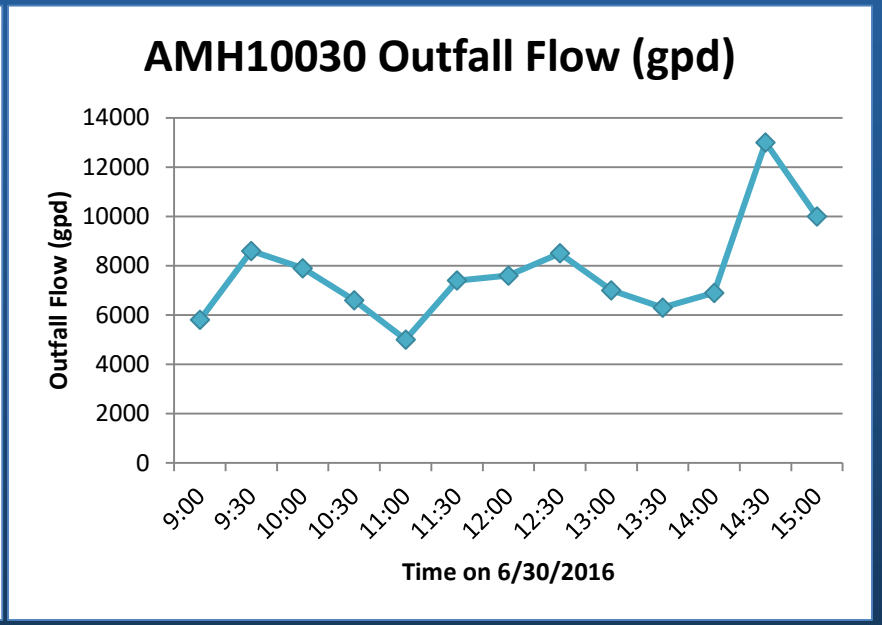
AMH10030 Results





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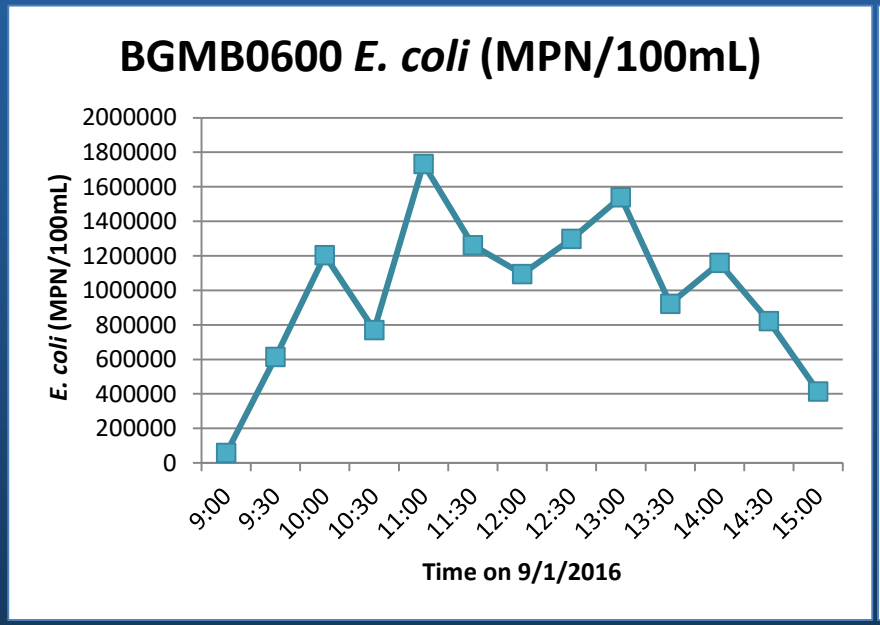
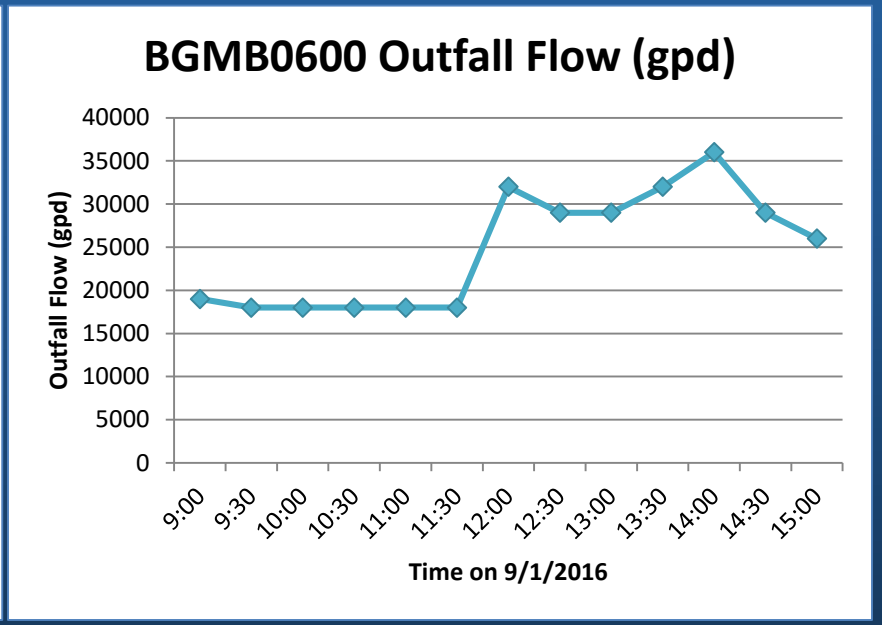
BGMB0600 Results





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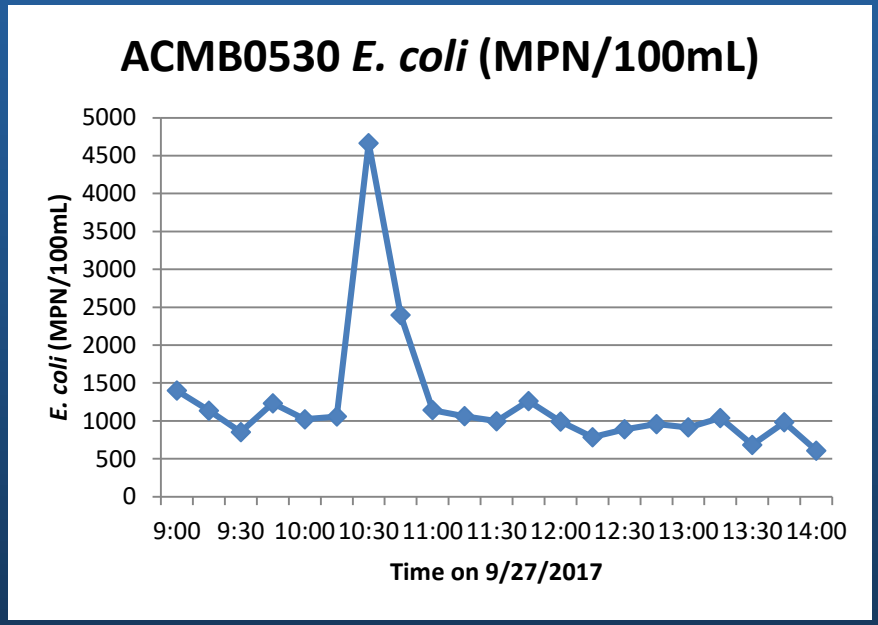
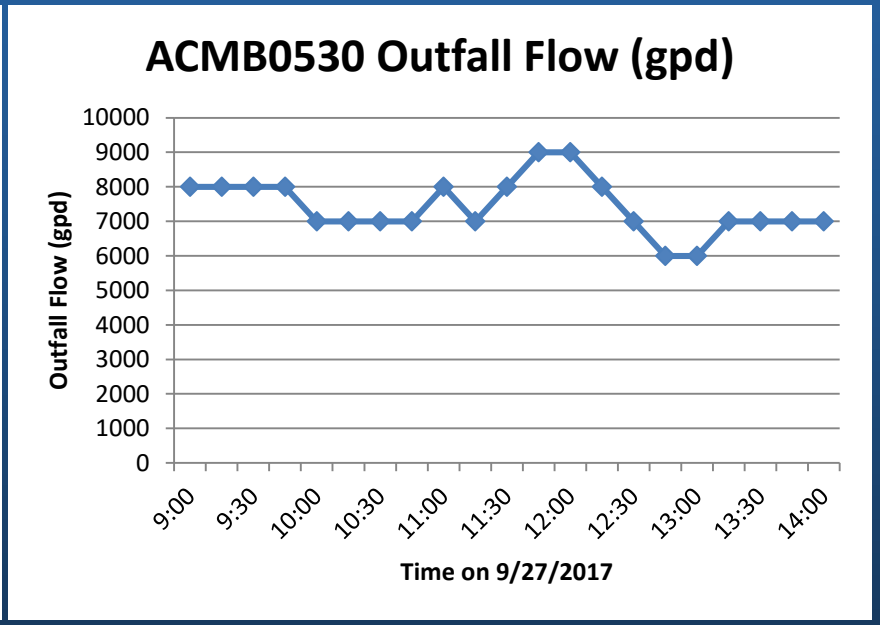
ACMB0530 Results





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Outfall *E. coli* Stats

Table 2. Statistical Results of *E. coli* Sampling (MPN/100mL)			
Site	**AMH10030**	**BGMB0600**	**ACMB0530**
Average	3,823	991,262	1,241
Standard Deviation	3,148	459,597	861
Percent Standard Deviation	82.4%	46.4%	69.4%
Range	1,742-13,940	57,300-1,732,900	608- 4,665
Geomean	3,241	801,616	1,103

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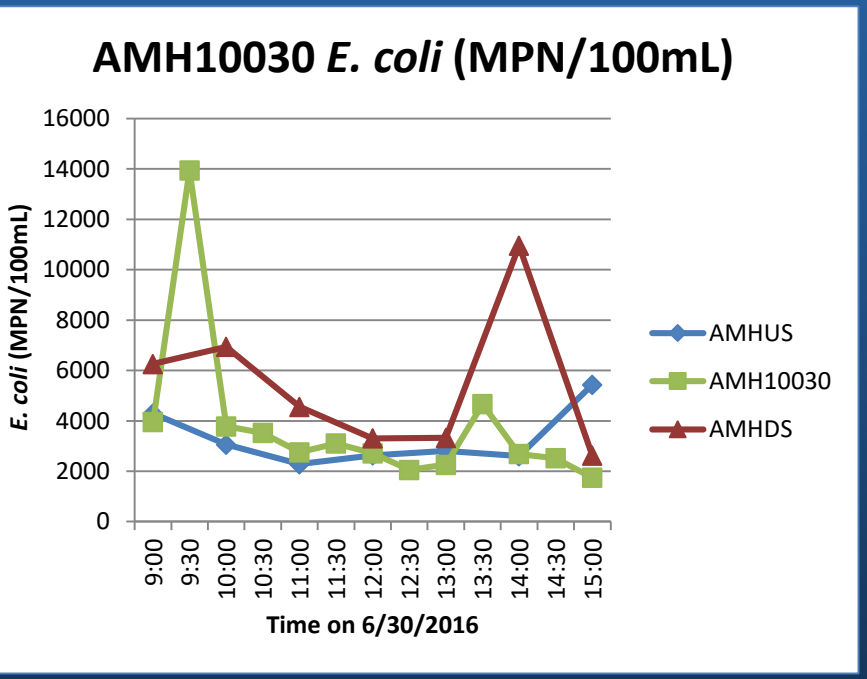
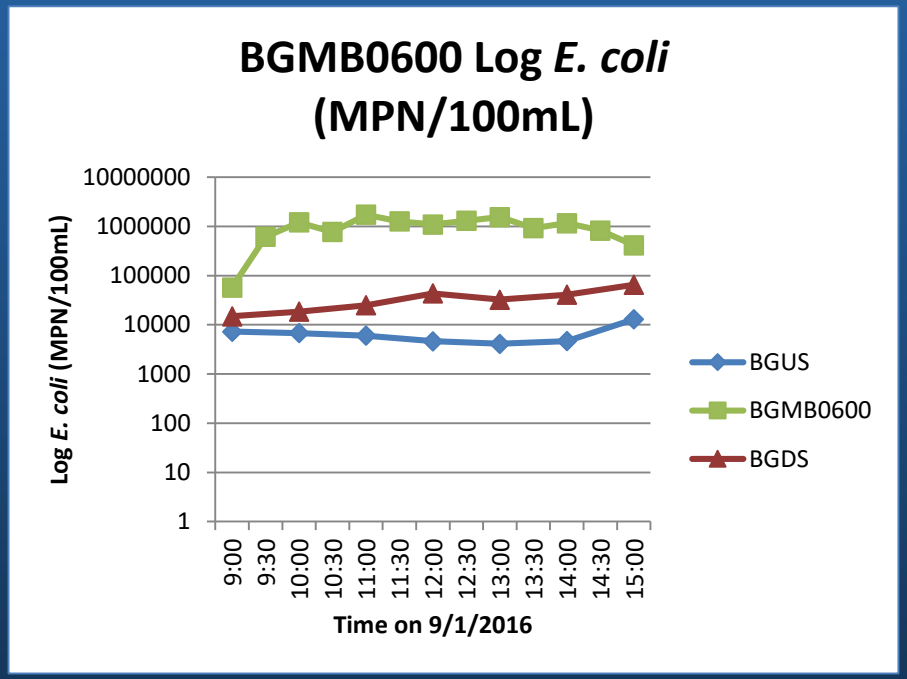
E. coli Downstream Impacts





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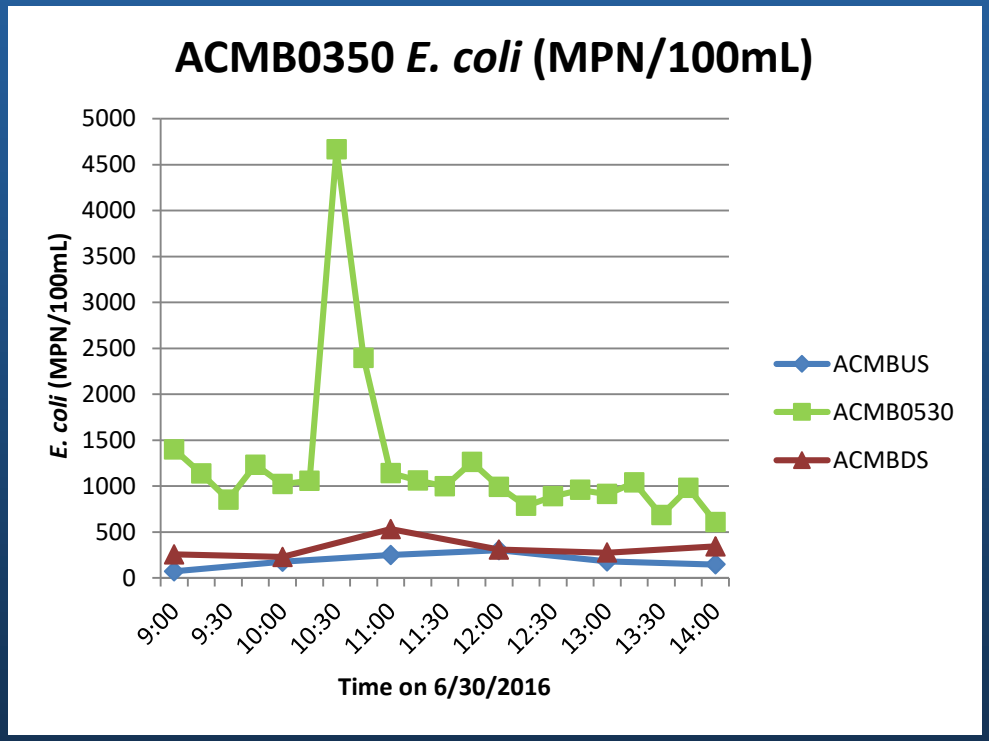
E. coli Downstream Impacts



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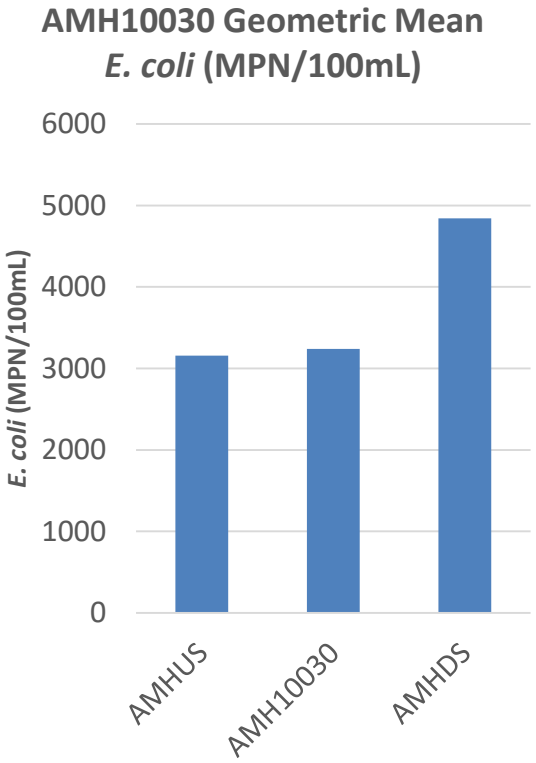
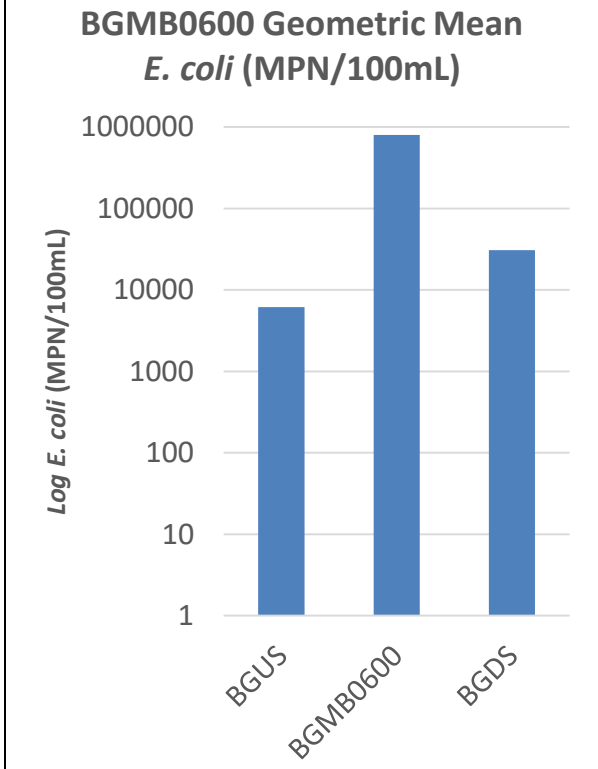
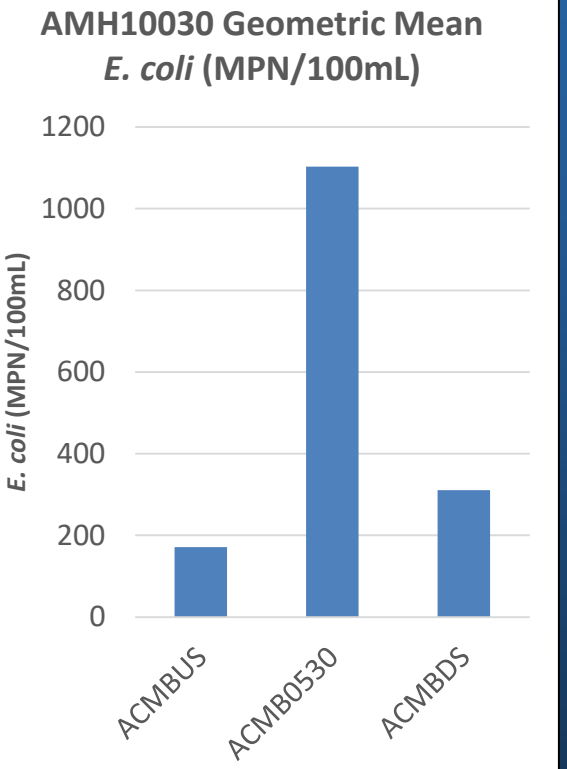
E. coli Geometric Means







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Conclusions

- High levels of *E. coli* density variation occur throughout the day.
- Determine the time of day that would best represent the highest flow based upon land use.
- Post-remediation video monitoring and/or dye testing in addition to grab samples is essential.
- The observed impacts to downstream locations emphasizes the importance of IDDE programs.

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Contact Information

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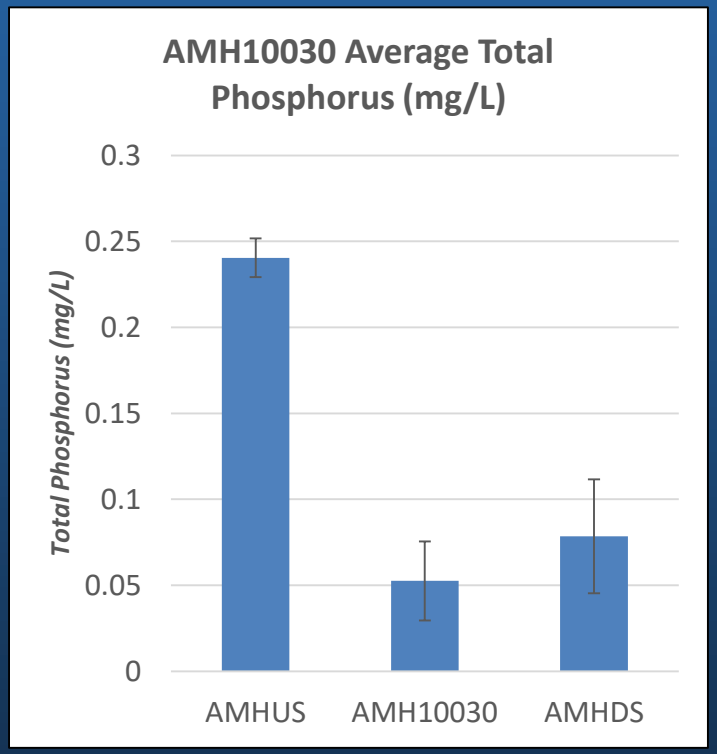
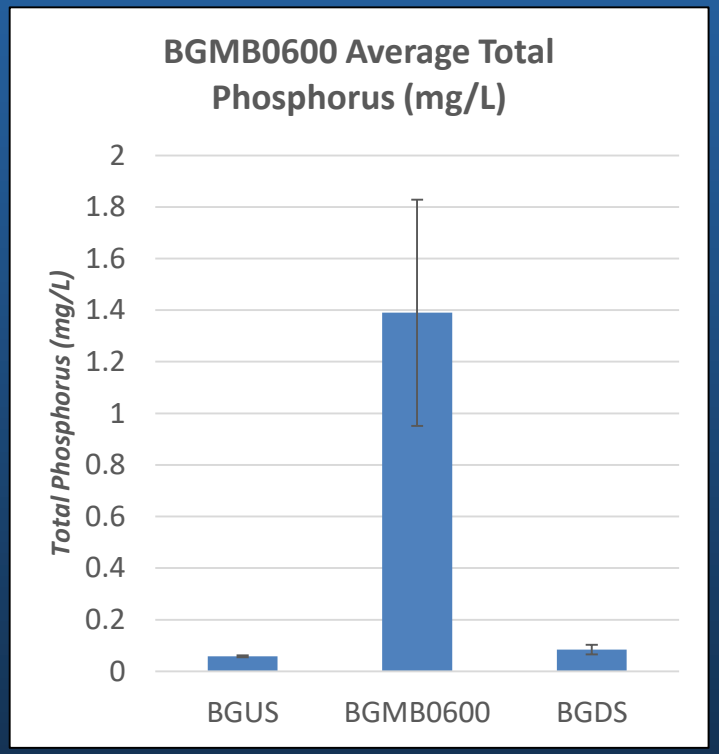
Total Phosphorus Results





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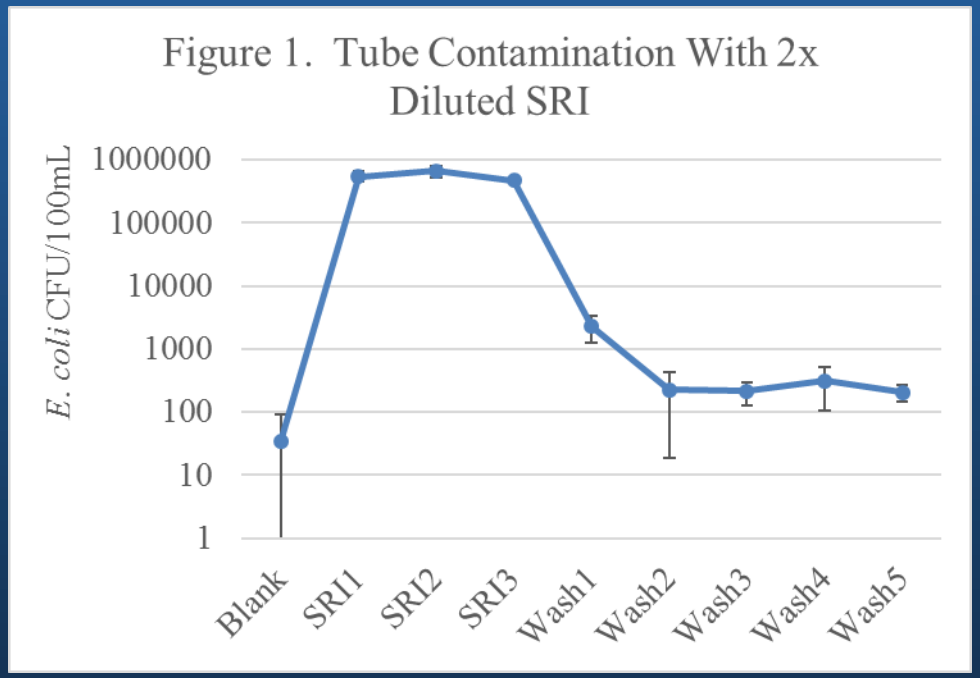
Automated Bacti Sampling Contamination Study



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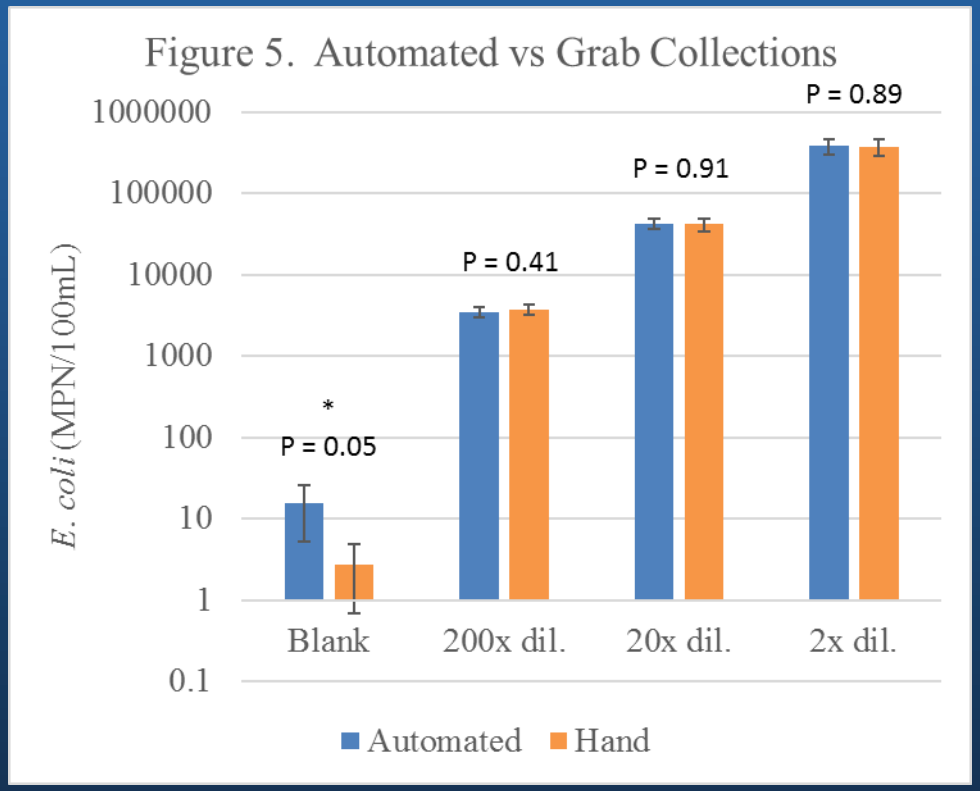
Automated vs. Grab *E. coli* Sampling



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