WHAT IS A TMDL?
Total Maximum Daily Load

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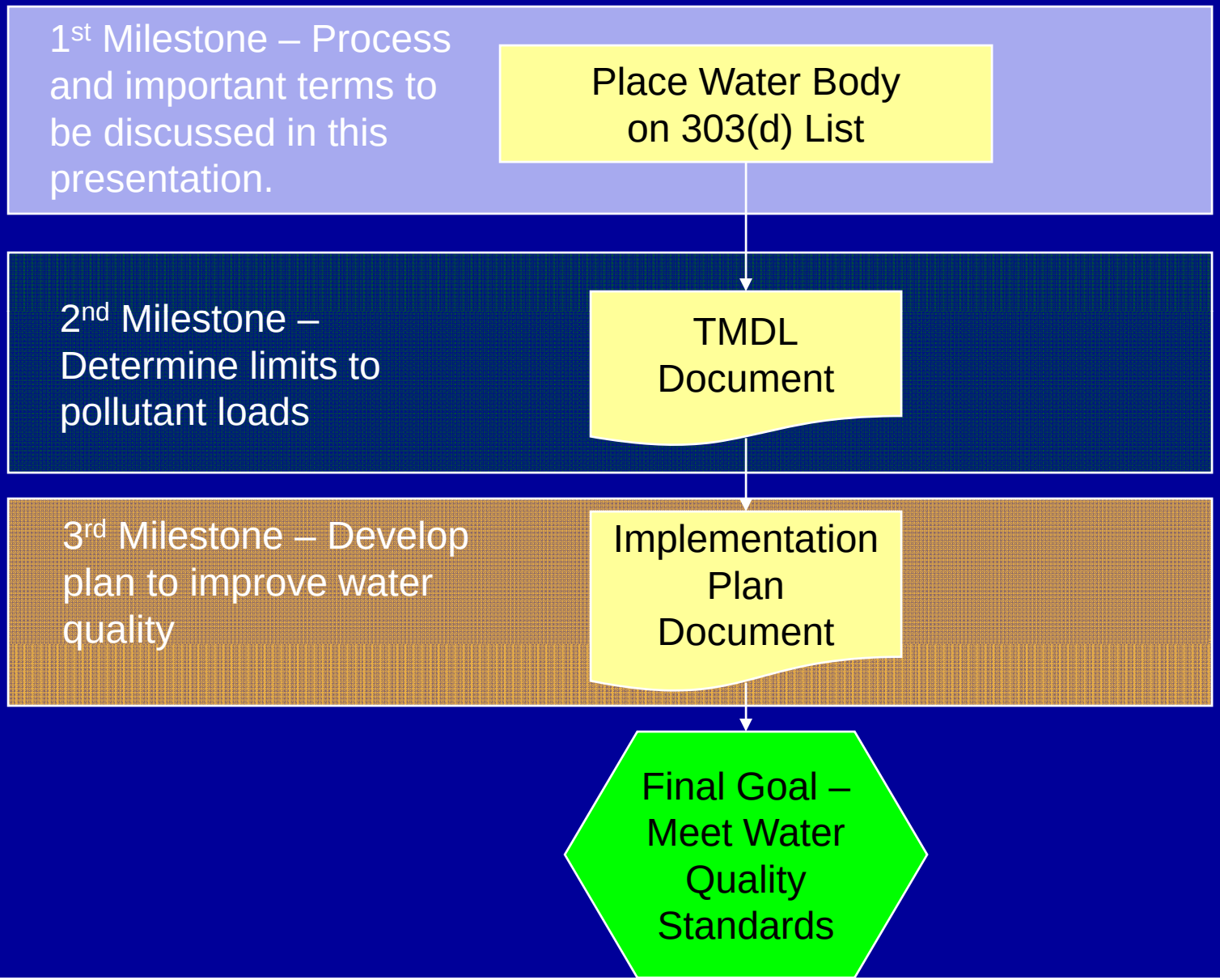
Total Maximum Daily Load (TMDL)

REQUIRED BY CLEAN WATER ACT

A TMDL equation specifies the maximum amount (load) of a pollutant that a water body can receive while still meeting water quality standards. The TMDL document allocates pollutant loadings among sources.

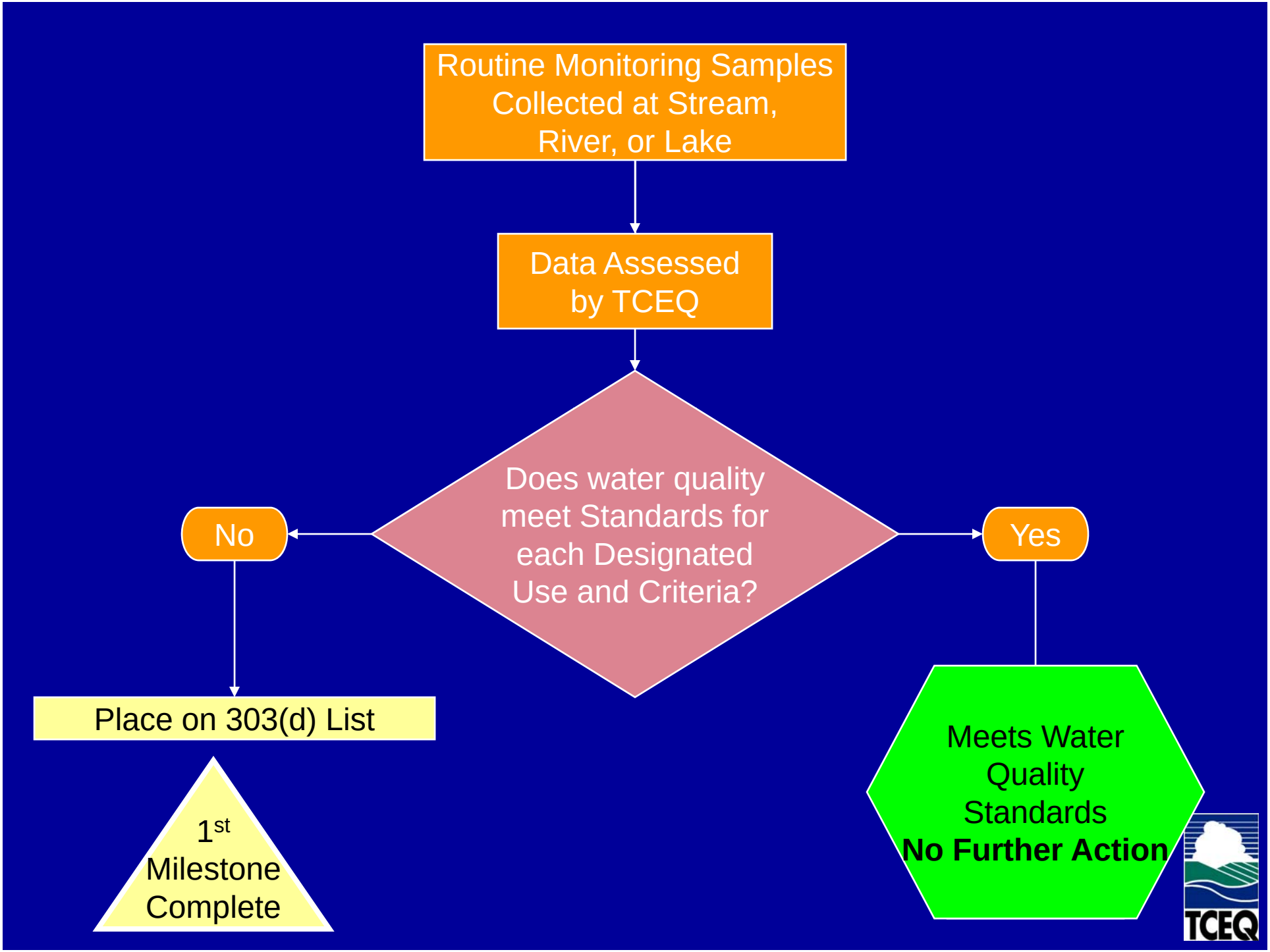
Example – A mug can only hold a specific amount of coffee before reaching its capacity.

TMDL Process Milestones



303(d) List

1. “List of Impaired Water Bodies”
2. List of water bodies not meeting Water Quality Standards, required by the Clean Water Act and approved by the EPA.
3. TCEQ assesses water quality biennially.
4. If sufficient data is available and levels exceed water quality standards, the water body is listed as impaired on the 303(d) list.


Routine Monitoring Samples Collected at Stream, River, or Lake
Data Assessed by TCEQ
Does water quality meet Standards for each Designated Use and Criteria?
No
Yes
Place on 303(d) List
1st Milestone Complete
Meets Water Quality Standards
No Further Action
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Water Quality Standards

- Water Quality Standards - define the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. *From 40 CFR Section 130.3*

- Components
  - Designated Uses
    - Contact Recreation, Water Supply, Aquatic Life Use, Non-contact Recreation
  - Criteria – limit numeric pollutant concentrations
    - Geometric Mean, Single Sample Maximum, 24-hour measurments
  - Pollutant Parameters
    - Bacteria, PCBs, Nutrients, Metals, etc.

Designated Use

- Contact Recreation - Recreational activities involving a significant risk of ingestion of water, including wading by children, swimming, water skiing, diving, and surfing. *From 30 TAC §307.3(a)(12)*

- Contact recreation criteria apply to all bodies of freshwater except where specifically designated otherwise in §307.10 of TAC.

Changing the Designated Use

- Designated Use can only be changed if a Use Attainability Analysis confirms that an alternative use is applicable. Designated Use changes must be approved by EPA.
- Secondary form of Contact Recreation is not assigned to any water body in the current WQS's.
- For more information on the history of Designated Uses - See Standards Table.

Criteria for Contact Recreation

- Texas Criteria for Bacteria (*E. coli)*
  - Geometric Mean (126 cfu/100mL)
  - Single Sample Max (less than 25% of sample exceed 394 cfu/100mL)

- States must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. *From 40 CFR Section 131.11*

What if Water Quality Standards Change?

- Approved TMDLs will be revised to reflect any future changes in Water Quality Standards.
  - This includes changes in designated use and criteria.
  - However, TMDLs will not be delayed in anticipation of a change in Water Quality Standards.

Where Are We Now?

1. Water bodies in this watershed are on Impaired Water Body List - 303(d)

2. Review of data and preliminary sampling have been conducted

3. TMDL limits are being determined

Background and Indicator Bacteria Data

Greens/Halls Bayous

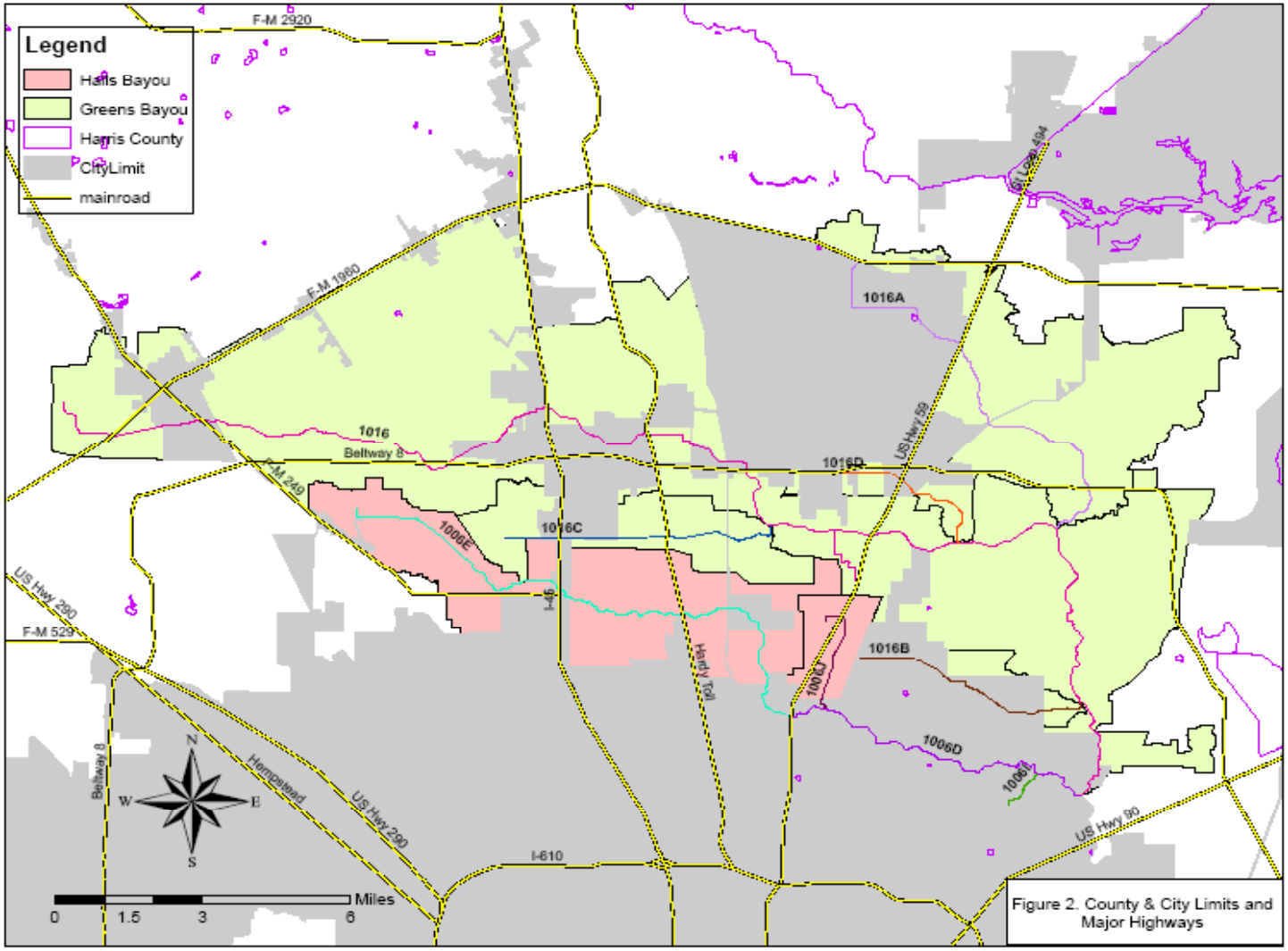

Figure 2. County & City Limits and Major Highways

Greens/Halls Bayou WQ Segments

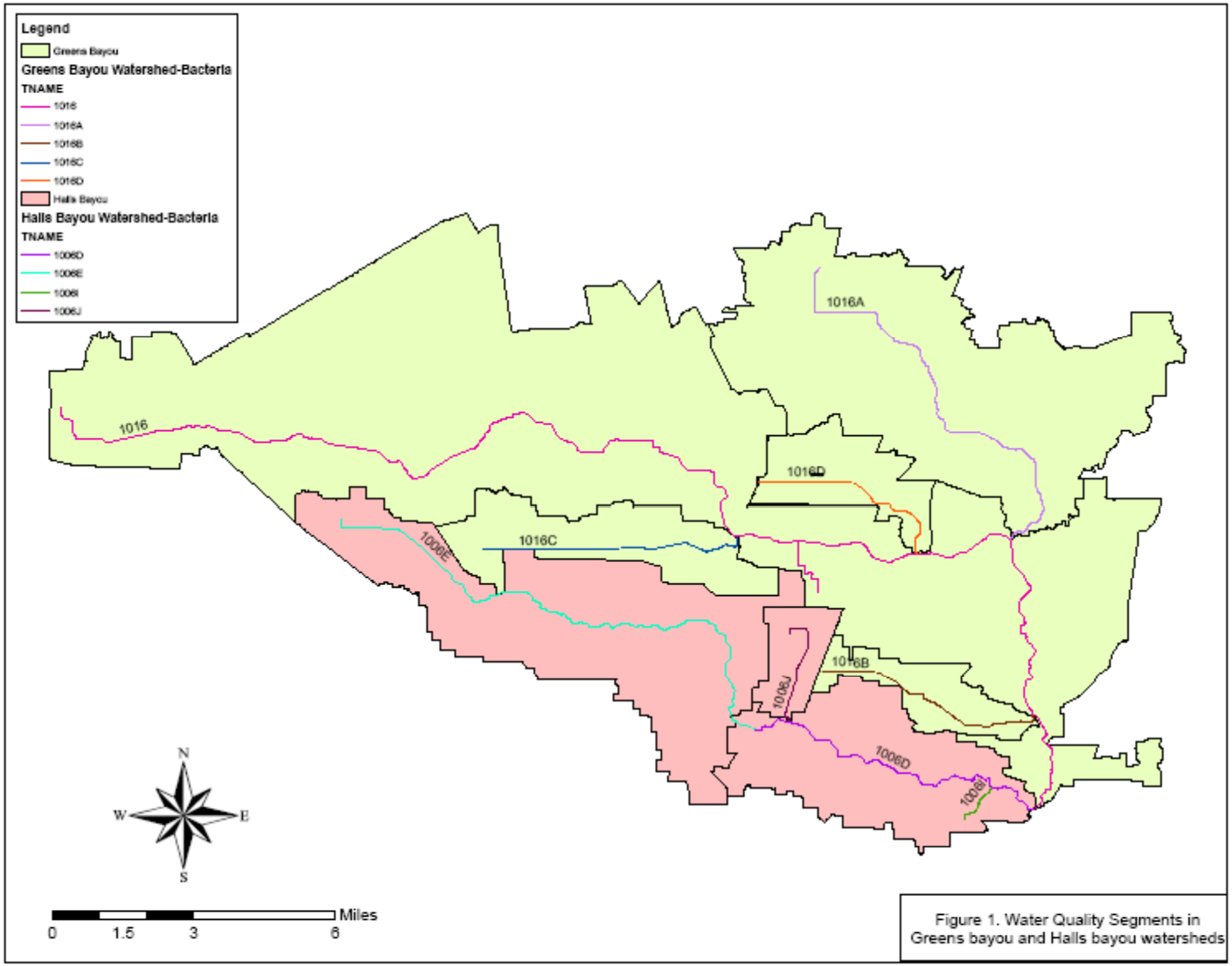

Figure 1. Water Quality Segments in Greens bayou and Halls bayou watersheds

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Greens/Halls Bayou WQ Segments

1016	Greens Bayou Above Tidal
1016A	Garners Bayou
1016B	Unnamed Tributary of Greens Bayou
1016C	Unnamed Tributary of Greens Bayou
1016D	Unnamed Tributary of Greens Bayou
1006D	Halls Bayou
1006E	Halls Bayou Above US 59
1006I	Unnamed Tributary of Halls Bayou
1006J	Unnamed Tributary of Halls Bayou

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Greens/Halls Bayou Watersheds

- Located in north Harris County and encompasses portions of the cities of Houston and Humble.
- The upper reach flows in an eastward direction and the lower reach flows southward into the Houston Ship Channel.
- Covers about 212 square miles and includes four primary streams: Greens Bayou, Halls Bayou, Garners Bayou and Reinhardt Bayou.
- The estimated population is nearly 398,000.

Greens/Halls Bayous Landuse/Landcover

Highly developed with some large undeveloped areas. Construction of residential/commercial developments is expected to continue in northern and western parts.

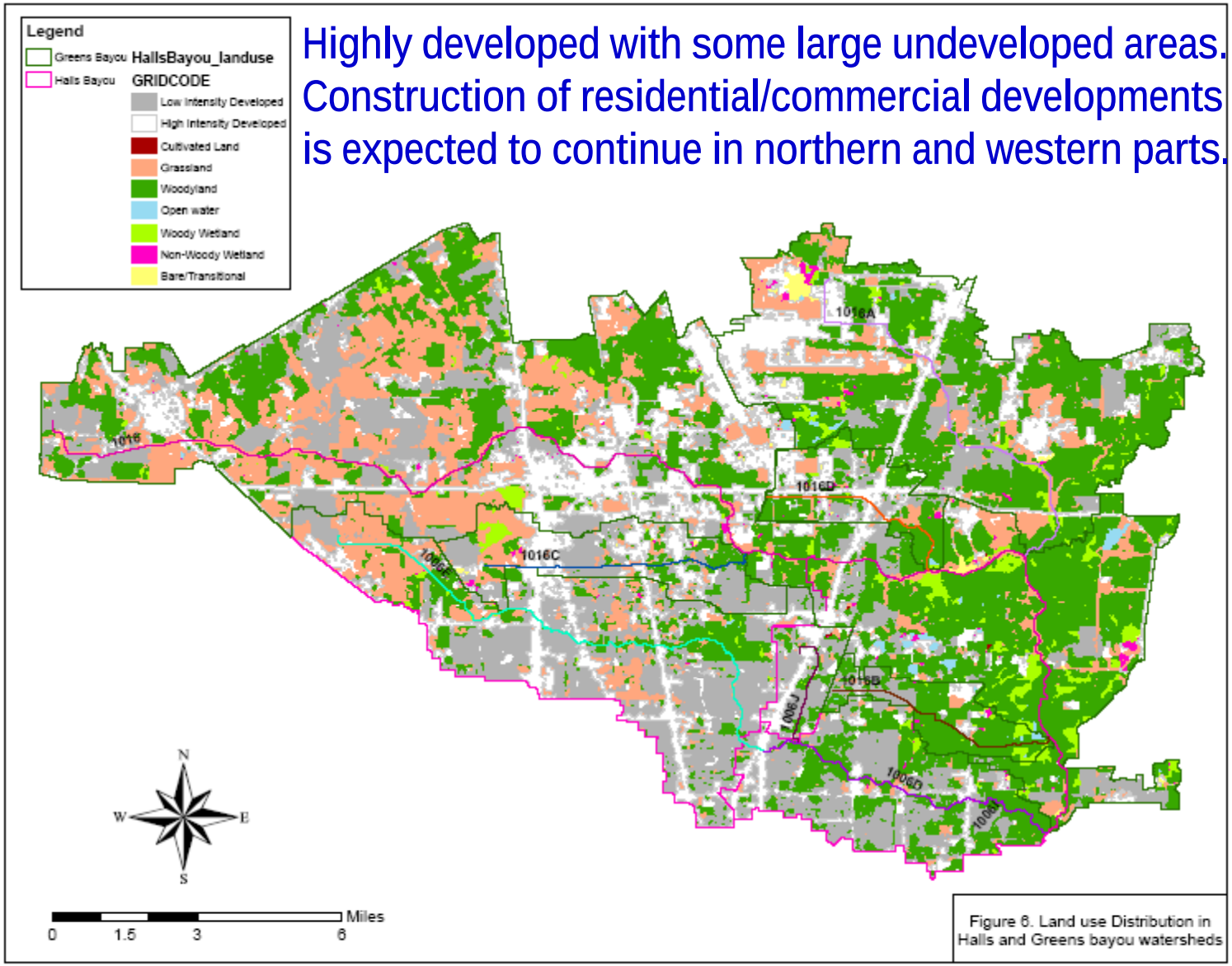

Figure 6. Land use Distribution in Halls and Greens bayou watersheds

Greens/Halls Bayous Soils

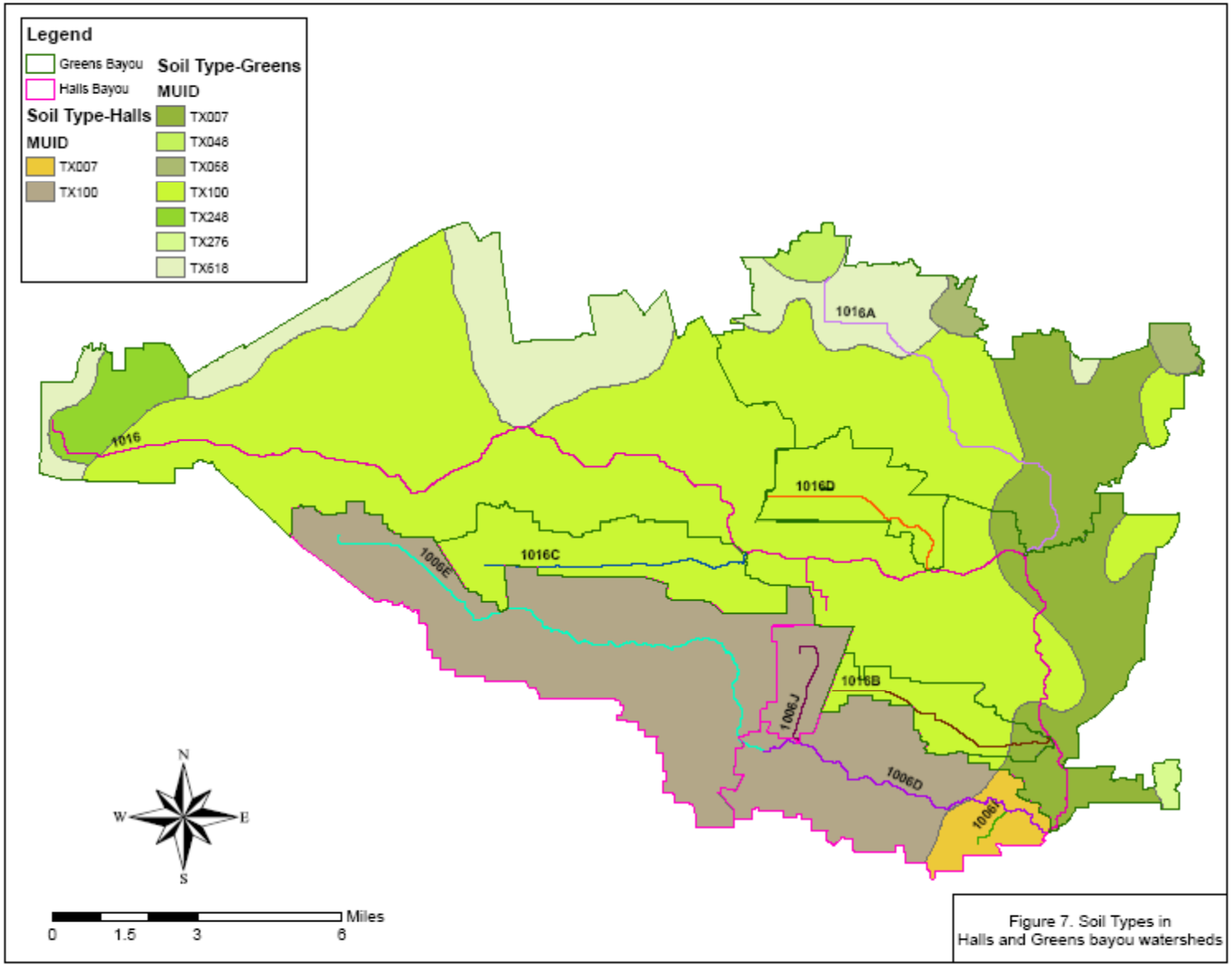

Figure 7. Soil Types in Halls and Greens bayou watersheds

Greens/Halls WQ Stations

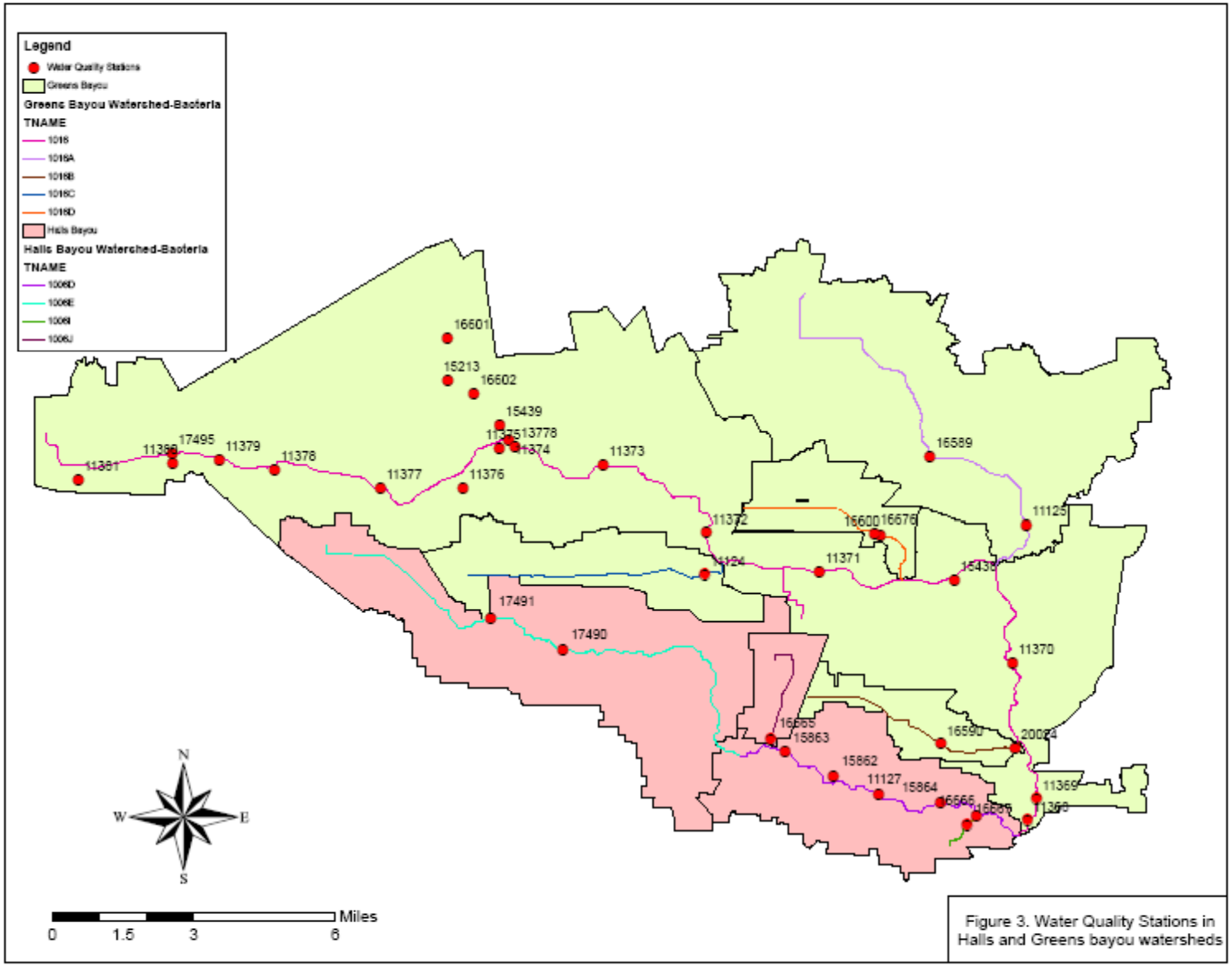

Figure 3. Water Quality Stations in Halls and Greens bayou watersheds

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Greens/Halls Bayous USGS Flow Gages

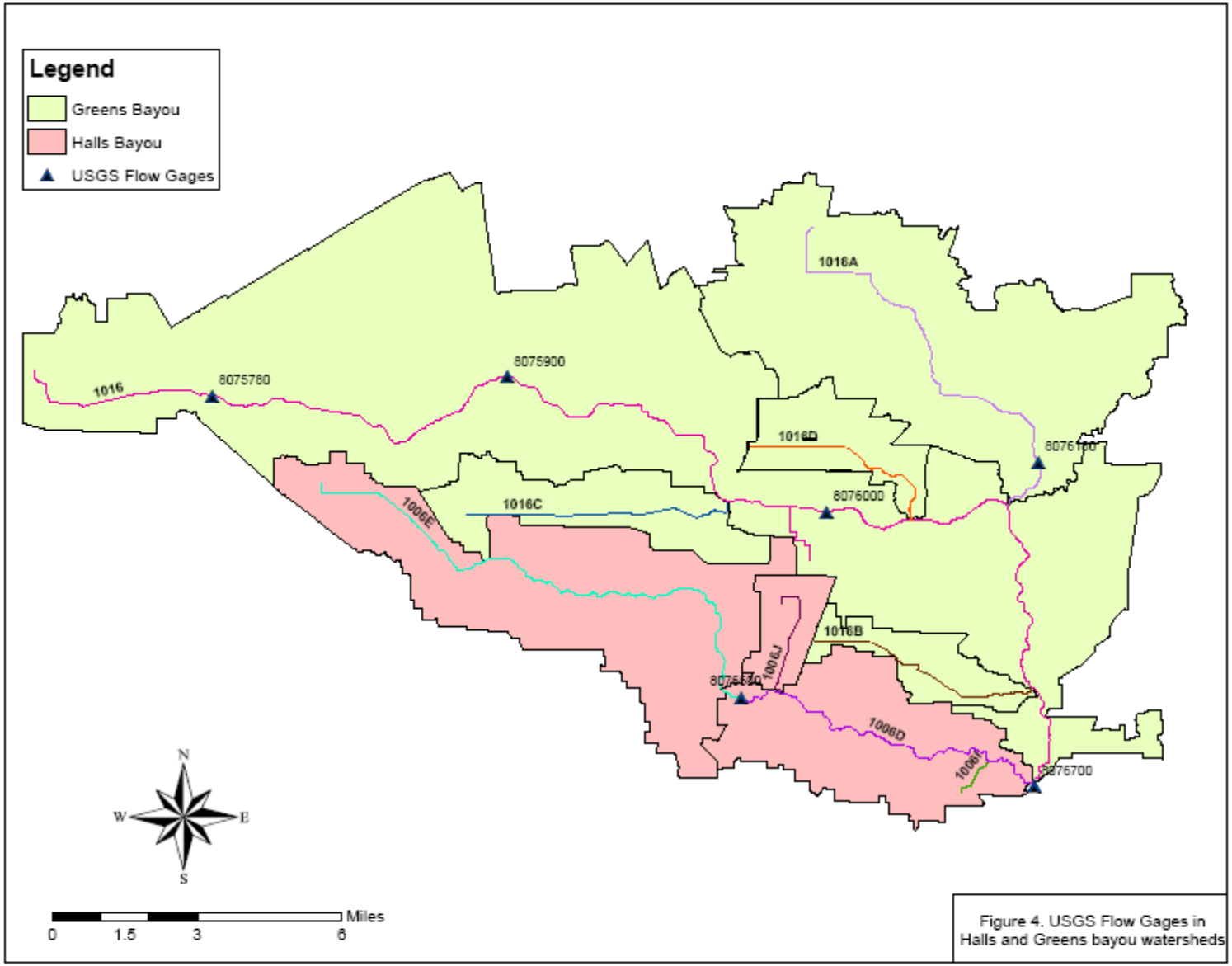

Figure 4. USGS Flow Gages in Halls and Greens bayou watersheds

Greens/Halls Bayous Rain Gages

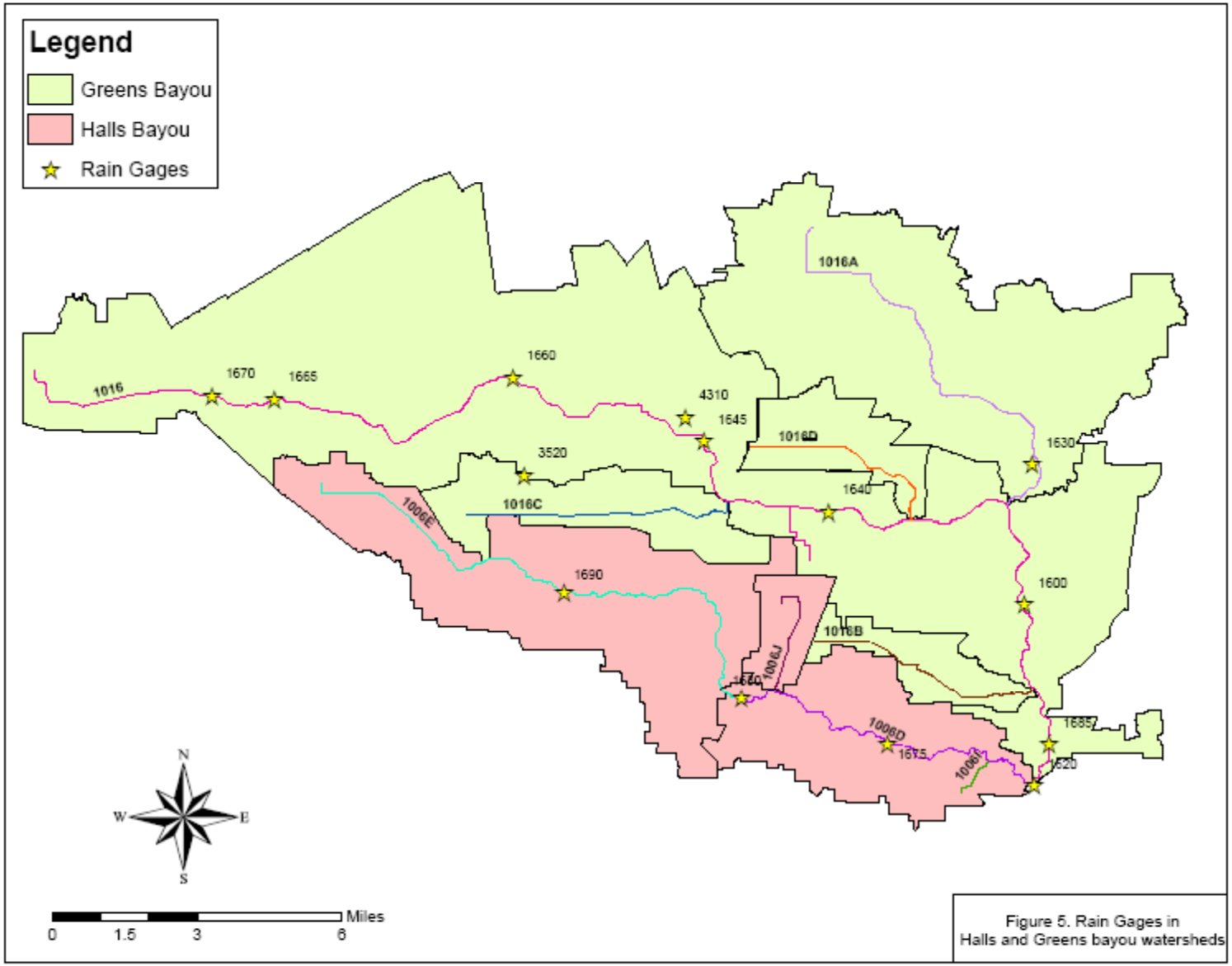

Figure 5. Rain Gages in Halls and Greens bayou watersheds

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Greens/Halls Bayous Permitted Dischargers

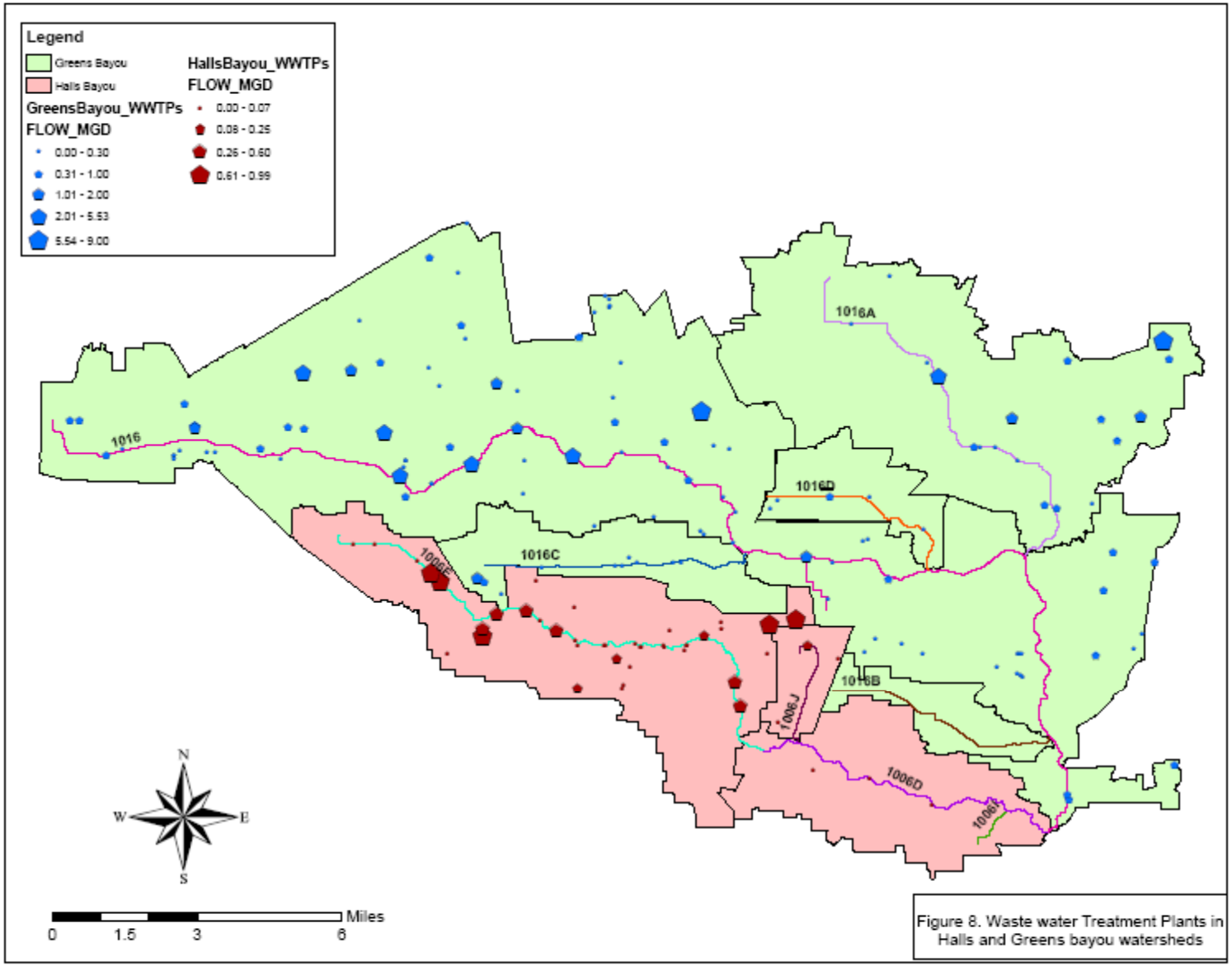

Figure 8. Waste water Treatment Plants in Halls and Greens bayou watersheds

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Greens/Halls Bayous E. Coli Geo. Means

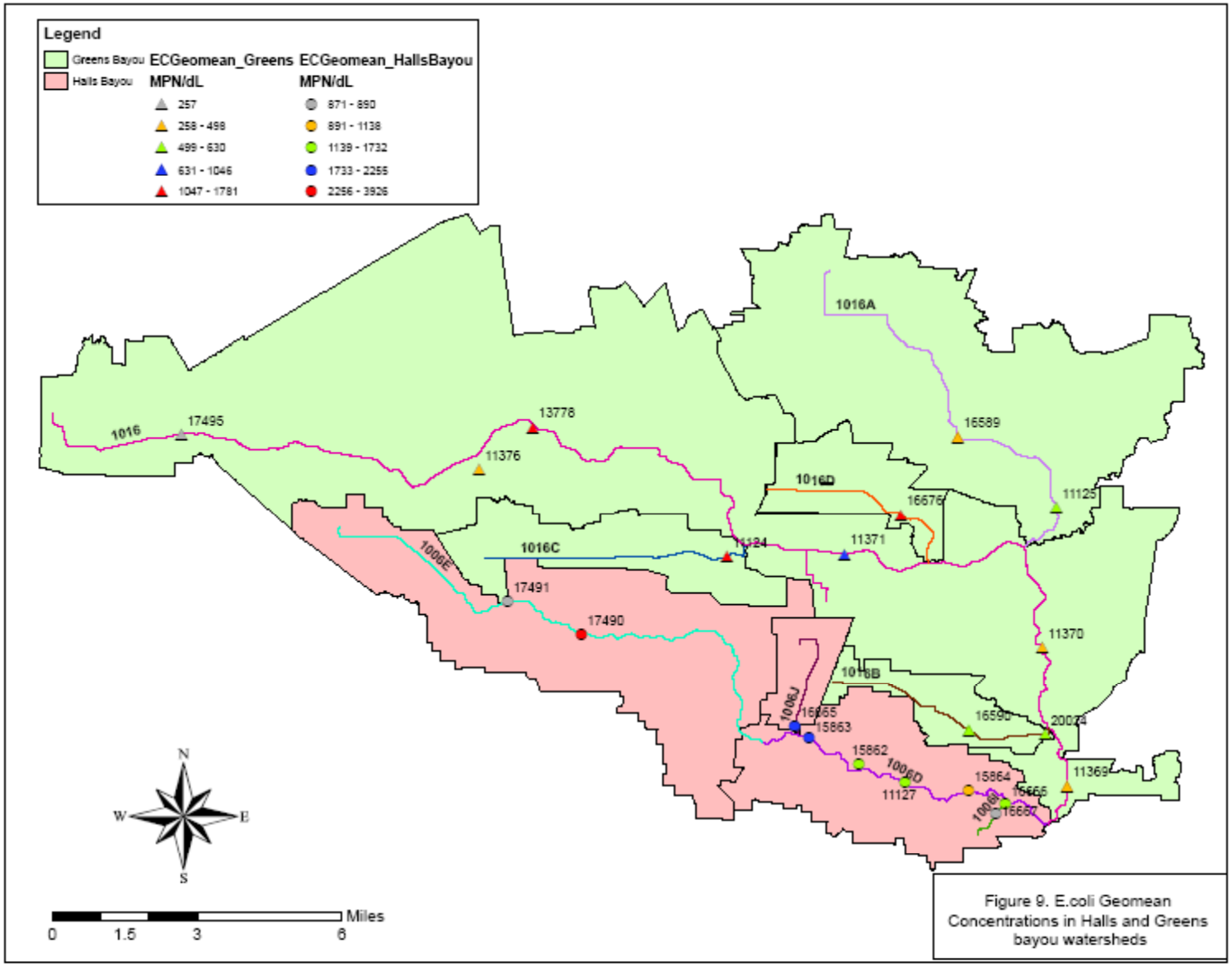

Figure 9. E.coli Geomean Concentrations in Halls and Greens bayou watersheds

Greens/Halls Bayous Fecal Geomeans

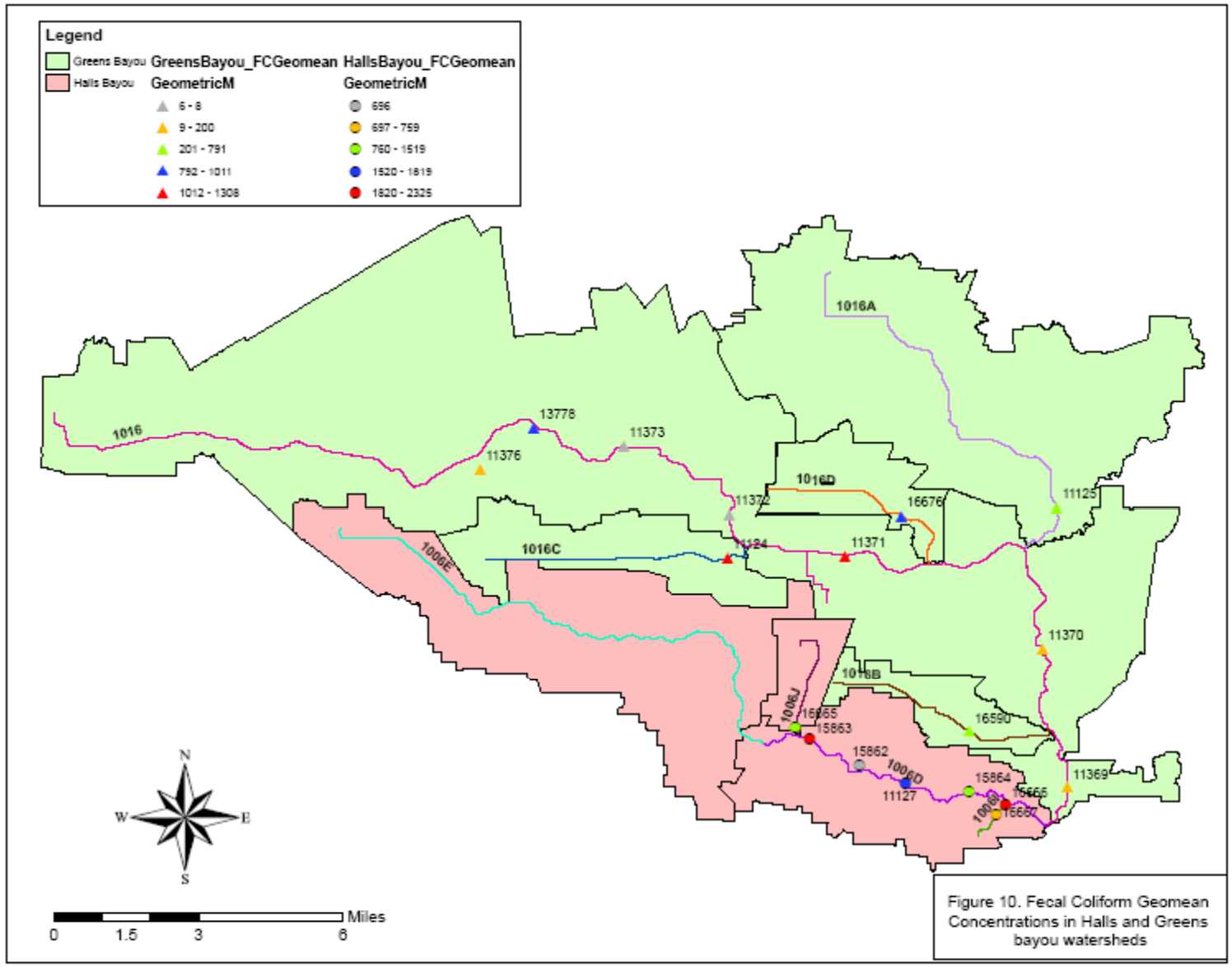

Figure 10. Fecal Coliform Geomean Concentrations in Halls and Greens bayou watersheds

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% Exceedances in Greens Bayou

Watershed	Segment	StationID	Indicator Bacteria	Single Sample Criteria (MPN/100ml)	Geometric Mean	Number of Samples	Number of Samples Exceeding Criteria	% of Samples
GREENS BAYOU	1016	11369	EC	394	395	61	27	44%
			FC	400	200	49	15	31%
	1016	11370	EC	394	498	39	20	51%
			FC	400	102	39	8	21%
	1016	11371	EC	394	1046	39	31	77%
			FC	400		142	99	70%
	1016	11372	FC	400	6	8	0	0%
	1016	11373	FC	400	8	8	1	13%
	1016	11376	EC	394	479	37	20	54%
			FC	400	108	15	6	40%
	1016	13778	EC	394	1564	61	52	85%
			FC	400	884	45	30	67%
	1016	17495	EC	394	257	37	11	30%
	1016C	11124	EC	394	1387	57	52	91%
			FC	400	1296	65	54	83%
	1016D	16676	EC	394	1781	57	46	81%
			FC	400	1011	67	40	60%
	1016A	11125	EC	394	630	38	20	53%
			FC	400	615	69	35	51%
	1016B	16590	EC	394	593	39	24	62%
			FC	400	791	39	19	49%
	1016A	16589	EC	394	417	39	18	46%
	1016B	20024 (TBD-	EC	394	568	18	9	50%

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% Exceedances in Halls Bayou

Watershed	Segment	StationID	Indicator Bacteria	Single Sample Criteria (MPN/100ml)	Geometric Mean Concentration (MPN/100ml)	Number of Samples	Number of Samples Exceeding Criteria	% of Samples Exceeding
HALLS BAYOU	1006E	17491	EC	394	890	40	29	73%
	1006E	17490	EC	394	3926	37	34	92%
	1006D	11127	EC	394	1699	41	34	83%
			FC	400	1819	49	37	76%
	1006D	15862	EC	394	1732	41	32	78%
			FC	400	696	30	18	60%
	1006D	15863	EC	394	2255	42	38	90%
			FC	400	2275	40	36	90%
	1006D	15864	EC	394	1138	61	46	75%
			FC	400	1396	30	25	83%
	1006J	16665	EC	394	2067	57	50	88%
			FC	400	1519	69	58	84%
	1006I	16666	EC	394	1505	59	51	86%
			FC	400	2325	70	55	79%
	1006I	16667	EC	394	871	41	29	71%
			FC	400	759	69	47	68%
	1006E	11126	EC	394	3188	42	39	93%
	1006D	20023	EC	394	923	17	10	59%

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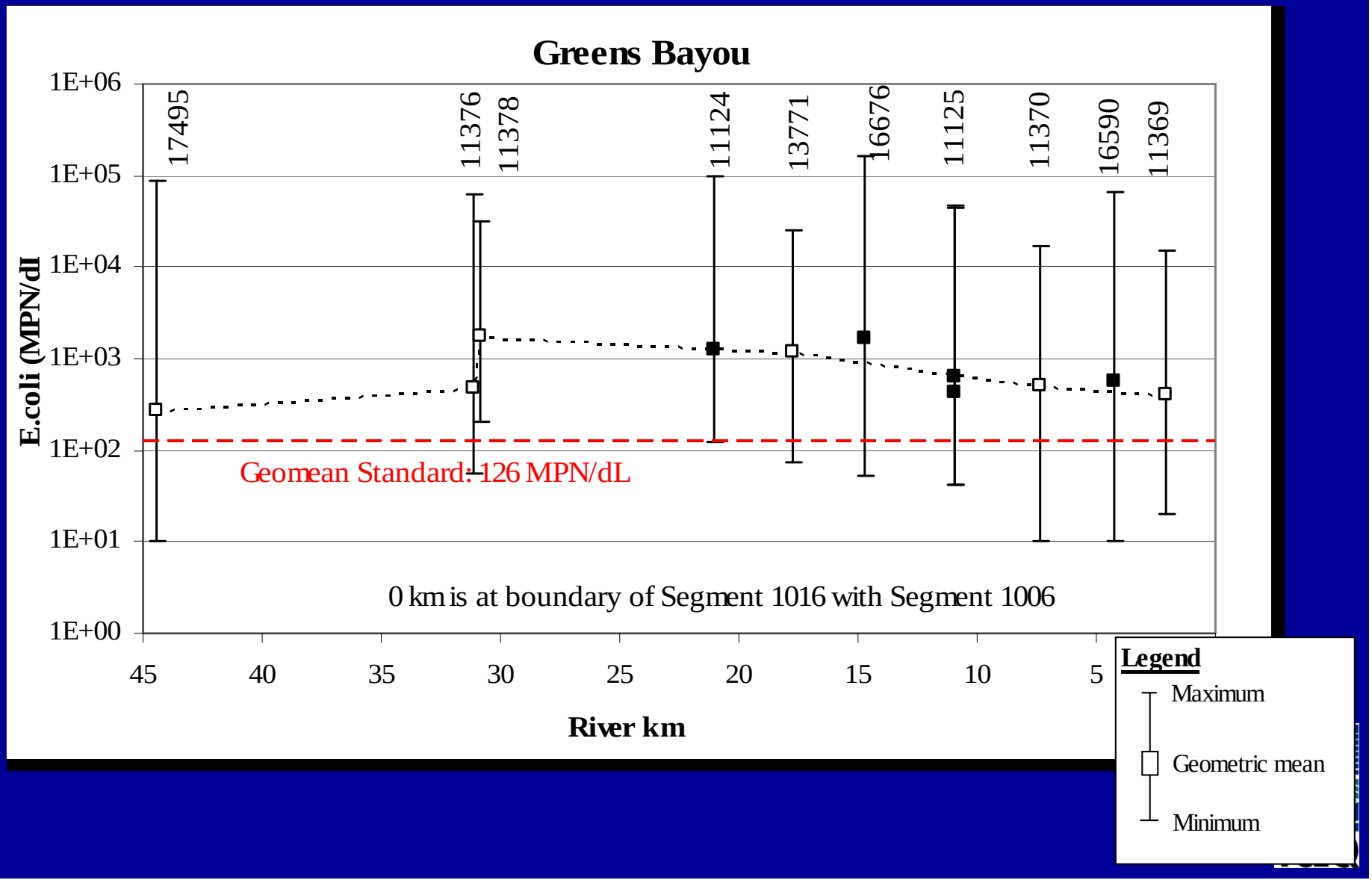
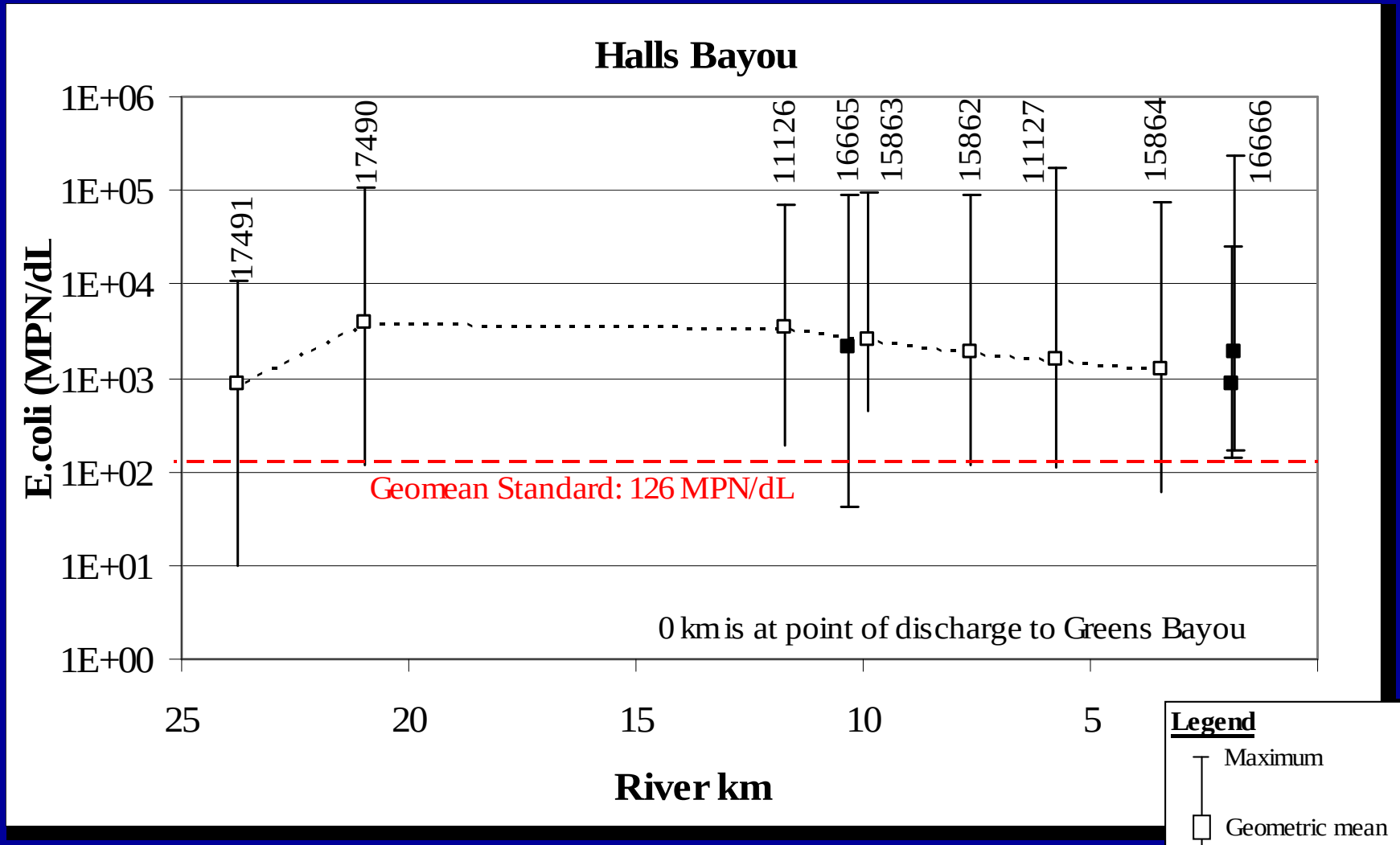
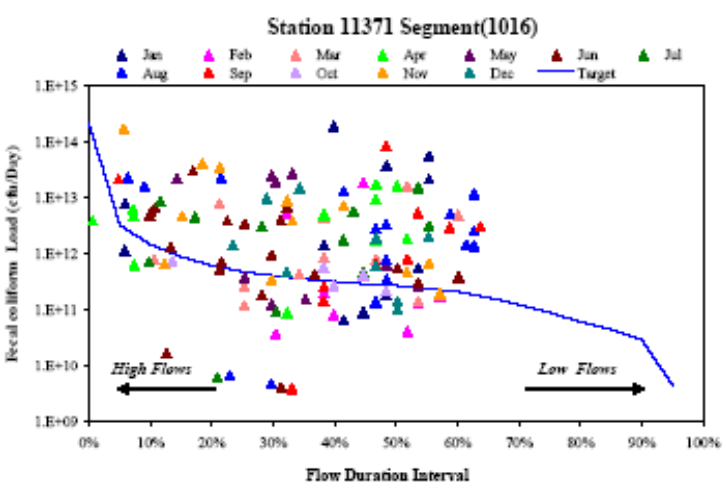
Greens Bayous E. Coli Longitudinal Profile

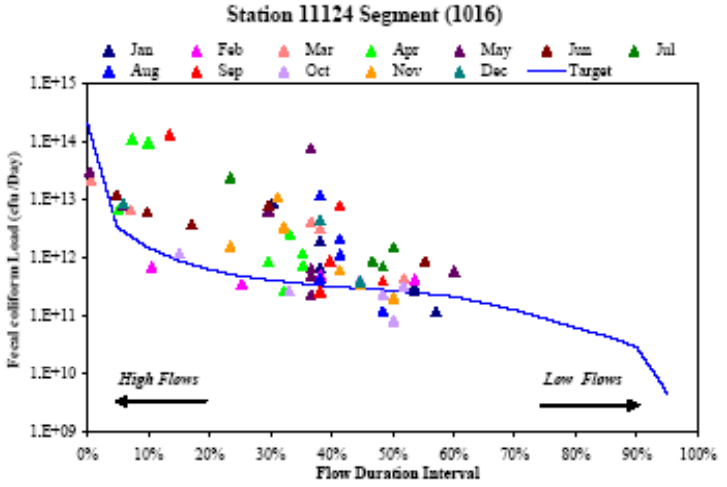


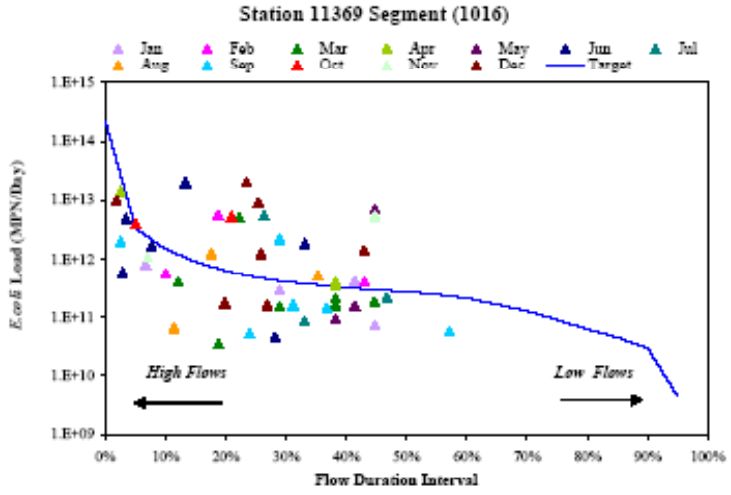
Halls Bayou E. Coli Longitudinal Profile



Historical LDC for Greens Bayou

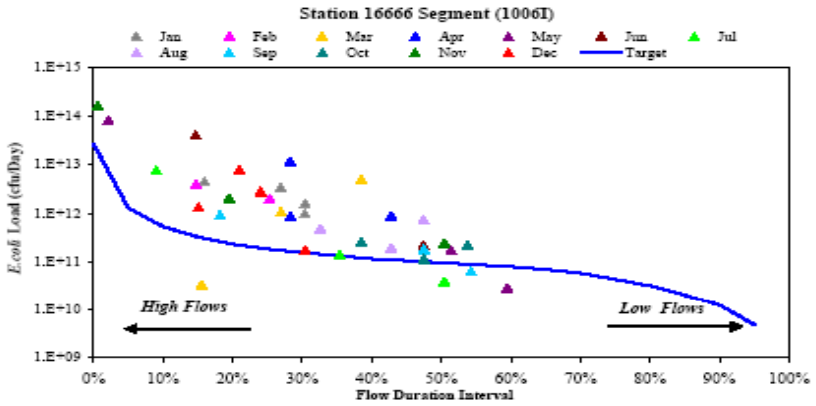


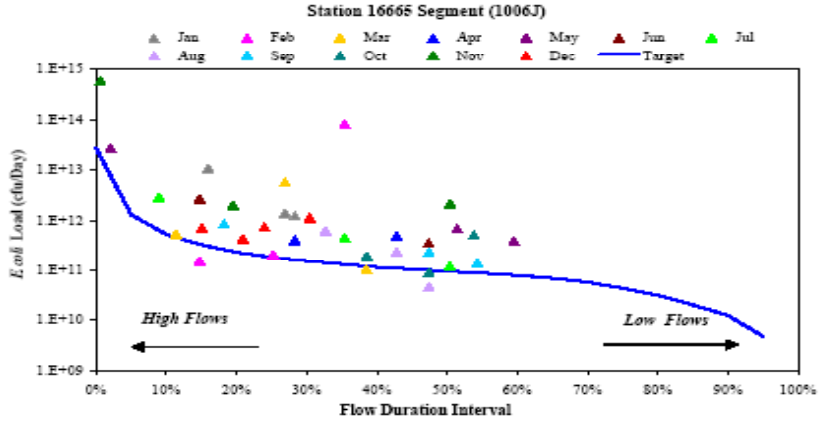




Load Duration Curves for Historical Data for Greens Bayou watershed

Historical LDCs for Halls Bayou





Load Duration Curves for Historical Data for Halls Bayou watershed

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For More Information

- Project Website
  http://www.tceq.state.tx.us/implementation/water/tmdl/72-houstonbacteria.html

- TCEQ TMDL Program
  http://www.tceq.state.tx.us/implementation/water/tmdl/index.html

Questions?

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