Final
Tributary Pollution Assessment Sampling and Analysis Plan

Prepared for:

JEA

21 West Church Street
Jacksonville, Florida 32202

Prepared by:

PBS&J

7406 Fullerton Street, Suite 350
Jacksonville, Florida 32256

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Tributary Pollution Assessment Sampling and Analysis Plan

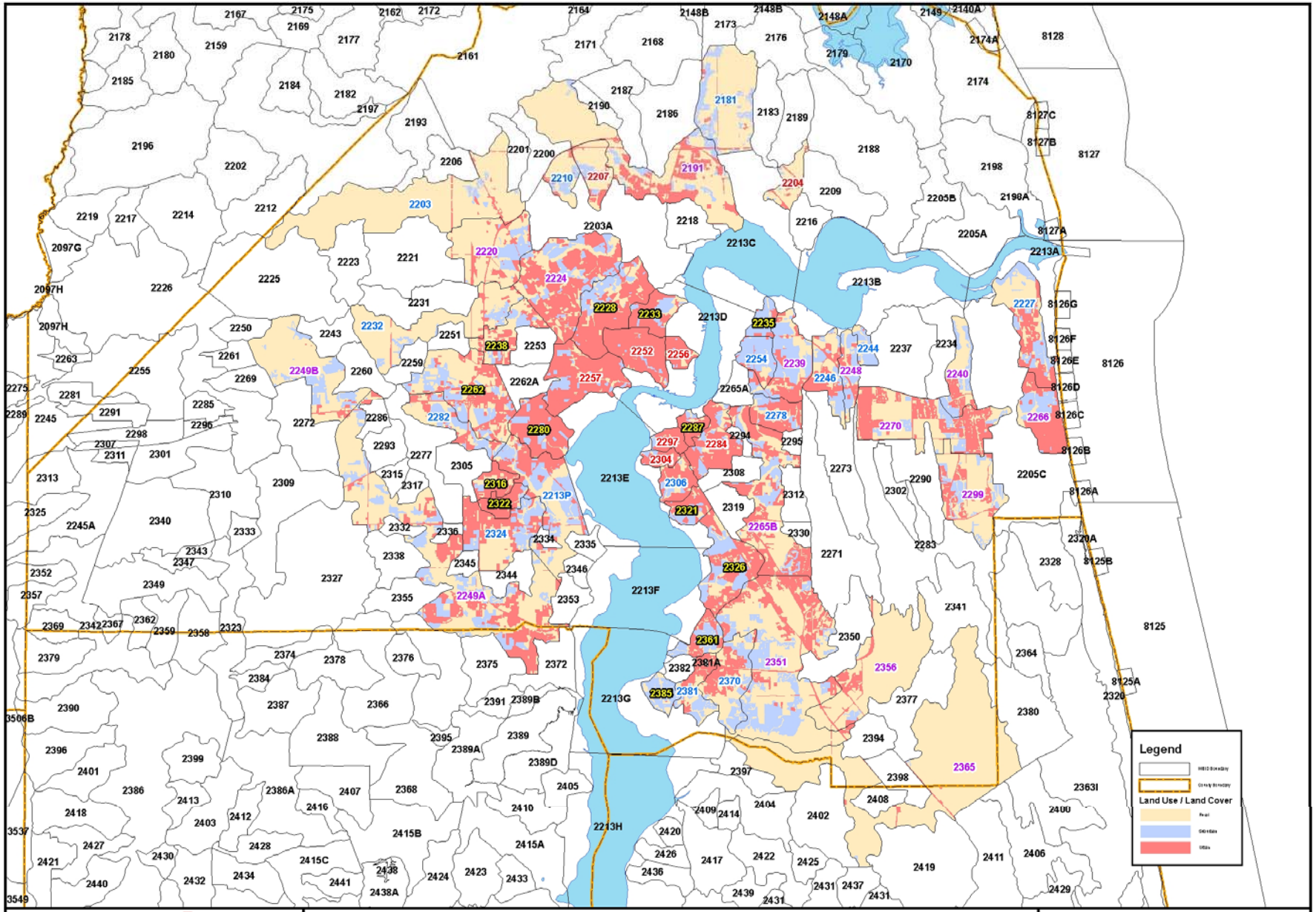
I. WBID Categorization and Selection Process

Land use classifications from 2002, obtained from the St. Johns River Water Management District (SJRWMD), were used to develop categories of WBIDs. These categories were intended to focus source assessment efforts and essentially constitute a pre-assessment based on the best available existing data. The land use classifications were aggregated into three primary categories: Urban, Suburban, and Rural. Land use data (percent land use of each classification, including relative population density) was used to categorize each WBID, based on the highest preponderance of aggregated use (Urban, Suburban, or Rural; Figure 1-1).

The WBID categorization process also considered data from existing databases, including GIS data, to the maximum extent practicable within the given timeframe, from various contributing Federal, State, and Local agencies. The data obtained as part of this effort was used to determine if each WBID had a putative source of fecal coliform contamination or no putative source. A putative source included at least one of the following: 1) repetitive, recent and localized Sanitary Sewer Overflows (SSOs) that intersected surface waters; 2) a septic nuisance and/or failure area adjacent to or intersecting a waterbody; or 3) targeted land use (e.g., cattle farms, aquaculture, marinas). Although the sampling methodology is the same for all WBID categories (discussed further in the *Tributary Pollution Assessment Manual*), this categorization scheme will provide validation that the sampling methods are useful and appropriate in a variety of land use/pollution source scenarios. Therefore, the WBID categories are as follows:

- 1a. Urban – Putative Source
- 1b. Urban – No Putative Source
- 2a. Suburban – Putative Source
- 2b. Suburban – No Putative Source
- 3a. Rural – Putative Source
- 3b. Rural – No Putative Source

The resultant categorizations of the 51 priority WBIDs are included Table 1.1. The table is based on the revised rankings of the WBIDs for 2000-2004 data. The priority numbers are from the original ranking (1998-2002 data) to show how they have shifted under the revised ranking.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PBS&J
7406 Fullerton Street, Suite 350
Jacksonville, Florida 32256
(904)363-6100 Fax (904)363-8811
WBID Land Use / Land Cover Classifications
Figure 1-1
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Source: St. Johns River Water Management District

Table 1.1 WBID Categorization and Selection					
Unit	**Name**	**WBID**	**Original Priority #**	**Category**	**Putative Source**
NMS	Craig Creek	2297	1	1a	Failure area
NMS	Deer Creek	2256	1	1b	
NMS	**Miramar Creek**	**2304**	**1**	**1a**	**Failure area**
NMS	Miller Creek	2287	2	1b	
NMS	**Terrapin Creek**	**2204**	**1**	**3a**	**Agriculture**
NMS	**New Castle Creek**	**2235**	**2**	**2b**	
NMS	Hogan Creek	2252	1	1a	SSO
OR	Big Fishwier Creek	2280	2	1a	Nuisance area
NMS	Gin House Creek	2248	4	2b	
SMS	Mandarin Drain	2385	2	2b	
NMS	Little Pottsburg Creek	2284	1	1a	Failure area
NMS	Christopher Creek	2321	2	1b	
TR	Moncrief Creek	2228	2	1a	Nuisance and Failure areas
NMS	McCoy Creek	2257	1	1a	Failure area
TR	**Blockhouse Creek**	**2207**	**1**	**3b**	
OR	**Butcher Pen Creek**	**2322**	**2**	**1b**	
SMS	**Deep Bottom Creek**	**2361**	**2**	**2a**	**Nuisance area**
OR	Williamson Creek	2316	2	1a	SSO
NMS	Cow Head Creek	2244	3	2b	
NMS	Long Branch	2233	2	1b	
NMS	Goodbys Creek	2326	2	1a	Failure area; Marina/Fish Camp
TR	Little Sixmile Creek	2238	2	3a	Failure area
TR	West Branch	2210	3	3b	
OR	Wills Branch	2282	3	3a	SSO
NMS	Silversmith Creek	2278	3	1a	Nuisance areas
IC	Hopkins Creek	2266	4	1b	
IC	Sherman Creek	2227	3	3b	
JC	Cormorant Branch	2381	3	1b	
NMS	Red Bay Branch	2254	3	2a	Failure area
NMS	Jones Creek	2246	3	1a	Aquaculture
NMS	Dunn Creek	2181	3	3b	
NMS	Broward River	2191	4	3a	Failure area
OR	Fishing Creek	2324	3	1a	Nuisance area; Agriculture
NMS	Strawberry Creek	2239	4	2a	Nuisance area; SSO
TR	Trout River	2203	3	3a	Agriculture; Marina/Fish Camp
IC	Open Creek	2299	4	3b	
OR	Cedar River	2262	2	3a	Marina/Fish Camp
TR	Sixmile Reach	2232	3	3a	Agriculture
OR	Ortega River P	2213	3	3a	Failure areas; SSO; Agriculture
NMS	Pottsburg Creek B	2265	4	1a	Nuisance and Failure areas; SSO; Agriculture
NMS	New Rose Creek	2306	3	1b	
JC	Oldfield Creek	2370	3	3a	Failure area; SSO

Table 1.1 WBID Categorization and Selection					
Unit	**Name**	**WBID**	**Original Priority #**	**Category**	**Putative Source**
OR	McGirts Creek B	2249	4	3a	Agriculture
IC	Hogpen Creek	2270	4	2a	SSO; Marina/Fish Camp
TR	Ribault River	2224	4	1a	Nuisance and Failure areas; SSO
JC	Durbin Creek	2365	4	3b	
OR	Ortega River A	2249	4	3a	Failure area; SSO; Agriculture
TR	Nine Mile Creek	2220	4	3b	
JC	Big Davis Creek	2356	4	3b	
JC	Julington Creek	2351	4	3a	Failure area
NMS	Greenfield Creek	2240	4	3b	

Category

1a Urban, Putative Source
1b Urban, No Putative Source
2a Suburban, Putative Source
2b Suburban, No Putative Source
3a Rural, Putative Source
3b Rural, No Putative Source

Possible Reasons for Categorization:

-- Water body intersects or is adjacent to nuisance or failure area
-- At least two SSO events-most recent (2004 or later) with at least one recorded surface water impact
-- Cattle/horse farms, marina, fish camp or aquaculture adjacent/intersecting water body
-- Selected for evaluation (Phase IV)

One WBID from each category was selected for evaluation in an effort to field-verify the methods proposed in the *Draft* Tributary Pollution Assessment Manual. The selection process was based on an effort to include those WBIDs that: 1) pose a significant public health issue; 2) geographically represent all of Duval County; and 3) are not currently undergoing substantial reconstruction that could impact the assessment. The selected WBIDs are indicated in yellow in Table 1.1. Thomas Creek was selected as a control WBID and will be used to verify that the results from each of the analysis techniques are accurate for use in the Manual.

II. Selected WBID Descriptions

A field site assessment of each selected WBID was performed in order to gain a comprehensive understanding of each tributary. Historical fecal monitoring data and other pertinent information, including GIS data, previously provided by the various contributing agencies was used as a guide. During the site assessment, site descriptions and observations were recorded, photographs depicting current local conditions were taken, and future sampling stations were determined. Sample station locations were determined using the methods described in Section 4.2.2 of the

Tributary Pollution Assessment Manual and are briefly described in Table 1.2. The Station ID number indicates the relative geographic location of the station with respect to the other stations and the St. Johns River. For example, MR1 is the most downstream sampling location for Miramar Creek while MR3 is the most upstream location, and MR2 is positioned in the middle.

Table 1.2 Summary of Selected Sampling Stations					
WBID Name	**Station ID**	**Street Location**	**GPS Coordinates**	**Infrastructure-Related Observations**	**Other Observations**
Miramar Creek	MR1	Intersection of San Jose Blvd. and Morvenwood Rd.	-81.656191281 30.284851328	Within septic failure area; pipe (30 inch gravity sewer) crossing over creek; culvert under San Jose Blvd.; old pipe noted along creek bed; spillway enters creek from residential neighborhood	Abundant, turbid/brown water
	MR2	Intersection of Hendricks Ave. and Greenridge Rd.	-81.651281370 30.284106246	Just east of septic failure area; spillway enters creek from Greenridge Rd.; sandbag embankment on north side;	Relatively little water
	MR3	Intersection of Orlando Terrace and Orlando Cir. West	-81.649592469 30.282063518	Well outside both septic failure areas; storm drain (?) pipe entering creek	Turtles, frogs and small fish present; shady; water flow to west
Butcher Pen Creek	BP1	Bridge at intersection of Butcher Pen Creek and Confederate Point	-81.734457406 30.264578281	Residential neighborhood with elementary school on south side; roadway drainage project upstream along Wesconnett; potential illicit connection from adjacent apartment building	Manatee feeding, ducks, and few wading birds present; tannic water; water flow to west; abundant water
	BP2	Bridge at intersection of Blanding Blvd. and Sage Dr.	-81.741393321 30.259446587	Sidewalk and metal fence bordering creek above culvert	Abundant water; grey water; water flow to southwest (tidal?); mix of sun and shade
	BP3	Just north of intersection of Randia Dr. and Ducheneau Dr. (down trail at end of cul de sac)	-81.743814544 30.256422202	Adjacent to JEA lift station; sewer pipe extends over creek from lift station; residential area (no septic mounds observed)	Shady; sewage odor; relatively little water; water flow to northeast
Deep Bottom Creek	DB1	Bridge at intersection of Deep Bottom Creek and Scott Mill Rd.	-81.637908990 30.178568392	In Scott Mill Hill septic nuisance area; Potential illicit connection from adjacent home; pipe (12 inch ductile iron water main) over creek; pipe (12 inch ductile iron sanitary force main) running along west side of bridge); pipe (stormwater?) entering creek; stormwater drains on bridge	Abundant water; turbid water; slight water flow to east; sunny on west side of bridge; residential with septic mounds

Table 1.2 Summary of Selected Sampling Stations					
WBID Name	**Station ID**	**Street Location**	**GPS Coordinates**	**Infrastructure-Related Observations**	**Other Observations**
	DB2	Bridge at intersection of Deep Bottom Creek and San Jose Blvd. just south of Halcyon Ln.	-81.628109207 30.177821380	Partially fenced; concrete canal culvert under San Jose Blvd.; water pumped into canal from retention pond adjacent to I 295; ditch entering creek from adjacent strip mall	Sunny; abundant vegetation; strong flow to west; clear water;
	DB3	Intersection of Hampton Rd. and Las Vegas Rd.	-81.620244754 30.180773915	Gated on west side; roadside ditch feeds into creek	Strong water flow to west; turbid water
New Castle Creek	NC1	Intersection of New Castle Creek and Ft. Caroline Hills Dr.	-81.579708561 30.365749747	Culvert under Ft. Caroline Hills Dr.	Clear water; fish and turtles present; mostly shaded; sulfur odor
	NC2	Intersection of New Castle Creek and Millcrest Pl. (down trail into woods)	-81.579707623 30.361895774	Culvert under Millcrest Pl.	Clear water; sulfur odor; water flow to north; shady, wooded area; most water on west side of "V" shape
	NC3	Intersection of New Castle Creek and Greenfern Ln.	-81.579090456 30.356398182	Large concrete canal; culvert under Greenfern Ln.;	Neighboring resident reported that culvert will remain ~half full after big rain and culvert used to carry more rain years ago; relatively little water
Terrapin Creek	TP1	Bridge at intersection of Terrapin Creek and Alta Dr.	-81.580336877 30.428835525		Abundant water; water flow north (tidal?); salt marsh habitat; sunny; residences with personal boat docks
	TP2	Bridge at intersection of Terrapin Creek and Faye Rd.	-81.565655286 30.434411656	Guard rails along bridge; culvert under Faye Rd.	Slight water flow to south; more water on north side of bridge; Hydrocotyl on north side; sunnier on south side of bridge
	TP3	Intersection of Terrapin Creek and road leading into new office park on off New Berlin Rd. South	-81.560385527 30.450761763	Erosion control turbidity barrier at north end of creek	Abundant vegetation, including duckweed, on surface of water; stagnant water; sunny; south of M&M Dairy (cattle and cattle egrets observed to north)
Blockhouse Creek	BH1	Bridge at intersection of Blockhouse Creek and Leonid Rd.	-81.689032424 30.429838559	Pipe (14 inch ductile iron sanitary force main) over creek along bridge; adjacent stormwater retention structure; gas storage tanks adjacent to creek	Water flow to north (tidal?); cattails present; scattered wading birds present

Table 1.2 Summary of Selected Sampling Stations					
WBID Name	**Station ID**	**Street Location**	**GPS Coordinates**	**Infrastructure-Related Observations**	**Other Observations**
	BH2	West of intersection of Pine Estates Rd. East and Pine Estates Rd. South (down trail at end of cul de sac)	-81.684109358 30.433569431		Abundant water in creek; water flow to north (tidal?); turbid water; several dogs in immediate area
	BH3	Intersection of Blockhouse Creek and Irma Rd. just north of Dunn Ave.	-81.689266562 30.439619715	Culvert under Irma Rd.	Turbid water; water flow to southeast; abundant water; shady (sunnier on west side); residential area with septic mounds; construction of new development nearby; light agriculture throughout area
Thomas Creek (control)	TC1	Bridge at intersection of Thomas Creek and New Kings Rd. (US 1)	-81.791620699 30.505280536	Major bridge over Thomas Creek	Abundant water; sunny; abundant vegetation
	TC2	Middle wooden bridge at intersection of Thomas Creek and Thomas Creek Rd. (just southeast of Danson Ln.)	-81.832320713 30.461221629		Abundant water; mostly shady; abundant vegetation; slight water flow to east; light residential area; depth gauge in place adjacent to bridge read 15 feet
	TC3	Intersection of Thomas Creek and Ford Rd. (just west of Settler's Ridge Dr.)	-81.884836972 30.436031739		Light agriculture in area; relatively new homes in area with septic tank mounds; cleared land for new developments in area; tannic water; water flow to north; sunny; frogs present

III. Sampling Methodology

a. When to Sample?

Each WBID was sampled once at the end of each month beginning in July 2005 and ending in February 2006 to integrate both the local wet and dry seasons. Preliminary analysis of the relationship between local rainfall data and historical fecal data indicated that any correlations would be detected within 3-5 days of a rainfall event. Whenever possible, rain events were captured within the sampling program.

b. What and How to Sample?

The sampling protocol was conducted by two teams; each comprised of personnel from PBS&J and the University of South Florida. Each team was assigned 3-4 WBIDs; every WBID was sampled within the same day. The sampling methodology followed that described in the Standard Methods for the Examination of Water and Wastewater (9060A) and the Tributary Pollution Assessment Manual. Due to financial constraints, one water sample was taken from each sampling station for a total of three samples per WBID, to be used for the bacteriological assays. Additional samples were collected and analyzed by the Department of Environmental Protection (DEP) and the City of Jacksonville Water Quality Division (COJ WQD), as necessary, to assist in the identification of contamination sources. One additional water sample from each sampling station was initially collected for analysis of optical brighteners using fluorometry; however, due to the non-navigable nature of the tributaries assessed throughout the duration of this project, fluorometry was found to be ineffectual in the investigation for sources of fecal coliform contamination. For comprehensive purposes, one sediment sample will also be taken from a maximum of one sampling station per WBID. Additional field data such as salinity, conductivity, temperature, turbidity, and dissolved oxygen, as well as general observations, including weather conditions and general tributary characteristics, will also be taken to help determine sources of fecal contamination.

c. Sample Evaluation

The entire decision tree described in the Tributary Pollution Assessment Manual was implemented, as finances allowed, after each sampling event (Figure 1-2). A brief description of each analysis technique is described in Section 1.5 of the Manual. To

ensure that the full approach could be executed, enough samples were collected from each sampling station to enable the necessary levels of analysis. Samples were prepared ahead of time for use on an as-needed basis throughout the evaluation process. PBS&J, in conjunction with the environmental microbiology laboratory of Dr. Harwood at the University of South Florida (USF), was responsible for all bacteriological sample collection. The USF laboratory performed all analyses except for some Enterococcus esp human-specific PCR and Bacteroides human and ruminant-specific PCR, which were performed by Biological Consulting Services of North Florida. All fluorometry samples were transported to the Mote Marine Laboratory for evaluation.

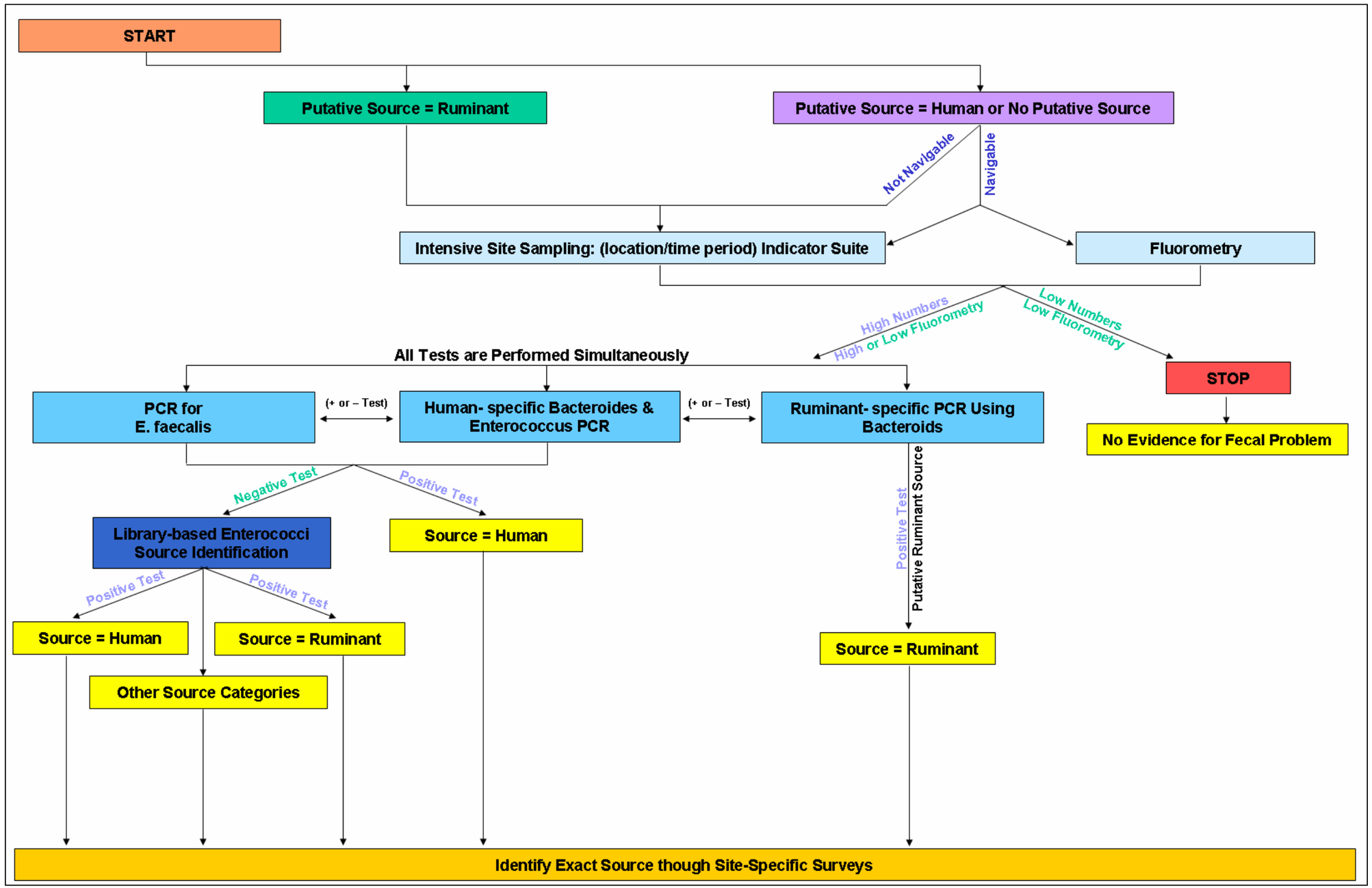

Figure 1-2. Flow Chart of Tiered Approach

Literature Cited

American Public Health Association, American Water Works Association, and Water Environment Federation. 1992. Part 9060A. In *Standard Methods for the Examination of Water and Wastewater*, eds. Greenberg, A. E., L. S. Clesceri, and A. D. Eaton, pp. 9-18-9-20. Washington, D.C.: American Public Health Association.