Implementation Strategy 9.0: Monitoring and I-Plan Revision

In order to assess progress toward reducing bacterial loading, the BIG will need to evaluate, on a regular basis, the results of ongoing monitoring. This evaluation will be used to determine any changes that are necessary to this I-Plan.

The I-Plan is to address a period of 25 years. However, given the many unknowns pertaining bacteria sources, the cost-effectiveness of management activities, and the availability of resources for implementation, this time frame is provisional. As such, it will be important to continually track both actions taken and instream bacteria levels to gauge the rate of progress and adapt the strategy accordingly.

Monitoring and annual evaluation will determine if the I-Plan or any of its parts are complete, must address a longer time frame, or require revision. Every five years, as resources are available and with stakeholder participation, a more in-depth evaluation will be completed.

Monitoring of both ambient and non-ambient water quality, as well as the implementation activities in this plan, will form the basis for an annual report to be prepared by H-GAC. Conclusions derived from post-implementation water quality monitoring data will be an important indicator of whether implementation activities are resulting in the desired reduction of bacteria loading. The contents of the report will be reviewed by the BIG to determine strategic changes that are necessary to the I-Plan in order to improve progress.

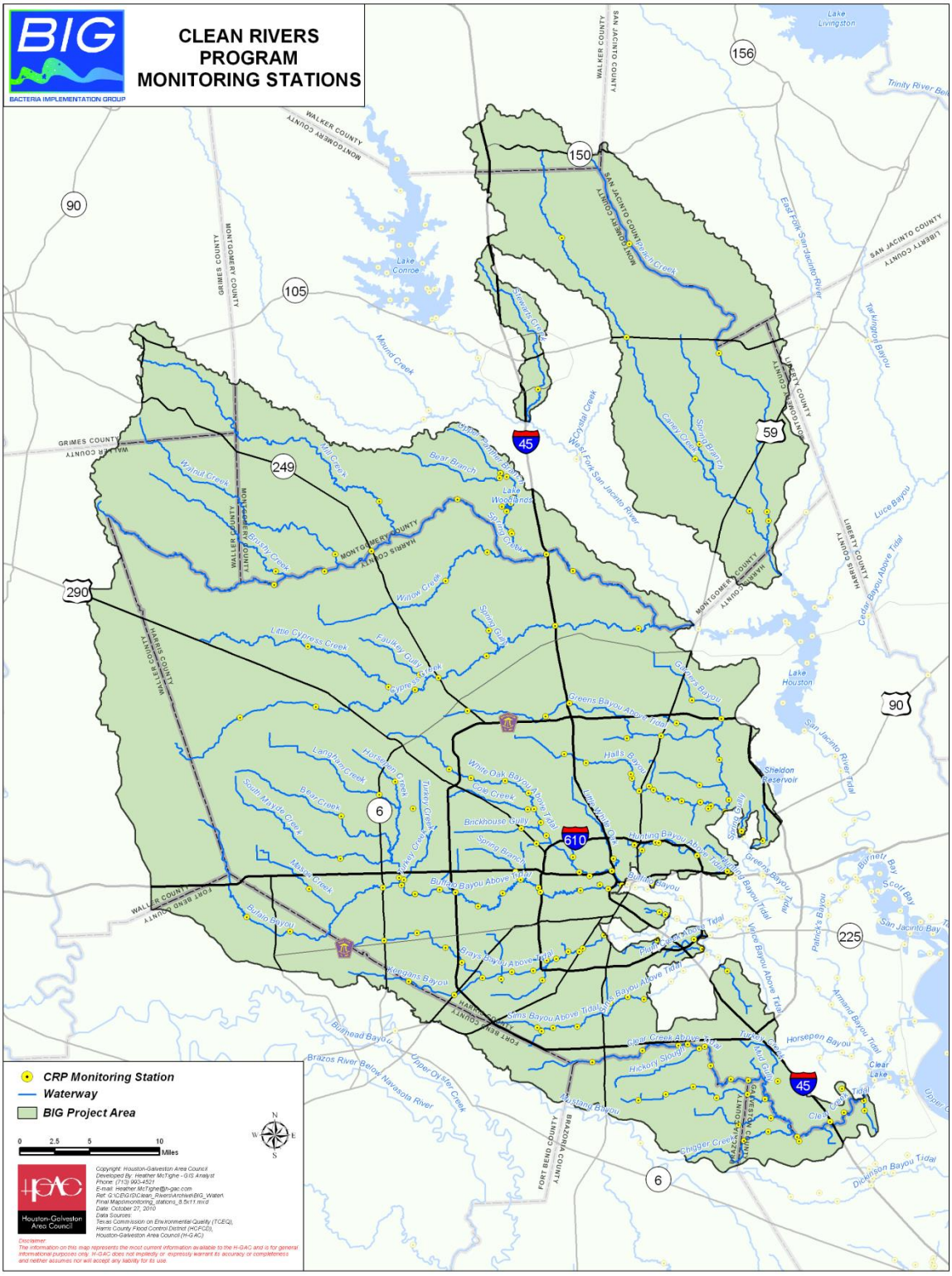
Implementation Activity 9.1: Continue to Utilize Ambient Water Quality Monitoring and Data Analysis

The results of monitoring and evaluating ambient water quality can help determine whether waterways are meeting standards for bacteria. The results will also identify trends of improvement and degradation that need to be addressed. This activity includes two elements: continuing the existing ambient water quality monitoring program and encouraging the use of two indicator organisms in sampling.

9.1.1: Continue to Utilize Clean Rivers Program

Ambient water quality monitoring within the BIG area is primarily the responsibility of the Clean Rivers Program, administered by H-GAC and the TCEQ in conjunction with local partner agencies. This program is ongoing and does not require additional funding for its current efforts. (See Figure 1 for locations of monitoring stations in the BIG project area. More detailed information regarding monitoring data can be found on H-GAC's Water Resources Information Map, or WRIM, which can be found at http://webgis2.h-gac.com/CRPflex/).

Figure 1: Map of Clean Rivers Program Monitoring Stations



The Clean Rivers Program is comprehensive, collecting samples region-wide, and should remain the primary source of data for ambient water quality.[1] This monitoring network includes over 300 sites and provides long-term data accredited by NELAC[2] for the evaluation of ambient conditions in the region's waterways. Monitoring sites are strategically chosen to give the greatest degree of coverage while also attempting to isolate individual waterways or their smaller units to allow for the accumulation of data with direct relevance to local conditions. Monitoring is conducted under a regional Quality Assurance Project Plan (QAPP).[3] Any new ambient monitoring by local partners shall be coordinated with the Clean Rivers Program and shall utilize the regional QAPP.

The Basin Summary Report,[4] produced every five years, evaluates at least seven years of data for each assessment unit and identifies statistically significant change. Along with the general benefit of coordinated regional data, these trend indicators will help guide I-Plan revisions and serve to verify the impact of implementation activities.

The local Clean Rivers Program steering committee meets regularly to discuss ways to improve the ambient water quality monitoring program. Local efforts are coordinated with those statewide to ensure consistency of data and to identify appropriate program improvements, which has already allowed for changes to facilitate this I-Plan. Specifically, monitoring reports now contain standardized information about any recreation that is observed at the sampling site.

9.1.2: Test for Additional Indicators

The presence of *E. coli* or Enterococcus species in water is a commonly employed indicator of the presence of enteric pathogens. Generally, TCEQ guidance and the location of the water sample determine which of the indicators is used. As resources are available, the abundance of both *E. coli* and Enterococcus species should be evaluated at freshwater sampling locations, to ensure a greater ability to correlate impacts of implementation activities on water quality. Additional parameters should be monitored, as deemed necessary and feasible, to target specific activities or sources for which the general correlation between indicators is not precise enough to show impacts. Additional testing may require a new or amended QAPP, and should take into account any existing or ongoing research on correlating current indicator bacteria with pathogens of concern. (See **Error! Reference source not found.**.)

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[1] (Houston-Galveston Area Council 2010a)

[2] NELAC, National Environmental Laboratory Accreditation Conference, provides accreditation of environmental labs.

[3] (Houston-Galveston Area Council 2010b)

[4] (Houston-Galveston Area Council 2006)

Implementation Activity 9.2: Conduct and Coordinate Non-Ambient Water Quality Monitoring

While the established ambient monitoring program will form the base of the data, some implementation activities, including monitoring plans for specific implementation activities, may require targeted sampling that may be site or contaminant specific. Because of requirements of the quality assurance plan,[5] this non-ambient program should be separate from the existing ambient program. As such, non-ambient monitoring should be facilitated through four activities.

9.2.1: Create and use a regional non-ambient QAPP

H-GAC will work with the TCEQ to establish a regional QAPP for non-ambient monitoring activities. Applicable sections of existing monitoring efforts, such as Harris County Flood Control District's wet weather monitoring for wet bottom detention basins, should be adopted and incorporated into a regional QAPP, as applicable and practicable.

9.2.2: Create and maintain a regional non-ambient monitoring database

Individual stakeholders will be responsible for implementing activities in their jurisdictions. However, to serve the combined purpose and interests of this I-Plan, the monitoring of non-ambient water quality data will be combined in a regional non-ambient monitoring database. This database could be compatible and coordinated with similar related databases, including the International Stormwater BMP Database[6] and the regional BMP effectiveness database being developed by the Harris County Flood Control District. This database could serve as a clearinghouse for non-ambient or targeted water quality monitoring data from across the region, to ensure availability and coordination of all related efforts. The database will be created in consultation with stakeholders and maintained by H-GAC and will be made available online. The coordinated approach to data acquisition will allow stakeholders, even when working separately, to benefit from their shared experiences. Evaluation of implementation activity effectiveness for one stakeholder can help other stakeholders make more informed decisions concerning the suite of measures they implement to meet the strategies of this I-Plan. Additional data sources that could be incorporated into the database include wet/dry weather monitoring data from MS4 permit holder annual reports, outfall monitoring, and pertinent data (including current and incoming monitoring requirements) from WWTF Discharge Monitoring Reports. This database shall be integrated with the database for tracking implementation activities, described in Implementation Activity 9.3. An ad hoc committee will be invited to participate in the creation of the database. This activity is not intended to create an additional reporting or liability burden for stakeholders.

[5] (Houston-Galveston Area Council 2010b)

[6] (Developed by Wright Water Engineers, Inc. and Geosyntec, Consultants 2010)

9.2.3: Implement targeted monitoring

Targeted monitoring should be implemented in those places where an entity needs to determine the direct impact of an implementation activity or BMP at a site where ambient monitoring will be unable to indicate changes to water quality as a result of the activity. Targeted monitoring may address sampling needs such as:

- Conditions during or differences in loading during dry and wet weather,
- Changes in instream bacteria levels throughout the day,
- Bacteria levels and loading during high-flow and low-flow regimes, and
- Locations specific to implementation activities, such as stormwater BMPs, or potential bacteria sources, such as the evaluation of bacteria levels in water coming from an outfall pipe.

Targeted monitoring of this type is already underway in the BIG area, as conducted by MS4 Phase I entities as part of stormwater permit requirements. These efforts should continue as practicable. Additionally, other entities, regardless of MS4 status, should consider or continue targeted monitoring as needed to evaluate implemented measures. The data collections efforts they undertake should be coordinated as part of the regional QAPP and monitoring database developed for non-ambient water quality in the region.

Implementation Activity 9.3: Create and Maintain a Regional Implementation Activity Database

Implementation tracking provides information that can be used to determine if progress is being made toward meeting the goals of the TMDL. Tracking also allows stakeholders to evaluate actions taken, identify those which may not be working, and make any changes that may be necessary to keep the I-Plan on track. The implementation activity database will contain information on implementation activities conducted by the stakeholders. Each stakeholder will be provided a list of the implementation activities designated under this I-Plan. Each year, the individual stakeholders will provide a report on the activities they implement during the year, and any related information regarding the activities. The BIG, through the H-GAC, will provide a reasonable reminder to each stakeholder prior to the due date, compile the individual reports in the database, and publish a summary as part of an annual I-Plan report. As an incentive to report in a timely manner and in addition to a list of implementation activities undertaken, the report will identify communities that either did not report or did not undertake implementation activities.

While there will be additional paperwork requested of stakeholders, the intent is not to increase reporting requirements unduly. Thus, copies of or access to existing reports or records can be submitted as part of the annual report to the BIG.

Implementation Activity 9.4: Assess Monitoring Results and Modify I-Plan

9.4.1: Assess Data

The information contained in the three databases (ambient, non-ambient, and implementation activity) shall be used to assess progress toward meeting the goals of this I-Plan. Annually, H-GAC shall assess information in the reports to identify whether progress is being made. In particular, H-GAC shall evaluate the following:

1. Does ambient water quality monitoring data indicate that bacteria levels are changing? If so, are the bacteria levels improving or degrading?
2. Do non-ambient water quality monitoring data indicate that implementation activities are reducing bacteria loading?
3. Are implementation activities and controls being undertaken as described in this I-Plan? Which activities have been implemented and which have not?

9.4.2: Communicate results

The information identified through the assessment process will form the basis for an annual report. H-GAC shall compile the annual report and shall present this information to stakeholders through various channels, including e-mail, web publication, presentations, and at an annual meeting.

9.4.3: Continue the BIG

The BIG shall continue to be the decision-making body for this I-Plan, as identified in its ground rules.

9.4.4: Update the I-Plan

The BIG shall review the annual report and, as appropriate, update the I-Plan. As it evaluates the I-Plan, the BIG shall consider reported activities and whether identified milestones are being met, changes in bacteria levels in waterways, changes to surface water quality standards or other regulations, and research. While progress shall be evaluated annually, a more rigorous evaluation should be conducted every five years. At the end of five years, the BIG shall identify costs for the implementation activities.

In its document titled, "Clarification Regarding Phased Total Maximum Daily Loads,"[7] the EPA describes adaptive implementation as "an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainly and adjust implementation activities." It is under these auspices that the BIG shall approach updates to the I-Plan. H-GAC shall provide support for these efforts.

[7] (U.S. Environmental Protection Agency, Best-Wong, B. 2006)

9.4.5: Expand the geographic scope of the I-Plan as appropriate

As other watersheds in the vicinity of the BIG project area have TMDLs adopted by the TCEQ, stakeholders from those watersheds may petition the BIG to consider incorporating those watersheds into the I-Plan. These requests shall be considered by the BIG as part of its annual review of the I-Plan. Communities and stakeholders within the region are encouraged to participate in I-Plan activities, either informally and voluntarily, or formally upon incorporation by the BIG into the I-Plan. Voluntary action is particularly encouraged in those watersheds with streams that are impaired for bacteria but which do not yet have adopted TMDLs.