TASK 3: WATER QUALITY MONITORING

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TASK 3: WATER QUALITY MONITORING

General Monitoring Guidance

Monitoring programs should address program goals, identify reference and baseline conditions for future comparisons, and address areas that have water quality concerns, as identified by Basin Steering Committees and water quality assessments (e.g., Texas Water Quality Inventory Report, Basin Summary Report). The TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods* (RG-415) and the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data* (RG-416) (www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/swqm_procedures.html) are crucial guides for conducting water quality monitoring. The most current version of the TCEQ *Guidance for Assessing and Reporting Surface Water Quality in Texas* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/305_303.html) should be referenced when determining the amount of data needed for the assessment of various uses.

Basin monitoring programs should provide:

- monitoring that considers chemical, physical, and biological data collection and evaluation that will advance the ability to identify and locate water quality issues
- water quality sampling to allow temporal and spatial analysis of water quality trends
- increased data collection for the development of water quality standards
- additional knowledge of flow for unclassified streams
- an enhancement of knowledge of current monitoring techniques.

Cost-effective watershed management decisions must be based on *scientifically valid* and *complete* assessments of water quality conditions and contributing causes of impact. Water bodies should be selected based on the importance of the resource, risk from pollution, and input from the Steering Committee. Sites are chosen to be representative of the water body or a portion of the water body.

Deliverables

Deliverables for this task include a summary of all the monitoring activities for each quarter with each progress report. In addition, quarterly status reports and final reports for special studies are included in this task. The status reports need to provide information on the activities related to each special study and will be submitted with each progress report. The special study final reports will be submitted as designated in the work plan, typically at the end of the contract period and will contain sections similar to those outlined in Exhibit 3B. The biological data reporting packets are another deliverable under this task and should be submitted as a final report in *.PDF format as outlined in Exhibit 3D. The checklist, forms, and metrics are available on the Internet at (www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/swqm_resources.html). The electronic data generated from this monitoring will be submitted, as outlined in the QAPP, in the Events/Results format described in Task 4 as part of the deliverables for Task 4. Coordinated monitoring efforts will include facilitating a meeting with the other monitoring entities in the basin and communicating statewide coordinated monitoring schedule updates to the CRP Project Manager.

Types of Monitoring

Monitoring activities can be grouped into four categories. Basin monitoring programs may employ any or all of these types of monitoring to achieve the stated monitoring objectives. These activities characterize the status of water quality conditions and provide specific data in support of permit and regulatory decisions. The four categories, described below, are:

- routine monitoring
- systematic monitoring
- non-routine monitoring
- permit support monitoring
- special studies in priority watersheds

Routine Monitoring

Routine monitoring is the traditional type of monitoring designed to delineate overall water quality throughout a river basin, and is not intentionally targeted toward any environmental condition or event. A routine monitoring network can provide information about water bodies with high public interest, reference conditions at ecoregion sites, and areas with persistent water quality problems. The monitoring design will be dependent on the actual use of the water body and potential sources of contamination. At a minimum, annual monitoring will include quarterly field measurements, flow measurements (where applicable), indicator bacteria analysis, and conventional chemical parameter analysis. Common objectives of routine water quality monitoring include:

- collection of surface water data needed for conducting water quality assessments in accordance with TCEQ's *Guidance for Assessing and Reporting Surface Water Quality in Texas* (see web site reference on page 3-3)
- identifying water quality trends
- monitoring progress in protecting or restoring water quality.

Systematic Watershed Monitoring

Systematic watershed monitoring is similar to routine monitoring except sampling is of short duration (1 to 2 years) and is designed to screen waters that are rarely monitored. Systematic monitoring has several common objectives including:

- screening waters that would not normally be included in the routine monitoring program
- monitoring at sites to check the status of water bodies (identify improvements or concerns)
- investigate areas of potential concern.

Due to the limited period of time for which these data will be collected, the data will be primarily used to determine whether any locations have values above the TCEQ's water quality criteria or screening levels (or in some case values elevated above normal). When values are significantly elevated, the Planning Agency will use this information to determine future monitoring priorities.

This monitoring can follow either a rotational watershed approach or an intensive watershed evaluation. A rotational watershed approach is a plan that divides the river basin into distinct watersheds or, in some cases, subwatersheds. The watershed areas are then designated for a year or two of monitoring, in succession. Within each watershed, sampling sites are selected that adequately characterize the watershed. An intensive watershed evaluation is similar to the rotational

watershed approach except that a specific watershed is selected due to a perceived condition and further information is needed to characterize the water body. Once the information is collected and analyzed, it may indicate the need for a special study which can be designed based on the data collected.

Monitoring will follow the same protocols and standard field and laboratory measurements as routine monitoring, unless otherwise specified in the Quality Assurance Project Plan (QAPP). At a minimum, monitoring will usually include quarterly field measurements, flow measurements (where applicable), indicator bacteria analysis, and conventional chemical parameter analysis. If one of the objectives for the systematic data is to have it assessed by the TCEQ for the *Water Quality Inventory and 303(d) List,* monitoring should be conducted considering the specifications outlined in the most current version of the TCEQ *Guidance for Assessing and Reporting Surface Water Quality in Texas* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/305_303.html).

Non-Routine Monitoring

Non-routine monitoring is designed to target specific environmental conditions (e.g., runoff flow, index period, spills). If the objective of the monitoring can only be met under these conditions, then the monitoring should be considered non-routine. These data quality objectives should be outlined and discussed in the QAPP so the eventual data use can be determined by the user.

Permit Support Monitoring

The TCEQ or the regulated community may identify specific areas where additional information on water quality and quantity is needed for the permitting process. Data objectives will be determined by the project, but common objectives include:

- studies to develop site-specific criteria
- receiving water assessments
- characterization of flow conditions.

Permit support monitoring must be planned with the appropriate TCEQ staff through the Clean Rivers Program (CRP) Project Manager to ensure the most beneficial data are collected appropriately. Since these efforts are generally of short, intense duration, the TCEQ has attempted to separate these efforts from routine and systematic monitoring. In order to simplify this process, these sampling efforts should be set apart by developing them as a QAPP appendix (as described in Task 2) that can be independently replaced or amended.

The TCEQ has developed a guidance document for measuring flows (location, frequency, and method), titled “Stream Classification and Flow Measurement,” and is included in Exhibit 3A. In addition to the standard electronic data submittal to SWQMIS described in Task 4, the flow cross section information must be provided in a format similar to the one located at (www.tceq.state.tx.us/assets/public/compliance/monops/water/wqm/forms/TCEQ20117_StreamFlowMeasurementForm.pdf). Field measurement data may also be collected during each flow survey and submitted electronically in the Event/Result format outlined in Task 4.

Special Studies in Priority Watersheds

Basin Steering Committee priorities and TCEQ assessment needs may be addressed through intensive data collection efforts to better identify and evaluate water quality issues, such as, loading contributions from nonpoint sources in the watershed and problems identified through data analyses. Typically, special study monitoring involves the development of a plan that is designed to answer a specific question, and is not used to generally screen a water body. Monitoring may be conducted at historical sites that are representative of the affected portion of the water body where previous

sampling initially identified an impact or concern. Additional sites may be needed to establish the geographic extent of the issue.

Planning Agencies should review available reports and data before submitting a special study proposal that will outline how they can address the issue(s). Special studies must be planned with the appropriate TCEQ staff through the CRP Project Manager, as specified in Task 2, to ensure the most beneficial data are collected appropriately. The CRP Project Manager will work with each Planning Agency to plan studies that meet its current resources and capabilities. Status reports describing activities related to special studies will be submitted with each progress report as either an attachment, or as part of the progress report. Most special studies will result in a final report that summarizes and concludes the activities. A basic report outline has been provided in Exhibit 3B. In order to simplify this process, these sampling efforts should be set apart by developing them as a QAPP appendix (as described in Task 2) that can be independently revised.

Special Studies Mapping

For some special studies, the Planning Agency will coordinate with the CRP Project Manager and specify in the work plan, the types of environmental factors influencing water quality that will be collected and mapped. Those factors selected will relate to the water quality issue under study for the watershed. The intent of efforts to collect spatial data is to gain a detailed understanding of the factors influencing the water quality in a relatively small watershed. The results of the data collection effort will be a series of maps and, in some cases, database tables showing the information that has been collected and mapped within each selected special study watershed. In addition, a discussion of the factors in the watershed will be used to determine if there is any correlation with water quality.

Continuous Monitoring

Basin monitoring programs have traditionally been implemented by visiting a site and taking grab samples to characterize water quality. This type of monitoring gives you a snapshot of the conditions at that point in time, but does not provide information about the variability that may be of interest to some water quality program managers. In situ analyzers characterize water quality in greater detail than is possible with grab samples or short-term deployments of monitoring instruments. This type of continuous monitoring has generically been referred to as “real-time monitoring” since it is possible to access the data from a remote location as the instrument is collecting them.

Continuous monitoring can potentially be used for a variety of purposes, with objectives including:

- identifying seasonal water quality trends and daily variation
- evaluating the influence of point and non-point sources of pollution, including short-term events
- assessing effectiveness of watershed management and implementation plans
- providing current data to the public

Improved instrumentation and communication systems are making real-time monitoring more feasible. Although the up-front costs in establishing a real-time monitoring strategy are considerably more than the traditional monitoring strategies, the expense may be justified by the monitoring objectives. Opportunities to partner with other agencies, including the TCEQ, has allowed real-time monitoring to be more economically feasible for those wanting to establish these programs.

Parameters Monitored

Field Parameters

Parameters measured in the field are used to detect and describe spatial and temporal changes, determine impacts of point and nonpoint sources, and assess compliance with water quality standards. Dissolved oxygen (DO), water temperature, total dissolved solids (often evaluated with specific conductance), and pH are field measurements for which water quality criteria are established for each classified water body. The measurement of flow at stream sites is also crucial in evaluating water quality. Samples for most parameters collected on perennial streams at flow conditions less than 7Q2 (seven-day, two-year low-flow) cannot be used for assessment purposes; however, extreme low-flow sampling results can contribute to the understanding of water quality changes during drought conditions and aid in long-term water resource planning.

Many chemical and biological processes in the aquatic environment are affected by the levels of each of these field parameters. Evaluation of field measurements also provides complimentary information necessary in evaluating chemical and biological data. A list of the Surface Water Quality Monitoring (SWQM) program water quality monitoring core parameters can be found in Exhibit 3C.

Like continuous monitoring, measuring the variability of short-term conditions over a 24 or 48-hour period will provide more information that an instantaneous measurement. The objective for diel data is to collect and report surface water quality data that are representative of the diurnal variation in field parameters, such as, pH, temperature, dissolved oxygen, and specific conductance for comparison against the water quality standard. Water bodies identified with aquatic life concerns based on instantaneous dissolved oxygen measurements should be considered for 24-hour dissolved oxygen monitoring.

Conventional Parameters

Water samples collected and sent to a qualified lab for analysis are also an important part of the water quality monitoring program. Analysis of nutrients in water samples is needed to determine whether the stream exhibits a potential for generating excessive plant growth which, in turn, can lead to eutrophication and problems with dissolved oxygen. Some of the most commonly used analyses for nutrients are nitrate-nitrogen, ammonia-nitrogen, orthophosphate-phosphorus, and total phosphorus. In addition, chlorophyll *a* may be analyzed to determine the level of algal phyto-pigments as an indicator of algal biomass in the water column. Chloride, sulfate, and total dissolved solids are analyzed to determine density stratification, document amounts and dispersion of pollutants, and evaluate the mixing of fresh and salt water in estuaries. A list of the SWQM program water quality monitoring core parameters can be found in Exhibit 3C.

Toxic Substances

Specific toxic substances (pollutants regulated by 30 TAC §307.6, Texas Surface Water Quality Standards) (www.tceq.state.tx.us/permitting/water_quality/wq_assessment/standards/WQ_standards_intro.html) should be monitored in water, sediment, and fish tissue at selected sites where water monitoring workgroups have deemed that impact to water quality is likely. After an impact has been identified, monitoring efforts should move upstream to focus on identifying sources of concern for each subwatershed (point and nonpoint sources). A list of the SWQM program water quality monitoring core parameters can be found in Exhibit 3C.

Metals and Organics in Water: Monitoring metals and organics in water should initially focus on those subwatersheds where concentrations of permitted and nonpoint source pollutants might be

anticipated. A complete scan of permitted pollutants may be prohibitive in cost, and is not generally recommended. The analysis of individual pollutants should be determined based on comprehensive watershed inventories, identification of water quality problems and their sources, and on past data analyses.

Metals and Organics in Sediment: Monitoring total metals in sediment should initially focus on those subwatersheds where the pollutants might be anticipated. In addition, conventional parameters in sediment can also be analyzed to provide valuable information. The results of sediment analyses are used to evaluate the condition of the benthic macroinvertebrate habitat, to determine point and nonpoint source impacts, and to monitor rates of recovery following establishment of pollution controls or improved wastewater treatment.

Fish Tissue: Fish tissue sampling to assess human health risk should only be conducted if tissue contamination is probable. Sampling should be designed and conducted cooperatively with the Department of State Health Services (DSHS) since these surveys require substantial resources. For example, fish tissue should be collected where instream concentrations of a toxic compound, known to bioaccumulate, have been found at levels above the human health criteria. Fish tissue samples for purposes other than to assess human health risk are outlined in the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue* (RG-415). Surveys to assess risk to aquatic predators can also be done cooperatively with the Texas Parks and Wildlife Department (TPWD).

Bacterial Measurements

Two forms of bacteria are analyzed in water samples to determine support of the contact recreation use: *Esherichia coli* (*E. coli*) in freshwater, and *Enterococci* in tidal water and designated inland waters. TCEQ can assist the Planning Agency in determining which indicator bacteria need to be analyzed. A list of the SWQM program water quality monitoring core parameters can be found in Exhibit 3C.

Biological/Habitat Assessments

The health of aquatic systems can also be assessed by evaluating the biological community present. Along with physical habitat information, fish and benthic macroinvertebrates are collected and identified in a manner that permits an assessment of the composition and integrity of the aquatic community. Biological communities are useful in assessing water quality for a variety of reasons, including their sensitivities to low-level disturbances and their function as continuous monitors. Common objectives for biological monitoring include:

- collect data useful for assessing, verifying, and determining appropriate aquatic life uses
- inventory fish and benthic macroinvertebrate communities
- collect data to be used for community structure trend analysis
- correlate measures of chemical water quality to biological information, where possible
- assess the effects of episodic spills and dumping of pollutants, wastewater treatment plant malfunctions, toxic nonpoint source pollution, or other impacts that periodic chemical sampling is unlikely to detect.
- assess the effects of perturbations of the physical habitat such as sedimentation from stormwater runoff, dredging, or channelization
- monitor rates of recovery following implementation of improved wastewater treatment
- provide early warning of potential impacts.

Methods outlined in the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data* (RG-416) (www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/swqm_resources.html) are recommended for fish, benthic macroinvertebrate, and habitat sampling in freshwater, wadeable streams. Methodologies for assessing tidal streams, reservoirs, and estuaries have not been developed. A systematic watershed monitoring approach of the biological community involves the determination of a "reference" condition that is representative of the watershed in a healthy, non-impacted condition from which to compare other sites within the watershed. Locations where conditions differ significantly from reference conditions may be impacted by pollution, and should be the focus of further investigation and/or possible remedial action. When possible, the determination of habitat, fish, and/or benthic macroinvertebrate integrity should be used in conjunction with physical and chemical data to provide an integrated assessment of support of the aquatic life use for water bodies identified in the Texas Surface Water Quality Standards (TSWQS) (Appendices A and D) (www.tceq.state.tx.us/permitting/water_quality/wq_assessment/standards/WQ_standards_intro.html).

All biological/habitat data reported to the TCEQ under the approved QAPP, should also be summarized and submitted electronically using the Biological Data Summary Packet, an outline of which can be found in Exhibit 3D, and available on the Internet at (www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/swqm_resources.html).

Ambient Toxicity

Ambient toxicity is another effective means of determining whether any substances in the water are having an effect on the reproductivity and survivability of fish and benthic macroinvertebrates that typically inhabit those waters. Sites should be selected based on the following criteria:

- known or suspected toxicity, suggested by supporting information
- integration of toxicity sampling with other biological or chemical testing at a contaminated site
- importance of the water body uses that may be impaired.

Basin Monitoring Planning, Coordination, and Development

Developing a comprehensive basin monitoring program that supports the various basin and statewide objectives requires intensive planning and coordination. The monitoring programs necessitate annual review and evaluation to address new cooperative efforts and emerging priorities and to ensure that monitoring programs remain effective and viable.

The intent, purpose, and protocols for each type of monitoring described in this task serve to support the decision about which type of monitoring to use and where to use it. A major objective of monitoring under the Clean Rivers Program is to provide data to support the assessment of surface water quality, water quality standards, and wastewater permits; therefore, monitoring decisions should be made considering the minimum requirements needed to support these objectives. These objectives are outlined in the most recent version of the TCEQ *Guidance for Assessing and Reporting Surface Water Quality in Texas* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/305_303.html).

Coordinated Monitoring Process

Each spring, monitoring organizations meet to develop a coordinated monitoring schedule to be implemented in the coming fiscal year. The goal of this activity is to provide a process by which the Planning Agencies will coordinate their monitoring activities with the TCEQ and other basin monitoring organizations collecting data under a TCEQ or federally approved QAPP. By participating in this activity, Planning Agencies will be in compliance with the contract provision requiring that monitoring programs be planned in consultation with the TCEQ, as it relates to routine monitoring, and that monitoring resources for the basin will be more efficiently used.

Coordinated Monitoring Meeting Participation

Those organizations that have been identified as willing to comply with TCEQ requirements for collecting quality-assured water quality data should be invited to participate in the coordinated monitoring meeting. Where possible, invite other local monitoring entities (e.g., Texas Parks and Wildlife, USGS, Texas State Soil and Water Conservation Board) to participate. Depending on the type of monitoring (e.g., stormwater, routine, seasonal), the information entered into the schedule will need to follow the monitoring types code definitions to ensure the data quality objectives are conveyed to the eventual data user. The monitoring type codes can be found in Chapter 4 of the TCEQ *Data Management Reference Guide* http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html.

The coordinated monitoring schedule also has a link to a Special Projects area. These special projects may extend over multiple basins and years, and generally include information about other monitoring efforts going on in each basin.

Coordinated Monitoring Meeting Preparation

In preparation for the meeting, the Planning Agency should seek input from the Basin Steering Committee or technical subcommittee regarding stakeholder monitoring issues or concerns to be addressed. Critical dates for monitoring meetings and associated deliverables are in the CRP shell work plan. The last possible date for the coordinated monitoring meeting should be indicated in the final work plan. Before finalizing the date of the meeting, the Planning Agency should get agreement on the date from all invitees.

Prior to the meeting, the current fiscal year's schedule will be used to populate the upcoming planning fiscal year's database on the statewide coordinated monitoring schedule posted at http://cms.lcra.org. The Special Projects page will also be updated to include projects where TCEQ is anticipating receiving data, even if it is not for assessment purposes. The TCEQ will post reference materials on the web that will provide guidance on monitoring priorities and preparing for the monitoring meeting (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/coop_monitoring.html). To ensure an effective meeting and the participation of all appropriate parties, the following steps should be taken prior to the meeting:

- Prior to attending a coordinated monitoring meeting, use the current TCEQ reference materials and monitoring objectives for the basin when developing a draft schedule for the upcoming state fiscal year.
- Sites should be selected to meet the objective of the monitoring. If the objective is the assessment of overall water quality, then the site should be representative of that water body. Please see Chapter 2 of the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods* (RG-415), for information on selecting a representative site.
- List the frequency of sampling for each parameter set. Provide a list of what will be included in each parameter set monitored.

- Print copies of the draft basin schedule, which is sorted by segment then site description, from the statewide schedule on the web to ensure the most current edits are incorporated. Generate enough copies for everyone to use as a worksheet at the meeting.
- If the internet is unavailable for your meeting, create maps of a suitable scale that clearly identify each sampling site on the proposed coordinated monitoring schedule. Be sure to include and label major roads, cities, county lines, water bodies, outfalls, and agricultural areas.

Conducting the Coordinated Monitoring Meeting

Coordinated monitoring meetings are working meetings in which monitoring will be discussed segment by segment, and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. It is important to begin documenting information about why sites are being monitored (e.g., site was added for BMP effectiveness monitoring; site is a long term trend site; site is a TCEQ least disturbed reference stream). This documentation can be added to the coordinated monitoring schedule "Comments" field or in a separate summary document about the stations in each basin. The TCEQ stations database has a comment field where this information may be captured when a station is created (SLOC process in SWQMIS), or a SLOC change request can be submitted to add this information.

Coordinated Monitoring Meeting Follow-Up

As a follow-up to each coordinated monitoring meeting, a "Summary of Changes" will be produced that reflects the meeting's discussions and outcomes. The summary should reflect what decisions were made: why a site was dropped or added, why the frequency was altered, why a parameter was dropped or added, why a monitoring need was unable to be addressed, and what are the future monitoring recommendations. This information will also be used in the QAPP Appendix B to help explain the sample design rationale, as well as, the justification of changes during the schedule updates. An example "Summary of Changes" can be found in Exhibit 3E.

Many factors may influence monitoring decisions after a coordinated monitoring meeting has been attended (e.g., stakeholder or TCEQ issues need to be addressed, monitoring resources needed in another basin). Participants in the coordinated monitoring schedule process should continue to communicate schedule changes until the schedule is finalized, as well as, throughout the year.

Maintaining the Monitoring Schedule

The statewide coordinated monitoring schedule will be maintained on the Internet at http://cms.lcra.org. A link to this web site should be readily accessible from the Planning Agency's CRP web page. All coordinated monitoring schedules need to be "finalized" by May 31, and the deliverable will be the submittal of the Summary of Changes. Changes to the monitoring schedule should also be provided to the Steering Committee. Updates that occur during the year should be described in the quarterly Progress Report.

Since CRP Partners, TCEQ Region Offices, and TCEQ program areas have password access to update the statewide schedule at any time, all parties identified in the schedule should coordinate and communicate monitoring changes with each other on an on-going basis. Changes to the QAPP may impact the statewide schedule. After a QAPP amendment or appendix has been approved, the information should be reflected on the statewide schedule, and email notification sent to the TCEQ CRP Project Manager and other affected parties (e.g., TCEQ Regional Offices). Updates should also be provided in the quarterly Progress Report. Only the portion of the coordinated monitoring schedule covered by the Planning Agency's QAPP will be included in Appendix B of the QAPP.

Exhibit 3A

Stream Classification and Flow Measurements

EXHIBIT 3A
STREAM CLASSIFICATION AND FLOW MEASUREMENTS

Stream Types

The TCEQ defines an intermittent stream as one that has a seven-day two-year low flow (7Q2) of less than 0.1 cfs or a period of zero flow for at least one week during most years. A stream is said to be intermittent with perennial pools if it meets the definition of intermittent and contains pools of sufficient size to support aquatic communities during times of critical low flow or no flow. A stream having a 7Q2 of 0.1 cfs or greater is considered perennial. Most streams for which flows have been requested are presumed to be perennial. Flow measurements have been requested for some streams that are intermittent with perennial pools in order to calculate a Harmonic Mean flow.

Flow Measurements

Flow measurements are needed by many in the regulated community during the permitting process. Some permittees discharge to intermittent streams that empty into perennial stream within three miles. In those cases, flows are not needed in the immediate receiving stream but in the perennial stream. *It is important for each River Authority to request a specific list of flow measurement sites from its CRP Project Manager to avoid collecting data at the wrong site.* In all cases, flow measurements should be made at least 100 feet above the point at which the effluent enters the perennial stream. For example, if the discharge is to “Dry Creek”, an intermittent stream that flows into “Big Soggy Creek”, a perennial stream within three miles of the discharge point, flows should be measured in Big Soggy Creek at least 100 feet upstream of the mouth of Dry Creek.

Ideally, flows should be measured monthly for two years to capture a full range of flow conditions, but at a minimum, one year of monthly flow data are needed for calculations. Flow should be measured at about the same time of each month to keep the data evenly spaced out over the year. A range of flows, **not just low flows**, is needed in order to optimize the statistical analysis that calculates 7Q2 and Harmonic Mean flows. Do not skip a flow measurement because of a rain event unless conditions are unsafe. It is important to note if stream flow ceases for one week or more at any time during the year.

The TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue* (RG-415), contains a very comprehensive discussion of flow measurement techniques. It would be best to follow that procedure as closely as possible. Flow estimates or flows based on “floating chip” velocities are **not** acceptable.

Flow Data Calculations

The flow measurements will be matched with gaged flows in a nearby watershed for the same days; these pairs of flows will be used to develop a linear relationship between the data sets. Approximate 7Q2 and Harmonic Mean flows will be determined from the fit.

Exhibit 3B

Special Study Report Outline

EXHIBIT 3B
SPECIAL STUDY REPORT OUTLINE

TITLE: Represents the report's content.
(Note: Titles should be clear, specific, and informative. If you cannot come up with such a title, then you may need to rethink your objective and your study design.)

TABLE OF CONTENTS: Provide an easy to follow guide of what the report has to offer. Add what is necessary so your audience can understand what is included in the report: list of abbreviations, list of tables, list of figures.

EXECUTIVE SUMMARY: Informative digest of the significant content and conclusions of the report. It is meant to be intelligible by itself, summarizing the purpose, findings, conclusions and recommendations.
(Note: This is the minimum that should be included on the web site when a report is too large, or includes graphs and figures that cannot be posted.)

INTRODUCTION: States the objective(s) of the report.
(Note: When the QAPP amendment was designed, the data quality objective(s) and the study design have already addressed this.)

PROJECT SIGNIFICANCE AND BACKGROUND: Why did you decide to do this project?

METHODS AND MATERIALS: Include enough detail that would allow someone to evaluate what was done or even duplicate if necessary (e.g., discuss experimental design).

RESULTS AND OBSERVATIONS: Presents the results that logically support (or provides data against) the objective stated in the introduction. Conclusions drawn from numerical data should be supported by brief explanations of the statistical criteria applied.

DISCUSSION: Interpret the data presented in the "Results and Observations" section, especially regarding the objective given in the introduction. Include discussion of previous findings that support and do not support your findings.

SUMMARY: State the conclusions that can be drawn from your data considering all the factors you presented in your "Discussion" section. State the logical implications of your findings for future application and study. What did you learn and what are the implications? What are the recommendations based on your findings? Was the objective accepted or rejected?

REFERENCES: Give credit where credit is due. If you reference or paraphrase other work, give the reference of the source document. If you researched lots of documents, but did not specifically reference them in your report, you may consider a BIBLIOGRAPHY since this will allow others more information if they are interested.

APPENDICES: Include as necessary to clarify or supplement the text. This could include the raw data or a survey used to gather data.

CBE Style Manual Committee. CBE style manual: a guide for authors, editors, and publishers in the biological sciences. 5th ed. rev. and expanded. Chicago, IL: Council of Biology Editors, Inc.; 1983.

Brusaw, C.T., G.J. Alred, and W.E. Oliu. Handbook of technical writing. 5th ed. New York, NY: St. Martin's Press. 1997.

Exhibit 3C

Surface Water Quality Monitoring Core Parameters

EXHIBIT 3C
SURFACE WATER QUALITY MONITORING CORE PARAMETERS

FIELD	*** Priority**
WATER TEMPERATURE (°C)	✔
PH (standard units)	✔
DISSOLVED OXYGEN (mg/L)	✔
SPECIFIC CONDUCTANCE (μmhos/cm @ 25°C)	✔
SECCHI DISC (meters) **Important parameter for reservoir ranking	✔
DAYS SINCE PRECIPITATION EVENT (days)	
SALINITY - ppt (saltwater only)	
CHLORINE RESIDUAL (mg/L) (downstream of WWTPs)	

FLOW	*** Priority**
FLOW:1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry	✔
INSTANTANEOUS FLOW STREAM (cfs, ft^3/s)	✔
FLOW METHOD 1=Flow Gage, 2=Electronic, 3=Mechanical, 4=Weir/Flume	

INDICATOR BACTERIA	*** Priority**
FECAL COLIFORM (#/100 ml)	✔
E. COLI (#/100 ml) (freshwater only)	✔
ENTEROCOCCUS (#/100 ml) (marine only)	✔

CONVENTIONAL PARAMETERS-INORGANIC	*** Priority**
ALKALINITY, TOTAL (mg/L as $CaCO_3$)	
TOTAL SUSPENDED SOLIDS (mg/L)	
VOLATILE SUSPENDED SOLIDS (mg/L)	
TOTAL DISSOLVED SOLIDS (mg/L)	✔
CHLORIDE (mg/L as Cl)	✔
SULFATE (mg/L as SO_4)	✔
TOTAL ORGANIC CARBON(mg/L as C)	

CONVENTIONAL PARAMETERS-NUTRIENTS	*** Priority**
NITRITE + NITRATE-NITROGEN (mg/L as N)	✔
AMMONIA-NITROGEN (mg/L as N)	✔
ORTHO-PHOSPHATE (mg/L as P)	✔
TOTAL PHOSPHATE (mg/L as P)	✔
CHLOROPHYLL-A (μg/L)	✔
TOTAL KJELDAHL NITROGEN (mg/L as N)	
PHEOPHYTIN-A (μg/L)	

* Parameter Used/Needed for Regulatory Purposes

24 HOUR (Diel) PARAMETERS	* Priority
DISSOLVED OXYGEN, 24-HOUR AVG (mg/L)	✔
DISSOLVED OXYGEN, # MEASUREMENTS DURING 24-HR	✔
DISSOLVED OXYGEN, 24-HOUR MAX.(mg/L)	✔
DISSOLVED OXYGEN, 24-HOUR MIN. (mg/L)	✔
WATER TEMPERATURE, 24-HR AVERAGE (°C)	
WATER TEMPERATURE, # OF MEASUREMENTS DURING 24-HRS	
WATER TEMPERATURE, MAXIMUM 24-HR (°C)	
WATER TEMPERATURE, MINIMUM 24-HR (°C)	
SPECIFIC CONDUCTANCE, 24-HR AVERAGE (°C)	
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS DURING 24-HRS	
SPECIFIC CONDUCTANCE, MAXIMUM 24-HR (°C)	
SPECIFIC CONDUCTANCE, MINIMUM 24-HR (°C)	
pH, # OF MEASUREMENTS DURING 24-HRS	
pH, MAXIMUM 24-HR (°C)	
pH, MINIMUM 24-HR (°C)	
SALINITY, 24-HR AVERAGE (°C)	
SALINITY, # OF MEASUREMENTS DURING 24-HRS	
SALINITY, MAXIMUM 24-HR (°C)	
SALINITY, MINIMUM 24-HR (°C)	

* Parameter Used/Needed for Regulatory Purposes

METALS IN WATER	* Priority
DISSOLVED (μg/L)	
ALUMINUM (Al)	✔
ARSENIC (As)	✔
CADMIUM (Cd)	✔
CHROMIUM (Cr)	✔
COPPER(Cu)	✔
LEAD (Pb)	✔
NICKEL (Ni)	✔
SILVER (Ag)	✔
ZINC (Zn)	✔
BARIUM (Ba)	
IRON (Fe)	
MANGANESE (Mn)	
MOLYBDENUM (Mo)	
TOTAL (μg/L)	
MERCURY (Hg)	✔
SELENIUM (Se)	✔
TOTAL HARDNESS (mg/L as $CaCO_3$)	✔

* Parameter Used/Needed for Regulatory Purposes

ORGANICS IN WATER (μg/L) ♦= AQUATIC LIFE USE; ■= HUMAN HEALTH	*** Priority**
Semivolatile	
PHENOL ($C_6H_5$0H)-SINGLE COMPOUND	
2-CHLOROPHENOL	
2-NITROPHENOL	
2,4-DICHLOROPHENOL	
PARACHLOROMETA CRESOL	
2,4,5-TRICHLOROPHENOL ■	✔
2,4,6-TRICHLOROPHENOL	
2,4-DIMETHYLPHENOL	
2,4-DINITROPHENOL	
4-NITROPHENOL	
DNOC (4,6-DINITRO-ORTHO-CRESOL)	
PCP (PENTACHLOROPHENOL)♦ ■	✔
N-NITROSODIMETHYLAMINE	
BIS (2-CHLOROETHYL) ETHER	
1,3-DICHLOROBENZENE ■	✔
1,4-DICHLOROBENZENE ■	✔
1,2-DICHLOROBENZENE ■	✔
BIS (2-CHLOROISOPROPYL) ETHER	
HEXACHLOROETHANE ■	✔
N-NITROSO-DI-N-PROPYLAMINE	
NITROBENZENE ■	✔
ISOPHORONE	
BIS (2-CHLOROETHOXY) METHANE	
1,2,4-TRICHLOROBENZENE	
NAPHTHALENE	
HEXACHLOROBUTADIENE ■	✔
HEXACHLOROCYCLOPENTADIENE	
2-CHLORONAPHTHALENE	
ACENAPHTYLENE	
DIMEHTYL PHTHALATE	
2,6-DINITROTOLUENE	
ACENAPHTHENE	
2,4-DINITROTOLUENE	
FLUORENE	
4-CHLOROPHENYL PHENYL ETHER	
DIETHYL PHTHALATE	
N-NITROSODIPHENYLAMINE	
1,2-DIPHENYLHYDRAZINE	
4-BROMOPHENYL PHENYL ETHER	
PHENANTHRENE ♦	✔

ORGANICS IN WATER (μg/L) ♦= AQUATIC LIFE USE; ■= HUMAN HEALTH	*** Priority**
ANTHRACENE	
DI-N-BUTYL PHTHALATE	
FLUORANTHENE	
PYRENE	
BENZIDINE ■	✔
N-BUTYL BENZYL PHTHALATE	
CHRYSENE ■	✔
BENZO(A)ANTHRACENE ■	✔
3,3'-DICHLOROBENZIDINE	
BIS(2-ETHYLHEXYL) PHTHALATE	
DI-N-OCTYL PHTHALATE	
BENZO(B)FLUORANTHENE	
BENZO(K)FLOURANTHENE	
BENZO-A-PYRENE ■	✔
INDENO (1,2,3-CD) PYRENE	
1,2,5,6-DIBENZANTHRACENE	
BENZO(GHI)PERYLENE	
CRESOL ■	✔
HEXACHLOROPHENE ■	✔
N-NITROSODIETHYL AMINE ■	✔
N-NITROSODI-N-BUTYL AMINE ■	✔
PYRIDINE ■	✔
1,2,4,5-TETRACHLOROBENZENE ■	✔
Volatile	
CHLOROMETHANE	
BROMOMETHANE	
VINYL CHLORIDE ■	✔
CHLOROETHANE	
ACRYLONITRILE ■	✔
CHLOROFORM ■	✔
METHYLENE CHLORIDE	
1,1-DICHLOROETHYLENE ■	✔
1,1-DICHLOROETHANE	
TRANS-1,2-DICHLOROETHENE	
1,2-DICHLOROETHANE ■	✔
CARBON TETRACHLORIDE ■	✔
BROMODICHLOROMETHANE	
BENZENE ■	✔
CHLORODIBROMOMETHANE ■	✔

ORGANICS IN WATER (μg/L) ♦= AQUATIC LIFE USE; ■= HUMAN HEALTH	*** Priority**
1,1,1-TRICHLOROETHANE ■	✔
1,2-DICHLOROPROPANE	
TRANS-1,3-DICHLOROPROPENE ■	✔
CIS-1,3-DICHLOROPROPENE ■	✔
1,1,2-TRICHLOROETHANE	
2-CHLOROETHYL VINYL ETHER	
TRICHLOROETHYLENE ■	✔
BROMOFORM	
TOLUENE	
ETHYLBENZENE	
1,1,2,2-TETRACHLOROETHANE	
TETRACHLOROETHYLENE ■	✔
CHLOROBENZENE	
XYLENE	
BIS (CHLOROMETHYL) ETHER ■	✔
1,2-DIBROMOETHANE ■	✔
METHYL TERT-BUTYL ETHER (MTBE) ■	✔
Pesticides	
DDT ♦ ■	✔
DDD ■	✔
DDE ■	✔
ALDRIN ♦ ■	✔
DIELDRIN ♦ ■	✔
ENDRIN ♦ ■	✔
CHLORDANE ♦ ■	✔
ALACHLOR ■	✔
HEPTACHLOR ♦■	✔
HEPTACHLOR EPOXIDE ■	✔
METHOXYCHLOR ♦■	✔
METOLACHLOR ■	✔
LINDANE (GAMMA BHC) ♦■	✔
TOXAPHENE ♦ ■	✔
SIMAZINE ■	✔
ATRAZINE ■	✔
CYANAZINE	
HEXACHLOROBENZENE ■	✔
ALPHA BENZENE HEXACHLORIDE (BHC) ■	✔
BETA BENZENE HEXACHLORIDE (BHC) ■	✔
DELTA BENZENE HEXACHLORIDE (BHC)	

ORGANICS IN WATER (μg/L) ♦= AQUATIC LIFE USE; ■= HUMAN HEALTH	*** Priority**
DICOFOL (KELTHANE) ♦ ■	✔
MIREX ♦	✔
PENTACHLOROBENZENE ■	✔
MALATHION ♦	✔
PARATHION ♦	✔
DIAZINON	
2,4-D ■	✔
2,4,5-T ■	✔
SILVEX	
DIURON (KARMEX) ♦	✔
DURSBAN (CHLOROPYRIFOS) ♦	✔
ENDOSULFAN I (ALPHA) ♦	✔
ENDOSULFAN II (BETA) ♦	✔
ENDOSULFAN SULFATE ♦	✔
DEMETON ♦	✔
GUTHION ♦	✔
SEVIN	
PCB-1242	
PCB-1254	
PCB-1221	
PCB-1232	
PCB-1248	
PCB-1260	
PCB-1016	
TOTAL PCBS ♦ ■	✔

* Parameter Used/Needed for Regulatory Purposes

METALS IN SEDIMENT (mg/kg-dry weight)	*** Priority**
ALUMINUM (Al)	✔
ARSENIC (As)	✔
BARIUM (Ba)	✔
CADMIUM (Ca)	✔
CHROMIUM (Cr)	✔
COPPER (Cu)	✔
LEAD (Pb)	✔
MANGANESE (Mn)	✔
MERCURY (Hg)	✔
NICKEL (Ni)	✔
SELENIUM (Se)	✔
SILVER (Ag)	✔

METALS IN SEDIMENT (mg/kg-dry weight)	* **Priority**
ZINC (Zn)	✔
Sediment Conventionals	
OIL & GREASE (mg/kg)	
PERCENT SOLIDS IN SEDIMENT, DRY WEIGHT	
TOTAL ORGANIC CARBON, DRY WEIGHT (mg/kg)	
SEDIMENT PARTICLE SIZE <0.0039 CLAY % DRY WT	
SEDIMENT PARTICLE SIZE 0.0039-.0625 SILT % DRY WT	
SEDIMENT PARTICLE SIZE 0.0625-2MM SAND % DRY WT	
SEDIMENT PARTICLE SIZE >2.0MM GRAVEL % DRY WT	
The highlighted sediment conventionals are not used for regulatory purposes but are extremely important in determining the availability of sediment toxics. Sediment grain size and TOC are recommended when analyzing metals and/or organics in sediment.	

* Parameter Used/Needed for Regulatory Purposes

ORGANICS IN SEDIMENT (μg/kg-dry weight)	* **Priority**
Semivolatile	
PHENOL(C6H5OH)-SINGLE COMPOUND	✔
2-CHLOROPHENOL	✔
2-NITROPHENOL	✔
2,4-DICHLOROPHENOL	✔
PARACHLOROMETA CRESOL	✔
2,4,5-TRICHLOROPHENOL	✔
2,4,6-TRICHLOROPHENOL	✔
2,4-DIMETHYLPHENOL	✔
2,4-DINITROPHENOL	✔
4-NITROPHENOL	✔
DNOC (4,6-DINITRO-ORTHO-CRESOL)	✔
PCP (PENTACHLOROPHENOL)	✔
N-NITROSODIMETHYLAMINE	✔
BIS (2-CHLOROETHYL) ETHER	✔
1,3-DICHLOROBENZENE	✔
1,4-DICHLOROBENZENE	✔
1,2-DICHLOROBENZENE	✔
BIS (2-CHLOROISOPROPYL) ETHER	✔
HEXACHLOROETHANE	✔
N-NITROSODI-N-PROPYLAMINE	✔
NITROBENZENE	✔
ISOPHORONE	✔
BIS (2-CHLOROETHOXY) METHANE	✔
1,2,4-TRICHLOROBENZENE	✔
NAPHTHALENE	✔
HEXACHLOROBUTADIENE	✔

ORGANICS IN SEDIMENT (μg/kg-dry weight)	* **Priority**
HEXACHLOROCYCLOPENTADIENE	✔
2-CHLORONAPHTHALENE	✔
ACENAPHTYLENE	✔
DIMETHYL PHTHALATE	✔
2,6-DINITROTOLUENE	✔
ACENAPHTHENE	✔
2,4-DINITROTOLUENE	✔
FLUORENE	✔
4-CHLOROPHENYL PHENYL ETHER	✔
DIETHYL PHTHALATE	✔
N-NITROSODIPHENYLAMINE	✔
1,2-DIPHENYLHYDRAZINE	✔
4-BROMOPHENYL PHENYL ETHER	✔
PHENANTHRENE	✔
ANTHRACENE	✔
DI-N-BUTYL PHTHALATE	✔
FLUORANTHENE	✔
PYRENE	✔
BENZIDINE	✔
N-BUTYL BENZYL PHTHALATE	✔
CHRYSENE	✔
BENZO(A)ANTHRACENE	✔
3,3'-DICHLOROBENZIDINE	✔
BIS(2-ETHYLHEXYL) PHTHALATE	✔
DI-N-OCTYL PHTHALATE	✔
BENZO(B)FLUORANTHENE	✔
BENZO(K)FLOURANTHENE	✔
BENZO-A-PYRENE	✔
INDENO (1,2,3-CD) PYRENE	✔
DIBENZ (A,H) ANTHRACENE	✔
BENZO(GHI)PERYLENE	✔
CRESOL	✔
HEXACHLOROPHENE	✔
N-NITROSODIETHYLAMINE	✔
N-NITROSO-DI-N-BUTYLAMINE	✔
PYRIDINE	✔
1,2,4,5-TETRACHLOROBENZENE	✔

ORGANICS IN SEDIMENT (μg/kg-dry weight)	*** Priority**
Pesticides	
DDT	✔
DDD	✔
DDE	✔
ALDRIN	✔
DIELDRIN	✔
ENDRIN	✔
CHLORDANE	✔
HEPTACHLOR	✔
HEPTACHLOR EPOXIDE	✔
METHOXYCHLOR	✔
LINDANE (GAMMA BHC)	✔
TOXAPHENE	✔
HEXACHLOROBENZENE	✔
ALPHA BENZENE HEXACHLORIDE (BHC)	✔
BETA BENZENE HEXACHLORIDE (BHC)	✔
DELTA BENZENE HEXACHLORIDE (BHC)	✔
DICOFOL (KELTHANE)	✔
MIREX	✔
PENTACHLOROBENZENE	✔
MALATHION	✔
PARATHION	✔
DIAZINON	✔
2,4-D	✔
2,4,5-T	✔
SILVEX	✔
DIURON (KARMEX)	✔
DURSBAN	✔
ENDOSULFAN I (ALPHA)	✔
ENDOSULFAN II (BETA)	✔
ENDOSULFAN SULFATE	✔
DEMETON	✔
GUTHION	✔
SEVIN	✔
PCB-1242	✔
PCB-1254	✔
PCB-1221	✔
PCB-1232	✔
PCB-1248	✔

ORGANICS IN SEDIMENT (μg/kg-dry weight)	* **Priority**
PCB-1260	✔
PCB-1016	✔
TOTAL PCBS	✔

* Parameter Used/Needed for Regulatory Purposes

FISH TISSUE ANALYSIS (mg/kg-wet weight)	* **Priority**
Tissue	
FISH SPECIES, USE EPA STORET NUMERIC CODE	✔
ANATOMICAL PART, USE EPA STORET NUMERIC CODE	✔
NUMBER OF INDIVIDUALS IN COMPOSITE TISSUE SAMPLE	✔
NUMBER OF SPECIES IN COMPOSITE TISSUE SAMPLE	✔
SAMPLE LENGTH IN INCHES	
SAMPLE WEIGHT IN POUNDS	
SEX (1-MALE, 2-FEMALE, 3-MIXED, 4-UNKNOWN)	
Metals in Tissue	
ARSENIC	✔
CADMIUM	✔
CHROMIUM	✔
COPPER	✔
LEAD	✔
MERCURY	✔
SELENIUM	✔
Semivolatile Organics in Tissue	
PERCENT LIPIDS	
PHENOL	
2-CHLOROPHENOL	
2-NITROPHENOL	
2,4-DICHLOROPHENOL	
PARACHLOROMETA CRESOL	
2,4,5,-TRICHLOROPHENOL	
2,4,6-TRICHLOROPHENOL	
2,4-DIMETHYLPHENOL	
2,4-DINITROPHENOL	
4-NITROPHENOL	
DNOC (4,6-DINITRO-ORTHO-CRESOL)	
PCP (PENTACHLOROPHENOL)	✔
N-NITROSODIMETHYLAMINE	
BIS (2-CHLOROETHYL) ETHER	
1,3-DICHLOROBENZENE	
1,4-DICHLOROBENZENE	

FISH TISSUE ANALYSIS (mg/kg-wet weight)	* **Priority**
1,2-DICHLOROBENZENE	
BIS (2-CHLOROISOPROPYL) ETHER	
HEXACHLOROETHANE	✔
N-NITROSODI-N-PROPYLAMINE	
NITROBENZENE	✔
ISOPHORONE	
BIS (2-CHLOROETHOXY) METHANE	
1,2,4-TRICHLOROBENZENE	
NAPHTHALENE	
HEXACHLOROBUTADIENE	✔
HEXACHLOROCYCLOPENTADIENE	
2-CHLORONAPHTHALENE	
ACENAPHTHYLENE	
DIMETHYL PHTHALATE	
2,6-DINITROTOLUENE	
ACENAPHTHENE	
2,4-DINITROTOLUENE	
FLUORENE	
4-CHLOROPHENYL PHENYL ETHER	
DIETHYL PHTHALATE	
N-NITROSODIPHENYLAMINE	
1,2-DIPHENYLHYDRAZINE	
4-BROMOPHENYL PHENYL ETHER	
PHENANTHRENE	
ANTHRACENE	
DI-N-BUTYL PHTHALATE	
FLUORANTHENE	
PYRENE	
BENZIDINE	✔
N-BUTYL BENZYL PHTHALATE	✔
CHRYSENE	
BENZO(A)ANTHRACENE	✔
3,3'-DICHLOROBENZIDINE	
BIS(2-ETHYLHEXYL)PHTHALATE	
DI-N-OCTYL PHTHALATE	
BENZO(B)FLUORANTHENE	
BENZO(K)FLUORANTHENE	
BENZO-A-PYRENE	✔
INDENO(1,2,3-CD) PYRENE	
1,2,5,6-DIBENZANTHRACENE	

FISH TISSUE ANALYSIS (mg/kg-wet weight)	* **Priority**
BENZO(GHI)PERYLENE	
CRESOL	✔
HEXACHLOROPHENE	✔
N-NITROSODIETHYLAMINE	✔
N-NITROSO-DI-N-BUTYLAMINE	✔
PYRIDINE	✔
1,2,4,5-TETRACHLOROBENZENE	✔
Pesticides in Tissue	
PERCENT LIPIDS	
DDT	✔
DDD	✔
DDE	✔
ALDRIN	✔
DIELDRIN	✔
ENDRIN	
CHLORDANE	✔
HEPTACHLOR	✔
HEPTACHLOR EPOXIDE	✔
METHOXYCHLOR	
LINDANE (GAMMA BHC)	✔
TOXAPHENE	✔
HEXACHLOROBENZENE	✔
ALPHA BENZENE HEXACHLORIDE (BHC)	✔
BETA BENZENE HEXACHLORIDE (BHC)	✔
DELTA BENZENE HEXACHLORIDE	
DICOFOL (KELTHANE)	✔
MIREX	✔
PENTACHLOROBENZENE	✔
MALATHION	
PARATHION	
DIAZINON	
2,4-D	
2,4,5-T	
SILVEX (2,4,5-TP)	
DIURON (KARMEX)	
DURSBAN	
ENDOSULFAN	
ENDOSULFAN SULFATE	
DEMETON IN FISH TISSUE (SYSTOX)	

FISH TISSUE ANALYSIS (mg/kg-wet weight)	*** Priority**
GUTHION	
SEVIN (CARBARYL)	
PCB-1242	
PCB-1254	
PCB-1221	
PCB-1232	
PCB-1248	
PCB-1260	
PCB-1016	
TOTAL PCBS	✔

* Parameter Used/Needed for Regulatory Purposes

Exhibit 3D

Biological Data Reporting Packet Outline

EXHIBIT 3D
ELEMENTS OF THE BIOLOGICAL DATA SUMMARY PACKET

This document provides guidance for **submitting** biological data which are collected for Routine Aquatic Life Monitoring (ALM), Aquatic Life Use Assessments (ALU), Use Attainability Analysis (UAA), and Receiving Water Assessments (RWA). For guidance in the **collection** of the biological data consult the Texas Commission on Environmental Quality (TCEQ) *Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data* (RG-415) in conjunction with the *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*.

Items 1 - 4 below are the minimum data which should be submitted to the TCEQ as part of any biological assessment. These items should be compiled in a packet and submitted electronically to the TCEQ. If submitting the data as part of an UAA, please also utilize the UAA Report Outline to ensure, the summary of the collection efforts is complete. The TCEQ regional staff should submit the packets to the Surface Water Quality Monitoring Team (SWQM). Clean Rivers Program (CRP) Planning Agencies should submit packets to the appropriate TCEQ CRP Project Manager. Item 5 is optional.

1. Aquatic Life Monitoring and Habitat Assessment Checklist with map of area sampled

2. Biological Assessment
   - TCEQ Nekton Biological Data Reporting Form or equivalent for seining efforts
   - TCEQ Nekton Biological Data Reporting Form or equivalent for electrofishing efforts
   - TCEQ Benthic Macroinvertebrate Biological Data Reporting Form or equivalent

3. Habitat Assessment
   - TCEQ Habitat Reporting Form or equivalent
   - Part I - Stream Physical Characteristics Worksheet
   - Part II - Summary of Physical Characteristics of Water body
   - Representative photographs of site sampled

4. Field Data Reporting Form or equivalent and Stream Flow (Discharge) Measurement Form or equivalent

5. Metric Sets for Biological and Habitat Assessments
   - Regional Scoring Criteria for Determining ALU - Nekton
   - Scoring Criteria For Benthic Macroinvertebrate Rapid Bioassessment (RBA)
   - Scoring Criteria For Benthic Macroinvertebrate Quantitative Samples (Surber)
   - Part III - Habitat Quality Index

Aquatic Life Monitoring and Habitat Assessment Checklist

Background Information

Name of Water Body: _____.

Segment Number: _____ **Station ID:** _____ **On Segment:** Yes No

Permit number, if applicable:_____ **Circle Monitoring Objective:** ALM, ALU, UAA, RWA

Historic Stream Characterization (check one):

Intermittent	Intermittent with perennial pools sufficient to support significant aquatic life use	Perennial	Unknown

Basis for Historic Stream Characterization (describe):

Current Aquatic Life Use Designation (if classified segment or site specific standard determined)(circle one):

Exceptional High Intermediate Limited

Current Assessment Status on the _____ **Water Quality Inventory [305(b)]** (circle one):

Supported Partially Supported Not Supported Concern Not Assessed

Field Data Entry (FDE) Information: Date Entered Into FDE: _____ RTAG #: _____.
(TCEQ Regional Biologists only)

Field Data (CRP Partners only): Tag #: _____.

Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes No **Reason:** _____.

Known/Potential Causes of Aquatic Life Use Concern/Impairment: _____.

_____.

Identify Sources of Pollution:

Point Source: Yes No **Identify:** _____.
Nonpoint Source: Yes No **Identify:** _____.

Ambient Toxicity Tests in Water body? Yes No

Results:

	Sediment Chronic	**Sediment Acute**	**Water Chronic**	**Water Acute**
Significant Effect				
No Significant Effect				

Monitoring Information: Biological Monitoring Conducted During Index Period (03/15-06/30 and 10/01-10/15) and Critical Period (07/01-09/30). **Note**: If sampling event for a RWA, characterize the receiving stream upstream of the existing discharge point or downstream of the proposed discharge point.

Stream Characterization, Event 1, Date:

Dry	Pools Covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)

Stream Characterization, Event 2, Date:

Dry	Pools Covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)

Describe conditions which may have adversely affected stream during each sampling event (e.g., recent rains, drought, construction):

Nekton Sampling Event 1:

Minimum 15-minute (900 seconds) electrofishing: Yes No
Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No
Fish sampling conducted in all available habitat types: Yes No
If No, describe why:

Benthic Macroinvertebrate Sampling Event 1:

Indicate Method(s) Used:
Rapid Bioassessment (5-minute kicknet or Snags):
Quantitative (Surber or Snags or Dredge):

Habitat Assessment Event 1:

TCEQ Habitat Protocols: Yes No

Stream Flow Measurement Event 1:

Instantaneous measurement: Yes No
USGS Gage Reading: Yes No

Nekton Sampling Event 2:

Minimum 15-minute (900 seconds) electrofishing: Yes No
Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No
Fish sampling conducted in all available habitat types: Yes No
If No, describe why:

Benthic Macroinvertebrate Sampling Event 2:

Indicate Method(s) Used:
Rapid Bioassessment (5-minute kicknet or Snags):
Quantitative (Surber or Snags or Dredge):

Habitat Assessment Event 2:

TCEQ Habitat Protocols: Yes No
If No, flow, wetted channel width, photographs, description of bank conditions relative to first event, and description of canopy cover conditions relative to first event must be provided in this packet.

Stream Flow Measurement Event 2:

Instantaneous measurement: Yes No
USGS Gage Reading: Yes No

Assessment Results (Optional)

Fish Community Index Event 1:
Exceptional High Intermediate Limited

Fish Community Index Event 2:
Exceptional High Intermediate Limited

Benthic Macroinvertebrate Community Index Event 1:
Exceptional High Intermediate Limited

Benthic Macroinvertebrate Community Index Event 2:
Exceptional High Intermediate Limited

Habitat Index Event 1:
Exceptional High Intermediate Limited

Habitat Index Event 2:
Exceptional High Intermediate Limited

Outline for Use Attainability Analysis Report

Introduction

Problem statement
Objectives

Study Area

Description of water body and designated uses and criteria
Environmental features and population characteristics
Permitted discharges
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Summary of historical data

Methodologies

Station descriptions
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Survey descriptions

Results and Discussions

Physical evaluation
- Hydrology
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Physicochemical evaluation

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Conclusions

References

Appendices

Exhibit 3E

Coordinated Monitoring Meeting Summary of Changes

Coordinated Monitoring Meeting: April 9, 2009

Summary of Changes

The following changes, additions, or deletions have been made to the FY2010 Coordinated Monitoring Schedule to address monitoring issues identified by the involved monitoring entities or steering committee members.

1. The Guadalupe River at Dupont site will be discontinued at the present location and a new site that is downstream and out of the mixing zone of the Dupont discharges will be found for 2010.

2. A new site on Peach Creek will be added bimonthly in 2008 (site no. 17935, Peach Creek at FM 397.) Data at this site was collected during the Peach Creek TMDL. The site will be monitored in 2008 and beyond to identify any changes in the water quality that may be a result of the implementation of BMPs in the watershed.

3. The UGRA weekly monitoring of E. coli will no longer be funded by CRP. The TCEQ has sufficient data for assessment purposes and does not need the bacterial data at this frequency any longer. UGRA will evaluate their ability to continue monitoring at these sites for their own use and use by their constituents.

4. Region 13 will add a quarterly monitoring location in Cypress Bend Park on the Guadalupe River (station id to be determined).

5. Samples for E. coli will be sampled every Saturday for eight weeks, beginning in mid-May and ending in July 2007, for screening of bacterial concentrations during peak recreational use on the Comal and Guadalupe Rivers.

6. Camp Meeting Creek, segment 1806A, is impaired for dissolved oxygen. Biological and 24H information needs to be collected at this site. Neither GBRA or the Regional office could pick up this monitoring with available resources.

7. Organics in sediment, specifically those organics associated with urban environments (TPH and BTEX) have been identified by the Steering Committee as a concern and will be added as a special study later.