ALNRC 00025
May 15, 2009

Enclosure M

MACTEC Standard Operating Procedure (SOP) for the
Callaway Nuclear Plant Unit 2 Siting Study

G-15 15b

Standard Operation Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study

Natural Resources
Field Sampling and Analysis

Prepared for:

Paul C. Rizzo and Associates, Inc.

Prepared by:
MACTEC Engineering and Consulting, Inc.
3199 Riverport Tech Center Drive
St. Louis, Missouri 63043

MACTEC PROJECT Number 3250075219

November 30, 2007

MACTEC

Stephen P. Stumne — 30 Nov 2007 — Date
Project Manager

William Elzinga — 11/30/07 — Date
Senior Principal Scientist by SBM with permission

Table of Contents

Table of Contents (cont.)

List of Appendices

Table of Contents (cont.)

List of Figures

List of Abbreviations and Acronyms

BBS	Breeding Bird Survey
C	coefficients of conservatism
CFR	Code of Federal Regulations
COC	Chain of Custody
COLA	Combined Operating License Application
CPE	catch-per-effort
CWA	Clean Water Act
EPT	Ephemeroptera, Plecoptera, and Trichoptera
FEMA	Federal Emergency Management Agency
FIRMS	Flood Insurance Rate Maps
FO	fly-overs
FQI	Floristic Quality Index
FT	fly-throughs
GIS	geographical information system
GPS	global positioning system
ID	identification
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
mm	millimeter
MSDIS	Missouri Spatial Data Information Service
NEPA	National Environmental Policy Act
NRC	U.S Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OHWM	ordinary high water mark
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
RS	Representative Species
RTE	Rare, Threatened or Endangered
SOP	Standard Operating Procedures
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

The purpose of this document is to establish a consistent procedure to perform natural resources field and laboratory studies conducted by MACTEC Engineering and Consulting, Inc. (MACTEC) in conjunction with the Combined Operating License Application (COLA) for Unit 2 at the Callaway Nuclear Power Plant (Figure 1-1).

1.2 Scope

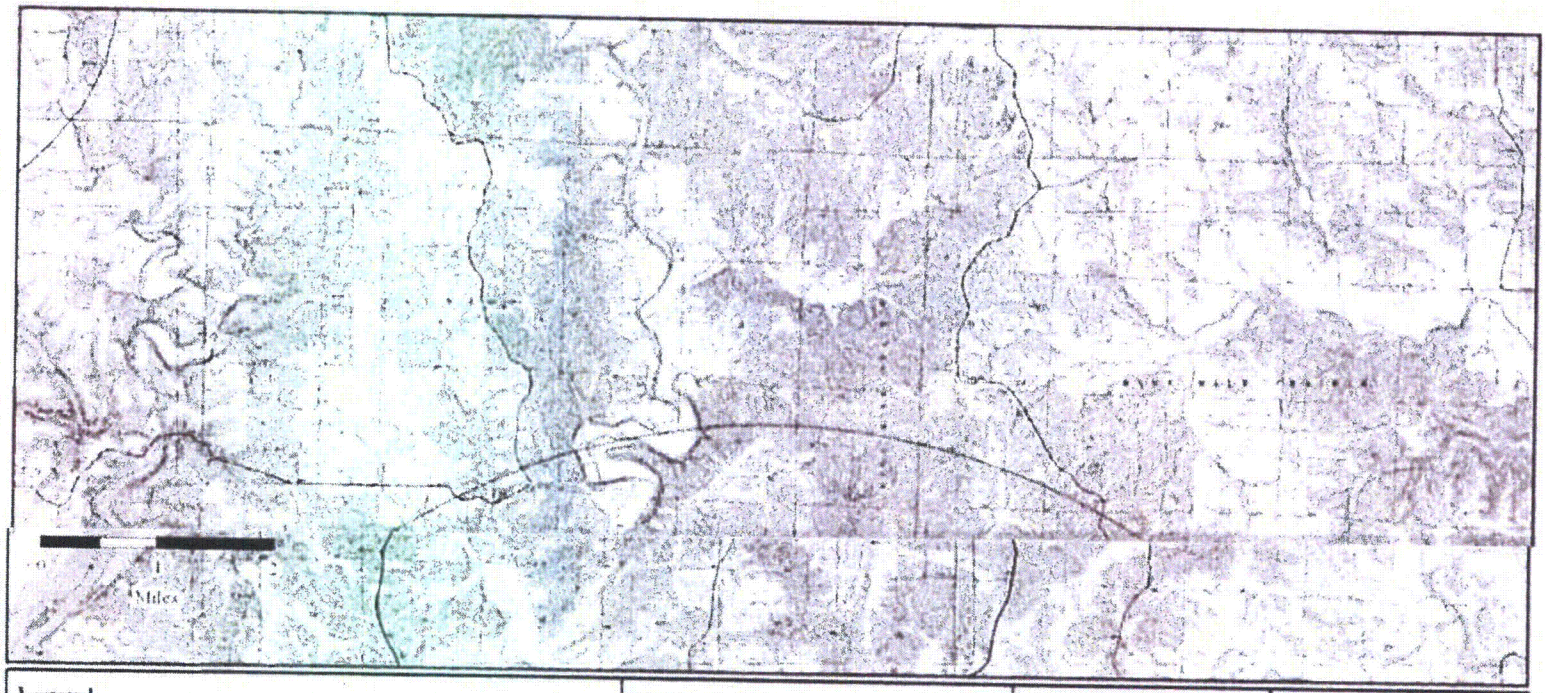
These Standard Operating Procedures (SOPs) are applicable to all field and laboratory sampling analysis by MACTEC personnel. It provides procedures that are specific to the Callaway COLA documentation requirements. Natural resources work to be performed is required to satisfy regulatory requirements for documenting and characterizing environmental conditions of the project vicinity and site, and in evaluating potential construction phase and operational phase effects. Specific work elements addressed in this SOP include the following:

- Terrestrial vegetation assessment,
- Herpetofaunal assessment,
- Avifaunal assessment,
- Mammal assessment,
- Waters of the United States delineation,
- Threatened and endangered species assessment,
- Adult/juvenile fish assessment,
- Benthic invertebrate assessment,
- Unionid assessment,
- Lake sturgeon survey,
- Sample custody, and
- Ecology laboratory sample logging, sorting, splitting, identification and quality control.

1.3 Key Project Contacts

Various personnel are involved in the Callaway COLA Program and will be available to discuss relevant issues, clarify applicability of this SOP, and resolve problems. The following table provides a list of key program personnel and their contact information.

Key Client Contacts	Key MACTEC Contacts
Paul C. Rizzo Associates Project Manger	**MACTEC Project Manager**
Mel Koleber, P.E. (412) 856-9700 ext. 1004 Project Manager Mel.Koleber@rizzoassoc.com	**Steve Stumne** 314-209-5981 *[314-541-4222 cell]* Ecology Department Manager, Terrestrial Resources spstumne@mactec.com
Melissa Dubinsky, Ph.D. (412) 856-9700 ext. 1009 Environmental Task Manager Melissa.Dubinsky@rizzoassoc.com	**Bill Elzinga** 314-209-5957 *[314-520-1506 cell]* Project Principal wjelzinga@mactec.com
Robert Halden, P.E. (412) 856-9700 Project Engineer Robert.Halden@rizzoassoc.com	**Steve Carter** 314-209-5911 *[314-420-9400 cell]* Chief Scientist srcarter@mactec.com
	Sam McCord, Ph.D. 314-209-5949 *[314-803-0933 cell]* Aquatic Ecological Resources sbmccord@mactec.com



Legend

- Proposed Transmission Corridor
- Missouri Conservation Land
- Callaway Plant Site
- 6 Mile Radius

Drawn By CGS Approved By SPS

Checked By BSM August 13, 2007

MACTEC

Figure 1-1
Callaway Nuclear Plant Vicinity Map

Callaway Nuclear Plant

1.4 Previous Studies

An environmental baseline inventory of the Callaway Plant Site was conducted in mid 1970s. This inventory involved studies of vegetation, mammals, birds, amphibians, reptiles, and invertebrates. Ten permanent terrestrial vegetation study plots measuring 2.5 acres (1 hectare) each were established within the Callaway Plant Site boundary. Four forested and four old field study plots were established in the early 1970s for baseline preconstruction monitoring of vegetation and wildlife. Two additional plots were established in 1982 for additional monitoring.

1.5 Regulatory Basis

The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. The U.S Nuclear Regulatory Commission (NRC) staff is required by parts of 10 Code of Federal Regulations (CFR) 51 (Environmental Protection Regulations For Domestic Licensing and Related Regulatory Functions) Subpart A (NEPA – Regulations Implementing Section) to assess project environmental impacts. In addition the NRC has created many Regulatory Guides. NRC Regulatory Guides Division 4 was established to provide guidance on Environmental and Siting issues. In accordance with NRC Regulatory Guides 4.2 (Preparation of Environmental Reports for Nuclear Power Stations), 4.7 (General Site Suitability Criteria for Nuclear Power Stations) and 4.11 (Terrestrial Environmental Studies for Nuclear Power Stations), the environmental studies as discussed below will involve the collection and analyzes of data seasonally, as appropriate, at the Callaway Plant Site. Regulatory Guide 4.11 provides technical information for the design and execution of terrestrial environmental studies for nuclear power stations, but where appropriate, this guide will also be used for performing aquatic environmental studies. The baseline data will be used to compare subsequent data to evaluate plant construction and operation impacts. It is anticipated that this environmental report will satisfy the requirements of NEPA, and the NRC Regulatory guides.

The NRC guidance document, NUREG-1555 (Environmental Standard Review Plan), provides guidance to Staff when performing environmental reviews for nuclear power plants pursuant to the provisions of 10 CFR 51 related to new site/plant applications. It is the intent of these environmental studies to satisfy all the terrestrial and aquatic ecosystem data needs to provide sufficient baseline characterization information to allow for a complete and thorough environmental review as required in NUREG-1555. This baseline data will be used at a later date to assess the requirements of NUREG-1555 (Parts 4.0 and 5.0) to evaluate the environmental impacts of construction and operations respectively. Results of this work shall also be considered in the formulation of future monitoring programs in accordance with the requirements of NUREG-1555 Part 6.5.

The responsibility for protection of the environment has also been assigned to many agencies. As a prerequisite to plant licensing and construction it is important to identify and assess the many environmentally related authorizations required by federal, state, regional, local and affected Native American tribal agencies. The baseline data collected in these studies will also be utilized to support potential future construction and operational activities and to address the concerns of the many agencies and insure compliance with these laws and regulations. Major required authorizations, permits or consultations include the following:

- U.S. Army Corps of Engineers (USACE) – Clean Water Act, Section 404 permit is required for fill activities within wetlands and waters of the United States.

- USACE – Rivers and Harbor Act of 1899, Section 10 permit is required for any activities "over, under, or through" navigable waters.
- U.S. Fish and Wildlife Service (USFWS) – Endangered Species Act, Section 7 consultation is required on project impacts to endangered species during construction and operation.
- U.S. Environmental Protection Agency (USEPA) – NEPA, documentation in support of Federal decision-making.
- Missouri Department of Natural Resources (MDNR), State Historic Preservation Office – National Historic Preservation Act, Section 106 consultation regarding impacts of Archaeological sites and Historic sites during construction and operations.
- MDNR – Clean Water Act, Section 401 water quality certification for discharges under the NPDES permit and CWA Section 404 permit.
- MDNR – Clean Water Act, Section 402 NPDES permits for land disturbance, point discharges and stormwater discharges.
- MDNR – Clean Water Act, Section 316(a) and (b) permits for NPDES actions entailing water withdrawal and thermal discharges.

1.6 Site and Vicinity Boundary

The NRC has created NUREG-1555 (Environmental Standard Review Plan) for providing guidance to Staff when performing environmental reviews for nuclear power plants. The format of NUREG–1555 includes 6 sections: area of review, acceptance criteria, review procedures, evaluation findings, implementation, and references. The area of review identifies data and information needs for Water (hydrology-wetlands) Ecology (terrestrial and aquatic) and Socioeconomics (historic properties) in addition to other environmental areas. The data and information requirements frequently mention the need to submit data on a site or vicinity basis. The site and vicinity boundaries defined in this regulation are larger boundaries than just considering the footprint of new construction. NUREG-1555 under 2.2.1 (The Site and Vicinity) defines site and vicinity as follows:

- "Site" – The site is defined as that area of land owned or controlled by the applicant for the principal purpose of constructing and operating a nuclear power station. As a general rule, the applicant's "site boundary" should be accepted as defining the site.
- "Vicinity"- For small sites (on the order of two square kilometers), the vicinity is the area encompassed within a radius of ten kilometers (six miles). For larger irregularly shaped sites, the vicinity is a band or belt ten kilometers (six miles) wide surrounding the plant site. The intent is to investigate land use in an area in which the site makes up no more than 10 percent of the area. If a lake or pond is to be created for use by the station, the entire water-body area should be included in the vicinity. The vicinity considered may follow natural or political boundaries.

In this report, the site boundary definition will be used to limit our field terrestrial and aquatic reconnaissance investigations. The site boundary generally coincides with the Missouri Department of Conservation (MDC) Reform Conservation Area and is 7,528 acres in size. However, some reconnaissance will be required off-site for the Missouri River near the plant intake (existing and proposed) and discharge pipe locations, along the discharge pipe alignment in the floodplain, and for the transmission line corridor routes.

In examining the vicinity definition, this site is a large site approximately 28.5 square kilometers. However, in this case it is prudent to investigate "an area in which the site makes up no more than 10 percent of the area." A radius of six miles defining the vicinity will result in an area of 72,345 acres of which the site area is approximately 10 percent. The six-mile radius will be used to gather environmental data in the vicinity. Data will be gathered by obtaining available

mapping, literature reviews, talking to local experts and consulting with appropriate agencies. The only exception to the six-mile radius is for historic properties where the station can have a visual or noise impact on cultural and historic resources that are located at a greater distance from the station. NUREG-1555 part 2.5.3 requires a description of historic properties within a radius of 10 miles of the site and 1.2 miles of proposed transmission lines.

2.0 Terrestrial Vegetation Assessment

2.1 Project Objectives

The specific objectives of this work plan are as follows:

1. Develop a recent Callaway Plant Site inventory of flora for comparison with the 1970s preconstruction inventory;
2. Prepare a recent photographic record of the vegetation communities;
3. Develop a current land cover map; and
4. Provide a description of the change in plant communities at the site since the 1970s monitoring project;

2.2 Methods

Due to succession of the previously established vegetation study plots (i.e., most old field plots are now immature forests), five new transects 1,500 feet in length have been established for the terrestrial vegetation assessment (Figure 2-1). Two transects (T-2 and T-4) have been established in forested areas, one (T-3) has been established in grassland/pasture, one (T-5) has been established in old field and forest, and one (T-1) has been established in the bottomlands near Logan Creek. To account for seasonal variability of the vegetation within the site, each of the five transects will be assessed in the spring and fall during the 2007 growing season.

The project will consist of the following components:

- Photographic documentation;
- Qualitative inventory of flora; and
- Report presenting the study results.

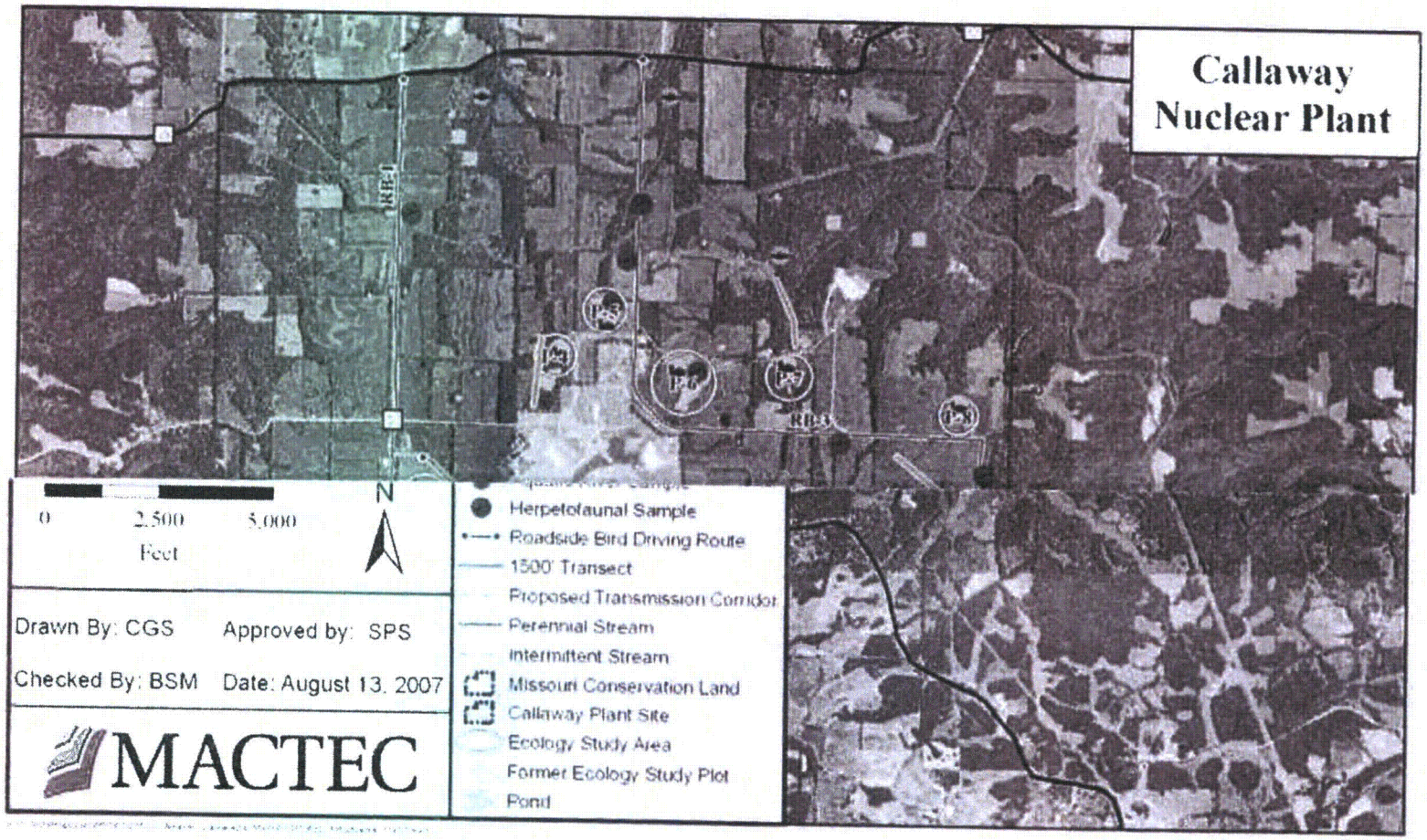
MACTEC will prepare geographical information system (GIS) (aerial and topographic) base maps and locate transects with global positioning system (GPS) for inclusion in the base maps. MACTEC field crews will be responsible for conducting field surveys and plant species identifications and will preserve voucher specimens for the project.

2.2.1 Land Cover Mapping

Missouri Spatial Data Information Service (MSDIS) mapping for the site was examined to evaluate its use for the project in establishing baseline conditions and in assessing project impacts. The data from MSDIS was noted to be coarse (30-meter grid) and was observed to contain known errors in cover type. For the project vicinity, this level of detail is assumed to be acceptable. Incorporation of MSDIS regional land cover data will be performed to quantify and tabulate land cover types within the project vicinity (six-mile radius). This work will be done using a GIS query of established data. No ground truthing will be performed within the project vicinity.

For the project site, MSDIS land cover information is considered to be inadequate, due to its inaccuracies and its coarse level of detail, and is considered to be insufficient for properly assessing project effects. Photo interpretation of current land cover on the project site will be performed to provide a more accurate tabulation of land cover characteristics. "Heads-up" digitizing will be used to delineate land cover types based on recent aerial photography.

A single field trip will be conducted to ground truth land cover types mapped by photo interpretation.


Callaway Nuclear Plant
0
2,500
5,000
Feet
N
Drawn By: CGS
Approved by: SPS
Checked By: BSM
Date: August 13, 2007
MACTEC
Herpetofaunal Sample
Roadside Bird Driving Route
1500' Transect
Proposed Transmission Corridor
Perennial Stream
Intermittent Stream
Missouri Conservation Land
Callaway Plant Site
Ecology Study Area
Former Ecology Study Plot
Pond

2.2.2 Qualitative Inventory of Flora

A qualitative inventory of the site flora will be documented during the 2007 growing season. The qualitative inventory will, to the extent practical, record the presence of each plant species growing on the Callaway Plant Site (Appendix A). Observations of plant species will be recorded during other terrestrial monitoring efforts and additional site reconnaissance visits will be used to record observations of plant species occurring outside the established transect locations to provide a more complete inventory of the site.

Due to the varying phenology (life cycles) of plant species and the need to observe plants in proper reproductive condition necessary to permit species identification, spring and fall on-site inventories will be performed to identify plant species occurring on the site. This approach will require pedestrian surveys during the growing season to observe and record plants occurring in various habitats on the site. Particular emphasis will be given to those areas potentially affected by future disturbance (construction sites, drift zones, etc.).

In order to effectively characterize plant communities of the site, the relative abundance of each species occurring along five terrestrial transects (same as those used for faunal inventories) will be assessed. Plant species shall be visually scored as follows: A-abundant, C-common, O-occasional, U-uncommon, or R-rare.

Particular attention will be given to identifying any listed (rare, threatened or endangered) species. Data recorded will be maintained by date and location and will be compiled into the final Callaway Plant Site flora inventory.

2.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the terrestrial vegetation assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

3.0 Herpetofauna Assessment

3.1 Project Objectives

Because the previous studies are more than 25 years old, this chapter will be used to establish current baseline information regarding the reptiles and amphibians that inhabit the Callaway Plant Site. The specific objectives of this work plan are as follows:

1. Characterize reptile and amphibian communities in the project vicinity and within the project site; and
2. Provide a basis for evaluating project effects due to construction, transmission line operation, and cooling system operation.

3.2 Methods

Herpetofauna occurrence will be evaluated by multiple methods to facilitate an inventory of reptile and amphibian species that utilize the site and that occur in the project vicinity.

3.2.1 Project Vicinity

Recorded range and distributional records shall be used to compile a list of species historically known to occur in the project vicinity. Coordination shall be conducted with regional MDC staff to validate the species included on the project vicinity lists.

Records shall be obtained from MDC for game species to tabulate relative harvest rates from the region to establish general context information for each species. Additionally, recorded occurrences of rare, threatened and endangered species shall also be obtained through consultation with MDC.

3.2.2 Project Site

Characterization of herpetofauna use of the Callaway Site will be performed seasonally (spring, fall and summer) by direct and indirect observational methods. Indirect methods shall include recording species presence based on signs including nests, skin sheds, shells or other evidence such as roadkills (see Appendix A). Such observations shall also be recorded during other field floral and faunal inventories.

In addition, since many reptiles and amphibians are not readily observed using these indirect methods, seasonal pedestrian surveys will be conducted along the five established transects (see Figure 2-1) and at other selected habitat types not represented by the transects (ponds, brush piles, within decaying logs, under flat rocks, etc.) to document species presence and relative abundance.

Audible listening surveys will be conducted at site ponds in the spring. Listening surveys will be conducted at night and will coincide with the breeding season of frogs and toads. Survey results will document weather conditions, species and relative abundance wherein the number of anurans calling will be estimated in a range of individuals calling through a full chorus. Listening surveys will be conducted only in the spring (see Appendix A).

Hoop net traps will be used to identify aquatic turtles within site ponds and streams. Hoop nets will be baited with fresh fish. Traps will be run every 24 hours for two consecutive days. Turtles captured will be marked by filing a small wedge on the marginal scutes in order to identify recaptured animals. Individuals captured will be identified to species. Turtles will be trapped

alive and released unharmed at the point of capture. Results of turtle trapping shall be expressed as the number of animals per trap night during each season (recaptured specimens will not be included).

When conducting a survey, general climatic conditions will be recorded including wind intensity (estimate its strength: no wind, slight, gusty, strong wind), temperature (Fahrenheit), and estimate percent of cloud cover (e.g., 50 percent cloud cover).

3.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the herpetofauna assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

4.0 Avifauna Assessment

4.1 Objective

The objectives the avifaunal (bird) survey is to:

1. Characterize bird communities in the project vicinity and within the project site; and
2. Provide a basis for evaluating project effects due to construction, transmission line operation, and cooling system operation.

4.2 Methodology

Avifaunal occurrence will be evaluated by multiple methods to facilitate an inventory of bird species that utilize the site and that occur in the project vicinity.

4.2.1 Project Vicinity

For the project vicinity the North American Breeding Bird Survey (BBS) will be a primary source of bird population trends and distribution. The typical survey unit is a roadside route, which is 39.4 kilometers (24.5 miles) long. With respect to the Callaway Site, the nearest established BBS route is the Danville Route (Route No. 52019), which will be used as a basis to report long term trends within the region. Historical data will be used to report relative abundances of birds along the route. The Danville Route however, is distant from the Callaway Site and reflects a different land cover mosaic from that which exists at the site. Consequently, it is not appropriate for use in characterizing avifauna of the immediate project vicinity or project site.

To document seasonal avifaunal use within the immediate project vicinity, three roadside survey routes have been established and will be sampled seasonally using a modified BBS methodology (see Figure 2-1). Accordingly, two observers will stop at 0.8 kilometers (0.5 mile) intervals along an established route, and record all birds seen or heard at each stop during a three-minute sampling period. Data recorded at each stop will include habitat type, weather, wind speed, bird species observed, sex, and behavior (see Appendix A). Each route will be driven on two separate dates during each season (two different days) with observations initiated approximately 15 minutes before sunrise on each day.

4.2.2 Project Site

Characterization of avifaunal use of the Callaway Site will be performed using a transect approach. This method will be focused on deriving relative abundance information on avifauna within the site boundary. Specific methodologies will be used to obtain relative bird inventory information along established transects within the site

- River/stream location (1) at Logan Creek floodplain;
- Forested Habitat at two locations near the plant; and
- Old field/Prairie Habitat at two locations near the plant.

No density determinations will be made.

Five transects within the site boundary will be established for use in characterizing bird use of the project site. Transects will be surveyed on two separate days during each season. A team of two observers shall inventory all birds seen or heard within 20 meters (65 feet) of the transect centerline. Transects will be established in generally uniform habitat types and shall be approximately 1,500 feet in length. After arriving at the transect starting point, observers shall wait for approximately two minutes to allow birds to acclimate to their presence prior to initiating

the transect. Transects shall be walked by the observers at an approximate rate of 0.7 kilometer per hour. For each bird species detected, the number of each species detected along with the species name shall be recorded.

Additionally in order to document waterfowl use of the site, spot counts will be made at selected waterbodies on site to document seasonal waterfowl use.

Weather: When conducting a transect, record general climatic conditions. Record wind intensity (estimate its strength: no wind, slight, gusty, strong wind), temperature (Fahrenheit), and estimate percent of cloud cover (e.g., 50% cloud cover). This is important because climatic variables are known to affect bird activity. Avoid counting birds if it is raining or if it is extremely windy.

4.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the avifauna assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

5.0 Mammal Assessment

5.1 Project Objectives

The specific objectives the mammal surveys are as follows:

1. Characterize mammal communities in the project vicinity and within the project site; and
2. Provide a basis for evaluating project effects due to construction, transmission line operation, and cooling system operation.

5.2 Methods

Mammal occurrence will be evaluated by multiple methods to facilitate an inventory of mammal species that utilize the site and that occur in the project vicinity.

5.2.1 Project Vicinity

Recorded range and distributional records shall be used to compile a list of species historically known to occur in the project vicinity. Coordination shall be conducted with regional MDC staff to validate the species included on the project vicinity lists.

Records shall be obtained from MDC for game and furbearing species to tabulate relative harvest rates from the region to establish general context information for each species. Recorded occurrences of uncommon species (e.g., bobcat, etc.) shall also be obtained through consultation with MDC.

In addition, roadside survey routes used for characterizing avifauna within the project site and vicinity shall also be used to record mammal presence in the project area. Specifically, any roadkills observed along the roadside while conducting bird surveys shall be recorded and tabulated.

5.2.2 Project Site

Characterization of mammal use of the Callaway Site will be performed by direct and indirect observational methods (see Appendix A). Indirect methods shall include recording species presence based on signs including tracks, scat, nests, or other indicated evidence (e.g., roadkills). Indirect evidence shall be recorded during all field faunal inventories (e.g., roadside bird surveys, bird transect surveys, etc.).

In addition, since many small mammals are not readily observed using these indirect methods, seasonal trapping surveys will be conducted along five transects established within the project boundary (Figure 2-1). The five transects are located within varying habitat types as follows:

- River/stream location (1) at Logan Creek floodplain
- Forested Habitat at two locations near the plant; and
- Old field/Prairie Habitat at two locations near the plant.

Surveys shall be conducted during spring and fall only. Along each transect 20 Sherman live traps will be set for two consecutive nights. Traps will be set at approximate 20-meter intervals with specific trap locations depending on microhabitat types available. All traps will be baited with a mixture of peanut butter and oatmeal. Traps will be run every 24 hours for two consecutive days. All animals captured will be marked by clipping the left front toe in order to identify recaptured animals. Each individual captured will be identified to species. In addition its sex, age, left hind foot length, tail length, weight, and specific habitat will be recorded.

Results of mammal trapping shall be expressed as the number of animals per trap night during each season (recaptured specimens will not be included).

When conducting a survey, record general climatic conditions. Record wind intensity (estimate its strength: no wind, slight, gusty, strong wind), temperature (Fahrenheit), and estimate percent of cloud cover (e.g., 50 percent cloud cover).

5.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the mammal assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

6.0 Waters of the United States Delineation and Mapping

The objective of the Clean Water Act (CWA) is to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredged or fill material into the waters of the United States, including wetlands. As such, the USACE issued the *Corps of Engineers Wetlands Delineation Manual* in January of 1987 (hereafter referred to as the 1987 Manual) to provide the methodology to determine whether a given area is a wetland for purposes of CWA Section 404 compliance. The 1987 Manual is the currently accepted guidance document for making wetland determinations and is the guiding document used on all MACTEC wetland projects.

Wetlands are defined as those areas that are "inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands have general diagnostic characteristics with regard to each of three parameters: hydrophytic vegetation, hydric soil and wetland hydrology. According to the 1987 Manual, characteristics of all three wetland parameters must be present in order for the site to be considered a wetland.

The following represents MACTEC's typical approach for the identification and delineation of project area wetlands using the Routine On-Site Investigation Approach of 1987 Wetland Delineation Manual.

6.1 Pre-Field Activities

Initial activities required in support of a defensible wetland determination and delineation consist of the acquisition and review of all available mapping, hydrologic, and soils data. Typical information MACTEC considers during this initial review process include the following:

- National Wetland Inventory (NWI) maps;
- U.S. Geological Survey (USGS) topographic maps;
- Natural Resources Conservation Service (NRCS) soil survey mapping;
- NRCS lists of hydric soils;
- NRCS Food Security Act wetland mapping;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMS);
- Detailed topographic mapping (1-2' contour intervals); and
- Current aerial photography (1"=400', prefer digital).

6.2 Field Investigation

6.2.1 Stream Identification

The field determination of streams as jurisdictional resources will be based upon the presence of an ordinary high water mark, bed and bank, and the presence of documented surface water connections to navigable waters of the United States. Streams will be delineated within the construction footprint of Unit 2 and the new transmission line corridor.

According to 33 CFR 328.3, "the term ordinary high water mark (OHWM)" means "the line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil,

destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." In general, the OHWM for a stream will be determined through an examination of the recent physical evidence of surface flow in the stream channel. Watercourses that contain bed and bank and exhibit an OHWM will be classified as jurisdictional waters of the United States. Coordination with the USACE is typically necessary for all identified waters of the United States as the USACE will make final determinations on jurisdictional waters.

Potential wetlands associated with the creeks and streams will be distinguished by field observations to determine the extent of adjacent wetlands (see Wetland Data Sheet, Appendix A). Vegetated areas located within stream channel boundaries will be considered part of the stream channel, and therefore, not adjacent wetlands.

Streams and stream crossings will be photographed and documented to characterize the composition of the stream channel, stream width, and adjacent vegetation. GPS and aerial photographic interpretation will be used to determine impacted stream lengths. This information will be subsequently quantified using a geographical information system. A final quality control check will be performed to insure that the impacted stream estimated lengths are accurate.

6.2.2 Wetlands

Wetlands will be delineated in accordance with the Routine On-Site Investigation Approach of the 1987 Manual within the construction footprint of Unit 2 and the new transmission line corridor. Potential wetland areas will be considered jurisdictional wetlands if they meet all three wetland criteria (USACE, 1987):

- **Vegetation** – The prevalent vegetation in wetlands consists of species that are typically adapted to inundated or saturated soil conditions. (Note: In some circumstances in which the area has been significantly disturbed, this criterion does not need to be met.) If greater than 50 percent of the dominant plant species are OBL, FACW, or FAC (excluding FAC-), hydrophytic vegetation is documented for that plot. The indicator status of each species at a given plot is determined by consulting the *National List of Plant Species That Occur in Wetlands.*
- **Soil** – Soils are present and have been classified as hydric if they possess characteristics that are associated with reduced soil conditions. Current hydric soils criteria and lists are available from the U.S, Department of Agriculture NRCS. As such, a hydric soil is a soil that has formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. NRCS hydric soil criteria includes those soils that are frequently ponded for long or very long duration during the growing season in accordance with it's *Field Indicators of Hydric Soils in the United States*, Version 4.0.
- **Hydrology** – Wetland hydrology is present if the area is inundated either permanently or periodically or the soil is saturated to the surface at some time during the growing season (i.e., 15-day inundations or greater). Indicators of wetland hydrology may include drainage patterns, drift lines, sediment deposits, watermarks, stream gage data and flood predictions, historic records, visual observations of saturated soils, and visual observations of inundation. Any of these indicators may be evidence of wetland hydrologic characteristics. Methods for determining hydrologic indicators can be categorized according to the type of indicator. Recorded data includes stream gage data, lake gage data, tidal gage data, flood predictions, and historical records. Use of these data is typically limited to areas adjacent to streams or other similar areas. Recorded data usually provide both short- and long-term information about frequency and duration of inundation, but contain little or no information about frequency and

duration of soil saturation. Information regarding the frequency and duration of soil saturation is gathered from NRCS soil surveys and other similar information.

In addition, wetlands must be hydraulically connected or adjacent to jurisdictional waters of the United States in order to be classified as jurisdictional wetlands (U.S. Supreme Court ruling, Solid Waste Agency of Northern Cook County). Typically, this includes wetlands located within the floodplain of a jurisdictional water.

Wetlands will be photographed, documented (vegetation, hydrology and soils) and classified according to the system of Cowardin et al. (1979). The boundary of the wetlands will be mapped with GPS and impacts quantified by GIS.

The wetlands within a given study area will be identified and illustrated using appropriate mapping and graphics. Cultivated palustrine emergent wetlands (i.e., farmed wetlands) will also be shown on NRCS wetland inventory.

Palustrine Wetlands

Palustrine wetlands cover less than 20 acres (8.1 hectares), lack active wave-formed or bedrock shoreline features, and have water depths at low water of less than 6 feet (1.8 meters). Palustrine wetlands are subsequently classified according to dominant vegetation:

- Palustrine unconsolidated bottom (PUB) wetlands are characterized by small-grained sediment particles and a vegetative cover less than 30 percent. This classification is typically applied to small "pond-like" wetlands. The PUB designation is used for the Open Water (OW) section of jurisdictional pond-like wetlands. If the pond contains vegetated areas large enough to map, these areas are classified separately as PFO, PSS or PEM wetlands.
- Palustrine emergent (PEM) wetlands are characterized by herbaceous (non-woody) plants. Emergent wetlands are also known as marshes, meadows, fens, etc.
- Palustrine scrub-shrub (PSS) wetlands are characterized by woody vegetation that is less than 19.6 feet (6 meters) tall.
- Palustrine forested (PFO) wetlands are characterized by woody vegetation that is 19.6 feet (6 meters) tall or taller.

Farmed Wetlands

The January 1994 MOA between the USACE and NRCS gives NRCS mapping authority over farmed wetlands. Farmed wetlands (FW) consist of active row crop or pasture that meet the hydric soils and wetland hydrology criteria, but are currently used for agriculture. Farmed wetlands typically are not used every year due to excess moisture. Farmed wetlands typically have lower plant diversity and other functional values compared to other wetland types. In addition to farmed wetlands, the NRCS has several classifications within this group (prior converted cropland, wetland pasture, wetland emergent, etc.). Prior converted wetlands occur on agricultural land that was manipulated and drained before December 1985 and are no longer considered jurisdictional wetland areas.

To obtain NRCS wetland inventory data, coordination would be necessary with the local NRCS office. Wetlands identified as a result of this coordination would be digitized into a GIS data layer and shown on field maps. NRCS should also be contacted regarding any Wetlands Reserve Program and Conservation Reserve Program lands as these are protected from development.

6.3 Preliminary Jurisdictional Determination Report

A separate individual report will not be written. Rather, reporting for the waters of the United States assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

7.0 RTE Survey and Natural Areas Assessment

Rare, Threatened or Endangered species (RTE) and natural areas potentially occurring within the site boundary and its vicinity shall also be evaluated.

Consultation shall be conducted with the MDC (Natural Heritage Program) to identify natural areas and species of concern. Furthermore, field assessments for RTE species will be performed in conjunction with other planned field inventories for mammals, birds, herpetofauna, terrestrial vegetation and aquatic biota. Any observed RTE species shall be photographed, their locations recorded, and the number of individuals will be recorded.

A separate individual report will not be written. Rather, reporting for the RTE species and natural areas assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

8.0 Adult/Juvenile Fish Community Characterization

8.1 Objectives

The objectives the adult and juvenile fish community characterization are to:

1. Characterize communities upstream and downstream of the new discharge into the Missouri River; and
2. Characterize communities in the Missouri River, and in streams in or adjacent to the project area to establish baseline conditions and evaluate project effects.

8.2 Field

Adult and juvenile fish samples will be collected quarterly at six locations in the Missouri River and seven stream reaches within the study area (see Figure 2-1).

- Missouri River at six locations in differing microhabitats focused in proximity to intake structure/discharge vicinity;
- Logan Creek watershed upstream of Katy Trail at three locations (one perennial, two intermittent);
- Mud Creek watershed at two locations (one perennial, one intermittent); and
- Auxvasse Creek watershed at two intermittent stream locations north of plant.

While several of these are locations where sampling was performed in 1980-81, five additional locations are needed to characterize baseline conditions in streams within or adjacent to the study area.

At Missouri River stations, fish will be collected by four methods: boat electrofishing, hoop nets, gill nets, and shoreline seining. Fish at stream stations will be collected by seining and/or backpack electrofishing.

Samples from the Missouri River will be collected at three locations near the north bank and three locations near the south bank. Boat electrofishing will be performed along shoreline areas of each location using a Smith-Root electrofisher powered by a 5,000 watt Honda generator. Electrofishing samples will represent timed runs (approximately 20 minutes). Sampling will begin at the upstream end of each zone and continue in a downstream direction. The sampling crew will consist of one driver and two dip netters using long-handled dip nets with 3/16-inch mesh. All fish stunned during the sampling run will be placed in holding tanks prior to processing. Hoop nets and gill nets will be set for 48-hour periods at each location during each sampling event and cleared of fish after 24 hours. Nets will be set parallel to shore and anchored with grappling anchors and cinder blocks. Shoreline seining, using a 6-foot by 30-foot 1/8-inch mesh seine with a 6-foot by 6-foot bag, will be performed on an opportunistic basis at six locations within the general study area. The goal will be to obtain samples at all stations, but suitable seining areas will be dependent on bank substrate characteristics and river levels.

At Logan Creek, Mud Creek, and intermittent streams in the Aux Vases creek watershed, a variety of seines will be used to collect fish specimens. Seining at stream locations will utilize a 6-foot by 6-foot kick seine and a 6-foot by 20-foot seine, both with 1/8 inch mesh. A minimum of two seine hauls will be made at each location. Backpack electrofishing may be used as a supplementary collection method.

Adult and juvenile fish, except reference specimens, will be processed immediately after sampling in an effort to return as many to the system alive as possible. Fish will be identified to the lowest taxonomic level possible using Pflieger (1997) as a reference. Certain specimens

(small individuals or those of questionable identity) will be returned to the laboratory for processing. A reference collection of each species encountered in the study will be prepared and maintained. The exceptions will be species listed as threatened or endangered in Missouri or in the United States. Field data will be kept separate by gear type, sampling date, and station. Specimens will be measured for total length (millimeter) and weight (grams), and will be examined for external abnormalities.

8.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the adult/juvenile fish assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

8.4 Additional

A literature search of the results of other surveys conducted in the sampling area will be performed.

9.0 Benthic Invertebrate Characterization

9.1 Objectives

The objectives the benthic macroinvertebrate survey are to:

1. Characterize communities upstream and downstream of the new discharge into the Missouri River; and
2. Characterize communities in the Missouri River and in streams in or adjacent to the project area, to establish baseline conditions and evaluate project effects.

9.2 Field Procedures

Macroinvertebrate samples will be collected on two occasions (spring and fall/winter) at two locations in the Missouri River and seven stream reaches within the study area (see Figure 2-1):

- Missouri River at locations upstream and downstream of discharge;
- Logan Creek watershed upstream of Katy Trail at three (one perennial, two intermittent);
- Mud Creek watershed at two locations (one perennial, one intermittent); and
- Auxvasse Creek watershed at two intermittent stream locations north of plant.

While several of these are locations where sampling was performed in 1980, additional locations are needed to characterize baseline conditions in the study area.

Benthic macroinvertebrates will be collected by three methods: ponar dredge, towed plankton nets, and rectangular kick nets. Samples from the Missouri River will be performed using a standard 9-inch by 9-inch ponar grab sampler. Three replicate grabs will be collected and sieved through a No. 30 (approximately 600 µ mesh) wash frame at each station. Samples will be washed into labeled 1-L containers and preserved with 10 percent formalin. Macroinvertebrate drift in the Missouri River will be sampled using towed plankton nets upstream and downstream of the plant discharge. Three replicate near-surface tows will be collected using a one-meter conical net of approximately 500 µ mesh. The volume of water sampled will be measured by a General Oceanics Model 2030 flow meter. Material collected in the nets will be washed into labeled one-liter containers and preserved with 10 percent formalin.

Stream samples will be collected with a rectangular 9-inch by 18-inch kick net with 500 µ mesh in accordance with MDNR procedures for wadeable streams (MDNR 2002). No replication will be performed for these samples, but multiple habitats will be surveyed to provide a comprehensive taxonomic characterization; a 30 minute effort will be made at each stream station. Potential habitats may include: (a) flow over coarse substrate, or riffle, habitat; (b) non-flow over fine substrate, or pool, habitat; and (c) root mat habitat; (d) accumulations of leafy or woody debris; and (e) rooted macrophytes.

Habitat data will also be collected at each sample location. Water depth and temperature, velocity, and substrate characteristics will be recorded. If sample location is nearshore, a description of the riparian area will also be recorded. A waypoint designation with a hand-held GPS instrument in latitude/longitude coordinates will be collected for all sample locations.

9.3 Laboratory Processing

Samples will be returned to MACTEC's St. Louis laboratory for analysis. Upon arrival, samples will be assigned a project-specific code and a sample number. Each step in the processing sequence from collection through identification will be recorded. In the laboratory, samples will be thoroughly rinsed through a 500 µ mesh sieve to remove preservative and fine sediments. Large organic material not removed in the field will be rinsed and visually inspected. Samples

will be sorted under a 10x magnifier lamp. Organisms will be separated from debris and placed in vials containing 80 percent ethanol. One of the vials will contain slide-mountable organisms (oligochaetes and Chironomidae), and the other will contain all other organisms. If the number of organisms is excessive (greater than (>)500 organisms for ponar and towed net samples; >1,000 organisms for kick net samples), subsampling may be conducted to obtain a more manageable number of specimens. However, if subsampling is used, samples will be "pre-picked" so that large and/or rare taxa are not eliminated from consideration. Sorting efficiency will be monitored throughout the project. After samples are sorted, the debris will be placed back in the sample jar and retained until the sorter passes a quality control check.

Organisms will be identified to the lowest practical taxon, typically genus, using keys recommended by MDNR (MDNR, 2005). A reference collection for the project will be prepared and maintained, and will be available for examination by agency personnel, or interested parties designated by UniStar.

9.4 Data Summarization

Macroinvertebrate data will be summarized by calculating the following characteristics for each sample:

- Density (ponar and towed net samples only)
- Total richness;
- Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness;
- Shannon diversity; and
- Hilsenhoff biotic index.

The latter four metrics are used by MDNR scientists in their assessment of biological conditions. Taxa richness will be calculated by counting all taxa, including those only encountered in the large and rare search. Likewise, EPT richness will be calculated by counting each taxon in these three orders, including those only encountered in the large and rare search. Biotic index values will be calculated using the formula:

$$BI = \Sigma (X_i T_i / n)$$

where X_i = number of individuals in taxon i, T_i = tolerance value of taxon i, and n = number of organisms in the sample. Tolerance values used for this calculation will be based on the information sources recommended by MDNR. These include Hilsenhoff (1987), Huggins and Moffett (1988), Lenat (1993) and Bode et al. (1996). Tolerance values, and thus the biotic index, range from 0 to 10, with higher values indicating more pollution tolerance by the taxon or community. Finally, Shannon diversity index will be calculated using the formula:

$$SDI = - \Sigma (p_i)(ln\ p_i)$$

where p = the proportion of the sample belonging to taxon i. Sample characteristics will be compared between stations and between seasons. For stream samples, the data will be used to establish baseline conditions in and near the study area.

9.5 Quality Assurance/Quality Control Procedures

In accordance with MACTEC's Ecology Quality Assurance (QA) Procedures, ten percent of each sorter's completed samples will be checked for thoroughness. If less than 90 percent of the organisms were found by the sorter, the samples will be resorted and rechecked until at least 90 percent efficiency is achieved. Additionally, a project voucher collection shall be made containing specimens of all identified taxa. Voucher specimens shall be verified by a second taxonomist to ensure accuracy.

9.6 Non-indigenous and Invasive Species

Two aquatic benthic invertebrate species that are designated as non-indigenous or invasive are the Asiatic clam (*Corbicula fluminea*) and the zebra mussel (*Dreissena polymorpha*) (USGS, http://nas.er.usgs.gov/). Both of these species have the potential to affect cooling water supply systems and may therefore, be a management concern. The collection of either of these species will be properly noted as to their location, their relative abundance, and will be reported.

9.7 Additional Considerations

Vulnerable (pollution-intolerant) species that are encountered in samples will be noted. Additionally, a literature search of the results of other surveys conducted in the sampling area will be performed. State listed (threatened or endangered) species will likewise be noted.

9.8 Reporting

A separate individual report will not be written. Rather, reporting for the benthic invertebrate assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.

10.0 Unionid Assessment

The potential presence and need for field investigation of unionid mussel communities shall be evaluated through the agency consultation process. Agency consultation shall be conducted to identify particular natural resource issues of concern and will include a discussion of unionid mussels. Recorded mussel beds shall be identified in the vicinity of the project area through this consultation process.

In the event that a recorded mussel bed is identified in the vicinity of the project, and subject to potential project effects, further consultation shall be conducted to develop an appropriate level of field investigation to adequately characterize the unionid resource and evaluate project effects.

As needed, unionid results will be reported in the Callaway Nuclear Power Plant's Environmental Report Section 2.4, Ecology.

11.0 Lake Sturgeon Survey

11.1 Objectives

The objective the lake sturgeon survey is to:

3. Determine whether lake sturgeon stocked by the Missouri Department of Conservation (MDC) in the mid-1980s are still present in settling ponds near the Callaway Nuclear Plant.

11.2 Field

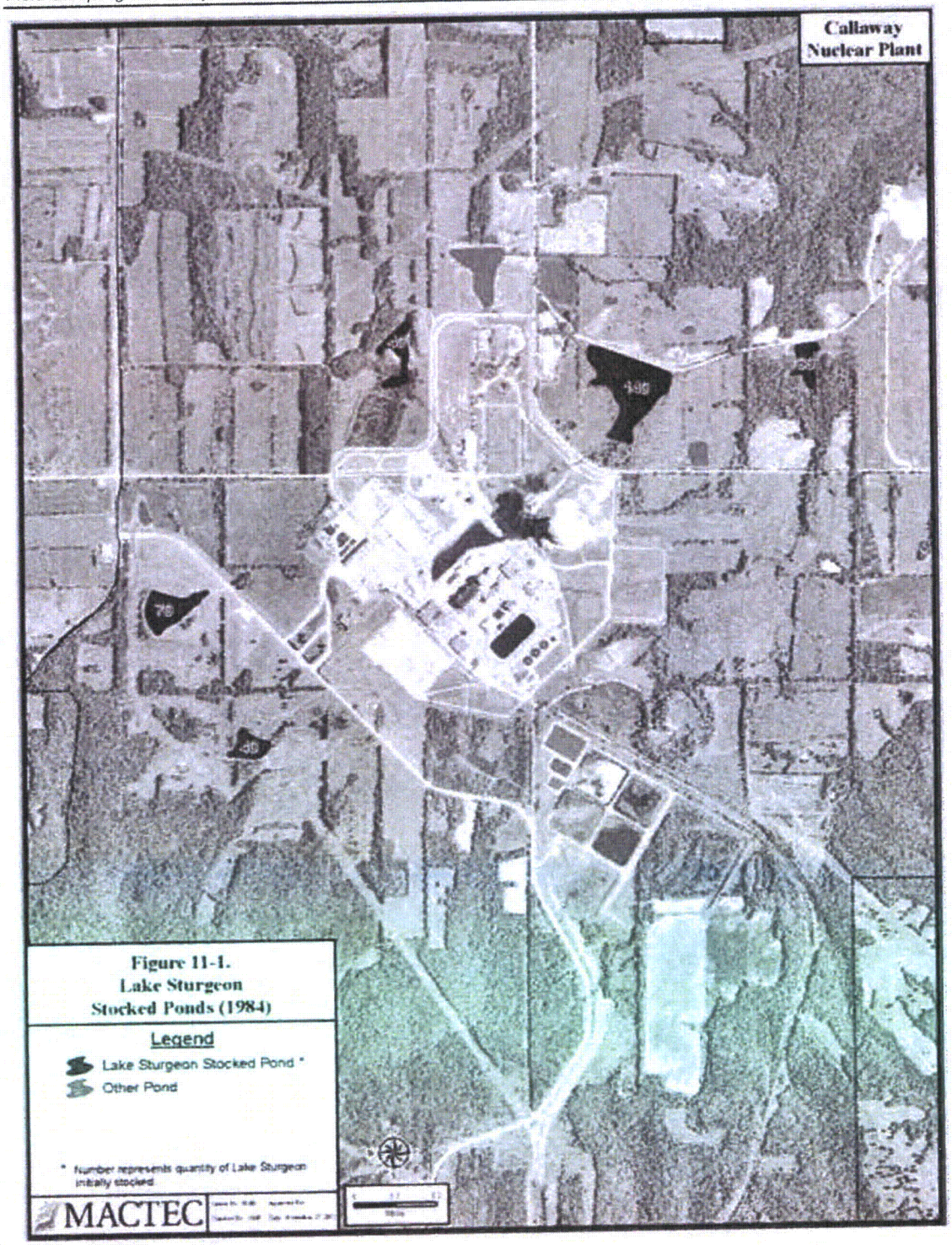
Samples will be collected in early November 2007 at five locations within the study area (see Figure 11-1).

At each location, fish will be collected by gill netting. Each pond will be sampled with two nets for a minimum of two net days each. Gill nets will be 100' in length by 6' in height, and will consist of either 3" or 4" bar mesh. Nets of both sizes will be used in each pond.

Nets will be checked in the morning and afternoon, at approximate 12 hour intervals. Fish collected (all species) will be measured for total length and immediately released back into the pond. If lake sturgeon are encountered, MACTEC biologists will contact an MDC fisheries biologist, so that the specimens can be tagged and transported to the Missouri River.

11.3 Report and Data Analysis

A separate individual report will not be written. Rather, reporting for the lake sturgeon assessment will be included in the Callaway Nuclear Power Plant COLA (Unit 2) Environmental Report, Section 2.4, Ecology.


Callaway
Nuclear Plant
Figure 11-1.
Lake Sturgeon
Stocked Ponds (1984)
Legend
Lake Sturgeon Stocked Pond *
Other Pond
* Number represents quantity of Lake Sturgeon initially stocked
MACTEC

12.0 Sample Custody

12.1 Scope and Applicability

The Chain of Custody procedures shall be followed whenever samples are not directly transported and logged into the Ecology Laboratory by the field crew collecting the sample.

12.2 Chain of Custody Form

The Chain of Custody (COC) Form (Figure 12-1) documents the custody transfer of samples from the sampler to another person, to the courier, or to/from MACTEC's Ecology laboratory. The chain of custody form shall be filled out in ink, signed or initialed, and dated. No erasures should be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed or initialed and dated by the sampler. The chain of custody form shall be completed to include date and time of sample, number of containers submitted, collector's initials, and any comments regarding sample condition. The chain of custody form requires appropriate signatures for the sample cooler preparer and the individual relinquishing sample custody to the courier. Information required on the custody form includes the following:

1. Project information (reference name and number),
2. Names of the individuals collecting the samples,
3. Place the office phone number and fax number on the form,
4. Project location,
5. Client name, address, and name of client project manager,
6. Sample information:
   a) Sample identification/name
   b) Sample date and time
   c) Collection method
   d) Sample contents or type of sample collected
   e) Number of containers for the sample
   f) Comments regarding any samples
7. Page number of total number of pages,
8. Signatures, date, and time of sample custody and sample relinquishment.

The signatures of all individuals that retain the custody of the samples are required to maintain a continuous chain of custody from field collection through laboratory processing. The signatures, dates and times of relinquishment and receiving are required as follows:

1. Individual that prepared the sample cooler for sample collection,
2. Individual that collected the samples and maintains samples during collection,
3. Individuals receiving the samples from the collectors (any additional individual that the collectors have turned the samples over to maintain before arriving at the laboratory), and
4. Laboratory personnel that accept the samples upon delivery into the laboratory for processing.

Project Reference Callaway COLA	Project No. 3250079219			Sample Contents	Number of Containers Submitted	Comments
Collector's Signature:		Phone:		Fish and Shellfish		
Project Location (city, county, state)		Fax:				
Client Name:		Client Proj. Mgr.				
Client Address:						
Sample ID	DATE	TIME	Collection Method			
				X		
				X		
				X		
				X		
				X		

Sample Cooler Prepared By:	Date								
Relinquished By: (Signature)	Date	Time	Received By: (Signature)	Date	Time	Relinquished By: (Signature)		Date	Time
Received for Laboratory By: (Signature)	Date	Time	Custody Intact	Sample Condition		Remarks			

Figure 12-1. Chain of Custody Form

12.3 Sample Packaging and Shipment

The following sample packaging and shipment procedures are to ensure that the samples will arrive at the laboratory with the chain-of-custody and sample bags intact.

a. The field sampler will be personally responsible for the care and custody of the samples until they are transferred or properly dispatched.
b. Sample containers will be identified by use of sample labels with sampling location ("PLANT NAME" Plant), MACTEC Project Number, collection method, date and time of collection, the collector's initials, and the number of sample containers.
c. Sample labels will be completed using waterproof ink unless prohibited by weather conditions. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed or initialed and dated by the sampler.
d. Samples will be accompanied by a properly completed chain-of-custody form that contains the associated sample information. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form.
e. Sample bags will be placed in a sample cooler along with enough ice to ensure that the bags/specimens remain preserved and do not get damaged. Additional insulation material such as Styrofoam peanuts or additional bubble pack may be used to ensure the sampling bags are secure or fill any remaining void space in the sample cooler.
f. Sample cooler lids will be securely closed and taped across with custody tape (placed on the front right and rear left of the cooler lid). The sample cooler will then be sealed shut with shipping tape to ensure the cooler doesn't open during shipment to the MACTEC Laboratory. (If the cooler has a drain, ensure that it has been closed and taped over for shipment.)
g. Affix properly completed shipping label to the cooler and send sample cooler to:

MACTEC
Attn: Lana Smith
3199 Riverport Tech Center Drive
St. Louis, MO 63043

12.4 Laboratory Custody Procedures

Samples are received by the MACTEC Ecology Laboratory which records and files all shipping documentation (COCs). The Ecology Laboratory has full responsibility for ensuring that proper custody procedures are followed at the laboratory and that project specific files are maintained. Upon receipt by the Ecology Laboratory, samples proceed through an orderly processing sequence designed to measure continuous integrity of both the sample and its documentation. Upon receipt of a sample shipment, the Ecology Laboratory initiates a sample log-in for each sample shipment.

The samples are unpacked, inspected, and checked against the accompanying chain-of-custody record. At this time, an Ecology Laboratory employee will sign for receipt of the sample on the COC. Any discrepancies involving sample integrity, sample damage, preservation, and missing or incorrect documentation are immediately noted. If inconsistencies, discrepancies or inadequacies with respect to the received samples are identified, the Ecology Laboratory personnel will notify the MACTEC Project Manager who is responsible for resolving the problem. Resolution typically will involve contacting the plant field sampling personnel with

follow-up documentation of conversations and resolution. Samples will not be logged until the problems are resolved.

Once all sample receiving problems have been resolved (if any), the Ecology Laboratory will log the samples into the Project Specific Sample Processing logbook (see Chapter 6.0). A unique laboratory identification number will be assigned to each sample at the time of logging. Sample numbers will be assigned sequentially. Sample numbers will be used on any paperwork associated with the sample so that documentation throughout the laboratory can be matched to the appropriate sample.

Actual samples are transferred to the laboratory project designated storage area until sample processing begins. Each sample will remain in its storage location until the time of processing. Each sample removed for processing by an Ecology Laboratory personnel is documented in the Project Specific Sample Processing logbook as to the date, personnel, and sample number.

13.0 Ecology Laboratory Sample Logging

13.1 Scope and Applicability

This SOP is applicable to all aquatic ecological samples being sent to the Ecology Laboratory for sample processing conducted by MACTEC St. Louis personnel. This SOP governs treatment of samples after they are received by the laboratory via chain of Custody or direct transport by field sampling teams.

13.2 Procedures

13.2.1 Sample Logging

Field Team Leader Responsibilities

When the samples are brought into the lab, the Field Team Leader will:

- ✓ Put all samples in order according to sampling station and date of collection.
- ✓ Check all samples to make sure they are preserved properly and lids are on tight.
- ✓ Make sure all field collection sheets are filled out properly with date, initials, sample locations, etc.
- ✓ Inventory samples to make sure all field sheets and labels on jars agree.
- ✓ Leave all samples and data sheets in the order in which they are to be logged in the lab *(This is important, as the lab personnel may not be familiar with the project and station sample numbering scheme).*
- ✓ Make sure a log book is available for the project.

13.2.2 Logging Procedures

Fill out sample log completely. Appendix B provides an example of logbook data forms.

13.2.3 Fisheries

Sample Naming Convention

This information should be on the sample jar and on the data sheet. Sampling sites and stations are project specific and typically use five separate fields to create unique sample identification numbers. Prior to the initiate of any field data collection, the MACTEC Project Manager, in consultation with the MACTEC QA/QC Officer will devise and agree upon a project specific naming convention which will be used by all field crews.

Number of Jar

Fill in the number of jars used when the sample was collected. The number of jars used should be on the jar label. If more than one jar is used, jar labels should indicate 1 of 2, 2 of 2 for two jars. The data sheets should also indicate the number of jars used for the sample.

Collection Method

This refers to how the sample was collected and should be indicated on the field data sheet.

Example:
1 = Electrofishing
2 = Gill net
3 = Trawl
4 = Seine
5 = Ichthyoplankton – Sled (bottom)
6 = Ichthyoplankton – Push nets (top)
7 = Impingement
8 = Entrainment
9 = Hoop Net

Collection Date

Collection date refers to the date the sample was collected. This information will be on the jar label and on the field data sheet. All dates will be listed in the order of month, day, and year.

Collectors

This refers to the personnel who collected the sample. Their initials should be on the jar label and on the field data sheet.

Sample Labels

A label indicating the sample code will be placed inside and outside of each jar. From this point on all samples will be referred to by the sample code.

Outside Label

On each jar place a circular tag indicating the sample code the sample was given in the log book. If more than one jar was used for the sample, place a tag on each jar.

- For ichthyoplankton samples use green tags.
- For fish samples use yellow tags.
- Write sample code legibly with a waterproof pen.
- Make sure the number on the tag agrees with the number in the log book.

Inside Label

Inside of each jar place a label indicating the sample code.

- Use waterproof paper.
- Write in pencil (or waterproof ink) only.

14.0 Ecology Laboratory Sample Sorting

14.1 Scope and Applicability

This SOP is applicable to sample sorting conducted by the MACTEC Ecology Department Laboratory personnel.

14.2 Procedures

14.2.1 Sample Sorting

Initiation

Check log book for project. Projects will have separate logbooks. All samples should be sorted by numerical order. Find the number of the next sample to be sorted. This should be apparent by a blank in sorted column (benthic -column 9 and fisheries – column 6) of the log sheets. Place initials in the appropriate sorted/picked columns at the beginning of the sample sorting process and place the completion date in the column when you have completed sorting the sample.

Find the appropriate sample on the project shelf. Take the next sample in the numerical order of the samples that needs to be processed (**Do Not Skip Samples**).

Sample Rinse

Rinse contents of sample into the project appropriate size sieve if the sample contains mostly detritus or light material such as silt or clay.

- Rinse jar and lid thoroughly.
- Use a 30 for all benthic invertebrate sample sorting
- Use a #35 for all ichthyoplankton sample sorting.
- If sample volume is substantial, split with Folsom plankton splitter (See SOP Splitter) so as to limit picking time to 4 hours or less (unless otherwise indicated by project manager). Splitting has to be approved by the project manager prior to being performed on project samples. If the sample is split the appropriate split code must be added to all sample labels (See SOP Splitter).

Sorting Preparation

Get clean vials out of lab supplies for sample processing.

- Label each vial with the sample code.
- Fisheries samples – use a green label for ichthyoplankton and a orange label for fish samples.
- Fill each vial 1/2 full of 75 percent (%) alcohol for benthic samples and 40 % alcohol for ichthyoplankton samples.

Sample Starting

Place a small amount of sample from the sieve in to a white sorting pan with enough water to cover the material. Usually 1/4 inch of water is enough.

- AT LEAST 3/4 of the white pan should be visible in the bottom of the pan.

Sample Sorting

All fish eggs, larvae and juveniles will be sorted from the sample using a 10X magnifying lamp and submitted for taxonomic analysis. If samples contain a large number of specimens or large amounts of detritus, samples may be split using a Folsom plankton splitter or other appropriate device. Sub samples will be processed until a minimum of 200 identifiable specimens are found, but counts for individual sub samples will be maintained.

Sort through the white pan completely while looking through the magnifier lamp. Move all detritus and sand around with forceps. The white pan has sections on the bottom of it that can be used as a grid to follow to ensure that the entire pan has been sorted. Once the entire pan has been sorted through then swish the pan contents around and sort through it again. Repeat the swishing and sorting of the pan until the pan has been sorted through twice without finding any animals.

Pick out of the sample all animals or parts of animals found and place animals into appropriately labeled vials

- Put ichthyoplankton specimens in green-labeled jar.
- Fish samples in orange-labeled jar.

Place any large animals that do not fit the vials into a larger jar - place the sample information on the jar using the appropriate type label. Use a counter while picking to enumerate all specimens collected from the sample.

When processing ichthyoplankton samples use a counter to count the number of specimens that were placed in the sample vial/jar.

14.2.2 Sample Sorting Cycle

Rinse remaining contents (debris and sand) of the white pan after it has been sorted into a separate sieve. Put a waterproof label in this sieve indicating the sample code and that it is the sorted material. Continue steps above until entire unprocessed sample sieve contents have been sorted and are in the processed/sorted sieve.

14.2.3 Sample Processing Completion

Rinse all debris in the sample processed sieve back into the original sample jar. Put an additional label on the jar indicating the following information – sorters initials, date sorted, and the number of organisms obtained from the sample. Place the jar on the project specific shelf marked for QA/QC jars. Place jars back on the shelf in numerical order.

Place the sample vials in to vial rack marked for the project. (Put empty labeled vial in slot if no animals were found). Place any large jars for the sample into the box labeled "Misplaced Animal" for that project.

14.2.4 Sorting Documentation

Fill out appropriate log book accordingly indicating:

- Your initials and date.
- Time required for sorting.
- Total number of organisms collected from the sample.

15.0 Ecology Laboratory Sample Splitter

Scope and Applicability

This SOP is applicable to sample splitting conducted by the MACTEC St. Louis Ecology Department Laboratory personnel using the Folsom Plankton Splitter.

Procedures

Use the Folsom Plankton Splitter to split samples that have already been sorted from the debris but to numerous to count and identify all organisms. The project manager must approve the splitting of any samples before it is split.

Sample Splitting Preparation

- Set up the Folsom Plankton Splitter with the troughs in place
- Rinse vial of organisms into wheel.
- Dilute sample in wheel by adding 300 mL of water. Do not exceed 500 mL.
- Cautiously rotate wheel back and forth, mixing the solution until a good distribution is reached.
- Slowly pour sample into the wheel's troughs. This will separate the sample in two equal parts.
- Add a slight amount of water to wheel to rinse the remaining organisms out of the splitter and pour into the same two troughs.
- Sieve each trough separately, designating one trough as the "taxonomic sample" and the other as a "saved portion."
- Pour saved portion back into original vial.
- "X" vial.
- Check one trough to see if more than 200 organisms remain. If so, repeat splitting with one of the trough's samples.
- If a second split is necessary, pour the "taxonomic sample" in the wheel, split sample again and choose one of the troughs for a new "mount sample" and add the other portion to the previously split "saved portion" in the vial.
- After splitting is complete, return the saved portion to the original vial, add alcohol and mark the splitting code on the vial. The splitting code is as follows:
  - Split once = 1x
  - Split twice = 2x
  - Split thrice = 3x
- Mark the splitting code in the log book in column 18 or 22, respectively.

Mark Sample Vial Processed

- Put an "X" on vial once sample is analyzed.

Problem Situations to Avoid

- Too much water in wheel--contents dump out.
- Forgetting to mark split codes in log book, on vials, and on slides.
- Putting alcohol in the plankton splitter.

Re-Store Sample

Rinse all remaining debris in the sample processed sieve back into the original sample jar. Put an X on the sample label. Place the jar on project shelf marked QA/QC. Place all jars back on the shelf in numerical order.

16.0 Ecology Laboratory Sorting Quality Control

Scope and Applicability

This SOP is applicable to QA/QC of samples sorted by the MACTEC St. Louis Ecology Department Laboratory personnel.

Procedures

QA/QC is a critical aspect of laboratory processing of samples and is necessary to ensure that such processing is completed in a technically proficient manner and that sample integrity is not compromised. As a general rule, 10 percent of all samples sorted by each sorter will be checked for sorting efficiency.

Sample Sorting

QA/QC Assessment – Check the log book for the project and note the number of samples that have been denoted as sorted. Designate a subset of ten samples that have been processed to do a QA/QC check on the sample sorting. Randomly pick one of the ten samples in the set to be the QA/QC sample.

QA/QC Sample – Obtain the QA/QC sample from the project shelf marked for QA/QC and process the same for a second time following the SOP for Sample Sorting. The individual performing the resorted is to be an Ecology Laboratory person other than the original sorter. Any animals found by QA/QC person during the resorting process will be counted and recorded.

QA/QC Check – The number of animals found by original sorter for the sample that is being checked will be counted and recorded. The number of animals found by the QA/QC sorting process will be added to that original number to obtain a total sample number. Efficiency will then be calculated by dividing the number of animals found by the original sorter by the total number of animals found for the sample. The efficiency number/result will be recorded on the QA/QC column and samples will be noted on the project Resort Logsheets in the logbook. The QA/QC entries of log book will be filled in.

QA/QC Efficiency Standards – A 90 percent efficiency is required for the designated sample group to pass the QA/QC check.

Sample Fate

Passing Samples

If the sample checked passes the QA/QC check then that group of samples will be marked with an "N" in the log sheet column. These samples can now be finished processing following the SOPs for Sample Identification.

Failing Samples

If the checked sample fails the QA/QC check:

1. The designated samples in the sample group will be placed back on the shelf for resorting.
2. A "Y" will appear in the log sheet.
3. A list of the samples to be resorted and the original sorter's initials will be placed on the resort logsheet of the project logbook.

Sample Resorting – All samples listed on the resort logsheets will be resorted. Place all animals from the resort in to the original sample vials. If vial has been marked X'ed, then make up a new vial. Put the new vial in to the large/oversized animal box and fill out the large/oversized animal form. Place the resorted samples back on to the projects QA/QC shelf. Mark "resorted" on the sample jar label. Fill in all appropriate columns of project logbook sheet for resorting.

Resort QA/QC Check – Ten percent of resorted samples will be QA/QC'ed using the above procedure.

QA/QC Corrective Actions – If a sorter continues to fail the QA/QC check, it is the responsibility of the sorter and the QA/QC person to identify the problem and set up a corrective action.

Possible Problems and Corrective Actions

Possible Problems

- Too much detritus in pan.
- Unfamiliarity of sorter with animals.
- Not swishing pan sufficiently to dislodge animals from detritus.

Corrective action

- QA/QC person may ask to check a pan after the sorter believes they have found all animals.
- The sorter may be asked to look through animals sorted from other samples and become more familiar with taxa.

In addition to the procedures outlined above, a QA/QC Audit Form should be completed by the auditor to detail the work subjected to the QA/QC review, the assessment of the technical accuracy of the work, and corrective measures required (if appropriate).

17.0 Ecology Laboratory Sample Identifications

Scope and Applicability

This SOP is applicable to sample sorting conducted by the MACTEC St. Louis Ecology Department Laboratory personnel. No identifications should begin until the sample has passed the QA/QC sorting check

Procedures

Adult and Juvenile Specimens

Proper taxonomic identification all fish collected will be accomplished by using properly trained personnel who are familiar with fish (native and non-native) occurring in Missouri. Standard keys that will be the primary taxonomic references include the following

- Pflieger, William L. 1997. The Fishes of Missouri. Missouri Department of Conservation.

Additional keys that will be used on an as-needed basis include the following:

- Smith, Phillip. 2002. Fishes of Illinois. University of Chicago Press Becker, George C. 1983. Fishes of Wisconsin. University of Wisconsin Press.
- Becker, George C. and Tom R. Johnson. June 1970. Illustrated Key to the Minnows of Wisconsin. Wisconsin State University.
- Hubbs, Carl L. and Karl F. Lagler. 1958. Fishes of the Great Lakes Region. Ann Arbor University of Michigan Press.
- Lee, Gilbert, Hocutt, Jenkins, McAllister, and Stauffer. 1980. Atlas of North American Freshwater Fishes. Publication Number 1980-12 of the North Carolina Biological Survey.
- Page, Lawrence M. 1983. Handbook of Darters. Illinois Natural History Survey.

Larval Fish Specimens

Taxonomic References

The following taxonomic references shall be used for the identification of larval fishes collected from the Missouri River (if applicable):

- Auer, Nancy A. December 1982. Identification of Larval Fishes of the Great Lakes Basin with Emphasis on the Lake Michigan Drainage. Great Lakes Research Division Special Publication 82-3.
- Hardy, J. D., G. E. Drewry, R. A. Fritzche, G. D. Johnson, P. W. Jones, and F. D. Martin. 1978.
- Tennessee Valley Authority. December 1976. Preliminary Guide to the Identification of larval Fishes in the Tennessee River. Technical Note B19.

Larval Fish Sample Identification

Obtain sample listed in the project book that is next to be identified.

a. All ID's should be done using one of the stereoscopes; polarized light set up should be used for ichthyoplankton taxonomy.
b. All ID's should be to the lowest practical taxonomic level (check with the lab manager or project manager for special cases).
c. Check misplaced animal form for additional specimens.
d. All identifications should be recorded on a bench sheet (see Appendix K).
e. Up to 30 specimens of each Representative Species (RS) and life stage (for Edwards Station see Appendix A) will be measured to the nearest 0.1 mm.

f. Subsampling using a Folsom Plankton Splittter may be conducted if the number of specimens in a given sample is large. However, for split samples the number of identified specimens must be no less than 200.
g. A reference collection of animals should be kept for each project.
   Use vials with tan labels.
   Indicate on bench sheet which animals were referenced.
h. After finishing a sample, return all animals to original "other" vial and place an "X" on label. (All misplaced animals should be put in original vial and additional vials cleaned out).
i. Fill in columns of log sheet.
j. Return vial of identified animals to its appropriate slot.
k. Fill out bench sheets completely. Include numbers and animal codes.
l. Put all bench sheets for that project in numerical order in a file.

Outside Taxonomic Verification

Taxa that are obscure or that require additional verification shall be sent to an outside recognized taxonomic expert for confirmation. Representative taxonomic experts who may be consulted to confirm species identifications may include:

- Dr. Brooks Burr, Southern Illinois University Carbondale (adult fish);
- Dr. Darryl Snyder, University of Colorado (larval fish);
- Dr. Bob Wallace (formerly of TVA) (larval fish); and
- Dr. Tom Simon, USFWS (larval fish).

Storage of Samples

Place all project samples upon completion of identification into a project specific storage box, labeled with the project specific information and documentations and place in the warehouse completed project storage area.

18.0 Ecology Laboratory Identification Quality Control

cope and Applicability

This SOP is applicable to QA/QC of sample identifications by the MACTEC St. Louis Ecology Department Laboratory personnel.

Procedures

QA/QC is a critical aspect of laboratory processing of samples and is necessary to ensure that such processing is completed in a technically proficient manner and that sample integrity is not compromised.

QA/QC Assessment

Check the log book for the project and note the number of samples that have been denoted as voucher specimens. Obtain the voucher collection for the project to be QA/QC checked from the project laboratory designated location.

QA/QC Vouchers

The individual performing the verification of the voucher collection is to be an Ecology Laboratory person other than the individual who performed the original identification. Alternatively, an independent third party known to be an expert in the taxonomic field subject to consideration, shall be identified and shall be contacted to verify the taxonomic identification of the voucher specimen.

QA/QC Check

The voucher collection specimens will be identified to confirm the original identification process of the organisms for the project. The verification of the voucher specimens will be noted in the sample logbook. The QA/QC entries of log book identification will be filled in.

QA/QC Efficiency Standards

A 100 percent efficiency is required for the designated project voucher collection to pass the QA/QC check.

Sample Fate

Passing Samples

If the voucher specimens pass the QA/QC verification then all sample identifications have been confirmed and that finishes the laboratory sample processing. The sample data collected can then be used for the project report following the SOPs for data processing and report generation.

Failing Samples

If the voucher specimen fails the QA/QC verification:

1. The designated specimen will be noted on the voucher specimen logsheet.
2. The specimen identification will be checked by a third party taxonomist.
3. The sample identification that is confirmed by the third party will be used.
4. If the identification is not that of the original taxonomist the data sheets will be corrected to the verified identification.

Overall QA/QC Check

Datasheets are reviewed to verify that information is filled out completely on the forms before they are sent for data processing.

QA/QC Corrective Actions

If a taxonomist continues to fail the voucher specimen QA/QC check, it is the responsibility of the project manager and the QA/QC person to identify the problem and set up a corrective action. Possible problems and corrective actions include the following:

Possible Problems

- Unfamiliarity of taxonomist with particular species of a geographical area.
- Organisms identified to a taxonomic level that is to low for confirmation.

Corrective action

- QA/QC person may ask to assist the taxonomist with particular aspects of the identification process.
- Taxonomist may work with various other/additional taxonomic keys to assist in an accurate identification.

19.0 References

Auer, Nancy A. December 1982. Identification of Larval Fishes of the Great Lakes Basin with Emphasis on the Lake Michigan Drainage. Great Lakes Research Division Special Publication 82-3.

Becker, George C. and Tom R. Johnson. June 1970. Illustrated Key to the Minnows of Wisconsin. Wisconsin State University.

Bode, R.W., M.A. Novak, and L.E. Abele. 1996. Quality assurance work plan for biological stream monitoring in New York state. Unpublished report prepared for New York State Department of Environmental Conservation.

Bystrak, D. 1981. The North American Breeding Bird Survey. Pp. 34-41 in C. J. Ralph and J.M. Scott, eds. Estimating numbers of terrestrial birds. Studies in Avian Biol. No. 6.

Droege, S. 1990. The North American Breeding Bird Survey. Pp. 1-4 in J. R. Sauer and S. Droege, eds. Survey designs and

Hilsenhoff, W.L. 1987. An improved biotic index of organis stream pollution. Great Lakes Entomologist 20:31-39.

Hubbs, Carl L. and Karl F. Lagler. 1958. Fishes of the Great Lakes Region. Ann Arbor University of Michigan Press.

Huggins, D.G. and M.F. Moffett. 1988. Proposed biotic and habitat indices for use in Kansas streams. Report No. 35. Kansas Biological Survey, Lawrence, Kansas. 128 pp.

Lee, Gilbert, Hocutt, Jenkins, McAllister, and Stauffer. 1980. Atlas of North American Freshwater Fishes. Publication Number 1980-12 of the North Carolina Biological Survey.

Lenat, D.R. 1993. A biotic index for the southeastern United States: derivation and list of tolerance values with criteria for assigning water quality ratings. Journal of the North American Benthological Society 12:279-290.

Missouri Department of Conservation (MDC). 1997. Department of Conservation Vegetation Monitoring Guidelines and Procedures.

Page, Lawrence M. 1983. Handbook of Darters. Illinois Natural History Survey.

Pflieger, William L. 1997. The Fishes of Missouri. Missouri Department of Conservation.

Smith, Phillip. 2002. Fishes of Illinois. University of Chicago Press Becker, George C. 1983. Fishes of Wisconsin. University of Wisconsin Press.

Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic Quality Assessment for Vegetation in Illinois, A Method for Assessing Vegetation Integrity. ERIGENIA, Number 15, Illinois Native Plant Society.

Tennessee Valley Authority. December 1976. Preliminary Guide to the Identification of larval Fishes in the Tennessee River. Technical Note B19.

The Nature Conservancy, Missouri. 2000. Missouri Flora.

Appendix A

Field Data Sheets

Vegetation Monitoring Data Sheet
Turtle Survey Data Sheet
Anuran Survey Data Sheet
Aviformes Survey Data Sheet (2)
Small Mammal Survey Data Sheet
Routine Wetland Determination Data Form
MACTEC Fisheries Field Form

Callaway Nuclear Plant
Vegetation Monitoring Data Sheet

Terrestrial Community: _____ **Date:** _____
Transect #: _____ **Personnel:** _____

BOTANICAL NAME	ABUNDANCE A-abundant C-common O-occasional U-uncommon R-rare	VEGETATION LAYER T-tree S-shrub H-herb

Comments:

Turtle Survey Data Sheet

MACTEC Engineering and Consulting, Inc.

Project: UniStar COL (Callaway Nuclear Plant)		**Project Number: 3250075219**
Location:		
Date:	**Time**:	**Personnel**:

Air Temperature (F):
Sky Code ☐ 0 – Few clouds ☐ 1 – Partly cloudy – scattered or variable sky ☐ 2 – Cloudy – cloudy or overcast ☐ 3 – Fog or smoke ☐ 4 – Drizzle or light rain ☐ 5 – Snow ☐ 6 – Showers
Wind Speed: Beaufot Scale ☐ 0 – Calm – (<1 mph) smoke rises vertically ☐ 1 – Light Air – (1-3 mph) smoke drifts, weather vane inactive ☐ 2 – Light Breeze – (4-7 mph) leaves rustle, can feel wind on face ☐ 3 – Gentle Breeze – (8-12 mph) leaves and twigs move around, small flag extends ☐ 4 – Moderate Breeze – (13-18 mph) moves thin branches, raises loose papers ☐ 5 – Fresh Breeze – (>19 mph) small trees begin to sway

Species	No.	*TCL (cm)	Sex	Comments

*TCL = Total Carapace Length

Anuran Survey Data Sheet

MACTEC Engineering and Consulting, Inc.

Location:	**Project No: 3250075219**	
Date:	**Time**:	**Personnel**:

Call Index

0 – None, no calls.
1 – Individuals – individuals can be counted; there is spacing between calls
2 – Overlapping – calls of individuals can be distinguished but there is some overlapping.
3 – Continuous Chorus – full chorus, calls are constant, continuous and overlapping

Sky Code

0 – Few clouds
1 – Partly cloudy – scattered or variable sky
2 – Cloudy – cloudy or overcast
3 – Fog or smoke
4 – Drizzle or light rain (not affecting hearing ability)
5 – Snow
6 – Showers – showers affecting hearing ability – do not conduct survey

Wind Speed: Beaufot Scale

0 – Calm – (<1 mph) smoke rises vertically
1 – Light Air – (1-3 mph) smoke drifts, weather vane inactive
2 – Light Breeze – (4-7 mph) leaves rustle, can feel wind on face
3 – Gentle Breeze – (8-12 mph) leaves and twigs move around, small flag extends
4 – Moderate Breeze – (13-18 mph) moves thin branches, raises loose papers
5 – Fresh Breeze – (>19 mph) small trees begin to sway

Site Name/No.					
Time					
Temperature (F)					
Wind Code					
Sky Code					

Species	**Calling Index**				
Acris crepitans (cricket frog)					
Bufo americanus (American toad)					
Hyla chrysoscelis – H. versicolor (gray treefrog)					
Pseudacris crucifer (n. spring peeper)					
Pseudacris triseriata (w. chorus frog)					
Rana areolata (northern crawfish frog)					
Rana catesbeiana (bullfrog)					
Rana clamitans (green frog)					
Rana sphenocephala (s. leopard frog)					
Other:					

Aviformes Survey Data Sheet

MACTEC Engineering and Consulting, Inc. Page__ of __

Location:		
Date:	**Time**:	**Personnel**:

Sky Code

0 – Few clouds
1 – Partly cloudy – scattered or variable sky
2 – Cloudy – cloudy or overcast
3 – Fog or smoke
4 – Drizzle or light rain (not affecting hearing ability)
5 – Snow
6 – Showers – showers affecting hearing ability – do not conduct survey

Wind Speed: Beaufot Scale

0 – Calm – (<1 mph) smoke rises vertically
1 – Light Air – (1-3 mph) smoke drifts, weather vane inactive
2 – Light Breeze – (4-7 mph) leaves rustle, can feel wind on face
3 – Gentle Breeze – (8-12 mph) leaves and twigs move around, small flag extends
4 – Moderate Breeze – (13-18 mph) moves thin branches, raises loose papers
5 – Fresh Breeze – (>19 mph) small trees begin to sway

Site Name/No.: _____ **Time:** _____ **Temperature:** _____

Wind Code: _____ **Sky Code:** _____

Species	Male	Female	Juvenile	Undifferentiated	Total

Aviformes Survey Data Sheet

MACTEC Engineering and Consulting, Inc.

Page__ of __

Project #: 3250-07-5219			**Project Name: CALLAWAY-UNISTAR**
Location:	**Date:**	**Time:**	**Personnel:**

Sky Code
0 – Few clouds
1 – Partly cloudy – scattered or variable sky
2 – Cloudy – cloudy or overcast
3 – Fog or smoke
4 – Drizzle or light rain (not affecting hearing ability)
5 – Snow
6 – Showers – showers affecting hearing ability – do not conduct survey

Wind Speed: Beaufot Scale
0 – Calm – (<1 mph) smoke rises vertically
1 – Light Air – (1-3 mph) smoke drifts, weather vane inactive
2 – Light Breeze – (4-7 mph) leaves rustle, can feel wind on face
3 – Gentle Breeze – (8-12 mph) leaves and twigs move around, small flag extends
4 – Moderate Breeze – (13-18 mph) moves thin branches, raises loose papers
5 – Fresh Breeze – (>19 mph) small trees begin to sway

Site Name/No.:	**Temperature:**	**Wind Code:**	**Sky Code:**

Transect Stopping Points (1, 2, ...)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
% Landcover (grassland, forestland, wetland, cropland, bare, etc...)																	
Species																	

Small Mammal Survey Data Sheet

MACTEC Engineering and Consulting, Inc.

Project: UniStar COL (Callaway Nuclear Plant)		**Project Number: 3250075219**
Location:		
Date:	**Time**:	**Personnel**:
Air Temperature (F):		

Sky Code

- ☐ 0 – Few clouds
- ☐ 1 – Partly cloudy – scattered or variable sky
- ☐ 2 – Cloudy – cloudy or overcast
- ☐ 3 – Fog or smoke
- ☐ 4 – Drizzle or light rain
- ☐ 5 – Snow
- ☐ 6 – Showers

Wind Speed: Beaufot Scale

- ☐ 0 – Calm – (<1 mph) smoke rises vertically
- ☐ 1 – Light Air – (1-3 mph) smoke drifts, weather vane inactive
- ☐ 2 – Light Breeze – (4-7 mph) leaves rustle, can feel wind on face
- ☐ 3 – Gentle Breeze – (8-12 mph) leaves and twigs move around, small flag extends
- ☐ 4 – Moderate Breeze – (13-18 mph) moves thin branches, raises loose papers
- ☐ 5 – Fresh Breeze – (>19 mph) small trees begin to sway

Species	Foot Leng. (cm)	Tail Leng. (cm)	Sex	Comments

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:		Date:	
Applicant/Owner:		County:	
Investigator:		State:	
Do normal circumstances exist on the site?	☐ Yes ☐ No	Community ID:	
Is the site significantly disturbed (atypical situation)?	☐ Yes ☐ No	Transect ID:	
Is the area a potential problem area?	☐ Yes ☐ No	Plot ID:	
(If needed, explain on reverse)			
Remarks:			

VEGETATION

Dominant Plant Species	Stratum	Indicator
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-):		
Hydrophytic Vegetation? ☐ Yes ☐ No		
Remarks:		

HYDROLOGY

Recorded Data (describe in remarks):
- _____ Stream, Lake, or Tide Gauge
- _____ Aerial Photographs
- _____ Other

_____ No Recorded Data Available

Field Observations:
- Depth of Surface Water: _____ (in.)
- Depth to Free Water in Pit: _____ (in.)
- Depth to Saturated Soil: _____ (in.)

Wetland Hydrology? ☐ Yes ☐ No

Wetland Hydrology Indicators:

Primary Indicators
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? ☐ Yes ☐ No

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Is the hydric soil criterion met? ☐ Yes ☐ No

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☐ Yes ☐ No
Wetland Hydrology Present? ☐ Yes ☐ No
Hydric Soils Present? ☐ Yes ☐ No

Is this Sampling Point Within a Wetland? ☐ Yes ☐ No

Remarks:

MACTEC Fisheries Field Form

Water Quality/Physical Data

Source Water Body: ____ River/Lake Stage: _____ Temp: _____ PH: _____ DO: ____ Conductivity ____

Fisheries Data

Sampling Method: **Sample Location:**

Sample ID: **Effort (electofishing - mins; gill/hoop nets - hours; etc.):**

Species (Common Name)	Length (mm)	Weight (g)	Condition (Live, Dead, etc.)	Abnor-malities	Batch Age Category	Batch Count	Batch Weight (g)	Voucher	Comments/Description of Sampling Conditions

Appendix B

Ecological Laboratory Logbook Data Forms

Project Personnel Identification Sheet
Ecology Laboratory Sample Processing Log – Fisheries
Large/Oversized Organism Sheet
Sorting and Resort QC Log
Voucher Collection and Verification Form
Sample Deviation - Additional Processing Information Form

Project Personnel Identification Sheet

Project Name: **Project Number:**

	Printed Initials *	Printed Name	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

* - If your initials match those of someone else already listed on the sheet then speak with the project manager and together the decision will be made as to the designated initials that you will use for the entire project.

Ecology Laboratory Sample Processing Log -- Fisheries

Sample No.	Collection Data					Sorting				Identification	
	Sample ID	Collection Date	# Jars/ Containers	Collection Method	Collectors	Sorted-Picked by/Date/Time	Total # Fish	QA/QC by/Date	Need Resort	I.D. by/Date	QA/QC by/Date

Large/Oversized Organism Sheet

Sample No	Sample ID	Initials/Date (logged in by)	Container - Vial or Jar	Split Code (if applicable)	ID'ed By	Date/Time	Voucher Specimen

SORTING AND RESORT QC LOG

Sample No.	Original Sorting Information					Resort Information				
	QC Checked By	Date	Sorter (Initials)	% Efficiency	Resort Y/N	Resorter Initials	Resort Date	QC Checked By	% Efficiency	Resort Y/N

VOUCHER COLLECTION AND VERIFICATION FORM

Project Name/Number: ______________________________ | **Page __ of __**

Voucher Collection Specimen Location:

____

Voucher No.	Sample ID (Source of Voucher Specimen)	Taxonomic Identification by/Date	Verification of Identification by/Date	Pass/ Fail	Corrective Action (CA) required	CA Completed by/date

SAMPLE DEVIATION - ADDITIONAL PROCESSING INFORMATION FORM

Project Name: ______________________________ **Page __ of __**

Project Number: ______________________________

Sample ID	Deviation, Issue, or Incident Occurring to Sample	Date of Occurrence	Initials	Informed Lab or Project Manager	Corrective Action (CA) Required	CA Completed by/date