APPENDIX C

CHECKLIST FOR QA PROJECT PLAN ELEMENTS FOR MODELING

Name of Project this QA Project Plan is for: ________________________________

GROUP A: PROJECT MANAGEMENT

A1. Title and Approval Sheet
Contents this element may contain:

- Title of QA Project Plan
- Revision number of QA Project Plan
- Effective date of QA Project Plan revision
- Names of all organizations involved in modeling project
- Names of all key project officials responsible for the work, with space for dated signatures

A2. Table of Contents and Document Control Format
Contents this element may contain:

- Title of all sections, including subsections, tables, figures, references, appendices
- Page numbers for each section
- Section for each QA Project Plan element
- Document control box

A3. Distribution List
Contents this element may contain:

- List of all individuals (and their role on the project) who will be provided copies of the approved QA Project Plan, including all persons responsible for implementation, including project managers, QA Managers, and representatives of all groups involved.

A4. Project/Task Organization
Contents this element may contain:

- Concise organizational chart showing the relationships and lines of communication among all project participants, other data users, and any subcontractors relevant to environmental data operations
- Project name and organizations involved, and a description of their respective responsibilities
A5. Problem Definition/Background
Contents this element may contain:

- Goals and objectives of this project that will address this problem
- Definition of the population the problem targets and what measures within this population the problem addresses
- Reason the project includes a modeling approach to address the problem (is it a new predictive tool?)
- Types of decisions that may be made as a result of this project
- Names of those responsible for making these decisions
- Any other types of problems that the project may address
- Background information on the problem
- Reasons the project is important, how it supports other existing research, programs, or regulations
- Conflicts or uncertainties that will be resolved by this project
- Reasons one model is determined to be better than another for this application

A6. Project/Task Description and Schedule
Contents this element may contain:

- Summary of all work to be performed, products to be produced, and the schedule for implementation
- List of products, deliverables, and milestones to be completed in the various stages of the project
- Schedule of anticipated start and completion dates for the milestones and deliverables, and persons responsible for each

A7. Quality Objectives and Criteria for Model Inputs/Outputs
Contents this element may contain:

- Project data quality objectives (DQOs), performance criteria, and acceptance criteria
- Description of task that needs to be addressed and the intended uses of the output of the modeling project to achieve the task
- List of requirements associated with the hardware/software configuration for those studies involving software evaluation

A8. Special Training Requirements/Certification
Contents this element may contain:

- Types of required training and certification needed by the project team
- Plan for obtaining training and/or certification
- Documentation of training and/or certification
A9. Documentation and Records
Contents this element may contain:

- Description of information to be included in reports
- Proper document control and distribution procedures
- Details on document storage
- Backup plan for records stored electronically
- Description of the change control process (who approves changes, etc.)
- Length of retention periods for each record
- Data assessment reports, interim project progress reports
- Model science formulation report, peer review reports
- Model assessment reports, interim project progress reports
- Code standards, code auditing and testing reports, interim project progress reports
- Model calibration report
- Model evaluation records (How well does the model report variability and uncertainty in its output?)
- User’s manual
- Configuration management (after production version) and code maintenance (e.g., or software internal documentation of logic and structure) manuals

GROUP B: MEASUREMENT AND DATA ACQUISITION

B7. Calibration
Contents this element may contain:

- Objectives of model calibration activities, including acceptance criteria
- Frequency of model calibration activities
- Details on the model calibration procedure
- Method(s) of acquiring input data
- Types of output generated by the model calibration
- Approach to characterize uncertainty (e.g., sensitivity analysis)
- Corrective action to be taken if criteria are not met
- Resources and responsibilities for calibrating the model
- Analysis of model output relative to acceptance criteria
B9. Non-direct Measurements (Data Acquisition Requirements)
Contents this element may contain:

- Types of data needed for implementing a project that are obtained from non-measurement sources such as databases, literature files
- Need for non-direct measurements, intended use of data
- Method(s) of identifying and acquiring data
- Method of determining the underlying quality of the data
- SOPs and field or lab-specific deviations associated with these procedures
- Acceptance criteria for non-direct measurements: such as completeness, representativeness, bias, precision, qualifying data

B10. Data Management and Hardware/Software Configuration
Contents this element may contain:

- Information on the project data management process (field, office, and lab)
- Record-keeping procedures, document control system, audit trails
- Control mechanism for detecting and correcting errors, preventing loss of data
- Procedures for assuring applicable Agency resource management requirements are satisfied
- Required computer hardware/software and any specific performance requirements

Data Management

- Any data forms, checklists, on-line interactive screens used in the modeling process
- Any graphics developed to document the data management process (process flow diagrams, modeling flow charts, etc.)
- Documentation of internal checks used during data entry
- Data calculations and analyses that should to be highlighted in the QA Project Plan
- Plans for characterization of uncertainty and variability in the model results (e.g., summary statistics, frequency distributions, goodness-of-fit tests)

Hardware/Software Configuration

- List of equipment, hardware, and software that will be used on the project
- Description of performance requirements
- Decisions regarding security issues
- Decision regarding communication issues
- Decisions regarding software installation issues
- Decisions regarding response time issues
- Plans for requirements documentation
• Coding standards
• Testing plans
• Plans for data dictionary (may not need to be a separate document)
• Plans for a user's manual
• Plans for a maintenance manual (explaining software logic and organization)
• Plans for source code for the ultimate user of the model or model framework
• Configuration management plan (procedures to control software/hardware configuration during development of the original model version)

GROUP C: ASSESSMENTS AND OVERSIGHT

C1. Assessment and Response Actions
Contents this element may contain:

• Assessment/oversight strategies and schedule of assessment activities, order of events
• Organizations and individuals expected to participate in assessments, including peer reviews
• Information expected, success criteria
• Scope of authority of assessors to recommend or direct changes to the model (corrective actions)
• Qualitative and quantitative assessments
• Internal assessments (internal QA officer's review of input data, code verification, calibration, benchmarking) and external assessments (peer review of model theory or mathematical structure)
• Surveillance activities (continued monitoring of status and progress of the project, tracking project milestones and budgets)
• Plans for model performance evaluations
• Plans for sensitivity analysis
• Plans for uncertainty analysis
• Plans for data quality assessment
• Plans for code testing

Hardware/Software Assessments

• Plans for hardware and software configuration testing, if appropriate
• Plans for code verification tests
• Plans for internal and external peer reviews
• Plans for checking for programming errors
• Plans for checking for correct insertion of model equations
• Plans for checking for code's linkage to analysis of uncertainty
Hardware/Software Configuration Tests

- Plans for software code development inspections
- Plans for software code performance testing
- Plans for a test of the model framework
- Plans for integration tests (check computational and transfer interfaces between modules)
- Plans for regression tests
- Plans for stress testing of complex models (to ensure that maximum load during peak usage does not exceed limits of the system)
- Plans for acceptance testing (contractually-required testing needed before a new model or model application is accepted by the customer and final payment is made)
- Plans for beta testing of pre-release hardware/software, recording of anomalies
- Plans for checking for programming errors

Plans for science and product peer review

- Theoretical basis for the model
- Mathematical model structure
- Model algorithms
- Model predictions
- Model calibration
- Plans for data quality assessment
- Plans for peer review of final technical product

C2. Reports to Management
Contents this element may contain: plans for documentation of:

- Project reporting schedule
- Frequency, content, and distribution of reports
- Deviations from approved QA Project Plan
- Need for response actions to correct deviations
- Potential uncertainties in decisions based on input data and model limitations
- Data Quality Assessment findings
GROUP D: DATA VALIDATION AND USABILITY

D1. Departures from Validation Criteria
Contents this element may contain:

- Criteria used to review and validate (accept, reject, or qualify) model components such as theory, mathematical procedures, code, and calibration (convergence criteria, etc.)
- Criteria used to review and validate input data
- Criteria used to test model performance
- Criteria used to review or validate model outputs

D2. Validation Methods
Contents this element may contain:

- Methods for review of model components such as theory, mathematical procedures, code, and calibration (peer review, etc.)
- Methods for review of input data
- Methods for review of model performance tests
- Methods for assessment of model output and usability

D3. Reconciliation with User Requirements
Contents this element may contain:

- Discussion of project or task results
- List of departures from assumptions set in the planning phase of the model
- Report on limitations on use of output data for decision makers or users