# Final Software Testing Plan

# *RACER* 2008 Maintenance and Support

Contract No. F08637-03-D-6996

Task Order No. 0034

Task 04

Prepared for:

U.S. Air Force Civil Engineer Support Agency

Technical Support Directorate

Tyndall Air Force Base, FL

Prepared by:

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August 2007

*RACER*™

**Approval Sheet**

Reviewed by (Signature, Date):


_____    Date: _____
*RACER* 2008 Project Manager


_____    Date: _____
*RACER* Product Manager


_____    Date: _____
*RACER* Quality Assurance Manager


The Software Testing Plan (STP) accurately reflects the expectations and constraints as required by the Government.


_____    Date: _____
AFCESA *RACER* Project Officer


_____    Date: _____
Chair, *RACER* Technical Work Group

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# Revision History

| Version | Primary Author(s) | Description of Version | Date Completed |
|---|---|---|---|
| Preliminary Draft | John Claypool, Whitney Littleton, Mike West (Earth Tech) | Initial draft created for internal review comments within Earth Tech. | 5/9/07 |
| Draft | Mike West (Earth Tech) | Draft submitted to the Government for review. | 5/31/07 |
| Final | Mike West (Earth Tech) | Revised per Government comments on the Draft version. | 7/23/07 |

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# 1. Introduction

The Statement of Work (SOW) for Task Order (TO) 0034 requires Earth Tech, Inc. (Earth Tech) to design, develop, test, release, distribute and support the 2008 version of the Remedial Action Cost Engineering and Requirements (*RACER*™) system. Section 2.4.1 of the SOW sets forth the following requirements:

> o 2.4.1 Software Testing Plan (STP). The contractor shall develop a Software Testing Plan (STP) for the *RACER* 2008 system. The STP shall incorporate the STP for other *RACER* Enhancements previously funded under Task Orders 0023 and 0029. The STP shall describe the scope and approach for conducting testing, the roles and responsibilities of personnel participating in the testing process, and the checklists and forms that will be used to document and report the findings from the testing process. The STP will also identify the quantitative objectives for defects and problems.

This Software Test Plan (STP) governs testing of the enhancements to *RACER* 2008 system developed under TO 0023 and TO 0029 and the annual database changes required under TO 0034. In particular, this document encompasses development, alpha, beta and final acceptance testing of the *RACER* 2008 system.

## 1.1 Document Overview

Section 1 of this STP provides an introduction, list of specific software changes for *RACER* 2008 and list of references. The scope for this STP, an overview of the *RACER* 2008 system, and an overview of this project are provided in Section 2 of this STP. Section 3 of this document describes the environments, software, hardware, personnel and other materials that will be used for development, alpha, beta and final acceptance testing. The test objectives, classes of tests, general test conditions, items to be tested, and procedures for recording and reporting results also are described in Section 3. The schedule for conducting the four phases of testing is summarized in Section 4. Procedures for capturing, managing, and clearing defects, problems and discrepancies identified during testing are described in Section 6. Section 7 traces the requirements specified in the SOW, requirements documents, and design documents against the test identification numbers assigned in this STP.

Appendix A presents a list of the Acronyms used in this Test Plan. Detailed procedures, scripts, and protocols for testing are provided in Appendix B to this STP. Appendix C provides the Problem/Change Requests (P/CRs) that have been addressed for the *RACER* 2008. Appendix D includes Software Testing Procedures for *RACER* 2008. Appendix E is the August 2005 Final Software Development Plan which describes the development, implementation and closeout phases of the software project life cycle.

## 1.2 Software Changes for *RACER* 2008

This section identifies the software items that were changed or updated for the *RACER* 2008 release. The *RACER* 2008 release consists of a Database Update (Assembly costs, Area Cost Factors, Escalation Rates and Per Diem). The specific changes that are being made for *RACER* 2008 are listed below:

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Database Update

- Update Assembly Prices & Line Items
- Update Escalation Factors
- Update Area Cost Factors (ACFs)
- Update Per Diem
- Update system tables (tblSystem & tblVersions)

*RACER* Executable

- New Splash Screen (*RACER* 2008) - new RACER.exe file
- Update clsEncrypt for new database password - new RACER.exe file

Utilities

- Recompiled Formerly Used Defense Sites (FUDS) Post Processor
- Elimination of the Template Compactor Utility
- New View Log File utility
- Price Leveling was modified for handling the revisions to Professional Labor Management
- The Army Interface Utility was changed to ensure that it would with the new technologies for *RACER* 2008

Technologies

- The following Technologies were reengineered or were developed under TO 0023:
  - Capping
  - Excavation
  - Monitoring
  - Off-Site Transportation and Waste Disposal
  - Operations & Maintenance
  - Permeable Barriers
  - Residual Waste Management
  - Trenching/Piping
  - Underground Storage Tank Closure/Removal
  - Well Abandonment (New)

- The following Technologies were reengineered or were developed under TO 0029
  - Buried Drum Recovery (New)
  - Decontamination & Decommissioning (D&D) Contaminated Building Materials
  - D&D Surface Decontamination
  - D&D Surveillance & Maintenance (New) – This technology will be included in a Service Pack after the release of *RACER* 2008
  - Drum Staging

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- o Feasibility Study

- o In-Situ Biodegradation

- o Professional Labor Management

- o Remedial Investigation

- TO 0029 Deleted Technologies

- o Air Sparged Hydrocyclone

- o In-Situ Vitrification

- o Operations and Maintenance (O&M) Startup

- o Solvent Extraction

Help System Changes

- Revise What's New in *RACER* Help topic

- Replace references in other Help Topics to *RACER* 2007 with *RACER* 2008

- Include the modified Help Topics for the technologies reengineered under TO 0023 and TO 0029

- Add the Help Topics for the new technologies developed under TO 0023 and TO 0029

Installation Program and Support Files

- Revise Readme.txt

- New installation program

- Updated License.mdb

Other Functionality Changes

- Save As…

- Copy Database

- Last Four Databases

- View Line Items

- Common Parameters moved to Level 2

  - o Media/Waste Type (Primary and Secondary)

  - o Contaminant (Primary and Secondary)

  - o Approach

- Change Level 3 to allow for larger Description field to be viewed
  Application of Area Cost Factors

The tests planned for each of these software changes are described in Section 3.4.3.

## 1.3    Reference Materials

1.    Final Software Development Plan for Remedial Action Cost Engineering &
      Requirements (*RACER*™) Software System, Earth Tech, Inc., dated 30 August 2005.

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2.   Contract No. F08637-03-D-6996 Task Order 0023 Statement of Work.  Remedial Action Cost Engineering and Requirements (*RACER*™) System, Development, Distribution, and Support (2006), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 07 July 2005.

3.   Contract No. F08637-03-D-6996 Task Order 0023 Statement of Work for Modification # 1.  Remedial Action Cost Engineering and Requirements (*RACER*™) System, Development, Distribution, and Support (2006), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 17 August 2005.

4.   Contract No. F08637-03-D-6996 Task Order 0023 Statement of Work for Modification # 2.  Remedial Action Cost Engineering and Requirements (*RACER*™) System, Development, Distribution, and Support (2006), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 30 March 2006.

5.   Technical Memorandum Evaluation of System Analytical Templates for *RACER* 2007, Earth Tech, Inc., dated 1 September 2006

6.   Contract No. F08637-03-D-6996 Task Order 0023 Statement of Work for Modification # 4.  Remedial Action Cost Engineering and Requirements (*RACER*™) System Support (2006), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 12 February 2007.

7.   Contract No. F08637-03-D-6996 Task Order 0023 Statement of Work for Modification # 6.  Remedial Action Cost Engineering and Requirements (*RACER*™) System Support (2006), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 7 March 2007.

8.   Contract No. F08637-03-D-6996 Task Order 0029 Statement of Work.  Remedial Action Cost Engineering and Requirements (*RACER*™) System Support (2007), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 11 September 2006.

9.   Contract No. F08637-03-D-6996 Task Order 0029 Statement of Work for Modification # 3. Remedial Action Cost Engineering and Requirements (*RACER*™) System Support (2007), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 6 November 2006.

10.  Contract No. F08637-03-D-6996 Task Order 0029 Statement of Work for Modification # 5. Remedial Action Cost Engineering and Requirements (*RACER*™) System Support (2007), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 15 February 2007.

11.  Contract No. F08637-03-D-6996 Task Order 0029 Statement of Work.  Remedial Action Cost Engineering and Requirements (*RACER*™) System, Development, Distribution, and Support (2008), U.S. Air Force Civil Engineer Support Agency (AFCESA), dated 12 March 2007.

12.  Tri-Service Automated Cost Engineering System (TRACES) English Cost Book 2006.1 May 2007.

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# 2. Scope

## 2.1    Identification

This STP encompasses all technical and functional testing of the *RACER* 2008 system being developed under TO 0023, TO 0029, and TO0034.  This STP addresses testing during the development process by the Earth Tech development team, as well as testing of the alpha, beta and final versions of the system by Earth Tech and the *RACER* Technical Working Group (RTWG).

The scope for the required testing for the *RACER* 2008 system is outlined in the SOW for TOs 0023, 0029 and 0034.

Specific types of testing that will be performed include:

- Unit
- Functional
- Deployment
- Ad Hoc
- Alpha
- Beta
- Final Acceptance

### 2.1.1   Unit Testing

The definition of a unit test according to the Institute of Electrical and Electronics Engineers (IEEE) is "Testing conducted to verify the implementation of the design for one software element; e.g., a unit or module; or a collection of software elements."  An example would be to test a reengineered *RACER* technology to ensure that the changes match the documentation associated with the technology such as the Software Requirements Document and Technology Addendum.

### 2.1.2   Functional Testing

The IEEE defines Functional Testing as "Testing conducted to evaluate the compliance of a system or component with specified functional requirements and corresponding predicted results." An example would be to test a re-engineered *RACER* technology to confirm that changes to the Required and Secondary parameters result in the correct output.

### 2.1.3   Deployment Testing

Deployment testing consists of verifying that the software will install on the supported operating systems and office suites and evaluate the installation options.

### 2.1.4   Ad Hoc Testing

Ad Hoc testing is improvised or impromptu testing of the software.  Ad hoc testing is not meant to follow a formal software test plan.  Instead, it is meant to emulate use of the software under field conditions.

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### 2.1.5   Alpha Testing

Alpha testing consists of operational testing of the initial version of the *RACER* 2008 system by the developer (Earth Tech) and Government clients (e.g. RTWG).  All aspects of *RACER* 2008 will be tested including new functionality, re-engineered and new technologies, assembly costs, ACFs, escalation factors, etc.

### 2.1.6   Beta Testing

Beta Testing is the operational testing of the draft release version of the system by users under realistic field conditions.

### 2.1.7   Final Acceptance Testing

Final Acceptance testing is performed by the Government to ensure that all problems identified during the Beta testing were completely fixed.  Final Acceptance testing is the last round of testing performed before the program is approved for distribution.  This testing is the final stage of the *RACER* 2008 software project and will be performed before the system is accepted by the Government.  *RACER* users will be actively involved in the test procedure.

### 2.1.8   General Nature of the System and Software

The Government utilizes the *RACER* system to produce standardized, auditable cost estimates for various environmental investigation and cleanup programs.  The *RACER* software application is an important part of the Federal Government's management and accounting procedures for estimating environmental cleanup activities.  At present, the *RACER* system is deployed as a desktop software application.

*RACER* is a tool for developing accurate cost estimates for all phases of remediation:

- Pre-Studies
- Studies
- Removal Action/Interim Corrective Measures
- Remedial Design/Corrective Measures Design
- Remedial Action/Corrective Measure Implementation
- Operations and Maintenance
- Long Term Monitoring
- Site Close-out

*RACER* employs a patented parametric cost modeling methodology using over 125 technology cost models (technologies) that represent various applications for site remediation.  Each of the technologies is based on generic engineering solutions for environmental projects, technologies, and processes.  These generic engineering solutions were derived from historical project information, industry data, government laboratories, construction management agencies, vendors, contractors, and engineering analysis.  When creating an estimate in *RACER*, the user tailors the generic engineering solutions by adding site-specific parameters to reflect project-specific conditions and requirements.  The tailored design is then translated into specific quantities of work and the quantities of work are priced using current price data.

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Assemblies in the *RACER* database were defined over the course of many years using several sources of data. In general, these sources include:

- Line Items and Crews contained in the Cost Book published by the Tri-Service Automated Cost Engineering Systems (TRACES) Committee.
- Line items and Crews developed under Government task orders for specific technologies.

### 2.1.9  System Development History

The *RACER* cost estimating system was originally developed under Air Force funding in 1991. Enhancements and new technologies have been added to the *RACER* system over the past 15 years through a combination of private funding and government funding. The current version of the system is *RACER* 2007 (version 9.1.0), which is a two-tier desktop software application that was developed in Visual Basic with a Microsoft (MS) Access database.

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# 3.  Software Testing Plan

## 3.1    Purpose

The purpose of this section of the STP is to set forth the test plans for *RACER* 2008.  The STP includes individual test plans in Appendix B.  The following paragraphs outline the general aspects of the STP.

### 3.1.1   Purpose and Scope of Testing

The purpose of this work is to test the *RACER* 2008 software with MS Windows XP and MS Windows 2000 operating systems, MS Office 2000 and XP Suites.  The test plans are organized by areas such as installation, general functionality and compatibility.  The scope of this work is testing of all items that have been added, deleted or changed for *RACER* 2008, as well as all modifications that interact or depend on the added, deleted and changed items.

Testing will be performed to:
1) Ensure a system release that meets or exceeds all functional and technical requirements specified in the SOWs and the design documents that were produced pursuant to those SOWs, and
2) Provide a high-quality system that provides defensible and consistent estimates..

### 3.1.2   Quantitative Objectives for Defects and Problems

Defects, errors, and problems reported by Government, Government Contractors and Earth Tech testers will be captured in the right hand column of the testing scripts and via screen shots attached to the scripts.  This form will be used instead of accessing the Design Review and Checking System (DrChecks).  Earth Tech uses a four-tier schema for categorization of errors, defects and suggested changes:

**Critical** – Errors and defects require immediate resolution by the developer.  For example, an error that causes the system to cease functioning would be considered a Critical error.  The objective is to achieve 3 or fewer in Critical Errors in the Alpha software, 2 or fewer in the Beta version and 0 in the Final Acceptance version.

**Necessary** – Errors and defects that must be addressed in the final system.  The developer decides when and how to address "Necessary" problems.  An example of a necessary error is if a cost model does not produce the correct output (i.e., assembly quantity algorithms are incorrect).  The goal is to achieve zero (0) necessary errors by the Final Acceptance version of the software.

**Cosmetic** – Suggested changes in the appearance of the system that would be desirable in the final system.  For example, typographic errors or alignment of input fields and data labels on the input screen of a cost model would be characterized as cosmetic.  The developer decides whether to address cosmetic changes, and if so, when and how to implement those changes.  Cosmetic errors do not affect the accuracy of the software and are addressed on an ongoing basis.  The goal is to achieve 12 cosmetic errors for the Alpha version, 6 for the Beta version, and 3 for the Final Acceptance version.

>**Enhancement** – Suggested changes that would improve the system.  Enhancements can include engineering change proposals (ECPs) to the existing *RACER* technologies or they can be suggestions for new *RACER* technologies, reports or other functionality.  Enhancements identified during testing of *RACER* 2008 will be logged into Earth Tech's Tracker database for presentation to and discussion with the RTWG.  Typically, enhancements are only addressed when included in a future Task Order.

These categories will be used for establishing quantitative testing objectives for the *RACER* 2008 system by phase of testing in the subsections that follow.

### 3.1.3   Test Environment (Hardware and Software)

The test environment will be recorded on each of the test plans.  The typical test environment will include a Dell Optiplex GX270, 2.8-Gigahertz (GHz) Personal Computers (PCs), loaded with the following combinations of operating systems and office suites:

* Microsoft® Windows 2000 and Microsoft® Office 2000 (including Microsoft Word, Microsoft Excel, and Microsoft Access), and *RACER* 2008™ accordingly.
* Microsoft® Windows 2000 and Microsoft® Office XP
* Microsoft® Windows XP Professional and Microsoft® Office 2000
* Microsoft® Windows XP Professional and Microsoft® Office XP

The minimum system requirements for *RACER* 2008 are:
>Pentium 500 MHz Processor
>256 Megabyte (MB) Random Access Memory (RAM)
>400 MB free hard disk space
>Compact Disk – Read Only Memory (CD-ROM) Drive

The recommended system requirements for *RACER* 2008 are:
>Pentium 1 GHz or above Processor
>512 MB or above RAM
>1 Gigabyte [GB] or above free hard disk space
>Compact Disk – Read Only Memory (CD-ROM) Drive

Computers will be imaged to ensure that the proper operating system and office suites are installed.

### 3.2   Roles and Responsibilities

The following table lists the Roles and Responsibilities of the Earth Tech personnel assigned to the development of the *RACER* 2008 software:

| Name | Role |
|---|---|
| Whitney Littleton | Project Manager/Product Line Manager |
| John Claypool | Engineering Support / Quality Manager |
| Mike West | Engineering Support/Testing Lead |
| Kara Ali | Engineering Support |

| Andrew Schleppi | Engineering Support |
|---|---|
| Sean Martin | Software Support |
| Linda O'Banion | Software Support |
| Vladimir Pomirchy | Software Support |
| Barbara Barnes | Technical Writer – Help Files |

### 3.2.1  Technical Testers

Technical testing is intended to evaluate the accuracy of *RACER* technology outputs. During the development process, cost engineers working with software professionals will have the primary responsibility for conducting technical testing of the *RACER* 2008 system.  The personnel assigned to this task have experience writing test scripts, and conducting unit testing and other technical tests.

### 3.2.2  Functional Testers

Functional testing is intended to evaluate the general software operation (e.g. the correct Help File opens when selecting the "F1" key).  During development, environmental engineers and scientists along with software professionals will be responsible for conducting functional testing. The personnel assigned to this task have experience using the *RACER* system for generating cost estimates.  This group of testers will be responsible for conducting side-by-side comparison testing using cost estimates using the *RACER* 2007 and the *RACER* 2008 systems.

### 3.3  Test Objectives

The purpose of testing the *RACER* 2008 system is to ensure that no errors are present before the software is released to the user community.  This STP provides a systematic effort to find errors in a planned way.  The objectives for testing determine the particular attributes of the *RACER* 2008 system on which each of the testing phases will focus.  The test objectives also drive the selection of tests to be performed in each of the testing phases.  The subsections that follow describe the general objectives for testing the *RACER* 2008 system.  In addition, specific objectives for testing during the development, Alpha, Beta, and Final Acceptance testing phases are described in the subsections that follow.

The test objectives will be recorded as a test case description summarizing what the objectives are for testing covered under the individual test plans.  The testing results will be included on the Test Scripts and will be presented in the Alpha, Beta and Final Software Test Results Reports. The overall objective of these test plans is to successfully produce the expected results.

### 3.3.1  General Test Objectives

The general objectives for testing the *RACER* 2008 system are as follows:

### 3.3.1.1 Development Testing

In quantitative terms, the objectives for development testing are to have no critical errors or defects.  There is no numeric goal for the number of necessary errors or defects or cosmetic problems or changes.

### 3.3.1.2 Alpha Testing

In quantitative terms, the objectives for alpha testing are to have no critical errors or defects. There is no numeric goal for the number of necessary errors or defects or cosmetic problems or changes.

### 3.3.1.3 Beta Testing

In quantitative terms, the objectives for beta testing are to have no critical errors or defects, and less than three (3) necessary errors or defects. There is no numeric goal for the number of cosmetic problems or changes.

### 3.3.1.4 Final Acceptance Testing

In quantitative terms, the objectives for Final Acceptance testing are to have no critical errors or defects, no necessary errors or defects, and minimal cosmetic problems or changes.

### 3.4    General Test Conditions

The general test conditions will be recorded as the steps which the tester will follow to test the *RACER* 2008 software. Testing expectations and allowable results are included in the Test Scripts.

### 3.4.1   Planned Tests

The following is a list of the planned tests which will be used for testing. The test plans were created using MS Excel 2003 and are included as Appendix B.

### 3.4.1.1 *RACER* Technology Category Testing

The purpose of the *RACER* Technology Category Testing is to ensure that the *RACER* technologies are assigned to the correct category as listed below. This is a test of basic functionality in *RACER* and also test that new technologies are assigned to the correct category.

- Containment
- Discharge
- Demolition
- Disposal
- Documentation
- Ordnance
- Radioactive work
- Removal
- Remediation Support
- Studies
- Site Work and Utility

### 3.4.1.2 *RACER* Menu Testing

The purpose of the *RACER* Menu Testing is to ensure that the new and existing Menu functionality works properly. New menu items such as Save as… and Copy Database will be tested. Existing menu items such as Import Project will be tested to ensure proper handling of

re-engineered cost models, markup templates, and analytical templates on upgrade as well as the deleted cost models and assemblies.

- File Menu
    - New Database
    - Change Database
    - Save as…
    - Copy Database
    - List of the four (4) most recently opened databases
    - Exit
- Estimating Menu
    - RACER
        - Add New Folder
        - Paste Folder
    - Folder
        - Add New Project
        - Copy Folder
        - Paste Project
        - Export Project(s)
        - Import Project
        - Delete Folder
        - Rename Folder
    - Project
        - Modify Project
        - Add Site to Project
        - Copy Project
        - Paste Site
        - Export Project
        - Delete Project
    - Site
        - Modify Site
        - Add Phase to Site
        - Copy Site
        - Paste Phase
        - Delete Site

- o Phase
    - Modify Phase
    - Copy Phase
    - Paste Phase
    - Delete Phase
  - o Technology
    - Run Technology
    - Copy Technology
    - Delete Technology
- Preferences Menu
  - o Level Names
  - o Project Categories
  - o Site Types
  - o Location Modifiers
  - o Safety Level
  - o Productivity
  - o Markup Templates
  - o No Markup Assemblies
  - o Assembly Cost Database
  - o Analysis Rates
  - o Analytical Templates
  - o Pro. Labor Rates
  - o Pro. Labor Templates
  - o Export Preferences
  - o Import Preferences
- Reports Menu
  - o Folder Level Reports
    - Site Cost Over Time
    - Assembly Level Data Report (New)
  - o Project Level Reports
    - Current Year Dollar Summary
    - Current Year Dollar Summary Report
    - Cost Summary Report

- Cost Detail Report (Project)
- Cost Over Time (Excel)
- Cost Over Time (Active Reports)
- WBS Report (New)
- WBS-ECES Report (New)
- Assembly Level Data Report (New)

o Site Level Reports

- Cost Over Time (Site) Report (Excel)
- Cost Over Time (Site) Report (Active Reports)
- Cost Detail Report
- Cost Summary Report
- Estimate Documentation Report
- WBS Report (New)
- WBS-ECES Report (New)
- Assembly Level Data Report (New)

o Phase Level Reports

- Cost Over Time (Phase) Report (with and without Markups - Excel or Active Reports)
- WBS Report
- WBS-ECES Report
- Cost Summary Report
- Cost Detail Report
- Phase Technology Cost Detail Report (No Markups)
- Phase Technology Cost Detail Report (With Markups)
- Markups
- Residual Waste Management Summary
- Assembly Level Data Report (New)

o Preferences Reports (New)

- All Preferences
- General Preferences
- Markup Templates
- No-Markup Assemblies
- Assembly Cost Database
- Analysis Rates

- ▪ Analytical Templates

- ▪ Professional Labor Rates

- Utilities Menu

  - o Compact Database

  - o Price Level Project Costs

  - o Agency Post Processors (more detailed testing specifics are included below).

  - o View Log File (New)

- Contact Information

- Help Menu

  - o Help Topics

  - o Technical Support

  - o Conversion Calculator

  - o Calculator

  - o About…

### 3.4.1.3 *RACER* 2008 Installation Testing

Installation of *RACER* 2008 will be tested for Windows 2000 and Windows XP Professional. The validation of all license types (A, C, G, I, X) will be tested.

### 3.4.1.4 *RACER* 2008 Agency Post Processor Testing

The agency post processors (FUDS Post Processor and Army Interface Utility [AIU]) will be tested to ensure full functionality with the changes in *RACER* 2008.

- FUDS Post Processor – Test output by viewing database and the Extensible Markup Language (XML) file to verify the values are identical. All new and re-engineered technologies will tested to ensure they function correctly with the Post Processor. Testing will be performed to verify that the costs are in the correct years, and that the values are correct due to changes in assemblies, markup templates and Sub Bid.

- AIU – Verify that the utility is reporting the correct marked up costs for the technologies that were re-engineered under TO 0023 and TO 0029. The AIU will be modified to include new technology codes for Buried Drum Removal and Well Abandonment. All new and re-engineered technologies will tested to ensure they function correctly with the AIU. Testing will be performed to verify that the values are correct due to changes in assembly costs (including addition of Sub Bid costs) and markup templates.

### 3.4.1.5 *RACER* 2008 Software Compatibility Testing

Although not a Contract requirement, *RACER* 2008 will be tested for compatibility with other Earth Tech developed software programs.

- Parametric Cost Engineering System (PACES) Compatibility – testing will be performed to verify that installation of *RACER* 2008 on a computer with PACES 2007 will allow full functionality of both programs. This is due to the number of Government users who run both PACES and *RACER*.

- Transportation Cost Estimator (TRACER) Compatibility – testing will be performed to verify that installation of *RACER* 2008 on a computer with the most recent version of TRACER will allow full functionality of both programs.

- Cost Risk Compatibility – Cost Risk will be updated to make compatible with *RACER* 2008 under TO 0034 Task 11. This work will be performed subsequent to the release of *RACER* 2008 and is therefore not part of this STP.

### 3.4.2   Test Description for New *RACER* Problem/Change Requests

The Problem/Change Requests (P/CR) that have been addressed for the *RACER* 2008 system are included as Appendix C. The P/CRs will be tested to ensure the changes/enhancements function as intended. Specific test scripts for the P/CRs that do not involve re-engineered or new technologies are also included in Appendix C.

### 3.4.3   Testing of *RACER* 2008 Changes

The following sections present details of the planned tests for the software changes that were made for *RACER* 2008. The testing will also include functionality impacted by the new and re-engineered technologies such as Import and Upgrade. The test scripts for each of these items are presented in Appendix B. All testing results will be recorded on the specific test scripts.

### 3.4.3.1 Database Update

The database update for *RACER* 2008 includes Assembly Prices & Line Items, Escalation Factors, ACFs, Per Diem, addition of Sub Bid costs and changes to Tables tblSystem & tblVersions. Testing of the database update will be accomplished via price leveling of prior estimates to ensure that the new assembly prices, escalation factors, ACFs, and Markups are applied correctly. Testing of the new and revised Analytical Templates will also be performed. The Remedial Action (RA) Wizard was also revised for 2008 and will be included in the testing.

### 3.4.3.1.1        Update Assembly Prices & Line Items

A test script will be developed to check the redefined and new assembly prices using the Micro-Computer Aided Cost Estimating System (M-CACES) Second Generation (MII) and *RACER*. Approximately 17% of the CSI Tasks in the Cost Book were revised in May 2007. Therefore, all assemblies that use Cost Book CSI Tasks were revised utilizing an update query due to the changes between the Revision 8 Cost Book used for updating the *RACER* 2007 assembly costs and the May 2007 release. Testing will verify (1) that the prices for Material, Labor, Equipment and Sub Bid (MLES) are correct in the database, (2) new assembly prices are applied correctly to prior estimates, and (3) assembly prices are marked up properly to calculate phase-level costs. Cost engineers will be doing manual calculations as well as comparisons using MS Access queries.

### 3.4.3.1.2 Update Escalation Factors

A test script will be used to check that the 2008 Escalation Factors were applied correctly. This will be performed by running a Cost Over Time technology such as Natural Attenuation and viewing reports to compare against the 2008 Escalation Factors.

### 3.4.3.1.3 Update Area Cost Factors

A test script will be used to check the ACF update. Estimates will be created in *RACER* for a minimum of 48 Contiguous United States (CONUS) and 50 Outside CONUS (OCONUS) locations to verify the ACFs.

### 3.4.3.1.4 Update Per Diem

A test script will be used to check the Per Diem update. Estimates will be created in *RACER* for a minimum of 48 CONUS and 50 OCONUS locations to verify the Per Diem rates.

### 3.4.3.1.5 Revision of Unit Price Categories to Include Sub Bid

A test script will be used to check the Sub Bid update. Estimates will be created in *RACER* 2007 and *RACER* 2008 that will include assemblies with Sub Bid costs such as analytical, testing and equipment rental. The following items will be checked during testing:

- Testers will make sure the Sub Bid cost that is displayed is correct when compared to the Cost Book;
- Tester will ensure that assemblies that had Sub Bid Costs included with Material costs in *RACER* 2007 are properly converted to show the Sub Bid costs in *RACER* 2008.
- Testers will make sure the Extended Cost for an assembly is calculated properly;
- Testers will make sure the Sub Bid items are being handled correctly in the phase-level markup routine;
- Testers will make sure ACFs are not applied to Sub Bid;
- Reports will be created and saved to ensure that Sub Bid unit prices are accurate.

### 3.4.3.1.6 Update System Tables

Confirmation of these changes will be made by attempting and failing to import a *RACER* 2005 database. *RACER* 2007 will also be used to attempt and fail to open a *RACER* 2008 database. Failing to import a *RACER* 2005 database will be indicated by the following message "Upgrade from 7.0.1 to Racer 10.0.0 is not supported."

### 3.4.3.1.7 Revision of View Line Items Functionality

Estimates will be generated within *RACER* 2008. The assembly grid for the estimated technologies will be opened. An assembly will be highlighted and View Line Items will be selected. The displayed information will be verified that it contains Line Items and Crews (if applicable). The information from the Line Item will be copied to the Clipboard and then pasted into a formatted Excel spreadsheet. This information will be compared to the same assembly by viewing it in the Assembly Cost Database. The line items and crew data will also be verified using the May 2007 Cost Book and MII.

### 3.4.3.1.8 Revision of the Markup Template

Estimates will be generated within *RACER* 2008 and the revised Markup Template will be viewed. Estimates will also be generated in *RACER* 2007 and either imported or the database

will be upgraded to 2008 to ensure that the new Markups are applied. Test cases will be included with no-markup assemblies, no-markup technologies, assemblies with Sub Bid costs, technologies with work split between prime & subs, and other combinations that can affect marked up costs. Testers will verify that the marked up cost is numerically correct on screen, in reports, in exported estimates and in the agency post processor output files.

### 3.4.3.1.9      Revision of the Phase Menu - Apply Preferences

Estimates will be generated within *RACER* 2008. The Rate Groups (Analytical and Professional Labor) and Markup Templates will be modified from the main *RACER* menu. The Phase screen will be opened. The new Apply Preferences menu item will be opened and the new rate groups and markup templates will be applied to the Phase. The technology markups will be revised and applied using the new functionality. The Analysis Rate Groups preference will be tested in conjunction with the new and re-engineered technologies and analytical templates to ensure that the correct rates are applied to new templates and/or assemblies in the redefined analytical templates.

### 3.4.3.1.10      Revision of the RA Wizard

New estimates will be created to verify the changes to the RA Wizard for 2008. Different combinations of Media/Waste, Contaminants and Approaches will be developed to ensure that the software is selecting the correct RA options as specified on the test script.

### 3.4.3.2 Testing of *RACER* Executable Changes

The *RACER* executable (RACER.exe) will be revised for the 2008 release to include new Splash Screen, database password and calculation of Remedial Design Percentage during price leveling.

### 3.4.3.2.1      New Splash Screen - *RACER* 2008

Confirmation of this change will be made by starting *RACER* 2008. The Splash Screen will be viewed to ensure that the screen contains no errors.

### 3.4.3.2.2      New Database Password

Verification will be made by confirming *RACER* 2008 opens a *RACER* 2008 database. Also, a *RACER* 2008 database will attempt to be opened using *RACER* 2007. Because of the new database password, this process should fail.

### 3.4.3.2.3      Remedial Design Percent Calculation During Price Leveling

Verification will be made by confirming *RACER* 2008 opens a *RACER* 2007 database that contains estimates using the Remedial Design Percent.

### 3.4.3.3 Testing of *RACER* Utilities Changes

The *RACER* 2008 will contain changes to the Utilities including a new View Log File functionality and elimination of the Template Compactor utility. The FUDS Post Processor will be recompiled for the 2008 release. Although no changes in the AIU are planned, it will be tested with the re-engineered and new technologies to ensure proper operation and output.

### 3.4.3.3.1        Recompiled FUDS Post Processor

Confirmation of changes to the FUDS Post Processor will be made by creating and upgrading a FUDS compliant estimate and verifying that it can be post processed. Additional testing will be performed with all re-engineered and new technologies and with the new FUDS markup templates. Testing will also be performed to make sure that the Post Processor output file contains correct dollar amounts, that those amounts are correctly apportioned between contractor (CON) and in-house (IH) categories, and that the costs are assigned to the correct year.

### 3.4.3.3.2        AIU Testing

Testing of the AIU will verify the contents of the output file to ensure that the correct technology codes are used, especially for the re-engineered and new technologies, and that the marked up dollar values are numerically correct.

### 3.4.3.3.3        Removal of the Template Compactor Utility

Verification will be made by ensuring that the utility is not on the list of options available under the Utilities menu.  Testing will be performed to verify that the templates (Markup, Analysis Rates, Analytical and Professional Labor Rate) can be still be deleted using the Preferences Menu.

### 3.4.3.3.4        View Log File Functionality

Verification will be made by viewing the list of options available under the Utilities menu. The functionality will be confirmed by upgrading a *RACER* 2006 or 2007 database and then using the View Log File to open a log file generated by the upgrade process.  *RACER* 2006 and 2007 databases will be created that contain items that will result in things that will be logged.  Earth Tech will design a database with errors (i.e., Markup identifications that do not exist) to verify that the logging function will find these as well.

### 3.4.3.4 Testing of *RACER* Help System Changes

The Help File system will have extensive changes made for the *RACER* 2008 release due to the re-engineering of existing and development of new technologies as well as changes in *RACER* functionality.  The test scripts for the new and re-engineered technologies include specific testing options for the Help File changes.

### 3.4.3.4.1        Revise What's New in *RACER* Help Topic

Confirmation will be made by opening the Welcome to *RACER* help topic and scrolling down to the *What's New in RACER 2008 (Version 10.0.0)* subtopic.  The search function will also be used to find the phrase "What's New".  The help topic will also be compared to the Readme.txt content to verify that the content is the same.

### 3.4.3.4.2        Replace References In Other Help Topics to *RACER* 2007 With *RACER* 2008

Verification will be performed by using the Search functionality in the Help system to search for *RACER* 2007.

### 3.4.3.4.3        Verification of Help Changes Due to New and Revised Functionality

Other changes to the Help System as a result of changes to re-engineered and new technologies, changes to screen layouts and functionality will be verified.  The revised Menu items will be

opened and the F1 key will be selected to verify that the Help information matches the Menu item. Changes to the Level screens in *RACER* 2008 will be verified by going the each Level and selecting the F1 key to verify that the Help information accurately describes what is displayed on the screen. The Help topics for the re-engineered and new technologies will be tested by opening each screen in the technology and selecting the F1 key to confirm that the Help information accurately describes what is displayed on the screen. New and revised functionality will be tested in a similar manner. For example, the list of reports in the Help File will be compared to verify that the list matches the changes made to the reports for *RACER* 2008.

### 3.4.3.5 Testing of Installation Program and Support Files

Changes to the installation program and support files for *RACER* 2008 will be tested. This includes the installation program (Setup_2008.exe) and associated files (License.mdb and Readme.txt).

### 3.4.3.5.1 *RACER* 2008 Installation Program

Confirmation will be made by installing *RACER* 2008 on all test environments and verifying the operation and correct installation of all software components.

### 3.4.3.5.2 *RACER* 2008 Updated License.mdb

Validation will occur by installing the system under each *RACER* license type and launching the software to validate license is correct in the Help About screen. All license types (A, C, G, I, T and X) will be validated.

### 3.4.3.5.3 *RACER* 2008 Revised Readme.txt

Verification will be made by opening the ReadMe.txt file as installed on the test computers and confirming the version and content is correct for *RACER* 2008.

### 3.4.4 *RACER* 2008 Technology Testing

Basic functionality, e.g., opening technologies, inputting data, saving, and closing technologies, etc., will be performed using an automated testing program. All new and revised *RACER* technology functionality will be manually tested by the Cost Engineer(s) involved with the development as well other testers such as Subject Matter Experts who were not involved in the technology design. This process ensures that the new or revised functionality meets the design requirements and expectations as defined by the test scripts and accurately reflects the field application of the technology as applied to a parametric estimate. Technologies that were re-engineered for 2008 will be included in a *RACER* 2007 database and run to cost. These technologies will be tested through both export from *RACER* 2007 and database upgrade from 2007 to 2008 to verify proper handling of the re-engineering changes. Testing will verify that the required parameters were mapped properly from the prior version of *RACER*. If applicable, testing of the technologies will include analytical templates to ensure proper handling of changed/deleted templates and/or analytical assemblies on upgrade or import. The following items will be tested for all re-engineered and new technologies:

- New and Revised Functionality
- Comments
- Reports
- Assemblies

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- Valid Ranges (minimum and maximum)

- Tool Tips; and

- Help Topics

The following paragraphs list the specific technologies that will be tested in *RACER* 2008. All testing results will be recorded on the specific test scripts.

### 3.4.4.1 *RACER* 2008 Automated Technology Testing

The *RACER* automated technology testing plan is comprised of the script used to run the automated functionality testing using Automated Q/As TestComplete Software. This testing was not a requirement in the SOW. However; it will be implemented so that the software will not be released without substantial testing. Automated testing will be performed on all *RACER* technologies. The expectation for all of the tests is that each technology will open and close without error. The automated testing script is provided in Appendix D of this STP.

### 3.4.4.2 TO0023 Technology Revisions

The following technologies that were re-engineered or developed under TO0023 will be tested to ensure that all changes and enhancements as specified in the test scripts and design documents for these technologies function as intended:.

- Capping

- Excavation

- French Drain

- Monitoring

- Off-site Transportation & Waste Disposal

- Operations & Maintenance (Including elimination of Startup Costs)

- Permeable Barriers

- Residual Waste Management

- Trenching

- UST Closure/Removal

- Well Abandonment

### 3.4.4.3 TO0029 Technology Revisions

The following technologies that have been re-engineered or developed under TO0029 will be tested to ensure that all changes and enhancements as specified in the test scripts and design documents for these technologies function as intended:

- Professional Labor Management

- Feasibility Study

- Remedial Investigation

- In-Situ Biodegradation

- D&D Contaminated Building Materials

- D&D Surface Decontamination

- Buried Drum Removal (New Technology)

- Drum Staging

- D&D Surveillance and Maintenance (Note: this technology is being developed as a service release for *RACER* 2008)

### 3.4.4.4 *RACER* Technologies Eliminated Under TO0029

The following technologies have been eliminated under TO0029:

- Air Sparged Hydrocyclone

- In-Situ Vitrification

- Solvent Extraction

- Operations & Maintenance Startup Costs

*RACER* 2008 will be tested to ensure that elimination of these technologies do not impact the functionality of the system. Cost estimates will be developed in *RACER* 2006 & 2007 that contain the technologies which were deleted for *RACER* 2008. These databases will be upgraded to *RACER* 2008 to verify that the assemblies in the technologies are mapped into a User-Defined Estimate (UDE). The UDE will be tested to ensure that it has the correct WBS number, Safety Level and Technology Name. The estimates with these deleted technologies will also be exported from *RACER* 2006 and 2007 and then imported into *RACER* 2008 to verify that the new proper handling during import.

### 3.4.5   *RACER* 2008 Enhancement Testing

The following sections list the enhancements that have been incorporated into *RACER* 2008 as well as the procedures for testing the enhancements.

### 3.4.5.1 *RACER* 2008 Functionality Enhancements

P/CR No. 944 *RACER* 2008 added the display of the Direct and Marked-up Costs at all *RACER* Tree Levels (Folder, Project, Site, Phase and Technology). This new functionality will be tested by copying the displayed costs at all levels and pasting into a spreadsheet. The costs will be verified by running reports at each tree level. The costs at the Phase level will be verified by comparing the values displayed for each technology and the values in the tree display.

P/CR No. 1451 Consistent Button Captions. The captions for the Deselect All button for the price leveling and FUDS post processor screens were changed from "Unselect All" to "Deselect All" to be consistent with the rest of *RACER*. This change will be tested by upgrading a FUDS compliant 2006 or 2007 database and then running the FUDS Post Processor to verify that the buttons on the Select Estimates screen are captioned "Select All" and "Deselect All'.

**3.4.5.2 Preferences Enhancements**

Per P/CR No. 865 all items in the Preferences Menu will be tested to ensure that the new Comments field appears in the preferences and functions as intended. The list of Preferences includes:

- Level Names
- Project Categories
- Site Types
- Location Modifiers
- Safety Level
- Productivity
- Markup Templates
- No Markup Assemblies
- Assembly Cost Database
- Analysis Rates
- Analytical Templates
- Pro. Labor Rates
- Pro. Labor Templates
- Export Preferences
- Import Preferences

Per P/CR No. 888 and the September 2006 Technical Memorandum Evaluation of System Analytical Templates in *RACER*, new analytical templates were developed for *RACER* 2008:

- Multi-Contaminant (water and soil);
- Wastewater Effluent;
- Air Emissions
- Herbicides (water and soil); and
- Perchlorate (water and soil).

Testing will be performed to confirm that prior estimates with technologies that contained deleted or redefined analytical templates are handled properly during the import and upgrade process. These new templates will be applied at Level 2 (Site) to verify that correct assemblies are used by the technologies.

Per P/CR No. 1047, the Markup Templates were reviewed for mobilization/demobilization in technologies and how markups are applied against them. An estimate will be created in *RACER* 2007 that contains mobilization/demobilization assemblies. The estimate will be exported and the database containing the estimate will be also upgraded.

P/CR No. 1503 fixed the Productivity Percentages so that the minimum valid range was 1 percent instead of 0 percent. This will be tested by modifying the Productivity Percentages in a

*RACER* 2007 database and upgrading to 2008. Testing will also be conducted in *RACER* 2008 by ensuring that the minimum Productivity Percentage cannot be set to 0.

### 3.4.5.3 General *RACER* 2008 Technology Enhancements

P/CR No. 860 added "Select All" and "Deselect All" buttons to the following technologies:

- Corrective Measures Study;
- D&D, Conduit, Pipe & Ductwork;
- D&D, Final Status Survey;
- D&D, Rad Contaminated Building;
- D&D, Removal, Attached Hazardous Materials;
- D&D, Site Characterization Survey;
- D&D, Specialty Process Equipment;
- Feasibility Study;
- Five-Year Review;
- MEC Archives Search Report;
- MEC Institutional Controls;
- MEC Monitoring;
- MEC Removal Action;
- MEC Sifting;
- MEC Site Characterization & Removal Assessment;
- Monitoring;
- Petroleum UST Site Assessment;
- Preliminary Assessment;
- Professional Labor Management;
- RCRA Facility Investigation;
- Remedial Investigation;
- Residual Waste Management;
- Restoration Advisory Board;
- Resurfacing Roadways/Parking Lots;
- Site Close-Out Documentation;
- Site Inspection;
- UXO Active Range Clearance Planning; and
- Well Abandonment

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These technologies will be added to a new estimate in *RACER* 20008. The technologies will be run to ensure the Select All" and "Deselect All" buttons are present and that the functionality works as designed.

P/CR No. 1425 simplified the Tab Notes functionality for 2008. The revised functionality will be tested by adding Tab Notes to a technology in *RACER* 2008 to verify that changes are present and that they work properly. Tab notes will also be tested by adding notes to a technology in *RACER* 2007. The estimate containing the tab notes will be imported into 2008 to verify proper operation of the revisions.

### 3.4.5.4 New Reports Developed for 2008

The following reports have been added to *RACER* under TO0023 and TO0029. If the new report was added as a result of a P/CR, the P/CR number has been added next to the report name.

- Folder Level Reports
    - Assembly Level Data Report
- Project Level Reports
    - WBS Report (P/CR No. 824)
    - WBS-ECES Report (P/CR No. 824)
    - Assembly Level Data Report
- Site Level Reports
    - WBS Report (P/CR No. 824)
    - WBS-ECES Report (P/CR No. 824)
    - Assembly Level Data Report
- Phase Level Reports
    - Assembly Level Data Report
- Preferences Reports (P/CR No. 930 and No. 974)
    - All Preferences
    - General Preferences
    - Markup Templates
    - No-Markup Assemblies
    - Assembly Cost Database
    - Analysis Rates
    - Analytical Templates
    - Professional Labor Rates

*RACER* 2008 will be tested to confirm that these reports function as intended. A test database will be upgraded to 2008. The tester will run each new report to verify that the costs match the Tree Display and all other comparable reports (e.g. Assembly Level Data Report for the Phase

Level should match the Cost Summary Report but should not match the Technology Cost Detail – with Markups).  The Preferences reports will be run to verify that the information in the report is the same as shown in *RACER*.

### 3.4.5.5 Reports Eliminated for 2008

The following reports have been eliminated under TO0029.  *RACER* 2008 will be tested to ensure that these changes function as intended by checking the Report menu to verify that the deleted reports are no longer available:

- Folder Cost Summary
- DD-1391
- Export to IGE (Independent Government Estimate)
- Reports that show first-year only costs, except those that display assembly-level data.

### 3.4.5.6 *RACER* File Menu Enhancements

Per Enhancement No. 911, the File Menu will be tested to ensure that the new List Last Four Previously Used Database Files functionality works as intended.

### 3.4.5.7 *RACER* Level 2 and Level 3 Data Element Changes

The following data elements have been removed from the Level 3 (Phase) screen and moved to the Level 2 (Site) screen.

- Primary Contaminant
- Secondary Contaminant
- Primary Media/Waste
- Secondary Media/Waste

Testing will be performed using upgrade & import of *RACER* 2007 estimates with multiple phases containing different combinations of media & contaminants to ensure this new functionality works as intended:

### 3.4.6  *RACER* 2008 Sequential Operation Testing

Testing of sequential operations likely to represent actual user actions will be completed using specific scripts which are included in Appendix B.  The list below displays the sequential *RACER* operation and the associated abbreviated testing procedure.

| *RACER* 2008 Sequential Operation | Testing Procedure |
|---|---|
| Copy/Paste/Delete | Items from Level 1, 2, 3, and 4 will be copied, pasted, and deleted from several databases to confirm functionality.  The copied items will be examined by a cost engineer to ensure that the assemblies, quantities and costs are correct. |
| Database Import/Export | An export of preferences and Level 1 items from a *RACER* database will be completed and imported to another *RACER* database to confirm functionality.  The imported items will be examined by a cost engineer to ensure that the assemblies, quantities and costs are correct. |
| Database Upgrade | Four unique operations will be run as described in the database upgrade test script.  These sequential operations will verify that upgrading, price leveling, agency post processors, and export and import are working properly.  Additionally, a test script will be carried out to ensure that RD percent is calculated correctly during price leveling.  The upgraded and price leveled items will be examined by a cost engineer to make certain that the assemblies, quantities and costs are correct. |

### 3.4.7   Test Description for Items Requiring More Detailed Explanation

The individual test scripts will consist of a step-by-step description provided within the test conditions, actions, and expected results sections.  These were written with a sufficient level of detail to give a tester general knowledge of the *RACER* 2008 software to successfully conduct these test plans.  Further detailed explanation is only required for those test conditions which are more complex.

### 3.4.7.1 Boundary Value Testing

For all new and re-engineered cost models and preferences with numeric fields, boundary cases will be tested (top and bottom of specified range) to make sure the highest and lowest allowable inputs produce proper output.  In addition, the number zero should be tested when numerical data is to be input.  Values outside of the ranges will be tested to make certain that the lower and upper values are valid.  This testing will begin with the Beta release because Parameter Validation will not be fully implemented until that time.

### 3.4.8   Alpha Testing

It is anticipated that personnel who will be testing the Alpha version of the *RACER* 2008 system will be a combination of technical staff and functional users of the *RACER* system.  Alpha testers

will also be included from other Earth Tech offices.  It is expected that representatives from the following RTWG Government agencies may participate in the alpha testing:

- Air Force Civil Engineer Support Agency (AFECSA);
- Department of Energy (DOE);
- Department of Interior (DOI);
- US Army Environmental Center (USAEC);
- US Army Corps of Engineers Hazardous, Toxic and Radioactive Waste Center of Expertise (USACE HTRW/CX); and
- US Navy (USN)

Other Government agencies that may participate in the testing are:

- Army National Guard
- Defense Logistics Agency (DLA)
- US Environmental Protection Agency (EPA)
- US Coast Guard (USCG)

### 3.4.9   Beta Testing

It is expected that the Earth Tech personnel and the Government agencies participating in the Beta testing will be the same as those who were involved with the Alpha testing.  Beta testing will also include retesting of problems identified during the Alpha testing have been fixed.

### 3.4.10  Final Acceptance Testing

*RACER* users will be actively involved in the Final Acceptance testing.  It is expected that the Earth Tech personnel and the Government agencies participating in the Final Acceptance testing will be the same as those who were involved with the Alpha and Beta testing.

## 3.5     Data Recording and Analysis

The results from the testing of the *RACER* 2008 system will be recorded in a manner which entails four different mechanisms for capturing the results of the testing.

The first mechanism for capturing the results of the testing involves the use of written scripts with space for the tester to indicate the results.  Each tester will be provided with a series of test scripts and a Comment Form (see Appendix B).  An example of a script for a functional test is provided in Figure 1.

## Figure 1: Example Testing Script



As shown in Figure 1, the test scripts include space for the tester to record the results in the right hand column of the form. The tester can do so by hand or by typing the results into the space provided.

The second mechanism for capturing results from the testing entails the use of screen shots depicting error messages, problems with page displays, etc. The testers will be requested to capture screen shots using the Print Screen button and paste screen shots, along with narrative explanations of the steps leading up to the unanticipated result, directly into the test script document.

The third mechanism for capturing results from the testing involves the use of printed reports generated by the *RACER* 2008 system. The testers will be requested to print cost over time reports for each cost estimate they generate using the *RACER* 2008 system. The reports will be submitted to Earth Tech along with the annotated test scripts.

The fourth mechanism for capturing results from the testing is to create an archive of the cost estimates created during the alpha, beta and final acceptance phases.  This will be accomplished by copying the *RACER* databases containing the input data values and the cost estimates created by the functional testers.

## 3.6    Quality Control

The 2005 Final Software Development Plan for Remedial Action Cost Engineering & Requirements (*RACER*™) Software System document provides detailed discussions of the following Quality Control (QC) procedures and is included as Appendix E:

- Project Quality Goals

- Roles and Responsibilities for QC

- Project Management Activities

- Schedule for Review Actions

- Code Documentation

    o Description

    o Standards

- Flaw Tracking

    o Tracking Tool (Bug Tracker database

# 4.   Test Schedules

The schedules for conducting development, alpha, beta and final acceptance testing periods summarized as depicted on the schedule below.

**Schedule for *RACER* 2008 Testing**

| Testing Phase | Start Date | End Date |
|---|---|---|
| Development | 10 April 2006 | 1 June 2007 |
| Alpha | 1 June 2007 | 10 August 2007 |
| Beta | 27 August 2007 | 31 August 2007 |
| Final Acceptance | 24 September 2007 | 1 October 2007 |

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# 5. Test Discrepancies

Defects and discrepancies identified during alpha, beta and final acceptance testing will be captured using the test scripts and comment forms, managed by tracking all of the test problems and comments for the Software Test Results Report and cleared by follow up testing to ensure the problem/comment/change has been resolved.

As described in Section 3.5, defects, errors, and problems reported by Government testers will be captured in the right hand column of the testing scripts and via screen shots attached to the scripts..

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# Appendix A:

# Acronyms

## Acronyms

| Acronym | Description |
|---|---|
| ACF | Area Cost Factor |
| AFCESA | Air Force Civil Engineer Support Agency |
| AIU | Army Interface Utility |
| CONUS | Contiguous Unites States |
| DLA | Defense Logistics Agency |
| DOE | Department of Energy |
| DOI | Department of Interior |
| ECP | Engineering Change Proposal |
| EPA | Environmental Protection Agency |
| FUDS | Formerly Used Defense Sites |
| GHz | Gigahertz |
| IEEE | Institute of Electrical and Electronics Engineers |
| MCACES | Micro-Computer Aided Cost Estimating System |
| MII | MCACES Second Generation |
| MS | Microsoft |
| OCONUS | Outside Contiguous Unites States |
| O&M | Operations and Maintenance |
| PACES | Parametric Cost Engineering System |
| PC | Personal Computer |
| P/CR | Problem/Change Request |
| QC | Quality Control |
| RA | Remedial Action |
| *RACER*™ | Remedial Action Cost Engineering & Requirements System |
| RTWG | *RACER* Technical Working Group |
| SOW | Statement of Work |
| STP | Software Test Plan |
| TO | Task Order |
| TRACER | Transportation Cost Estimator |
| TRACES | Tri-Service Automated Cost Engineering Systems Committee |
| USACE HTRW CX | United States Army Corps of Engineers Hazardous, Toxic and Radioactive Waste Center of Expertise |

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| Acronym | Description |
|---------|-------------|
| USAEC | United States Army Environmental Center |
| USCG | United States Coast Guard |
| USN | United States Navy |

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**Appendix B:**

*RACER* **2008 Software Test Scripts**

**Appendix C:**

**Problem/Change Requests Addressed for *RACER* 2008**

**Appendix D:**

*RACER* **2008 Software Testing Procedures**

**Appendix E:**

**Final Software Development Plan for Remedial Action Cost Engineering & Requirements (*RACER*™) Software System)**
**August 2005**

**Appendix F:**

**Response to Government Comments
On Draft Software Test Plan**