



Quality Assurance & Quality Control Plan

Project No. SP-LC05(1)

Prepared For:



UTAH DEPARTMENT OF TRANSPORTATION

July 1998

Prepared By:

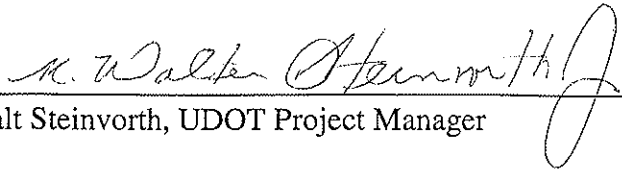


APPROVALS

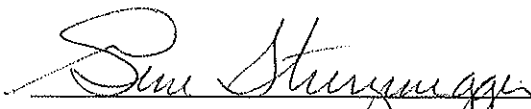
Cache Valley Corridor Study SP-LC05(1)

Quality Assurance and Quality Control Plan

Utah Department of Transportation



Walt Steinvorth, UDOT Project Manager 9/29/98
Date

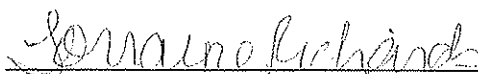
MK Centennial Project Team

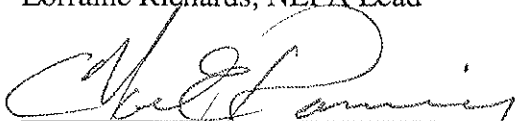

Gene Sturzenegger, Consultant Principal-in-Charge 9/29/98
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Jose Farran, Traffic Modeling Lead 9/29/98
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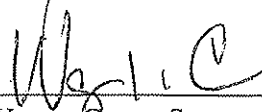

Wayne Crow, Survey and Mapping Lead 9/29/98
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I. INTRODUCTION

The Cache Valley Corridor Study will be completed by the MK Centennial project team which includes Wilbur Smith Associates, Entranco, SWCA Inc., and Knighton and Crow P.C.. The project team is committed to producing quality work, on time, and within budget. In accordance with UDOT policy and procedures, this document provides a description of the specific measures that will be utilized by the project team to fulfill the commitment to quality.

This Quality Assurance/Quality Control Plan includes routine quality control practices following guidelines of the National Society of Professional Engineers. The program includes contract monitoring; frequent budget and schedule reviews; interim technical review and approval for key project phases; procedures for checking planning and design calculations; and close coordination with UDOT, in-house staff, and subconsultants. The result of these measures is an appreciation by professional and support staff of the importance of error-free performance and a commitment to excellence.

II. STUDY PRODUCTION

A. Management Responsibilities

Planning

A project program, i.e., task descriptions, man-hour estimates, budget, and schedule has been prepared for this job. The Project Manager finalized the program immediately after the Notice-to-Proceed and sent the required information to the Accounting Department. Forms include Project Authorization/Time Distribution, Project Labor Budgets, and Project Direct and Reimbursables. The Project Manager distributed the task/phase breakdown to all MK Centennial planning team members with adequate instructions for completing time sheets.

Controlling

The Project Manager has prime responsibility for successful completion of the project. This requires careful and continuing monitoring of the budget, schedule, and work effort to ensure that the actual results are consistent with the planned program. The SureTrak project management program is being used, in conjunction with the standard MIS reports for labor hours and cost expenditures. The Project Manager will develop a submittal tracking log that identifies the required submittals, due date, submittal date, approval date, and the person responsible. It is critical that the Project Manager make early identification of results that vary from the planned program and immediately implement corrective action as appropriate.

Coordinating

The Project Manager will prepare a written project plan that summarizes the key project elements, establishes criteria, and identifies the key personnel (including subconsultants) and their respective responsibilities. This plan will be distributed to key team members. The Project Manager will establish a procedure for distributing all correspondence and pertinent project information to project team members, including subconsultants.

Record Keeping

The Project Manager will maintain a project notebook that contains the budget, schedule, contract, billings, and other information as appropriate. The Project Manager will be responsible to see that all pertinent telephone discussions,

meeting minutes, and other project related contacts and correspondence are prepared and put in the central project file.

B. Schedule and Cost Control

Project Progress Reports

A procedure is available to review and monitor project progress and budget expenditures on projects.

The Project Progress report is available from the MKC Accounting Department for all projects. The monthly billing cycle report is printed and distributed to Project Managers. Intermediate reports can be accessed by the Project Manager over MK Centennial's wide area network. The report lists manhours and dollars expended by phase per reporting period and to date. It compares dollar expenditures to the budget, lists percentage expended, and calculates remaining manhours at the effective rate of expenditure. The Project Manager will review this report at regular intervals and compare the percentage of the budget expended to his estimate of percentage completed for each phase to identify potential overrun areas.

For this project, project management programs will be utilized that estimate and track the project by manpower and scheduling analysis. Regular updates to the program will be made corresponding to the Project Progress Report billing cycle distribution.

The Project Manager will prepare Project Status Review forms each month.

Client Reporting

Detailed progress reports are prepared to accompany the monthly billing submittal to the client. The report summarizes the project's budget, expenditures, work progress, and schedule and indicates the nature and status of problems encountered, change orders, etc.

Principal-in-Charge Review

A formal project status briefing for the Principal-in-Charge will be conducted monthly for this project. The briefing shall be presented by the Project Manager and will include:

- Description of project work elements, project team, budget, and schedule.

-
- Identification of unique features, constraints, problems, etc.
 - Status of project, including an estimate of percentage completed vs. percentage expended.
 - Discussion of change orders in progress or anticipated.
 - Assurance that Quality Control Procedures are being followed and evaluation of the integration of the various disciplines (including subconsultant work products.)

C. Control Procedures

A Quality Control Program is a comprehensive, well defined, written set of procedures and activities designed to produce services and products at an established quality level.

Quality Control reviews are defined as a product specific review. It is the continual and routine comparison of products to standards. Quality Assurance is program oriented. It involves the reviewing of a sampling of the product, as well as looking at the processes used to obtain the product, in order to assess the quality of the program.

Responsibility

The Project Manager, with support from the Principal-In-Charge, is responsible for the overall quality of the work and work products accomplished by the planning team. The Principal-in-Charge, or designated representative, is responsible for the Project Quality Assurance. The Principal-in-Charge, or designated representative, will monitor the Quality Control Program in effect, document the findings, and provide direction or recommendations for program improvement as may be required. This involves the reviewing of a sampling of the product, as well as looking at the processes used to obtain the product, in order to assess the quality of the program.

The Project Manager and the Project Engineer are responsible that appropriate study procedures and methodologies for each discipline are followed by the staff. Accordingly, they will establish and implement guidelines, and provide direction

as required to make sure that professional standards of practice for study and report preparation are met.

The Project Manager and the Project Planners are responsible for meeting the technical and administrative goals for the project. They are also responsible to make sure that interdisciplinary coordination is achieved by the project team.

The Project Engineer and other members of the team are responsible for the accuracy and correctness of studies and technical reports which are prepared under their direction. They will verify that all such work is checked in accordance with the guidelines herein.

Project Reviews

Project reviews will be conducted by the Project Manager at key points in the study process. Reports and other work products will be reviewed before submittal to the Client. If warranted by project size or complexity, the Project Manager may lead a small group in conducting these reviews. The reviews are intended to compare the product to the original program/scope of work, evaluate the integration of the various disciplines (including subconsultant work products), verify the completeness of the work product for the particular planning phase, and checked cross references in the plans. Changes will be noted as appropriate.

Standard Checking System

Complete Project Manager and Project Engineer coordination and final QA/QC reviews and checks of all documents shall take place prior to each submittal.

All work products will be checked in accordance with the requirements and procedures listed below. Work products include:

- Design Calculations
- Reports
- Drawings
- Specifications
- Cost Estimates
- Budget and Schedule
- Quantity Computations

-
- Project Manuals
 - Computer Input

A structured checking, backchecking, and verification system is used that:

- Utilizes planning development checklists as well as a dated tracking and responsibility stamp or sign-off system on each review document to promote the thoroughness of the checking process.
- Utilizes an industry standard color-coded checking and marking system to promote the thoroughness of the planning, quality control, and quality assurance reviews.

The basic principle of this system is that two responsible, qualified professionals agree that the work is correct.

The two parties are defined as:

Lead Technical Professional (LTP's/Originators) who:

- Originate the documents.
- Concur with the revisions.
- Sign and stamp the document (if applicable).

QC Reviewers (QCR's/Checkers with equivalent qualifications) who:

- Check the work.
- Verify that revisions are made correct.

The QC reviewer must be a senior professional, experienced in the particular field for which they are reviewing work. The QC reviewer cannot be involved with the preparation of the document being QC'd.

The LTP and QCR shall sign and date a tracking and responsibility cover sheet (illustrated in appendix) at the completion of each step of the process to signify the completeness and accuracy of their part of the effort. Each person responsible for a checking function shall sign and date the tracking and responsibility stamp upon completion of their function.

Checking of work products shall be accomplished with colored pencils as follows:

1. Checking

- a. Lead Technical Professionals (LTP) bring all work to substantial completion.
- b. The Quality Control Reviewer (QCR) will review all work prepared by the LTP for:
 - Requirements for the Project.
 - Technical Adequacy.
 - Compatibility with Other Associated Project Documents.
- c. The QCR will determine if the document is suitable and adequate to accomplish the required function.
- d. The QCR will shade in **yellow** on the checked copy all work that is correct and mark in **red** on the checked copy the required corrections, additions or deletions.
- e. The QCR will sign and date the checked copy and forward the checked copy to the LTP.
- f. Any comments or direction will be indicated using **blue** pencil.

2. Backchecking

- a. The LTP (usually the original planner) will review the QCR's marks on the checked copy.
- b. The LTP will place a checked mark in **green** near each of the QCR's **red**-marked changes if they agree the document original should be changed.
- c. The LTP will consult with the QCR directly if they do not agree with the **red** marked changes. If both the QCR and the LTP agree that the document original should not be changed, the LTP will

cross out in **green** and mark **STET** in **green** on each of the QCR's **red** marked changes. The QCR will put a **red** check mark near **STET** indicating agreement that no change is needed. If it is agreed that additional or different changes need to be made, the LTP will indicate the changes in **green**, the QCR will then put a **red** check mark next to the **green** corrections indicating concurrence.

3. Updating

- a. The LTP, QCR, or other person will update the document original to incorporate the agreed-to changes and circle in **green** to show inclusion.

4. Verifying

- a. The QCR or LTP (whomever was not involved in updating the originals) will compare the updated original with the checked copy and verify the incorporation and correctness of each change by shading in **yellow**.
- b. Incorrect or unincorporated changes will be incorporated or verified by remarking in **red** on a new checked print (to be numbered and attached to the preceding checked print), incorporated and checked according to the above process. A new checked print is recommended because the sheet will be too busy by this stage.

Computer Data Checking

Computer input files, calculations, and reports must also be checked, utilizing the same color coding. Computer input/output, calculations, and reports used to check drawings must be checked prior to checking drawings. A copy of the checked computer input/output report and calculations must be attached to the report QC package.

Program output/results including generated spreadsheets should be checked by doing random hand calculations on some portions of the work or by obtaining

written validation from manufacturer. Hand calculations used to verify program output must be written and checked. This should be put in the project file.

Verification of program (including version) usage will include acceptance of client or agency approval.

Project Submittal Review

Before each submittal, the Project Manager will have:

- Checked and coordinated all aspects of the work.
- Checked for inclusion of client requirements.
- Confirmed and certified completion of all quality control functions.

As a minimum, the following items will typically be examined:

- Assumptions and criteria.
- Applicable codes and regulations.
- Judgement, methods, and procedures.
- Appropriate alternatives selection.
- Adequacy of calculations.
- Errors and omissions in the documents.
- Compliance with presentation and practice "standards."
- How well the solutions meet the objectives.

The Project Manager shall make use of a checklist developed with the client during contract negotiations and early stages of the project.

The project LTP's will assemble all checking documents and a copy of all deliverables for the final Quality Assurance reviews. Finished documents or camera-ready copy will also be included in the Quality Assurance reviews.

All Quality Control checks and reviews and any corrective measures are to be completed prior to the final Quality Assurance and coordination review and printing.

Principal-In-Charge Quality Assurance Review

The Principal-in-Charge is responsible for:

- Evaluating the submittal Quality Control.
- Verifying that Quality Control is complete and acceptable.

Once the QC process has been finalized and all corrections have been made and verified, the complete QC package along with a copy of the final document will be reviewed by the Principal-in-Charge. The review will be for the purpose of verifying that proper QC procedures were followed and that the proper documentation and backup is available to demonstrate the QC process. Any discrepancies noted during the QA process will be brought to the attention of the Project Manager who will make the necessary corrections. Once the Principal-in-Charge determines the QC package to be complete the Principal-in-Charge will sign off indicating acceptance of the procedures.

The Principal-in-Charge, or designated representative, will review reports and other work products for general content, completeness and suitability before issuance in final form. They may also review interim submittals at their discretion, depending on the size and complexity of the project.

Peer Review

Peer Reviews are an external, independent evaluation of study concepts, criteria and assumptions and/or management procedures. The intent of such reviews is to improve the value and integrity of the planning thereby enhancing the quality of the planning product. Peer Reviews will be conducted when requested by the client or when the project is large and complex and the Project Manager and the Principal-In-Charge determine that it is warranted. Peer Reviews will be performed by a team of outside professionals not directly involved in the project.

Subconsultant Quality Control

MK Centennial is responsible that its subconsultants follow as rigorous a quality control procedure as it does. They must document their internal Quality Control/Quality Assurance activities and submit documentation for evaluations and audits. They will submit certification that they have followed their QC procedure. They shall also retain documents according to the guidelines established in the "Retention of Quality Control Records" section of this document.

Data prepared or furnished by subconsultants shall be checked by the subconsultant before acceptance by MK Centennial. When subconsultant material has been incorporated into our work, proof copies of our work shall be sent to the subconsultant for verification. The subconsultant shall check the proofcopies as required to verify their work has correctly been incorporated into our work.

D. Documentation of Study Decisions

As the leader of the project, the Project Manager will be responsible for the proper documentation of all data, meetings, and decisions made which may affect the acceptance or rejection of the project. Key decisions and all client directions shall be documented in writing. All changes in previously approved or established study elements shall also be documented in writing. Record copies of such documentation shall be placed in the central project file.

The Project Manager will maintain a "Daily Diary" to routinely record project activities. Notations of the work performance, meetings, and any decisions made during the day will be recorded in the diary. This diary would then serve as a source document for the future evaluation of the problems encountered, changes in the existing conditions, and other factors which may alter the project needs.

Over the project duration, many important decisions will be made which may cause redirection of the project tasks. These decisions will be formally documented in writing. Immediately upon reaching the decisions, the Project Manager will prepare memoranda and letters for transmittal to all persons involved in the project. Copies will be provided for filing in the official project files. This correspondence will outline the decisions made and explain the action needed for implementation.

For quick reference of the project decisions, the Project Manager will maintain a log of these occurrences. This log will be filed in the front of the official project file and will also be distributed for incorporation into the project manual.

Prior to each status meeting, the Project Manager will review his "Daily Diary" and the Log of Project Decisions made to date. They will confirm that proper action has been taken to notify all involved persons of the decisions which may alter the project. They should also evaluate the need for changes in the project schedule and for revisions to the Consultant Agreement. At the status meeting,

they will then be able to analyze the project and redirect the work effort as necessary to implement the project decisions.

Retention of Quality Control Records

MK Centennial retains an archive of all project documents for at least seven (7) years after completion of the study (in many cases, permanently). This archive contains all quality control and assurance documents, including both the Quality Control (planning review) and the Quality Assurance checked prints and copies for all deliverables including plans, calculations, and quantity computations. They shall be maintained in an orderly manner, ready for examination to demonstrate that high quality standards have been met in the development of the project.

Appendix

Client Name/Job Title _____

Job/Charge Numbers

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JOB NO. TASK NO.

Document Title _____

PROJECT PHASE

- Study
- Preliminary Design
- Final Design
- _____
(Other-Specify)

DISCIPLINE

- Highway
- Drainage
- Structures
- Traffic
- Other

DOCUMENT TYPE

- Report
- Project Design Criteria
- Design Analysis
- Drawing
- Cost Estimate
- Schedule
- _____
(Other-Specify)

PROGRAMS USED

- _____
- _____
- _____
- _____

DOCUMENT STATUS

- Original
- Revision # _____
- _____
(Other-Specify)

This quality control check contains the following:

SIGNATURE
(Must be legible)

DATE

Originate	_____	_____
Check	_____	_____
Backcheck	_____	_____
Update	_____	_____
Recheck	_____	_____
Audit	_____	_____