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Memo to Brown 2/19
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Q.A. PROGRAM

PARADOX BASIN PROJECT
QUALITY ASSURANCE
MANUAL

DRAFT

Woodward-Clyde Consultants



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**TYPING REQUEST AND
DOCUMENT TRACKING SHEET**

Project Name PBP Project No. _____ Charge Task No. _____

Responsible Person _____

DESCRIPTION OF WORK QA Manual

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OK TO FINALIZE: _____

V-Anne Chernock, Project Editor

Date _____

29 February 1984

TO: ALL PERSONNEL OF WOODWARD-CLYDE CONSULTANTS ASSIGNED TO THE
PARADOX BASIN PROJECT

Woodward-Clyde Consultants has established a Project Quality Assurance Program for services being performed for the Paradox Basin Project. Transmitted herewith is Revision 2 of the manual that describes this program. The Project Quality Assurance Program presented in this manual is an amplification of Woodward-Clyde Consultants' Quality Assurance Program and is authorized for use effective as of this date.

The responsibility and authority for administration of the Project Quality Assurance Program is assigned to Mr. Fred R. Conwell, Business Unit Manager, who reports to the Director. Each individual assigned to the project is charged with the responsibility for performing all activities under his direction efficiently and effectively, and in conformance with the requirements, procedures, and guidelines presented in this manual.

Changes will be made from time to time to keep the Project Quality Assurance Program current. All assigned project personnel have the additional responsibility to submit to Mr. Terry Grant, Project Manager, suggestions for changes that they consider will improve the program. Changes will be issued by the Project Manager in the form of revisions to this manual, approved by the Quality Assurance Manager, accepted by the Battelle/ ONWI Quality Assurance Department, and authorized for use by the Director. Such changes will be effective as of the date of issue of the revision.

Sincerely,

Ashok Patwardhan
Director of Nuclear Waste Management

APPROVED:

Robert Harpster
Quality Assurance Officer
Western Operating Group

CONTROLLED MANUAL NO. _____

MANUAL HOLDER _____

REVISION CONTROL LOG
(see 1.5, Distribution Control)

This record provides a summary of revisions made to individual pages of this document. It is revised each time a change is made to any page.

<u>Rev. No.</u>	<u>Date</u>	<u>Pages Revised</u>
0	7/18/79	Entire Document
1	1/15/80	Entire Document
2	9/1/82	i, ii, iii, 1-1, 1-2, 1-3 (deleted), 2-2, 2-3, 2-4, 2-5, 3-1, 3-4, 5-1, 6-2, 7-1, 7-2 (new), 9-1, 9-2, 10-1, 10-2, 12-1, 13-1, 13-2, 13-3
3	5/18/83	5-2
4	3/1/84	Entire Document

WOODWARD-CLYDE CONSULTANTS
PARADOX BASIN PROJECT

QUALITY ASSURANCE MANUAL
ACKNOWLEDGMENT OF RECEIPT

TO: Terry A. Grant, Project Manager

FROM: _____

SUBJECT: Acknowledgment of Receipt of PBP
Quality Assurance Manual

I hereby acknowledge receipt of PBP Quality Assurance Manual No. _____ dated _____. I understand that this manual is the property of WCC and is assigned on a loan basis. It is my responsibility to keep this manual current by the insertion of revisions as they are issued.

I will promptly surrender this manual upon the request of the PBP Project Manager or the WCC Western Region Quality Assurance Officer, or whenever I no longer have need of the manual because of reassignment from the Project, retirement, or termination of employment.

ACKNOWLEDGED BY:

(Signature)

(Date)

PLEASE RETURN THIS COMPLETED ACKNOWLEDGMENT TO:

Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596
Attention: Ms. Renate B. Macdonald

WOODWARD-CLYDE CONSULTANTS
PARADOX BASIN PROJECT

QUALITY ASSURANCE MANUAL REVISION
ACKNOWLEDGMENT OF RECEIPT

TO: Terry A. Grant, Project Manager

FROM: _____

SUBJECT: Acknowledgment of Receipt of PBP
Quality Assurance Manual Revision

I hereby acknowledge receipt of the revised pages shown on the attached Revision Control Log for Revision No. _____, dated _____, for Paradox Basin Project Quality Assurance Manual No. _____.

I further acknowledge (1) that the revised pages have been properly inserted in the referenced Manual, and (2) that superseded pages have been marked "SUPERSEDED" or have been destroyed.

ACKNOWLEDGED BY:

(Signature)

(Date)

PLEASE RETURN THIS COMPLETED ACKNOWLEDGMENT TO:

Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596
Attention: Ms. Renate B. Macdonald

1 INTRODUCTION

1.1 Purpose

The purpose of this Quality Assurance Manual is to document and describe the Woodward-Clyde Consultants (WCC) Quality Assurance Program applicable to services WCC is providing to Battelle's Office of Nuclear Waste Isolation (ONWI) for the Paradox Basin Project (PBP).

1.2 Scope

This manual describes the requirements of the Quality Assurance Program for planning, performing, reviewing, documenting, and auditing activities affecting site safety as conducted on the project by personnel, consultants, and subcontractors of WCC. This manual supplements the WCC Quality Assurance Manual and incorporates the requirements that are applicable to the siting of nuclear waste repositories, as contained in the latest revisions of:

- o Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants," to Title 10, Code of Federal Regulations, Part 50 (10 CFR 50), "Domestic Licensing of Production and Utilization Facilities" (see Table 1-1)
- o ANSI/ASME NQA-1-1983, "Quality Assurance Program Requirements for Nuclear Power Plants"
- o NRC Review Plan, Quality Assurance Programs for Site Characterization of High Level Nuclear Waste Repositories, July 1983
- o Contract No. E512-01800 between Battelle/ONWI and Woodward-Clyde Consultants.

1.3 Authority

The PBP Quality Assurance Manual is prepared under the direction of the Project Manager, approved by the WCC Quality Assurance Manager, accepted by the ONWI Quality Assurance Department, and authorized for use on the project by the WCC Director, Nuclear Waste Management Group. Revisions of this manual are similarly prepared, approved, accepted, and authorized.

1.4 Applicability

The PBP Quality Assurance Program applies to those services and items provided by WCC personnel, consultants, and subcontractors that yield safety-related data for use in the site characterization study as described in the ONWI-authorized Work Plan.*

*Paradox Basin Project Phase II Work Plan, 1979, Volume 1: Scope of Work

2 PROJECT ORGANIZATION

The staff engaged in performance of professional and technical services for the project are an integral part of the PBP Quality Assurance Program. The Project Organization chart, Figures 2-1 and 2-2, illustrates the lines of authority and quality assurance responsibilities of key personnel assigned to the project.

In particular, the WCC Quality Assurance Manager, the PBP Quality Assurance Officer (Sections 2.1 and 2.2) have the direct responsibility to monitor the PBP Quality Assurance Program and to verify its implementation. They have the authority and organizational freedom to (1) identify quality problems; (2) initiate, recommend, or provide solutions to these problems; and (3) verify implementation of these solutions. The duties and responsibilities of assigned project personnel as they relate to quality assurance are briefly outlined below.

A record of the qualifications of project technical personnel will* be maintained in the project files; a current record of their assignment of duties and responsibilities will be similarly maintained (Section 11).

2.1 WCC Quality Assurance Manager

The WCC Quality Assurance Manager (QA), as an officer of WCC, performs independently of the project. He has the overall authority and responsibility for the Quality Assurance Program. He shall have verifiable education, experience, training, and audit experience so as to meet the lead auditor specified requirements in NQA-1, 1983, pp. 4, 11, 41 and 42. He shall have knowledge and understanding of the standards stated in NQA-1, 1983, and other nuclear-related codes, standards, regulations, and regulatory guides, and have management capabilities necessary to implement the regulations. He is assigned full time to devote his attention to quality assurance matters. He reports to and receives direction from the Executive Vice President, Practice. He has effective communications channels with the Executive Vice President of Operations, Director, Business Unit managers, as well as all members of the staff. He directly supervises the Project Quality Assurance Officer, as required. His duties include the review and approval of the Project QA manual and all other QA documents that give guidance or instruction. He audits all project activities and makes appropriate reports to management regarding nonconformances, and reviews and approves corrective action. The WCC QA Manager has the authority and responsibility to verify implementation of corrective action and to stop work, if necessary. He is responsible for the training and indoctrination of project personnel.

2.2 Quality Assurance Officer

The Project Quality Assurance Officer reports to the WCC Quality Assurance Manager and assists him in monitoring the program. He will conduct audits as required in addition to those performed by the WCC Quality Assurance Manager. The Project Quality Assurance officer has the authority and responsibility to verify implementation of corrective action and stop work if necessary. His responsibilities include review and approval of Procedures, Work Plans, Instructions, Activity Plans, and any other documented quality assurance directions issued to the staff. He is to assess the effectiveness

of the Quality Assurance Program and initiate and/or review appropriate revisions. He is also responsible for the review of all Procurement documents that include Quality Assurance Provisions.

2.3 Director of Nuclear Waste Management

The Director of Nuclear Waste Management is responsible to the Executive Vice President, Operations and has overall responsibility to ONWI for all WCC activities on the project. In this capacity he** has overall responsibility for establishing the PBP Quality Assurance Program and for implementing the program in all project activities. He supervises the Business Unit Manager and relies on him and his assigned project managers for the direction of day-to-day project quality assurance activities.

2.4 Business Unit Manager

The Business Unit Manager receives supervision from the Director. He is directly responsible for the performance of his unit. He is responsible to his supervisor for implementing, within his assigned unit, the Woodward-Clyde Quality Assurance Program and the Paradox Basin Project Quality Assurance Program and is responsible for responding to any possible nonconformance through corrective action. The Business Unit Manager supervises the Paradox Basin Project Manager and is responsible for verifying that the Project Manager implements the appropriate Quality Assurance requirements. He is responsible with the assistance of the Project Manager for developing and implementing the Paradox Basin Project Quality Assurance Program.

2.5 Project Manager

The Project Manager is responsible to the Business Unit Manager for the technical performance of the project. He also directs Quality Assurance program development, implementation, planning and coordination. He is responsible for the development and maintenance of the project administrative and quality assurance files.

2.6 Project Contracts Manager

The Project Contracts Manager is responsible to the Business Unit Manager and acts as designated representative for the Business Unit Manager on matters concerning the review, negotiation, and preparation of contracts and procurement documents. He will assure the inclusion and the implementation of QA requirements for subcontract documents provided by project technical personnel and the Quality Assurance Officer.

*The term "will" as used in this manual is defined in the instructive sense; activities that "will" be done are not optional.

**The term "he" as used in this manual is defined to mean the person discussed, regardless of gender.

2.7 Geoengineering Properties Cost Account Manager

Under the direction of the Project Manager, the Geoengineering Cost Account Manager is responsible for the coordination and control of all geotechnical engineering investigations and related activities that are carried out as part of the project. In the absence of the Project Manager he may act as a designated representative for technical activities of WCC personnel under his supervision. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities.

2.8 Earth Science Project Management Cost Account Manager

Under the direction of the Project Manager, the Earth Science Project Management Cost Account Manager is responsible for coordination of project activities with ONWI/BPMD, contractually required financial and administrative reporting, procurement of purchased items and subcontractor services, management of the Denver core facility and USGS support, management of drilling activities, and permitting activities designated by ONWI/BPMD. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities. In the absence of the Project Manager, he may act as a designated representative for technical activities of WCC personnel under his supervision.

2.9 Surface/Subsurface Geology Cost Account Manager

Under the direction of the Project Manager, the Surface/Subsurface Geology Cost Account Manager is responsible for the coordination and control of investigations carried out as part of the project in the disciplines of Structural Geology, Stratigraphy, Physiography and Topography, Quaternary Geology and Geomorphic Processes, Paleoclimates, Tectonic History, and Energy and Mineral Resources. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities.

2.10 Hydrology Cost Account Manager

Under the direction of the Project Manager, the Hydrology Cost Account Manager is responsible for the coordination and control of hydrogeologic investigations carried out as part of the project. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities.

2.11 Geochemistry and Lab Analysis Cost Account Manager

Under the direction of the Project Manager, the Geochemistry and Lab Analysis Cost Account Manager is responsible for the coordination and control of investigations in the disciplines of Hydrogeochemistry, Rock-Water Interactions, and laboratory chemical analysis carried as part of this project. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities.

2.12 Geophysical Studies Cost Account Manager

Under the direction of the Project Manager, the Geophysical Studies Cost

Account Manager is responsible for the coordination and control of seismological and Geophysical investigations carried out as part of this project. The Cost Account Manager has the responsibility to carry out the PBP Quality Assurance Program as applicable to these assigned activities.

2.13 Activity Leaders

Under the direction of the assigned Cost Account Manager, activity leaders are responsible for a technical discipline or activity series. In this capacity, an Activity Leader has the responsibility to carry out the PBP Quality Assurance Program as applicable to his assignment including the development and maintenance of an activity file. This responsibility includes the preparation of technical procedures applicable to his task, the training of personnel in the use of these procedures and other procedures applicable to the overall PBP Quality Assurance Program, and defining technical specifications for procurement documents.

2.14 Staff

Each staff member is responsible to his Activity Leader for completing his assigned portion of the project activities in accordance with the PBP Quality Assurance Program as applicable to his assignment.

2.15 Technical Reviewers

Selected WCC personnel with special qualifications provide overall technical advice and review to the project, as required. Each Technical Reviewer is responsible for quality assurance activities that are appropriate to this task. A Technical Reviewer is assigned by an Activity Leader with approval of the Project Manager.

2.16 Subcontracts

Subcontractors who provide materials or services will be listed, if known, in project test plans. Services and items provided by these subcontracts will conform to the QA requirements incorporated in procurement documents (Section 10). The Quality Assurance Officer has the responsibility to review all applicable documents and assure the inclusion of adequate QA specifications.

2.17 U.S. Geological Survey (USGS)

WCC will provide staff support to the USGS for their work on the Paradox Radwaste Project. The activities of all such support personnel will be approved by ONWI, coordinated by the WCC Core Facility manager and directed by the USGS. Such support personnel are responsible for implementing all applicable Quality Control activities from both the WCC and USGS Quality Assurance programs. Data generated by staff support personnel will become a part of the USGS Paradox Radwaste Project and will be under the control of the USGS.

3 DOCUMENT CONTROL

The PBP Quality Assurance Manual, technical procedures and activity plans will be controlled documents. The Project Manager is responsible for their control, distribution, and accountability. A list of technical procedures and activity plans, their current revision number, and approval date will be periodically distributed as a controlled document.

Acknowledgement of receipt of these documents by project members will be documented by signing the appropriate Acknowledgement of Receipt form (Figures 3-1, 3-2, and 3-3) and returning it to the Project Manager for inclusion into the project files. Project members not returning forms within 30 days of mailing will be contacted by memo or other appropriate means to assure document receipt and return of the forms to the project file.

The holder of controlled documents is responsible to (1) keep his manual, procedures, or activity plans current by entering all revisions issued to him; (2) remove, destroy, or appropriately mark as superseded all earlier revisions; and (3) return the Acknowledgement of Receipt Form.

Revisions to this manual will be distributed with an updated copy of the Revision Control Log (Figure 3-4), which will be retained with the manual as a control document.

In addition to the above, Quality Assurance Manuals will be serially numbered.

4 PROJECT RECORDS

4.1 Project Files

A Project file system,* including a file index, will be established and implemented by the Project Activity Leaders. The system will provide for easy retrievability so that personnel not intimately familiar with the files may retrieve an item without undue delay.

The project file system will include provisions for records in progress (working files, including field data) and for completed records. File indexes for each project activity will be periodically updated and a copy sent to the project secretary for filing in the project files. Working files may be separated by technical activity and located where they are convenient to the staff.

4.2 Completed Records

A document is complete and becomes a quality assurance record when there is no further action to be taken, and when it has been signed and dated by the originator, checker, and/or reviewer. Procedures for inspecting, classifying, authenticating, and storing completed records will be in accordance with NRC Regulatory Guide 1.88 and ANSI N45.2.9.

*Technical Procedure No. 39, "File Indices, Inventories, and Filing"

5 PROCEDURES

Written technical procedures will be developed and implemented for project-specific field, laboratory, and office activities that are not covered by existing procedures. The identification of the need for a procedure is the responsibility of the Cost Account Manager or Activity Leader, and any project member may assist in this identification. These procedures will be written in an established standard format,* in sufficient detail to clearly depict the quality assurance requirements of the activity. Procedures will be reviewed and signed by the preparer, project Editor, appropriate Activity Leader and Cost Account Manager, and Project Quality Assurance Officer. The Project Manager will approve and sign all procedures.

Where applicable, procedures will include acceptance criteria, rejection criteria, calibration requirements (Section 7), and requirements for inspection of subcontractor activities or items for conformance to quality assurance requirements. In addition, technical procedures will reference appropriate technical memoranda or other required instructions** not detailed in the procedures (e.g., collection of samples, details for installation of packers, testing of core samples). Copies of approved procedures and revisions thereto will be transmitted by the Project Manager to the ONWI Quality Assurance Department as soon as they are available, preferably (but not necessarily) prior to use. Distribution will be controlled as described in Section 3.

During the course of the work, changes to procedures may be required or desirable. Changes will be initiated by a Revision Form, which will state the reason for change and section or sections of the procedure that were changed. The revision will be in effect on the designated date. Changes will be assigned the same file identification as the original, and an appropriate revision number and date. The revised edition of the procedure will be published as quickly as appropriate. The requirements for review and documentation are the same as those that applied to the original document, and distribution is controlled in the same manner as the original. A copy of each superceded procedure will be marked and maintained in the project files.

A listing of all procedures with current revision numbers and dates will be periodically distributed as a controlled document. This list will be filed with the technical procedures.

*Technical Procedure No. 22, "Guidelines for Preparation of Technical Procedures"

**These documents will be approved for use by the applicable activity leader or technical manager.

6 PROGRAM CONTROL

Program control includes actions taken by project personnel to assure that the work is complete, documented, and reviewed. Procedures (Section 5) will be established for conducting project activities in a planned, controlled, orderly, and correct manner. These procedures apply to data acquisition, data analysis, and peer review.

6.1 Data Acquisition

Data acquisition is accomplished through literature searches, field investigations, and laboratory testing. Written procedures will define the scope and objectives for data acquisition.

6.2 Data Analysis

Data analysis will be based on logical and systematic procedures and will be legibly documented in a form suitable for reproduction and filing. Analyses will be sufficiently detailed and in a format such that they may be reviewed without recourse to the originator. The originator, subject, date, and the specific data used in the analyses will be identified. All data analysis will have a documented review, approval, and verification.

Data analysis may include computer computations. Computer programs will be approved by the appropriate Activity Leader prior to the completion of the analysis. Computer programs will be checked and documented by solving problems with known solutions. ANSI N413-1974, "Guidelines for the Documentation of Digital Computer Programs," will be followed to the extent required to produce adequate documentation.

6.3 Peer Review

"Design Control," as described in 10 CFR 50, Appendix B, is not easily adaptable in the study phase of a nuclear repository siting. Peer review is the alternate means used to assure quality for the Paradox Basin Project.

Peer reviews will be performed in accordance with written procedures.* They must be performed by qualified personnel not directly involved in performing the work being reviewed. Procedure provide for review and documentation of the consistency and defensibility of technical concepts, methods, assumptions, calculations, and conclusions.

Peer reviews will be performed during each successive stage of the work. The peer reviewer will be given review comments from ONWI if available. The procedures will state what is expected of the peer reviewer and may include a checklist to assist him in his task. Procedures will also contain provisions for (1) resolution of the reviewer's comments; (2) modification of the work's result to reflect such resolution, if required; and (3) documentation of the completed peer review.

*Technical Procedure No. 35, "Peer Review"

6.4 Independent Technical Review

Independent technical review means a review by an equally or more qualified person than the person performing the investigation. Independent means that the reviewer is independent of specific work being reviewed.

Independent technical review will be performed for activity plans, test plans, reports, drawings, calculations, and computer programs. In certain instances, verification may be performed by the originator's supervisor, if the supervisor (1) did not specify a singular approach; (2) did not rule out certain considerations and did not establish the specific technical inputs; or (3) is the only individual in the organization competent to perform the review.

7 CALIBRATION

7.1 Field Calibration

Quality assurance requires that all devices and equipment used to perform field testing or data recording operations be calibrated prior to use. Procedures will include criteria for calibration and requirements for documentation. Documentation will include positive identification of the specific device or equipment calibrated, the date calibrated, the results of the calibration, reference to the national standards or recognized physical constants on which the calibration was based, adjustments or repairs which were (or should be) made; and the signature of the person performing the calibration. Where practical, calibrations performed prior to movement of the device or equipment to the field will be checked in the field.

It is recognized that, because of the nature of the device or equipment used or of the testing environment, formal calibration as described above may not always be possible or practical. Means will be provided for identification and documentation of such exceptions to the formal calibration procedures, including the alternate methods to be used to assure that the validity of the results of the field testing or data recording operations can be assessed.

A calibration status log will be maintained in appropriate technical files for all PBP equipment requiring calibration. The log will include the following when applicable:

- o Item
- o Serial number
- o Frequency of calibration
- o Date last calibrated
- o Results of calibration
- o Standard calibrated to or means of calibration.

7.2 Laboratory Calibration

Laboratories providing subcontractor services will provide documentation of calibrations performed on the laboratory equipment used for testing. Documentation will include a description of the calibration method, identification of the equipment calibrated and of the equipment used in the calibration, signature of the person performing the calibration, documented frequency of calibration and the date the calibration was performed. Where applicable, equipment will be tagged to indicate when the calibration is due.

7.3 Validity of Tests When Equipment is Determined to be Out of Calibration

If after performing tests it is determined that the test equipment is out of calibration but the acquired data can be used, a Nonconformance and Corrective Action Report (Section 13.2) will be completed describing the modifications or recalculations necessary to bring the data up to standard. If remedial work is unnecessary this conclusion will be explained.

7.4 Inspection, Tests, and Operating Status

This requirement as stated in ANSI/ASME NQA-1-1983, refers primarily to items used in the construction or operation of a nuclear power plant. In the geologic exploration phase, inspection of items and services takes place primarily upon receipt (Section 10). Other tests and operational status data are primarily in the form of calibration records (this section). Items such as tubular products (drill pipe, casing) used at a drill site that are substandard are marked and segregated from standard items.

8 COLLECTION, HANDLING, AND STORAGE OF SAMPLES

Technical procedures will be written by the appropriate Activity Leader or his designated representative that include methods for collecting, handling and storing rock, core, soil and water samples. The applicable technical procedures will include provisions for sample identification and tracking and, where appropriate, a description of handling and storage at the collection site and during interim storage. Permanent storage of core is discussed in the PBP Core Management Plan.

9 TEST PLANS /

9.1 Introduction

Test plans will describe the sequence of activities associated with the major testing programs conducted in the field or laboratory. Test plans will include at least the information outlined below.

In addition to the test plans themselves, specific instructions, procedures, and drawings will be prepared for performing tests and inspections, surveillance of tests, and recording of test results. Criteria for acceptable test performance will be included in test instructions or procedures. Test plans will be controlled documents requiring review by the project staff, project Editor, Project QA Officer, appropriate technical Activity Leader, and Cost Account Manager; approval by the Project Manager; and acceptance by ONWI. Document control is as described in Section 3.

Test plans will be submitted to ONWI sufficiently in advance of the proposed start date of major test programs to permit a minimum of ten (10) working days for ONWI review. Major test programs will be implemented only after having received a notification of acceptance of the test plan from the ONWI Project Manager.

Significant deviations from test plans will be reported to the ONWI Project Manager as soon as possible.

9.2 Test Plan Requirements

Test Description. A test description will describe the testing methodology and scheme. For drilling activities (including water wells) the test description will include:

- o Site layout of boreholes, mud pits, and cuttings disposal area
- o Underlying formations, intervals to be cored or sampled, and techniques for coring or sampling
- o Drilling technique, type of rig, hole sizes, bit types, and drilling fluids (e.g., mud, brine, water, air)
- o Downhole geophysical logging techniques (e.g., gamma, gamma-gamma, SP&R, density)
- o Hydrogeologic testing technique - formation interval to be screened, well construction, well development, type pump, duration, and rate of pumping
- o Geotechnical testing technique - formation intervals to be tested, type of equipment, duration of tests, and anticipated pressures.

For geophysical surveys (gravity, magnetics, resistivity profiling, seismic reflection and refraction, and microearthquake monitoring) the test description will include:

- o Layout of survey lines and grids with reference to the study area
- o Techniques to be used in surveys
- o Instrumentation to be used in tests.

Test Schedule. The test schedule will include the sequence of activities with reference to applicable instructions, procedures and drawings, the planned start and duration of activities, and any mandatory hold points requiring approval by project management or QC to permit further work.

Expected Results. The expected results will include the data to be obtained, the required tolerance of measurements, and the manner in which data will be recorded (e.g., magnetic tapes, strip charts, log books).

Responsibilities. The test plan will identify the project personnel with the authority for decision making regarding the test plan's execution. An organizational chart of the project individuals and subcontractors and their functions may be included.

Safety Requirements. Provisions will be included that assure adherence to standard safety practices.

References. The test plan will include a list of instructions, procedures and drawings, and other documents applicable to the test plan (e.g., technical work procedures, quality control inspection/surveillance procedures, QA Manual/Plan, maps).

Methodologies/Procedures. Rationale for selecting particular methods or procedures will be included.

10 PROCUREMENT CONTROL

The following quality control measures apply to the procurement of materials, equipment, and services that affect the precision, accuracy, and reliability of site characterization and safety-related data.* Procurements involving safety related materials, data, and services will be reviewed and approved by the Quality Assurance Officer. This review will be conducted on items that require calibration, laboratory services, testing equipment, data purchases, geophysical logging, and the services of consultants and subcontractor technical personnel involved in data acquisition. The procurement of items such as small tools, vehicles, office equipment, and expendable supplies will not be included. The procurement of services under the direct control and supervision of WCC personnel, such as trenching subcontractors, will also be excluded from these requirements. Off-the-shelf items not requiring calibration or standard services not involved in data acquisition, such as casing crews, nitrogen service, and bits and hole openers will be monitored through normal procurement and delivery inspection procedures.

10.1 Materials and Equipment

During the course of the project, WCC may procure various specially fabricated or commercially available items. The measures described below will be followed to assure that the purchased items are appropriate for their intended functions, are properly specified in procurement documents, and conform to the requirements of the procurement documents.

Prior to purchasing, documentation will be prepared presenting the technical, operating, or other pertinent specifications appropriate to the type of items to be purchased. Based on these specifications, procurement documents will describe or specify the quantity, type, and quality of the desired items, and may include technical and operating specifications for the item; requirements that the supplier furnish objective evidence of quality of the item or of calibrations having been performed; provisions to inspect and audit at the source; and any special instructions, provisions, or requirements. Review of these documents will be performed and documented prior to contract award. If appropriate, a documented preaward inspection of subcontractor's facility or product will be performed.

Procurement documents will specify when production of an item requires an approved Quality Assurance Program. Changes made in procurement requests will be documented and will be subject to the same degree of control that was utilized in the preparation of the original documents.

Upon receipt, the purchased items will be examined by the rig geologist (for drilling-related procurement) or by an appropriate Activity Leader or designated representative to assure that the items conform to the requirements of the procurement documents. Such examinations may include checking of

*Technical Procedure No. 20, "Quality Control of Procured Items and Services".

quantity, type, and received condition of the item; inspection and review of supplier-furnished documentation of the quality of the item (e.g., drawings, specifications, or inspection and test reports); post-receipt inspection, testing, and checking of performance or other pertinent characteristics of the item. The results of such examinations of purchased items will be documented on the receipt forms or, if appropriate, an inspection checklist may be prepared for receipt documentation.

10.2 Services

During the course of the project, WCC may procure various services or data such as geophysical logging, seismic data, laboratory analysis, or consultants. The measures described below will be followed to assure that the purchased services are appropriate and properly specified in procurement documents, and that they conform to the requirements of the procurement documents.

Prior to purchasing services, documentation will be prepared presenting the technical, operating, or other pertinent requirements appropriate to the services to be procured. The procedure to be used in evaluation and selection of the subcontractor will also be documented. Based on these requirements, procurement documents will be prepared to adequately describe or specify the services desired. Procurement documents may include requirements that the supplier furnish objective evidence of experience or capability. If appropriate, a documented preaward inspection of the subcontractor's facility will be performed.

The procurement documents will specify whether the supplier's services will include the preparation and implementation of a special quality assurance program or whether the services will be subject to the WCC PBP Quality Assurance Program. In the former case, copies of existing or proposed special quality assurance programs will be furnished by the supplier.

During the performance of services or immediately thereafter, the services will be monitored or inspected by the appropriate Activity Leader or his designated representative for conformance to the requirements of the procurement documents. Such examinations may range from the observation and supervision of subcontractor's operations to the inspection of his product. The results of such examinations will be documented.

10.3 Subcontracts Without an Internal QA Program

Procurement documents for subcontractors who do not have an internal quality assurance program will include provisions for WCC QA or QC personnel or a designated representative to perform the QA/QC function not performed by the subcontractor.

11 QUALIFICATIONS AND TRAINING

All personnel and outside consultants assigned to this project will be qualified to perform the work to which they are assigned.

Appraisal of the qualifications of technical personnel assigned to the project is required by project procedures.* The results of this appraisal, which will occur when assignment is made, will be documented and maintained in the project files. A copy of a current resume will be filed with each qualifications appraisal.

The procedure will include the comparison of the requirements of the job assignment with the appraised qualifications. It will also include a determination whether further training is required and, if required, by what method. On-the-job training is an acceptable method of training. An employee requiring on-the-job training will receive such training by a person qualified to perform the trainee's assignment, and the results of that training will be documented.

Procedures for training of WCC laboratory personnel and review of their qualifications are included in the WLA** Laboratory Testing Procedures Manual, which is authorized for use on this project until it is superseded by the WCC Western Region Laboratory Procedures Manual.

The WCC Quality Assurance Manager or his designated representative will provide training to each new employee to indoctrinate him to the purpose and operation of the PBP Quality Assurance Program and to assure compliance with this manual and all pertinent technical and QA procedures. These training sessions will be documented by memo to the Project Manager with a copy to the project files.

At the discretion of the WCC Quality Assurance Manager, informal, documented group or individual training sessions will be held to review or reemphasize aspects of the QA Program.

*Technical Procedure No. 40, "Project Personnel Assignment, Qualifications Review and Training"

**Prior to 1 January 1975, the Oakland office of WCC was incorporated under the name of Woodward-Lundgren & Associates (WLA).

12 INSPECTION AND SURVEILLANCE

Procedures* provide for the inspection and surveillance of activities that may affect quality. These procedures will be implemented to verify conformance to procedures and instructions by all WCC personnel and subcontractors performing an activity that results in the generation of safety related data.

Inspection and surveillance will be performed by the Quality Assurance Officer or the appropriate Activity Leader, or his designated representative. Designated representatives shall be (1) independent of any technical or administrative duties related to the activity to be witnessed; (2) knowledgeable of the technical activities being conducted; (3) knowledgeable of the project QA program and applicable technical procedures; and (4) responsible to the Activity Leader and the Quality Assurance Officer for the inspection and surveillance activities performed.

*Technical Procedure No. 38, "Quality Control Inspection or Surveillance of Field Activities," and Technical Procedure No. 11, "Inspection of Subcontractor Facilities," and Technical Procedure No. 20, "Quality Control of Procured Items and Services."

13 QUALITY ASSURANCE REPORTING

13.1 Audits

Periodic internal audits will be performed to review and evaluate the adequacy of the PBP Quality Assurance Program and to ascertain whether it is being completely and uniformly implemented. Audits will be performed by the WCC Quality Assurance Manager, the Project Quality Assurance Officer, or other qualified auditor meeting the requirements as specified in NQA-1, 1983, pp. 4, 11, 41, and 42. An audit schedule will be prepared, and audits will be planned to coincide with appropriate activities on the project schedule. In this capacity, the Quality Assurance Officer or other auditor has the authority and responsibility to stop work if necessary.

Scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- o When significant changes are made in the PBP Quality Assurance Program
- o Changes in the scope of technical activities
- o To verify that corrective action has been taken on a nonconformance reported in a previous audit
- o When requested by the Director or Business Unit Manager.

In order to avoid serious conflicts with activities of the project and to assure the presence of the Project Manager or his designated representative, the WCC Quality Assurance Manager or other auditor will give reasonable notice to the Project Manager prior to the audit of the group or activity to be audited and of the proposed time and place of the audit.

Audits will be performed on the basis of written checklists or lists of questions prepared prior to the audit. During the conduct of the audit, each item on the list will be marked with one of the following entries:

- S - Item is satisfactory
- U - Item is unsatisfactory
- X - Item is not applicable
- N - Item was not audited.

Within 15 working days of completion of the audit, the auditor will prepare and submit an Audit Report. The report will be addressed to the Project Manager, with copies to the Director, the Business Unit Manager, the ONWI Project Manager and Quality Assurance Department, and the WCC Quality Assurance Officer.

Within 15 working days after receipt of the Audit Report, the Project Manager will prepare and submit a Reply to Audit. This reply will include, as a minimum, a plan for implementing any corrective action that may be indicated in the Audit Report, and the date by which such corrective action will be completed. If the corrective action has been completed, supporting documentation may be attached to the reply. The auditor will verify whether

appropriate and timely corrective action has been taken. The Reply to Audit will be addressed to the auditor, with copies to the WCC Quality Assurance Manager, the Director, and the Business Unit Manager.

Records of all audits will be maintained in the project files, and will include, as a minimum, the Audit Report, the Reply to Audit, and any supporting documents.

Audits may also be performed by ONWI or DOE. Procedures for such audits are established by the agency conducting the audit. It is the responsibility of the Project Manager to respond and conform to the established procedures, particularly as they apply to audit reports and implementation of such corrective action as may be indicated.

13.2 Reporting Deficiencies, Noncompliance, Procedure Change, or Data Loss

13.2.1 Nonconformance and Corrective Action

The Nonconformance and Corrective Action Report (NCAR)* provides a means for informing the Project Manager of all nonconformances discovered and corrective action initiated, and provides a documented history of each nonconformance and corrective action. A nonconformance is defined as "a deficiency in characteristic, documentation, or procedure that renders the quality of an item unacceptable or indeterminate" (ANSI N45.2). Whenever a deficiency, error, noncompliance, or reason for change is identified, it is the responsibility of the identifying person to institute an NCAR. The NCAR will include provisions for (1) reporting the deficiency, error, or other reason for nonconformance and change and the corrective action recommended; (2) action that must be taken to prevent recurrence; and (3) documentation of the actual corrective action completed.

The PBP Project Manager and ONWI Project Manager shall be notified as soon as practical if significant deficiencies occur that may affect the validity or timeliness of work. A copy of the initial and completed NCAR shall be forwarded to the ONWI QA department.

13.2.2 Incident Report

The reporting requirements describing nonconformance as stated within 10 CFR 50, Appendix B are not entirely applicable in the study phase of a nuclear waste repository siting. The "Incident Report" (Figure 13-1) supplements the NCAR for those cases in which procedures or plans were followed but loss of data or incorrect data was the inadvertent result of the activity. Incidents such as significant loss of core or hydrogeologic or geotechnical test failure would be recorded by submitting this report.

*Technical Procedure No. 42, "Nonconformance and Corrective Action Report"

The report will (1) briefly describe the incident; (2) state if remedial action is required; and (3), if applicable, how may recurrence of the incident be avoided.

The report will be signed by either the rig geologist, appropriate Activity Leader, or the Cost Account Manager. A copy of the completed report will be maintained in the activity files of the originator; other copies will be forwarded to the Quality Assurance Officer for review, and for distribution to the project files, and to the Project Manager.

13.3 Reporting of Safety-Related Defects

13.3.1 Introduction

Part 21 of 10 CFR, "Reporting of Defects and Noncompliance," requires that the directors and responsible officers of organizations that construct, own, operate, or supply components of a facility or activity that is licensed or otherwise regulated by the NRC inform the NRC if they receive information reasonably indicating that such facility, activity, or basic component fails to comply with regulatory requirements relating to substantial safety hazards, or that such facility, activity, or basic component contains a defect that could create a substantial safety hazard. The NRC has indicated that their interpretation of the organizations to which this requirement applies includes organizations that supply safety-related services such as design, inspection, testing, or consultation (e.g., site geological investigations).

Part 21 additionally requires that these organizations establish procedures to provide for correcting or evaluating deviations, or informing purchasers of the deviation so the purchaser may evaluate the deviation. These procedures must also provide for informing a responsible officer or director of the organization of any resulting defect or failure to comply. These individuals may provide notification to the NRC or may designate another individual to do so.

13.3.2 Report of Suspected Failure to Comply or Defect

It is the responsibility of all WCC personnel to report immediately any suspected (1) failure to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the NRC relating to substantial safety hazards; or (2) defect that could create a substantial safety hazard, as defined by regulations that the NRC shall promulgate. Such report will be in writing, addressed to the Project Manager, and will include at least the following information:

- o The date of the report
- o The name and WCC number of the project
- o A description of the "failure to comply" or "defect"
- o Reasons for suspecting that a substantial safety hazard may be involved
- o Suggestions for correction, if any
- o The name of the person submitting the report (optional).

The report will be submitted as soon as practical, but not more than 48 hours after discovery. If a written report is impractical within that time period, the report will be submitted by the most direct method, followed as soon as

practical by a confirming written report.

13.3.3 Evaluation

Upon receipt of a report of a suspected failure to comply or defect, the Project Manager will proceed to evaluate the report. He may perform this evaluation personally, if within the area of his technical qualifications, or he may appoint one or more persons with special qualifications to perform the evaluation. If upon receipt of the report, or at any time after an evaluation has started, the Project Manager considers that he will be unable to perform an evaluation for any reason or that the evaluation may take an unreasonably long time, he shall immediately inform the Business Unit Manager and the Director and transmit the report, together with all pertinent information accumulated to that time, to ONWI for evaluation.

The evaluation will determine whether in fact there is a substantial safety hazard involved, and, if so, recommendations for corrective action will be made. Substantial safety hazard is defined as a major reduction in the degree of protection provided to the public health and safety.

The evaluation will be documented in such a manner that it may be reviewed without contacting the person or persons conducting the evaluation. Evaluation documents will be stored in the project files. A negative conclusion requires no further action. A positive conclusion, together with the recommended corrective action, will be reported immediately to ONWI and to the person designated to provide notification to the NRC for this project.

13.3.4 Reporting to the NRC

The NRC will be notified of a safety-related defect within 2 days after receipt of the information, by telephone call to the Director of the Regional Office, at the number listed in Table 13-1. A written confirming report will be submitted to the Regional Director within 5 days after the information is obtained, with three copies to the National Director. Addresses of the Directors are listed in Table 13-1. The written report will include, but need not be limited to, the following information, to the extent known:

- o Name and address of the individual or individuals informing the NRC
- o Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States that fails to comply or contains a defect
- o Identification of the firm involved in the activity that fails to comply
- o Nature of the defect or failure to comply and the safety hazard that is created or could be created by such defect or failure to comply
- o The date on which the information of such defect or failure to comply was obtained

- o In the case of a basic component that contains a defect or fails to comply, the number and location of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in 10 CFR 21
- o The corrective action that has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be required to complete the action
- o Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

TABLE 13-1
PERTINENT ADDRESSES

Person Designated to Report to the NRC for the PBP Project

Name: Terry A. Grant, Project Manager
Address: Woodward-Clyde Consultants
100 Pringle Avenue
Walnut Creek, California 94596

Phone: (415) 945-3000

NRC Regional Office

Address: Director, Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission, Region V
1990 North California Blvd., Suite 202
Walnut Creek, CA 94596

Phone: (415) 486-3141

NRC National Office

Address: Director, Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

STANDARD AUDIT REPORT FORMAT

Project and Activity No. _____

To: _____, Project Manager

From: _____, _____
name title

Subject: Report of Audit of _____ (project unit) _____, on _____ (date) _____

PURPOSE: Indicate as periodic audit, or state purpose if it is a special audit.

AUDITOR: Give the name and title of the person conducting the audit, and list any individuals who may have assisted in conducting the audit.

PERSONNEL CONTACTED: List all persons contacted during the conduct of the audit.

AUDIT CHECKLIST: Present the checklist from which the audit was conducted, with the appropriate S, U, X, or N marking.

DISCUSSION: Discuss the conduct of the audit, including the specific items examined for each item on the checklist, and the reasons for assigning the S, U, X, or N marking.

NONCONFORMANCES: Indicate nonconformances noted. A nonconformance is defined as a deficiency in characteristic, procedure or documentation that renders the quality of an item unacceptable or indeterminate. Examples of nonconformances include incorrect or inadequate documentation and deviations from prescribed office, field, or laboratory procedures.

CORRECTIVE ACTION: Indicate action required to correct and to prevent recurrence of nonconformances, and dates by which reply to audit must be received and corrective action completed.

RECOMMENDATIONS: Present suggestions regarding items or procedures that are not considered nonconformances, but that may result in nonconformances if allowed to continue, or for which relatively minor changes may result in improved quality.

INCIDENT REPORT

Submitted to:

Project: Paradox Basin

Project Manager

Date: _____

Copy to: 1. _____
(Activity File)
2. _____
(Quality Assurance Officer)
3. _____
(Project File)

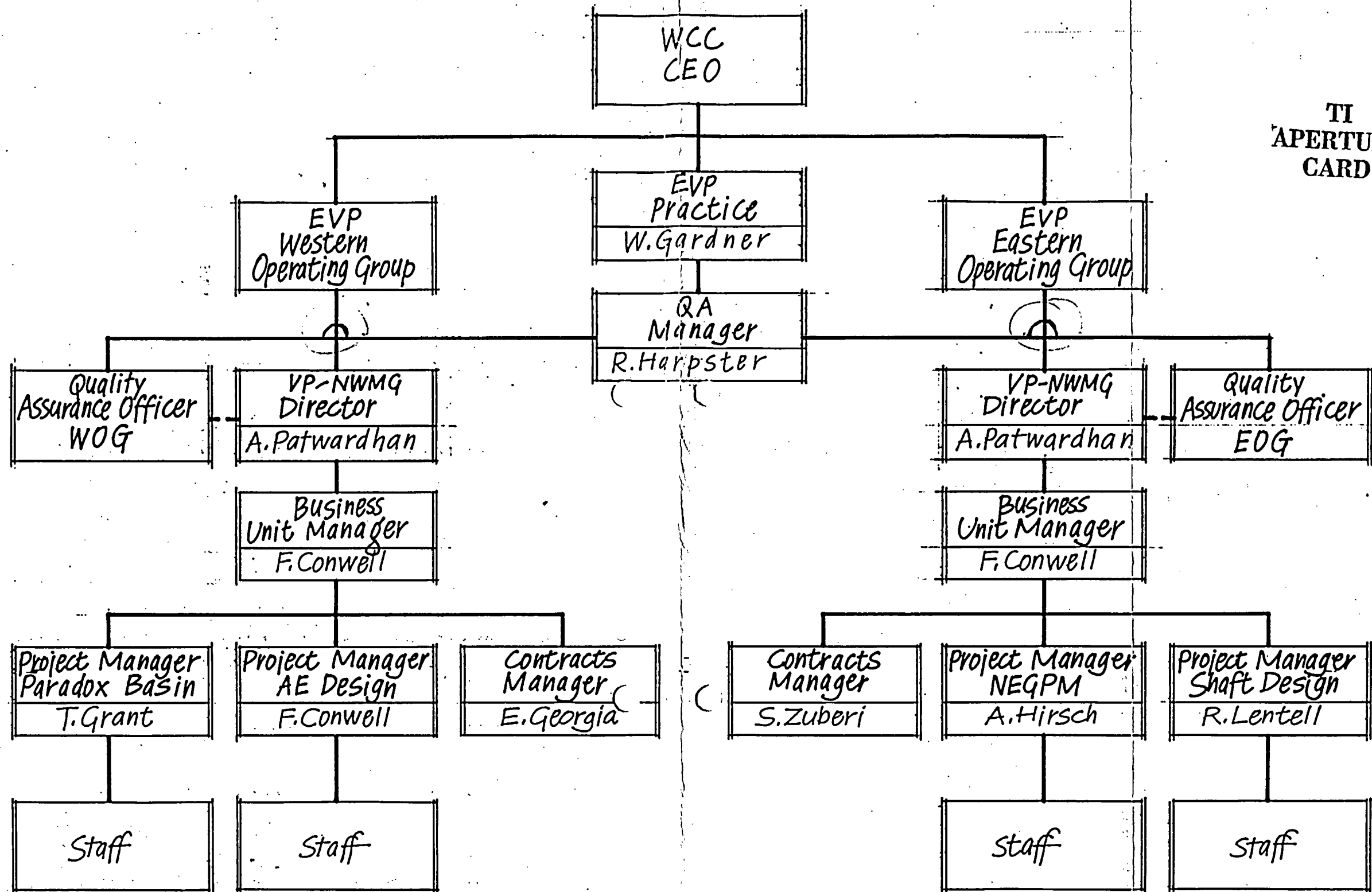
Description of the Incident

Action Taken to Prevent Recurrence (if applicable)

Submitted by: _____
Signature, Title Date

Reviewed by: _____
Signature, Title Date

Reviewed by: _____
Signature, Quality Assurance Officer Date



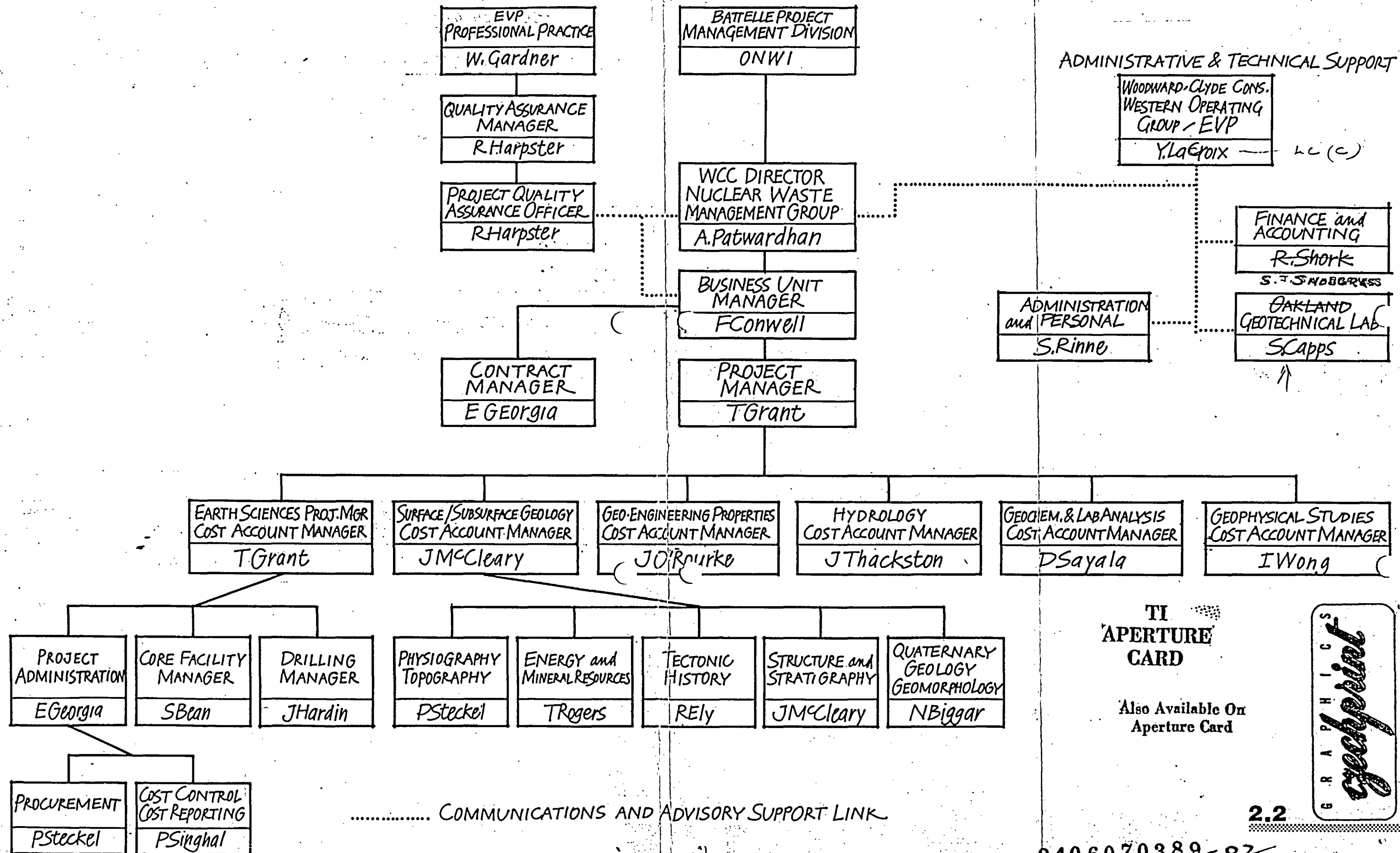
————— Project Responsibility
 - - - - - Administrative Support/Communication

2.1

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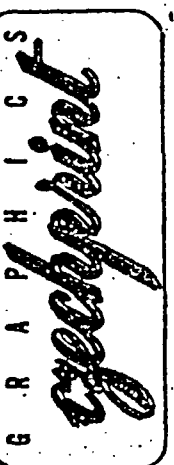
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Aperture Card



2.2

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PBP QA MANUAL