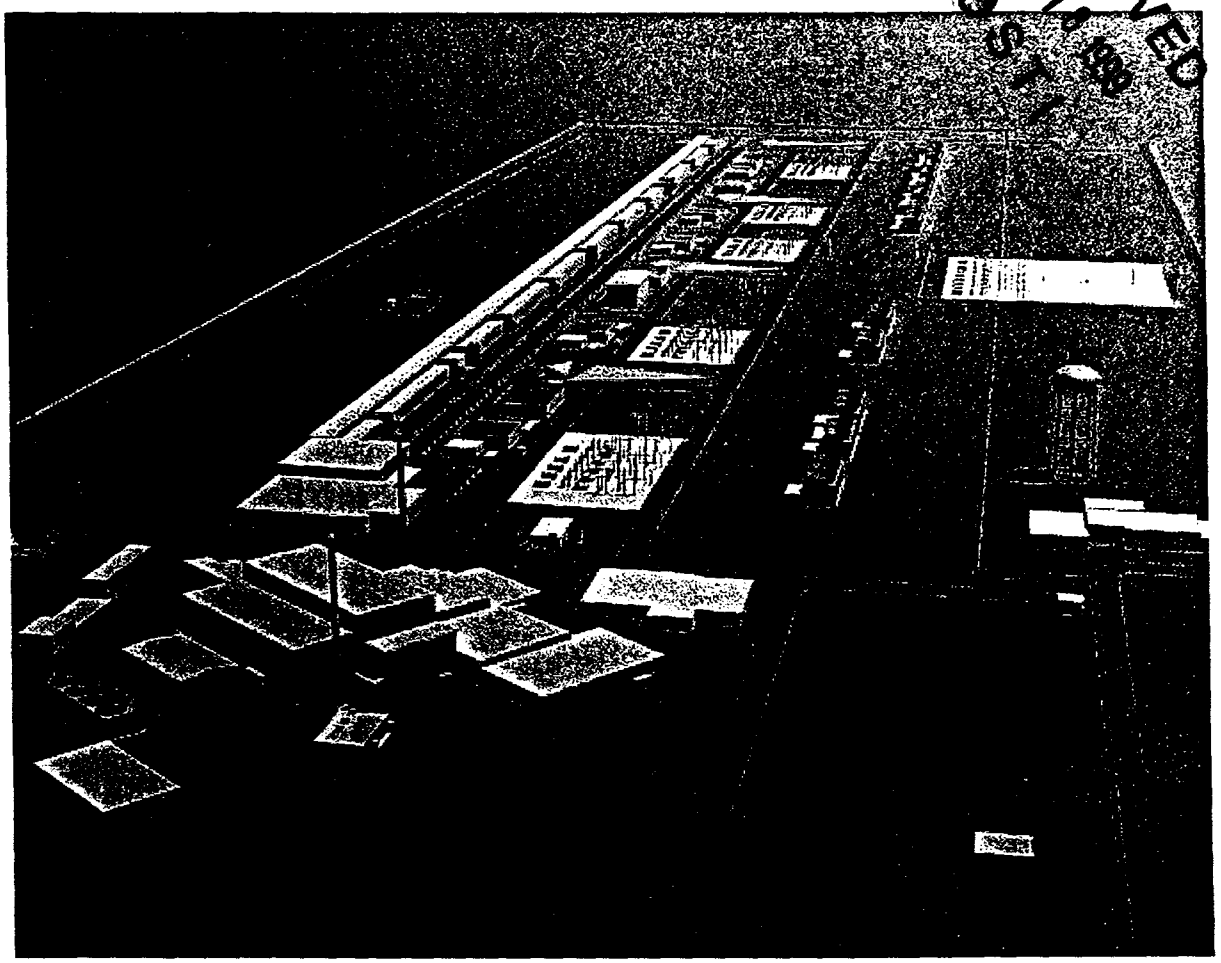
LA-UR- 98-4608

APT-PPO-0001, Rev 0

March, 1998

Accelerator Production of Tritium

PPO Management Plan



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N/A	APT-PPO-0001	0

TITLE: PPO Management Plan

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Management Plan, Rev. 0

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MANAGEMENT PLAN REVISION CONTROL

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APT PPO Project Director

Management Plan for Accelerator Production of Tritium Project	**APT - MP Revision 0**
PPO Configuration Manager Approval of Change Signature	Date:
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Summary of Changes	

Revision No. and Date	Pages Affected by the Change	Reason

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Acronyms

AP	Acquisition Plan
APT	Accelerator Production of Tritium
BCP	Baseline Change Proposal
BCCB	Baseline Change Control Board
BOP	Balance of Plant
BREI	Burns and Roe Enterprises, Inc.
CAD	Computer Assisted Design
CAE	Computer Assisted Engineering
CD	Critical Decision
CDR	Conceptual Design Report
CLWR	Commercial Light Water Reactor
CM	Construction Management
CMP	Configuration Management Plan
DA	Design Authority
DEP	Design Execution Plan
DOE	Department of Energy
DPD	Deputy Project Director
ED&D	Engineering Development and Demonstration
EIS	Environmental Impact Statement
ES&H	Environment, Safety and Health
FAR	Federal Acquisition Regulation
FDD	Facility Design Description
FY	Fiscal Year
GA	General Atomics
I&C	Instrumentation and Control
IMS	Information Management System
LANL	Los Alamos National Laboratory
linac	linear accelerator
MP	Management Plan
O&M	Operations and Maintenance
OPC	Other Project Costs
OT&C	Operational,Testing and Commissioning
OPO	Operations Project Office
OSHA	Occupational Safety and Health Administration
P&FD	Preliminary and Final Design
PCSD	Project Controls System Description
PDO	Project Director's Office
PEP	Project Execution Plan
PPO	Plant Project Office
PPP	Public Participation Plan
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
RAM	Responsibility Assignment Matrix
RAMI	Reliability, Availability, Maintainability and Inspectability
S&S	Safeguards and Security
SDD	System Design Description
SEMP	Systems Engineering Management Plan
SIP	Safety Implementation Plan
SRS	Savannah River Site
SSC	Systems, Structures and Components
T/B	Target Blanket
TEC	Total Estimated Cost
TPC	Total Project Cost
TPO	Technical Project Office
TSF	Tritium Separation Facility
VE	Value Engineering
VECP	Value Engineering Change Proposal
WBS	Work Breakdown Structure
WMP	Waste Management Plan
WSRC	Westinghouse Savannah River Company

PLANT PROJECT OFFICE MANAGEMENT PLAN

1.0 Introduction

1.1 Purpose and Scope

The purpose of this Management Plan is to describe the following:

1. Scope and responsibilities of the Accelerator Production of Tritium (APT) Plant Project Office (PPO).
2. PPO Organization.
3. Guiding vision and strategies.
4. PPO work processes and controls.

1.2 APT Project Mission and Objectives

The Department of Energy (DOE) defined mission of the APT Project is to design, construct and commission a facility to produce 3 kg of tritium per year and be operational by FY2007 (Reference: APT Project Execution Plan, PEP). Additional objectives consist of the following:

- Ensure a 40-year design life for the plant.
- Minimize public and worker exposure to radiological hazards and materials, non-radiological toxic hazards and materials and industrial hazards by meeting all applicable DOE orders, requirements and Sate and Federal regulations.
- Construct the APT using technically acceptable and cost effective methods and practices.
- Design, construct and operate the APT using methods that are environmentally sound.

The facility will be built at the Savannah River Site.

The PPO is one of five team member organizations established to plan and execute the APT Project (Ref.: Figure 1).

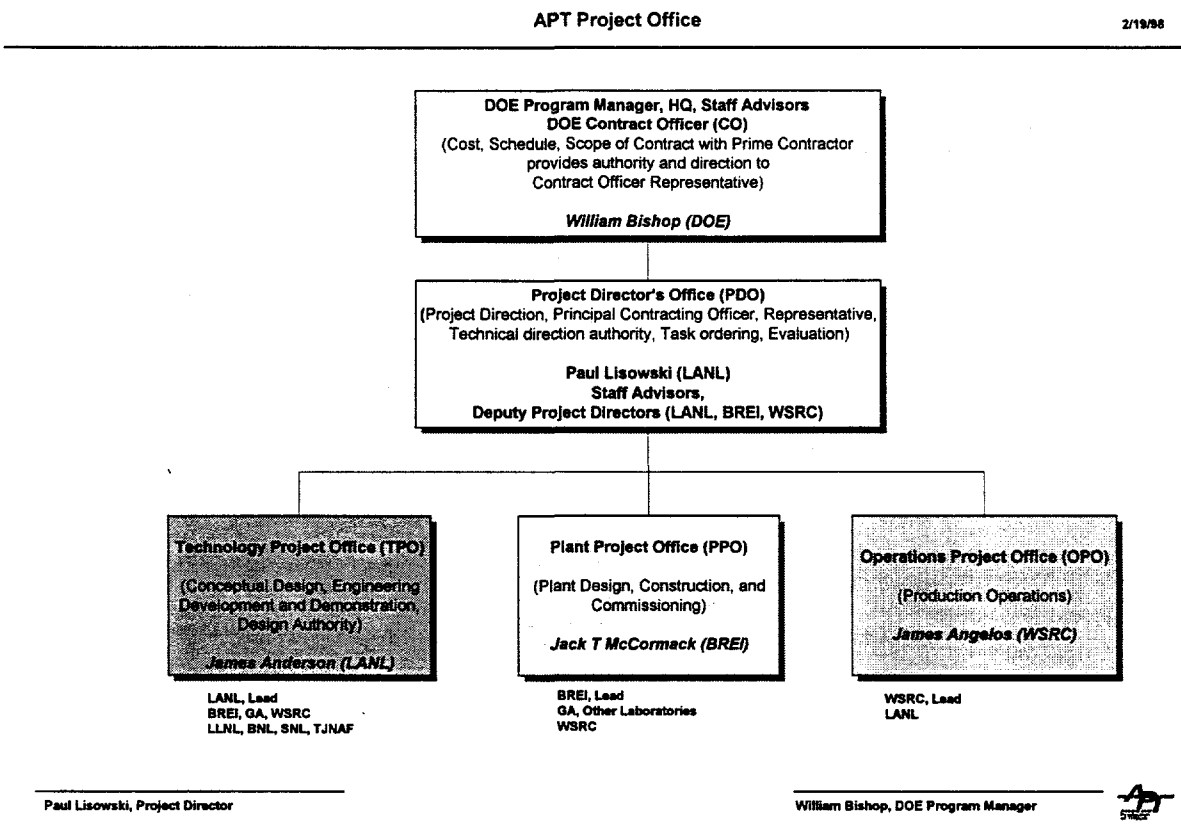
1.3 APT Project Organization and Responsibilities

The APT team member roles and responsibilities are defined at a high level within the PEP and are summarized in the following sub-sections.

1.3.1 Department of Energy (DOE)

DOE holds the responsibility for establishing Project policy, securing resources and monitoring performance of the implementing organizations. The DOE

Figure 1 - APT MANAGEMENT TEAM RELATIONSHIPS



establishes Project baselines and reviews and approves proposed changes, which exceed established thresholds (Ref.: PEP, Table 2, Project Baselines Scope, Cost and Schedule Change Control Authorities). The DOE is also responsible for contract control and administration, and coordination of the roles and participation of DOE groups, agencies and support.

1.3.2 Project Director's Office (PDO)

The APT Project Director's Office is responsible for project management and execution and for organizing all activities necessary to manage and execute the project within the technical, cost and schedule baseline. The Project Director's Office (PDO) is the single point of contact with DOE and ensures timely decisions are made to meet project objectives. The PDO monitors progress and performance and reports to DOE regularly. The PDO provides technical oversight and ensures the work is performed in accordance with applicable orders, codes, standards and guidelines.

1.3.3 Plant Project Office (PPO)

The PPO Project Director who operates under the direction and guidance of the PDO leads the APT Plant Project Office. The PPO Project Director also serves as Deputy Project Director for Plant Design, Construction and Commissioning (DPD) on the staff of the Project Director. In this role as Deputy Project Director, the DPD will work closely with and provide advice and recommendations to the Project Director and other members of his staff. The responsibilities of the PPO are described in Section 2, while those of the APT PPO Project Director/Deputy Project Director of Plant is described in Section 4.

1.3.4 Interfaces With TPO and OPO

The Technical Project Office (TPO) and the Operations Project Office (OPO) Project Managers are also Deputy Project Directors as is the PPO Project Manager. Collectively, they support the Project Director in the establishment of project wide strategies and priorities. They act for their respective organizations and are the source of project direction and guidance from the Project Director to the implementing organizations.

Project scope is generally assigned to the three organizations as follows:

- TPO – Engineering Development and Demonstration Program
- PPO – Plant design, construction and commissioning
- OPO– Plant operation and maintenance

Each of the three supports the other two participants in performing their assigned scope. For example, the PPO is responsible for system design but relies on the TPO to provide the test and demonstration results to support design decisions. The OPO supports the design by providing input regarding operations and maintenance. To achieve the intended results, multi-discipline, multi-organization working groups and teams are established to ensure the appropriate information flow occurs to and from the respective specialists.

The TPO also fills the role of Design Authority (DA) as delegated by the Project Director. In the capacity as DA, the TPO has the responsibility to ensure design adequacy, technical accuracy and appropriateness. The PPO will work closely with the assigned Design Authority functional leads to assist in the performance of the DA role. The specific Design Authority functions and the means of achieving the intended results, will be specified in a Project Director procedure.

2.0 Plant Project Office, Detailed Scope and Responsibilities

The specific requirements imposed upon the PPO derive from the Prime Contract Statement of Work, see Section 2.1 and the Technical, Cost and Schedule Baseline information from the Project Execution Plan, see Section 2.2.

2.1 Statement of PPO Work

BREI, as the Prime Contractor in association with GA, will design, construct and commission the APT Plant which will satisfy the technical (scope), cost and schedule baseline. The scope baseline consists of a linear accelerator, target/blanket, tritium separation facility, balance of plant complex and necessary sites and buildings. This technical baseline is defined in the PEP, expanded in the Facility Design Description (FDD) and further elaborated in the System Design Descriptions.

The Project is to be executed in five phases: Engineering Development and Demonstration (ED&D), Conceptual Design (CD), Preliminary and Final Design (P&FD), Construction and Operational Testing and Commissioning (OT&C). Several of these will overlap as defined in the baseline schedule (See Section 2.2.2).

The conceptual design of the plant described in the Final Conceptual Design Report (CDR) is the basis for the initial technical baseline and for initiating the P&FD phase. Continuing evaluations, development and demonstrations may result in the identification of improvements or changes that will be considered consistent with the overall Project costs and schedules.

The detailed Statement of Work of the PPO, provided in Section J Attachment A of the Prime Contract, is included as Attachment 1 to this Plan for understanding and completeness. In summary, the overall responsibility of the PPO from the Statement of Work is to design, procure, construct, and commission the APT plant, which will include:

- Review and comment resolution of the draft CDR and acceptance of the final CDR with *Open Items* forming the basis for initiating the P&FD.
- Develop and maintain the plant APT Project Execution Plan for the APT Project Director.
- Develop and maintain the project technical, cost and schedule baselines.
- Design the Plant Systems and all site structures and facilities and integrate all aspects of the APT plant design. This includes performing the systems engineering and integration necessary to ensure the APT performs as planned.
- Prepare and maintain the Configuration Management Plan (CMP), project communications, filing, document control, retrieval systems and other electronic information management systems.
- Develop and maintain the Plant Project Control System. This includes:
    1. Developing, maintaining and promulgating project costs and schedules.
    2. Collecting, integrating, and reporting project control information to the PDO.
- Manage the construction of the plant and be responsible for the procurement,

fabrication, installation and inspection of all equipment and components.

- Direct the commissioning of the Plant with the assistance of the TPO and the OPO contractor during the OT&C phase. This will include training the Operations and Maintenance (O&M) staff and testing all integrated systems.

The Work Breakdown Structure (WBS) has been established at the Level 2 as shown in Figure 2. The WBS is product oriented and represents a logical breakdown of work to implement the Project. The WBS is discussed further in Section 5 as it relates to the Responsibility Assignment Matrix (RAM).

2.2 APT Project Baseline

The APT Project Baseline is an integrated definition of the project technical scope, cost and schedule, summarized at different levels of detail. At the highest level (defined as Level 0), the current baselines are as follows:

- Technical: Use linear accelerator, Target/Blanket and Tritium Separation to produce 3 kg of tritium per year.
- Cost: Total project cost $4.4 Billion (CDR Section 10, Table 10.2)
- Schedule: Operational in FY2007.

In authorizing the Project to commence Preliminary Design, DOE has directed that a modular accelerator design approach be pursued. This entails designing a plant to produce 3 kg of tritium per year, in a manner that would allow construction effort and cost reductions if by FY2002, a decision is made to reduce production capacity to 1.5 kg/yr. This approach is being evaluated and will be pursued as a proposed change to the baseline described above.

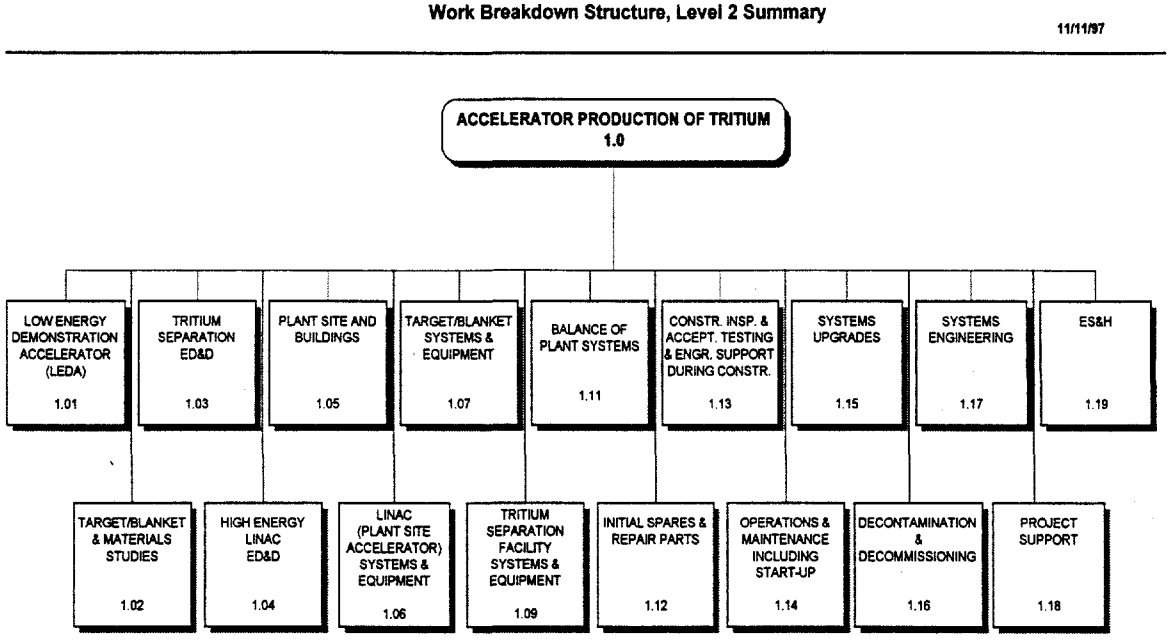
2.2.1 Technical Baseline

The APT is comprised of five major segments. The technical baseline at the next level of detail (defined as Level 1) is in Section 1 of the Facility Design Description and is summarized as follows:

Linear Accelerator (Linac) - produces and directs an energetic proton beam to a tritium-producing Target/Blanket (T/B). This System will:

- Produce proton power to generate tritium in the T/B at a rate sufficient for the APT plant to produce 3 kg of tritium per year.
- Provide a design for low enough activation due to proton losses to allow hands-on maintenance of the accelerating structures.
- Provide an expanded beam power density distribution that meets the requirements of the T/B System.
- Provide the capability to turn off the proton beam quickly enough to protect equipment and personnel.

Figure 2. Work Breakdown Structure, Level 2 Summary



Target/Blanket - produces neutrons by proton spallation of tungsten and lead and generates tritium through the ^{3}He reaction. This System will:

- Produce tritium in the T/B, using the proton beam from the Linac, at a rate sufficient to produce 3 kg of tritium per year.
- Remove heat produced by the beam during operation and by decay heat during shutdown conditions.

Tritium Separation Facility (TSF) - extracts tritium from the ^{3}He and prepares it for shipment to the Savannah River Site (SRS) Tritium Facility. This System will:

- Extract 3 kg of tritium per year.
- Recover >99% of the tritium transported from the T/B assembly.
- Purify the tritium to a minimum of 98.6% both isotopically and chemically.

Balance Of Plant (BOP) Complex - supports the integrated operation of these systems. The BOP will:

- Provide electric power distribution, heat removal, process control, utility services, maintenance and waste management, emergency services, safeguards and security (S&S) and logistics services to support process related operation of the facility at a production rate of 3 kg of tritium per year.

Necessary Sites and Buildings - supports the operations and maintenance (O&M) needs of the plant. These sites and buildings will:

- Provide site improvements consistent with facility design to facilitate O&M.
- Provide facility structures and buildings to house all systems and components with adequate space to provide O&M, in-service inspection and surveillance testing.

The detailed definition of the technical baseline and the thresholds at which different levels of management are required to approve baseline changes are discussed in Section 3.3 of the Project Execution Plan.

2.2.2 Schedule Baseline

The schedule baseline includes having the APT Plant on-line and producing tritium during FY 2007. To achieve these ends, critical milestones were established with the approval of DOE Critical Decision-1 (CD-1), Approval of Mission Need, in December 1995. That action established the APT Project, authorized commencement of the Conceptual Design activities, and established SRS as the APT Plant site. It also established the following top-level (Level 0) schedule for critical decision milestones:

- CD-2, Approve Project Baselines, July 1997
- CD-3, Approve Start of Construction, October 1998
- CD-4, Approve Plant Acceptance, June 2007

To support the CD-3, Approve Start of Construction, in October 1998, the DOE has committed to make the technology down select decision no later than September 1998. At that time it will select one of the dual track concepts (either APT or the Commercial Light Water Reactor, CLWR) that will serve as the primary source for the production of tritium. The critical decision milestones and major activities are shown in Figure 3.

2.2.3 Cost Baseline

The Total Project Cost (TPC) of the APT Project, as presented in the CDR (Ref. Section 10), is $4.4 Billion. This represents the total escalated (i.e. as spent) estimated costs, which will have been accrued when the facility becomes operational in FY2007. One portion of this cost is the Total Estimated Cost (TEC) of $2.3 Billion, which includes all engineering and design costs, procurement of plant equipment, construction of the plant and all support costs necessary to achieve the plant operation. The Other Project Cost (OPC) portion of the TPC is $0.8 Billion and includes the Engineering Development and Demonstration Program (ED&D), the conceptual design effort, Environmental Safety and Health (ES&H) activities, plant startup costs and other support costs. The remaining elements of the TPC include Contingency of almost $0.9 Billion and Escalation to year of expenditure of $0.5 Billion.

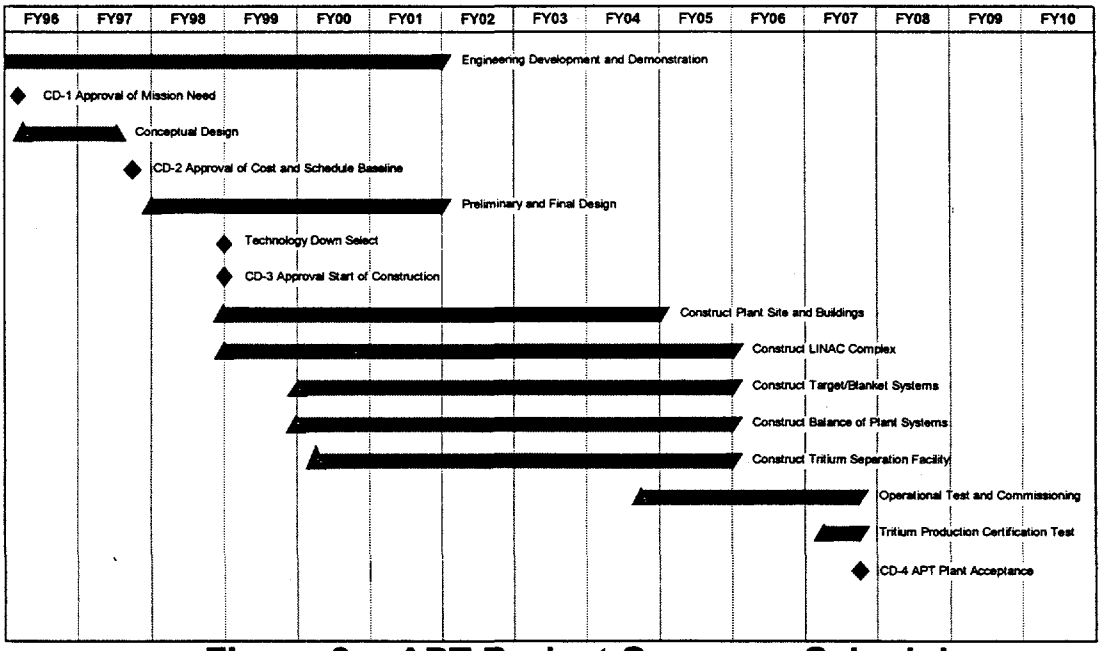


Figure 3. APT Project Summary Schedule

The thresholds at which different levels of management are required to approve changes to the cost baseline are discussed in Section 3.3 of the Project Execution Plan.

3.0 Guiding Core Values and Management Principles

3.1 Core Values

To guide the planning and execution of its work activities, the PPO has adopted the following core values:

3.1.1 Customer Orientation Value

We are committed to seek and obtain customer involvement and feedback, and to factor that feedback into our culture so as to maintain an affirmative customer satisfaction orientation. We in-turn are demanding customers, and place the same clearly articulated expectations on all those performing work for us.

3.1.2 Integrity/Professionalism Value

We will conduct ourselves with the highest standards of personal and professional ethical behavior. We will not compromise our personal or professional integrity. We keep our commitments, both individually and as a

team. We are committed to the values of fairness and objectivity.

3.1.3 Leadership Management

We are committed to doing the right things and doing them right.

3.1.4 Quality/Excellence Value

Quality begins with the individual. We are committed to continuous improvement and excellence in everything we do. We consider quality, cost and schedule to be of the utmost importance, but we will never compromise quality.

3.1.5 Seamless Organization

The PPO team of BREI, as prime contractor, in association with General Atomics, is structured to function as a single entity. Each organization performs work in its area of expertise. Activities needing multiple disciplines use qualified staff without regard for organization. Organizational boundaries do not impede flow of ideas, cooperation and resources, or the support and loyalty to the end goal and to one another.

3.1.6 Roles and Responsibilities

Clear roles, and single line points of responsibility, authority and accountability are established. The PPO is organized to ensure that all assigned scope is addressed with clear interfaces between the elements and with clear lines of accountability

3.17 Self/External Assessments

Self-assessments and external assessments are used to evaluate performance, with a willingness to change in order to improve.

3.1.8 Chief Executives Direct Involvement.

The Project Executive Advisory Board, consisting of BREI and GA Corporate Executives, are used to enforce the support of the APT Project by providing the visibility of Project progress and needs at the highest corporate levels.

3.2 Management Principles

Consistent with the above core values, the following management principles and tools are utilized in executing the PPO work scope:

3.2.1 Control of Costs

Control of costs through technical competence using validated project control systems. The PPO staff provides complete coverage of the design, manufacturing, construction, management and integration issues in the project.

The designs will be carried forward to the level needed to obtain competitive, firm priced bids from industry for equipment and services to the maximum extent practical.

3.2.2 Team Building

Team building through words and deeds. The team building starts with co-location of the core of the design team in Los Alamos and organization of the seamless team discussed above.

3.2.3 Processes and Tools

Use effective processes and tools to perform assigned tasks. The System Engineering approach is the basic process selected to achieve the desired results. Supporting this are proven analysis tools and user friendly Computer Assisted Design/ Engineering (CAD/CAE) equipment and software.

3.2.4 Full Time Support

Undivided attention to APT from assigned staff. The core team of engineers, designers, construction and support staff and specialists are basically assigned full time to the project. Consultants and other specialist are called upon as needed to satisfy particular short time needs.

3.2.5 Act On Recommendations

Evaluate recommendations and constructive criticism in a fair manner. Whether from the assessments of the PPO, or evaluations by peer individuals, consultants, reviewers, and the customer, recommendations for change will be thoroughly and fairly evaluated seriously. The consequences will be considered, dispositions will be established and recorded and will be implemented.

3.2.6 Lessons Learned

Incorporation of lessons learned from other programs. The need to learn from past relevant projects will be continually emphasized.

3.3 Management Strategies

There are aspects of the APT Project that require special attention. For example, (a) performing the engineering at diverse work locations, (b) overlapping phases of the project (e.g. ED&D with P&FD and construction; construction with OT&C), and (c) the importance of using domestic suppliers. In order to meet these challenges it is important to define strategies to be employed for those areas that are critical to the success of the project. To this end, the following strategies are established:

3.3.1 Design and Engineering Strategy

The main elements of the Design and Engineering Strategy that support near term priorities are as follows:

- Implementation of a Systems Engineering Process, which started in the Conceptual Design Phase, and will continue through the Preliminary and Final Design Phases (see Section 3.3.1.1).
- Strategically locating the plant design (PPO) engineering staff so as to maximize the effective integration of the Conceptual Design and ED&D efforts into the Preliminary Design efforts, and to support the near-term construction activities. This includes locating work close to where human and infrastructure resources exist. (see section 3.3.1.2).
- Utilizing a controlled, electronic based storage and sharing of engineering information over geographically diverse engineering sites, and effectively integrating the engineering data into the procurement effort to provide timely support of construction (see section 3.3.1.3, and section 3.3.2).

3.3.1.1 Systems Engineering Process

The Accelerator Production of Tritium (APT) Project employs a Systems Engineering process whereby design and operation of systems and components are analyzed and evaluated on their ability to meet the DOE requirements. The process involves the following activities:

1. Defining the top-level functional, performance and general design requirements that will fulfill the established mission. These are established in the Facility Design Description, which is the starting point for the Preliminary Design.
2. Establishing an allocation of requirements among plant systems and components (e.g., Accelerator, Target/ Blanket, Tritium Separation Facility, and BOP) which will result in a plant design that is optimized with respect to performance, reliability, cost, schedule, environmental impact and safety. A functional analysis is conducted to facilitate requirement allocation. The requirements are defined in the individual System Design Descriptions (SDDs).
3. Selecting the designs that satisfy the requirements set forth in the SDDs. The specific selections are the Technical Baseline while their estimated costs and the schedule for implementation are their respective baselines. The design process may involve consideration of design alternatives, in which case risk, cost and schedule, and safety are a few of the evaluations that are likely to be performed. During the process, information will be augmented including: system interfaces and limitations, set-points and precautions, maintenance, in-service-inspection and surveillances.
4. Defining the design specifics in the SDDs and preparation of the engineering and design products such as Equipment Specifications, Drawings, Layouts

and other data.

5. Integrating the engineering and design activities to ensure all elements are compatible and support fulfillment of the mission. Interface control, design control and technical reviews and document control are some of the means of achieving this.

3.3.1.2 Strategic Locating of Plant Design Engineering Staff

Another major element of the near-term Engineering and Design Strategy is to evaluate engineering work in terms of where it is to be done most effectively, and provide the necessary resources in that location. In order to accomplish a smooth transfer of technology from the ED&D program to the design program, PPO lead staff will be located at Los Alamos during (a) key phases of the ED&D Program, and (b) through Preliminary Design to the point where design selections and system interfaces are adequately defined. As these efforts are completed, portions of the Preliminary and Final Design may be accomplished at SRS.

In parallel with the above, staffing at SRS has begun in order to provide (a) an office infrastructure to support design and construction there, and (b) performance of the design activities which are closely related to FY 99 construction activities.

Further details regarding both the Systems Engineering approach and the location of staffing can be found in the Design Execution Plan.

3.3.1.3 Electronic Storage and Transfer of Engineering Data

Given the geographically diverse locations involved with the production and review of the engineering and design effort, integration of these efforts among the sites is to be facilitated through electronic means. Creation of documents, reviews and release of approved engineering documents across the project will be accomplished through an Information Management System (see section 3.3.2).

3.3.2 Information and Document Management Strategy

Given the geographically diverse locations of the APT Project offices, it is important that current information management technologies be effectively integrated into the work processes.

Some of the work processes and the development of the supporting information technologies, are managed within functional organizations. For example, in creating and managing 'in-process' engineering documents, the engineering organization selects the system of hardware and software that is to be utilized. When documents are approved, however, a document control system is utilized to control the distribution of these documents to the various project team member organizations, and to ensure that user friendly interfaces are established to facilitate access to the documents by authorized users. These functions are

accomplished through part of the Information Management System (IMS).

Some of the salient features of the IMS are as follows:

- Is a web based repository of approved project documents; examples include approved engineering documents (such as SDDs), and Project Plans and Procedures
- Provides a "mailbox" for PPO deposit of documents that are to be reviewed by the other team member organizations outside of the PPO; this same mailbox function provides for receipt of comments back from these same organizations
- Provides for:
    1. a centralized and controlled identification of engineering documents (consistent with the conventions established in the Configuration Management procedures);
    2. identification of correspondence (consistent with the conventions established in the Project Administration procedures);
    3. identification of Programmatic Documents such as Monthly Reports (consistent with the conventions established in the Project Administration procedures); and
    4. retention of all of these documents (consistent with the conventions established in the Document Management portion of the Project Administration procedures.

The features described above support near term project activities. As the project proceeds, other features will need to be developed to effectively support procurement, construction, testing and turnover. Further, these efforts will be defined, prioritized, and discussed in more detail in a PPO Information Management Plan. Elements of this plan exist in a report being developed by the Information Management Working Group. The PPO Information Management Plan will utilize, and -- where necessary -- expand upon applicable elements of that report.

3.3.3 Procurement Strategy

The procurement approach adopted for APT has been used successfully on other relevant projects. The approach, which is documented in the Acquisition Plan (AP), includes the following principal features

- Maximize the use of fixed-price, competitive, best value procurements.
- Minimize the use of cost-type contracts or sole source procurements.
- Utilize the negotiated procurement process as described in the Federal Acquisition Regulation (FAR).
- Allow for award of purchase orders under General Services Administration agreements as permitted.

- Allow for local procurements and involvement by the local economy.
- Encourage the use of small, small disadvantaged, and women-owned small business concerns.
- Use procedures which comply with the FAR, the Department of Energy Acquisition Regulation and have been approved by DOE and other government agencies.

3.3.4 Training Strategy

Staff qualifications will be maintained and enhanced through training efforts that include:

- Providing activities to ensure the requisite initial training is in place
- Providing resources to allow efficiency or effectiveness improvements.

The training is focused on skill development (technical, managerial, and interpersonal).

Training on plans and procedures is partly based on "self study" . For example, when a person is assigned to the project he/she is given a list of topics that have to be understood. The topics are annotated on the employee's Personnel Orientation and Training Requirements/Record, by their lead. Other methods of training are Video-based, computer based and in-class (internal or external) training.

The training procedure provides that training requirements for individuals be reviewed at least annually and additional training be scheduled commensurate with the individual and the specific job assignments to strive for continual improvement. Advanced training will generally be provided in Subject Matter Workshops by appropriate specialists, attendance by the individual at external courses or workshops or by self-study based on material identified by specialists.

3.3.5 Construction Strategy

A strong construction management team is being set up to actively manage the entire construction. Subcontractors will work in their areas of expertise, responsible for their own means, methods and techniques, guided by a complete discipline oriented design package. To minimize risk, the contracts will be packaged to include appropriate and complete discipline oriented interfaces.

This multiple, discipline-oriented contracts approach focuses on awarding contracts in a structured, organized and controlled manner that will optimize the execution of each contract. The work is broken down into meaningful, biddable, funded areas of work, that support a levelized craft manpower pool and allow the use of fixed-price competitive bidding.

The APT construction approach is consistent with the Engineering Development and Design/Procurement efforts and facilitates cost effective subcontracting and control of the project schedule. Other advantages include:

- Contractual flexibility to minimize effects of changes of direction or funding.
- Opportunities to provide for participation by local firms and minority and women-owned businesses.
- Ability to reduce performance risk by controlling the size of contracts and the number of contractors performing similar work.

4.0 Plant Project Office Organization

The organizational structure of the PPO will evolve as the project progresses from the Preliminary and Final Design (P&FD) phase, to the Construction (CM) phase and finally the Operational Testing and Commissioning (OT&C) phase. The basic organization for each of these phases is shown in Figures 4, 5 and 6. The descriptions of the organizational elements are prepared for the P&FD phase and although some of them also cover the CM and OT&C phases, they all will be re-examined and revised as the project emphasis changes to plant construction and then commissioning.

The organization charts of the detailed PPO elements, as established at the start of Preliminary Design are included as Attachment 2 to this plan.

4.1 Plant Project Office Project Manager

The Project Director of the PPO is also the APT PDO Deputy Project Director (DPD) of the Plant Project Office (PPO) (See Figure 1). For clarity and completeness, the roles and responsibilities of the PPO Project Director as DPD has been extracted from the APT Project Execution Plan and is provided below (Section 4.1.1). This is followed by his roles and responsibilities as PPO Project Director (Section 4.1.2).

4.1.1 Deputy Project Director (DPD) PPO

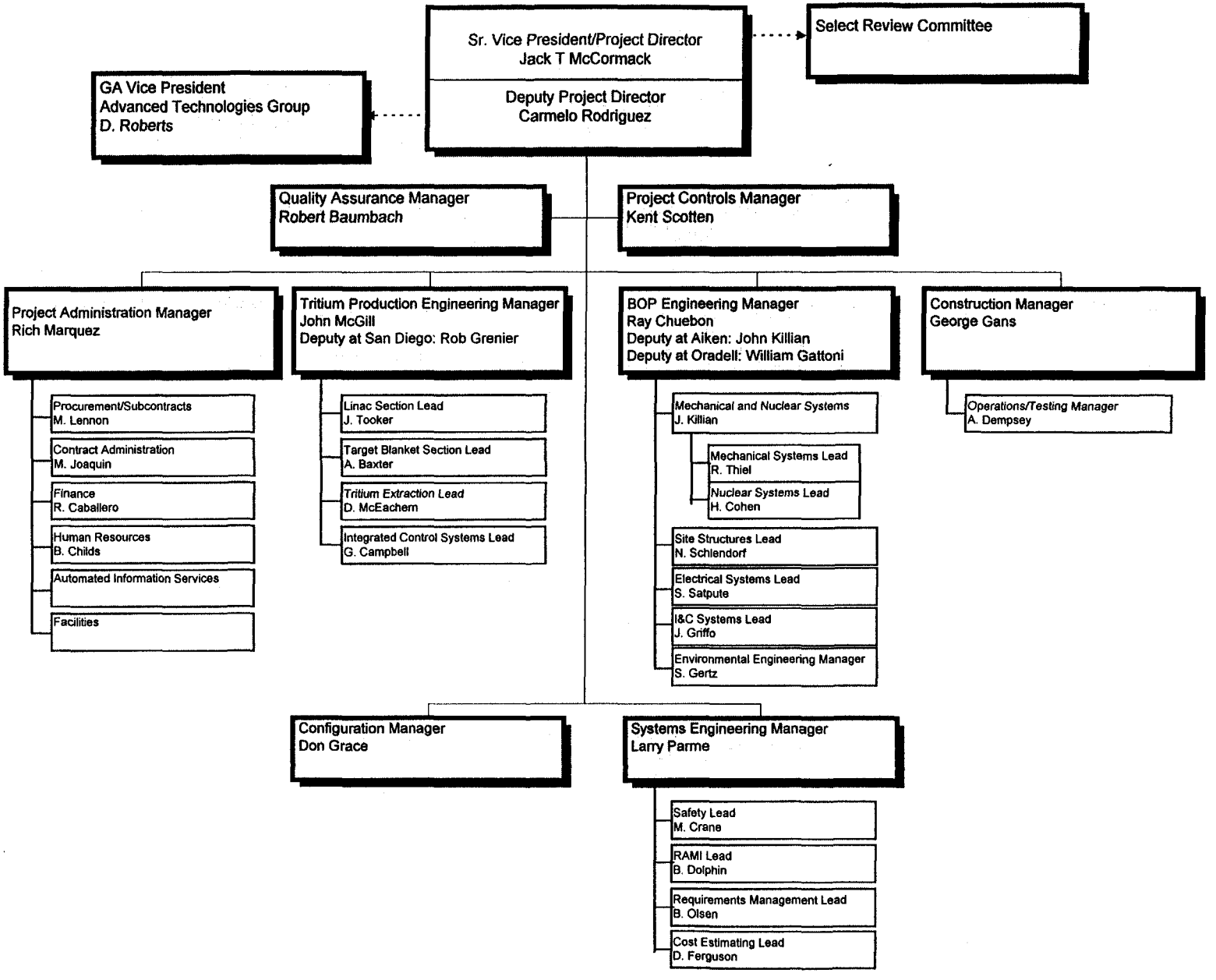
The DPD for Plant Design, Construction and Commissioning oversees the Plant Project Organization (PPO) and reports functionally to the APT Project Director. The PPO DPD is responsible for ensuring the PPO fulfills its contractual requirements. By serving on the staff of the Project Director as DPD, the PPO Project Director is the direct link with the other major project participants to ensure their total efforts are coordinated and integrated with consistent priority.

Specific responsibilities of the PPO Deputy Director include the following:

- Direct and manage the APT Plant design, construction and commissioning efforts and supporting activities, ensuring the activities are correctly defined and controlled.

Figure 4 - APT Plant Project Office (PPO) P&FD Phase

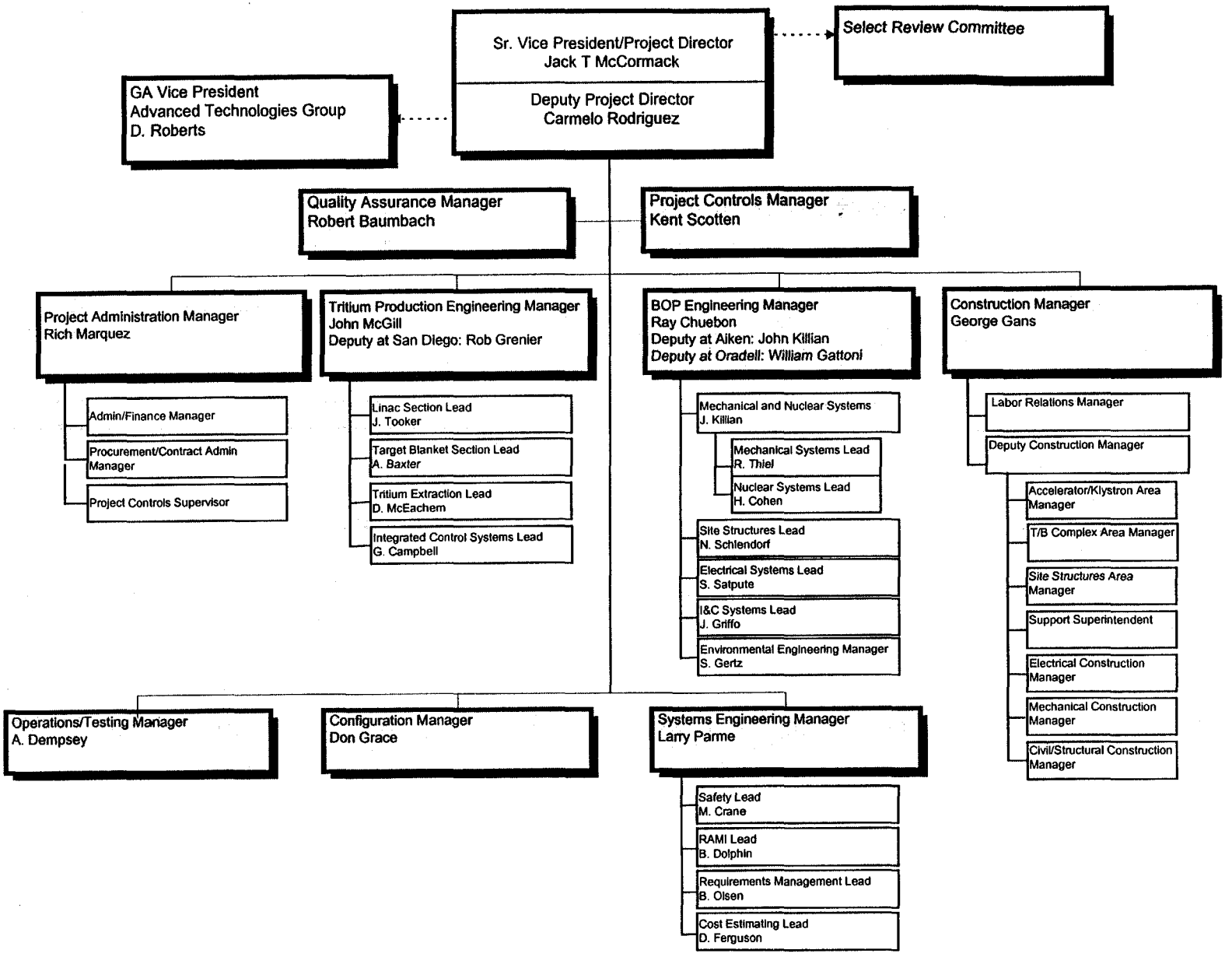
2/19/98



Jack T McCormack, PPO Project Director

Paul Lisowski, PDO Program Director

Figure 5 APT Plant Project Office (PPO) CM Phase



Jack T McCormack, PPO Project Director

Paul Lisowski, PDO Program Director

Figure 6 APT Plant Project Office (PPO) OT&C Phase

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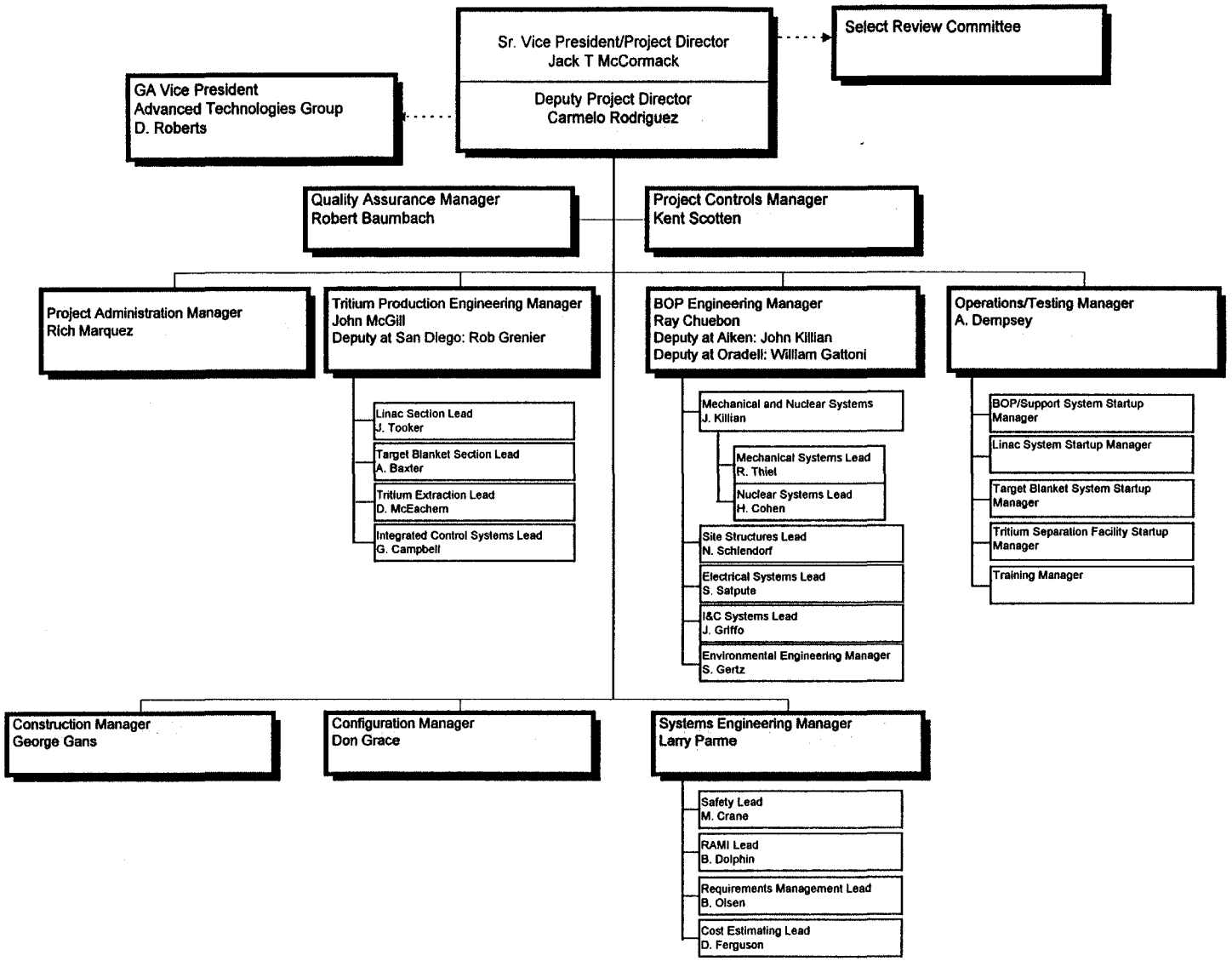


Jack T McCormack, PPO Project Director

Paul Lisowski, PDO Program Director

- Direct and control project configuration during P&FD, construction and commissioning phases.
- Establish and chair the APT Plant PPO Control Level 3 Baseline Change Control Board (BCCB) by coordinating reviews, assessments, and actions on Baseline Change Proposals BCPs.
- Approve APT PPO BCPs exceeding the Control Level 3 approval thresholds with recommendations to the Level 2 BCCBs.
- Participate in plant Level 2 BCCP reviews and approvals.
- Provide contract management and technical oversight of PPO subcontractor activities.
- Ensure project work is performed in accordance with applicable DOE Orders, State and local government laws and regulations, institutional standards, requirements and procedures.
- Ensure compliance with DOE Environmental, Safety and Health, Quality Assurance and Safeguards and Security requirements.
- Appoint, with the concurrence of the APT Project Director, key APT personnel.
- Direct the development and maintenance of APT Plant Project Management plans and procedures.

The PPO (Prime Contractor) also supports the APT Project Director in planning and implementing the technical program in all phases of the project.

4.1.2 PPO Project Director

The PPO Project Director is responsible for all activities at the APT Plant Project Office (PPO). The PPO Project Director reports functionally to the APT National Project Office Director and operationally to the BREI President and CEO. The PPO Deputy Project Director (see Section 4.2) supports the PPO Project Director.

The PPO Project Director is responsible for ensuring that all work is performed in accordance with the Prime Contract, the PEP, the Quality Assurance Program Plan (QAPP), other established Plans and the implementing project procedures. The PPO Project Director has the organizational freedom and authority to address problem areas in all activities on the project and to initiate and effect corrective action. The PPO Deputy Project Director, subordinate managers, lead staff, and professional personnel assigned to the project organization support the PPO Project Director. The PPO Project Director retains the primary responsibility, and is accountable, for the scope and implementation of PPO management systems.

The PPO Project Director effectively achieves performance objectives through:

- Building a team of scientists, engineers and administrators that can effectively

and efficiently perform all items of the scope of work

- Establishing task assignments,
- Ensuring that individuals are responsible for the quality of their work,
- Establishing and implementing the planning necessary to meet the APT contractual requirements,
- Determining and providing the needed resources and environment so that individuals can accomplish the work.
- Maximizing efficiencies by encouraging optimization and integration of engineering, procurement and construction,
- Identifying lines of communication and promoting communication of project information to the customer and between all involved parties.

4.2 PPO Deputy Project Director

The PPO Deputy Project Director reports to the PPO Project Director. On matters specifically related to the BREI and GA interface, the GA Deputy Project Director reports to the GA Vice President for Advanced Technologies Group.

As Technical Director, in addition to his managerial duties, the Deputy Project Director has direct responsibility for the full exploitation of known tritium technology toward the success of the Project.

The specific responsibilities of the PPO Deputy Program Director include the following:

- Planning, coordinating, directing, monitoring and controlling the technical aspects of the APT plant design, procurement and construction,
- Fulfilling all technical milestones,
- Building a team of scientists and engineers that can effectively and efficiently perform all items of the scope of work
- Maintaining the project schedule and performing the work within the established budget,
- Ensuring the results of the Engineering Development and Demonstration program are properly integrated into the design,
- Leading the effort to resolve technical problems and conflicts,
- Assuming the responsibilities of the PPO Project Director in the event of his absence.

4.3 PPO Organizational Elements

The responsibilities of the groups reporting to the PPO Project Director and the

PPO Deputy Project Director, as shown in Figure 4 for the Preliminary Design Phase, are discussed below. Each of the group managers will develop objectives based on the PPO Guiding Principles (see Section 3.0) and the Objectives for the Project (see Section 1.0). The entire PPO organization will be measured by a common set of criteria, along with the PDO, TPO and OPO.

4.3.1 Project Administration

The Project Administration Manager is responsible for the Procurement/Sub-contracts, Financial and Human Resources functions and Information Management Systems and reports directly to the PPO Project Director. Project Administration is responsible for:

- Developing and maintenance of the APT procurement system including the Acquisition Plan and its implementing procedures, procurement and sub-contracting of APT equipment and services, and interface with DOE on procurement/sub-contracting matters.
- Coordinating of all PPO human resource activities including recruiting, processing new hires, administering the compensation and benefits program, and preparing and maintaining the Diversity and Affirmative action plans.
- Management and maintenance of the APT PPO contract and the main subcontract and all changes to them.
- Automated information services including those related to computers and networks.
- General administrative support services including word processing and temporary services.
- Office facilities management.
- Developing and administering the PPO Training Program.

4.3.2 Configuration Management

The Configuration Manager is responsible for project configuration management, document control and records management, and the coordination of the Baseline Change Control Process. The Configuration Manager is also responsible for the configuration management of operating Plans, Procedures and support management tools. The Configuration Manager reports to the PPO Deputy Project Director. Configuration Management is responsible for:

- Developing and maintaining the Project Execution Plan (PEP) and this PPO Management Plan.
- Developing and maintaining a schedule for preparation of PPO plans.
- Developing and maintaining the Configuration Management Plan and Program and the implementing procedures.
- Coordinating the APT Plant PPO Control Level 3 BCCBs by scheduling

reviews, assessments, and actions on BCPs as delegated from the PPO Project Manager.

- Developing and maintaining the APT Value Engineering Program.
- Developing and maintaining the APT Document Management System.
- Developing, implementing and maintaining a project wide Information Management System.
- Managing the Configuration Management and Document Control functions.

4.3.3 Project Controls

Responsibility for the planning and scheduling of all activities on the APT Plant Project is vested in the Project Controls Manager, who reports directly to the PPO Project Director. The Project Controls Group is responsible for :

- Developing current year cost and schedule project management baselines that are consistent with the total project baseline.
- Preparing and maintaining time-phased, resource allocated schedules.
- Providing and maintaining integrated cost and schedule tools.
- Providing analysis of proposed baseline changes from a cost and schedule viewpoint.
- Providing integrated cost and schedule performance reports.

4.3.4 Tritium Production Engineering

The Tritium Production Engineering Manager reports to the PPO Deputy Project Director and is responsible for the management of the engineering and design of the Accelerator (LINAC), Target and Blanket (T/B) Assembly and the Tritium Separation Facility (TSF). The Tritium Production Engineering Group is responsible for :

- Developing the functions, requirements, and design of LINAC, T/B, TSF and Integrated Control System based on the Conceptual Design (CD) and Engineering Development and Demonstration (ED&D) phases.
- Preparing technical specifications and drawings.
- Technical monitoring of the procurement, fabrication, assembly, and construction of components and systems.
- Technical supervision of testing and commissioning of the LINAC, T/B, TSF and Integrated Control related components and systems.

4.3.5 Balance of Plant Engineering

The Balance of Plant Engineering Manager is responsible for the management of the engineering and design of the Balance of Plant (BOP) and reports to the PPO

Deputy Project Director. The Balance of Plant Engineering Group is responsible for:

- Developing the functions, requirements, and design of electrical, mechanical, civil, structural and instrumentation systems and components based on design input developed during the Conceptual Design (CD), Engineering Development and Demonstration (ED&D), and Preliminary Design phases;
- Preparing technical specifications and drawings.
- Technical monitoring of the procurement, fabrication, assembly, and construction of components and systems.
- Management of the Environmental, Safety and Health (ES&H) permitting and assessment activities.
- Engineering support during construction.
- Technical supervision of testing and commissioning of the Balance of Plant related components and systems.

4.3.6 Systems Engineering

The Systems Engineering Manager reports to the PPO Deputy Project Director and is responsible for:

- Preparing, maintaining and implementing the APT Systems Engineering process, plan and procedures. This includes functional analysis and allocation, design selection and its evaluation and optimization, and the integration of engineering activities including interface definition and control.
- Coordinating and training of Systems Engineering processes with all APT project participants.
- Reliability, Availability, Maintainability and Inspectability (RAMI) analyses.
- Cost Estimating activities, which includes developing and maintaining the Total Project Cost (i.e., Capital Engineering and Construction Cost) estimate.
- Plant Safety including analyzing, evaluating, recommending and approving safety aspects of the plant design, construction and operation.

4.3.7 Construction Management

The Construction Manager reports to the PPO Project Director and is responsible for the management of construction on the APT Plant Project. The Construction Management staff is responsible for providing constructability input to the design, planning of the construction, and the actual construction of the APT facility. Construction Cost Estimating is a part of the Construction Management function.

Constructability input involves the sequence and timing of engineering, procurement, and construction events; the efficient construction of the structures and systems; and the quality of the construction work. It considers the various

phases of the facility life, from groundbreaking through decommissioning.

Construction planning includes the development of schedules, specifications, procedures, packaging of work tasks, site physical layout, environmental permit support, environmental hazard prevention and mitigation, and active participation in the selection and award of subcontracts.

4.3.8 Safety Management

The Safety Manager has responsibility for the Safety Program on the APT Plant Project and reports to the Systems Engineering Manager. The Safety Group works with all other team members developing and maintaining safe working locations during all phases of the Project. The group develops safety methods and plans, supports development of technical safety requirements, participates in external safety reviews and performs safety audits of on-going activities.

4.3.9 Quality Assurance Management

The APT Plant Project Quality Manager is responsible for the development, maintenance and administration of the Quality Assurance Program Plan (QAPP) and for verification that quality-affecting activities on the APT Plant Project are performed in accordance with the Program.

The Project Quality Manager reports directly to the BREI President and CEO and interfaces directly with APT Project Management and other APT Project participants. He has the authority to establish direct lines of communications with external organizations including DOE APT, suppliers, and contractors. The Project Quality Manager has the responsibility to:

- Initiate action to preclude the occurrence of non-conformities related to items, processes and the quality assurance program.
- Identify and record problems related to items, processes and the quality assurance program.
- Initiate, recommend, or provide solutions to quality problems.
- Verify the implementation of solutions.
- Control further processing (stop work), delivery, or installation of nonconforming product until the deficient or unsatisfactory condition has been corrected.

Deputy Project Quality Assurance Managers, assigned to each location where APT Plant Project work is being performed, report functionally to the Project QA Manager. These individuals interface with local APT Plant Project Management at their assigned locations and have the same responsibility and authority as the APT Plant Project QA Manager.

4.3.10 Environmental Management

The Environmental Manager has responsibility for the environmental

management program on the APT Plant Project and reports to the Balance of Plant Engineering Manager. The Environmental Group works with all team members to ensure full compliance with all appropriate environmental rules and regulations during all phases of the Project. The group is responsible for the continuing development and maintenance of the Environmental Permitting Plan, APT Facility Waste Management Plan and the Pollution Prevention Design Assessment Report. The group performs audits of on-going activities and supports efforts to obtain environmental permits.

The Environmental Group is responsible for:

- Providing data and confirmatory analyses to support preparation of the APT Environmental Impact Statement (EIS);
- Providing data and preparing permit applications to obtain the required environmental permits;
- Developing and implementing a Public Participation Plan;
- Assuring the integration of pollution prevention, waste minimization and ALARA concepts into design and construction efforts;
- Participating in the Environmental Working Group and the Waste Management, Permitting and other environmental teams.

4.3.11 Procurement/ Subcontracts Management

The Procurement/Subcontracts Manager has responsibility for the management of APT Plant Project procurement and subcontracting and reports directly to the Project Administration Manager. The Project Procurement Group is responsible for:

- Developing of procurement and subcontracting plans;
- Developing the Acquisition Plan and the Prospective Bidders List;
- Developing and maintaining the equipment lead-time report;
- Development of procurement documents and bid packages;
- Selection of sources, and placement, administration, and expediting of contracts for procured items and construction services;
- Warehousing, storage, and issuance of procured items and equipment.

4.3.12 Human Resources Management

The Human Resources Manager reports administratively to the BREI Vice-President of Human Resources and functionally to the Project Administration Manager and is responsible for the coordination of all PPO APT Project human resources activities.

Human Resources is responsible for:

- Recruiting exempt and non-exempt personnel for the APT Project PPO

- Processing new hires and scheduling required training for personnel badged at Los Alamos National Laboratory (LANL) and processing security clearances as required
- Preparing and maintaining Diversity and Affirmative Action plans and overseeing EEO activities, and
- Administering Compensation and Benefits programs.

4.3.13 Financial Management

The Finance Manager reports administratively to the BREI Controller and functionally to the Project Administration Manager and is responsible for the coordination of all PPO APT Project finance activities.

Finance is responsible for:

- Coordinating all cost data input into accounting system and financial reporting for APT Division.
- Generating monthly invoice to the DOE.
- Reconciliating accounting system data with the Project Control system.
- Oversight of funding for contract activities and measurement of actual costs incurred against authorized task assignments.

4.3.14 Section Lead Responsibilities

The responsibilities of the individual Section Leads depicted on the detailed PPO organization charts in Attachment 2, are described in Attachment 3. Section Lead responsibilities for Construction Management and OT&C phases will be added later.

5.0 Responsibility Assignment Matrix

A Responsibility Assignment Matrix (RAM) is established to ensure a complete understanding of which organizational element has responsibility for each component of the scope of work. The RAM depicts the Work Break Down Structure (WBS) element, defined in a detail necessary to understand discrete responsibilities by each of the organizational elements.

The initial issue of this RAM, shown in Attachment 4, reflects the details of the Preliminary Design phase and its supporting Engineering Development and Demonstration (ED&D) program. It will be updated to reflect responsibilities for the other program phases.

For completeness and clarity, the PPO RAM includes responsibilities of organizations outside of the PPO (depicted by dashed boxes).

6.0 Plant Project Office Plans

Previous sections of this Management Plan described the Scope assigned to the PPO (Section 2), the strategies for accomplishing the work (Section3), and how the PPO is organized to perform the work (Sections 4 and 5). This section summarizes the plans developed, as required by the Project Execution Plan (PEP), to define the processes to perform the work assigned to the PPO. The plans then provide the bases of the corresponding implementing procedures. The PPO plans, including this Management Plan are listed in Table 1 along with a definition of the review organizations and approving authority for each plan. A summary of the purpose of each plan follows. Also listed in Table 1 is:

- the Project Execution Plan which will be maintained by the PPO after its initial issue
- other plans for which the PPO has major involvement even though it is not the lead organization.

The initial issue of this PPO Management Plan and many of the other project plans focus on the needs for Preliminary Design. The plans will be revised to reflect experience of the early design activities and to add information relevant to later phases of the program.

6.1 Management Plan

The Management Plan (this Plan) defines the scope and responsibilities of the PPO, describes the strategies for implementing the scope, describes how the PPO is organized to accomplish the assigned scope, defines other needed PPO plans and establishes other management requirements to ensure proper implementation of the work. The requirements included in the Management Plan flow from the Contract Statement of Work and from the Project Execution Plan.

6.2 Systems Engineering Management Plan

A Systems Engineering process for the design, described in Section 3.3.1.1, will be used to ensure the APT is focused on achieving the DOE mission and satisfies the requirements for effective systems engineering, integration, planning, and control. The Systems Engineering Management Plan (SEMP) identifies and describes these processes and methods used to structure the conduct of activities necessary to develop a total system design:

- Process flow
- Activities to be accomplished under each process step
- Documentation summaries and other outputs generated as part of each process step
- Reviews or milestone dates used to measure progress toward completion of the task.

Table 1 PPO Plans, Review and Approval Matrix

Plan Title	Document No.	Lead Organization	Review Organizations				Approval			
			OPO	TPO	PPO	PDO	OPO	TPO	PPO	PDO or DOE
Project Execution Plan (PEP) *	APT-PDO-001	PDO/PPO	●	●	●	o	●	●	●	o
Configuration Management Plan (CMP)	APT-PPO-0003	PPO	●		o	●			o	
Design Execution Plan (DEP)	APT-PPO-0005	PPO	●		o	●			o	
Safety Implementation Plan (SIP)	APT-PPO-0007	PPO	●		o		●	●	●	o
Systems Engineering Management Plan (SEMP)	APT-PPO-0006	PPO			o	●			o	
Acquisition Plan (AP)	APT-PPO-0004	PPO			o	●			●	o
APT Diversity Plan	APT-PPO-0010	PPO			o				o	
EIS Management Plan (OPO Lead)	APT-PPO-00XX	OPO	o	●	●	●	●	●	●	o
Environmental Permitting and Compliance Plan (OPO Lead)	APT-PPO-00XX	OPO	o	●	●	●	●	●	●	o
Management Plan (MP)	APT-PPO-0001	PPO			o				o	
Project Controls System Description (PCSD)	APT-PPO-0011	PPO		●	o	●			o	

Table 1 PPO Plans, Review and Approval Matrix (continued)

Plan Title	Document No.	Lead Organization	Review Organizations				Approval			
			OPO	TPO	PPO	PDO	OPO	TPO	PPO	PDO or DOE
Quality Assurance Program Plan (QAPP)	APT-PPO-0002	PPO			o	●			●	o
Safeguards and Security Plan (S&S)	APT-PPO-0009	PPO	●		o				o	
Value Engineering Plan (VE)	APT-PPO-0008	PPO			o				o	
Waste Management Plan (OPO Lead)	APT-PPO-00XX Rev 0	OPO	o	●	●	●	●	●	●	o
Public Participation Plan (PPO Lead)	APT-PPO-00XX Rev 0	PPO	●	●	o	●			o	
Resource Plan	APT-PPO-0012	PPO			o				o	
● Review of Plan or Revisions										
o Final Review/Preparation or Final Approval of Plan or Revisions										

6.3 Configuration Management Plan

All participants must be provided with accurate, up-to-date information of theconfiguration of the plant at any given point in the project life cycle. To achieve this, a Configuration Management Program will be established and described in the Configuration Management Plan. The Program will use a system by which technical information is documented and changes to the documents are controlled. This integrated management process, described in detail in the APT CMP, will provide the means to:

- Identify and control the documents which define the configuration baseline for the plant
- Provide a systematic method for managing approved changes to the technical baseline and ensuring the changes are correctly documented
- Provide verification that end-item configuration conforms to the technical baseline.

The DOE Life Cycle Asset Management, Good Practice Guide GPG-FM-012, Configuration and Data Management, and the SRS Configuration Management Strategic Implementation Plan, WSRC-RP-94-0766, as amended, will be used as the basis for developing the APT CMP.

The CMP is supported by a series of implementing PPO procedures.

6.4 Quality Assurance Program Plan

The PPO Quality Assurance Program Plan (QAPP) documents the application of quality management to all activities to be performed on the project. The QAPP is supported by a series of implementing procedures.

6.5 Value Engineering Plan

The Value Engineering Plan defines the process by which improvements to the design and construction of the facility will be proposed, evaluated and accepted. The process will be consistent with established guidelines, which facilitate developing, reviewing, accepting and implementing Value Engineering Change Proposals (VECPs).

The VECP requirements and basis for sharing in cost savings are defined in the FAR Paragraph 248.1 and have been incorporated by reference into contracts for the APT participants.

6.6 Environment, Safety, and Health Planning

The planning for Environmental, Safety and Health issues is driven by regulatory requirements. The plans to meet the requirements will include the drivers, logic,

assumptions, schedules and milestones necessary to meet such requirements. The plans will address facility safety, worker protection, environmental compliance, pollution prevention, and waste minimization for the APT Project.

All plans will be assessed periodically to incorporate program and regulatory changes and to develop detailed strategies as the project requirements develop.

6.6.1 Safety Implementation Plan

The purpose of the Safety Program is to ensure the facilities will provide protection for the workers, the public and the environment. The APT Safety Implementation Plan will be developed to define the process by which the Safety Program will be accomplished. It will include preparing safety documents following a hazard-based approach. The methodology to be used will provide a systematic approach to developing safety documentation, consisting of the following steps:

- Hazard Identification - Hazardous energy sources, radiological hazards, non-radiological toxic hazardous materials will be identified. Additionally, potential initiators for release of hazards such as natural phenomena hazards or external events will be identified. These hazards , if released, might place a facility, an operation, workers or the public in jeopardy.
- Hazard Analysis - An evaluation of the identified hazards relative to possible events and their causes will be performed. Such analyses include release of the hazard or the consequences caused by the hazard itself. Available features for mitigating and preventing each event are identified. The consequences of each event will be qualitatively evaluated and the events will be grouped based on hazard level and potential event frequency.
- Preliminary Functional Classification - The Systems, Structures and Components (SSCs) that provide the required worker safety and defense-in-depth safety functions will be identified. Additionally, the classification will provide preliminary selection of SSCs to perform the required safety function.
- Accident Analysis - Event scenarios and analyses of specific events will be developed. These will verify that the selected SSC safety functions will prevent or mitigate an event and therefore will meet established safety criteria.
- Final Functional Classification - A final selection of SSCs credited in the safety analysis will be performed. The analysis will ensure the required safety functions are provided.
- Technical Safety Requirement - The requirement will ensure the safety functions are maintained and the safety envelope for the facility is protected.
- Safety Analysis Report - The Report will provides the formal documentation of the safety case for the facility.

The project will use FDD and SDDs to document and control APT requirements including safety requirements and to define the project technical baseline. The

safety requirements imposed on the Project are based on DOE orders and will be developed by the use of applicable DOE rules and regulations.

6.6.2 Environmental Impact Statement (EIS) Management Plan

An EIS Management Plan will be developed to provide the process to produce and maintain the EIS.

6.6.3 Waste Management Plan

The Waste Management Plan (WMP) identifies the regulatory drivers for waste management requirements. The WMP details the evaluation of waste streams that will be generated by the APT, addresses the key issues regarding the waste stream dispensation and identifies the SRS interfaces for each. The WMP also outlines an approach for waste minimization opportunities.

6.6.4 Environmental Permitting and Compliance Plan

The Environmental Permitting and Compliance Plan identifies the environmental permits necessary for constructing and operating the APT. The Environmental Permitting and Compliance Plan addresses all applicable EPA, South Carolina, and DOE rules, regulations and orders. The Plan includes a list of assumptions and a schedule.

Prior to construction and operation, the APT facilities will require additional environmental permits such as:

- National Pollution Discharge Elimination System permit for liquid effluent outfalls.
- National Emission Standards for Hazardous Air Pollutants permit for radiological emissions to the air.
- Clean Air Act Title V Permit for non-radiological air emissions.
- Resource Conservation and Recovery Act permits for hazardous waste storage, treatment or disposal activities.
- Various construction and operating permits including permits obtained from the South Carolina Department of Health and Environmental Control (SCDHEC) and the EPA through application and, where appropriate, hearing processes.
- The EIS Record of Decision which includes decisions regarding purpose, need, and technical and site alternatives. A positive decision on the project-specific analysis of the environmental impacts of APT construction and operations will allow finalizing design and initiating site preparation and building excavation.
- After the National Environmental Protection Agency (NEPA) determination is complete, the environmental permit required for construction will be obtained.

6.6.5 Public Participation Plan

The Public Participation Plan (PPP) describes the process to obtain, consider and address community views and comments on the project.

6.6.6 Worker Protection Plan (later)

The basic regulations pertaining to worker safety are contained in Occupational Safety and Health Administration (OSHA) requirements that form the bases on which all other worker safety considerations are developed. In addition, the SRS maintains a Process Safety Management Program that accounts for all the elements of the OSHA Process Safety Management Program. Both OSHA and the Process Safety Management requirements will be taken into account. These elements will become the basis for a Worker Protection Plan. The APT Project will classify worker functions as safety significant with appropriate protection specified within the Technical Safety Requirements.

6.7 Safeguards and Security

The APT Project involves data and special equipment, which will require specific safeguards. The FDD and the SDDs contain guidance for the security-system design requirements. A Safeguards and Security Plan will be prepared during preliminary design and will be updated prior to the ORR. The Plan will describe the DOE requirements as well as the project compliance of the APT design such as access control, vaults, secure transfer lines and other S&S issues. It will also include the implementing administrative procedures.

6.8 Design Execution Plan

The Design Execution Plan (DEP) provides a description of the APT design process (see Section 3.3.1). It defines a generic workflow for each product or deliverable for each system within the scope of responsibility of the PPO. The DEP provides a logical, concise path for developing the design; defines interface requirements; and defines the Peer Review Process. The DEP initially emphasizes the Preliminary Design process. It will be revised to provide detailed description of the Final Design phase and will be further revised and expanded to provide for engineering support during construction.

6.9 Acquisition Plan

This Acquisition Plan provides a detailed system for procurement of equipment, supplies and construction services. The requirements will ensure equipment and material is delivered to the APT Project efficiently and timely.

6.10 Diversity Plan

The APT Project is committed to diversity in the work place. The Diversity Plan outlines the following specific commitments:

- Create and maintain an organization where employees are encouraged to work in an environment of inclusion.
- Follow Affirmative Action and Equal Employment Opportunity practices.
- Maintain a diverse organization, which effectively manages and value individual differences and encourage open participation.
- Encourage employees to value the diversity of others.

The Diversity Plan describes the actions to be taken to achieve the intended results.

6.11 Project Controls System Description

The Project Controls System Description (PCSD) describes the project management system utilized by the PPO. It will also serve as an orientation and training document for persons involved in the implementation and use of the system.

The PCSD provides an orderly systems framework to:

- Integrate contract work scope, schedule and budgets.
- Provide objective assessments and measurements of work accomplished against the baseline plan.
- Prepare timely and auditable reporting of cost, schedule and earned value of work performed, both current and cumulative.
- Present a vehicle for continuously updating estimates of cost at completion and funding requirements.

6.12 Resource Plan

The PPO Resource Plan will:

- Define the resources required to perform the contract scope.
- Establish the timing for the resources needs.
- Define resource allocation.
- Describe the process of attaining the defined resources.

The emphasis will be on establishing the staffing resources. However, the Resource Plan will also address other resources including Information and Document Management Systems, computer assisted Engineering and Design systems, and facilities and infrastructure.

7.0 Other Management Requirements

7.1 Reporting

The PPO is required to provide weekly activity highlights and monthly project wide integrated reports of progress, status and performance. The requirements for each are discussed below. In addition, performance and schedule reports are updated regularly to support management reviews.

The weekly highlight report will address important accomplishments and findings. The input should be factual, stress achievements and provide continuity from week to week. Problems will also be addressed and scheduled meetings for the coming week will be reported.

The integrated monthly status report for the APT Project will be compiled from all participant's input, edited and submitted to the Project Director for approval and final submittal to DOE. The monthly report will cover APT Plant and ED&D program status, progress and performance. The monthly report will have three parts plus attachments: Executive Summary, Technical Progress, and Performance. The progress will be reported at the WBS Level 2 with input provided to the WBS Level 2 designee. The performance will be reported at WBS Level 2, and at lower levels to adequately address performance and variances.

Emphasis should be given to decisions, conclusions, results, milestones and major achievements. Problems should be addressed with action plans defined for resolution and should be addressed in follow-on reports until a resolution is achieved.

7.2 Procedures

Procedures must be prepared to describe and control the PPO implementation of the assigned scope of work for APT. The procedures must satisfy the requirements of the approved plans and DOE requirements. Wherever possible, the APT procedures were adopted from procedures of projects similar to APT or from Corporate procedures of BREI or GA. PPO procedures that also apply to other project participants will be processed for their review and acceptability.

Attachment 1 – APT Statement of Work

Section J, Attachment A, Contract No. DE-AC04-96-AL89607

Accelerator Production of Tritium

STATEMENT OF WORK

August 20, 1997
(revised)

TABLE OF CONTENTS

1. INTRODUCTION

The Accelerator Production of Tritium (APT) program mission is to produce tritium with a fully operational accelerator plant based on associated accelerator, target/blanket, and tritium extraction development and demonstrations performed at LANL. The program will include a Prime Contractor, National Laboratories, and the Savannah River Site (SRS) Operator to prove the technology, define the design parameters, design, build, and commission the APT plant. The APT plant will be capable of producing up to 3 kilograms (kg) of tritium per year. The APT plant, to be built at the Savannah River Site, is to be operational no later than the end of fiscal year 2007.

2. BACKGROUND

Tritium is an isotope of hydrogen that is required for every nuclear weapon in the strategic stockpile. Without tritium, nuclear weapons will not work as designed. At present, no tritium is produced by the US for the stockpile of nuclear weapons. Radioactive decay depletes the available tritium by approximately 5.5% each year.

Since the end of the Cold War, the annual production requirement for tritium has decreased as the number of weapons in the stockpile has been reduced, leading to revised production requirements. In this context, by 1992, accelerators had become an attractive alternative to nuclear reactors for producing tritium. The APT alternative is attractive because of lower environmental, safety and health (ES&H) impacts compared to a reactor. Guidance from the Department of Energy (DOE) requires a tritium production plant design capacity of 3 kg per year. The DOE requires that the plant be capable of sustained, normal operation at a production rate within the range of 2 to 3 kg per year, capable of sustained operation at the higher 3 kg production rate averaged over five years, and have the ability to increase from a production rate of about 2 kg per year to a full and sustained 3 kg per year.

APT was reviewed by the DOE Energy Research Advisory Board (ERAB) in late 1989 and by the JASONs, an independent scientific review panel, in 1992 and 1995. Reviews of APT technology were positive and endorsed the need for a technology demonstration and design program. As a result, DOE/Defense Programs (DOE-DP) decided to sponsor an APT preconceptual design study. A multi-Laboratory and industry team worked from 1992-1994 on this preconceptual effort to support the DOE Programmatic Environmental Impact Statement (PEIS) for Tritium Supply and Recycling. Positive reviews of that work led to the announcement by the Secretary of Energy on October 10, 1995, of APT as part of the preferred alternative for the PEIS for Tritium Supply and Recycling. This program is a dual-track approach to pursue the design and construction of the APT system and to pursue the purchase or lease of an existing commercial light water reactor. The PEIS Record of Decision was signed on December 5, 1995.

3. SCOPE

The APT project is an effort to produce tritium efficiently and cleanly using a proton linear accelerator system, to secure a source of tritium for the Nation's stockpile of nuclear weapons.

The new APT plant includes but is not limited to the following four major systems:

- A linear accelerator that produces and directs an intense high-energy continuous wave (cw) proton beam to a tritium-producing target/blanket (T/B).
- A T/B facility in which the protons strike heavy metal targets, producing neutrons, that subsequently produce tritium in a feed stock.
- A tritium separation facility (TSF) that extracts, purifies, and processes tritium.
- A balance of plant (BOP) complex that houses these systems and supports their integrated operation.

The scope of this contract includes five phases: Engineering Development and Demonstration (ED&D); Conceptual Design (CD); Preliminary and Final Design (P&FD); Construction Management (CM); and Operation Test and Commissioning (OT&C) of the APT plant. The APT plant production, including operation and maintenance, system upgrades, and decommissioning and decontamination (D&D) of the facility are not within the scope of this statement of work, but plant design must include planning for D&D.

The APT Work Breakdown Structure (WBS), Section J, Attachment B of the Request for Proposal (RFP), is product-based, not activity-based. Thus, some WBS tasks combine ED&D and design activities. The APT Detailed Schedule, Section J, Attachment C of the RFP reflects the most current data and assumptions. A summary schedule is included in Figure 1.

The first two phases of the project include the ED&D Phase and the CD Phase. The ED&D Phase includes but is not limited to activities such as low-energy demonstration accelerator (LEDA) work, tritium production efficiency measurements, and materials certifications tests. The ED&D Phase includes engineering demonstration in support of design. The CD Phase involves CD formulation and documentation for all APT plant systems and equipment.

The next phase of the project includes P&FD of all APT plant systems and equipment. The CM Phase includes the management of fabrication, procurement, installation, inspection, and tests of various systems and equipment; site infrastructure development and construction; construction of the accelerator tunnel complex, T/B complex, TSF, and other civil structures.

The OT&C Phase includes commissioning of individual plant systems, groups of systems, and their integrated operation.

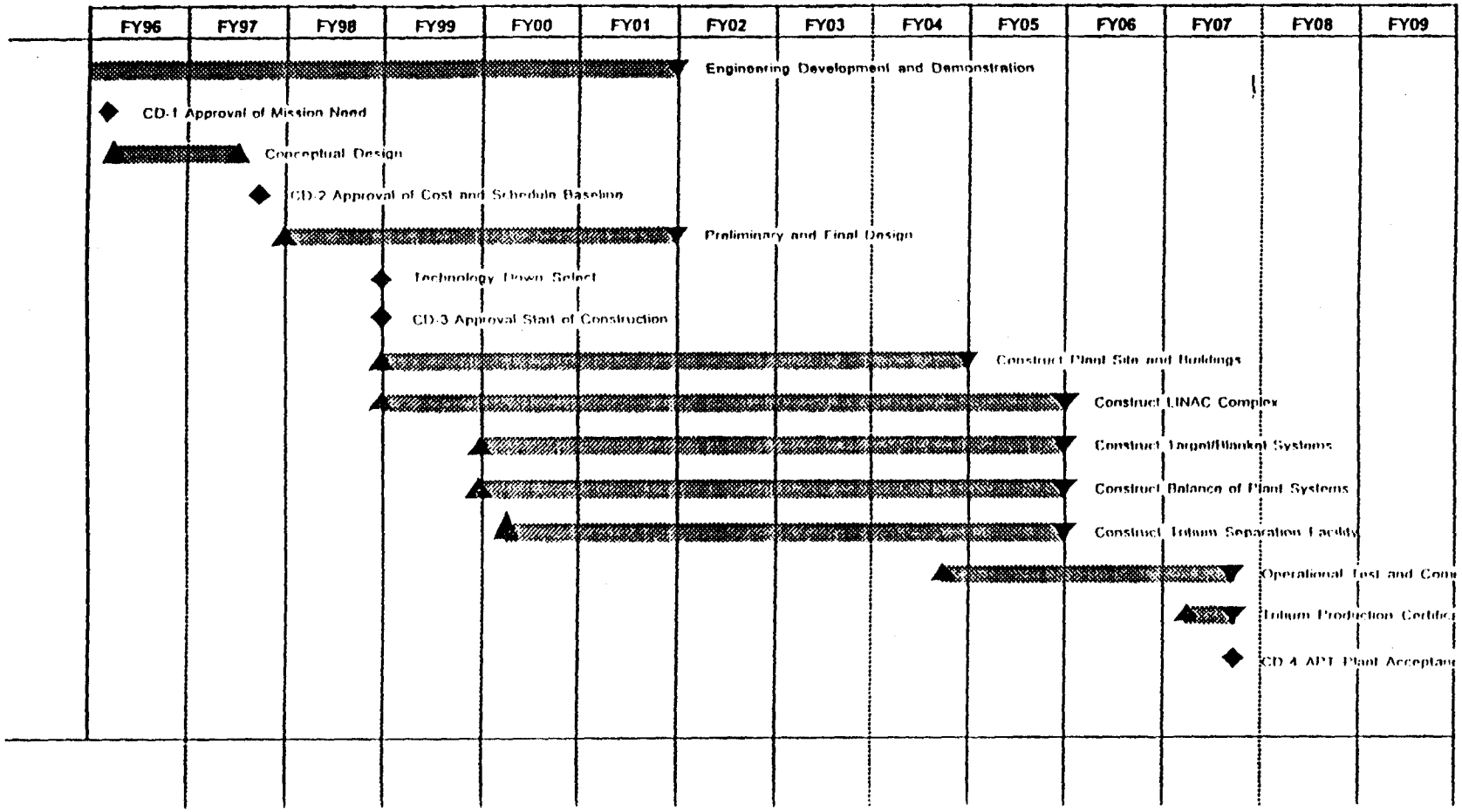


Figure 1. APT summary schedule.

4. ROLES & RESPONSIBILITIES

The APT project will involve the DOE, the APT Project Director's Office (PDO), National Laboratories, the Prime Contractor (referred to as the Contractor), and the SRS Operator. The DOE has responsibility for overall program management and project oversight. The specific DOE organizations charged with policy, management or oversight responsibilities include the Secretary of Energy (DOE-HQ), the Assistant Secretary of Defense Programs, the Tritium Project Office, the Office of Accelerator Production (OAP) and DOE/HQ. Field Office support from DOE-AL and DOE-SR will be provided as directed by DOE-HQ.

The PDO has responsibility for managing and executing the Project to ensure it fulfills the established mission and objectives under the direction of the APT Project Director. The PDO reports functionally to the APT Program Office, DP-61, DOE-HQ, and administratively to the Director of LANL. The PDO will serve as a single point of contact with the DOE for the Project and will be responsible for integrating, coordinating, and overseeing all activities associated with ED&D, conceptual design, P&FD, plant construction and commissioning, and tritium production certification. Project execution is implemented by three organizations whose leaders serve as deputy directors to the Project Director. The Technology Project Office (TPO) Deputy reports functionally to the APT Project Director and administratively to the LANL Director, and is responsible for ensuring that APT technology is adequately demonstrated for safe, efficient construction and operation. The TPO is the design authority for APT and will ensure that technical expertise is maintained throughout design, construction, commissioning and start-up. The Plant Project Office (PPO) Deputy reports functionally to the APT Project Director and administratively to BREI and is responsible for ensuring the plant is designed, constructed, and commissioned to meet the DOE tritium production requirement as in the APT Prime Contract and design requirements as provided by the PDO. The Operations Project Office (OPO) reports functionally to the APT Project Director and administratively to WSRC. The OPO will provide site-specific, operability and maintainability support throughout the Project by providing input to design. The OPO will be responsible for the long term operation and maintenance of the plant.

5. TECHNICAL REQUIREMENTS

The Contractor will provide technical support and lead particular tasks. as noted. The remainder of this document describes the technical requirements for the APT project. organized according to the phase of work: Engineering Development & Demonstration (ED&D): Conceptual Design (CD); Preliminary & Final Design (P&FD); Construction Management (CM); and Operational Test & Commissioning (OT&C) of the APT plant. The ED&D and CD Phases are performed on a level of effort authorized by task assignments. These two phases run concurrently.

In general. technical support to the project includes but is not limited to engineering design and analysis. support of procurements and fabrication. installation. testing, analysis. special studies, and commissioning capabilities. Lead on particular tasks involves leading efforts to accomplish items described in the Task Requirements.

The quantification of power. current. energy, frequency. and other parameters are provided throughout this SOW as approximate numbers and represent conceptual design as of July 1997. These numbers and designs are expected to change during the ED&D and P&FD Phases.

Pictured in Figure 2 is the functional layout of the APT Plant.

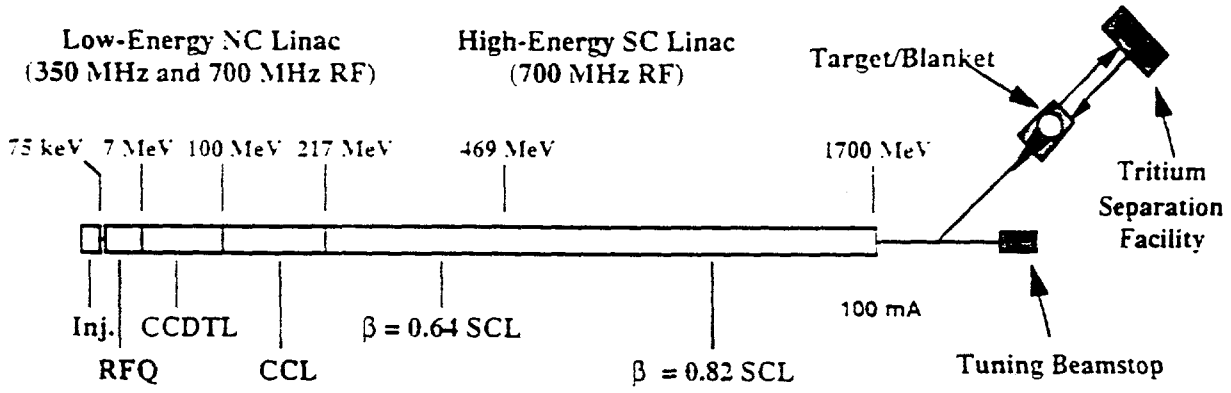


Figure 2. Functional Layout of APT Plant.

5.1 Engineering Development and Demonstration Phase

Contractor involvement in the ED&D Phase of the APT Project includes technical support to the TPO on a level-of-effort basis. The Contractor will begin by integrating into the TPO team during this phase.

The largest segment of the ED&D Phase is the development and testing of LEDA. The objective of LEDA is to build, test, commission, and operate an integrated front end linac representative of that part of the APT accelerator at full cw power but at low energy. Other elements of the ED&D Phase include development and testing of cw high-power radio-frequency (RF) components; coupled-cavity drift-tube linac (CCDTL) structures, specialized RF cavities (low-power modeling and testing at full RF field amplitude); more efficient high-power RF tubes; superconducting radiofrequency (SCRF) technology applicable to the high energy linear accelerator sections of the APT; and funneling technology (optional).

As these elements are developed, changes are expected in the baseline APT accelerator design. For example, during the Conceptual Design phase, successful SCRF cavity and coupler tests lead to the replacement of the high-energy (HE) room temperature radiofrequency (RTRF) conventional linac design with one based on SCRF cavities.

A prototypic beam expander will be installed in an existing target area at the Los Alamos Neutron Science Center (LANSCE). Efforts to prototype key target/blanket components are also planned.

5.1.1 Low-Energy Demonstration Accelerator

LEDA Summary

The LEDA activities will demonstrate full-power operation of the most challenging part of the APT accelerator, confirm system availability and component reliability, confirm beam parameters, provide experimental determination of the beam halo distribution, and provide information for design of the HE accelerator and beam transport systems.

The low-energy (LE) accelerating system, as currently defined, consists of the following accelerating structures and support systems:

- A microwave-driven injector producing a 110-mA continuous proton beam at an energy of 75 keV.
- A multi-section 350-MHz radiofrequency quadrupole (RFQ) linac that accelerates a 100-mA beam at 100% duty factor to an energy of 7 MeV.
- A 700-MHz CCDTL that accelerates the 100-mA continuous wave (cw) beam to a nominal energy of 20 MeV.

The first stage of LEDA work will test the injector and RFQ. The second will test the combination of injector, RFQ, and a section of CCDTL up to 20 MeV.

The LEDA design will overlap to a high degree with the design of the APT plant LE accelerator so that when completed, LEDA will represent all the major segments of the LE accelerator. The only part of the LE accelerator not built as part of the current plan for LEDA is the CCDTL section from 20 MeV to 100 MeV. The design of the LE linac is a straightforward extension of the LEDA design, involving no new accelerating structure elements.

An accelerator control system will integrate the various subsystems in the LEDA complex. The unique requirements of each will be met with a common architecture for control-system hardware and software. Input/output controllers will be located throughout the LEDA complex to acquire data, automate most accelerator operations, and integrate the accelerator with the rest of the LEDA complex. Operation of the accelerator will be conducted from a central control room. The operator consoles will provide information on accelerator operation and allow changes to control parameters. Demonstration of this control system will provide design information for the plant Instrumentation and Control (I&C) system.

In addition, LEDA has auxiliary systems and equipment including but not limited to accelerator and HEBT vacuum systems, accelerating-structure and magnet support stands, alignment systems, and beam diagnostics systems.

All components of LEDA will remain at LANL after the demonstration program to provide a continuing technology insertion test-bed for the APT plant accelerator system, and to support training for APT plant operations staff.

Task Requirements

The Contractor shall integrate into the ED&D activities and provide technical support to the TPO in design, procurement, fabrication, installation, testing, analysis, construction, and commissioning of LEDA components, including the CCDTL accelerating structures, linac, beam transport focusing magnet assemblies, the vacuum system, mechanical support assemblies, beam diagnostics and controls.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.
- Build-to-print drawing package of the plant LE linac.

5.1.2 High-Energy Room-Temperature and High-Energy Superconducting Radiofrequency Linear Accelerator

HE RTRF & HE SCRF Linac Summary

The APT plant HE accelerating system will consist of 700-MHz linac accelerating structures that are needed to accelerate a 100-mA proton beam to full energy, nominally 1.7 GeV, from an initial energy of 100 MeV. The baseline technology for the HE part of the accelerator up to 217 MeV is a room temperature (RT) copper side-coupled linac similar to the 800-MeV LANSCE accelerator at LANL. The RT copper structures are cooled by water, the temperature of which is tightly regulated to maintain the correct resonant frequency in the accelerating cavities. The side-coupled

cavity chains are alternated with intertank assemblies containing focusing magnets, beam diagnostics, and isolation valves.

The ED&D work for the HE accelerator includes but is not limited to low-power physics modeling of the short-tank structure design, high-power RF tests of a prototype CCL accelerating module (without beam), and an SCRF technology program to demonstrate the SCL (Superconducting Cavity Linac) modules used in the APT HE linac. The baseline HE accelerator is based on groups of niobium (Nb) superconducting cavities operating at accelerating gradients of 5-7 MV/m, with negligible RF losses in the cavity walls.

The SCRF technology program consist of several steps, including the following:

- Fabrication and high-gradient testing of several single-cell Nb cavities (designed for intermediate-velocity proton beams).
- Fabrication and testing of high-power couplers for SCRF intermediate-velocity cavities using a resonant-ring RF test station to provide the required power flow.
- Fabrication and high-field testing of two or more multi-cell SCRF cavities that are prototypes for an SCRF version of the HE accelerator.
- Tests of multi-cell prototype SCRF cavities and couplers in beam cryostats at full power, using resistive loads to simulate the beam.
- Evaluation of radiation damage of a prototype Nb cavity and Nb samples.

Task Requirements

The Contractor shall provide technical support to the TPO for the HE RTRF and HE SCRF linac activities.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.3 High-Energy Beam Transport System & Equipment

Task Requirements

The Contractor may be required to provide technical support to the TPO involving the beam expander tests at LANSCE Area C.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.4 Radiofrequency Power Systems

RF Power Summary

The APT accelerator RF power system presently includes the 350-MHz RF systems that provide radiofrequency power to the RFQ(s), and the 700-MHz systems that provide radiofrequency power to the low-energy (20-MeV) CCDTL, the medium-energy (100-MeV)

CCDTL, and the normal and superconducting sections of the CCL. There are three 1-MW 350-MHz cw systems for each RFQ, and approximately 234 1-MW 700-MHz cw systems to power the rest of the accelerator.

In the baseline accelerator design, each RF station consists of a 1-MW klystron and modulator, a circulator and resistive load, waveguide connections to accelerating cavity module and between the circulator and load, a high-voltage power supply, low-level controls, a crowbar, and diagnostics. The RF control system maintains field amplitude and phase in the accelerating cavities to a tolerance of ±1% and ±1°, respectively, using feedback and feedforward circuits. Multiple RF stations supply RF power in parallel through separate ports to a long resonantly coupled section of the accelerator referred to as a "super-module." The accelerating section, which acts as a power joiner, can operate with the correct field amplitude using only $n-1$ of the n klystrons feeding it. If any individual klystron fails, it can be isolated from the cavity by a waveguide switch, and its output is made up by the idle klystron in each supermodule. Thus accelerator operation can continue while the failed unit is replaced or repaired.

The 350-MHz 1-MW klystrons are available as catalog items from several electron-tube vendors. The 700-MHz 1-MW klystron is within the standard design space, but will be a new tube, and will require development of a production prototype.

This phase will also include the development of an advanced, high-efficiency, 1-MW cw RF generator for the 700-MHz RF stations, using a scheme based on the principles of the inductive output tube. If development of this tube is successful, it will replace the conventional klystron in the baseline design, with an estimated improvement in electrical efficiency of about 20%, plus other technical advantages.

This phase will also include the testing of several other key RF system components, including high-power windows and couplers, and high-reliability, high-efficiency, high-voltage dc power supplies.

Task Requirements

The Contractor shall provide technical support to the TPO for RF power activities.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.5 Linear Accelerator Auxiliary and Beam Diagnostics Systems and Equipment

Linac Auxiliary & Beam Diagnostics Summary

Linac auxiliary systems and equipment includes but is not limited to accelerator and HEBT vacuum systems, accelerating-structure and magnet support stands, alignment systems, and beam diagnostics systems.

There will be a vacuum system for the accelerating structure modules and connecting beam pipes, and the HEBT. It will consist of ion pumps to maintain the operating vacuum, high-throughput

turbomolecular pumps to exhaust the air during initial pumpdown, vacuum valves, manifolding, piping, and vacuum gauges. The support stands mount the accelerating modules and magnets in the tunnels, and include alignment fixtures for the precision adjustment of transverse and longitudinal position of these elements.

The beam diagnostics system includes but is not limited to a large number of sensors and processing electronics distributed along the accelerator and HEBT that provide information on beam properties and performance. The diagnostic elements measure transverse beam position, beam intensity, relative bunch phase and bunch width, beam quality and beam halo. There is one position measuring unit in each quadrupole magnet in the linac and HEBT.

Vacuum, mounting, and alignment systems for the APT accelerator are all standard components and require no development. Most of the LEDA beam diagnostics in the APT linac fall into this category. There is a small number of specialized beam diagnostic systems, such as profile, bunch length, that will require some extension from current hardware. Development and demonstration of these diagnostics are part of the LEDA program.

Task Requirements

The Contractor shall provide technical support to the TPO for linac auxiliary and beam diagnostics activities. The Contractor support for this activity will be priced under WBS 1.06, Linac.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.6 Target/Blanket Materials Studies

Task Requirements

The Contractor may be required to provide technical support to the TPO.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.7 Target/Blanket Methods Development and Benchmarking

Task Requirements

The Contractor may be required to provide technical support to the TPO.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.1.8 Target/Blanket Engineering Development

Task Requirements

The Contractor shall be responsible for T/B activities which include the following: weld development, hot flow tests, flow distribution tests, corrosion tests, spallation products

purification tests; T/B instrumentation qualification, development of remote handling components and procedures. These activities will be scheduled to coincide with the T/B P&FD efforts.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.
- Hardware to support the T/B engineering development tests.

5.1.9 Tritium Separation Facility Systems and Equipment

Task Requirements

The Contractor may be required to provide technical support to the TPO and OPO.

Deliverables

- Test plans, drawings, analyses, and reports to support Task Assignments.

5.2 Conceptual Design Phase

The TPO will led preparation of the initial CD Report (CDR). In addition, the TPO provided initial data necessary to support validation of FY 98 capital funds. The TPO and Contractor-furnished plant design criteria, functional performance requirements, and design basis using the preconceptual studies and initial ED&D results for the Accelerator, T/B, TSF for the CD. Changes from the design basis for the accelerator, T/B, and TSF shall be approved by the TPO.

The Contractor's primary responsibility in the CD Phase is to review and accept the CD. The CDR will be self-standing, complete, and consistent, so that it allows independent reviewers to assess the proposed design. The Contractor will track, coordinate, and document responses to all questions generated during the CDR reviews. The CDR will establish the project baseline for a detailed scope, cost, and schedule. The CDR and supporting documentation will enable reviewers independently to verify cost estimates prepared by the Contractor.

The Contractor will provide support in conducting performance/cost/benefit analyses, system engineering, design and analysis of components, producibility analysis, reliability analysis and derivation of a comprehensive cost estimate for the APT plant.

The TPO will present and defend the Conceptual Design, working with the Contractor, at design review meetings. These meetings will be organized by the PDO during the Conceptual Design. The Contractor will provide access to the complete work package at the time of reviews and assist technical reviewers. The Contractor will be responsible for addressing technical and project management issues and documenting resolution through the project control process.

The Contractor will support formulation of TPO designs to ensure that CDR scope is properly reflected in cost estimates and schedules. The Contractor will support the TPO in scoping and trade studies to evaluate alternative systems and equipment designs that meet mission goals and functional performance, but minimize capital and operating/maintenance costs, and improve APT plant safety, reliability, and equipment lifetime. Trade-off analyses will include a cost-benefit analysis. The Contractor will support the TPO in establishing a formal design downselect process to provide the basis and traceability for selection of the most compatible combination of design attributes for conceptual design of plant systems and equipment.

For all elements of CD Phase work, the Contractor will establish a document control system so that the conceptual design drawings produced by the Contractor and the PDO are controlled and easily retrievable. The document control system will include major subsystems conceptual design descriptions, basis for conceptual design selection, supporting engineering studies, calculation notes, drawings and line diagrams, equipment conceptual engineering parameter lists, equipment conceptual design specifications and drawings, and any other relevant documents as noted below.

The CDR shall include the following:

- Drawings produced on Computer Aided Design Drafting system that is compatible with LANL and SRS systems and is approved by DOE.

- Text to include definition of regulations, codes and standards used, system descriptions, cost estimates/material quantities, and alternatives investigated.
- Text to include mission requirements, functional performance criteria analysis, functional performance allocation, documentation of systems, and equipment functional parameters.
- Civil design information to include a site plan with building, parking contours, utilities requirements, and appropriate landscaping.
- Architectural information to include floor plans with overall dimensions, exterior elevations, and building sections.
- Structural design information to include accelerator tunnel complex design, T/B building design, TSF design, and remote handling/maintenance facilities design.
- Mechanical design information including process and instrumentation diagrams (P&IDs), with equipment layouts, mechanical equipment room plans with major equipment layout, and a preliminary process piping layout.
- Electrical design information to include floor plans with preliminary electrical equipment layout, one-line diagrams with power source identification, a grounding diagram, a lightning protection diagram, preliminary I&C diagrams, and a list of major materials and equipment.
- Designs to make maximum practical use of existing SRS infrastructure in order to reduce costs.
- Technical assessments including ES&H and licensing issues.
- Planning for D&D during the design of APT systems.

At the end of the CD Phase, the Contractor will assist with the update of Construction Project Data Sheets and inputs, including scope, schedule, and cost.

5.2.1 Site and Buildings

Task Requirements

The APT site improvements include but are not limited to land improvements (including security fence); roads (both site access and inside site), parking and paved areas; transportation access; electric power supply, including incoming switchyard, transformer yard, switchyard; utilities (gas, water, sewage); and other site preparation activities.

The Contractor will establish site improvements and yardwork functional requirements; develop site improvements and yardwork plans; develop manpower resources; and schedule plans to meet site preparation deadlines.

The Contractor shall work with the TPO and the SRS Operator to ensure that the site is developed to meet the technical specifications of the future buildings and structures. Alternative plans shall be developed to accommodate changes in the accelerator tunnel length to meet changing production goal requirements and/or to accommodate the results of the ED&D activities.

The Contractor shall develop detailed descriptions and site plans for each of the major subsystems.

The Contractor shall plan site preparation work with SRS Operator and obtain site access and transport permits for all machinery and earth-moving equipment.

The conceptual design of the APT buildings and structures shall include the engineering design of the following systems and equipment:

- T/B Building Complex, including the Target Building, Piping Tunnels, Passive Cooling Heat Exchanger Structure, Radioactive Waste Processing Facility, and other related structures systems.
- Accelerator Complex including the Accelerator Tunnel and Access Shafts, Accelerator Klystron Gallery, Front-end structure (Injector Building), and Accelerator Cooling Tower Structure.
- Tritium Separation Facility.
- Other plant site facilities including a Klystron Remanufacturing & Maintenance Facility, Cryogenic Systems /Facilities, Warehouse & Maintenance Facility, Administration Building, Main Guard Station, Simulation and Training Building, ES&H Building, Remote Handling Building, T/B Building Access Control Facility, T/B Mock-up Training Building, Operations Building and an Equipment Test Laboratory and Shop. The Equipment Test Laboratory and Shop includes an accelerating structure integration and tuning shop, a magnet field mapping and acceptance testing facility, a vacuum components (pumps, valves) acceptance and testing facility, a facility for acceptance testing of beamline diagnostics sensors, an RF-station integration and testing facility, and other specialty shops and facilities as required, such as for vacuum, alignment, and diagnostics integration and testing. This lab/shop may be a centralized facility and/or multiple facilities distributed along the tunnel.
- Electrical Auxiliary structures including the Emergency Power Building, Office Building, Service Building and associated power distribution switching and filtering structures.
- Water Auxiliary Buildings include the Water Treatment Building, Waste Treatment Building and Water Towers.
- Other office and administrative facilities.

The Contractor shall perform all the civil, architectural, electrical, mechanical and structural design, modeling and analysis tasks necessary for the development of an engineered, optimized, conceptual design of the APT buildings and structures. The Contractor shall have access to the TPO for additional capabilities in structural response analysis. The Contractor shall make design changes, such as reinforcement of enclosures, anchoring, and support of internal components, in the final revision of the conceptual design, if required by these analyses. Analysis shall cover mission requirements, functional performance criteria analysis, functional performance allocation, and documentation of APT buildings and structures functional parameters.

During this phase, the Contractor shall develop detailed cost and schedule estimates and design criteria packages. Where necessary, original work in this area completed by LANL and WSRC, will be reviewed and adapted by the Prime Contractor.

Deliverables

- Final CDR package for buildings and structures and site improvements and yardwork, and cost and schedule estimates for remaining phases of the project.
- Supporting CDR documentation including Design Criteria, Functional Performance Requirements, and supporting analysis.

5.2.2 Accelerator Systems and Equipment

Task Requirements

The TPO will perform overall accelerator conceptual design, including beam physics, initial engineering, and performance/cost tradeoffs. The TPO will define the technologies and components of the accelerator system, including accelerator architecture, accelerating structure types and modularization, focusing system configuration, RTRF and SCRF technology, RF power system configuration and generator types, beam diagnostics, control systems, and safety and protection systems.

Conceptual design of the LE linac is a straightforward extension of the LEDA design, involving no new accelerating structure elements.

Baseline conceptual design for the HE accelerator, using normal-conducting (copper) cavity technology, will be developed in parallel with LEDA. The TPO will develop the HE superconducting accelerator and beam transport conceptual design.

Conceptual design of the APT plant RF power system may be revised based on results of the ED&D program. System modifications may be introduced to accommodate the use of more efficient RF generators.

The Contractor shall support component analyses such as RF performance, electrical performance, thermal, stress, materials compatibility, vacuum system performance, and mechanical behavior. The Contractor shall provide support for revisions of the linac system resulting from the ED&D program.

The Contractor shall work with the TPO and with the RF vendors to plan for production of large numbers of complex key components, such as tubes, circulators, and windows.

During this phase, the Contractor shall develop detailed cost and schedule estimates and design criteria packages.

Deliverables

- Final CDR package for the accelerator systems and equipment including cost and schedule estimates for remaining phases of the project, adapting as necessary information provided by the TPO.

- Supporting CDR documentation including Design Criteria, Functional Performance Requirements, and supporting analyses.

5.2.3 Target/Blanket Systems and Equipment

Task Requirements

For the T/B assembly, the TPO led conceptual design of the primary neutron source and tritium-producing blanket for both the primary ^{3}He system and the LiAl backup system. It is not anticipated that the LiAl T/B will be developed past the CD Phase.

The Contractor shall support refinement of the T/B design, assist in the development of design requirements for T/B systems and equipment, and help complete conceptual designs. The Contractor shall provide design input with respect to fabricability, maintainability, operability, reliability, and component specifications and on design requirements, with the concurrence of T/B design and safety teams. The Contractor shall incorporate T/B materials and corrosion studies information.

The Contractor shall lead the design of the T/B primary coolant systems. The Contractor shall support investigation of coolant cleanup methods for primary and auxiliary heat removal systems. The TPO will develop the heat loads and safety requirements for the heat removal systems, including the auxiliary system and provide those results to the Contractor, who shall use them to update the pre-conceptual design and produce a conceptual design.

The TPO will develop changeout intervals for components that will need to be replaced, the level and type of radioactivity, and component decay heat. The Contractor shall use that information to develop the conceptual design of the storage area and cooling and monitoring designs. The T/B design shall include features to allow for disassembly and maintenance of components.

The LE beam stops and support equipment includes but is not limited to a 20-MeV and a 100-MeV beamstop, as well as a backshine neutron dump. TPO will led the physics and conceptual design efforts for the beam stops. The Contractor shall support design for the beam stop assembly and support equipment. The Contractor shall be responsible for identifying and designing support equipment.

TPO will develop the instrumentation and controls (I&C) requirements, including safety systems. The Contractor shall develop instrument and control system layouts, and develop trip system logic and incorporate it into the overall APT plant I&C design.

During this phase, the Contractor shall develop detailed cost and schedule estimates and design criteria packages.

Deliverables

- Final CDR package for T/B and related I&C systems, including cost and schedule estimates for remaining phases of the project, adapting as necessary information provided by the TPO.

- Supporting CDR documentation including Design Criteria, Functional Performance Requirements, and supporting analyses.

5.2.4 Tritium Separation Facility System and Equipment

Task Requirements

The TPO will define the technologies for tritium processing, including tritium extraction, purification and isotopic separation from hydrogen, and tritium safety systems, including tritium waste treatment systems, monitoring systems, air detritiation systems, and containment/confinement systems for the TSF.

Because the LiAl T/B is considered a backup, no conceptual design effort on a LiAl TSF is required.

The Contractor shall provide technical support to the TPO for the conceptual design.

The Contractor shall provide support for trade/sensitivity studies to select the baseline technologies for tritium processing and tritium safety systems. The trade/sensitivity studies will assure that chosen technologies provide the most efficient and cost-effective tritium processing system. Criteria to be used in determining the "best" technology include, but are not limited to, efficiency of separating tritium from ^{3}He, tritium inventory in the ^{3}He, simplicity of operation, demonstrated reliable tritium operations, process hazards and safety, and capital and operating costs.

During this phase, the Contractor shall develop detailed cost and schedule estimates and design criteria packages.

Deliverables

- Final CDR package for the TSF complex, including cost and schedule estimates for remaining phases of the project.
- Supporting CDR documentation including Design Criteria, Functional Performance Requirements, and supporting analyses.

5.2.5 Balance of Plant

Task Requirements

The OPO is responsible for all electrical and mechanical design, modeling, and analysis tasks necessary to develop an engineered, optimized, conceptual design of the Balance of Plant (BOP) systems and equipment. The Contractor will support the OPO in this task. This task includes but is not limited to the following:

- Electrical systems and equipment:
  - switchyard layout and equipment
  - high-voltage ac distribution system including substations and substation internal equipment

  - individual converter stations and internals
  - converter equipment:
  - high-voltage dc distribution systems
  - emergency on-site power supply system, equipment and distribution
  - low-power ac distribution systems and equipment
  - local switchboards and load control systems and equipment: and grounding, lightning, and cathodic protection equipment
- Heat-rejection systems and equipment:
  - Secondary and tertiary (to ultimate heat sink) heat-rejection loops for all of the accelerator sections. The accelerator cooling loads include the accelerating structures, magnets, RF systems loads and accelerator support systems
  - T/B auxiliary secondary and tertiary heat-rejection loops for the neutron source and blanket assemblies, a beam entrance window, beamstop, spent target pools, and target and beamstop shielding
  - TSF auxiliary secondary heat-rejection loops
- BOP miscellaneous systems and equipment:
  - water treatment system and distribution
  - radioactive and nonradioactive waste treatment systems
  - HVAC systems
  - chilled-water system
  - domestic water supply system
  - compressed air system
  - fire protection system
  - liquid nitrogen system
  - other systems identified in the course of the conceptual design
- BOP integrated instrumentation and controls:
  - Integrated APT plant control systems and equipment for the accelerator complex, T/B complex, and TSF complex and other systems

During this phase, the Contractor shall develop detailed cost and schedule estimates and design criteria packages.

Deliverables (Provided by Contractor and SRS staff in order to satisfy schedule)

- Final CDR package for BOP systems and equipment, including cost and schedule estimates for remaining phases of the project.
- Supporting CDR documentation including Design Criteria, Functional Performance Requirements, and supporting analyses.

5.3 Preliminary & Final Design Phase

The Contractor shall continue to work with the TPO to integrate the ED&D results and update the APT design basis from the conceptual design baseline and throughout the design phase to ensure that systems, subsystems, and equipment interfaces are identified, tracked and documented, and that APT functional requirements are optimized at the subsystem and equipment level. The Contractor will complete the preliminary and final design of the APT plant. The TPO will maintain design authority for all technical aspects of the Accelerator, T.B, and TSF systems, consistent with the APT Project Execution Plan.

The Contractor shall develop complete engineering packages that will be used to operate, maintain, and upgrade APT systems during the lifetime of the APT plant, including detailed System Design Descriptions (SDDs) for each major facility subsystem, with appendices and supporting documentation. These SDDs are to be consistent with facilities requirements specified in the Facility Design Description (FDD), and to be developed jointly with the TPO, which also serves as the Design Authority, and the OPO. The APT plant operations and maintenance procedures, engineering modifications, and training packages will be based on the comprehensive set of information in the SDDs and the FDD. The SDDs will be self-standing and comprehensive to facilitate independent design and future engineering modifications. The Contractor shall assemble and edit all sections of the SDDs, including compilation and editing of supporting documentation and references as a series of appendices. All official versions of the SDDs are to be archived as official SDDs are updated.

The Contractor shall incorporate information from conceptual design and relevant tests into preliminary and final design, along with any baseline changes and maintain an ongoing interface with design teams for other disciplines and systems. The Contractor shall develop fabrication, assembly, integration, and testing plans in concert with the TPO.

The Contractor shall implement a formal document control and design-change process. Documentation includes preliminary and final designs, including, basis for design selection, supporting engineering studies, calculation notes, drawings and line diagrams, equipment engineering final parameter lists, equipment specifications and drawings, final construction drawings, construction specifications, and other supporting materials.

The Contractor shall ensure consistency between trade studies and detail design. The Contractor shall perform additional trade studies as necessary to optimize functional performance and life cycle cost. Reliability, Availability, Maintainability & Inspectability (RAMI), and QA. The Contractor shall establish a documentation process with the PDO to provide the basis and traceability of the optimized APT plant systems and equipment P&FD.

The Contractor shall present and discuss the preliminary and final designs at design review meetings. The Contractor shall provide access to the complete work package at the time of the reviews and assist technical reviewers.

The Contractor shall address and resolve technical and project management issues, documenting their resolution through the design control process.

The TPO and OPO will provide support as GFS to the Contractor in the areas of the accelerator, T/B, and TSF systems for the following:

- The majority of the physics designs, and the accompanying dose rate and activation calculations.
- Accelerator physics, including cavity physics and beam physics.
- Physics and system analysis of the cavity/beam/RF drive interaction, beam diagnostics architecture, and similar design aspects.
- Overall RF system design, including RF system performance analysis, response to transients, fault recovery mechanics.
- Overall T/B configuration.
- Beam optics and modification of field specifications of the beam transport elements.
- Technical and engineering input for TSF design activity.

Task Requirements

The Contractor shall develop and deliver preliminary and final designs for site improvements and yardwork for each of the site subsystems and other site preparation activities. The Contractor shall integrate all design and planning tasks, planning and coordination with the SRS Operator and DOE/SR. Designs shall make maximum practical use of existing SRS infrastructure in order to reduce costs. The Contractor shall develop preliminary and final designs for the APT buildings and structures.

The Contractor shall lead preliminary and final engineering and design for accelerator, T/B, and TSF auxiliary systems. The Contractor shall work with the TPO/OPO teams to assure proper integrated systems function and compatibility, and shall optimize component design for life cycle cost, function and producibility.

The Contractor shall be responsible for the production of large numbers of key system components such as the RF power system and the accelerating structures. The Contractor shall develop final specifications for other components such as vacuum systems, alignment fixtures, and beamline diagnostic sensors.

The Contractor shall develop detailed preliminary and final BOP designs including the electrical systems and equipment, heat-rejection systems and equipment, BOP miscellaneous systems, BOP integrated controls system, and Integrated APT plant control systems and equipment.

Design of the facility-wide controls will be coordinated with the SRS Operator.

The Contractor shall plan for D&D during the design of APT systems.

The Contractor shall develop a design review process that provides review and approval of the design by the Design Authority, consistent with the Project Execution Plan.

Deliverables

- P&FD package, SDDs, construction documents and cost and schedule estimates for the entire plant including the following: Site improvements and yardwork; APT plant systems and equipment; Accelerator systems and equipment; T/B systems and equipment; BOP systems and equipment.
- Design Specifications and Criteria for Contractor and subcontractor designs.
- Value engineering studies on structures, systems, and equipment.
- Energy management analysis and reviews.
- Procurement and Bid Packages.
- Coordination of facility-wide controls with SRS Operator.

5.4 Construction Management Phase

The Contractor, as the construction manager, shall be responsible for all construction activities including inspection and approval for installation. The Contractor will serve as the construction manager, subcontracting the equipment fabrication and construction activities. The Contractor shall maximize subcontract competition for all APT systems, subsystems, assemblies, subassemblies, equipment, components, and parts.

Task Requirements

The Contractor shall be responsible for managing the construction at the site, preparation and construction of all APT buildings, and other civil structures, including building beneficial occupancy permits.

The Contractor shall be responsible for procurement, fabrication, installation, and inspection of all accelerator components including the RF power system and accelerating structures, beam transport, T B, beam stop, TSF, and BOP components and equipment. The Contractor shall test subsystems to ensure that they comply with functional performance requirements and specifications. The Contractor shall address technical issues resulting from audits, and shall document corrective actions. The Contractor will lead the construction inspection and testing activities in addition to leading engineering support activities during construction. The Contractor will manage the configuration management program, and will resolve technical issues including equipment functional interfaces resulting from changes during construction and/or equipment fabrication.

Deliverables

- APT site improvements.
- Fully operational APT buildings and other civil structures.
- Staged, integrated beam turn-on, test plans, and commissioning plans and schedule.
- Training plan and schedule.
- Schedule and cost updates for procurement, fabrication, inspection, and installation of components and systems.

5.5 Operational Test & Commissioning Phase

The Prime Contractor will be responsible for APT plant commissioning. The Contractor, with input from the TPO and OPO, shall finalize operational test plans, training plans, and procedures developed during the CM Phase to assure the operability of components, subsystems, systems and the integrated APT plant. These test and training plans and procedures will be reviewed and approved by the TPO, the SRS Operator, and DOE. The functional performance acceptance criteria for the APT plant will be developed by the TPO and approved by DOE and supported by the SRS Operator and Contractor.

The Contractor has responsibility for the following:

- Allocation of plant functional performance criteria to system-level to develop system functional performance criteria and procedures.
- Subsystems and integrated systems functional performance procedures.
- Auditable commissioning process.
- Commissioning of all APT systems and equipment.
- Testing and commissioning results and database for all of APT systems.
- Planning and conducting an operational readiness review, in cooperation with the OPO.

The Contractor will be expected to deliver the operating APT Plant with the operator's employees in place, trained, qualified, and fully capable of operating the APT Plant. It will be necessary to initiate training activities during the latter stages of the Construction Phase to accomplish this.

Task Requirements

The Contractor has responsibility, with support from the TPO and the SRS Operator, to issue a staged, integrated beam turn-on and accelerator commissioning plan developed during P&FD; a staged RF power system turn-on and commissioning plan; and carry out measurements and tests necessary to bring all systems into a state of readiness for turn-on. Working with the TPO and the SRS Operator, the contractor shall test and commission the accelerator, T/B and beam stop, TSF, and BOP systems and equipment for the APT plant. The Contractor shall maintain the configuration management program to reflect the as-commissioned state of the plant.

The Contractor shall support the establishment of a materials surveillance program.

The Contractor, with technical support from the TPO, shall develop a comprehensive training package with the SRS Operator and provide comprehensive, on-the-job training for operators and maintenance personnel.

The Contractor shall develop a plan for staged turnover of completed and tested systems of the plant to the SRS operator. The Contractor shall be responsible for testing the integrated APT plant during the OT&C phase, prior to turnover to the SRS operators.

Deliverables

- An APT plant that meets acceptance specifications.
- Procedures, analyses, and reports to support plant operations.
- Documented approval to begin operations.

5.6 Project Management and Support Activities

The Contractor shall develop and implement a single formalized project management system to collect, track and integrate project cost, schedule and scope information from all participants including the PDO, TPO, OPO, and PPO. The formalized management processes will apply a graded approach to the expenditure of effort, resources, and funding. Key factors in the graded approach to determine appropriate management levels include safety and health risk, security, environmental consequences, regulatory compliance, complexity, cost risk, and schedule risk.

The Contractor shall support all APT project activities, including ED&D through OT&C with the project management system. The Contractor shall assume plant project management responsibility and oversee subcontractors and design and schedule interface, holding responsibility for design management.

5.6.1 Project Management

Task Requirements

Contractor project management systems will be consistent with DOE Project Execution Plan (PEP), DOE project management guides, and supporting documents.

The Contractor shall update, expand, and maintain the PEP and supporting documents and obtain appropriate approvals for all changes. The Contractor shall work with the PDO and TPO to fully develop and implement a technical resolution process, documented in the APT PEP to ensure that all major technical changes have received appropriate agreement.

The Contractor shall review, modify, and update the WBS. The Contractor shall implement a detailed, integrated project schedule and cost management system.

The Contractor, working with the TPO, will develop and support a system engineering design process to ensure that systems interfaces are identified, tracked, and documented, and that systems and equipment functional requirements are optimized. Systems engineering tasks during this phase will cover functional performance analysis, including definition of systems performance requirements, requirement allocation analysis at system and subsystem level, functional analysis including identification and tracking of functional interfaces, systems performance modeling and evaluation and design evaluation support. Lead responsibility for definition and allocation of functional performance requirements will reside with the TPO during this phase. The Contractor will provide support to the TPO in all systems engineering areas as requested, including support for the Systems Engineering Management Plan. The Contractor will lead design integration activities by putting in place the foundation for a configuration management system capable of evolving as the project matures and design options are firmed-up.

The Contractor shall report monthly schedule information such as but not limited to:

- Cash Flow Curve, showing expected progress payments over the time of the project.

- Progress curves, showing cumulative scheduled, actual, and forecast progress as a time-scaled curve from 0% to 100% complete.
- Equipment schedule, showing site delivery dates, quantity, type and capacity of key construction equipment.
- Material Status Report, showing planned delivery of long-lead items, including actual or forecasted date for order placement, submittal preparation, submittal review, delivery, and quantity delivered to date.
- Labor curve, showing the labor requirements per week per labor category over the length of the project, and plotting actual and forecasted labor requirements against the baseline.

The Contractor shall coordinate all prime subcontractors, plant construction equipment, and material and delivery schedules. The Contractor shall work with the SRS Operator to schedule and coordinate utility tie-ins and outages with the utility companies and the DOE. The Contractor shall schedule and coordinate any traffic interruptions with DOE and the SRS Operator.

The Contractor shall work with the PDO to implement a project controls system to collect and distribute project data electronically. The system will follow DOE requirements and industry standards for project controls systems. The system will measure cost, earned value, and schedule performance, and compare data to project baselines to identify variances and trends. It will include accruals, so that costs and earned values are measured consistently. The system will not allow costs or obligations to be incurred without formal authorization. It will be updated appropriately for Cost-To-Date (CTD). Changes to scheduled or actual dates will be updated regularly. Problem areas and corrective actions will be included in updates. Results of analyses shall be provided to the PDO and DOE.

The Contractor shall participate in formal independent design reviews, documenting review comments and comment resolution. The Contractor shall also support peer reviews.

The Contractor shall provide engineering support to resolve design, construction, and installation problems.

The Contractor shall conduct operational readiness reviews with the support of the SRS operators, and ensure readiness of the machine for turnover to the plant operators.

The Contractor shall manage subcontracts, monitor subcontractor performance, evaluate proposals, perform contract adjustments, negotiate settlements, and manage subcontractor claims and disputes.

The Contractor shall establish and utilize an aggressive, comprehensive health and safety program and provide a full-time industrial hygienist on-site during all construction and installation activities and provide inspectors.

The Contractor shall provide an Executive Secretary for the Change Control and Configuration Management Boards.

The Contractor shall participate in monthly review meetings. During ED&D and CD phases, those meeting will be held at LANL. During later phases, those meeting will be held at SRS. The monthly report will form the basis for the meetings. During ED&D and CD, the Contractor will support the PDO in developing the Monthly Report. During the P&FD, CM, and OT&C Phases, the PDO will support the Contractor in developing the Monthly Report. The Contractor shall participate in quarterly and annual reviews. The Contractor shall provide updated budgets, schedules and progress reports.

The following documents, at a minimum, are considered controlled documents after DOE approval: the CDR, functional performance requirement documents, and the PEP. Design criteria packages, as-built design packages, and other supporting documents are considered controlled documents after PDO approval.

Deliverables

- Updated APT PEP and supporting documents.
- WBS and schedule updates.
- Technical Resolution Process draft and final documentation.
- Update Functional Performance Analysis.
- Updated System Engineering Management Plan.
- System Engineering support to the Task Assignments.
- Develop and Implement a Configuration Management System.
- Change Control Process and Documentation.
- Summary monthly report, including information such as the following:
  - Current Budget, CTD, Estimate-to-Complete, Estimate-At-Completion (EAC), Percent Complete, and technical, cost and schedule variances.
  - Quality Assurance Activities such as: trends, problem areas, non-conformance reports, corrective actions.
  - Tasks with actual or projected late start/finish dates.
  - Open commitments and obligations.
  - Recovery plans for late or over-budget tasks and tasks where EAC is greater than budget.
  - Pending or completed baseline changes.
  - Safety deficiencies and corrective actions.
  - Updated project schedule.
  - Technical accomplishments and milestones.
  - Status of open action items and any action items completed.
  - Major activities planned for the next month.
  - Purchasing Activities.

- Project Controls System.
- Administrative space design compliance documentation.
- Integrated, resource-loaded schedules for engineering, construction, material and equipment procurement, fabrication, and installation, and integration.
- Local, state, and federal permits for construction and operation, as coordinated through the SRS Environmental Protection Department.
- Comprehensive health and safety program in compliance with the comprehensive health and safety program already in place at the SRS.
- Security Plan, coordinated through the DOE-SR Security Branch.
- Photographs and videos of construction and installation progress quarterly and aerial photographs of the site prior to construction and annually throughout construction.
- Draft Facility Management/Operating Plan, developed jointly with the SRS Operator and BREI, and consistent with SRS "Conduct of Operations".
- FDD and SDD updates

5.6.2 Environmental

Task Requirements

DOE/SR, with assistance from WSRC, will lead the effort to obtain all site-specific environmental approvals. The Contractor shall support the DOE and WSRC effort to obtain necessary environmental permits and approvals, providing data for the site specific environmental impact statement (EIS) and coordinating with DOE on work that can be performed prior to EIS completion and the subsequent Record of Decision (ROD). The schedule for the EIS and ROD will be incorporated into the project schedule. The EIS will be prepared by a DOE supplied contractor. In addition, the Contractor shall coordinate with the OPO regarding a Waste Minimization/ Process Waste Assessment process led by WSRC.

Deliverables

- Studies and data to DOE for environmental permits and approvals.
- Waste Minimization/Process Waste Assessment Plan, analyses and reviews, in cooperation with WSRC.

5.6.3 Safety

Task Requirements

During ED&D and CD, the Contractor shall provide technical support on safety matters for the accelerator, TB, BOP, and TSF to the TPO as specified in applicable DOE accelerator and non-reactor nuclear facility requirements. The Contractor shall provide design input to support a Preliminary Hazards Safety Assessment (PHA). The Contractor shall participate in external safety reviews. The Contractor shall support preparation of the safety section in the final CDR.

During P&FD and CM, the Contractor shall lead all safety matters, with technical support from the TPO and OPO. The Contractor shall provide the draft and final Preliminary Safety Analysis Documentation (PSAD). The Contractor shall provide APT plant construction review and documentation to ensure that the as-built plant satisfies all safety design documents.

During OT&C, the Contractor shall support the SRS Operator in preparation of the Final Safety Analysis Documentation (FSAD) and in the development of the Technical Safety Requirements. The Contractor shall support the close out of open safety issues, completion of final pre-operational safety system tests, and certification for full-power production operation.

Deliverables

- The Contractor shall provide input, updates and maintenance of the following PEP documents: Safety Review Plan, Safety Assessment Documentation and Development Plan, Safety Issues Resolution Plan, Safety Test Plan, Safety Methods Development Plan, Safety Analysis Documentation Plan, and Safety Implementation plan.
- Safety section and PHA with Final CDR, Draft PSAD with Preliminary Design, Final PSAD with Final Design, Safety tests, including final pre-operational safety system tests leading to accelerator commissioning; and input to FSAD.

5.6.4 Quality

Task Requirements

The Contractor shall provide a Quality Assurance Program Plan (QAPP) consistent with 10 CFR 830.120, DOE Order 5700.6C, and the APT QAPP. Initially the plan will address the contractor's work during the Preliminary and Final Design Phase of the project. As the project progresses, the plan will be revised to include the remaining project life phases.

The QAPP shall also include the following:

- Qualification of processes, procedures, facilities and equipment.
- Qualification of special process personnel.
- Product End Item Documentation to include as a minimum:
  - Non-conforming reports dispositional as "repair" or "use as-is."
  - Listing of as-builts configuration (engineering/process).
  - Material Certification showing physical and chemical properties as well as inspection and test reports.
  - Certification of conformance signed by approved authority.
- Part identification traceability.
- Facility cleanliness and environmental requirements.
- Failure reporting, analysis, and corrective action (FRACA) showing PDO participation.
- Control of purchases.

- Notification of change to design methods or processes.
- Age/shelf-life and storage control.
- DOE/PDO access to Contractor and subcontractors.

Deliverables

- The QAPP and each revision shall be submitted to DOE and PDO for approval.

5.6.5 Other Support Activities

Task Requirements

The Contractor shall provide other support to DOE and PDO to include but not be limited to reviewing documentation, formulating management strategies, preparing technical/management approaches, providing technical support at sites, conferences and meetings, gathering and developing information for lessons-learned activities, training, and other project requirements.

Deliverables

- Plans, studies, reports, and support as described in the Task Assignments.

6. ACRONYM LIST

^{3}He	helium-3
APT	Accelerator Production of Tritium
BOP	balance of plant
CCDTL	coupled-cavity drift-tube linear accelerator
CCL	coupled cavity linear accelerator
CD	conceptual design
CDR	conceptual design report
CM	Construction Management
CTD	cost to date
cw	continuous wave
dc	direct current
DOE	Department of Energy
DP	Defense Programs
EAC	estimate at completion
ED&D	engineering development and demonstration
EIS	Environmental Impact Statement
FSAD	Final Safety Analysis Documentation
GRD	General Requirements Document
HE	high energy
HEBT	high-energy beam transport
HQ	headquarters
HVAC	heating, ventilating, and air conditioning
I&C	instrumentation & control
LANL	Los Alamos National Laboratory
LE	low energy
LEDA	low energy demonstration accelerator
LiAl	Lithium-Aluminum
linac	linear accelerator
OPO	Operations Project Office
OT&C	Operational Testing and Commissioning
P&FD	preliminary and final design
PDO	Project Director's Office
PEP	Project Execution Plan
PPO	Plant Project Office
PSAD	Preliminary Safety Analysis Documentation
QA	quality assurance
RF	radiofrequency
RFP	Request for Proposals
RFQ	radiofrequency quadrupole
ROD	Record of Decision
RT	room temperature
RTRF	room temperature radiofrequency
SCL	superconducting cavity linac
SDD	system design description
SCRF	superconducting radiofrequency
SRS	Savannah River Site
T/B	target/blanket
TPO	Technical Project Office
TSF	tritium separations facility
WBS	work breakdown structure

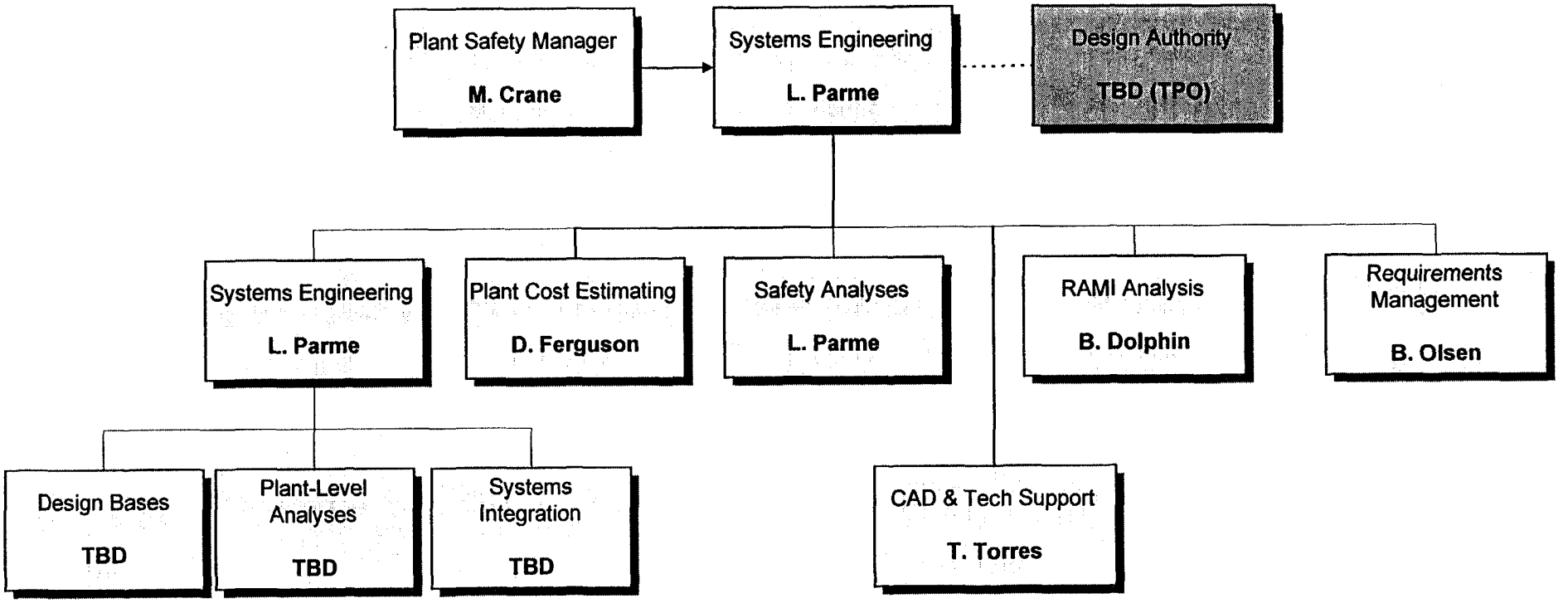
Attachment 2 - Detailed PPO Organization Charts

The following detailed PPO organization charts are attached:

- Systems Engineering
- Accelerator Engineering
- Target/Blanket Systems Engineering
- Tritium Separation Engineering
- BOP/Facilities and Structures Engineering
- Plant Safety Engineering
- Environmental, Safety and Health
- Quality Assurance
- Project Administration
- Project Controls
- Configuration Management
- Human Resources
- Procurement/Subcontracts
- Construction Management

Systems Engineering

2/26/98



Accelerator Engineering

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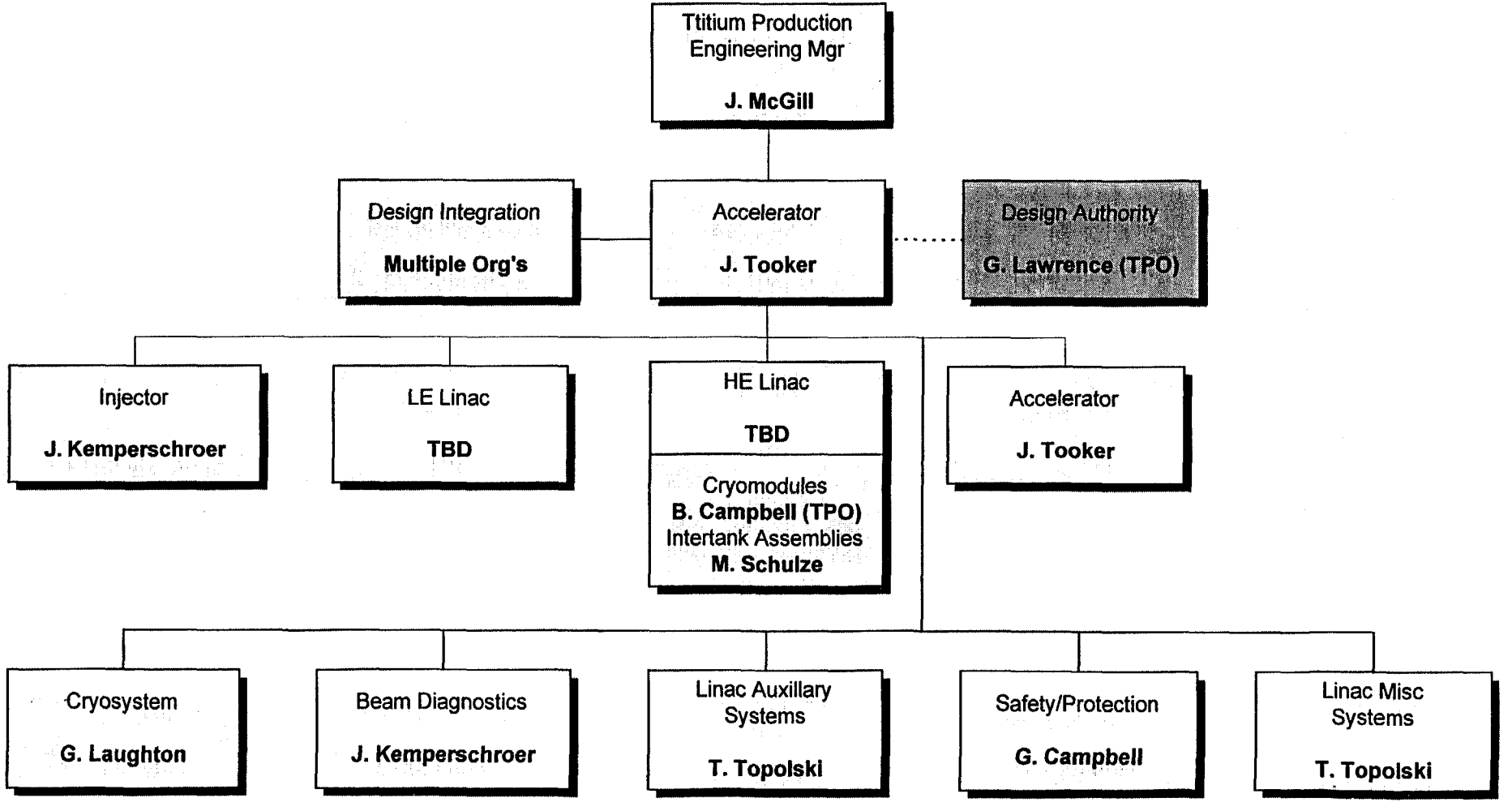

Target/Blanket Systems Engineering

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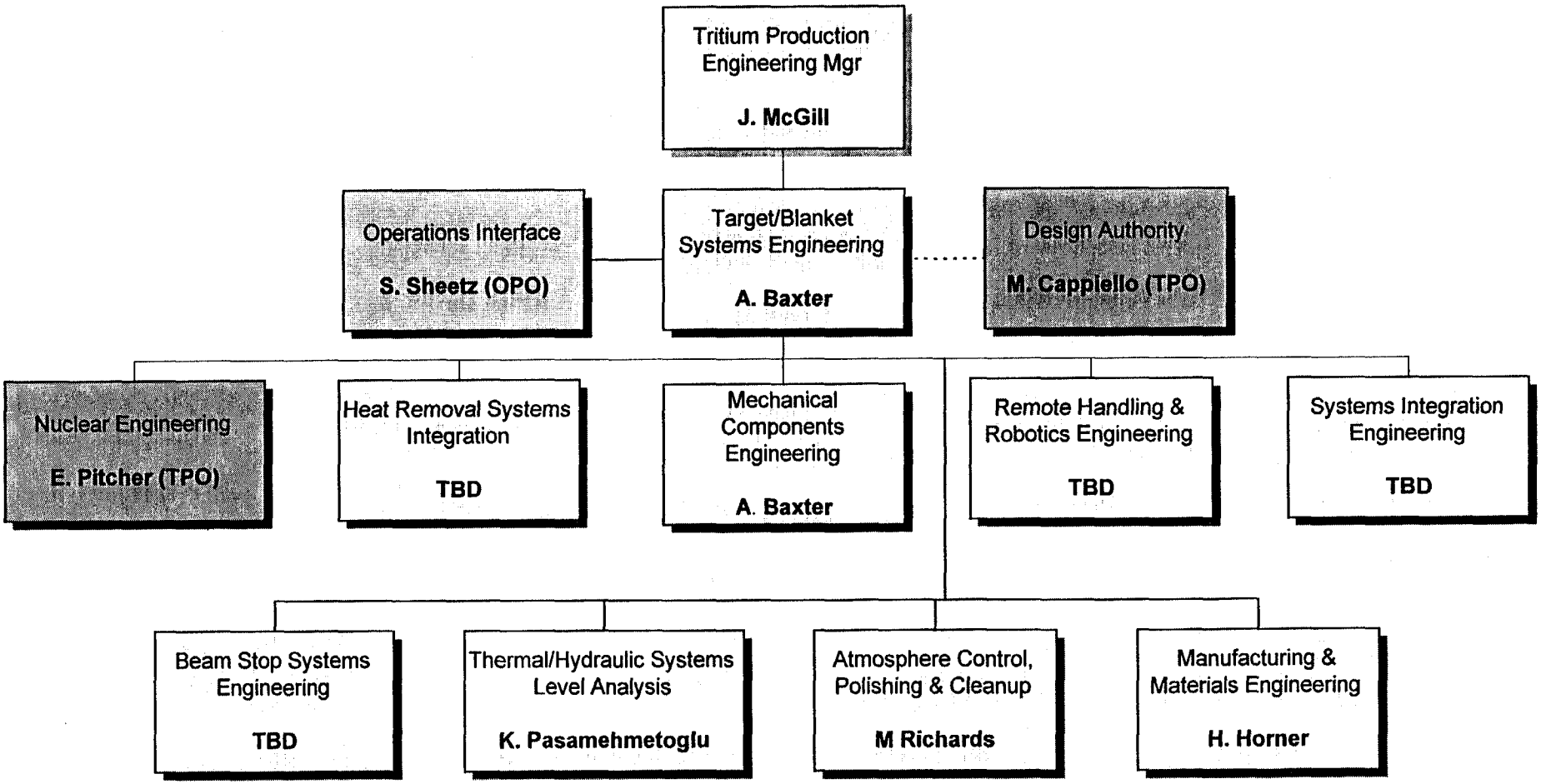

Tritium Separation Facility Engineering

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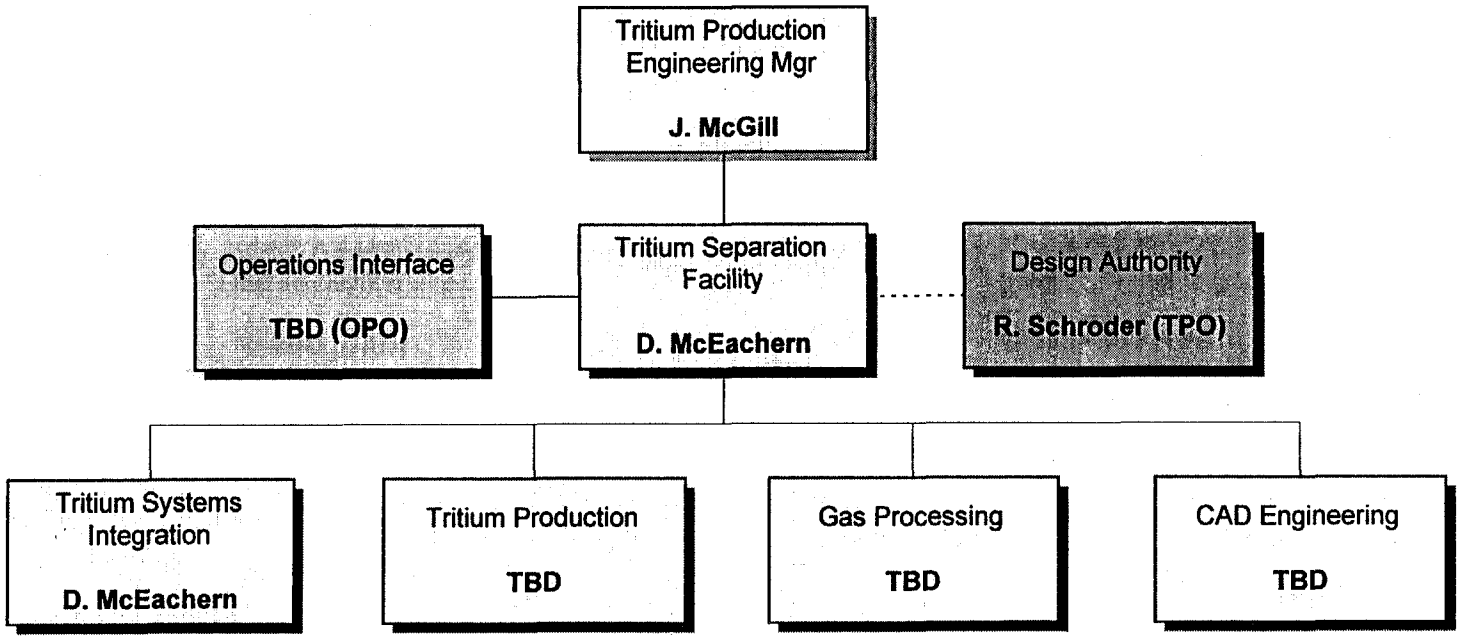

Balance of Plant/Facilities and Structures Engineering

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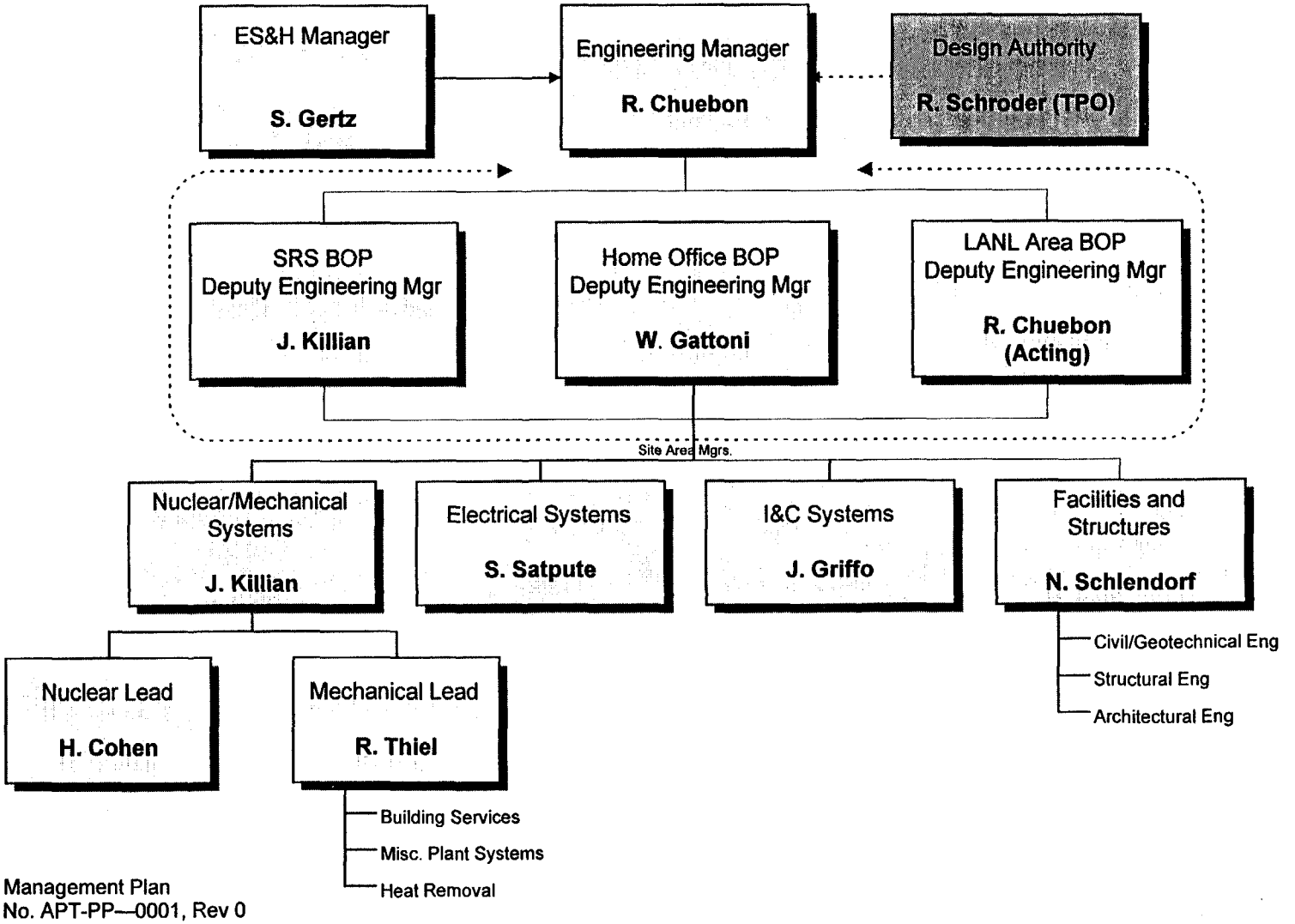
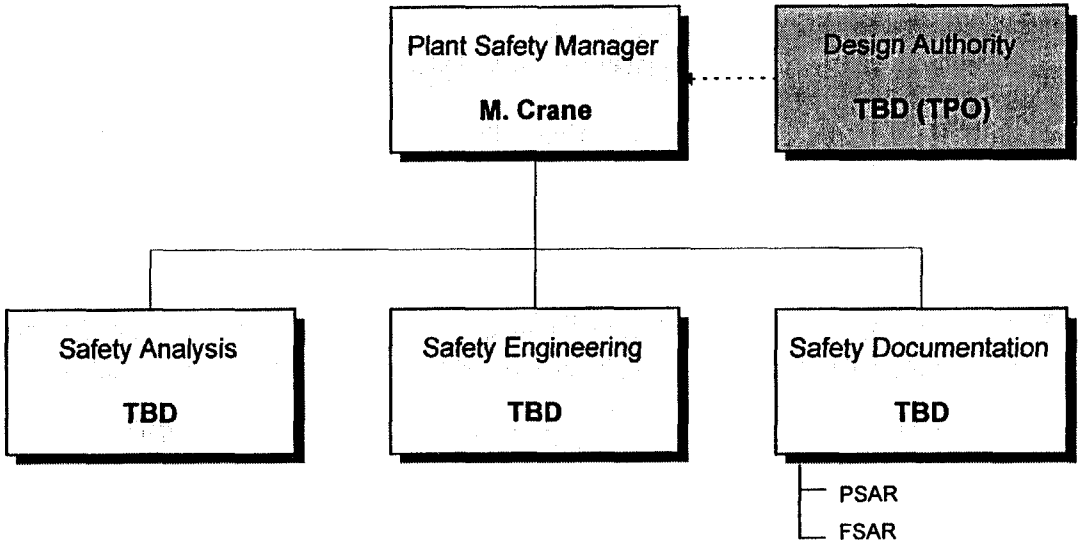


Plant Safety Engineering



Environmental, Safety & Health

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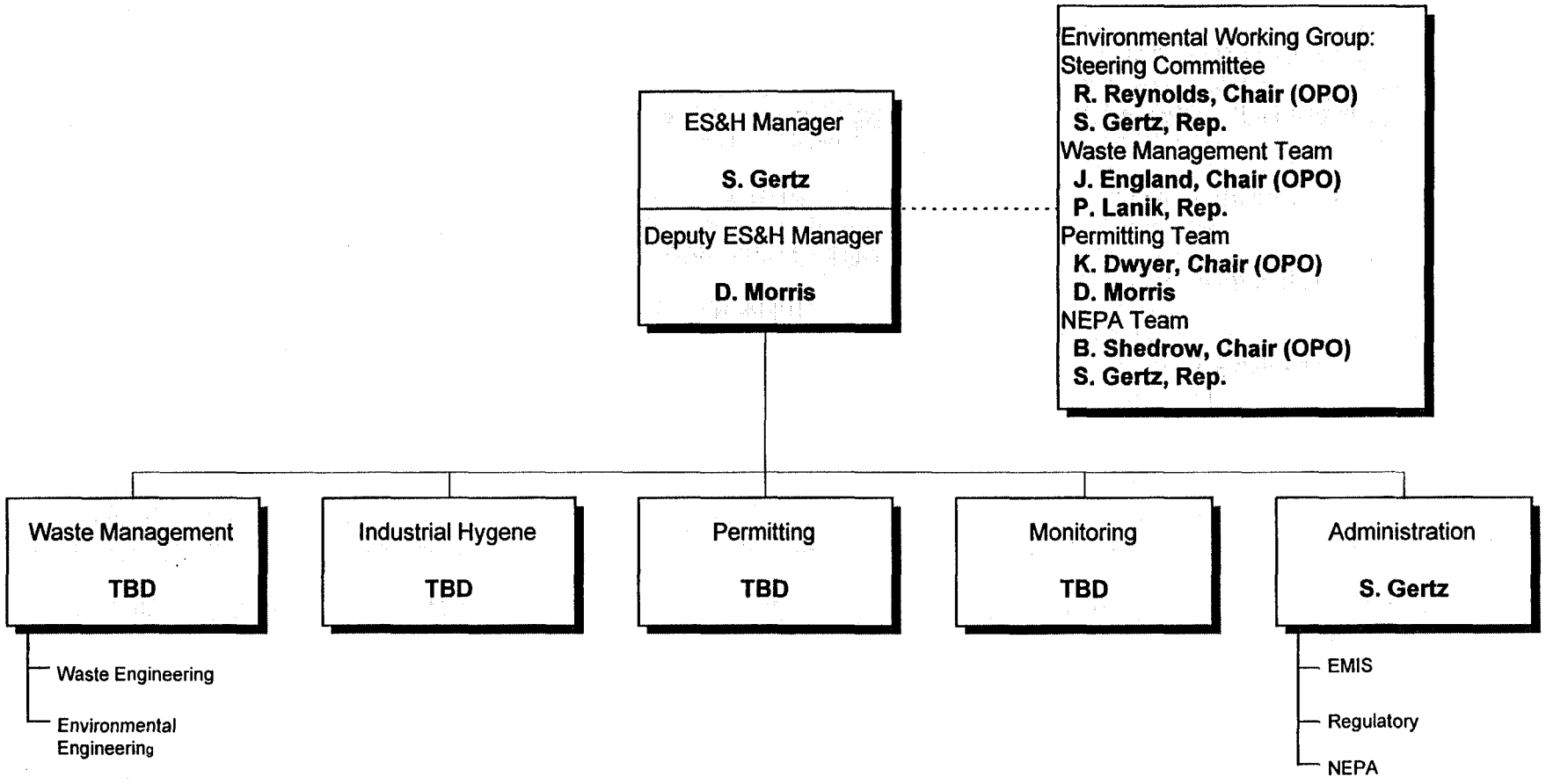
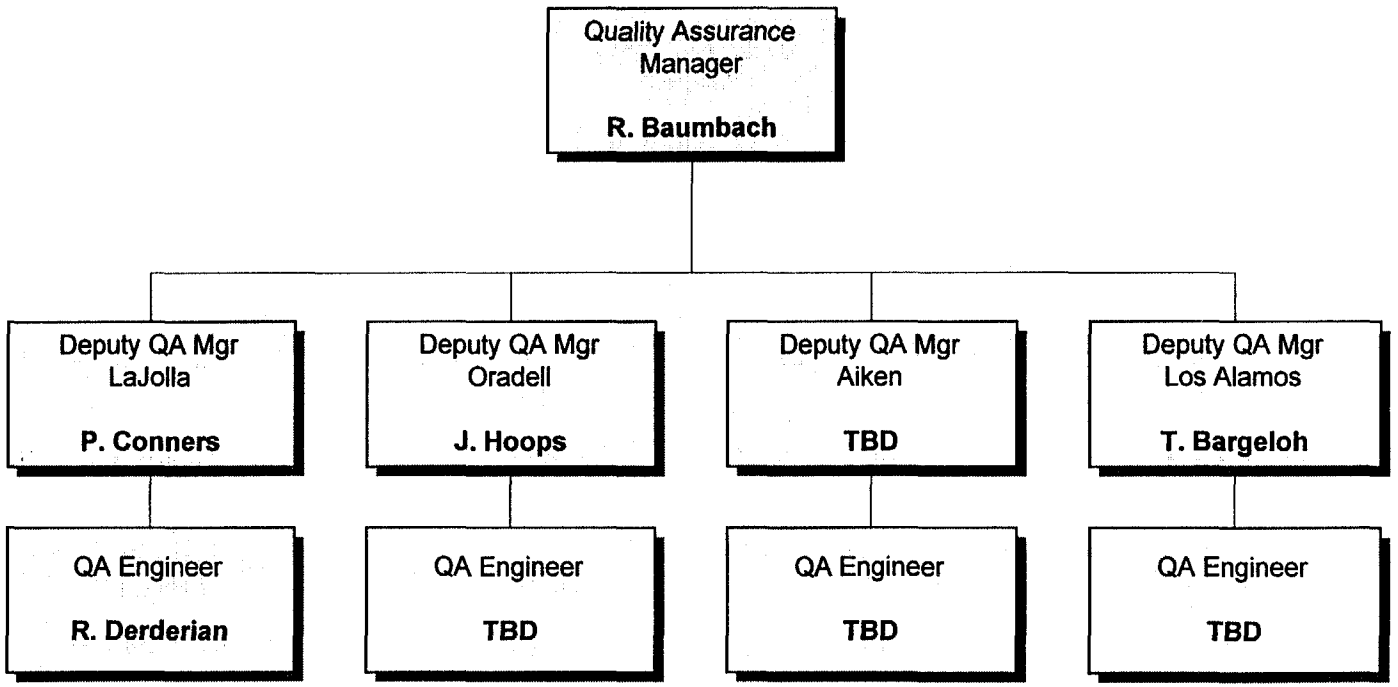


Quality Assurance



Project Administration

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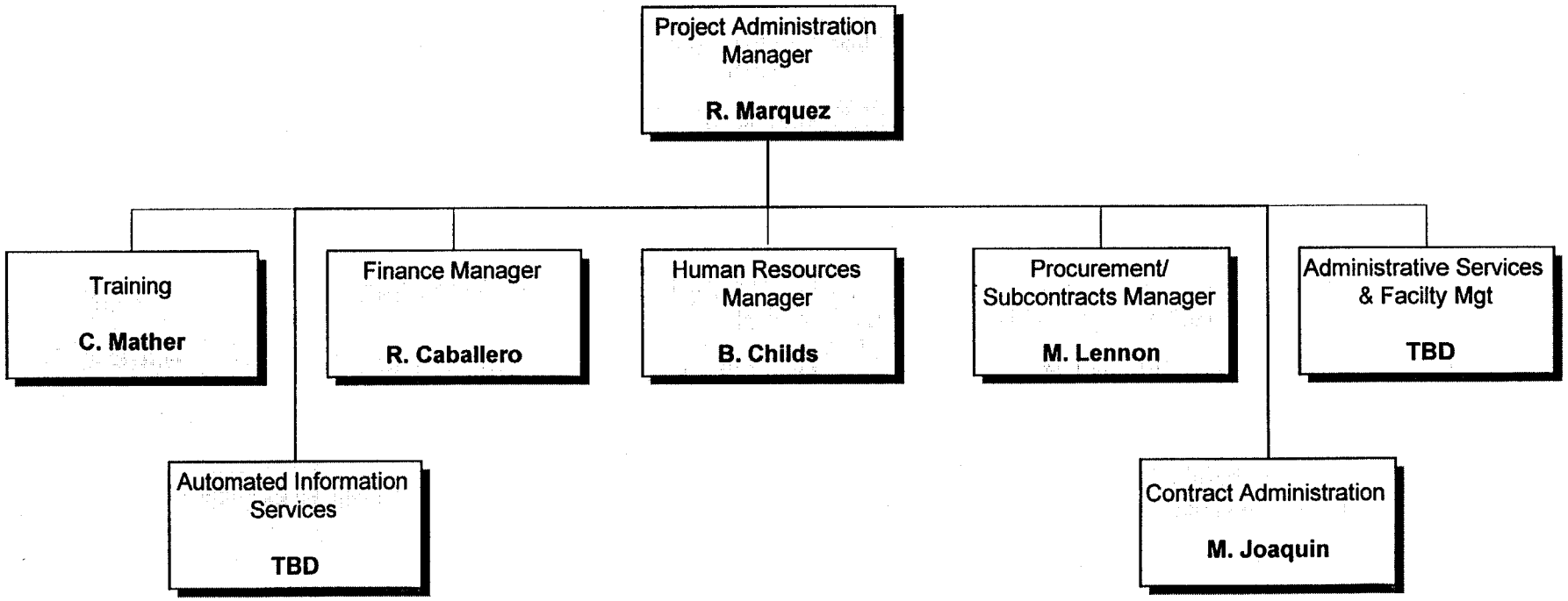

Project Controls

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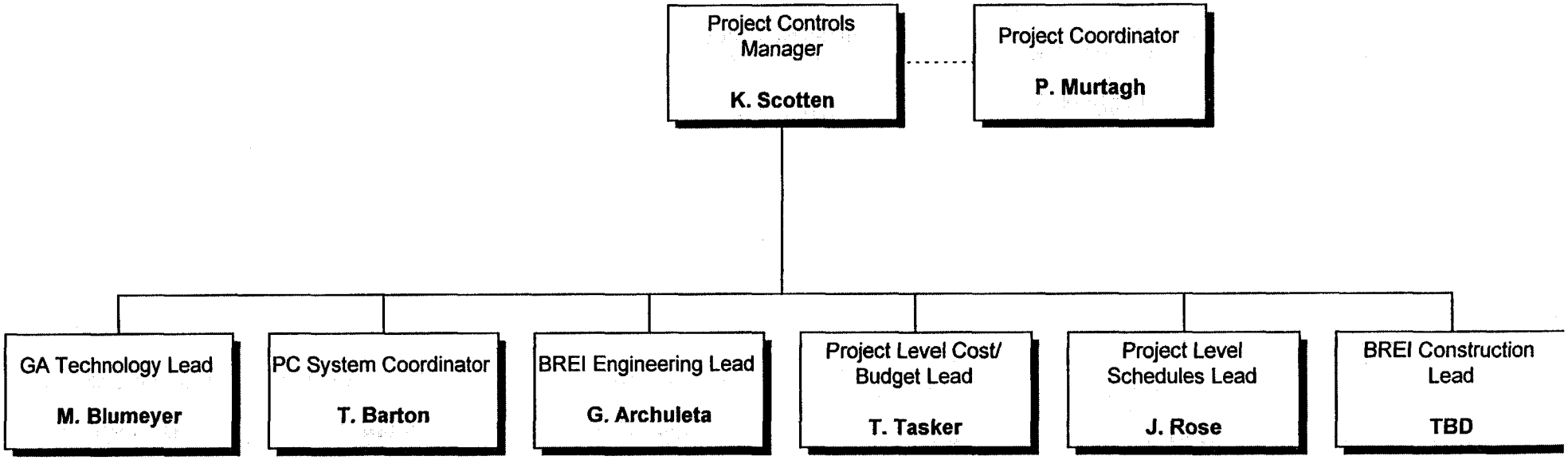
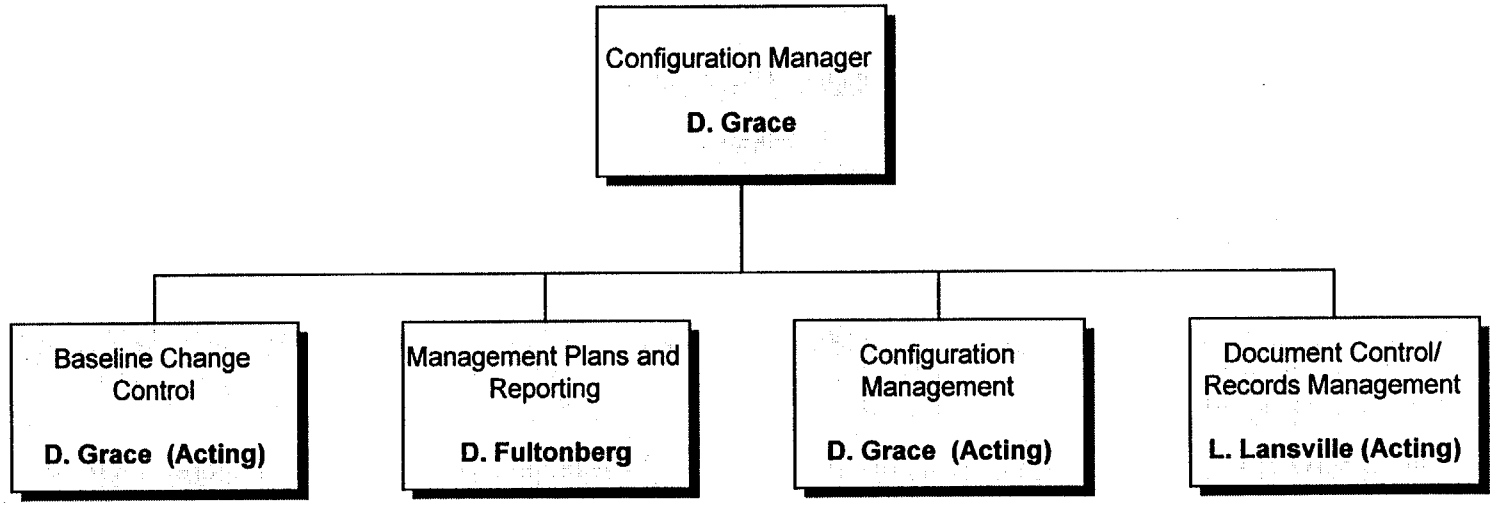
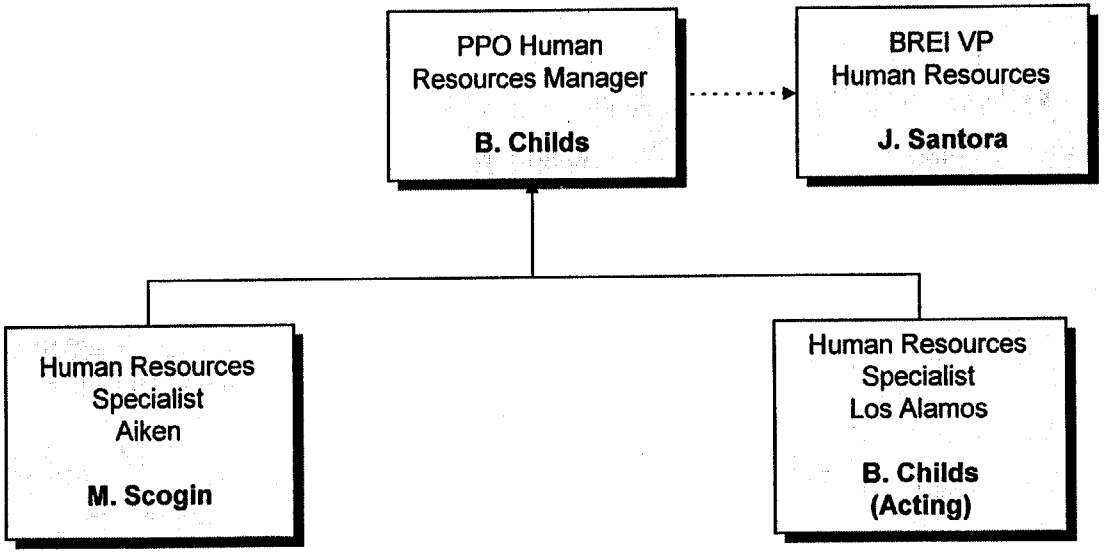


Configuration Management

2/26/98

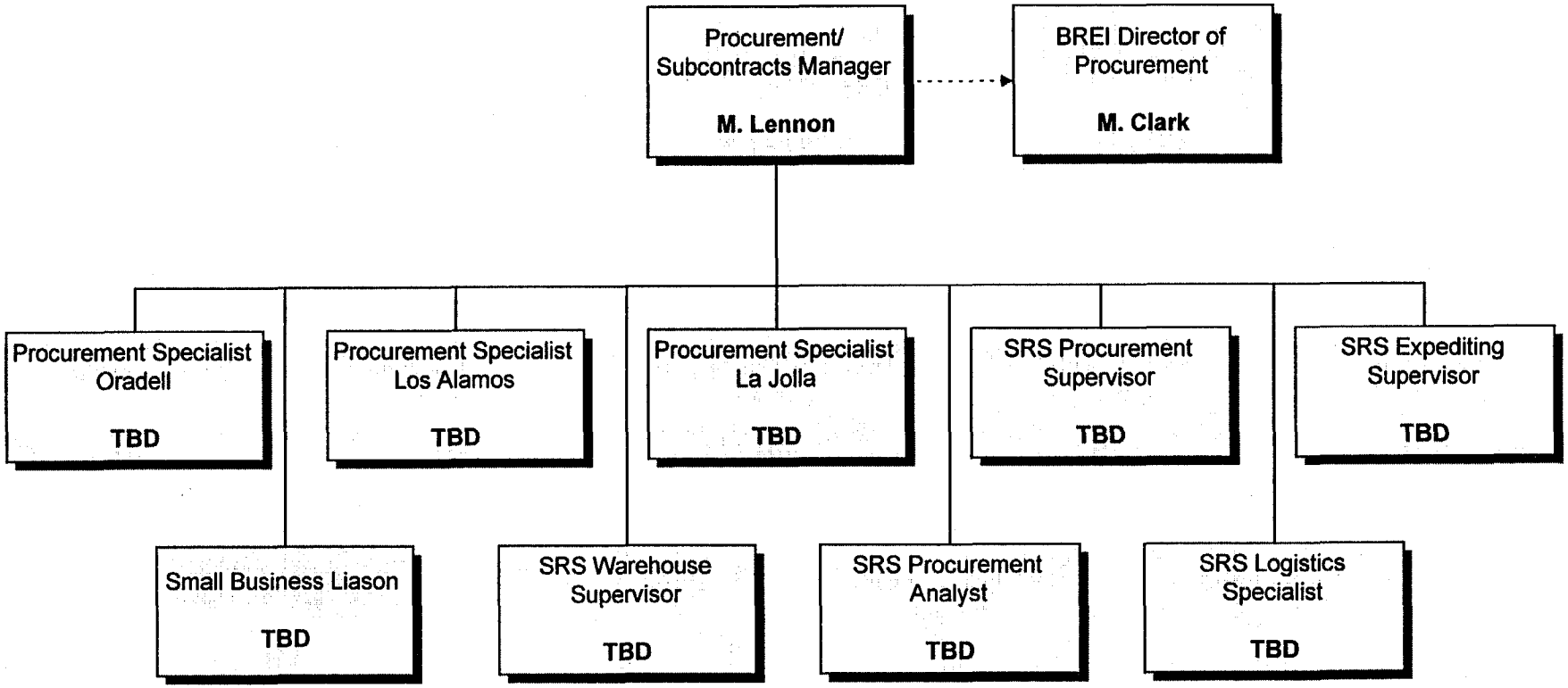


Human Resources



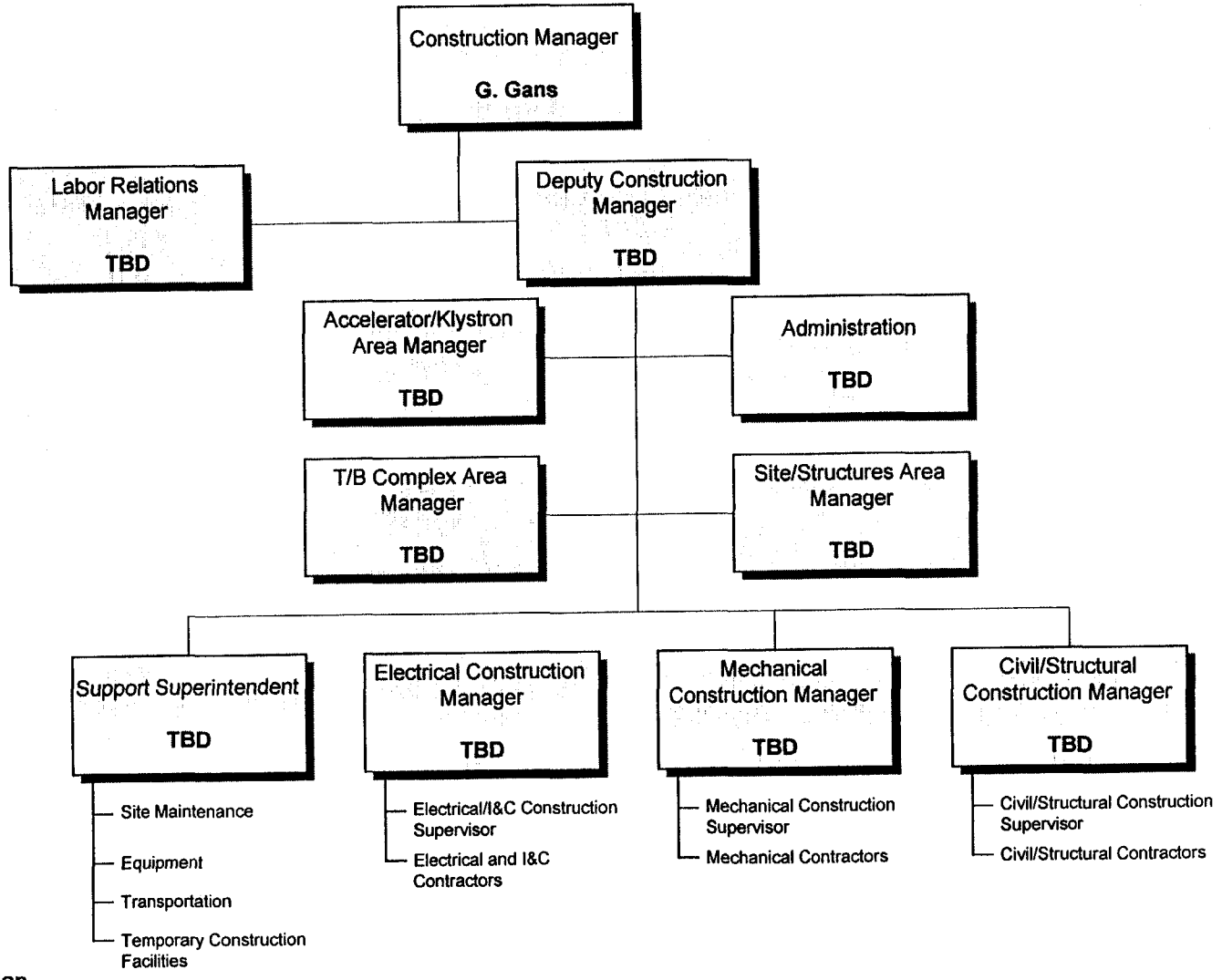
Procurement/Subcontracts

2/26/98



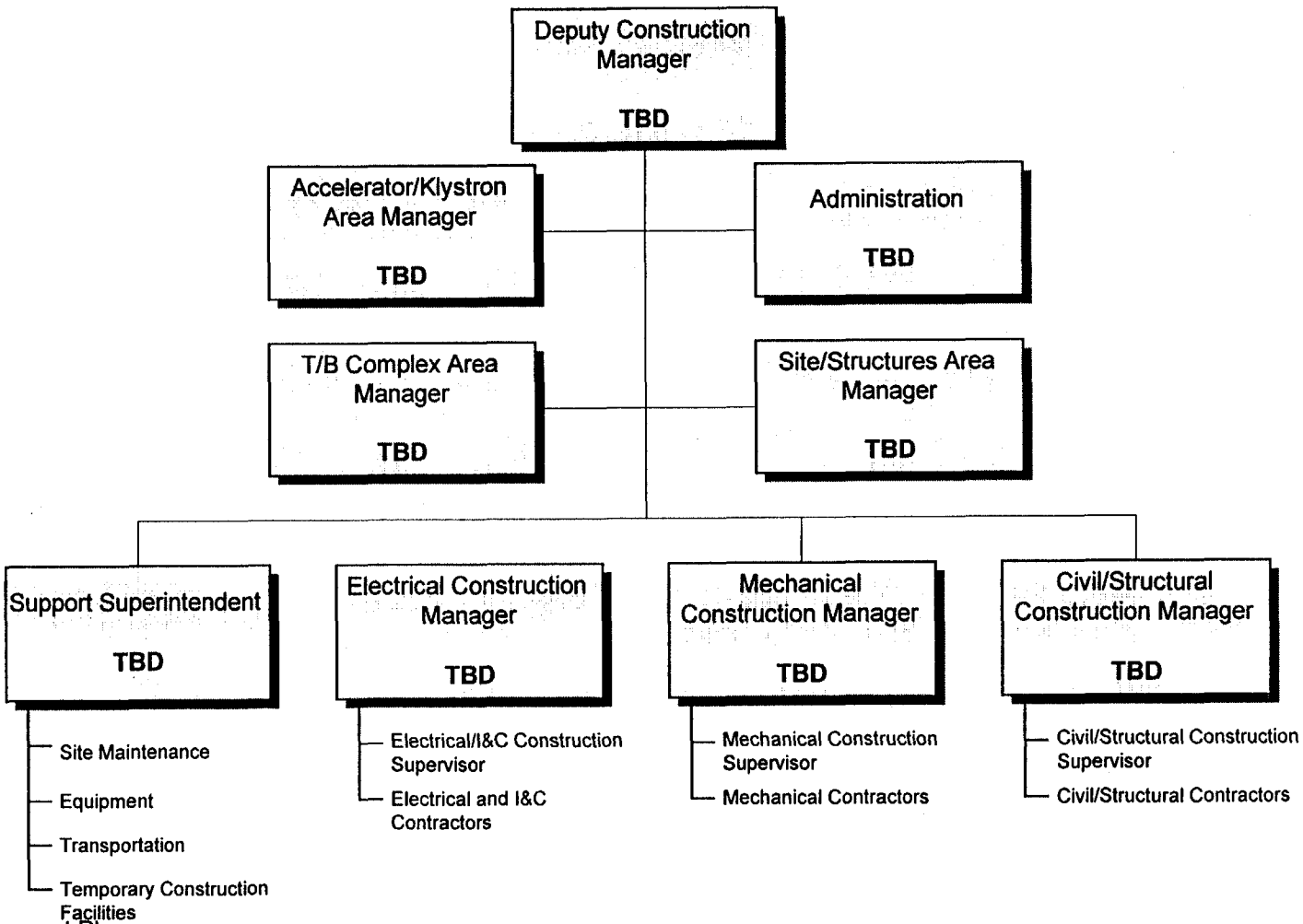
Construction Management

2/26/98



CM Organization - Deputy Construction Manager

2/26/98



Attachment 3 – PPO Section Lead Responsibilities

Linac Section Lead

The Linac Section Lead reports to the Tritium Production Engineering Manager and is responsible for:

- Specialized Linac ED&D and design integration efforts in support of TPO
- Manages the procurement, fabrication, installation, and testing of the second 20-Mev low-energy Linac
- Supports the Systems Engineering effort and performing plant wide trade studies and assessments of operability, reliability, maintainability, and cost
- The definition and negotiation of Linac functional and physical interfaces with other tritium production and BOP systems
- Production of Linac design packages during conceptual and P&FD phases
- Technical leadership and responsibility during CM in the procurement, fabrication, installation, and inspections of Linac systems
- Preparation of plant testing and commissioning plans and procedures for the Linac
- Support of Linac testing and commissioning and in the analysis, evaluation, and documentation of Linac test results

Target/Blanket Section Lead

The Target/Blanket Section Lead reports to the Tritium Production Engineering Manager and is responsible for:

- Specialized T/B ED&D Tritium Separation and design efforts in support of TPO
- Supports the Systems Engineering effort and performing plant wide trade off studies and assessments
- The definition and negotiation of T/B functional and physical interfaces with other tritium production and BOP systems
- Production of T/B design packages during conceptual and P&FD phases
- Technical leadership and responsibility during CM in the procurement, fabrication, installation, and inspections of T/B systems
- Preparation of plant testing and commissioning plans and procedures for the T/B
- Support of Linac testing and commissioning and in the analysis, evaluation,

and documentation of T/B test results

Tritium Separation Lead

The Tritium Separation Lead reports to the Tritium Production Engineering Manager and is responsible for:

- Tritium Separation systems design efforts in support of TPO
- Supports the Systems Engineering effort and performing plant wide trade off studies and assessments
- The definition and negotiation of Tritium Separation functional and physical interfaces with other tritium production and BOP systems
- Production of Tritium Separation design packages during conceptual and P&FD phases
- Technical leadership and responsibility during CM in the procurement, fabrication, installation, and inspections of Tritium Separation systems
- Preparation of plant testing and commissioning plans and procedures for the Tritium Separation systems
- Support of Tritium Separation systems testing and commissioning and in the analysis, evaluation, and documentation of Tritium Separation systems test results

Site and Structures Lead

The Site and Structures Lead directs all related engineering activities and reports to the BOP Manager and is responsible for:

- Deciding the kind and extent of engineering and related programs needed to accomplish the established objectives
- Negotiating critical and controversial issues with top level engineers and managers of the program, customers and clients
- Administering assigned report and study projects, assuming full responsibility for work schedule, budgetary control and technical quality of the overall effort
- Act as Senior Technical advisor in areas requiring research into new practices, procedures, equipment and/or material applications

Specific Project systems responsibilities:

- Site improvements and yardwork, including: access roads, access shaft, parking and site access control
- Underground and aboveground site improvements

- Buildings including: Target Building Complex, Accelerator Complex (Klystron gallery, accelerator tunnel), TSF Complex, Heat Rejection structures, Simulator/Training building, Security facilities, and other support buildings

Mechanical Lead

The Mechanical Lead directs all related engineering activities and reports to the BOP Manager and is responsible for:

- Deciding the kind and extent of engineering and related programs needed to accomplish the established objectives
- Negotiating critical and controversial issues with top level engineers and managers of the program, customers and clients
- Administering assigned report and study projects, assuming full responsibility for work schedule, budgetary control and technical quality of the overall effort
- Act as Senior Technical advisor in areas requiring research into new practices, procedures, equipment and/or material applications

Specific Project systems responsibilities:

- Primary accelerator and T/B heat transport & rejection systems
- Secondary (intermediate), tertiary and auxiliary cooling systems
- Heating, Ventilation and Air-conditioning, and non-radioactive waste treatment
- Chilled water and domestic water supply & distribution
- Compressed air supply & distribution
- Fire protection, cover gas, and liquid nitrogen
- Lift cranes and transportation, and miscellaneous mechanical systems

Electrical Lead

The Electrical Lead directs all related engineering activities and reports to the BOP Manager and is responsible for:

- Deciding the kind and extent of engineering and related programs needed to accomplish the established objectives
- Negotiating critical and controversial issues with top level engineers and managers of the program, customers and clients
- Administering assigned report and study projects, assuming full responsibility for work schedule, budgetary control and technical quality of the overall effort
- Act as Senior Technical advisor in areas requiring research into new

practices, procedures, equipment and/or material applications

Specific Project systems responsibilities:

- 230-500KV Power Grid, 230KV Switchyard
- Main AC power supply, main DC bus, Klystron level converter stations
- 4.16KV AC power distribution, 480V AC power distribution, and MCCs
- Emergency power supply and distribution, Uninteruptable Power Supply, 120V load centers
- Grounding, lightning and cathodic protection
- Communications, signal and security systems

Instrumentation and Control (I&C) Lead

The I&C Lead directs all related engineering activities and reports to the BOP Manager and is responsible for:

- Deciding the kind and extent of engineering and related programs needed to accomplish the established objectives
- Negotiating critical and controversial issues with top level engineers and managers of the program, customers and clients
- Administering assigned report and study projects, assuming full responsibility for work schedule, budgetary control and technical quality of the overall effort
- Act as Senior Technical advisor in areas requiring research into new practices, procedures, equipment and/or material applications
- *Specific Project systems responsibilities*:
- Target sensor technology
- Specific system controls and integrated Plant controls for the accelerator complex, T/B and TEF complex, and plant simulator/training

Nuclear Engineering Lead

The Nuclear Engineering Lead directs all related engineering and shielding activities and reports to the BOP Manager and is responsible for:

- Deciding the kind and extent of engineering and related programs needed to accomplish the established objectives
- Negotiating critical and controversial issues with top level engineers and managers of the program, customers and clients
- Administering assigned report and study projects, assuming full responsibility for work schedule, budgetary control and technical quality of the overall effort

- Act as Senior Technical advisor in areas requiring research into new practices, procedures, equipment and/or material applications

Specific Project systems responsibilities:

- Solid Radioactive Waste Treatment System
- Liquid Radioactive Waste Treatment System
- Gaseous Radioactive Waste Treatment System
- Radioactive Waste Storage Building
- Remote and Material Handling Systems

Configuration & Information Management Lead

The Configuration & Information Management Lead directs all related configuration & information management activities and reports to the Configuration Manager and is responsible for:

- Implementing the Configuration Management elements described in the CMP.
- Preparing and maintaining the APT Configuration Management implementing procedures.
- Coordinating Configuration Management implementation with all APT Project participants.
- Developing and maintaining project Information management systems to contain, control and provide visibility for project issued and released documentation.

Management Plans and Reporting Lead

The Management Plans and Reporting Lead directs all related activities and reports to the Configuration Manager and is responsible for:

- Preparing and maintaining the Project Execution Plan.
- Preparing and maintaining the PPO Plans and coordinating plans with the PDO.
- Preparing and issuing the PPO weekly highlight report.

Indoctrination and Training Lead

The Indoctrination and Training Lead directs all related indoctrination and training

activities and reports to the Project Administration Manager and is responsible for:

- Preparing and maintaining personnel orientation and training programs.
- Ensuring project personnel receive orientation and training as prescribed in personnel training requirements/record specified by responsible managers and supervisors and maintaining training records
- Coordinating with qualified instructors, the development of training plans, lesson plans, and providing training materials, equipment, and facilities.
- Developing and maintaining the process for preparing and approving PPO procedures.
- Preparing and issuing approved procedures, and providing availability of procedures for use (electronically and/or hard copy).

BREI APT Engineering Project Controls Lead

The BREI APT Engineering Project Controls Lead directs all related project controls activities and reports to the Project Controls Manager and is responsible for:

- Working with BREI Engineering Leads to prepare Work Plans including the detailed schedules for the near term engineering activities
- Reviewing and revising plans for Construction and Procurement packages and the out-year schedules for these activities
- Monitoring BREI Engineering progress and performance and trends of the Work Activities and working with the Engineering to prepare corrective plans as needed.

Project Cost/Budget Lead

The Project Cost/Budget Lead directs all related project cost/budget activities and reports to the Project Controls Manager and is responsible for:

- Coordinating all cost/budget activities with the Project Director's Office (PDO)
- Preparing annual funding proposals for the PPO scope of work
- Preparing and processing change proposals involving baseline cost and schedules (BCP) and funding change proposals

Project Integrated Schedule Lead

The Project Integrated Schedule Lead directs all related project schedule activities and reports to the Project Controls Manager and is responsible for:

- Preparing the Integrated Project Schedule from the individual elements provided by the cognizant managers
- Coordinating all schedule activities with the Project Director's Office (PDO)
- Monitoring the progress and performance of the overall APT Project effort providing reports and visibility to the cognizant managers
- Working with the cognizant managers to prepare alternate plans as required to correct schedule variances.

Cost Estimating Lead

The Cost Estimating Lead directs all related project cost Estimating activities and reports to the Systems Engineering Manager and is responsible for:

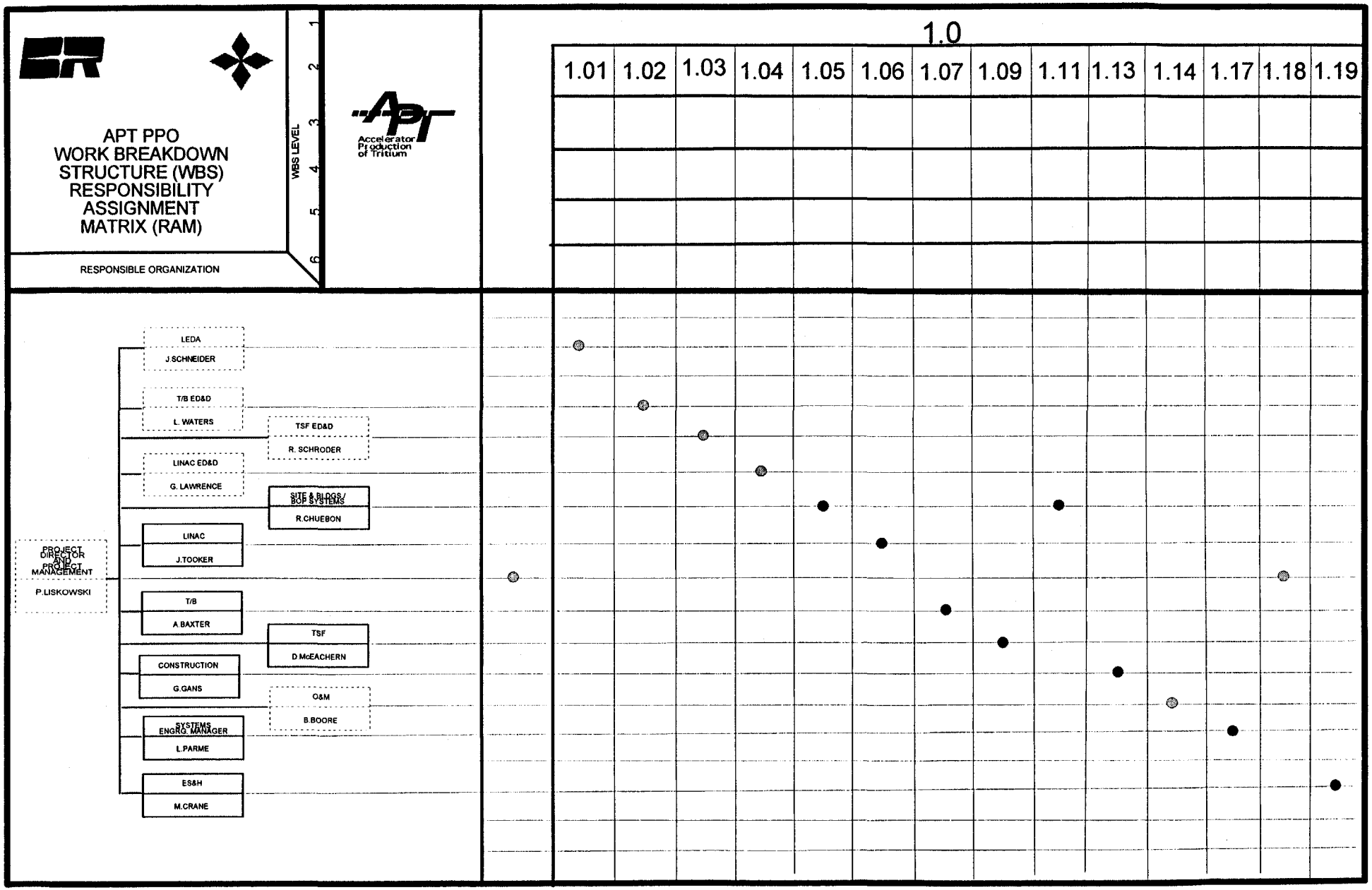
- Working with the cognizant managers to prepare cost estimates for engineering activities, equipment and construction
- Developing and maintaining processes for collecting and reporting project cost estimates
- Providing cost estimate visibility to all levels of project management and coordinating all cost estimate activities with the Project Director's Office
- Working with cognizant managers to prepare revised cost estimates to support change proposals

GA APT Technology Project Controls Lead

The GA APT Technology Project Controls Lead directs all related Technology Project Controls activities and reports to the Project Controls Manager and is responsible for:

- Working with GA Technology Leads to prepare Work Plans including the detailed schedules for the near term engineering activities
- Reviewing and revising plans for Construction and Procurement packages and the out-year schedules for these activities
- Monitoring GA Technology progress and performance and trends of the Work Activities and working with the Engineering to prepare corrective plans as needed.

Attachment 4 – PPO Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

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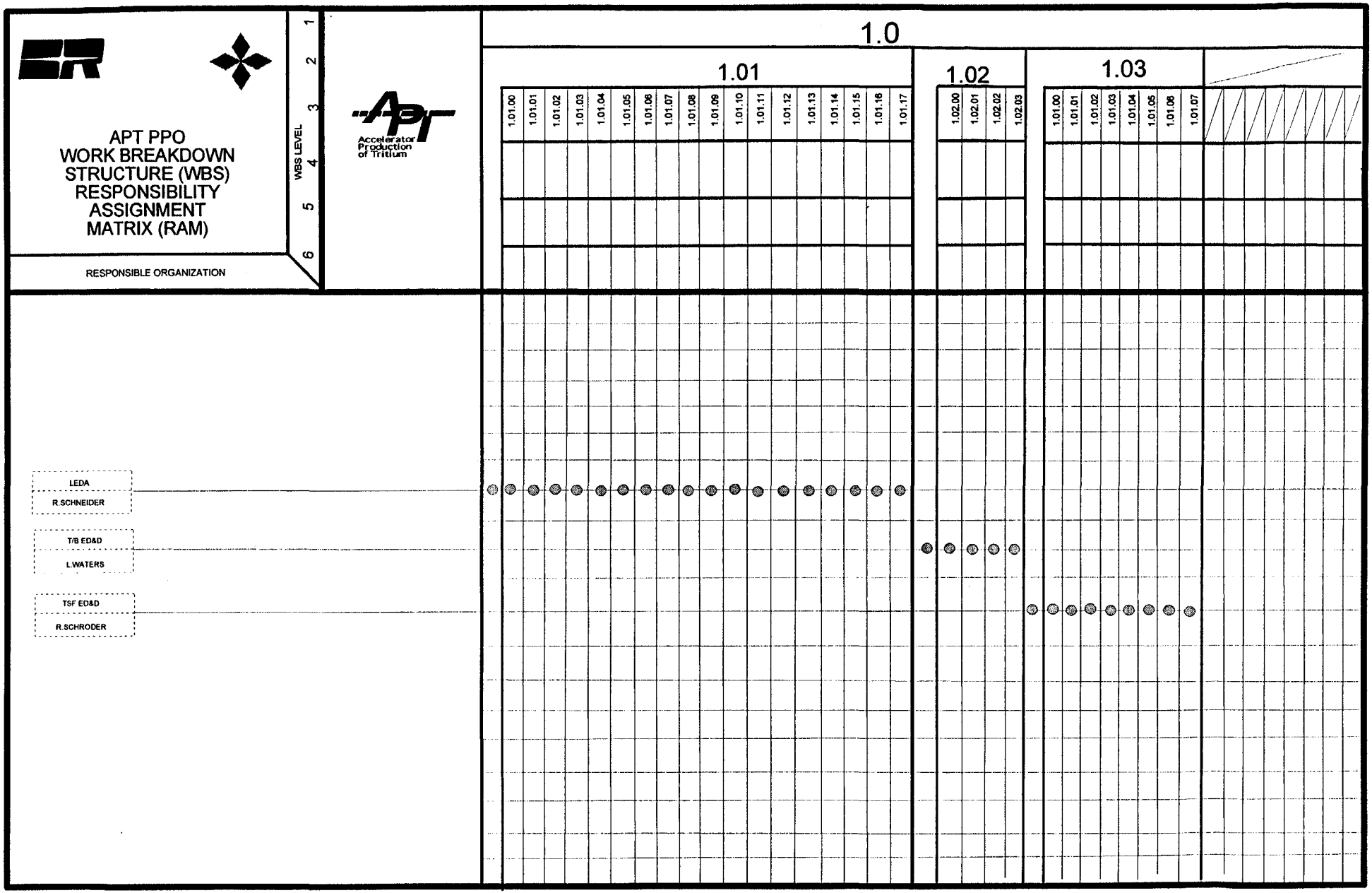
APT PPO LEVEL 2 WBS Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

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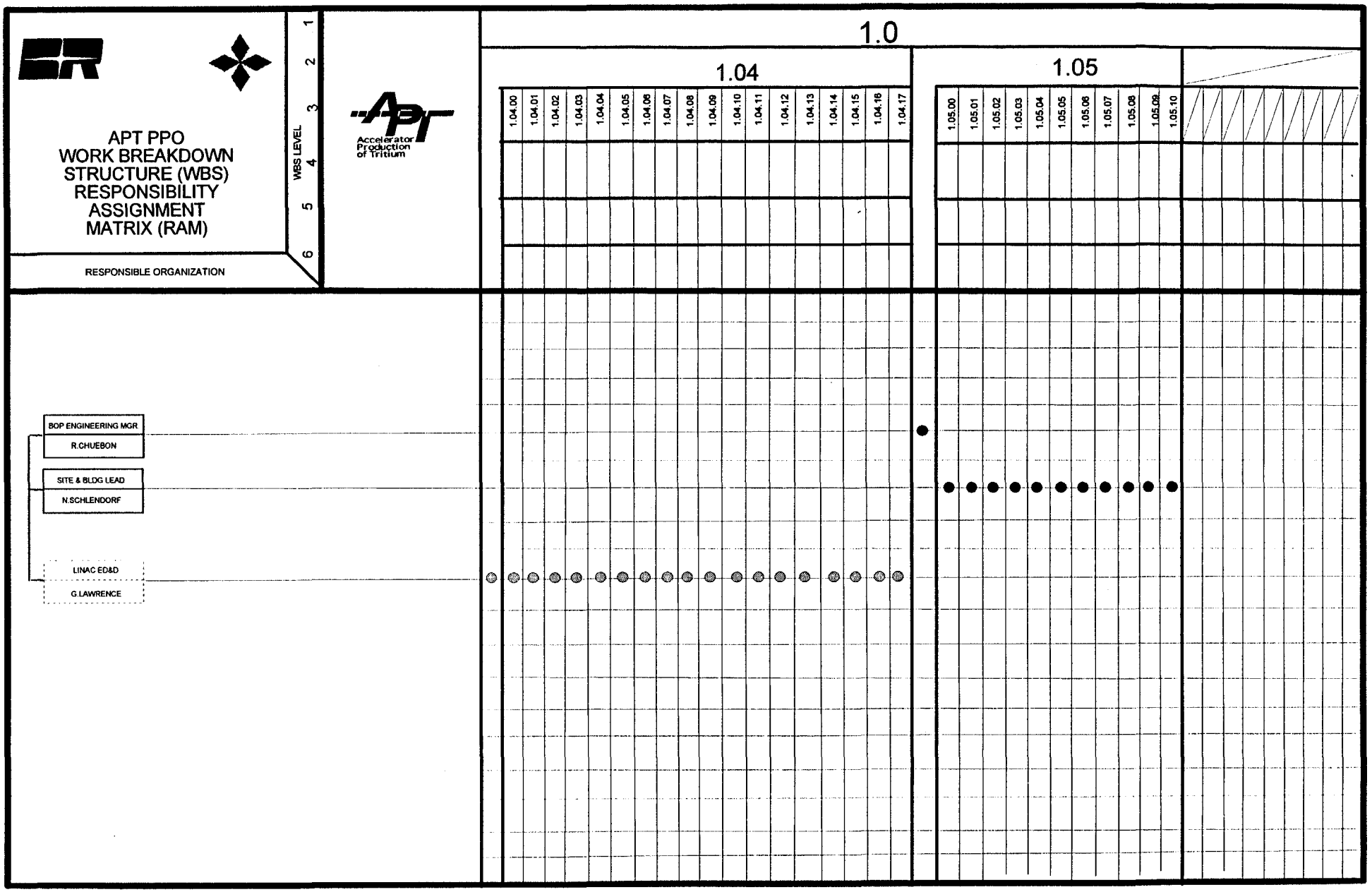
APT PPO LEVEL 3 WBS Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

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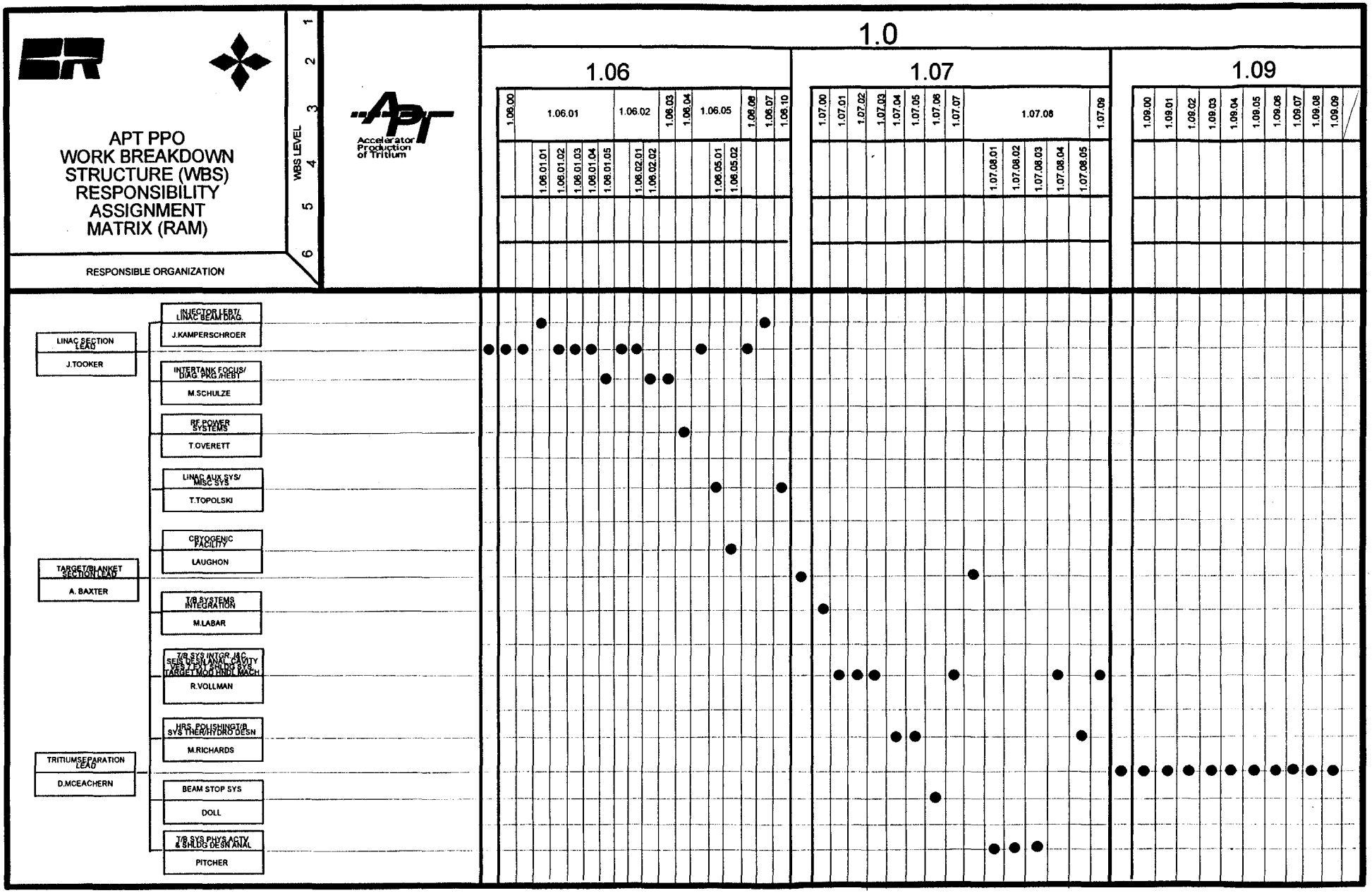
APT PPO LEVEL 3 WBS Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

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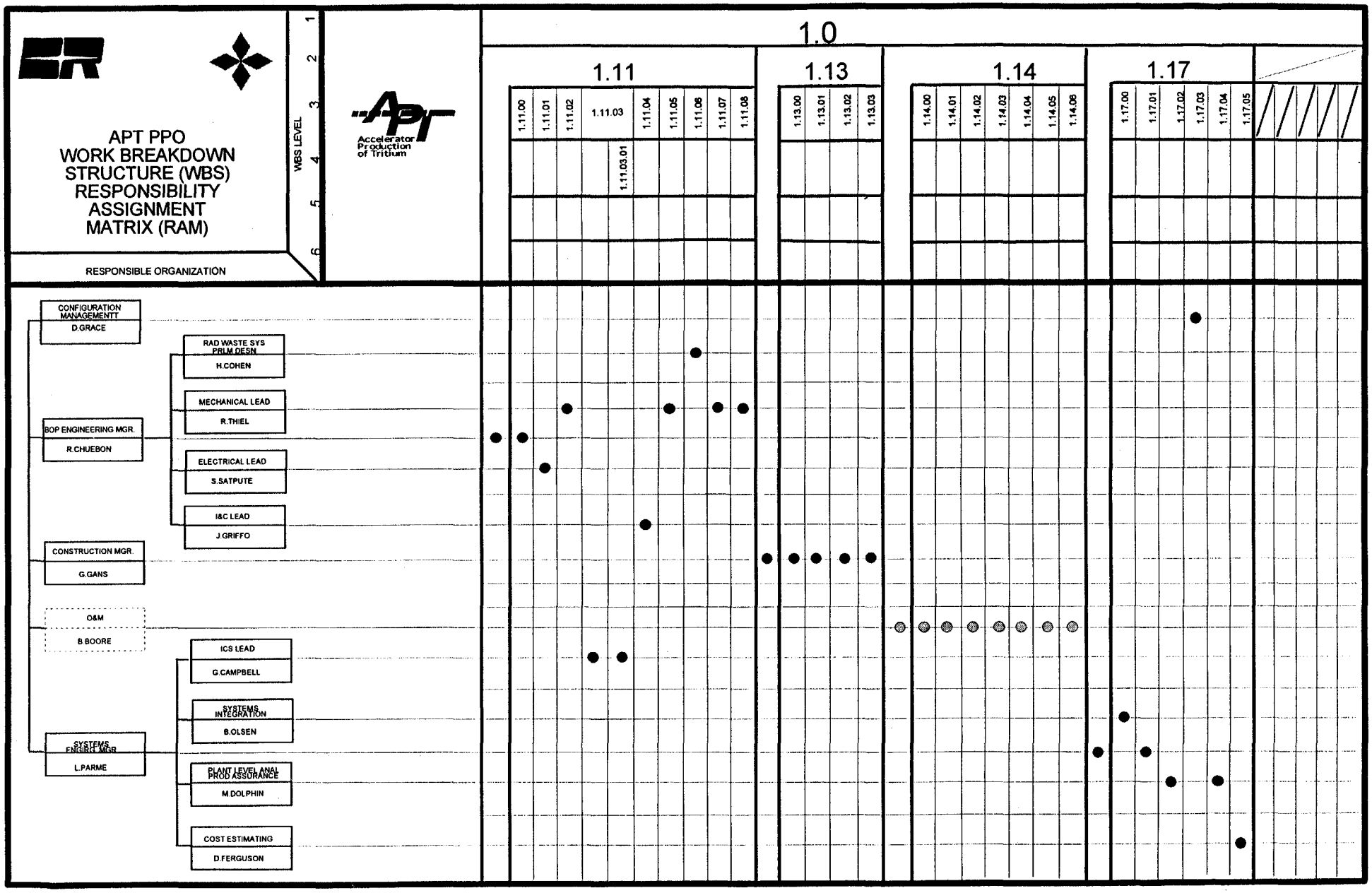
APT PPO LEVEL 3 WBS Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

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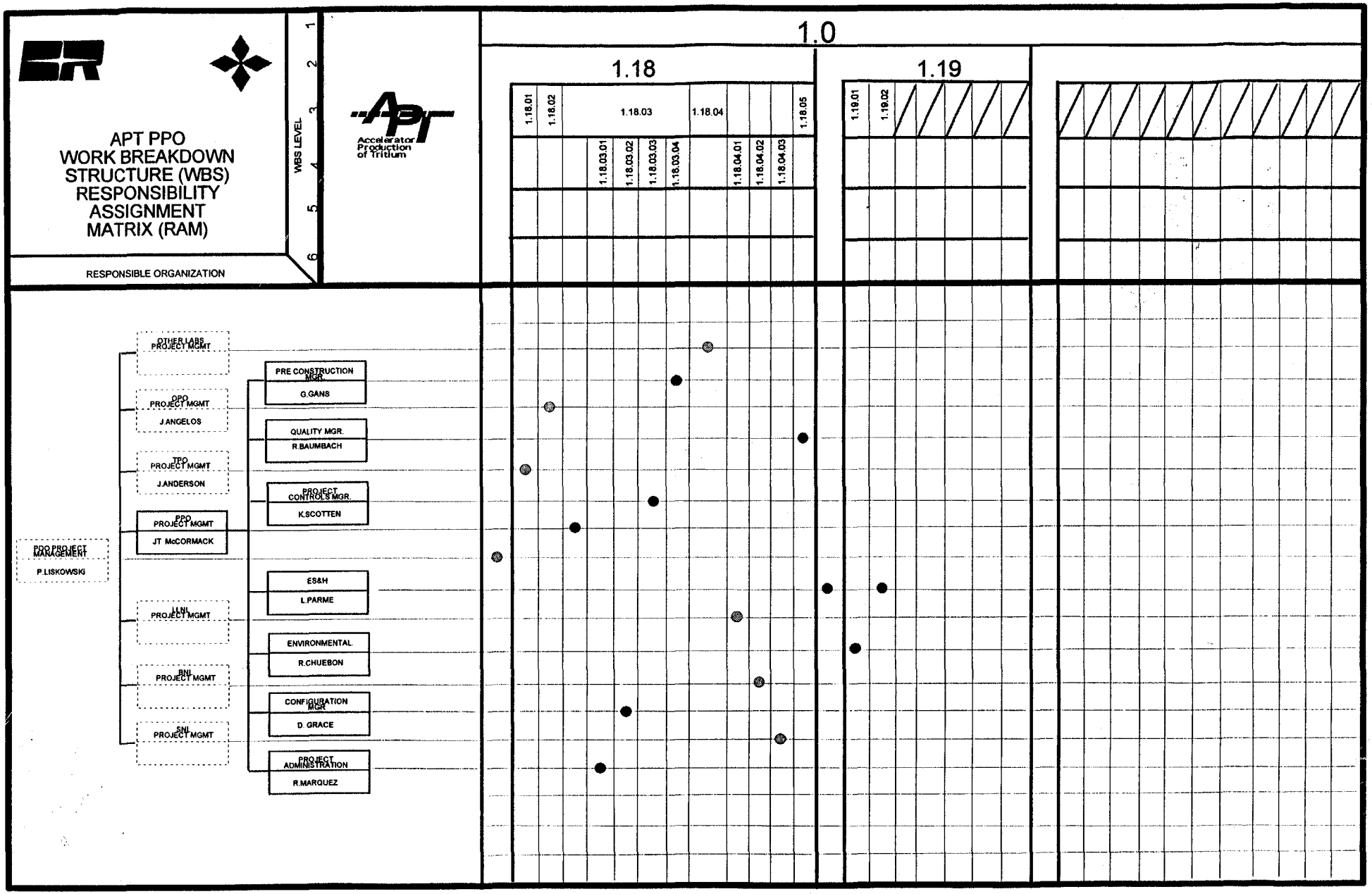
APT PPO LEVEL 4 WBS Responsibility Assignment Matrix



Note: Dashed boxes and shaded dots represent non-PPO functional groups.

3/11/98

APT PPO LEVEL 4 WBS Responsibility Assignment Matrix