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Technical Safety Appraisal of the Naval Petroleum Reserve No. 1 Elk Hills - California

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TECHNICAL SAFETY APPRAISAL

NAVAL PETROLEUM RESERVES NO. 1

PREPARED UNDER
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ACRONYMS

The following acronyms are used throughout this report.

ANSI	American National Standards Institute
API	American Petroleum Institute
BPOI	Bechtel Petroleum Operations, Inc.
CUSA	Chevron USA
DOE	Department of Energy
EH	DOE Office of the Assistant Secretary for Environment, Safety, and Health
ES&H	Environment, Safety, and Health
NPR-1	Naval Petroleum Reserves No. 1
NPRC	DOE Naval Petroleum Reserves California
OSHA	U.S. Occupational Safety and Health Administration
PPM	Policy and Procedures Manual
SAR	Safety Analysis Report
TSA	Technical Safety Appraisal

In this report, the title "Safety Department" is used to refer to the BPOI functional organization "Safety/Health/Security Department."

I. INTRODUCTION

This report presents the results of a focused Technical Safety Appraisal (TSA) of the Naval Petroleum Reserve No. 1 (NPR-1), Elk Hills, California, conducted during November 27 through December 8, 1989. The Department of Energy (DOE) program organization responsible for NPR-1 is the Assistant Secretary for Fossil Energy (FE); the responsible Field Office is the Naval Petroleum Reserves California (NPRC) Office.

This appraisal is an application of the program that was initiated in 1985 to strengthen the DOE Environment, Safety and Health Program. The appraisal was conducted by the staff of the DOE Assistant Secretary for Environment, Safety and Health (EH), Office of Safety Appraisals, with support from experts in specific appraisal areas, including a number from the petroleum industry, and a liaison representative from FE. The Senior EH Manager for the appraisal was Mr. Robert Barber, Acting Director, Office of Compliance Programs; the Team Leader was Dr. Owen Thompson, Office of Safety Appraisals.

NPR-1 is an active oil and gas field covering about 75 square miles and located about 30 miles west of Bakersfield and near Taft, California. The oil and gas ownership is shared between the DOE (about 78 percent) and Chevron U.S.A. (CUSA) (about 22 percent). Oil and gas from the field is sold and the proceeds shared proportionally by the Government and CUSA. DOE has full responsibility for production, including rate and quantity of production. DOE and CUSA share equally in the major operating decisions through an Operating Committee, which has a Government member and a CUSA member. The production operations have been conducted for DOE by Bechtel Petroleum Operations, Inc. (BPOI), since August 1985 under a cost-plus-award-fee contract.

The existing NPR-1 facilities consist of oil and gas wells and associated production pipelines, tanks, gas and oil/water gathering systems, gas separation plants, lease automatic custody transfer units that meter crude oil for sales, gas sales facilities, water injection and source wells, and gas injection wells and associated pipelines.

The principal safety concerns presented by operations at NPR-1 are fires and explosions, and the occupational safety and industrial hygiene considerations associated with oil and gas production. Oil field production operations typically involve hazardous petroleum materials and processing equipment, such as oil and its by-products, rotating machinery, compressors, oil drilling equipment, boilers, and electrical distribution systems. The age of many of the facilities, some constructed as early as 1952 and operated routinely since the early 1970s, may be a factor in the safety of some operations.

The appraisal focused on specific activities considered by EH management to present the most significant safety hazards. The team also gave particular attention to the requirements of the U.S. Occupational Safety and Health Administration (OSHA) because NPR-1 is regulated under OSHA (through the State of California). The separate listing of OSHA noncompliances was developed during the normal course of the appraisal, but a comprehensive OSHA-type

inspection was not conducted except for seven small parts of the facility as a sampling.

The team performed a follow-up on concerns identified during the 1988 TSA at NPR-1. The status of the contractor's action to address those concerns will be provided to line management separately; however, the team's assessment of the safety implications of the contractor's progress has been incorporated into the review findings in this report.

Team members participated in a process of verifying their findings with cognizant NPR-1 personnel and presenting the facts that supported each concern.

The findings and concerns developed during this appraisal were discussed with the DOE Field Office and BPOI management at an exit meeting on December 8, 1989.

II. PERFORMANCE EVALUATION

This is the second TSA of the NPR-1 site. The TSA team found a commitment on the part of BPOI to improve the site safety culture by strong emphasis on line management of operations and the presence of management in the workplace. Improvements were found in the emergency preparedness and industrial hygiene programs, and compliance with asbestos, respiratory protection, and noise standards was evident. Safety communications with workers is good. A well-qualified fire protection staff and an effective fire protection engineering program is present.

Despite the above strengths, there are many deficiencies in the NPR-1 safety program. There is a lack of understanding of the DOE Safety Analysis and Review System and a poorly documented design basis for facilities. As a result, adequate safe operating specifications based upon applicable codes and standards are not available. Consequently, the chillers in the gas plants were operated outside known safety limits for a number of years.

Lack of clear guidance from DOE and aggressive action by the contractor to either comply with DOE orders or seek an exemption based on sound analyses has led to deficiencies in the fire protection and emergency preparedness programs. Consequently, the emergency response staff does not know whether to adopt a defensive or offensive fire-fighting posture, and the efficacy of previously recommended passive protection systems (detection and suppression systems) cannot be made.

Lack or ineffective allocation of resources is a major concern. The staff appears to be so busy with production-oriented activities that safety awareness and attention to safety details are not receiving adequate attention. For example, a number of safety deficiencies resulted in work being conducted in an area of a known gas leak without adequate precautions. This was identified as a Category I concern requiring immediate attention. Also, many of the safety deficiencies appear to be related to the resource issue, including a lack of safety and engineering staffs and maintenance supervision. Many of the concerns from the 1988 TSA are still in the planning stage and easily corrected safety deficiencies have not received prompt attention.

Supervisors and workers do not have a high awareness of OSHA requirements and there is little incentive for compliance with OSHA. There is a lack of safety awareness in all levels of management. No comprehensive safety program plan is available for either the short or long term, nor is there a critical self-assessment program that uses in-depth analysis of lessons learned from previous incidents, other appraisals and assessments, other DOE operations, and similar sources.

Despite a good team spirit, pride of ownership, and some safety improvements, serious safety deficiencies remain. Improvements are being made, but the rate of improvement needs to be increased or the program will take years. Better plans need to be made and substantial resources applied. In the meantime, short-term compensatory measures are needed to correct serious concerns. If this is carried out, the threat of major safety breakdowns will be greatly diminished.

III. REVIEW FINDINGS

This section of the report contains the appraisal results. The team used preestablished performance objectives and criteria for petroleum facilities to assess the safety of NPR-1 in eight specific appraisal areas. The team also assessed the status of concerns identified in the 1988 TSA report and incorporated significant observations into the new assessment of NPR-1. The follow-up status reports, however, are provided to line management separately.

The narrative description identifies the substantive strengths and weaknesses in each appraisal area. All the performance objectives for each appraisal area were addressed by the team, and weaknesses under a performance objective are presented as concerns along with their supporting findings. Accordingly, the report explicitly includes only those performance objectives where a substantive weakness was found, and a balanced view of the appraisal results can only be found in the narrative descriptions.

The appraisal activities included observations of routine operations at NPR-1, inspections of the physical condition of hardware, review of documents and discussions/interviews with management and staff of BPOI, NPRC, CUSA, and some outside support personnel, such as medical and fire-fighting personnel in Taft, California. A concern addresses a situation that in the opinion of the team meets one of the following criteria: (1) does not comply with a DOE safety and health requirement or mandatory safety standard; (2) threatens to compromise the safe operation of the facility; or (3) if properly addressed, would substantially improve that particular situation. It should be noted that this appraisal is an evaluation at a fixed point in time. As a result, improvements to safety that are planned but not yet completed are identified as concerns if the team judged that failure to complete the improvements would significantly impact the safety of plant operations.

After completing the new and independent appraisal of the facility, the team assessed the previous 1988 TSA findings. New findings that support 1988 concerns are not necessarily identified in this report; they are included in the separate status reports on the follow-up of the 1988 TSA. In some instances, however, the new findings are sufficiently important to the team's assessment that they are included in this report in addition to the 1988 TSA status reports. New concerns that were not previously identified are presented in this report.

In developing the new concerns, a team approach was used so that the extensive experience of the team members could be utilized. An attempt was made to identify the factors responsible for safety weaknesses and express them as "concerns." However, the team's limited time on site and its limited size could not allow a complete safety assessment of NPR-1. Furthermore, neither the 1988 TSA nor this appraisal purport to identify all the concerns associated with a performance objective or appraisal area. That is the responsibility of line management. They should consider the findings and even the statements of concerns as examples of safety weaknesses and possible symptoms of deeper root causes, and should search out and correct those root causes in the interest of enhanced safety at NPR-1.

The team identified 30 new concerns based on the appraisal findings. The concerns were rated in accordance with the criteria in Appendix A.

One concern about hazard identification practices was rated Category I, requiring immediate attention to mitigate a clear and present danger to personnel working near a gas leak. Although the work in the area of the gas leak has ceased, the concern (MA.1-1) addresses the broader concern that personnel must respond appropriately to work-place hazards. This issue needs expedited attention to assure that similar situations do not arise.

Eight of the concerns were identified as Category II because they contain one or more elements that require expedited attention without waiting for issue of the final report and preparation of a formal action plan. The remaining concerns were classified as Category III and do not demand such urgency. Accordingly, these concerns can be addressed in the action plan that responds to this TSA.

The facility is regulated under the requirements of the U.S. Occupational Safety and Health Administration (OSHA), as implemented by agreement with the State of California (Cal-OSHA). During the course of the appraisal, the team maintained an ad hoc list of noncompliances with OSHA requirements, and one team member conducted an OSHA-type compliance inspection of seven discrete parts of the facility. This effort was not intended to represent a comprehensive inspection, but the identification of almost 60 noncompliances (about 30 percent of them classified as serious) indicated weaknesses in OSHA compliance at NPR-1. The OSHA noncompliances are listed in Appendix C. The noncompliances identified as serious need to be corrected promptly.

A. ORGANIZATION AND ADMINISTRATION

BPOI is under contractual mandate to maximize safety for all employees engaged in the operations and activities at NPR-1 and to maximize the safety of all on-site facilities. To fulfill this mandate, top management has expressed a strong commitment to the philosophy that the greatest benefits accrue within an organization where safety is a line management responsibility. The organization of BPOI is well defined and structured so as to accomplish operational goals without sacrificing safety goals. Organization charts are maintained and updated quarterly. Formal job descriptions are developed by Department Managers for all positions within their organization. Lacking is a formal overview by senior management of the consistency of job descriptions from department to department, and of their accuracy in describing an incumbent's duties and responsibilities.

Line management actively promotes safety programs and encourages upward communication on safety issues. It does not, however, require an independent annual review of the state of safety at NPR-1 with feedback to supervisors and employees. Nor is there a system in place to provide an up-to-date ranking of safety issues, based on priorities preestablished by BPOI management. The TSA team identified a significant number of serious deficiencies in operating procedures and facility conditions. This led to the conclusion that resources are inadequate or not effectively allocated to support field and staff operations to a level necessary to assure the identification and timely correction of safety problems. Department Managers are required to visit facilities and operations for which they are responsible at least once a month, and to report their observations and findings to the General Manager. Despite these formal scheduled walk-throughs, the day-to-day presence of upper-level management in the workplace could be improved.

Safety and health appraisals, the general oversight of the safety readiness of facilities, and the conformance of work activities with standards, requirements, and good safety practices are the responsibility of the Assistant General Manager for Technical Assurance. The program for tracking and reporting unusual occurrences, established by Technical Assurance, is comprehensive, as are the steps taken by top management to review and analyze recordable accidents, especially those involving personal injury and/or motor vehicles. Although a program exists for reporting safety violations, employee concerns, and the unsafe operation of facilities, the effectiveness of the program has yet to be measured.

The stated policy of the President of Bechtel Group, Inc., is that all necessary actions should be taken to establish and maintain safe and healthful working conditions at Bechtel operations and facilities. BPOI safety policy does not, however, specifically provide assurances that safety interests will be adequately prioritized and protected when there may be conflicts with cost, production schedules, or other interests. BPOI largely functions independently in the safety arena, incorporating feedback provided by corporate management on safety policy, procedures, and requirements.

All safety-related professionals are centralized in Technical Assurance, either in the Safety Department or in the Quality Assurance Department. This means that all personnel responsible for performing safety and quality reviews are functionally detached from the areas being reviewed and the influence of the operational objectives of line management. At the present level of staffing, a comprehensive series of safety audits and reviews to confirm line management decisions relative to the need for safety analyses, as required by DOE 5481.1B, "Safety Analysis and Review System," is not being performed in a timely manner. The review of Unusual Occurrence Reports (UORs) by Technical Assurance is thorough, but there is no rigid enforcement by line management of the reporting procedures. Audits are not performed to determine if all events covered by DOE 5000.3, "Unusual Occurrence Reporting System," are being reported, or if events of an order lower than those required by DOE 5000.3 are being reported to and by line supervisors. UORs are not distributed to all managers and supervisors as a matter of course.

There are both formal and informal systems for apprising employees of safety policies and requirements. New employee safety training and specialized training for specific hazards are provided. The Safety Department prepares a "Safety and Health Bulletin" for distribution to all employees approximately once a month, and BPOI distributes an excellent "Safety and Health Booklet" that provides mandatory rules for the guidance of employees and sub-contractors. An informal system exists for disseminating safety information verbally to employees through daily tailgate meetings and weekly and monthly supervisors' meetings as well as by written instructions, operating procedures, and on-the-job training handouts. However, management has no direct mechanism for judging the effectiveness of these systems and thus cannot be sure that each employee is apprised of current safety policy and requirements. Furthermore, BPOI management does not make available to all supervisors and employees information from the Management Accident Review Meetings describing the corrective actions defined and/or taken to prevent a recurrence of avoidable motor vehicle accidents and personal injury accidents.

Awareness of and responsiveness to safety policy and procedures are part of the annual employee performance evaluations. Performance ratings of all BPOI employees, from the General Manager down, are based on the same 10 preestablished criteria, one of which is "Safety and Housekeeping." Appraisals by supervisors do not as a rule mention the attainment or nonattainment of safety goals, or the state of an employee's safety awareness, in their Performance Summary Statements.

Safety training is widely recognized at BPOI as being an important element in the overall development of employees and in the programs for reducing safety breaches. However, records of the safety-related training performed by the Human Resources, Operations, and Safety Departments are not readily retrievable. There is no policy that mandates a prescribed course of training for those involved in occurrences stemming from breakdowns in safety consciousness.

Line management does not seem to recognize the strengths of the safety analysis and review system detailed in DOE 5481.1B. Safety analyses presently exist for only the major plant operations, and they are more a compilation of

individual noncorrelated hazards and recommended corrective actions than a systematic analysis of risks, design and administrative controls, and operational limitations.

BPOI has a written Drug and Alcohol Policy (PPM 530-100, "Drug and Alcohol Program") applicable to all employees, subcontractors, and visitors. Included is an Employee Assistance Program (EAP) designed to help employees who suffer from drug- or alcohol-related problems. The drug-abuse program appears to be effective but the alcohol-abuse program is weak. Managers and supervisors receive some training in techniques for identifying and handling personnel suspected of being unfit for duty, but not on a continuing basis.

OA.1 SITE/FACILITY ORGANIZATION

PERFORMANCE OBJECTIVE: Management should organize and manage the site/facility's work, programs, and resources so that safety and health are an integral part of the personnel duties and requirements are consistently implemented.

FINDINGS:

- o Other than the major safety improvements included in the Annual Operating Plan, there is no system in place, based upon preestablished priorities, to provide an up-to-date ranking of all NPR-1 safety issues, including such issues as TSA findings and concerns.
- o Management does not require an annual review of the state of safety at NPR-1 with feedback to supervisors and employees.

CONCERN: See 1988 TSA "Concern MC.5-1. Management is not providing for formal independent verifications or evaluations to determine the effectiveness of the Environmental, Safety and Health Program in accordance with the DOE Order 5482.1B and other DOE 5480 series orders."

FINDINGS:

- o The team identified a significant number of serious deficiencies in operating procedures and facility condition, e.g., Concerns OP.3-1, MA.5-1, and EP.2-1.
- o Safety Department staff members spend a significant portion of their time performing administrative functions, such as tracking UORs, performing training, and managing the Material Safety Data Sheets, the Kern County Business Plan, and Proposition 65, at the expense of responding to the needs of the field.
- o Many concerns in this TSA and their supporting findings indicate that resource limitations are a constraint in meeting more fully the objective of an accident-free work environment, e.g., Concerns OP.1-2, MA.4-1, EP.1-2, and IH.1-1.

CONCERN: (OA.1-1) (H1/C2) Resources are either not adequate or not effectively allocated to support field and staff operations to a level necessary to assure the identification and timely correction of safety deficiencies.

OA.5 MANAGEMENT ASSESSMENT

PERFORMANCE OBJECTIVE: Management and supervisory personnel should monitor and assess facility activities to improve performance in all aspects of the operation.

FINDINGS:

- The requirements and responsibilities for the UOR system defined by PPM 1210-006, "Notification, Investigation and Reporting of Occurrences"; PPM 22200-001, "Unusual Occurrence Reporting"; and PPM 22200-002, "Notification and Reporting of Unusual Occurrences" meet the expectations of DOE 5484.1 and DOE 5000.3. Management review and follow-up actions are thorough, except that the 72-hour reporting deadline set forth in PPM 22200-001 is not being met. (Of the 15 unusual occurrences reported in 1989, 7 were initially reported after the established deadline.)

- Audits are not performed to determine if events of an order lower than those required by DOE 5000.3 are being reported to and by line supervisors.

- UORs are not distributed to all managers and supervisors as a matter of course.

- New BPOI employees receive an initial safety orientation and are required to read and sign the Safety and Health Booklet. All employees attend scheduled and structured bimonthly safety meetings. Training is provided to employees on special hazards, such as confined-space work, as needed. An informal system exists for disseminating safety information verbally to employees through daily tailgate meetings and weekly and monthly supervisors' meetings, as well as by written instructions, operating procedures, and on-the-job training handouts. However, management has no direct mechanism for judging the effectiveness of the dissemination of safety information, and hence of ensuring that each employee is aware of current safety policy and requirements.

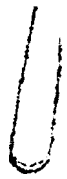
- The Safety Department prepares a "Safety and Health Bulletin" for distribution to all employees approximately once a month. BPOI management does not make available to all supervisors and employees information from the Management Accident Review meetings describing the corrective actions defined and/or taken to prevent a recurrence of avoidable motor vehicle accidents and personal injury accidents.

- The team identified a number of deficiencies in safety practices in the various facilities. The nature of these deficiencies indicates that the objectivity and depth of safety assessments and audits are insufficient to pinpoint

details important to the subsequent safe operation of the facility.

- o Although a program exists for reporting safety violations, employee concerns, and conditions that could lead to the unsafe operation of a facility, results indicate that line management does not aggressively support and encourage participation in such activities.

CONCERN: (OA.5-1) (H2/C1) Line management oversight and enforcement are not adequate to assure consistent conformance with safety and health policies, practices, and procedures. Also see 1988 TSA "Concern MC.4-1. A satisfactory safety culture is not evident throughout the NPR-1 site."



OA.6 PERSONNEL PLANNING AND QUALIFICATION

PERFORMANCE OBJECTIVE: Personnel programs should ensure that appropriate job qualification requirements or position descriptions are established for all positions that affect safe and reliable operation.

FINDINGS:

- Performance evaluation ratings of all BPOI employees, from the General Manager down, are based on the same 10 preestablished criteria, one of which is "Safety and Housekeeping." Appraisals by supervisors do not as a rule mention the attainment or nonattainment of safety goals, or the state of an employee's safety awareness, in their Performance Summary Statements.

- The team could not verify that employees are able to obtain safety-related operational experience through coordinated training programs with other sites or facilities operated by the contractor or by other DOE contractors.

- Findings by the team in the Occupational Safety and Maintenance areas suggest that initial and follow-up safety training for new employees, as well as for Contract Technical Representatives and for employees and supervisors who have transferred to NPR-1 from other locations, is not sufficient to improve their safety awareness or to qualify them to assist others with safety-related problems.

- Safety training is an important element in the overall development of BPOI employees and in the programs for reduced safety breaches. However, there is no policy that requires supervisors to develop an annual training plan for employees or that mandates a prescribed course of training for those involved in occurrences stemming from breakdowns in safety consciousness.

CONCERN: See 1988 TSA "Concern MC.6-1. No control mechanism exists to ensure that all persons who require training receive both initial training and periodic retraining to proper standards and that records are established to document training completion and quality."

OA.7 DOCUMENT CONTROL

PERFORMANCE OBJECTIVE: Document control systems should provide correct, readily accessible information to support site/facility operations.

FINDINGS:

- o The Policy and Procedures Manual (PPM) does not establish requirements, following the policies and procedures established in DOE 5481.1B, "Safety Analysis and Review System," for the preparation, review, and approval of safety analyses of BPOI operations and facilities.
- o The three safety analysis review reports on plant operations performed to date do not describe nor provide analysis and evaluation of potential hazards, accidents, or risks, and do not constitute a systematic evaluation of normal or unusual potential accidents or consequences as required by DOE 5481.1B.
- o Safety analyses are required to develop comprehensive safety programs in many areas, including Emergency Preparedness and Fire Protection.

CONCERN: (OA.7-1) (H2/C1) There is no safety analysis process established at NPR-1 that meets the requirements or intent of DOE 5481.1B.

FINDINGS:

- o The safety analysis review reports do not identify all the systems or equipment operating parameters that are required to determine safe conditions or approaches to unsafe or upset operations.
- o The safety analysis review reports do not demonstrate conformance with applicable guides, codes, and standards.

CONCERN: (OA.7-2) (H2/C1) Adequate operating parameters, codes, and standards are not documented or available to ensure safe facility operation.

FINDINGS:

- o Safety-related training of employees is performed by the Human Resources, Operations, and Safety Departments, each of which maintains records of the training provided.
- o An evaluation of an employee's or supervisor's specific safety skills or overall qualifications to perform a work assignment may need to be made in a timely manner.
- o An employee's complete training record is not readily accessible.

CONCERN: See 1988 TSA "Concern MC.6-1. No control mechanism exists to ensure that all persons who require training receive both initial training and periodic retraining to proper standards and that records are established to document training completion and quality."

OA.8 FITNESS FOR DUTY

PERFORMANCE OBJECTIVE: A Fitness for Duty Program should be capable of identifying persons who are unfit for their assigned duties as a result of drug or alcohol use, or other physical or psychological conditions, and should provide procedures to remove them from such duty and from access to vital areas of the site or facility pending rehabilitation or remedial actions.

FINDINGS:

- The BPOI policy on drug and alcohol use is detailed in PPM 530-100, "Drug and Alcohol Program." Although comprehensive, PPM 530-100 does not specifically assign responsibilities for administering, implementing, and measuring the effectiveness of the drug- and alcohol-abuse program.
- In response to the Drug-Free Workplace Act of 1988, a change was made in PPM 530-100. Records do not show that employees and subcontractors were advised of this change.
- PPM 530-100 does not include a mechanism for making changes in its provisions available to all employees, subcontractors, and visitors.
- There is no aggressive outreach program to encourage personnel to report drug and alcohol abuses or other physical or psychological conditions affecting themselves or others that could impair fitness for duty and jeopardize the safety of personnel and facilities.
- Managers and supervisors receive some training in techniques for identifying and handling personnel suspected of being unfit for duty, but not on a continuing basis.
- BPOI maintains an Employee Assistance Program (EAP) that handled only two alcohol problems in the last year, but many related to abuse of other drugs.
- An education and training program has yet to be implemented that will provide (1) drug- and alcohol-awareness education; (2) the knowledge required to recognize unusual conduct and fitness-for-duty concerns; and (3) guidance for individuals affected by personnel who may be unfit for duty.

CONCERN: (OA.8-1) (H2/C1) The Drug and Alcohol Program is yet to mature to the point where employees and their families and visitors to BPOI can have complete confidence in its effectiveness.

B. OPERATIONS

Responsibilities and authorities of management, supervisory, and professional staff in the Operations Departments at NPR-1 are well defined. Little overlap or duplication of activities or responsibilities exists. Operations personnel have regularly defined duties and were observed to be qualified to perform assigned duties. Administrative controls are not always employed effectively to ensure that documented policies and requirements affecting safe and reliable operations are continuously implemented.

The team observed that the majority of operational activities are conducted in a businesslike and professional manner. The operations cadre are experienced and well trained. Many, if not most, of the supervisors have over 10 years of work experience at NPR-1. Safety meetings and job-training sessions are scheduled and held on a periodic basis, and attendance and discussion items are documented. Safety systems are reliable and maintained operable. Implementation, control, and documentation of the pressure relief valve testing and calibration program are exceptionally good.

NPR-1 has prepared and implemented many written procedures, policies, and check sheets to provide guidance for the safe operation of each facility. The Policy and Procedures Manuals (PPMs) and Operating Instructions (OIs) are controlled documents that are widely disseminated in three-ring binders and periodically reviewed and updated; all supervisors are familiar with them and have copies. Preparation of new documents and the revision of existing documents are on an ad hoc basis, usually when a need is realized by a supervisor. As a result, some safe operating procedures are lacking and others should be more comprehensive. No single group is assigned the ongoing responsibility of reviewing all critical operations activities at NPR-1, defining those safe operating procedures lacking or in need of improvement, and initiating and following up on their preparation.

In general, operations personnel are continually aware of the status of the systems and equipment under their control. Drilling and well servicing operations are closely supervised by a BPOI supervisor who is either at the site or on 24-hour call. Personnel from the Operations Departments monitor field producing operations by site visits, usually two per shift. A corrosion control program is in effect. Radio alarms are installed on critical processes to quickly inform operators of shutdown or other malfunction. A configuration control system is implemented to control equipment modifications. Locks and tags are effectively employed for the safety of personnel and equipment. Instrumentation is provided on machinery and process equipment to define operating status and provide data necessary for safe process control. Essential instrumentation, such as alarms, shutdowns, pressure gauges, pressure relief valves, emergency shutdown devices (ESDs), etc., are periodically tested and calibrated. Records are retained. There is a concern, however, that some systems and equipment are at times operated under conditions when both personnel and process safety cannot be assured.

Routine maintenance and housekeeping are considered weak at NPR-1, particularly in the area of field gas compressor stations. One compressor

station had considerable oil leakage collected on and around the skid package, sufficient in the judgment of the team member to present both a slipping hazard to personnel and a fire hazard. This condition was also noted in the 1988 TSA for the identical location.

An operations training program is in place and effective at NPR-1. Successful completion of prescribed American Petroleum Institute (API) home-study courses, including written testing, is a requirement for promotion. In addition, hands-on training is formalized by job rotation during career progression. In field and plant operations, new employees can only enter the system at the lowest maintenance level and progress through the system as openings develop. Special craft training is also provided through Westech, a local training organization, for about 20 people per year. Key operators and technicians are also sent to selected industry schools out of the area. Training rec s are not readily accessible at this time, but centralization on a computer system is planned and scheduled for completion by September 30, 1990.

Shift turnover practices were observed to be effective and in line with industry practice.

BPOI has not conducted an adequate engineering review of the facilities to ascertain that all equipment meets DOE requirements, industry practices, and codes. Further, BPOI has not determined that the facilities are operating within design constraints.

Operating controls, gauges, meters, etc. for all facilities observed are accessible and readable. Marking/labeling on piping is not done uniformly at NPR-1, but rather only when a judgment has been made that confusion is probable. Valves at field compressor stations that must be manually activated during start-up and shutdown are inconsistently located, and sometimes inconvenient for emergency use. Clearances are generally adequate for personnel egress in an emergency, but a few obstructions were noted. (See the OSHA noncompliance list in Appendix C.)

It is evident that greater emphasis is being placed on operations safety since the last TSA, and this is reflected in the attitude of the personnel. Nevertheless, there is still a weakness in the area of hazard awareness and recognition of the safety value of comprehensive written procedures and their rigorous observance.

OP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Operations organization and administration should ensure effective implementation and control of operations activities.

FINDINGS:

- o Three contract well servicing supervisory employees were found not to possess current well control school certification, although this is a requirement under the procurement contract by which they operate.

- o While an ignition source was present (namely, a work truck with its engine running), several operations personnel were observed working in the vicinity of a known gas leak at compressor K-35 at the 30R Compressor Station, in a proximity a team member judged hazardous.

- o Propane chillers in the Low Temperature Separation (LTS) Gas Plants No. 1 and No. 2 were observed operating with a shell temperature lower than -30°F, although the American Society of Mechanical Engineers (ASME) code documentation for the vessel specified a minimum design temperature of -20°F.

- o After the chillers were found to be operating under conditions outside of known safe limits (i.e., below code-certified temperature), operation continued for over 24 hours before the chillers were returned to code-certified conditions. (This was accomplished by raising chiller temperatures with a concomitant reduction in propane recovery.) Subsequently, part of the corrective action included reducing the pressure relief valve settings.

- o Operating outside of known safety limits is a violation of OSHA regulations.

- o Start-up (light-off) of the four, direct-fired natural draft therminol heaters in the LTS-1 and LTS-2 Gas Plants is accomplished without positive assurance that the large-volume fire box is not already filled with an explosive mixture. Moreover, the control panel where the operator is positioned is located only about 5 feet from the furnace shell.

CONCERN: (OP.1-1) (H1/C1) CAT. II — Critical process operations with significant safety ramifications are sometimes conducted under conditions that are unsafe or not known to be safe.

FINDINGS:

- o Field surveys of processes and equipment are not conducted by engineering staff to assure operating compliance with codes and standards such as BPOI design criteria. For example, the chillers at LTS-1 and LTS-2 were operating outside of code design limits.

- o Safety analysis reviews are not made in accordance with DOE 5480 series orders.

- o Procedures and criteria manuals are not prepared for all critical operations. (See Section OP.3.)

CONCERN: Engineering (technical) support for field operations is lacking.
(OP.1-2)
(H1/C2)

OP.2 CONDUCT OF OPERATIONS

PERFORMANCE OBJECTIVE: Operational activities should be conducted in a matter that achieves safe and reliable operation.

FINDINGS:

- Three contract well servicing supervisors and a contract drilling rig foreman did not possess current well control certification (blowout prevention training). The uncertified supervisors were replaced the following day.
- Current well control certification for well control supervisors is not a PPM requirement at NPR-1, although certification is a procurement requirement.
- There is no NPR-1 requirement for well control schooling and certification for contract drilling rig supervisors, although this degree of qualification is a widely accepted, best industry practice.

CONCERN: (OP.2-1) (H1/C2) CAT. II

Well control schooling with current certification for contract drilling rig foremen and drillers is not required at NPR-1.

OP.3 OPERATIONS PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Approved written procedures, procedure policies and data sheets should provide effective guidance for normal and abnormal operation of each facility on a site.

FINDINGS:

- o Policy and Procedures Manuals (PPMs) and Operating Instructions (OIs) that encompass all critical operations have not been prepared and disseminated. Some of the existing procedures do not cover all critical activities.
  - Current procurement specifications for completion and remedial rigs, but not for drilling rigs, require that operator-drillers possess current certification from a well control school. However, PPM TOC-14.6, "Blowout Prevention and Control Responsibilities," does not require that contract foremen or drillers have formal schooling in well control.
  - No written instructions exist for safe start-up and shutdown of the large direct-fired therminol heaters at the LTS-1 and LTS-2 Gas Plants, including assurance of a nonexplosive atmosphere in the fire box.
  - No written instructions exist for the safe changing of well head chokes on high pressure flowing wells.
  - PPM TOC-14.6 does not specify choke manifold design and layout. At the Cleveland drilling rig, the blowout prevention choke manifold discharge (vent) lines were observed to terminate a short distance from the well (approximately 50 feet), and prior to reaching the reserve pit (approximately 15 feet).
- o Subcontractor layout plans are available for drilling sites, but BPOI does not have explicit policy or procedures to assure that actual equipment locations meet acceptable safety criteria.
- o Safe operations instructions for specific critical activities are not always required or posted in a conspicuous location to assist safe operations.
  - Posting a Blowout Prevention Station Bill in the rig floor doghouse is not required. One was not posted on the Cleveland rig. However, a Fire Station Bill was posted.
  - Safe start and stop instructions for furnace-type direct-fired heaters and gas compressor installations are not conspicuously posted.

Safety instructions, such as no smoking, turn off truck engine, chock wheels, connect ground cable, etc., are not clearly posted and visible to drivers arriving at the Natural Gas Liquids Loading Islands.

CONCERN: (OP.3-1) (H1/C2) Control mechanisms are lacking to assure that all critical operations are defined by written safe practices and procedures, including conspicuous postings where needed.

OP.5 OPERATIONS STATIONS AND EQUIPMENT

PERFORMANCE OBJECTIVE: Operations stations and facility equipment should effectively support facility operation.

FINDINGS:

- o The 17R Compressor Station had considerable oil leakage collected on and around skids. This identical finding was noted in the 1988 TSA, at this location.
- o Several other field compressor installations and the basement rooms of the LTS-1 and LTS-2 Compressor Plants were observed to have excessive amounts of crankcase oil accumulations.
- o No external grounding cables were observed at the 8R Compressor Station Coolers, where the fans are electrically powered.
- o Numerous OSHA-type work-site violations, some with a "serious category" listing, were observed by team members. (See Appendix C.)

CONCERN: See 1988 TSA "Concern MA.1-2. Maintenance of the general condition of the facilities is inadequate. Also see Concern OS.5-4."

OP.8 HUMAN FACTORS

PERFORMANCE OBJECTIVE: Human factors considerations should be incorporated in the design, layout, and operation of all facilities on the site in order to facilitate operator control, information processing, and the recognition and proper response to alarms, instruments, and other equipment.

FINDINGS:

- o Marking/labeling on piping is not rigorous or uniform at NPR-1.
- o The location of manually activated start/shut-down valves at field compressor stations is inconsistent, and sometimes quite distant from the control panel.
- o Emergency shutdown devices (ESDs) in plants and field compressor stations are not optimally located for activation in emergencies.
- o Some pressure relief valves discharge in a way that could present a hazard to personnel in the area.

CONCERN: (OP.8-1) (H2/C2) Insufficient attention is given to human factors (ergonomics) in the design, layout, and modification of facilities at NPR-1.

C. MAINTENANCE

The maintenance management program required by DOE 4330.4 is being developed but is not completely functional at this time. Maintenance activities are split between the Production Operations and Gas Operations Departments and the Facility Maintenance Department. The Operations Departments have Service and Relief (S&R) crews that perform "day-to-day" and welding maintenance, whereas the Facility Maintenance Department handles rotating equipment, instruments, and electrical maintenance. Facility maintenance activities are documented and controlled by a computerized work order system. S&R work is also controlled and documented through a computerized system.

A preventive maintenance program is established and effective on major production components, but the program does not cover all items requiring periodic maintenance.

Facility inspections are scheduled and controlled by the Safety Department. This program is not effective and the Facility Maintenance Department does not have a separate inspection program.

Sufficient resources have not been effectively allocated to the supervision and completion of needed maintenance at NPR-1. Although progress has been made (e.g., K-57 Compressor restoration), resources have not been dedicated to perform necessary work such as correction of compressor oil leakage and general housekeeping.

Work is not being completed before equipment is placed back in service. The required supervisor inspections of completed maintenance work has not corrected this deficiency.

The working relationships and informal cooperation between the Facility Maintenance Department and the Operations Departments are notably excellent. Although the same apparent relationship exists with all other departments, the Safety Department, for example, does not participate in regularly scheduled meetings of the Operations Departments and the Facility Maintenance Department. Because of the informality of these relationships, the team concluded that maintenance personnel are not adequately trained and instructed in their responsibilities and authorities related to hazard identification, avoidance, and correction. Personnel were dispatched to work under hazardous conditions during the TSA.

The Facility Maintenance Department is obviously skilled and dedicated to an effective on-line maintenance approach to conducting repairs. Downtime is minimal; compressor availability is 95 percent, which is creditable; and more than 4,000 facility and S&R maintenance work orders are processed each month. A weakness in the maintenance activities appears to be related to the widely scattered work force and the large number of maintenance jobs needed to keep this facility at peak production. Even routine maintenance cannot be thoroughly covered, so predictive maintenance receives very little attention at this time.

MA.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Maintenance organization and administration should ensure effective implementation and control of maintenance activities.

FINDINGS:

- o A subcontractor vacuum truck was dispatched by radio to the 30R Compressor Facility to remove crankcase oil from the K-35 Compressor during a time when there was a reported natural gas leak at the compressor.

CONCERN: (MA.1-1) (H1/C1) CAT. I

Hazard identification practices do not preclude employee entry into areas with existing dangerous conditions.

FINDINGS:

- o Two separate groups of employees arrived at a hazardous work site and proceeded to perform assigned tasks without taking appropriate action for hazardous conditions.
- o The following activities were subsequently observed by a TSA team member.
  - There was a significant gas leak (creating a "fog" of about a 2-foot radius and 2-foot arc) within 25 feet of an operating vacuum truck.
  - A mechanic pickup was parked about 10 feet from the leak.
  - The mechanic crew was working within about 10 feet of the leak.
- o The hazardous condition was pointed out to the vacuum truck operator, the facility operator, and the mechanic crew by the team member's guide.
- o Over 1 hour later, the gas was still leaking, the vacuum truck had left, the mechanic truck was moved closer to the leak, and the mechanic crew was still working on the compressor.
- o Safety personnel do not attend regularly scheduled Operations Departments and Facility Maintenance Department meetings.

CONCERN: (MA.1-2) (H1/C2) CAT. II

Personnel training in responsibilities and authorities related to hazard recognition, avoidance, and correction is not effective.

FINDINGS:

- o The vacuum truck operator did not have a written permit and the vacuum truck was not noted in the facility operator log book.
- o The vacuum truck was not grounded.

CONCERN: See Concern MA.8-1.

MA.2 CONDUCT OF MAINTENANCE

PERFORMANCE OBJECTIVE: Maintenance should be conducted in a safe and effective manner to support each facility condition and operation on the site.

FINDINGS:

- o Unusual Occurrence Reports (UORs) and accident reports are not distributed to all maintenance personnel.

CONCERN: See Concern OA.5-1.

FINDINGS:

- o A significant number of unlabeled containers of hazardous material were installed at various field locations.
- o Block valves under relief valves were not always chained open.
- o The external grounds on all six water flood pumps were disconnected.
- o On the Glycol Reboiler at LTS-1, 2-inch and 4-inch valves were left open-ended.
- o A 4-inch flanged valve on reinjection pump was open-ended.
- o Injection line from scrubber skid and scrubber was not blinded. A 6-inch valve was used for isolation.
- o Pump repairs at the 7R Area were not complete before pump was placed in service. Considerable crude oil was spilled and not cleaned up.
- o Supervisors signed off on these items as being completed.
- o Other deficiencies are noted in the OSHA noncompliance list (Appendix C).

CONCERN: (MA.2-1) (H1/C1) CAT. II

Inspection and closure of work orders by operators, maintenance staff, and supervisors are inadequate.

MA.3 MAINTENANCE FACILITIES, EQUIPMENT, AND MATERIAL

PERFORMANCE OBJECTIVE: Facilities, equipment, and material should effectively support the performance of maintenance activities.

FINDINGS:

- o Natural gas relief valves at the 30R Compressor Facility discharge 3 to 5 feet from the engine exhaust.
- o Numerous 500-gallon and some 100-barrel methanol tanks did not have leak containment dikes.
- o Low pressure pipe caps were noted on various end connections in the Low Temperature Separation (LTS) Gas Plant No. 1.
- o Three contractor truck cranes were inspected and all were without anti-two block devices.
- o Several slings were noted to be excessively worn or damaged.
- o An inactive well was located about 75 feet from the BPOI Welding Building. The well tubing pressure was 1800 psig and casing pressure was 130 psig. The well was last checked for pressure in 1983.
- o An abandoned tank was converted to a storage shed. The homemade door could not be opened from the inside and the exposed electrical wire was not protected at the point of entry.
- o Several hundred feet of indoor-type Romex cable was laid on top of the ground, from the Welding Building to the cathodic protection storage building.

CONCERN: See Concern MA.5-1.

MA.4 PLANNING, SCHEDULING, AND WORK CONTROL

PERFORMANCE OBJECTIVE: The planning, scheduling, and control of work should ensure that identified maintenance actions are properly completed in a safe, timely, and effective manner.

FINDINGS:

- o A significant amount of facility corrective maintenance work has not been identified and scheduled. (See Concern MA.5-1.)
- o Preventive maintenance is not performed on all items needing preventive maintenance. (See Concern MA.6-1.)
- o Supervisors are required to cover a large area and a significant number of employees.

CONCERN: See 1988 TSA "Concern MA.1-2. Maintenance of the general condition of the facilities is inadequate. Also see Concern OS.5-4."

MA.5 CORRECTIVE MAINTENANCE

PERFORMANCE OBJECTIVE: The material condition of components and equipment should be maintained to support safe and effective operation of all facilities on the site.

FINDINGS:

- The team noted numerous open-ended valves, some 1/4-turn; these could easily be opened inadvertently.
- Numerous electrical conduit boxes in hazardous areas were improperly sealed.
- The configuration of the threaded nipple and valve setup at the K-35 and K-34 compressors at the 30R Compressor Facility do not follow good piping practice, which precludes the use of threaded piping in vibrating service. This piping was changed during the TSA.
- Numerous plastic containers containing drained flammable fluids were noted throughout the facility.
- A scrubber at the 24Z Area was not grounded, and various drilling rig components were not grounded.
- All inactive production wells are not checked for change in condition.
- The Glycol Reboiler Flame Arrestor was dirty.
- Piping at several compressors was vibrating excessively.
- Gas vents on the K-9 and K-10 Compressors were close to the compressor exhaust.
- Control panel building at the 35R Gas Plant was not vented, the two access doors were not grounded to the frame, and there was no gas detector.
- All relief valves in the 35R Gas Plant process area are locally vented, except for the compressors.
- The inlet Gas Chillers at LTS-1 and LTS-2 were found operating significantly outside of design low-temperature limits.
- Electric motors in classified areas in LTS-1 and LTS-2 and at most production sites did not have an underwriter's label.
- Numerous product, process liquid, and compressor oil leaks were noted.

- o There was no relief valve (process or thermal) on the blocked-in Peco gasoline filter.
- o The 440-volt pump at the 24Z Area was surrounded by water leaking from the cooling tower.
- o There was a significant leak in the bottom of a 100-barrel methanol tank at the 1-7R Tank Battery.
- o None of the propane loading racks has excess flow valves.
- o No ground was connected to a propane trailer.
- o Loading Rack Island Nos. 3, 4, and 5 were noted to have improperly made electrical fittings or connections.
- o The Cleveland drilling rig had several electrical integrity deficiencies that were pointed out to the rig foreman.
- o The walkways and stairs on the cooling tower were adequate, except at the top landing.
- o Two steam turbine relief valves were vented horizontally at waist level.
- o Storage tank pressure relief valves at the 24Z Area were spraying oil on the tank.
- o LTS-1 Compressor Sump Pump ground wire was damaged.
- o Additional details of deficiencies in components and equipment are provided in the list of OSHA noncompliances (Appendix C).

CONCERN: (MA.5-1) (H1/C2) Inspections by supervisors and maintenance and operating personnel are inadequate to identify hazards needing correction.

MA.6 PREVENTIVE MAINTENANCE

PERFORMANCE OBJECTIVE: Preventive maintenance should contribute to optimum performance and reliability of systems and equipment important to operations.

FINDINGS:

- o The on-line maintenance program appears to be effective, as evidenced by the high availability of compressors, but numerous lubricating oil leaks were noted around compressors.
- o The preventive maintenance program does not include routine checks of facility valving to identify and correct external leaks. However, relief valves are checked annually.
- o Several abandoned (out-of-service) vessels were noted open to atmosphere and not sealed and protected or regularly checked. For example, at LTS-1, the out-of-service separator on the high pressure gas injection line remains connected (through a closed block valve) to the in-service pipeline, but has open-ended flanges that could leak.
- o Many chemical storage tanks (e.g., methanol tanks) throughout the site are not periodically checked. (For example, Baker tank P7135 at 17Z has no vehicle guard or label.)
- o Check valves are not routinely tested.

CONCERN: (MA.6-1) (H1/C2) Preventive maintenance is not performed on all items needing periodic attention.

MA.8 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Maintenance procedures and related documents should provide appropriate directions and guidance for work and should be used to ensure that maintenance is performed safely and effectively.

FINDINGS:

- o "No vehicle entry" signs were not posted at numerous hazardous area sites, e.g., at well sites.
- o Plant procedures do not use a multicopy work permit for subcontractors unless hot work is to be done.
- o No work permit is required for BPOI maintenance personnel unless hot work is to be done.

CONCERN: (MA.8-1) (H1/C2) CAT. II — The safe work permit procedures do not adequately control hazardous area entry or safe work practices.

FINDINGS:

- o The 35R Gas Plant V-140 Lean Oil Carry Over Flash Tank had a stub-on type weld connection. Approximately 12 feet of unsupported piping was hanging on the connection.
- o Unsupported and threaded piping on compressors was vibrating.
- o Work orders do not include safety checks before commencing work.
- o Generally, electrical switch gear and cabinets were left unlocked.
- o Generally, fluid lines at wellheads were blown down to the ground.
- o The propane loading rack has only one (continuity) ground.

CONCERN: (MA.8-2) (H1/C2) — Facility maintenance procedures are sometimes inadequate.

D. EMERGENCY PREPAREDNESS

The Safety Department staff members project a professional image and are working diligently toward meeting DOE 5500.1A requirements. Program goals and objectives are realistic, but fall short of the performance objectives established by DOE.

The position of overall responsibility and authority for management of operational emergencies is clearly defined and assigned at the senior management level. Individuals and alternates are designated to perform all emergency roles, and clear lines of succession have been assigned.

Personnel clearly understand their authorities, responsibilities, and relationships within the emergency organization and interfaces with support groups. Technical support, operations, and maintenance personnel are identified and available during emergencies.

An independent annual review of the emergency management program is conducted and documented. Timely and effective action is taken to track and correct identified emergency response deficiencies and their basic causes.

The Emergency Response Team (ERT) is well organized; however, management has given insufficient attention to an even distribution and assignment of fire fighters. Inadequate resources have been provided to deal with emergencies on the night shift, and serious concerns were expressed by employees over their ability to safely cope with fires between the hours of 6 p.m. and 6 a.m.

An excellent general emergency preparedness plan exists, but the facility emergency plans are not based on a site-specific process hazards management review. Detailed actions required to be performed during emergency operations are not spelled out. For example, the emergency preparedness plan addresses earthquakes, but there is no analysis of how each individual facility would be affected.

Emergency response training is being provided for all response team members, but there are no written program goals or objectives that tie training directly to job performance. No lesson plans exist to ensure consistent delivery of training between shifts.

Good quarterly drill and exercise programs are in place to evaluate response team capabilities. Scenarios are realistic, and a well-organized critique system helps improve employees' level of proficiency. During the appraisal, a preplanned, announced training exercise was conducted to allow evaluation of BPOI's ability to plan, conduct, and evaluate an exercise and to effect self-correction on any noted deficiencies. Planning, conduct, and evaluation of the exercise was effective, and the ERT performed satisfactorily. A very good critique was held following the exercise, and should result in effective self-correction.

There are two serious equipment deficiencies that should be addressed on a priority basis. First, the existing radio communications system is inadequate

for emergency response, and places team members in unsafe situations. Secondly, fire-fighting protective clothing has not been distributed to all members of the ERT.

Overall, significant improvements have been made to the emergency preparedness system since the last TSA. Nevertheless, many additional corrections are required to meet DOE guidelines. There are some justifiable concerns among employees over their ability to meet program objectives with the current level of full-time staff.

EP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Emergency preparedness organization and administration should ensure effective planning for, and implementation and control of, site/facility emergency response.

FINDINGS:

- o An emergency preparedness program has been established in accordance with DOE 5500.1A. Some specific program elements have not been met as required by DOE. For example, resources are not sufficiently allocated to accomplish assigned tasks for both routine and emergency duties.

- o Approximately 50 personnel are assigned to the Emergency Response Team, but only 10 individuals are trained and equipped to fight major fires. Most of these trained fire fighters are assigned to the day shift.

CONCERN: (EP.1-1) (H2/C2) The emergency preparedness organization and administration has not sufficiently ensured a span of command and control for emergencies that may occur from 6 p.m. to 6 a.m.

FINDINGS:

- o Responsibility has not been assigned to one individual for coordinating facility and site emergency response planning, maintaining the emergency management program document, and implementing procedures. While these program elements are assigned to the Safety Department staff, responsibilities are divided among several individuals. This has resulted in a fragmented program with some major gaps. For example, provisions are not in place for managing the spectrum of operational emergencies at each plant. An excellent emergency preparedness plan is in place; however, there are no written guidelines for specific plant-level emergencies.

- o Much progress has been made toward completing organizational and administrative requirements. However, the present level of personnel commitment leaves serious doubt about BPOI's ability to meet mandatory program performance objectives over the next 2 years. For example, there are no prefire plans for specific facilities. Completing this task using existing staff resources would probably consume 2 employee-years.

CONCERN: (EP.1-2) (H3/C2) The responsibilities for emergency preparedness have not been assigned to one individual with the time, experience, and training necessary to implement major program elements required by DOE 5500.1A.

EP.2 EMERGENCY PLAN AND IMPLEMENTING PROCEDURES

PERFORMANCE OBJECTIVE: The emergency plan, the emergency plan implementing procedures, and their supporting documentation should provide for effective response to operational emergencies.

FINDINGS:

- The facility emergency plan is not based on a site-specific process hazards management review.
- Emergency operations guidelines are not in place to manage various aspects of severe accidents that involve unusual problems, such as multiple failures or operator errors.
- There are no emergency procedures checklists, prefire plans, or easily accessible facility drawings available for each building or plant.

CONCERN: (EP.2-1) (H3/C1) Detailed actions required to carry out emergency operations are not available or organized for easy use at the scene of the emergency.

EP.3 EMERGENCY RESPONSE TRAINING

PERFORMANCE OBJECTIVE: Emergency response training should develop and maintain the knowledge and skills for emergency personnel to respond to and control an emergency effectively.

FINDINGS:

- o Training is being conducted in a professional manner, with three individual opportunities for shift workers to attend. No lesson plans that help ensure quality and repeatability among the various classes are provided for instructors.

- o Training records are well maintained, and training is documented on a monthly basis. Evidence exists that some members of the Emergency Response Team (ERT) are not meeting the required number of drills.

CONCERN: (EP.3-1) (H2/C1) The current level of ERT training is inadequate to ensure qualified members can actually perform fire-fighting duties 24 hours a day, 365 days per year.

FINDINGS:

- o ERT members receive approximately 50 hours of annual training. Subjects are dedicated to a broad range of basic first aid, rescue, or fire emergency topics. There are no written training program objectives that help ensure each ERT member is provided with job-oriented practical skills.

- o The fire training received is designed to provide basic fireground support in a defensive rather than offensive mode.

CONCERN: (EP.3-2) (H3/C2) There is not a comprehensive emergency response training program plan that defines goals and objectives tied to the desired level of performance necessary for real hydrocarbon fire emergencies.

EP.5 EMERGENCY FACILITIES, EQUIPMENT, AND RESOURCES

PERFORMANCE OBJECTIVE: Emergency facilities, equipment, and resources should adequately support site/facility emergency operations.

FINDINGS:

- o The 1988 TSA noted that radio communications systems were not adequate to support emergency response at NPR-1. (See 1988 TSA "Concern PP.4-2. Radio communications systems are not adequate to support emergency response at NPR-1.") Discussions with Emergency Response Team (ERT) members indicated that no improvements have been made that will enable direct radio communications between the Emergency Operations Center, Incident Commander, and key operational units.

- o Security and ERT members are expected to perform high-risk operations without frequent and confirmed reliable radio communications. For example, ERT members are expected to use fully encapsulated (Level-A) garments without internal suit radio communications. More serious, however, are expectations created by management that fire fighters can function safely without direct radio contact with the Incident Commander or backup teams. Operating in and around hostile environments without radio support is a widely recognized unsafe practice, and has been responsible for fire-fighter fatalities when crews became separated or trapped.

CONCERN: (EP.5-1) (H1/C1) CAT. II — Reliable communications equipment is not available to permit direct contact between the Incident Commander and the ERT.

FINDINGS:

- o Emergency equipment inventories are available and well documented. However, there are insufficient quantities of emergency response equipment available to effect efficient operations and ensure personnel safety. For example, fire-fighting turnout gear has only been issued to about 15 of the 50-member ERT. Also, there are not enough fully encapsulated suits available to provide for a two-person entry team and a two-person backup team.

- o OSHA and accepted safe operating practices require that employees engaged in fire combat duties be adequately protected. Garments meeting the level of protection defined in the National Fire Protection Association Code 1500 should be issued to each fire fighter.

CONCERN: (EP.5-2) (H1/C1) CAT. II — Insufficient fire-fighting and chemical protective clothing inventories exist to ensure emergencies are handled safely.

E. INDUSTRIAL HYGIENE

BPOI's written industrial hygiene policies and procedures place implementation responsibility on line management. The industrial hygiene staff is responsible for evaluation of health concerns.

The staff consists of an industrial hygienist who is a certified safety professional cross-trained in industrial hygiene, and two industrial hygiene specialists. The specialists have backgrounds in environment and occupational health nursing. Continuing education provided to the staff appeared adequate. Reports prepared by the industrial hygienists are reviewed and signed by the Safety Department Manager and forwarded to the appropriate supervisor through upper management.

BPOI has not identified and documented potential health hazards at NPR-1, as required by DOE orders. However, the industrial hygiene staff has identified specific health concerns: hydrogen sulfide, asbestos, benzene, noise, and use of solvents. Surveillance of the industrial hygiene concerns consists of monitoring for asbestos, benzene, and noise. Subcontractors conducting asbestos work are required to perform air monitoring. Two surveys have been conducted on benzene, and area noise monitoring has been conducted in most noise-hazardous areas. The annual noise monitoring required by PPM 1230-002, "Occupational Noise and Hearing Conservation," is not being conducted. This was previously noted during the 1988 TSA. Protective equipment is available to exposed personnel. BPOI does not have an industrial hygiene laboratory. Equipment is calibrated and samples are stored in employees' offices.

Material Safety Data Sheets (MSDS), which address hazardous materials, are available for employees. Affected personnel have been trained in MSDS and in the hazards of noise, hazard communication, confined spaces, respiratory protection, and other requirements. New employees are informed of basic requirements during employee orientation. The training program is well documented. Employees participate through periodic safety meetings and a suggestion program.

Two projects for labeling tanks and containers and identifying and labeling pipes have been developed. The tank-labeling project has been approved and is being funded from general funds. The pipe-labeling project is scheduled for review and approval in January 1990.

BPOI has policies and procedures covering industrial hygiene concerns. They provide a hierarchy of hazard control: engineering controls, substitution for hazardous materials, administrative controls, and use of protective equipment. The procedures on hazard communication, noise and hearing conservation, respiratory protection, confined space entry, handling of hazardous materials, and radiography appear to be adequate. The procedure on asbestos handling and abatement is under revision to address deficiencies found during the previous TSA. Draft procedures for carcinogens and personnel exposure monitoring, identified as missing during the previous TSA, have been written but have not been implemented.

Many violations of regulations and BPOI safety and health requirements were observed. Specific items are included in Appendix C. A concern that line supervisors were not adequately enforcing BPOI safety rules was noted in the previous TSA. This is discussed further in Occupational Safety Section OS.5 of this report.

BPOI does not address how industrial hygiene objectives will be achieved, and the industrial hygienists spend the majority of their time performing administrative functions. Consequently, the industrial hygiene program is not fully effective. Calibration and field data for noise monitoring were inadequate, and there was no evidence of chain of custody for industrial hygiene samples. A similar concern was found during the 1988 TSA.

The industrial hygiene program has improved since the 1988 TSA. Overall, the staff has made significant efforts, but the administrative work load has limited their ability to carry out essential industrial hygiene field responsibilities.

IH.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Site and facility organization and administration should ensure effective implementation and control of the industrial hygiene program.

FINDINGS:

- The site does not have an industrial hygiene laboratory. Industrial hygienists calibrate equipment and store samples in their offices.
- BPOI does not address how specific industrial hygiene objectives in the Annual Operating Plan will be achieved. This includes identification of specific tasks and allocation of time and resources.
- The industrial hygiene staff performs primarily administrative functions, such as management of hazard communication, Proposition 65, the Kern County Business Plan, and training. The staff appears to do minimal field work.

CONCERN: (IH.1-1) (H2/C1) The industrial hygiene program is not fully effective in addressing all industrial hygiene problems at NPR-1.

IH.2 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE: Procedures and documentation should provide appropriate direction, record generation, and support for the industrial hygiene program.

FINDINGS:

- o No chain of custody records were found for industrial hygiene samples collected by BPOI industrial hygienists.
- o Sound level meter calibrators were not calibrated annually as required by the manufacturer.
- o Noise data were collected on drawings, and did not have supporting instrument or post-use calibration data.
- o A quality assurance audit of the Safety Department, conducted May 11, 1989, did not address technical aspects of the industrial hygiene program.

CONCERN: See 1988 TSA "Concern TS.6-1. Calibration activities do not meet the requirements of the QA manual, Section 22.12, with regard to calibration coverage, status marking, and proper documentation."

IH.3 MANAGEMENT OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE: Chemical, biological, and/or other environmental stresses arising in the work place should be identified, evaluated, and controlled.

FINDINGS:

- Although periodic walk-throughs are performed, no complete site walk-through to identify all health hazards has been conducted. The logical next step of quantifying all significant health hazards also has not been completed. For example, the health effects of electromagnetic radiation, solvents, welding fumes, and ergonomic stresses have not been fully evaluated.

CONCERN: (IH.3-1) (H2/C1)

BPOI has not identified and documented all existing and potential health hazards at NPR-1 as required by DOE 5480.10.

IH.4 SURVEILLANCE OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE: Appropriate surveillance of activities should be conducted to measure health performance and ensure the continued effectiveness of controls.

FINDINGS:

- o A draft employee exposure program has been written, but has not been implemented.
- o Annual noise monitoring required by PPM 1230-002 is not being done. This was identified in the previous TSA.

CONCERN: See 1988 TSA "Concern IH.2-3. No comprehensive personal exposure monitoring program has been established; therefore, exposures to many physical and chemical hazards are unknown."

F. OCCUPATIONAL SAFETY

The NPR-1 occupational safety program is effectively organized to assure implementation and control. Top management support is evident and visible through many avenues. Support begins with the 90-minute new employee orientation program and continues with commitments to regularly scheduled safety meetings and specified refresher programs covering Confined Space Entry, Lockout/Tagout, Asbestos, and Hazard Communication.

The Safety Department Manager and two senior members of his staff are well qualified by education and experience to coordinate safety activities and to assist other departments. This is in agreement with department responsibilities as stated in PPM TOC-12, "Safety and Health." Those three individuals carry a heavy work load that includes training four new employees of the staff. Department personnel reportedly have been working six 10-hour days since September 1, 1989. They attribute this, in part, to their coordinating responsibility for the 1988 TSA. The need for increased training of site personnel, plus the increased correspondence and recordkeeping load, limits job-site inspections by occupational safety personnel.

A comprehensive OSHA-type compliance inspection was conducted by one team member in seven small areas of the site. Other team members identified OSHA noncompliances on an ad hoc basis. Noncompliance items are listed in Appendix C. Although many of the items were corrected immediately, the significant number of items indicates a weakness at NPR-1 in the enforcement of OSHA regulations.

Occupational safety items generally receive high priority for budget approval. Typical recently approved items with large capital expenditures were: the Standardized Alarm Project, the Drug Testing Program, 35R Lighting Modifications, and Fire Protection System Modifications.

Considerable documentation is generated because of monitoring safety concerns, such as noise and chemical hazards. Work orders are listed on a print-out that is reviewed by a member of the Safety Department.

Management sets frequency and severity accident goals and notifies supervisors monthly regarding the goal for their area of responsibility. The effectiveness of the occupational safety program is audited annually by the Quality Assurance Department.

Employees involved in accidents are questioned at a Management Accident Review Meeting by the three levels of supervision. Minutes of the meetings reveal a rigorous approach to questioning, plus firm statements by management supporting the safety program.

The Safety Department and Engineering Department use guidelines such as the Chevron Design Guide, standard drawings for platforms, ladders, etc., and standard specifications for concrete, welding, etc. The Safety Department reviews construction designs prior to the start of the job, and at completion intervals of 30 percent, 75 percent, and 100 percent. They also review all

Authorizations for Expenditures where safety is an integral part (e.g., facility projects).

Recently, process piping and Emergency Shutdown Device (ESD) instrumentation were changed at the 35R Gas Plant to allow a more controlled rerouting of streams in the event of an emergency shutdown. It is now possible to depressurize individual areas of the Gas Plant or to depressurize the entire 35R Gas Plant.

The effectiveness of the occupational safety program was recently indicated when the Low Temperature Separation (LTS) Gas Plants No. 1 and No. 2 had a turnaround without a lost-time accident, recordable accident, or first-aid case. Approximately 25,000 employee-hours were logged in compact work areas during the 2-week, 24-hour-a-day project.

Most safety rules are followed by contractors, but violations were found. Subcontractors' work activities are observed by the Contract Technical Representatives (CTRs), whose training does not include construction safety standards. Furthermore, the required oversight by the CTRs remains deficient as noted in the 1988 TSA.

The site has numerous noncontract personnel on its grounds at all times. Of special concern are service personnel, such as vendors replenishing beverage/food machines. They are not provided adequate instructions on the safety hazards they may encounter on site.

BPOI attempts to communicate job hazards to employees when they begin employment. In addition, safety bulletins are mailed with paychecks to notify employees of safety concerns. The job site has numerous precautionary signs, but there are shortcomings. (See Concern OP.3-1.) Employees receive specialized training, but there were also shortcomings in this area. (See, for example, Concern MA.1-2.) BPOI also gives additional motivation to employees through a safety incentive award program, but there is no measure of its success.

There have been improvements in the occupational safety program since the 1988 TSA. However, the listing of OSHA noncompliances indicates that many easily recognizable and correctable deficiencies do not receive adequate attention. There is good definition of policy and demonstrated commitment at the senior management level, and an apparent safety awareness at first line supervisor and lower levels. However, the program has not been fully effective in raising the safety awareness and safety culture of all employees.

OS.3 MANAGEMENT OF SAFETY CONCERNS

PERFORMANCE OBJECTIVE: Physical and/or other environmental stresses arising in the work place should be identified, evaluated, and controlled.

FINDINGS:

- An employee at the 35R Warehouse was not wearing a hard hat as required. The supervisor accompanying the team member took no action until the team member brought it to the supervisor's attention.
- Three employees were not wearing hearing protection at the 30R Compressor location, although instructed to do so by posted signs; one employee was a supervisor.
- The driver of a Clark Graylift Forklift was not wearing the seat belt provided. This was brought to the attention of the supervisor who was accompanying the team member.

CONCERN: See 1988 TSA "Concern IH.2-1. Field inspections and policy enforcement performed by line supervisors are not adequate to assure compliance with safety and health policies and procedures."

OS.4 SURVEILLANCE OF SAFETY CONCERNS

PERFORMANCE OBJECTIVE: Appropriate surveillance of activities should be conducted to measure safety performance and ensure the continued effectiveness of controls.

FINDINGS:

- Four contract workers at the 35R Rental Compressor Site were working without hard hats. When questioned, they said no one had instructed them to wear hard hats.
- An extension cord laid over the gravel at the 35R Rental Compressor Site was not protected from possible damage by a nearby crane and other vehicles. Exposed electrical wires in a damaged cord can result in an electrical shock when touched.
- An excavation company had excavated a trench more than 5 feet deep without shoring or laying back the side slopes. No one was in the trench at the time the team member visited the site, but wood supports beneath the line indicated that someone had entered the trench.
- The scaffold at a construction site was improperly installed. Findings included a small work platform without a guard rail/rope; scaffold planks secured (wired) at one end only; and no horizontal pin installed at the location where the sections were joined. The scaffold was placed directly on the ground instead of footplates.
- Three contract well servicing supervisory employees did not possess current well control school certification, although this is a requirement under the procurement contract by which they operate.

CONCERN: See 1988 TSA "Concern OS.2-2. Oversight of subcontractor safety performance is deficient because Contract Technical Representatives are not provided sufficient safety training to enable them to meet technical monitoring responsibilities."

OS.5 COMPLIANCE WITH OCCUPATIONAL SAFETY STANDARDS

PERFORMANCE OBJECTIVE: Work places should be free of uncontrolled physical safety concerns and be in compliance with DOE-prescribed occupational safety standards.

FINDINGS:

- o An employee recorded the installation of a caution tag on a piece of equipment, but listed the wrong piece of equipment. The employee later removed the tag from the equipment, but failed to record its removal in the tag book.
- o Two gas cylinders are not properly secured in the laboratory.
- o Relief valve discharge port is directed horizontally and can burn personnel at two turbine drive fans at the 35R Cooling Tower.
- o Compressed gas cylinder is not capped at EIT shop.
- o No backup alarms exist on 35R warehouse forklifts.
- o Fire blanket box is empty in 35R Control Room.
- o Fire blanket at 35R heater is not readily serviceable.
- o An OSHA-type inspection of seven small parts of the site was conducted as follows.
  - Maintenance-Instrumentation-Electrician Technician Shop
  - 35R Pump Shop
  - NOX Pump Shop
  - 36S Welding Shop
  - 36S Welding Garage
  - LTS-1 Compressor Site
  - 30R Compressor Site
- o There were a large number of other safety violations that are identified as OSHA noncompliance items in Appendix C. Included in the list are bolts missing from explosion-proof covers, no backup alarm on a backhoe, and lack of guarding.

CONCERN: See 1988 TSA "Concern OS.5-4. Readily identifiable safety hazards are not expeditiously corrected and/or controlled"; and 1988 TSA "Concern IH.2-1. Field inspections and policy enforcement performed by line supervisors are not adequate to assure compliance with safety and health policies and procedures."

OS.6 PERSONNEL COMMUNICATION PROGRAM

PERFORMANCE OBJECTIVE: Site/Facility personnel should be adequately informed of physical stresses that may be encountered in their work environment.

FINDINGS:

- Numerous occasional noncontract personnel have business on site for duties such as replenishing beverage/food machines and checking for sufficient supplies in first-aid kits. These persons are not instructed on plant hazards or given emergency preparedness instructions.
- The TSA team received no safety orientation other than the need for team members to wear leather shoes and informing them of the emergency phone number.

CONCERN: (OS.6-1) (H2/C2) Visitors and occasional noncontract personnel on site are not provided with adequate safety instructions.

G. FIRE PROTECTION

Within the limited fire protection capabilities at NPR-1, the fire protection organization structure is well defined and understood. Fire protection professionals clearly understand their authorities, responsibilities, accountabilities, and interfaces with support groups. Resources are allocated to accomplish assigned tasks. BPOI Policies and Procedures Manuals are issued to managers of departments. However, not all of the important information on fire protection is included in the "Safety and Health Booklet" issued to all employees.

Generally, life safety requirements are met. Where strict code compliance is not feasible, alternate protection is used. Due to the remote location of the site from population centers, no added threat to the public would result from an on-site fire.

The facility does not meet the improved risk criteria required by DOE Orders because the closest responding fire department has a 15- to 30-minute response time; the Emergency Response Team (ERT) is not always available; and alternative protection (automatic fire detection and suppression systems) is not provided. Accordingly, a maximum credible fire could result in unacceptable property loss. In the event of a fire, reliance must be placed on on-site personnel at the fire location followed by response by the ERT. For this reason, annual training of personnel in the use of fire extinguishers is essential. The on-site water systems are available for fire fighting. The fire water and process water systems are not separate. Thus, a credible fire could cause shutdown of site processes because process water would be required for fire fighting. A written plan to curtail process water or shutdown processes in the event of a credible fire is available.

During the 1988 TSA, a concern was identified that the cluster of propane, butane, and natural gasoline tanks in the 35R Liquid Propane Gas (LPG) storage area should be protected with an automatic water deluge sprinkler system. At the present time, these pressurized tanks are protected with manually operated water systems, some foam nozzles on the dikes (fire walls) around the tanks, and some nozzles inside the diked area between the tanks. They cannot be controlled from outside the dikes. The team endorses that previous concern.

The dehydration tanks at the 18G Area are protected with fire hose stations connected to hydrants and one-wheeled dry chemical units with no other fire protection. In 1987 and 1988, topside foam or subsurface foam was recommended for the dehydration tanks at the 18G Area. BPOI also recommended subsurface foam in 1988, but the Operating Committee did not approve BPOI's recommendation.

At the LPG truck loading racks, there are six emergency shutdown devices (ESDs). However, excess flow (shutoff) valves were not provided for the truck loading racks in the LPG Loading/Storage Area, as required by NFPA Standard No. 58 and improved risk criteria. This is an outstanding concern from the 1988 TSA.

An inspection and testing program for all items of existing fire equipment is being adequately performed by an outside contractor. The specifications for judging the conduct of the work are well written and reviewed periodically by the site Fire Protection Engineer. However, there are deficiencies in the fire water system electric and diesel pumps.

The fire protection engineering program is effective. Fire protection engineering surveys are conducted. Fire loss records are maintained, analyzed, and reported. There is an engineering procedure for fire protection engineers to review and sign off on design of new projects, including the acceptance of fire protection systems.

There have been many studies, reviews, surveys, etc., addressing the fire protection problems at NPR-1, but very little progress has been made over the last 6 years. Part of the blame rests with DOE, because no policy direction has been provided to advise BPOI on whether DOE wants a defensive or offensive fire-fighting posture. The options open are: a) evacuation of the facility with no fire-fighting effort; b) incipient stage fire-fighting, using simple hand-held fire extinguishers and fixed hose reels; or c) offensive fire fighting, using traditional heavy fire appliances and an organized fire brigade with an adequate response time to save facilities.

Federal regulations and trends in civil tort law recognize an employer's right to assume an evacuation or defensive position concerning fire protection. However, NPR-1 employees have not been given clear fire-fighting direction from management. For example, the ERT gives the general impression that they assume an offensive fire-fighting position on the day shift and a defensive position on the night shift. Interviews with employees and management indicate that there is much confusion over the exact roles they are expected to take.

While the lack of clear DOE direction is a problem, some responsibility rests with BPOI for not taking more aggressive action to resolve this problem, for their own liability protection as well as for the protection of NPR-1 personnel and facilities.

FP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Fire protection organization and administration should ensure the effective implementation and control of fire protection equipment and activities.

FINDINGS:

- o DOE Naval Petroleum Reserves California (NPRC) does not have a written fire protection policy.
- o Without a written fire protection policy by DOE, BPOI has no direction for fire protection for NPR-1.

CONCERN: See 1988 TSA "Concern FP.1-1. The failure to establish a fire protection program at NPR-1 consistent with DOE policy (DOE 5480.7) has resulted in the non-uniform and inconsistent application of fire protection standards that are mandatory as a matter of DOE policy (DOE 5480.4)."

FP.4 IMPAIRMENT OF OPERATIONS

PERFORMANCE OBJECTIVE: The site should not be vulnerable to being shut down for an unacceptable period as the result of a credible fire.

FINDINGS:

- o A credible fire would cause a shutdown of other site processes because process water would be required for fire fighting.

CONCERN: See Concern EP.2-1.

FP.5 PROPERTY PROTECTION

PERFORMANCE OBJECTIVE: A maximum credible fire, as defined in DOE 5480.7, Section 6.f, should not result in an unacceptable property loss.

FINDINGS:

- The cluster of propane, butane, and natural gasoline tanks in the 35R LPG Storage Area is not protected with an automatic water deluge sprinkler system. At the present time, these pressurized tanks are protected with manually operated water systems and some foam nozzles.

CONCERN: See 1988 TSA "Concern FP.1-1. The failure to establish a fire protection program at NPR-1 consistent with DOE policy (DOE 5480.7) has resulted in the non-uniform and inconsistent application of fire protection standards that are mandatory as a matter of DOE policy (DOE 5480.4)."

FP.7 PROGRAM IMPLEMENTATION

PERFORMANCE OBJECTIVE: A fire protection engineering program should be in place to effectively provide and maintain an "improved risk" level of fire protection.

FINDINGS:

- o Because of the following deficiencies on fire pumps, the inspection and testing program for the water system does not assure operability, even though some temporary gauges are used during annual testing.
  - Gauges on suction and discharge lines are missing or inoperative on diesel or electric fire water pumps at 35R, LTS-1, LTS-2, 24Z, 11G, and 18G.
  - No test header is installed on the diesel and electric pumps at 24Z.
  - For the electric pumps at 11G, the manufacturer's data for pump testing are not available to determine pump capacity; pressure switches (mercoid) for pump controls are not installed in the control panel; and the pumps will not start if fire hydrants are in use.
  - For the diesel pump at 18G, a test loop with metering device is not installed for flow testing, and the discharge line for the test loop should discharge back into the water tank.

CONCERN: (FP.7-1) (H3/C1) Deficiencies exist in the fire water system electric and diesel pumps.

FINDINGS:

- o Portable fire extinguisher training is given to employees every 2 years. There is a fire protection safety training meeting given once each year to employees. This annual training does not familiarize employees with the hazards involved with incipient stage fire fighting, as required by California OSHA requirements, Title CAC 6151(g)(1).
- o Employees in hazardous remote locations are expected to be familiar with and operate hand-held portable fire extinguishers.

CONCERN: (FP.7-2) (H2/C1) CAT. II Hands-on portable fire extinguisher training should be given to all employees each year, including office employees, because employees who do not normally handle fire extinguishers forget the procedures, and an extinguisher in untrained hands can be dangerous.

H. MEDICAL SERVICES

BPOI does not have on-site medical facilities nor personnel at NPR-1. They use the services of a Bakersfield physician on a fee-for-service basis. The physician has many years of experience in the industrial medical field and has a number of clients in the petroleum business. His nursing staff is also knowledgeable in the field of occupational medicine. His clinic is spacious and well equipped. X-ray, audiometric, pulmonary function, and vision testing apparatus meet Government requirements. The staffing does not meet the requirements of DOE orders, and no evaluation has been made to determine if the orders should be met or an exemption should be requested.

The site has an Emergency Response Team well equipped and trained to handle a medical emergency. A certified occupational health nurse is a member of the team and functions as an emergency nurse when required. The Taft ambulance service has three well-equipped ambulances. All attendants have advanced life support training, and response time to the site has averaged 15 minutes. The attendants have the capability of stabilizing all serious injuries before transport. They also have the capability of administering a new heart-attack-aborting (anti-clotting) drug to heart-attack victims. The emergency room at the Taft hospital is staffed with professional emergency room physicians on a 24-hour basis. The equipment is state of the art.

Since there is no centralized medical unit administering medical activities, these responsibilities are divided between two separate organizations. The Safety Department is responsible for the worker's compensation program, hearing conservation program, off-site medical contract, and medical surveillance exams, as required. The Human Resources Department has responsibility for the "wellness" program; the Employee Assistance Program (EAP), including drug and alcohol issues; and sick leave administration. This lack of centralized responsibility does not assure adequate lines of communication to upper management.

BPOI has developed a detailed substance-abuse policy statement and procedure manual. Seven months were required for this to be approved by corporate headquarters. The policy is weak because it does not require management's commitment to an effective program in which the overall well-being of the employee is the primary concern. There is no step-wise disciplinary structure, and employee and supervisory training are missing. The illegal drug portion requires "for cause testing" and has been quite successful; positive rates have run as high as 38 percent. Subcontractors are covered under the program. Twelve BPOI employees have been referred to the EAP counselor; seven remain on roll after 1 year -- a commendable success rate. However, only one employee has been referred for alcoholism during the same time frame.

The weakness of the alcohol-abuse program and the lack of an aggressive "wellness" program indicate that upper management has not fully realized the importance of the long-term health of employees.

MS.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Site and facility organization and administration should assure effective implementation and control of the medical services program.

FINDINGS:

- o There are no medical treatment facilities on site. However, many of the on-site personnel work at remote locations that would not be readily accessible to a centrally located on-site medical facility.
- o Comprehensive medical services are available at Taft, about 5 miles south of the site, and Bakersfield, about 30 miles east of the site.
- o The on-site medical staff consists of one registered nurse. Some employees are trained in first aid.
- o DOE 5480.8 requires at least one part-time physician and three full-time nurses for the first 1000 employees.

CONCERN: See 1988 TSA "Concern IH.7-1. The minimal medical program requirements set forth in DOE 5480.8 are not met."

FINDINGS:

- o BPOI employees returning to work after a sickness absence require only approval of their private physician, without consultation with medical personnel who know the employee's particular work environment.
- o The employee absentee rate of four absences/year/employee appears to be unusually high. This, coupled with a relatively low average length of absence, results in total annual absences within the expected range.
- o There is no comprehensive preventive health education program or aggressive "wellness" program comparable to common industrial practice. For example, BPOI does not have an active smoking-cessation program.
- o There is no periodic medical examination program for all employees.

CONCERN: (MS.1-1) (H2/C1) The medical program is not actively addressing issues for controlling employee absences or that have a long-term health benefit.

APPENDIX A

System for Categorizing Concerns

Each concern contained in this report has been characterized using the following three sets of criteria.

A. CATEGORY

I. Addresses a situation for which a "clear and present" danger exists to workers or members of the public. A concern in this category is to be immediately conveyed to the managers of the facility for action. If a clear and present danger exists, the Assistant Secretary for Environment, Safety, and Health, or his/her designee, is informed immediately so that consideration may be given to exercising the Secretary's facility shutdown authority, or directing other immediate mitigation measures.

II. Addresses a significant risk or substantial noncompliance with DOE Orders (but does not involve a situation for which a clear and present danger exists to workers or members of the public). A concern in this category is to be conveyed to the manager of the facility no later than the appraisal close-out meeting for immediate attention. Category II concerns have a significance and urgency such that the necessary field response should not be delayed until the preparation of a final report or the routine development of an action plan. Again, consideration should be given to whether compensatory measures, mitigation, or facility shutdown are warranted under the circumstances.

III. Addresses significant noncompliance with DOE Orders, or the need for improvement in the margin of safety, but is not of sufficient urgency to require immediate attention.

B. HAZARD LEVEL

H1. Has the potential for causing a severe occupational injury, illness, or fatality, or loss of the facility.

H2. Has the potential for causing minor occupational injury or illness, or major property damage, or has the potential for resulting in, or contributing to, unnecessary exposure to radiation or toxic substances.

H3. Has little potential for threatening safety, health, or property.

APPENDIX A

System for Categorizing Concerns (Cont.)

C. COMPLIANCE LEVEL

C1. Does not comply with DOE Orders, prescribed policies or standards, or documented accepted practices. The latter is a professional judgment based on the acceptance and applicability of national consensus standards not prescribed by DOE requirements.

C2. Does not comply with DOE references, standards, or guidance, or with good practice (as derived from industry experience, but not based on national consensus standards).

C3. Has little or no compliance considerations. These concerns are based on professional judgment in pursuit of excellence in design or practice (i.e., these are improvements for their own sake and are not deficiency driven).

APPENDIX B

Categorization and Tabulation of Concerns

Appendix B-1 and B-2 are provided as reference tables. The reader is reminded to read the supportive findings contained in Section III of the report in order to fully understand each statement of concern.

APPENDIX B-1

Categorization of Concerns

Concern Number	Category	Potential Hazard Level	Compliance Level
OA.1-1	III	1	2
OA.5-1	III	2	1
OA.7-1	III	2	1
OA.7-2	III	2	1
OA.8-1	III	2	1
OP.1-1	II	1	1
OP.1-2	III	1	2
OP.2-1	II	1	2
OP.3-1	III	1	2
OP.8-1	III	2	2
MA.1-1	I	1	1
MA.1-2	II	1	2
MA.2-1	II	1	1
MA.5-1	III	1	2
MA.6-1	III	1	2
MA.8-1	II	1	2
MA.8-2	III	1	2
EP.1-1	III	2	2
EP.1-2	III	3	2
EP.2-1	III	3	1
EP.3-1	III	2	1
EP.3-2	III	3	2
EP.5-1	II	1	1
EP.5-2	II	1	1
IH.1-1	III	2	1
IH.3-1	III	2	1
OS.6-1	III	2	2
FP.7-1	III	3	1
FP.7-2	II	2	1
MS.1-1	III	2	1

APPENDIX B-2

Tabulation of Concerns

A. ORGANIZATION AND ADMINISTRATION

CONCERN: (OA.1-1) (H1/C2)	Resources are either not adequate or not effectively allocated to support field and staff operations to a level necessary to assure the identification and timely correction of safety deficiencies.
CONCERN: (OA.5-1) (H2/C1)	Line management oversight and enforcement are not adequate to assure consistent conformance with safety and health policies, practices, and procedures. Also see 1988 TSA "Concern MC.4-1. A satisfactory safety culture is not evident throughout the NPR-1 site."
CONCERN: (OA.7-1) (H2/C1)	There is no safety analysis process established at NPR-1 that meets the requirements or intent of DOE 5481.1B.
CONCERN: (OA.7-2) (H2/C1)	Adequate operating parameters, codes, and standards are not documented or available to ensure safe facility operation.
CONCERN: (OA.8-1) (H2/C1)	The Drug and Alcohol Program is yet to mature to the point where employees and their families and visitors to BPOI can have complete confidence in its effectiveness.

B. OPERATIONS

CONCERN: (OP.1-1) (H1/C1) CAT. II	Critical process operations with significant safety ramifications are sometimes conducted under conditions that are unsafe or not known to be safe.
CONCERN: (OP.1-2) (H1/C2)	Engineering (technical) support for field operations is lacking.
CONCERN: (OP.2-1) (H1/C2) CAT. II	Well control schooling with current certification for contract drilling rig foremen and drillers is not required at NPR-1.
CONCERN: (OP.3-1) (H1/C2)	Control mechanisms are lacking to assure that all critical operations are defined by written safe practices and procedures, including conspicuous postings where needed.

CONCERN: (OP.8-1) (H2/C2) Insufficient attention is given to human factors (ergonomics) in the design, layout, and modification of facilities at NPR-1.

C. MAINTENANCE

CONCERN: (MA.1-1) (H1/C1) CAT. I Hazard identification practices do not preclude employee entry into areas with existing dangerous conditions.

CONCERN: (MA.1-2) (H1/C2) CAT. II Personnel training in responsibilities and authorities related to hazard recognition, avoidance, and correction is not effective.

CONCERN: (MA.2-1) (H1/C1) CAT. II Inspection and closure of work orders by operators, maintenance staff, and supervisors are inadequate.

CONCERN: (MA.5-1) (H1/C2) Inspections by supervisors and maintenance and operating personnel are inadequate to identify hazards needing correction.

CONCERN: (MA.6-1) (H1/C2) Preventive maintenance is not performed on all items needing periodic attention.

CONCERN: (MA.8-1) (H1/C2) CAT. II The safe work permit procedures do not adequately control hazardous area entry or safe work practices.

CONCERN: (MA.8-2) (H1/C2) Facility maintenance procedures are sometimes inadequate.

D. EMERGENCY PREPAREDNESS

CONCERN: (EP.1-1) (H2/C2) The emergency preparedness organization and administration has not sufficiently ensured a span of command and control for emergencies that may occur from 6 P.M. to 6 A.M.

CONCERN: (EP.1-2) (H3/C2) The responsibilities for emergency preparedness have not been assigned to one individual with the time, experience, and training necessary to implement major program elements required by DOE 5500.1A.

CONCERN: (EP.2-1) (H3/C1) Detailed actions required to carry out emergency operations are not available or organized for easy use at the scene of the emergency.

CONCERN: (EP.3-1) (H2/C1) The current level of ERT training is inadequate to ensure qualified members can actually perform fire-fighting duties 24 hours a day, 365 days per year.

CONCERN: (EP.3-2) (H3/C2) There is not a comprehensive emergency response training program plan that defines goals and objectives tied to the desired level of performance necessary for real hydrocarbon fire emergencies.

CONCERN: (EP.5-1) (H1/C1) CAT. II Reliable communications equipment is not available to permit direct contact between the Incident Commander and the ERT.

CONCERN: (EP.5-2) (H1/C1) CAT. II Insufficient fire-fighting and chemical protective clothing inventories exist to ensure emergencies are handled safely.

E. INDUSTRIAL HYGIENE

CONCERN: (IH.1-1) (H2/C1) The industrial hygiene program is not fully effective in addressing all industrial hygiene problems at NPR-1.

CONCERN: (IH.3-1) (H2/C1) BPOI has not identified and documented all existing and potential health hazards at NPR-1 as required by DOE 5480.10.

F. OCCUPATIONAL SAFETY

CONCERN: (OS.6-1) (H2/C2) Visitors and occasional noncontract personnel on site are not provided with adequate safety instructions.

G. FIRE PROTECTION

CONCERN: (FP.7-1) (H3/C1) Deficiencies exist in the fire water system electric and diesel pumps.

CONCERN: (FP.7-2) (H2/C1) CAT. II

Hands-on portable fire extinguisher training should be given to all employees each year, including office employees, because employees who do not normally handle fire extinguishers forget the procedures, and an extinguisher in untrained hands can be dangerous.

H. MEDICAL SERVICES

CONCERN: (MS.1-1) (H2/C1)

The medical program is not actively addressing issues for controlling employee absences or that have a long-term health benefit.

APPENDIX C

Listing of OSHA Noncompliances

Standard	Class*	Noncompliance Description
Title 8 CAC 1540(d)	S	Trench more than 5 feet deep was not shored, properly sloped or benched at 27R disposal site on 11/30/89.
Title 8 CAC 1644(a)6	S	Planks did not cover entire space between uprights.
Title 8 CAC 3219(a)	S	An abandoned tank that was converted to a storage shed had a door that could not be opened from the inside.
Title 8 CAC 3225(a)	S	A rack on the floor of the weld shop blocked the exit from the east side of the shop so that it was not readily accessible on 11/29/89.
Title 8 CAC 3273(b)	S	Gullies on the east side of the weld shop, outside, were a trip and fall hazard to employees on 11/29/89.
Title 8 CAC 4184(b)	S	The Turnmaster 1550 lathe in the 35R pump shop was not guarded at the point of operation on 11/29/89.
Title 8 CAC 6151(c)(1)	S	Fire extinguisher locations in the garage warehouse were not identified so they were readily accessible on 11/29/89.
Title 8 CAC 6540(a)	S	Gas from the K-35 compressor was not promptly stopped when employees were endangered at 30R on 11/27/89.
Title 8 CAC 6631(a)	S	Reciprocating shafts on pumps at 27R disposal site and 3G Steam Drive Plant were not guarded.
Title 29 CFR 1910.110(b)18	S	At the 35R LPG Loading Rack, Island 3 covers on two electrical boxes lay loose; Island 4 had a loose ground wire on vapor return line; and Island 5 had a cross-threaded conduit box cover.

*S=serious O=other than serious

Standard	Class*	Noncompliance Description
Title 29 CFR 1910.110(b)18	S	At the 30R compressor facility, a plug on the electrical conduit was missing and a junction box had bolts missing at the K-33 compressor, and the K-32 compressor had bolts missing from an ignition box, and an electrical conduit box was loose.
Title 29 CFR 1910.303(g)(2)(i)	S	The heater fan 110-volt switch box in the Cleveland rig doghouse was uncovered. Live wires were exposed directly under the heater.
Title 29 CFR 1910.307(b)	S	The drilling rig shale shaker electrical box had a bolt missing.
Title 29 CFR 1910.307(b)	S	At well 338-34-S, the water pump electrical switch box inside the rig base was missing all but one bolt.
Title 29 CFR 1910.307(b)	S	Bolts were missing from the explosion-proof cover at LTS-1 and LTS-2 (e.g., therminol pump electric box).
Title 29 CFR 1910.307(6)(3)	S	Temporary wiring was not protected from traffic (e.g., an extension cord on rock parking area at 35R rental compressor site).
PL 596-5(a)(1)	S	The propane chiller for LTS-1 and LTS-2 gas plants was operating at a temperature lower than -30°F. (Specified minimum design temperature is -20°F.)
PL 596-5(a)(1)	S	A vacuum truck pumping crankcase oil at a hazardous location at 30R was not grounded in accordance with API RP No. 2219, Safe Operation of vacuum trucks in the petroleum industry.
Title 8 CAC 1592(b)(1)	O	The backhoe at the 35R warehouse did not have a backup alarm on 11/30/89.
Title 8 CAC 1644(a)(3)	O	None of the legs on the scaffold at the 27R disposal site were resting on base plates.
Title 8 CAC 1646(d)	O	A two-section scaffold at the 27R disposal site did not have a horizontal pin installed at the scaffold connection.

*S=serious O=other than serious

Standard	Class*	Noncompliance Description
Title 8 CAC 3273(a)	O	The top landing on the 35R lean oil plant cooling tower was loose.
Title 8 CAC 3273(a)	O	An electrical conduit and compressed air line on the west side of the wheel alignment machine in the 36S garage presented a tripping hazard on 11/29/89.
Title 8 CAC 3273(a)	O	A rack on the floor of the 36S weld shop presented a tripping hazard on 11/29/89.
Title 8 CAC 3273(b)	O	Condensate pipes on the ground on the south side, west end of compressors K-34 and K-35 at 30R were tripping hazards on 11/30/89.
Title 8 CAC 3381(a)	O	An employee at 35R warehouse was not wearing a hard hat on 11/28/89.
Title 8 CAC 3381(a)	O	Four contract workers were without hard hats at the 35R rental compressor on 11/28/89.
Title 8 CAC 3387	O	Eye protection such as face shields, goggles, and safety glasses were not stored in a sanitary condition in the 35R and NOX pump shops, garage, and Instrumentation Electrician Technician Shop on 11/29/89.
Title 8 CAC 3400(d)	O	Eyewash water flow was insufficient at the 35R gas plant on 11/30/89.
Title 8 CAC 3406(a)	O	Fire-fighting protective clothing was not provided to emergency response team members who may respond to fires.
Title 8 CAC 3653(a)	O	The driver of a Clark forklift truck at the 35R warehouse was not wearing a seat belt on 11/30/89.
Title 8 CAC 5024	O	Throughout NPR-1, overhead cranes had not been inspected annually as required on 11/29/89.
Title 8 CAC 5097(b)(2)	O	Two Quest calibrators used to calibrate sound level meters used for survey work at NPR-1 were not in calibration on 11/28/89.

*S=serious O=other than serious

Standard	Class*	Noncompliance Description
Title 8 CAC 5097(d)(4)	O	An employee who had a significant hearing threshold shift was not notified in writing of the shift on 11/30/89.
Title 8 CAC 5098(a)(2)(A)	O	BPOI did not ensure that hearing protectors were worn by employees who were required to wear them at the 30R compressor station and LTS-1 on 11/28/89 and 11/30/89.
Title 8 CAC 5144(c)	O	An employee in the 36S garage who had a respirator wore a beard that would prevent proper fit of the respirator on 11/29/89.
Title 8 CAC 5144(c)	O	Employees in the 36S garage had been issued respirators but were not trained on 11/29/89.
Title 8 CAC 5144(d)(4)	O	Respirators in the 36S garage were not stored to protect against dust on 11/29/89.
Title 8 CAC 5144(h)	O	Employees at the 36S garage were issued respirators, but had not been determined by a physician to be able to wear respirators on 11/30/89.
Title 8 CAC 5194(f)(4)(A)	O	Containers of oil, paint, and solvents in the 35R and NOX pump shops, garage, and weld shop were not labeled with identity of contents on 11/29/89.
Title 8 CAC 5194(f)(4)(B)	O	Containers of oil, paint, and solvents in the 35R and NOX pump shops, garage, and weld shops were not labeled with appropriate hazard warnings on 11/29/89.
Title 8 CAC 6151(e)(2)	O	Monthly check cards on fire extinguishers in the 35R and NOX pump shops, 36S welding shop, LTS-1, and 26S, 18G and 10G LACT sites were not completed (monthly inspections not done) on 11/29/89.
Title 8 CAC 6539(a)	O	At LTS-1, oil that had leaked out of storage tanks on the west fence had contaminated the surrounding soil on 11/30/89.
Title 8 CAC 6539(a)	O	At 30R, oil had spilled on the ground surrounding the 30R compressors on 11/30/89.

*S=serious O=other than serious

Standard	Class*	Noncompliance Description
Title 8 CAC 6539(a)	O	Excessive oil on the catwalk around the K-36 compressor in LTS-1 presented a slipping hazard on 12/01/89.
Title 8 CAC 6539(a)	O	Oil from a tank at 26Z asphalto/dehydration LACT had spilled on the ground on the west side of the tank on 11/28/89.
Title 29 CFR 1910.22(a)(1)	O	A chair in the 35R compressor operator room was broken on 11/30/89. (The seat spring leveling device did not work.)
Title 29 CFR 1910.36(d)(1)	O	The north exit door in the instrument compressed air building in LTS-1 was separated from its upper hinge on 12/01/89.
Title 29 CFR 1910.106(f)(3)(iv)(a)(1)	O	A tank trailer was not grounded during filling of a propane tank at the 35R bullet site.
Title 29 CFR 1910.120(g)(4)(iii)	O	Totally encapsulating chemical protective suits were not tested and found to be capable of preventing inward gas leakage of more than 0.5 percent.
Title 29 CFR 1910.120(l)(4)(ii)	O	Hazardous materials team members had not received physical examinations meeting the requirements of 29 CFR 1910.120(f).
Title 29 CFR 1910.155(c)(1)	O	Only 10 of approximately 50 emergency response team members are trained to fight major fires.
Title 29 CFR 1910.303(h)(2)(ii)	O	At NPR-1, electrical switch gear and cabinets with greater than 600 volts were not locked, and were not in an area controlled by a lock.
Title 29 CFR 1910.304(f)(1)(iv)	O	Six water flood pumps at NPR-1 were not grounded. Grounds were present but not connected.
Title 29 CFR 1910.305(g)(1)(i)	O	Exposed electrical wiring at the storage shed that had been converted from an abandoned tank was not protected at the point of entry. A 440-volt pump at 24Z was surrounded by water.

*S=serious O=other than serious

Standard	Class*	Noncompliance Description
Title 29 CFR 1910.1001 (j)(2)(ii)	O	The Hako Asbestos vacuum in the 36S garage was not labeled with the wording, "Danger, contains Asbestos Fibers, Cancer and lung disease hazard" on 11/29/89.

*S=serious O=other than serious

APPENDIX D

Team Composition and Areas of Responsibility

Area of Responsibility	Name/Organization
EH Senior Manager	Robert W. Barber Office of Safety Compliance (EH-34) Department of Energy
Team Leader	Owen O. Thompson Office of Safety Appraisals (EH-331) Department of Energy
Assistant Team Leader	James Snell Office of Safety Appraisals (EH-331) Department of Energy
Organization and Administration	William E. Mott Consultant Rockville, MD
	Larry D. Warren* Consultant Newton Grove, NC
Operations	Patrick J. Doody Consultant Galveston, TX
Maintenance	Carl W. Mangus Technical Safety & Standards, Inc. Lacombe, LA
Emergency Preparedness	Michael S. Hildebrand HazMat-TISI, Inc. Columbia, MD
Occupational Safety	Robert J. Cordes Consultant London, OH
Industrial Hygiene	David Kernan Occusafe, Inc. Wheeling, IL

*Also Technical Editor for TSA report

APPENDIX D (Cont.)

Team Composition and Areas of Responsibility

Area of Responsibility	Name/Organization
Fire Protection	Dean J. Blackwell Consultant Amarillo, TX
Medical Services	Paul B. Mossman, M.D. Consultant Albuquerque, NM
TEAM SUPPORT	
Appraisal Coordinators	Fran Kimball Office of Safety Appraisals (EH-331) Department of Energy
	Patricia L. Davidson Office of Safety Appraisals (EH-331) Department of Energy
Compliance Project Manager	John S. Stone Kaiser Engineers Richland, WA
Program Office Liaison	Walter (Hal) Delaplane Office of Petroleum Reserves (FE-421) Department of Energy
Field Office Liaison	Donald B. Ross DOE Naval Petroleum Reserves California

APPENDIX E

Biographical Sketches of Team Members
Technical Safety Appraisal
Naval Petroleum Reserves of California

NAME: Owen O. Thompson (Team Leader)

ASSOCIATION: DOE Headquarters, Office of Safety Appraisals

EXPERIENCE: 25 years

- o U.S. Department of Energy, Germantown, MD
  - Office of Safety Appraisals, Team Leader
  - Office of Compliance Programs, Project Manager for Idaho Operations
  - Office of Civilian Radiological Waste Management, Licensing Project Manager for proposed Basalt Waste Isolation Project

- o U.S. Nuclear Regulatory Commission
  - Licensing Project Manager, TMI-1 restart
  - Technical Assistant to Director, Division of Engineering
  - Staff Reviewer, Geosciences for power plants, low-level waste sites, mill tailings dams
  - NRC Deputy Dam Safety Officer
  - ANSI Subcommittee on NQA-2

- o ATEC Associates of Maryland, Inc.
  - Chief Engineer: Provided consulting services for foundations, highways, dams, hazardous waste sites; expert witness.

- o U.S. Waterways Experiment Station
  - Research Engineer: Performed heavy duty pavement studies.

- o University of Illinois
  - Lecturer for Illinois Highway Department Training Program
  - Research on dynamic response of highway pavements

EDUCATION: B.S., Royal Melbourne Institute of Technology (Australia)
Ph.D., Civil Engineering, University of Illinois (Urbana)
NRC, Chattanooga Training Center, BWR & PWR Series

OTHER: Member, American Society of Civil Engineers
Registered Professional Engineer

NAME: James C. Snell (Assistant Team Leader)

ASSOCIATION: DOE Headquarters, Office of Safety Appraisals

EXPERIENCE: 26 years

- o U.S. Department of Energy, Germantown, MD
  - Team Leader for Technical Safety Appraisals of DOE facilities
  - Policy review and revision to DOE Environmental Health and Safety Policies
- o U.S. Department of Transportation, Washington, DC
  - Safety engineer for regulatory review of Motor Vehicle Codes and Standards
- o U.S. Department of Defense (Army), Alexandria, VA
  - Inspector General: Responsible for technical engineering inspections and reviews of Defense Weapons Systems.
- o General Physics Corporation, Columbia, MD
  - Manager of Licensing: Responsible for nuclear power plant licensing concerns.
- o NUS Corporation, Gaithersburg, MD
  - Manager of Licensing: Responsible for review and compliance of licensing activity for power plant clients.
- o U.S. Nuclear Regulatory/Atomic Energy Commission, Bethesda, MD
  - Regulatory Project Manager to a variety of PWRs and BWRs: Responsible for Government acceptance and review of applications to construct and operate facilities.
- o U.S. Navy
  - Communication Division Officer: Responsible for both fleet and ship communication.

EDUCATION: B.S., Math and Physics, Lebanon Valley College, Annville, PA
Graduate studies in Nuclear Engineering and Mechanical Design

NAME: Dean J. Blackwell (Fire Protection)

ASSOCIATION: Private Consultant

EXPERIENCE: 36 years

- o Private Safety Consultant
  - Petroleum Industry: Exploration, drilling, refining, gas processing, marketing, onshore and offshore, petrochemical, chemical, and pipeline.

- o Mesa Petroleum Company
  - Manager of Safety: Responsible for establishing and administering the first safety and fire protection department for Mesa, an exploration and production company of natural gas and crude oil (onshore and offshore).

- o Tenneco Oil Company
  - Corporate Safety Manager: Responsible for managing the safety and fire protection department for Tenneco Oil Company with 6600 employees in exploration, drilling, production (onshore and offshore), refining, gas processing, marketing terminals, and transportation (land and water).

EDUCATION: B.S., Public Administration, University of Houston

OTHER:
Registered Professional Safety Engineer (California)
Certified Safety Professional
General Chairman, National Safety Council, Petroleum Section, 1984-1985
Board of Directors, Texas Safety Association
Advisory Member, American Petroleum Institute, Safety and Fire Protection Committee
Member, American Society of Safety Engineers
Member, Veterans of Safety
Member, National Petroleum Refiners Association
Past Member, Gas Processors Association
Past Member, Off Shore Safety and Training Association

NAME: Robert J. Cordes (Occupational Safety)

ASSOCIATION: Robert J. Cordes & Associates

EXPERIENCE: 31 years

- o Robert J. Cordes & Associates
  - President: Providing petroleum industry safety consultant services, including expert witness, inspections, investigations, and program development.

- o Marathon Oil Company
  - Safety Supervisor, Safety and Training Coordinator, and Environmental and Safety Coordinator: Responsible for the safety, training, and environmental aspects of Marathon's production operations in the Gulf of Mexico.
  - Senior Risk Engineer: Responsible for inspecting refineries, gas plants, product terminals, fuel gas plants, pipeline terminals and production, both offshore and onshore.
  - Safety Representative, Supervisor of Safety and Security: Responsible for safety during a $100 million plant expansion at a 200,000 B/D refinery.
  - Design Engineer: Involved with selection, design, and operation of refinery equipment.
  - Process Engineer: Daily involvement with operations at refinery process units.

EDUCATION: B.S., Mechanical Engineering, Washington University, St. Louis, MO

OTHER:
Certified Safety Professional
Member, ANSI Z244 Lockout/Tagout Standard Committee
Member, ANSI Z117 Confined Space Entry Standard Committee
Member, American Society of Safety Engineers
Member, Executive Committee, National Safety Council, Petroleum Section
Advisory Member, American Petroleum Institute, Safety and Fire Protection Committee
Author of eight publications
President, Society of Ohio Safety Engineers (1978-1979)

NAME: Patrick J. Doody (Operations)

ASSOCIATION: Private Consultant

EXPERIENCE: 40 years

- o Apex Environmental, Inc.
  - Technical audit and safety consultant to the Petroleum Industry

- o Sarawak Shell Berhad (SSB)
  - Manager Technical Audit: Performed technical safety assessments for Shell International Group Company in Malaysia for offshore drilling and production facilities.

- o Shell Oil Company
  - Safety Engineer Advisor: Preparation of technical safety manuals and guidelines relating to oil and gas drilling and producing facilities and operations. Evaluation and commentary on engineering designs and specifications of onshore and offshore producing facilities, including safety systems and controls, fire protection, and emergency evacuation. On-site safety audits of onshore and offshore drilling and producing installations, facilities, and operations.

EDUCATION: B.S., Civil Engineering, Gonzaga University
M.S., Civil Engineering, Harvard University

OTHER: Chairman, American Petroleum Institute Production Safety Committee, 1980-1987
Member, American Petroleum Institute Subcommittee for preparation of RP 54, "Occupational Safety and Health, Drilling and Well Servicing Units"

NAME: Michael S. Hildebrand (Emergency Preparedness)

ASSOCIATION: HazMat-TISI, Inc., Columbia, MD

EXPERIENCE: 17 years

- o HazMat Training, Information and Services, Inc., Columbia, MD
  - President: Responsible for the overall operations as well as Chief Operating Officer for Hazardous Materials Training, Information and Service, Inc.

- o American Petroleum Institute, Washington, DC
  - Director, Safety and Fire Protection: Managed a safety and fire protection program for 120 Fortune 500 companies. Primary area of responsibility included legislative and regulatory analysis, development of engineering standards, and management of operational safety forums for the petroleum industry. Developed petroleum industry code compliance programs, operation of an extensive safety data system, and media relations.
  - Managed the revision of 45 technical standards on safety and fire protection using volunteer labor force.

- o Hazardous Materials, College Park, MD
  - Consultant: Provided consulting services for emergency response, industrial and governmental organizations in the area of occupational safety and health. Areas of special concentration were hazardous materials, toxic waste, and emergency services.

- o National Emergency Training Center, National Fire Academy, Emmitsburg, MD
  - Provided assistance with the development of the NETC Hazardous Materials Incident Analysis Course and represented the National Fire Academy as an instructor at locations throughout the United States.

- o Montgomery College, Rockville, MD
  - Advisory Board Member and Internship Coordinator, Fire Science Curriculum: Provided guidance on fire science curriculum content, department and facility policies.

EDUCATION: B.S., Fire Safety Analysis and Criminal Investigation, University of Maryland, College Park, MD
A.A., Fire Science, Montgomery College, Rockville, MD

OTHER: Member, Standards/Council, National Fire Protection Association
Member, American Society of Safety Engineers

NAME: David M. Kernan (Industrial Hygiene)

ASSOCIATION: Occusafe, Inc.

EXPERIENCE: 10 years

- o Occusafe, Inc., Wheeling, IL
  - Project Manager
  - Industrial Hygiene Program Appraisal, DOE-CH facilities, Brookhaven National Laboratory, Argonne National Laboratory and OSHA Compliance Audits, Fermi National Accelerator Laboratory, Ames Laboratory and DOE Boston and New York Support Offices
  - Team Leader, AHERA type building inspections
  - Project manager, occupational health and safety projects

- o Occupational Safety and Health Administration, Upland Area Office, Upland, CA
  - Journeyman Industrial Hygiene Compliance Safety and Health Officer
  - Conducted compliance inspections of industries in Los Angeles, Ventura, and San Bernardino Counties.

- o U.S. Naval Medical Command, Naval Hospital Bremerton, Bremerton, WA
  - Industrial Hygienist: Responsible for industrial hygiene program reviews, employee training in occupational health hazards, air sampling, physical agent hazard evaluations, ventilation system evaluations, building plan and engineering drawing reviews for potential health hazards.

- o University of Washington, Department of Environmental Health and Safety, Seattle, WA
  - Industrial Hygienist: Responsible for hazardous waste, laboratory safety equipment testing, air sampling, and ventilation system testing.

EDUCATION: B.S., Chemistry, Seattle Pacific University, Seattle, WA
Graduate Studies in Industrial Hygiene, University of Washington

OTHER: Certified Industrial Hygienist, American Board of Industrial Hygiene
Member, American Industrial Hygiene Association
Member, American Conference of Governmental Industrial Hygienists
Member, Legal Affairs Committee, AIHA Chicago Local Section

NAME: Carl W. Mangus (Maintenance)

ASSOCIATION: Private Consultant

EXPERIENCE: 35 years

- o Private Consultant
  - Consultant to legal firms: Safe work practices, crane and wire rope failures, offshore workboat safety operations, crew, and helicopter helipad facilities.
  - Consultant to offshore producing companies: Development of gas processing and offshore/onshore production, operating procedures. Performed technical safety surveys of offshore/onshore oil and gas producing/processing facilities.

- o Shell Offshore, Inc.
  - Senior Staff Technical Safety Specialist: Performed technical safety review/ approval of engineering and operating procedures.
  - Manager of Offshore Regulatory Affairs: Formulated/ commented on government regulations/industry standards.
  - Superintendent Offshore Production and Maintenance; Offshore Engineering Section Leader
  - Project Manager: Projects included Calumet Gas Processing Plant, North Terrebonne Natural Gas Processing Plant Expansion, Dual 36" Natural Gas Pipelines, Chalkley Gas Processing Plant.
  - Project Developer, Gas Department: Proposed and organized seven natural gas processing plant projects.

- o Independent Contractor
  - Various duties on workover rigs, drilling rigs, and pipeline construction projects.

EDUCATION: B.S., Mechanical Engineering, Oklahoma State University

OTHER:
Registered Professional Engineer (Louisiana)
Member, American Society of Safety Engineers
Member, Society of Petroleum Engineers
Member, Gulf Coast Safety and Training Group
Past participation, International Association of Drilling Contractors, Offshore Operators Committee, U.S. Coast Guard Committees
Member, American Petroleum Institute (API)
Chairman, Offshore Crane Specifications
Chairman, Offshore Crane Operating and Maintenance Procedures

NAME: Paul B. Mossman (Medical Services)

ASSOCIATION: Private Expert

EXPERIENCE: 40 years

- o Private Expert
  - Consulting with government and private agencies, offering expertise in the Medical Services field with respect to organization and administration, procedures and documentation, and medical treatment.

- o Sandia National Laboratories
  - Medical Director: Responsible for the overall management of the Medical Services Department.
  - Associate Medical Director of Sandia National Laboratories

- o Arabian American Oil Company (ARAMCO), Dhahran, Saudi Arabia
  - Occupational Health Physician

- o Northern California State
  - General Practitioner

- o U.S. Army
  - Captain in Medical Corps

EDUCATION: M.D., George Washington University, Washington, DC
M.P.H. and Occupational Health, University of California, Berkeley.

OTHER: American Board of Family Practice
American Board of Preventive Medicine in Occupational Medicine

NAME: William E. Mott (Organization and Administration)

ASSOCIATION: Private Consultant

EXPERIENCE: 36 years

- o Private Consultant
  - Participated in DOE Technical Safety Appraisal of the Lawrence Berkeley Laboratory and in a series of firearms safety appraisals at various DOE facilities.

- o U.S. Department of Energy, Germantown, MD
  - Retired Annuitant: Served as technical safety expert to the Director, Office of Operational Safety on oversight and appraisal activities relating to safeguards and security and the packaging and transportation of hazardous materials.
  - Deputy and Senior Technical Advisor to the Director, Office of Operational Safety
  - Director, Division of Environmental and Safety Engineering
  - Director, Division of Public Safety

- o U.S. Energy Research and Development Administration, Germantown, MD
  - Director and Assistant Director for Non-nuclear Programs, Division of Environmental Control Technology

- o U.S. Atomic Energy Commission, Germantown, MD
  - Assistant Director for Technical Programs, Division of Isotopes Development

- o Gulf Research and Development Company, Pittsburgh, PA
  - Research Scientist and Manager of Nuclear Applications

EDUCATION: B.S., Physics, College of Wooster
M.S., Physics, Carnegie-Mellon University
Ph.D., Physics, Carnegie-Mellon University

OTHER: Author or coauthor of 96 publications and reports
Eight patents
Member, American Physical Society
Member, American Nuclear Society
Member, Sigma Xi
Member, Phi Beta Kappa

NAME: Larry D. Warren (Report Quality)

ASSOCIATION: Private Consultant

EXPERIENCE: 26 years

- o Private Consultant
  - Technical safety consulting to the Department of Energy and its contractors. Represented the Assistant Secretary for Defense Programs, as the Headquarters program office representative, for two Technical Safety Appraisals (TSAs) and five TSA follow-ups.

- o U.S. Department of Energy, Germantown, MD
  - Safety Programs Manager, Office of Weapons Safety and Operations, Deputy Assistant Secretary for Military Applications (DASMA), Defense Programs: Formulated safety and health policy and long-range plans for three major national laboratories and five primary manufacturing facilities in the nuclear weapons complex. TSA coordinator and contact for DASMA. Headquarters program office representative on 11 TSAs.

- o Wilmington District, U.S. Army Corps of Engineers
  - Deputy District Commander: Managed and directed annual planning and execution of $60-70 million in civil works projects, and $9-15 million in military construction projects. Contracting office for construction and service contracts.

- o Los Alamos National Laboratory
  - Program Manager, Insertable Nuclear Component Technology Program; Project Manager, Corps Support Weapon System Concept Study; Design Engineer: Nuclear weapon components and subsystems.

- o U.S. Army (Lieutenant Colonel, Retired)
  - Various troop commands, troop operations, and training and nuclear weapons research and development staff assignments.

EDUCATION: B.S., Nuclear Engineering, North Carolina State University
M.S., Nuclear Engineering, North Carolina State University
United States Army Command and General Staff College

OTHER: Member, Society of American Military Engineers