Onshore Oil and Gas Production Practices for Protection of the Environment

API RECOMMENDED PRACTICE 51
SECOND EDITION, SEPTEMBER 1995

STEP
Strategies for Today's Environmental Partnership

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005

One of the most significant long-term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, API member companies have developed a positive, forward looking strategy called STEP: Strategies for Today's Environmental Partnership. This program aims to address public concerns by improving our industry's environmental, health and safety performance; documenting performance improvements; and communicating them to the public. The foundation of STEP is the API Environmental Mission and Guiding Environmental Principles.

API ENVIRONMENTAL MISSION AND GUIDING ENVIRONMENTAL PRINCIPLES

The members of the American Petroleum Institute are dedicated to continuous efforts to improve the compatibility of our operations with the environment while economically developing energy resources and supplying high quality products and services to consumers. The members recognize the importance of efficiently meeting society's needs and our responsibility to work with the public, the government, and others to develop and to use natural resources in an environmentally sound manner while protecting the health and safety of our employees and the public. To meet these responsibilities, API members pledge to manage our businesses according to these principles:

- To recognize and to respond to community concerns about our raw materials, products and operations.
- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly, appropriate officials, employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters and others in the safe use, transportation, and disposal of our raw materials, products, and waste materials.
- To economically develop and produce natural resources and to conserve those resources by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health, and environmental effects of our raw materials, products, processes, and waste materials.
- To commit to reduce overall emission and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and others in creating responsible laws, regulations, and standards to safeguard the community, workplace, and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of similar raw materials, petroleum products and wastes.

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Exploration and Production Department

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FOREWORD

API Recommended Practice 51, First Edition, was issued in February 1976.

These recommended practices were prepared by the Subcommittee on Onshore Production Practices for Protection of the Environment. This standard is under administration of the American Petroleum Institute Exploration and Production Department's Executive Committee on Drilling and Production Practices.

It is intended that these voluntary recommended practices serve as a guide to promote protection of the environment in domestic onshore production operations. Users of this publication are reminded that constantly developing technology, specific company requirements and policy, and specialized or limited operations do not permit coverage of all possible operations, practices, or alternatives. This standard is not so comprehensive as to present all possible practices for protecting the environment in oil and gas producing operations. Alternative operating procedures and/or equipment are available and routinely used to meet or exceed recommended practices or performance levels set forth herein. Recommendations presented in this publication are not intended to inhibit developing technology and equipment improvements or improved operating procedures. This publication, or portions thereof, cannot be substituted for qualified technical/operations analysis and judgement to fit a specific situation.

There may be federal, state, or local statutes, rules, or regulations requiring onshore production operations to be conducted in a certain manner. Organizations and individuals using this standard are cautioned that requirements of federal, state, or local environmental laws and regulations are constantly evolving and these should be reviewed to determine whether or not the practices recommended herein are consistent with current laws and regulations.

Suggested revisions to these recommended practices are invited and should be submitted in writing to the director of the Exploration and Production Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

Onshore Oil and Gas Production Practices for Protection of the Environment

1 Scope

This standard provides environmentally sound practices for domestic onshore oil and gas production operations. It is intended to be applicable to contractors as well as operators. Facilities within the scope of this document include all production facilities, including produced water handling facilities. Offshore and arctic areas are beyond the scope of this document. Operational coverage begins with the design and construction of access roads and well locations, but does not include drilling operations, and ends with abandonment/restoration operations. Gas compression for transmission purposes or production operations, such as gas lift, pressure maintenance, or enhanced oil recovery is included, however, gas processing for liquids recovery is not addressed.

2 References

2.1 REFERENCE STANDARDS

This recommended practice includes by reference, either in total or in part, the following standards. Users should investigate use of the appropriate portion of the most recent editions of the standards listed below:

API

Bul D16	*Suggested Procedure for Development of Spill Prevention Control and Countermeasure Plans*
Bul E2	*Bulletin on Management of Naturally Occurring Radioactive Materials (NORM) in Oil and Gas Production.*
Bul E3	*Well Abandonment and Inactive Well Practices for U.S. Exploration and Production Operations, Environmental Guidance Document*
Bul E4	*Environmental Guidance Document: Release Reporting for the Oil and Gas Exploration and Production Industry as Required by the CWA, CERCLA and SARA Title III*
Environmental	*Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations*
Spec 7B 11C	*Specification for Internal-Combustion Reciprocating Engines for Oil Field Service*
RP 7C 11F	*Recommended Practice for Installation, Maintenance, and Operation of Internal-Combustion Engines*
Bul 11K	*Data Sheet for the Design of Air Exchange Coolers*
Spec 11N	*Specification for Lease Automatic Custody Transfer (LACT) Equipment*
Spec 11P	*Specification for Packaged High Speed Separable Engine-Driven Reciprocating Gas Compressors*
Spec 12B	*Specification for Bolted Tanks for Storage of Production Liquids*
Spec 12D	*Specification for Field Welded Tanks for Storage of Production Liquids*
Spec 12F	*Specification for Shop Welded Tanks for Storage of Production Liquids*
Spec 12J	*Specification for Oil and Gas Separators.*
Spec 12K	*Specification for Indirect-Type Oil Field Heaters*
Spec 12L	*Specification for Vertical and Horizontal Emulsion Treaters*
RP 12N	*Recommended Practice for Operations, Maintenance and Testing of Firebox Flame Arresters*
RP 49	*Recommended Practices for Drilling and Drill Stem Testing of Wells Containing Hydrogen Sulfide*
RP 53	*Recommended Practices for Blowout Prevention Equipment Systems for Drilling Wells*
RP 55	*Recommended Practices for Conducting Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide*

NACE[1]

Std. MR0175	*Standard Material Requirements Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment*
RP0475	*Selection of Metallic Materials to be Used in All Phases of Waste Handling for Injection Into Oil Bearing Formations*

2.2 REGULATIONS

The following regulations are referenced in this recommended practice. All regulations are subject to revision, and users should determine the latest version for compliance.

OSHA[2]

29 CFR Part 1910.119	*Process Safety Management of Highly Hazardous Chemicals*

[1]NACE International (National Association of Corrosion Engineers), P.O. Box 218340, Houston, Texas 77218-8340.
[2]U.S. Occupational Safety and Health Administration, U.S. Department of Labor, available from U.S. Government Printing Office, Washington, D.C. 20402.

29 CFR Part 1910.120	*Hazardous Waste Operations and Emergency Response*
29 CFR Part 1910.1000	*Toxic and Hazardous Substances (Air Contaminants)*
29 CFR Part 1910.1200	*Hazard Communication Standard*

EPA[3]

40 CFR Part 110	*Discharge of Oil*
40 CFR Part 112	*Oil Pollution Prevention*
40 CFR Part 122	*The National Pollution Discharge Elimination System*
40 CFR Part 122.26	*Stormwater Discharges (NPDES)*
40 CFR Part 122.28	*General Permits (NPDES)*
40 CFR Part 144.7	*Identification of Underground Sources for Drinking Water and Exempted Aquifiers—UIC Program*
40 CFR Part 146.4	*Criteria for Exempt Aquifiers—UIC Program*
40 CFR Part 261	*Identification and Listing of Hazardous Waste*

DOT[4]

49 CFR Part 172.101	*Hazardous Materials Table*

BLM[5]

NTL 4A	*Royalty or Conservation for Oil and Gas Lost*
Onshore Order 6	*Hydrogen Sulfide Operations*
Onshore Order 8	*Well Workovers, Completions, and Abandonments*
Onshore Order 9	*Waste Prevention and Use of Produced Oil and Gas for Beneficial Purposes*

NTIS[6]

NTIS Accession No. PB89 190755/XAB	*Surface Operating Standards for Oil and Gas Exploration and Development* (BLM, U.S. Department of the Interior, and Forest Service, U.S. Department of Agriculture).

2.3 OTHER REFERENCES

National Register of Historical Places[7]

Spill Reporting Procedures Guide[8]

Migratory Bird Treaty and Enforcement Improvement Act

3 Acronyms and Abbreviations

The following acronyms and abbreviations are used in this standard:

API	American Petroleum Institute
BAT	Best Available Technology
BCT	Best Conventional pollutant control Technology
BLM	Bureau of Land Management
BNA	Bureau of Natural Affairs
BOPE	Blowout Preventer Equipment
BPT	Best Practicable control Technology
CAA	Clean Air Act
CAAA-90	Clean Air Act Amendments of 1990
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOT	Department of Transportation
E&P	Exploration and Production
EHS	Extremely Hazardous Substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act (Title III of SARA, commonly called "Right-to-Know" or SARA Title III)
ESA	Endangered Species Act
ESD	Emergency Shut Down
FWPCA	Federal Water Pollution Control Act
HAP	Hazardous Air Pollutant
HAZCOM	Hazard Communication standard
HAZWOPER	Hazardous Waste Operations and Emergency Response
HMTA	Hazardous Materials Transportation Act
IC	Internal Combustion
LACT	Lease Automatic Custody Transfer
LEPC	Local Emergency Planning Committee
MCL	Maximum Contaminant Levels
mg/l	milligrams per liter
MMS	Minerals Management Service
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NACE	National Association of Corrosion Engineers

[3]Environmental Protection Agency, available from U.S. Government Printing Office, Washington, D.C. 20402.
[4]U.S. Department of Transportation, available from U.S. Government Printing Office, Washington, D.C. 20402.
[5]Bureau of Land Management (U.S. Department of the Interior), available from U.S. Government Printing Office, Washington, D.C. 20402.
[6]National Technical Information Service, Springfield, VA 22151.
[7]Available from Preservation Press, 1785 Massachusetts Avenue, N.W., Washington, D.C. 20036.
[8]Available from Bureau of Natural Affairs, Box 6036, Rockville, MD 20850-9914.

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NORM	Naturally Occurring Radioactive Materials
NPRS	National Planning and Response System
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission or National Response Center
NSPS	New Source Performance Standards
NTL	Notice To Lessees
OPA '90	Oil Pollution Act of 1990
OSHA	Occupational Safety and Health Administration
OSH Act	Occupational Safety and Health Act
PCB	Polychlorinated Biphenyls
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RP	Recommended Practice(s)
RQ	Reportable Quantity
RSPA	Research and Special Projects Administration
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SERC	State Emergency Response Commission
SIC	Standard Industrial Classification
SOP	Standard Operating Procedure
SOPS	State Operating Performance Standard
SPCC	Spill Prevention Control and Countermeasure
Superfund	See CERCLA.
TCLP	Toxicity Characteristic Leachate Procedure
TDS	Total Dissolved Solids
TPQ	Threshold Planning Quantity
TSCA	Toxic Substances Control Act
UIC	Underground Injection Control
USCG	United States Coast Guard
USDW	Underground Source of Drinking Water
UST	Underground Storage Tank

4 Regulatory Agencies

Prior to the construction, and, in some instances, prior to revision, of onshore oil and gas production facilities it may be necessary to obtain approvals from one or more federal, state, and local regulatory agencies. In addition to local building permits, permits may be required because of air emissions, discharges to surface waters or sewer systems, injection activities, stormwater discharges (including during construction activities), impacts to threatened or endangered species or their critical habitat, impacts to wetlands, impacts to federal or state lands, other environmental impacts, or impacts to other cultural resources. Operators should ensure that all necessary permits have been obtained prior to commencing operations.

5 Federal Environmental Legislative Acts

5.1 CLEAN AIR ACT (CAA)

The CAA, first enacted in 1970 and amended several times since then, has several features that can lead to significant regulation.

Under the CAA, EPA has established national ambient air quality standards for several air pollutants: sulfur oxides, nitrogen oxides, ozone, carbon monoxide, particulate matter, and lead. On an ambient standard-by-standard basis, every area of the United States is classified as attainment or nonattainment. This classification determines, in part, what additional controls on emission sources are required and the timetable for implementation.

EPA is also authorized, under the CAA, to set new source performance standards (NSPS) for certain categories of stationary sources and separate standards for listed hazardous air pollutants (HAPs). These requirements often take the form of technology standards, but may take the form of performance standards or work practice standards.

Overall, EPA assumes the authority for regulating new sources, whereas states assume the authority for regulating existing sources. In addition, state standards are often applicable only to nonattainment areas, whereas federal standards are generally applicable in both attainment and nonattainment areas.

Standards aside, the CAA also imposes permitting requirements. Depending on an emission source's nature, emission profile, size, and geographic location, a new source (or major modification) may require a preconstruction review permit. Irrespective of preconstruction review permits, existing sources also generally require operating permits, which are intended to be the vehicle for all applicable source requirements.

The temporary addition on the well site of mobile emission sources, such as drilling rigs or well servicing equipment, should be considered in accordance with relevant permitting requirements, as these activities may trigger state or federal permit requirements.

5.2 CLEAN WATER ACT (CWA)

The CWA was enacted in 1972 with a goal to restore the surface waters for protection of fish and wildlife and for recreation by the elimination of pollutant discharges from

point sources into "Waters of the United States." These "Waters" are very broadly defined and include any conveyance, including dry stream channels, that lead to waterways, including the oceans. The CWA created the National Pollutant Discharge Elimination System (NPDES) permitting program (or state equivalent) for all point source discharges, including stormwater. The discharge permit program regulates discharges of 297 chemical substances through receiving water quality limits and application of best available technology (BAT), best conventional pollutant control technology (BCT), best practical control technology (BPT), and new source performance standards (NSPS). Permits for onshore discharges are issued by the states (which have been delegated primacy from the EPA), the EPA, or both.

The CWA also established regulations covering the response to an oil spill which could reach navigable waters (including "Waters of the United States"), adjoining shoreline, or the exclusive economic zone. Spill prevention, control, and countermeasure (SPCC) plans are required for any facility (including temporary fuel storage facilities) storing 42,000 gallons or more of oil in underground tanks or with more than 1,320 gallons of aboveground storage capacity or with a single tank of more than 660 gallons of storage capacity. The SPCC plan must be written to address the specific location and state the most likely course of the runoff. The plan must be written within six (6) months of beginning an operation, be certified by a registered professional engineer as to its technical feasibility, and be implemented within 1 year. A copy of the plan should remain at the facility or on location, if manned at least 8 hours per day, or at the nearest field office if unmanned. The plan must be reviewed at least once every 3 years and be recertified if significant changes to the plan are required.

Any spill of a reportable quantity (RQ) of oil or hazardous chemicals listed in the CWA requires immediate reporting to the National Response Center at (800) 424-8802 by the person in charge of the facility. An RQ of oil is one which creates a sheen on navigable waters, adjoining shoreline, or the exclusive economic zone, or which causes a violation of applicable water quality standards. Refer to API Bulletin E4, *Environmental Guidance Document: Release Reporting for the Oil and Gas Exploration Industry as Required by the CWA, CERCLA, and SARA Title III*, for additional information.

The U. S. Army Corps of Engineers regulates the dredging and filling of navigable waters. In order to discharge dredged material into these waters, operators must first obtain a permit from the Corps of Engineers.

5.3 OIL POLLUTION ACT OF 1990 (OPA '90)

OPA '90 mandated amendments to the existing oil pollution prevention regulations (40 CFR Part 112 and as discussed in 5.2) that were originally established by the CWA.

OPA '90 requires operators of facilities meeting certain criteria to develop and submit a response plan that has been designed to handle routine and worst case discharges of oil or hazardous substances. OPA '90 defines who is considered responsible when a spill occurs, what costs and damages they can be liable for, dollar limits of liability, and defenses to liability.

Operators should determine whether their facilities fall under applicable OPA '90 requirements and take appropriate action(s). OPA '90 impacts those drilling, production, processing, pipeline, and marine transfer facilities that exceed trigger levels established for storage and handling of certain materials, including crude oil. Facilities that could reasonably be expected to cause significant and substantial harm to the environment by discharging oil into navigable waters (includes "Waters of the United States") or the adjoining shorelines must prepare response plans and submit such plans to EPA, RSPA, USCG, MMS, or other applicable regulatory agency, as appropriate. As of August 18, 1993, such facilities cannot handle, store, or transport oil without an approved plan, unless the owner or operator certifies, by contract or other approved means, the availability of personnel and equipment necessary to respond to a threat of or an actual worst case discharge.

5.4 SAFE DRINKING WATER ACT (SDWA)

The SDWA, enacted in 1974, regulates the nation's sources of drinking water. The legislation outlines primary and secondary drinking water standards by establishing maximum contaminant levels (MCLs) which cover mainly metals and organics. To protect the nation's groundwater supply, the underground injection control (UIC) program was developed. This program classifies underground aquifers, with waters containing less than 10,000 ppm total dissolved solids (TDS) designated as underground sources of drinking water (USDWs). All injection of fluids must be permitted, and a new permit will not be issued until the applicant can demonstrate the injection operation will not endanger an USDW. The oil and gas industry injection wells are regulated as Class II wells in the UIC program. States that have been delegated primacy for this program by the EPA are responsible for the issuance of permits. The EPA is responsible for issuing permits for injection activities in nonprimacy states and on most federal and Indian lands.

Class II injection wells can be used for enhanced oil recovery projects to dispose of nonhazardous exploration and production (E&P) wastes and must not endanger an USDW. These wells must be protected from surface water entering the wellbore and must maintain mechanical integrity and be tested periodically. Injection of hazardous waste is regulated under the Resource Conservation and Recovery Act.

5.5 RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA was enacted in 1976 to address the management of wastes (including hazardous waste) and this legislation developed the concept of "cradle-to-grave" responsibility. Hazardous waste, which is regulated under Subtitle C of RCRA, may be solid, liquid, or contained gas, and be regulated either because it is "characteristically" hazardous or is one of more than 400 listed wastes. The characteristics of ignitability, reactivity, corrosivity, or toxicity cause a waste to be regulated as hazardous. Toxicity is generally determined by an acid solubility test termed the toxicity characteristic leachate procedure (TCLP). The TCLP requires analysis for a list of 39 chemical substances, composed of 8 metals, 6 pesticides, and 25 organic substances. The regulations covering hazardous wastes can be onerous and contain elements that can result in significant environmental liability. At present, nearly all hazardous wastes are prohibited from land disposal ("land ban") until they meet specified treatment standards. States may be delegated the responsibility of preparing programs to manage hazardous wastes.

EPA, in a 1988 regulatory determination, decided that oil and gas exploration and production wastes were high volume and low toxicity wastes which should continue to be exempt under Subtitle C. These wastes include produced water, drilling fluids, drill cuttings, rigwash, drilling fluids and drill cuttings from offshore operations when disposed onshore, well completion/treatment/stimulation fluids, basic sediment and water and other tank bottoms, accumulated materials from separators and fluid treating vessels and production impoundments, pit sludges, workover wastes, glycol compounds from gas dehydration units, gas plant sweetening wastes, cooling tower blowdown, spent filters/media, backwash from exempt waste streams, packing fluids, produced sand, pipe scale, hydrocarbon-bearing soil, pigging wastes, constituents removed from produced water before injection or other disposal, liquid hydrocarbons removed from production streams but not from oil refining, waste crude oil from exploration and producing operations, ejected blowdown materials, gases from production streams, and volatilized light organics from exempt wastes. It should be noted that not all wastes generated by exploration and production (E&P) operations are exempt under Subtitle C. Care must be taken to avoid commingling nonexempt wastes, such as paint wastes, cleaning solvents, and batteries, with exempt wastes, as the resultant mixture will be considered nonexempt and regulated under Subtitle C.

Underground storage tanks (USTs) are regulated under RCRA Subtitle I. For applications in this standard, an UST is defined as any tank and piping system with more than 10% of its volume underground and containing petroleum or a CERCLA hazardous substance other than a RCRA hazardous waste. Tanks containing RCRA hazardous wastes are regulated under RCRA Subtitle C. Existing USTs must undergo modification to provide for leak detection, overfill protection, monitoring of vapors and liquids in soil, and monitoring of tank volume. A new UST must have overfill protection, monitoring, leak detection, and cathodic protection, as provided by regulation. Secondary containment is required for USTs containing hazardous substances. Proof of financial responsibility must be available to cover cleanup costs and compensation if leaking does occur. Leaks and contamination of soil surrounding an UST must be reported to the National Response Center or to the appropriate state agency within 24 hours of discovery.

Some states have solid waste programs in place that are more stringent than federal RCRA requirements. Some states do not recognize the RCRA Subtitle C exemptions for E&P wastes. Individual state regulations should be carefully reviewed for compliance before managing wastes from E&P operations.

5.6 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA)

CERCLA, which has become known as "Superfund," established a program to identify and remediate sites from which hazardous substances are, or there is a substantial threat that they could be released into the environment. It identifies over 700 substances as "hazardous" and creates a process to provide funding to investigate and cleanup sites. The EPA has initiated investigation and cleanup action at over 2000 sites and has sought to find the potentially responsible parties (PRPs) to finance and/or finish the cleanup of these sites.

CERCLA also requires notification of the National Response Center in the event of a release of a reportable quantity (RQ) of a hazardous substance. Refer to API Bulletin E4, *Release Reporting for the Oil and Gas Exploration and Production Industry as Required by the CWA, CERCLA, and SARA Title III,* for additional information.

The CERCLA definition of hazardous substance does contain an exclusion for petroleum, including crude oil and fractions thereof, which is not otherwise specifically listed by one of the five environmental statutes referred to in the definition of hazardous substance. The General Counsel of EPA has opined that this exclusion does not apply to hazardous substances which are added to petroleum or which increase in contamination solely as a result of contamination of petroleum during use. The CERCLA definition of hazardous substance includes RCRA wastes and excludes drilling fluids, produced waters, and other wastes associated with the exploration, development, and production of crude oil or natural gas. The EPA has not always treated RCRA

exempt production wastes as excluded from the definition of CERCLA hazardous substance. Legal counsel should be consulted if clarification of this issue is needed.

CERCLA provides EPA with broad authority to require PRPs to remediate sites and to pay for the agency's work on sites. It establishes strict liability for remediation without regard to degree of responsibility. EPA can also impose "joint and several" liability, with each party potentially responsible for the entire cleanup. Past and present generators, transporters, storage owners, and operators can be considered PRPs.

5.7 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA, ALSO KNOWN AS SARA TITLE III)

The Superfund Amendment and Reauthorization Act of 1986 (SARA) reauthorized and extended the Superfund law which was established under CERCLA. SARA Title III, known as the Emergency Planning and Community Right-to-Know Act (EPCRA), is a separate statute that addresses the concern for potential release of toxic chemicals into surrounding communities.

EPCRA has been amended by the Pollution Prevention Act (PPA) and has three major sections, §302-4, §311, 312, and §313.

Under §302-4, facilities producing, using, or storing listed extremely hazardous substances (EHSs) above the threshold planning quantity (TPQ) designated in the regulations, must provide emergency planning notification to the State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC) and identify a facility representative. Releases over the reportable quantity (RQ) of those substances must be reported unless an exception applies. Simultaneous CERCLA reporting may also be required. Refer to API Bulletin E4, *Environmental Guidance Document: Release Reporting for the Oil and Gas Exploration and Production Industry as Required by the CWA, CERCLA, and SARA Title III,* for additional information.

Under §311 and 312, if threshold amounts of chemicals are present for which a material safety data sheet (MSDS) is required under OSHA's Hazard Communication Standard, facilities must submit information on location and inventory amounts. Reporting is required at least annually or when threshold amounts of new materials come on-site, etc. Refer to API Bulletin E1, *Bulletin on the Generic Hazardous Chemical Category List and Inventory for the Oil and Gas Exploration and Production Industry* (Superfund Amendment and Reauthorization Act of 1986, Emergency Planning and Community Right-to-Know Act), to help simplify compliance with §311 and 312. Also, refer to API Bulletin E4.

Under §313 Toxic Release Inventory (TRI) reporting, releases to air, land, water, and certain waste disposal and recycling information must be reported annually for listed substances that meet the threshold criteria. E&P Standard Industrial Classification (SIC) codes are not yet covered under §313, but are under active consideration by EPA for inclusion for reporting. The PPA adds additional data elements for reporting on §313 TRI forms.

States may impose additional or different reporting requirements.

5.8 NATIONAL HISTORIC PRESERVATION ACT (NHPA)

The NHPA was established to preserve, restore, and maintain cultural resources of the United States. *The National Register of Historic Places* identifies property which, for historic reasons, has been declared a treasure and future construction on or around the site must not disturb it. The National Park Service administers this program. Exploration and production operations must take into account the listed and potential historic sites when planning future work.

5.9 ENDANGERED SPECIES ACT (ESA)

The Fish and Wildlife Service of the U.S. Department of the Interior and the National Marine Fisheries Service of the U.S. Department of Commerce are responsible for identifying threatened and endangered plant and animal species, the protection of critical habitats for those species and preparing recovery plans for listed species. The ESA also requires all federal agencies to consider the impact of any of their actions (including the granting of approvals, rights-of-way, or permits of any type) on threatened and endangered species. The act also prohibits "incidental take" of endangered species on either public or private lands.

5.10 MIGRATORY BIRD TREATY ACT

The Fish and Wildlife Service, U.S. Department of the Interior, is responsible for the identification and protection of threatened migratory birds. As such, the destruction or possession of the bird, nest, or eggs, in whole or in part, either intentional or incidental, is punishable by fine, imprisonment, and/or confiscation of all equipment related to the destruction of said items. For intentional acts, penalties include fines of no more than $2,000, imprisonment for no more than 2 years, or both. Protection status is dependent on bird population, time of year, and economic and environmental considerations. Due to the variability of protection status, local agencies should be consulted for specifics.

5.11 TOXIC SUBSTANCES CONTROL ACT (TSCA)

The TSCA gives EPA authority to regulate chemical substances which potentially present a hazard to health or the environment. This authority includes the right to issue

regulations requiring import and export notifications, premanufacture notification, testing of both new and old chemical substances, and various reporting requirements (e.g., Section 8 inventory reporting updates and substantial risk notifications) and supplements existing toxic substances laws under the CAA, Federal Water Pollution Control Act (FWPCA), and Occupational Safety and Health Act (OSH Act). The chemicals most commonly associated with TSCA Section 6 controls include mercury, polychlorinated biphenyls (PCBs), asbestos, lead, and vinyl chloride. The current TSCA inventory contains more than 67,000 different chemicals. New chemicals not on the inventory are subject to various requirements before manufacture or use.

5.12 HAZARDOUS MATERIALS TRANSPORTATION ACT (HMTA)

The HMTA is the authority for the regulation of all shipments of regulated materials by highway (i.e., public access roads and highways), rail, air, or water. Regulated materials or wastes shipped as a result of exploration and production operations are typically subject to either DOT or USCG regulations.

A hazardous material is defined as a substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated (49 CFR Part 171.8). In general terms, a hazardous material is defined as any material deemed to be hazardous by the DOT. The regulations also provide that hazardous wastes (as defined by RCRA in 40 CFR Part 261) and hazardous substances (refer to 49 CFR Part 172.101 Appendix) are subject to DOT regulations when shipped. Some E&P waste streams (e.g., zinc bromide), although not subject to the hazardous waste regulations, may be subject to the DOT regulations since they are either listed as a hazardous material or contain a regulated quantity of a hazardous substance.

Shipments completely within a facility or lease are not subject to DOT regulations provided the materials are not shipped on or across public access roads or highways, waterways, or railroads. Depending on the task(s) being performed or required to be performed in preparing a material for shipment, the regulations assign duties that must be performed prior to the hazardous material being offered, accepted, or transported, including training of personnel, as appropriate, to their assigned job duties.

5.13 OCCUPATIONAL SAFETY AND HEALTH ACT (OSH ACT)

The standards written under authority of the OSH Act are directed primarily at protecting employees. The standards address a broad area of subjects ranging from mechanical specifications to work procedures, recordkeeping, training, written procedures, physical hazards, and emergency response plans. Some of the OSHA standards that address environmental issues as well as personnel safety include:

a. HAZCOM (refer to 29 CFR Part 1910.1200) requires that employees be informed of the physical and health hazards of chemicals in the work place.
b. Management of Process Hazards (refer to 29 CFR Part 1910.119) requires employers to manage hazards associated with processes using highly hazardous chemicals, including crude oil, condensate, and natural gas. The standard has specific requirements for developing process safety information, performing process hazard analysis, developing operating procedures, providing training to employees, ensuring mechanical integrity, and performing audits.
c. HAZWOPER (refer to 29 CFR Part 1910.120) requires that employees be appropriately trained and equipped to respond to emergency events.
d. Toxic and Hazardous Substances (Air Contaminants) (refer to 29 CFR 1910.1000) establishes workplace exposure limits for certain toxic and hazardous substances.

5.14 OTHER LAWS AND REGULATIONS

Environmental laws and regulations may vary with each city, county, and state. Applicable regulations are also issued by Bureau of Land Management (BLM), Forest Service, National Park Service, Environmental Protection Agency (EPA), U.S. Department of Transportation (DOT), Minerals Management Service (MMS), and others. The operator and all pertinent contractors should be familiar with the provisions of applicable laws and regulations prior to beginning operations. The operator should advise contractor of permit requirements and other restrictions that may impact or limit their operations.

6 Lease Roads

6.1 INTRODUCTION

Lease roads are constructed and used to support various exploration and production operations. The environmental impact of the construction of a roadway can have long lasting effects well beyond the limits of the right-of-way. Existing roads should be utilized, where feasible, to limit the extent of new road construction. When it is necessary to build new roadways, they should be developed in an environmentally acceptable manner consistent with landowner recommendations. Lease roads must conform with all applicable federal, state, and local laws, rules, and regulations.

6.2 PLANNING

6.2.1 Road alignment and right-of-way selection is a multidisciplinary process. The total infrastructure that may later be developed should be considered during the selection process. Government agencies, land owners, tenants, and other users may need to be consulted during the planning process.

6.2.2 Standards should be established for the road based on its long-term function.

6.2.3 Alternative alignments should be developed considering the following parameters as appropriate:

a. Topography.
b. Hydrology and drainage.
c. Erodible soils.
d. Location and amounts of excavation and fill materials.
e. Type and location of materials for road construction.
f. Air, water, and noise pollution.
g. Wetlands and wetland drainage.
h. Consistency with community character and local government needs and plans.
i. Proximity to dwellings or other permanent structures occupied or used by the public.
j. Visual sensitivity.
k. Power lines and pipelines.

6.2.4 Road alignments and potential environmental impacts should be reviewed. Environmentally significant areas should be identified and avoided to the maximum extent practical, including:

a. Sensitive wildlife and fish habitats.
b. Areas with endangered and threatened animals and plants.
c. Cultural and historical sites.
d. Federal, state, or local areas of concern.
e. Areas with the potential for flooding or snow drifting.
f. Wetlands.

6.2.5 When required, mitigation strategies should be developed in the planning process, including:

a. Road operation schedules and/or use of special designs to minimize any adverse impacts in areas with sensitive wildlife and fish habitats, wetlands, existing facilities, crops, and federal, state, or local areas of concern.
b. Plans to take appropriate action on cultural and historic resources before changes are made.
c. Maintenance of existing traffic patterns on highways and local access roads.

6.2.6 Restoration plans should be developed and incorporated into the planning process.

6.2.7 Stormwater and air (dust) permit requirements should be considered during the planning phase of the roadway.

6.2.8 Activities that require federal agency actions (permits, granting of rights-of-way, etc.) may trigger other federal requirements such as a National Environmental Policy Act (NEPA) evaluation. A NEPA evaluation will, at a minimum, include the portion of the project requiring the federal action, and in some instances may include the entire project.

6.3 DESIGN AND CONSTRUCTION

6.3.1 The design and construction of a road should be site specific. Each road will have its own unique terrain, safety, operation, and maintenance requirements. Each area within a route will support a distinct ecology.

6.3.2 Design and construction documents, including plans and drawings (where appropriate), should be prepared during the planning and design phases prior to the construction of the project. Plans will enable proper and timely review of items of environmental concern. They will also be beneficial for later restoration work.

6.3.3 Construction work should be scheduled and the use of special designs and local construction practices should be considered to minimize or avoid undesirable effects on sensitive wildlife and fish habitats, wetlands, and designated federal, state, or local recreational areas. Seasonal restrictions, such as freeze-thaw cycles, potential flooding, and wildlife migration should be considered.

6.3.4 The operator should confirm that the construction contractor has implemented an environmental and safety program, including the training of construction personnel. This program should include, where applicable, written procedures for a hazard communication program, hazardous material handling, spill reporting, emergency response, stormwater management, special environmental requirements within the project area, and blasting. The contractor should supply material safety data sheets (MSDSs) for all hazardous materials brought on site. Regulatory agencies often require performance bonds when roads are to be constructed in environmentally sensitive areas.

6.3.5 The operator should hold a pre-construction meeting with the contractor(s) to establish environmental and safety responsibilities along with desired objectives of the project.

6.3.6 Field inspections and lab analysis of soil samples may be used to assess soil erosion hazards and slope stability. Properties of soils, length and gradient of slopes, and vegetative cover contribute to soil stability. Fitting the profile to topography, locating roads on moderate slopes, providing adequate drainage, and stabilizing slopes decreases surface disturbance and reduces erosion and sedimentation.

6.3.7 Means and methods for erosion control are numerous and often site specific. Revegetation with local species,

rip-rap, gabions, woven jute, and energy dissipators are effective measures that may be used to reduce erosion.

6.3.8 The use of geotextiles and geosynthetics should be considered in road planning and construction. These materials offer a variety of applications, aid in stabilizing the road, and minimize the utilization of road bed and surface materials.

6.3.9 An adequate drainage system should be incorporated into the design and construction of the road. This system should efficiently intercept, collect, remove, and discharge water from roads. A drainage system that is inadequate or blocked will result in excessive erosion, failures, and higher maintenance costs.

6.3.10 The number of river, stream (including ephemeral streams), lake, and wetland crossings should be minimized, where possible. Bridges, culverts, and other drainage structures should be incorporated to ensure the free flow of water when drainage ways are intersected. Different flood stages should be considered for the design and construction of the crossings.

6.3.11 The use of snow fences should be considered in areas with snow drifting characteristics. Minimization of snow build up will reduce the use of deicers on the roadway and will also reduce the problems associated with the disposal of the bladed snow/salt mix during maintenance operations.

6.3.12 Clearing widths should be kept to a minimum. These limits should be delineated and marked in the field. Sensitive areas or features should be marked or fenced as required.

6.3.13 Where practical, topsoil should be salvaged and stockpiled in a safe and accessible location and be protected from erosion. The stockpiled material should be utilized for revegetation and reclamation purposes.

6.3.14 Revegetation should be done with local plants, seeds, and grasses species. Means and methods will be dependent upon seasonal considerations, the specific project area, and government agency requirements.

6.3.15 Areas of excavation should be approved prior to the start of construction. Permits are required for opening pits on federal land and may be required on other public lands. Pit layout and restoration should be planned prior to opening of the pit.

6.3.16 Environmental impacts during coarse/fine borrow material extraction should be minimized. The following should be considered:

a. Use of recycled road surface material from abandoned roads and locations.
b. Use of existing mineral material sites.
c. Selecting new sites that minimize environmental impacts.
d. Developing upland sites to maximize potential for revegetation and minimize adverse visual impact and possible erosion.
e. Maintaining a buffer of undisturbed vegetation between borrow pits and highways or other sites.

6.3.17 Warning signs should be provided to comply with local requirements. The signs may include road crossings, animal crossings, speed limit, road hazards, pipelines, etc.

6.3.18 Existing pipelines and other subsurface facilities should be identified prior to construction. These facilities should be protected to prevent accidental damage during the construction and operation of the road. Pipeline "one-call telephone numbers" should be used to obtain additional information prior to initiation of excavation operations.

6.3.19 Measures should be taken to ensure proper and adequate procedures for waste disposal, general housekeeping, and fuel/oil storage and handling. A SPCC plan may be required for temporary fuel storage areas. An effective emergency response plan should be in place prior to initiating construction. The plan may simply be a listing of telephone numbers to call should a utility or product line be damaged. Many times, the existing emergency response plan for the field area may be adequate. Construction personnel should be familiar with these plans.

6.3.20 Construction activities should be carried out as described in the construction documents, including plans and specifications.

6.3.21 Construction supervision should be provided throughout operations. Many potential problems associated with incorrect interpretation of construction documents, spills, waste disposal, poaching, and hunting can be avoided through proper supervision.

6.4 MAINTENANCE

6.4.1 Proper road maintenance is critical for the performance of the road and to prevent and control erosion and sedimentation. Maintenance personnel should be made aware of environmentally difficult and sensitive areas.

6.4.2 Maintenance work should be scheduled and the use of special designs and maintenance programs should be considered to minimize undesirable effects on sensitive wildlife and fish habitats, wetlands, and designated federal, state, or local recreational areas.

6.4.3 When performing scraping and leveling operations, care should be exercised to avoid disrupting ditches and shoulders, and creating undesirable berms with the bladed material.

6.4.4 Ditches, culverts, and drains should be regularly cleaned of debris and sediment to allow the free passage of water. Periodic inspections of all culverts should be conducted. Culverts found to be blocked should be cleared.

6.4.5 Borrow and surface materials should be readily accessible to be utilized during maintenance operations. Pits opened during construction should be used as a source for maintenance material, where feasible.

6.4.6 The use of dust control materials or measures should be evaluated prior to their utilization. The materials should not be detrimental to health, vegetation, wildlife, or water quality.

6.4.7 Cutting back weed and hedge growth is essential for road safety. This maintenance operation should be done with light equipment. Critical review should occur before herbicides or other chemicals used for weed control are applied.

6.4.8 There should be continuous monitoring of drainage and erosion control structures. They should be maintained and revised, as required, to provide for the intended function.

6.4.9 Erosion should be prevented and controlled. Areas should be revegetated, and slopes and soils should be stabilized.

6.4.10 There should be an environmental emergency response plan ready to be placed in action during construction and maintenance operations. The plan should include emergency procedures to be followed in the event major drainage ways are blocked, fail, or don't perform as required during or immediately after major storm events.

6.5 ABANDONMENT

6.5.1 Abandonment procedures should comply with regulatory requirements, contractual obligations, and lessor and landowner requirements. Consideration should be given to cost-effective measures that will minimize environmental impacts.

6.5.2 Abandonment procedures may include the following considerations:

a. Restoration.
b. Abandonment in place.
c. Restoration of original or improved drainage.
d. Agreement on maintenance requirements, if any, after discontinued use, to be reached between the operator and new user.
e. Agency approval requirements.

6.5.3 Restoration plans should be prepared in detail and should consider methods such as:

a. Priority of stabilization and revegetation of disturbed areas.
b. Use of native plant species.
c. Stockpiling where reclamation would be enhanced.
d. Use of agency approved designs and seed mixes.

7 Producing Wells

7.1 COMPLETION, STIMULATION, AND WORKOVER OPERATIONS

7.1.1 Planning

For a new wellsite, an effective planning process should be carried out and should incorporate the latest guidelines and regulations for waste management, pit location and construction, handling of water discharges, and waste disposal. The location and size of new pits and pads for completion and workover equipment should be selected so as to minimize disruption of the surface resources and retain the potential for reclamation of the site.

For an existing wellsite, the planning process is just as important to provide for safe and environmentally acceptable completion and workover operations. Existing facilities, such as pits and production equipment, should be reviewed and assessed to determine whether the facility is suitable in its present condition for the intended well operations or if modifications are required. Facilities should also be reviewed to ensure compliance with all applicable regulations.

For both new and existing wellsites, a waste management plan for handling and storing all waste materials generated during completion and workover activities should be available. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for information on how to develop such a plan.

The waste management plan should address the specific wastes which are expected to be produced by the particular operations being performed, as well as provide guidelines concerning the actions to be taken in the event that unexpected waste materials, including hazardous materials, are encountered during the operations. In addition to safe handling and storage of waste materials on the wellsite, provisions should also be made for each type of waste to be disposed of and all applicable regulations should be observed.

Refer to API Recommended Practice 55 and API Recommended Practice 49 for planning and conducting operations involving hydrogen sulfide. Refer to API Bulletin E2 for information regarding management of naturally occurring radioactive materials (NORM).

Since much of the work on producing wells is performed by contract or service company personnel, the operating company should confirm that the contractor's personnel have appropriate safety training, including hazard communication training, and are aware of requirements of the site specific

waste management plan. Consideration should also be given to requiring performance bonds, if appropriate. The operator should also confirm that the contractor's personnel are aware of all applicable safety and environmental regulations and specific requirements of the operator.

7.1.2 Equipment Selection

Temporary equipment required to carry out well completion and workover operations should be included in the overall plan to ensure that equipment is in compliance with all applicable regulations. Equipment should be installed in a manner so as to utilize the smallest practical area for prudent operations. Equipment should be maintained to present an acceptable appearance.

7.1.3 Remedial Cementing

For both new and existing wells, the known and anticipated needs for remedial cementing to protect underground sources of drinking water (USDW) should be considered in the planning stage.

Excess cement, cement returns, and water used to wash cementing equipment should be contained and disposed of in an environmentally sound manner. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information.

7.1.4 Selection, Use, and Storage of Fuels and Completion Fluids

Completion fluid selection should take into account the safety and logistics of transporting, handling, storing, and disposing of clean and contaminated fluid in accordance with all applicable regulations. Material safety data sheets (MSDS) should be available for all hazardous materials on the wellsite.

For both new and existing wellsites, all fuels, treatment chemicals, completion brines, and other similar liquids should be properly stored in labeled containers intended for that purpose.

Wherever practical, tanks or existing drilling pits should be used for completion and workover operations. Completion brines and other potential pollutants should be kept in lined pits, steel pits, or storage tanks. If a new earthen pit is necessary, it should be constructed in a manner that prevents contamination of soils, surface water, and groundwater, both during the construction process and during the life of the pit. Consideration should be given to the use of tanks or lined pits to protect soil and groundwater, especially for brines and oil-based fluids.

Normal operations should preclude oil in pits. However, in the event well completion operations dictate use of pits containing oil for a brief period of time, they should be fenced, screened, netted and/or flagged, as appropriate, to protect livestock, wild game, and fowl. Refer to the Migratory Bird Treaty and Enforcement Improvement Act for additional guidance. Oil accumulated in pits should be promptly removed and recovered, recycled, or disposed in accordance with applicable regulations.

All liquids and other materials placed in pits should be recovered, recycled, or disposed in accordance with applicable rules and regulations.

When operations are completed, pits not required for well operation should be closed in accordance with applicable regulations. The surface area should be restored, as far as practical, to a condition compatible with the uses of the adjacent land area. Any pit retained should be of minimum size commensurate with well operations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information and permitting requirements.

7.1.5 Stormwater Runoff

Natural drainage patterns of the area should be considered in the location of equipment, pads, and pits so that stormwater runoff does not create an environmental hazard by erosion of base material, which could lead to equipment instability, or by flooding of pits, which could cause a discharge of oil or other fluids into the local surface waters.

Discharges of contaminated stormwater from exploration and production facilities (including oil and gas exploration, production, processing, or treatment operations or a transmission facility), which can reach waters of the U.S., require a stormwater discharge permit and submittal of a stormwater pollution plan to the EPA. Contamination includes stormwater that comes into contact with any overburden, raw materials, or waste products on the site. Exploration and production sites will need a stormwater discharge permit if:

(1) there has been a discharge of a reportable quantity of a hazardous substance in stormwater from the site under the CWA or CERCLA since November 16, 1987, or
(2) there has been a discharge of oil in stormwater from the site that required notification under the FWPCA since November 16, 1987, or
(3) a discharge of stormwater from the facility violates a water quality standard.

Refer to 40 CFR Part 122, as revised September 9, 1992, for additional information.

For purposes of triggering the submittal of permit applications for oil and gas operations, the EPA has determined that the release of oil to a stormwater discharge in amounts that cause an oil sheen, or has the potential to cause an oil sheen, on waters of the U.S. is a good indicator of the potential for water quality impacts for stormwater releases from oil and gas operations. In addition, any facility that requires a

stormwater discharge permit may be required to be in accordance with applicable spill prevention control and countermeasure (SPCC) requirements (refer to 40 CFR Part 112) for discharge of oil into or upon navigable waters of the U.S. or adjoining shorelines.

Construction stormwater discharge permits and construction pollution prevention plans may be required for construction of exploration and production facilities, including pads, access roads, pipeline rights-of-way, etc.

7.1.6 Blowout Prevention Equipment

All blowout prevention equipment (BOPE) should be selected, installed, and properly maintained in order to prevent uncontrolled releases to the environment. Refer to API Recommended Practice 53 and applicable federal, state, and local regulations.

All BOPE should have a working pressure rating that exceeds the maximum expected surface pressure.

Training exercises or drills should be held as required by regulations or as necessary to ensure crew familiarity and that the BOPE is in good working order.

7.1.7 Control of Noise and Other Nuisances

Engines and production equipment should be provided with noise abatement measures, if appropriate, to reduce noise levels to the extent practical, considering the local environment. Other nuisances such as odors and dust should be controlled in keeping with applicable regulations, or as considered appropriate for the location. Consideration should be given to minimizing traffic in general, particularly in or near urban areas.

7.1.8 Solids Removal or Capture

All produced fluids, drill cuttings, cement, cement returns, NORM scale, and other solids should be captured and classified, then reused, recycled, or disposed of as required by regulations. Hazardous waste should be segregated in order to prevent contamination of nonhazardous materials.

7.2 WELL OPERATIONS

7.2.1 Environmental Reporting and Permitting Requirements

All applicable environmental permitting and reporting requirements should be identified during the planning stage in order to assure compliance when the operation begins. Training regarding permit requirements, release reporting, and emergency response should be provided to appropriate operations personnel.

Oil and gas well production operations may require many different permits under the CAAA-90, CWA, SDWA, and other federal, state and local laws and regulations. Substantial periods of time may be required to secure permits for such operations. In many instances, permits must be obtained before operations are commenced or revisions to operations and facilities are initiated.

7.2.2 Equipment Operation and Maintenance

All well producing equipment should be kept neat, clean, painted and in good working order. Equipment should be painted to blend into the surroundings, if required or appropriate, and kept clean to present an acceptable appearance. Selected equipment may be painted to enhance visibility.

Safety guards necessary to protect humans, livestock, wildlife, and promote public safety should be maintained around equipment. Refer to API Recommended Practice 11ER for information on guarding of pumping units. Equipment lockout/tagout procedures should also be developed and implemented.

Drip pans should be provided under equipment and storage containers potentially subject to minor leaks. These drip pans should be monitored on a routine basis to recover and recycle or dispose of accumulated oil and other liquids.

Bulk storage, recyclable, and reusable containers should be considered in order to reduce the number of containers that must be maintained and disposed. All reusable containers should be well marked to denote contents and the fact that they are to be reused. All shipments of hazardous materials must be in accordance with U.S. Department of Transportation (DOT) requirements if transported along public highways or waterways.

The installation or use of double stuffing boxes, leak detectors, and shutdown devices should be considered in areas of particular environmental sensitivity.

Well cellars should be kept clean, dry, and guarded to prevent accidental falls.

7.2.3 Metallurgy and Corrosion

All equipment should be manufactured from materials which are suitable for the environment in which they are to operate. NACE Standard MR0175 and NACE RP0475 should be consulted for more information.

Equipment operating in known corrosive conditions should be inspected on a routine basis for signs of corrosion, with corrective action taken, as needed, to assure the equipment continues to operate in an environmentally acceptable manner.

If well production or injection conditions change in terms of hydrogen sulfide or carbon dioxide content, pressure, water cut, or any other parameter, the metallurgy of the well equipment should be reassessed to assure its suitability for the new conditions.

7.2.4 Leak Detection

All equipment should be inspected on a routine basis for signs of leakage, with corrective action taken, as needed, to assure the equipment continues to operate in a safe and environmentally acceptable manner.

All wells should be equipped to allow pressure to be measured and the integrity of each annulus to be tested, as appropriate for the specific well type.

Mechanical integrity testing of injection wells should be conducted in accordance with regulations and guidelines established for such wells.

7.2.5 Inspection and Certification

Equipment should be manufactured, refurbished, inspected, and installed according to manufacturer, API or other industry standards, and legal requirements.

7.3 WELL TESTING

7.3.1 Venting and Flaring

Venting and flaring should be restricted to a safe location and conducted in compliance with applicable regulatory guidelines. Where possible, the flare or vent should be located downwind considering the prevailing wind direction at the well location. When practical, all gases released to the atmosphere should be burned.

7.3.2 Environmental Permitting and Reporting Requirements

Environmental permitting and reporting concerning venting and flaring encompass federal, state, and local requirements. Federal permitting and reporting may include both EPA and, on federal leases, Bureau of Land Management (BLM) requirements.

EPA air regulations are not applicable to most production well testing. However, the EPA requirements may be invoked on long well tests of wells where sulfur dioxide emissions are greater than 250 tons per year (i.e., a major source). In addition, the CAAA-90 directs EPA to issue technology-based regulations to reduce emissions of Hazardous Air Pollutants (HAPs), as listed in the statute, from major sources (those that emit HAPs in amounts greater than 10 tons per year for a single HAP or 25 tons per year for a combination of HAPs). EPA may also regulate area (smaller) sources.

Under the CAAA-90, risk management plans should be developed for pollutants on the SARA EHS list, which includes hydrogen sulfide and other substances.

Nonattainment areas are areas determined by the EPA to be out of compliance with the National Ambient Air Quality Standards (NAAQS) for one or more pollutants. In a nonattainment area, many additional requirements may be imposed.

BLM Notice to Lessees 4A (NTL-4A) stipulates that flaring and venting of gas must be authorized. NTL-4A provides for two exemptions:

(1) well purging and evaluation for 24 hours, or
(2) well production testing for 30 days or 50 MMCF, whichever occurs first.

In addition, some BLM districts may have a higher threshold volume below which venting or flaring is exempt from regulation (refer to specific district requirements). Reporting requirements typically include information concerning production rate, volume, gas composition, and duration of testing.

BLM Onshore Order No. 6 addresses venting and flaring of sour gas. In addition, some natural resource stipulations may be included by the BLM for operations in environmentally sensitive areas.

State permitting and reporting requirements may include requirements of the appropriate state environmental agency as well as the appropriate state oil and gas agency. State and local environmental agencies typically have air permitting thresholds for various pollutants. Environmental regulations in several states contain emission exemptions for venting and flaring associated with production well tests. The exemption may specify emission limitations as well as criteria concerning flare height, autoignition, continuous pilot fuel, flare tip, and heating value of the gas. However, in nonattainment areas for NAAQS or state air quality standards or in environmentally sensitive areas, an applicable exemption probably does not exist. In these instances, air dispersion modeling may need to be performed to obtain a state emissions permit.

The state environmental agency may also impose restrictions on well operational criteria, location, testing period and duration, as well as natural resource considerations. In rare instances, the state agency may require an alternative testing schedule such as testing during daylight hours only. Under the Clean Air Act amendments, states may also promulgate State Operating Performance Standards (SOPS) or issue "Temporary Permits". Reporting requirements would typically include information concerning production rate, volume, gas composition, and duration of testing.

State oil and gas regulatory agencies typically have permitting requirements for venting or flaring gas which contain permit exemptions for venting and flaring associated with production well testing (refer to specific state requirements). Some agencies are also requiring fees to process exemption applications. Restrictions on well operational criteria, location, testing period and duration, as well as natural resource considerations may be addressed in such permits. Reporting requirements may include information concerning production rate, volume, gas composition, and duration of testing.

7.3.3 Flare Pits

Flare pits, sometimes called blowdown or emergency pits, should not be used for storage or disposal. The primary purpose of a flare pit is to catch any incidental fluid that might be associated with the gas stream that does not burn. Fluids in a flare pit should be removed daily, or as quickly as practical, in accordance with all local, state, and federal regulations.

Siting and construction of flare pits should minimize the risk of surface and groundwater contamination. The size of the flare pit should be commensurate with the volume of liquid effluent that might be expelled from the gas flare. Use of a knockout vessel should be considered.

Flares may require federal, state, or local permits.

7.3.4 Control of Noise and Other Nuisances

Flares may need to be provided with noise abatement measures to maintain noise levels compatible with the local environment. The noise intensity, duration, location relative to public areas and natural resources, as well as the flare/vent exit design should be considered, where applicable.

Other nuisances, such as light emittance from a lighted flare, odors, and dust, should be controlled in accordance with applicable regulations, or as considered appropriate for the location.

7.4 PLUGGING AND ABANDONMENT

Permanent abandonment is done when the wellbore has no further utility and is permanently sealed against fluid migration. Temporary abandonment operations may be performed when a wellbore has future utility, such as for enhanced oil recovery projects, and must be maintained in a condition where routine workover operations can restore a wellbore to service. The same environmental concerns exist in both cases.

7.4.1 Subsurface

Several environmental concerns related to well abandonment should be addressed. The primary environmental concerns are protection of freshwater aquifers and underground sources of drinking water (USDW), as well as isolation of downhole formations containing hydrocarbons or used for injection. Additional issues which should be evaluated are the protection of surface soils and surface waters, future land use, and permanent documentation of abandoned wellbore locations and conditions.

7.4.1.1 Rules and Regulations

There are numerous federal and state statutes, rules, and regulations requiring specific exploration and production well abandonment practices. API supports proper well abandonment practices and has published API Bulletin E3, *Well Abandonment and Inactive Well Practices for U.S. Exploration and Production Operations*. Federal well abandonment programs should be consistent with Bureau of Land Management (BLM) practices. Refer to *Surface Operating Standards for Oil and Gas Exploration and Development*. Individuals and organizations using these recommended practices should review applicable federal, state, and local regulations to determine that operations are consistent with requirements of those regulations.

7.4.1.2 Plugging Purpose

The purpose of plugging wells is to prevent interzonal migration of fluids; the contamination of freshwater aquifers, surface soils, and surface waters; and to conserve hydrocarbon resources either in the production interval or potential production intervals. Generally, contamination by an improperly plugged and abandoned well can occur in two ways:

a. The abandoned well can act as a conduit for fluid flow between penetrated strata, into an USDW, or to the surface.
b. Contaminated water can enter the abandoned wellbore at the surface and migrate into an USDW.

Such contamination is prevented when a well is properly plugged. Not only do the plugging operations prevent an abandoned well from becoming a conduit for contamination to occur, but, well construction and completion methods also contribute to the prevention of contamination.

7.4.1.3 Underground Source of Drinking Water Protection

When EPA promulgated final underground injection control (UIC) regulations in 1980 under the Safe Drinking Water Act (SDWA), these regulations provided for protection of all aquifers or parts of aquifers which meet the definition of USDW, except where exempted (refer to 40 CFR Part 144.7 (6) and 146.4). USDW is defined by EPA as an aquifer or its portion which supplies any public water supply system or currently supplies drinking water for human consumption, or which contains sufficient water to supply a public water system or has a total dissolved solids (TDS) concentration of less than 10,000 mg/l. EPA may exempt an aquifer if it will not serve as a source of drinking water in the future because it is economically or technically impractical to recover the water or to render it fit for human consumption, or because the aquifer produces, or is expected to commercially produce, minerals, hydrocarbons, or geothermal energy. Certain state programs (such as California and Texas) have generally protected water sources having a maximum TDS concentration of 3000 mg/l. Other state programs, which existed prior to the enactment of the SDWA and have been granted primacy, may also have groundwater protection requirements that differ from the EPA's UIC program.

Well plugging operations are focused primarily on protecting USDWs, isolating downhole formations productive of hydrocarbons or used for injection, and protecting surface soils and surface waters. A surface plug prevents surface water runoff from seeping into the wellbore and migrating into an USDW. Cement plugs isolating hydrocarbon and injection/disposal intervals and a plug at the base of the lowermost USDW accomplish this primary purpose. Surface water entry into an abandoned well is a concern because the water may contain contaminants from agricultural, industrial, or municipal activities. Note that the cement plugs also work to protect surface soils and water from wellbore fluids by confining those fluids in the well. API *Environmental Guidance Document: Well Abandonment and Inactive Well Practices for U.S. Exploration and Production Operations* recommends that operators set a cement plug at the base of the lowermost freshwater aquifer or USDW during plugging and abandonment operations, as required by the rules and regulations applicable to the well.

In addition to the cement plugs described herein, many state and federal regulatory agencies require cement plugs across the base of the surface casing and in, or between, each producing or potential producing zone.

7.4.1.4 Fluid Confinement

It is essential that all formations bearing usable quality water, oil, gas, or geothermal resources be protected and/or isolated. The prevention of gas or fluid migration to other zones or to the surface is of primary importance. Open hole plugs, casing plugs, or cement squeezed through casing perforations will isolate the target formations in most cases. However, special procedures, such as perforating casing and circulating cement, may be necessary to isolate those potential production or injection formations existing behind uncemented casing. It is important to prevent interzonal flow in an abandoned well so that such cross-flow does not interfere in the commercial exploitation of the zones through nearby wellbores.

7.4.1.5 Permitting and Inspection

State and federal governments require prior approval before abandonment procedures may begin. Plug setting depths, plug type, and abandonment marking are all part of the plugging plan. While oral approval from an agency may be obtained, written confirmation by an authorized state and/or federal agency is almost always required. Regulatory agencies and oil operators recognize that properly plugged wells prevent freshwater aquifer contamination and fluid migration either to the surface or between zones. Inspection/verification of well plugging operations should be conducted by operator personnel and by the proper regulatory agencies.

7.4.2 Surface

The cleanup and remediation of the surface may include cutting off the surface casing below ground level, restoring the surface to conditions near those that existed prior to the well being drilled, and marking the surface of the wellbore by installing an upright marker. The operator should restore the well site consistent with the criteria presented in API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations.* However, the landowner and Federal and state regulations should be consulted prior to beginning wellsite remediation. Some states require that the landowner be notified that a well is to be plugged. The landowner may have a right to use the well for a freshwater source.

7.4.2.1 Cleanup and Remediation

Assuming the landowner elects not to use the well as a freshwater source, the operator should set the required surface plugs; remove the wellhead; weld a steel plate on the surface casing stub, if required; fill in the well cellar, rat hole and mouse hole; and level the area. Casing strings left in the well should be cut off 3 to 6 feet below ground level, or deeper if required by regulation or the landowner.

Pits should be emptied and reclaimed to a condition similar to the rest of the reclaimed pad area. Pits should be allowed to dry or be solidified in situ prior to filling. The pit area may be mounded to allow for settling.

Prior to removing or abandoning pipelines or flowlines, fluid displacement and line purging should be considered and fluid reclaimed, recycled, or properly disposed of according to fluid type.

Open burning can be used in some areas to dispose of nonhazardous, hydrocarbon-containing wastes that are unsuitable for recycling. Burning should be restricted to materials such as oily sorbents and paraffin and should be conducted only with approval of state or local air pollution regulatory agencies. Burning should be conducted during daytime hours and with due regard to wind direction and velocity. The results should not cause a nuisance that could result in black smoke or particulates.

Off-site commercial facilities should be used for other nonhazardous and hazardous waste disposal. The offsite facilities should be permitted and care should be taken with site selection. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information and guidance.

7.4.2.2 Soil Erosion

Disturbed areas, such as roads, pits, and wellsites, may need to be further remediated depending on lease agreements.

While some private lands have no stipulations concerning site remediation, public lands may have detailed requirements. These requirements may include furrowing, terracing, reduction of steep cut-and-fill slopes, revegetation, reseeding and replanting, or other special requirements. Mulching, fertilizing, fencing or other practices may be required. The federal "Sundry Notices and Reports on Wells" (Form 3160-5) must be filed with BLM prior to well or site abandonment on federal lands. Agency approval may include certain requirements to be followed at well abandonment.

Pipelines and flowlines may also have to be removed. Replacing fill, reducing and grading cut-and-fill slopes to conform to adjacent terrain, and the replacement of surface soil material may also be required.

7.4.2.3 Inspection

Final abandonment is complete only after all surface equipment is removed, all pits are closed, the surface is restored, and company and state and/or federal agency inspection is complete and approved. Final abandonment approval on federal lands may take as long as 2 years, depending on land restoration requirements and growing season. Final written approval of the applicable state or federal regulatory agency may be required.

If a well is covered by an individual lease bond, the liability period on the bond can be terminated once the final abandonment of all activities conducted under the bond has been approved.

State and federal agencies may require former operator site cleanup and possibly well re-entry and replugging at a later date. This is of particular significance if surface indications such as leaking well fluids or dead vegetation indicate improper plugging procedures.

While not required by all states or agencies, a vertical steel monument may be required that indicates the well location, operator, and well number. Thereafter, the abandoned wellsite can more easily be located and the former operator determined.

8 Lease Gathering and System Lines

8.1 INTRODUCTION

In planning lease gathering and system lines, including electrical distribution systems, it is important to consider the impact that construction operations and maintenance activities will have on people, animals, plants, and the land itself, both surface and shallow subsurface. The impact on current use, as well as possible future uses, should be evaluated along with potential future facilities expansion.

8.2 ROUTE SELECTION

8.2.1 The following environmental factors should be considered in planning lease gathering and system lines:

a. Proximity to lakes, streams (including dry washes and ephemeral streams), wetlands, drainage and irrigation ditches, canals, flood plains, and shallow water wells. These features should be evaluated in terms of disturbances during construction and routine operations, and in the event of accidental releases.
b. Depth to, and quality of, groundwater. The potential impact to groundwater, particularly from any releases from buried lines should be considered.
c. Removal of trees, disturbances to dikes, levees, and terraces, and destruction of growing crops. These impacts should be evaluated with a focus on construction and routine maintenance activities.
d. Impacts to migratory bird habitat or critical habitat of threatened or endangered plant and animal species, including noise and dust.
e. Proximity to buildings or other facilities occupied or used by the public. Particular consideration should be given to homes, churches, schools, and hospitals.
f. Impact on cultivated lands.
g. Areas of special historical, archeological, recreational, biological, or scenic significance.
h. Land ownership. Activities that require federal agency actions (permits, granting of rights-of-way, etc.) may trigger other federal requirements, such as a National Environmental Policy Act (NEPA) evaluation of the whole project, not just the portion triggering federal action.
i. Location of recently active shallow faults.

8.2.2 The selection of routing for lease gathering and system lines, consistent with production requirements and overall economics, should consider:

a. Foreseeable use of surface areas by either the land owner or tenant.
b. Possible exposure to future construction and excavation work.
c. Topography, when it is an important factor in:

1. Line design.
2. Right-of-way maintenance.
3. Possible land erosion.
4. Emergency response and containment of releases.

d. Location of existing rights-of-way.
e. Location of existing roads.

8.3 DESIGN

8.3.1 In design of lease gathering and system lines, appropriate industry codes and federal and state regulations should be followed.

8.3.2 Lease gathering and system line design should consider:

a. Estimated life of the line.
b. Line environment (nature of the soil, presence of water-saturated soil, alkaline flats, depth of frost, etc.)
c. Nature and quantity of product throughput, initially and as production matures, including the potential for enhanced oil recovery processes.
d. Impacts on existing facilities.
e. Consequences of possible line failure. Release of oil, water, or gas should be qualitatively evaluated. Consideration should be given to installing block valves to isolate line segments located in or near environmentally sensitive areas (such as wetlands), on either side of stream crossings, and in close proximity to areas occupied by the public. Consideration should also be given to sleeving lines or using heavier walled pipe in these areas.

The qualitative evaluation should consider the following:

1. Public impact.
2. Environmental impact (including potential natural resource damage assessment liability).
3. Damage to crops and domesticated animals.
4. Cleanup costs.
5. Political or regulatory impacts.

f. Corrosion inhibition measures (external and internal). All equipment should be manufactured from materials which are suitable for their operating environment. NACE Standard MR0175 should be consulted for further guidance, as applicable.
g. Burial to optimum depth to reduce exposure to hazards such as plowing, freezing, and other construction.
h. Provisions for various crossings (roads, streams, and other lines.)
i. Optimum location for blowdown tanks, valves, etc.
j. Noise abatement (where appropriate).
k. Miscellaneous variable factors including operating pressures, temperature changes, line expansion, and desired safety factors.
l. If electrical distribution lines are to be installed in areas where raptors are likely to use them as perches, consideration should be given to installing wooden perch guards or cross members on the poles above the lines to prevent the birds from coming in contact with the charged lines.

8.4 CONSTRUCTION AND INSTALLATION

8.4.1 Lease line routes and applicable rights-of-way should utilize the smallest practical surface area, consistent with prudent operations. Any construction activity may require a stormwater discharge permit and submittal of a construction pollution prevention plan. State regulations should be consulted to determine if the state has primacy for the area and what the applicable regulations are. In areas where EPA has primacy, it will be necessary to file a Notice of Intent to be covered by the General Permit at least 2 days prior to commencing construction (refer to 40 CFR Parts 122.26 and 122.28.

8.4.2 Unnecessary damage to trees and other vegetation adjoining lease line routes should be avoided.

8.4.3 If contractors are used to install lines, the operator should verify that the contractor has implemented a safety program which includes a written hazard communication program. The contractor should supply MSDSs for all hazardous materials brought on site.

8.4.4 Appropriate inspections should be performed during construction to ensure design specifications are met.

8.4.5 Upon completion, lines should be inspected and pressure tested for possible leaks in accordance with state and local codes. Pressure test fluids should be collected and disposed in accordance with applicable regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for recommendations for disposal of these test fluids.

8.4.6 After installation of a new line, all lease line routes and rights-of-way should be cleaned up and restored to conditions compatible with existing land use, unless other arrangements have been made with the landowner. Disposal of all waste should be in accordance with local, state and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations.*

8.4.7 Line routes and burial depth should be adequately documented to aid in preventing ruptures and/or accidental leaks during future excavation activities. Crossings should be marked in accordance with applicable regulatory requirements.

8.5 OPERATION AND MAINTENANCE

8.5.1 All applicable personnel (both company and contractor) should receive training to provide for proper operation and maintenance of the lines. This training should include startup and shutdown procedures, normal operating procedures, and emergency response procedures. In the event of a leak or spill of a hazardous substance, emergency response personnel should have proper training as required by 29 CFR Part 1910.120.

8.5.2 Line routes and facilities should be inspected at intervals dictated by evaluation of exposures and/or failures.

8.5.3 Appropriate steps should be taken to prevent surface and environmental damage from the use of hot oil, chemicals, and other treatments that are used to maintain lease gathering and system lines.

8.5.4 Proper maintenance practices should be exercised with respect to crossing markers, blowdown tanks, venting equipment, and corrosion protection equipment. Blowdown fluids should be collected and placed in the production system to recover hydrocarbons. Waste materials should be recycled, reclaimed, or disposed in accordance with applicable regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations.*

8.5.5 Pressure tests, profile surveys, and other means should be considered to meet operating safety requirements.

8.5.6 Operating procedures should provide for early identification of developing corrosion problems, failure prone equipment, and malfunctions so that corrective action can be taken before environmental or safety consequences occur. Frequency of failure analysis should be considered to aid in scheduling line replacements.

8.5.7 Appropriate industry codes and state and federal rules and regulations should be followed with respect to maintenance of records, repairs, reporting of leaks, etc.

8.5.8 Whenever modifications are made to existing lines or there are significant changes in physical parameters (temperature, pressure, composition, etc.), the changes should be considered for evaluation pursuant to management of change principles. Where appropriate, facility drawings should be updated to show modifications and the superseded drawings should be destroyed.

8.6 ABANDONMENT OF GATHERING AND SYSTEM LINES

8.6.1 All surface lines should be removed. Lines should be purged prior to removal.

8.6.2 Surface and subsurface equipment connected to buried lines should be removed to a depth consistent with subsequent land use or, preferably, to the depth of the buried lines.

8.6.3 Deleterious or hazardous materials should be displaced from any lines abandoned in place.

8.6.4 Where appropriate, each outlet of abandoned lines should be permanently sealed.

8.6.5 All crossing markers and other line markers should be removed.

8.6.6 The location of abandoned lines should be identified on facility maps.

8.6.7 Upon completion of abandonment activities, all disturbed surface areas should be cleaned up and restored to conditions similar to the adjacent lands.

8.6.8 Disposal of all waste should be in accordance with local, state and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management In Exploration and Production Operations.*

9 Production and Water Handling Facilities

9.1 REQUIREMENT DETERMINATION (PRE-PLANNING CONSIDERATIONS)

The overall basis for siting, designing, constructing, and operating oil, gas, and water production, handling, and disposal/injection facilities should be to minimize adverse effects on the environment, consistent with providing an economical means of accumulating well, lease, or unit production from primary, secondary, or tertiary recovery methods and producing the ultimate recoverable reserves. Impacts on local population, land, surface and subsurface waters, air quality, and animal and plant species, including habitat, should be considered.

Water handling facilities are typically located adjacent to, or within, production facilities. Initial planning for these facilities within a field should consider future development potential in order to minimize surface disturbance. When practical, facilities should be constructed in a central field location to avoid the use of multiple facilities. Facility sizing should consider future throughput increases to minimize the need for additional tankage and treating vessels.

Produced water disposal and injection facilities should be planned, constructed, and operated with the foregoing considerations in mind. In addition, produced water may be saline and corrosive. Therefore, special care should be taken to minimize the possibility of environmental damage due to equipment upsets, spills, and leaks.

Ultimate site selection may require and must consider various agency permitting and regulatory approvals and requirements, such as construction permits, emergency response agency approvals, zoning variances, right-of-way agreements, biological surveys, historical resource surveys, air permits, injection permits, and contingency plans. Any construction activity may require a construction stormwater discharge permit and submittal of a construction pollution prevention program. State regulations should be consulted to determine if the state has primacy for the area and if so, what their applicable regulations are. In areas where EPA has primacy, it will be necessary to file a Notice of Intent to be covered by the General Permit at least 2 days prior to commencing construction (refer to 40 CFR Part 122.26 and 40 CFR Part 122.28. Road surface area should be included in the calculation of disturbed acreage.

9.2 SITE SELECTION CONSIDERATIONS

9.2.1 Land Use

Topographic, population, environmental hazard, zoning, and other maps should be consulted, where applicable, to locate sensitive or high exposure areas [such as churches, schools, hospitals, residential areas, surface waters, waters of the U.S., freshwater wells, flood zones, active fault areas, threatened and endangered plants and animals (including habitat), migratory bird habitat, wetlands, archeological, recreational, biological, or scenic areas]. Where feasible, the site should be located away from these sensitive areas. The potential impact from upset conditions, such as oil or produced water spills and leaks, should be considered.

Final well patterns should be considered, if possible, to minimize right-of-way requirements for roads and lease lines. Existing roads and rights-of-way should be utilized to the maximum extent possible.

The land owner and/or surface tenant should be consulted to consider present and future uses of affected and adjacent land.

Production and water handling facilities should be planned to utilize the smallest practical surface area consistent with safe and prudent operations. Future expansion possibilities should be considered.

On federal or state administered lands, appropriate agencies should be consulted in advance with respect to land use and environmental issues.

9.2.2 Erosion and Drainage

A site should be selected that minimizes the amount of surface terrain alteration to reduce environmental and aesthetic damages. Cuts and fills which pose possible land slide or slump problems should be avoided. Consideration should be given to stock piling top soil, if feasible.

The natural drainage patterns of the land should be considered in selecting the site. Adequate culverts and drainage ditches should be provided, as required by the terrain. Soil stabilization, such as sod or grass seeding, should be provided to prevent erosion. Unnecessary removal of trees or alteration of other natural features should be avoided.

9.2.3 Subsurface Soil Conditions

Subsurface soil conditions should be considered for adequate foundation support of buildings, pumps, engines, tankage, and equipment used in the construction process.

Soil characteristics should be evaluated for construction of dikes, firewalls, and emergency containment areas. Lining of containment areas with compacted clay or synthetic liners should be considered where porous soil conditions exist or groundwater could be impacted.

Soil corrosiveness or resistivity should be evaluated to determine whether coating or wrapping of lease lines will be necessary to prevent or control corrosion. Cathodic protection should be considered for highly corrosive conditions or sensitive areas.

9.2.4 Fire Protection

Production and water handling facilities should be located in compliance with existing fire codes or ordinances. Production and water handling facilities should not be located where the equipment will create a potential fire hazard. As applicable, proper fire safety equipment should be stored nearby.

9.2.5 Public Exposure

In noise control planning, production and water handling facilities should be located as far as practical from buildings or facilities occupied or used by the public. Regulations covering acceptable noise levels in certain heavily populated urban areas may require soundproofing or other noise abatement measures and consideration of the use of an alternate power source to reduce noise levels.

Facilities should be located to minimize risk of public exposure from potential hazardous material releases, considering prevailing winds and topographic elevations to the maximum extent practicable. All hazardous material releases should be reported, as required by local, state, and federal rules and regulations.

9.3 FACILITY DESIGN

9.3.1 Equipment Sizing, Specifications, and Design

Consideration should be given to the following items in designing and constructing production facilities:

a. Production related equipment should be sized and designed to provide appropriate safety and utility. Future development and exploration plans should be considered when sizing equipment. Where appropriate, the facilities should be sized to handle current and future production to minimize retrofitting and improper use of equipment. Equipment should be designed with appropriate spill control devices, such as high/low level indicators or high/low pressure indicators, to improve safety and protection of the environment.

b. The anticipated time the equipment is expected to remain active should be considered. Proper design and installation can minimize future equipment failures and downtime.

c. Equipment and foundations should be designed and installed giving consideration to adverse natural conditions common to the area, such as floods, excessive snow and rain, earthquakes, tornadoes, hurricanes, and dust storms.

d. Equipment installations should comply with industry standards and applicable regulations. Consideration should be given to federal, state, and local regulations and permit requirements as to construction, operations, emissions, noise, and appearance. Air pollution control facilities should be

installed whenever practical, economical, and technically feasible. Flaring versus venting should be evaluated based on regulations, gas volume and composition, safety, economics, and local environmental impact.

e. Pressure requirements for vessels, lines, and other equipment should be considered. Any variance from the manufacturer's recommended rates or pressures should be thoroughly considered. Refer to API Specification 12J for information on sizing and designing lease pressure vessels.

f. The following items should be considered in installing fired lease vessels:

1. Consideration should be given to surrounding facilities when selecting the placement of fired lease vessels.
2. Manufacturer's recommendations should be followed. Any variances from these recommendations should be thoroughly considered.
3. Fired lease vessels should not be located immediately adjacent to oil, gas, or any other flammable or explosive storage facilities. It should be noted that some states have minimum distance requirements between fired vessels and storage facilities. Facilities should have a grade established so that releases of flammable fluids drain away from fired equipment.
4. Vessels should be well maintained and free of unnecessary debris or flammable products.
5. Fencing or some form of guarding should be considered to protect the public, livestock, and wildlife.
6. Refer to API Specification 12K and API Specification 12L for some information on selecting and designing fired lease vessels.
7. Consideration should be given to air permitting requirements for fired lease vessels.

g. The following items should be considered in installing bulk storage and loading facilities:

1. Adequate fire/retaining walls or other containment measures should be provided around tanks, where necessary to comply with regulatory requirements, in order to contain accidental discharges and prevent environmental damage. No open pipes should extend from within the firewalls which might allow contaminated fluids to be drained or siphoned from inside the containment area. Any draining of uncontaminated rainwater from the containment area should be done in accordance with SPCC regulation requirements (refer to 40 CFR Part 112).
2. Installation of impervious foundations or liners under storage tanks should be considered to allow detection and containment of fluid releases.
3. Installation of high level alarms and/or monitors should be considered on tankage.
4. Installation of drip pans or other containment should be considered at truck or barge loading/unloading hose connections to contain any spillage.
5. Emission permits, if required, should be obtained prior to installation of facilities.
6. The following API recommended practices and specifications should be considered in designing storage and loading facilities:

Spec 11N	*Specification for Lease Automatic Custody Transfer (LACT) Equipment*
Spec 12B	*Specification for Bolted Tanks for Storage of Production Liquids*
Spec 12D	*Specification for Field Welded Tanks for Storage of Production Liquids*
Spec 12F	*Specification for Shop Welded Tanks for Storage of Production Liquids*
RP 12N	*Recommended Practice for Operation, Maintenance and Testing of Firebox Flame Arresters*
Spec 12P	*Specification for Fiberglass Reinforced Plastic Tanks*

h. The following items should be considered in installing internal combustion engines and compressor facilities:

1. Consideration should be given to minimizing noise disturbance. Internal combustion (IC) engines and compressor facilities should be located as far as practical from areas accessible to the general population. If feasible, alternate types of prime movers, such as electric motors, should be considered.
2. The emissions generated by the engine(s) exhaust should be of concern. Appropriate lead time for permitting should be allowed, as it may require from 6 months to 1 year to permit compressor facilities. All required construction and emissions permits must be obtained before construction, modification, or relocation of an engine is initiated. The type of fuel should be selected to minimize pollutants. Electric power should be considered, where feasible.
3. Consideration should be given to installing drip pans or placing engines and compressors on impervious pads to minimize the impact of potential oil and chemical drips and spills. If drip pans or impervious pads are used, special attention should be given to ensuring that they are kept clean and that any oil or chemical collected is removed, recovered, and recycled or disposed in a timely and proper manner.
4. Piping for the relief valves of compressors should be of adequate size and piped to an appropriate vent or flare.
5. Placing fences, guard walls, or buildings around all engines and compressors should be considered for the protection of the public and any livestock or wildlife.
6. The following API standards and publications should be considered when installing and maintaining IC engines and compressor facilities:

Spec 7B 11C	*Specification for Internal Combustion Reciprocating Engines for Oil Field Service*

RP 7C 11F	*Recommended Practice for Installation, Maintenance, and Operation of Internal Combustion Engines*
Bul 11K	*Data Sheet for the Design of Air Exchange Coolers*
Spec 11P	*Specification for Packaged High Speed Separable Engine-Driven Reciprocating Gas Compressors*

i. The following items should be considered in planning, installing, and using pits, firewalls, and dikes:

1. Whenever practical, tanks should be used instead of pits.
2. Many state regulatory agencies require that pits be lined and permitted. Some states do not allow the use of either lined or unlined pits. Operators should ensure compliance with all Federal and state regulations when constructing production pits.
3. Existing pits should be utilized in accordance with existing regulations, with their use being minimized and alternate means considered, where feasible. Pits should only be used for the purpose they were intended. Personnel should be advised on the specific use of the pit and what substances are allowed in the pit.
4. During the design and construction of pits and firewalls, necessary precautions should be taken to protect ground and surface water, crops, trees, livestock, and wildlife.
5. Pits should be designed and constructed to have sufficient freeboard, or provide adequate reserve capacity, to prevent overflow under maximum anticipated operating requirements and precipitation.
6. Pits should be fenced or otherwise equipped, as necessary, for public safety and to protect livestock and wildlife.
7. Netting of pits should be considered to protect migratory birds from exposure to the pit contents if there is a potential for the pit to have an oily surface or to contain potentially harmful substances. Netting is mandated by some states.
8. Burn pits are allowed in some states. If allowed, these pits should be located where prevailing winds will reduce fire hazards and smoke nuisance.
9. Storage vessels for liquid hydrocarbons, saltwater, chemicals, or other fluids that are not acceptable to be discharged into the local environment should have dikes constructed around their perimeters.
10. Dikes and firewalls should be constructed of material to prevent the release of fluids to the local environment during an accidental or emergency discharge from their original containment.
11. Consideration should be given to designing dikes and firewalls with a sufficient perimeter and wall height to contain the maximum volume of the largest vessel or tank contained within, and with sufficient freeboard for maximum rainfall and snow melt. SPCC plan requirements (refer to 40 CFR Part 112) may dictate the required volume. Any drain lines through dikes should be equipped with valves/blinds that are normally closed and locked.
12. Discharges of contaminated stormwater from exploration and production facilities (including oil and gas exploration, production, processing, or treatment operations, or a transmission facility) which can reach waters of the U. S. require a stormwater discharge permit and submittal of a stormwater pollution plan to the EPA. Contamination includes stormwater that comes into contact with any overburden, raw materials, or waste products on the site. Exploration and production sites will need a stormwater discharge permit if:

(1) there has been a discharge of a reportable quantity of a hazardous substance in stormwater from the site under the CWA or CERCLA since November 16, 1987, or
(2) there has been a discharge of oil in stormwater from the site that required notification under the FWPCA since November 16, 1987, or
(3) a discharge of stormwater from the facility violates a water quality standard.

Refer to 40 CFR Part 122, as revised, for additional information.

For purposes of triggering the submittal of permit applications for oil and gas operations, the EPA has determined that the release of oil to a stormwater discharge in amounts that cause an oil sheen, or has the potential to cause an oil sheen, on waters of the U. S. is a good indicator of the potential for water quality impacts for stormwater releases from oil and gas operations. In addition, any facility that requires a stormwater discharge permit may be required to be in accordance with applicable spill prevention control and countermeasure (SPCC) requirements (refer to 40 CFR Part 112) for discharge of oil into or upon the navigable waters of the U. S. or adjoining shorelines.

Point discharges from exploration and production facilities to waters of the U. S. may require a National Pollutant Discharge Elimination System (NPDES) permit.
13. Pit closure procedures should be in accordance with local, state, and federal regulations.

j. The following items should be considered in using utilities at production sites:

1. Existing utilities should be considered in the design of production and water handling facilities.
2. If electricity is available, the use of electric motors/prime movers should be considered to minimize air emissions and noise.
3. Storage facilities should not be located under or near major electrical transmission lines.

4. All electricity, potable water, sewage, and municipal gas lines should be installed in accordance with federal, state, and local codes and regulations.

k. The following items should be considered in designing and installing flares/vents at production sites:

1. Flares/vents utilized in production facilities should be located downwind (with respect to prevailing wind direction) from the installation and at a proper safe distance from the related equipment.
2. The surrounding environment should be considered when designing flares. The flare should be located far enough from trees and other vegetation to ensure they will not be ignited during times of maximum flare and strong winds. Installation of liquid scrubbers should be considered.
3. Flares and vents, assuming vent ignition, should be of sufficient height to protect workers and the public during maximum flaring/venting and strong winds.
4. Fencing around flares should be considered to protect the public, livestock, and wildlife.
5. Installation of automatic igniters, rather than standing pilots, should be considered, where feasible, to conserve natural gas and reduce emissions. State regulations may require automatic igniters. Federal CAA New Source Performance Standards (NSPS) require automatic igniters.
6. Flares should be of a smokeless design, if possible.
7. Consideration should be given to design features which will prevent raptors or other birds from perching on flares.

l. Safety systems for protecting the environment should be considered as follows:

1. Installation of safety equipment and systems should be considered, i.e., emergency shut down (ESD) systems which have the ability to shut wells in, shut down compressors or other engines, or divert production during malfunctions or accidental releases. Where appropriate, alarm systems should be installed to notify the public or company officials of equipment failure or accidental releases. Equipment for fire protection should be installed and maintained, such as, fire extinguishers, spray nozzles, fire pumps, water storage, and automatic extinguishers.
2. API Recommended Practice 2350, *Overfill Protection for Petroleum Storage Tanks,* should be considered in the design of safety systems.

m. Corrosion abatement procedures should be considered as follows:

1. The corrosiveness of the anticipated gas or fluid should be considered during the design and selection of the equipment.
2. Where corrosion problems are anticipated, a corrosion abatement program should be established to minimize the potential for leaks.
3. Soil corrosiveness or resistivity should be evaluated for necessity of coating or wrapping of lines to be buried. In some cases, cathodic protection may be necessary.

n. Special consideration should be given to reducing air emissions associated with production and water handling facilities. The following items should be considered during design and construction of these facilities:

1. Vapor recovery units and flares.
2. Catalytic converters on fired equipment exhausts.
3. Minimization of benzene, hydrogen sulfide, and other hazardous emissions from tanks, glycol reboilers, and other equipment.
4. Minimization of operational gas vents, leaks, and discharges from pneumatic controls and other equipment. All required air emission permits and/or waivers should be obtained before construction is initiated.
5. Electric powered prime movers.
6. Valves installed on dead end piping should be capped, plugged, or sealed by a blind flange.

9.3.2 Equipment Location

a. Production and water handling facilities should be located in compliance with existing fire codes or ordinances. Fired vessels, internal combustion engines, flares, or other equipment that produce sparks or flames should be appropriately separated from oil and gas storage facilities.
b. Production and water handling facilities should be designed to utilize the smallest practical surface area consistent with safe and prudent operations. Construction activities and operations involving disturbance of the land may require a construction stormwater discharge permit and submittal of a construction pollution prevention plan. State regulations should be consulted to determine if the state has primacy for the area and if so, what regulations are applicable. In areas where EPA has primacy, it will be necessary to file a Notice of Intent to be covered by the General Permit at least 2 days prior to commencing construction (refer to 40 CFR Part 122.26 and 40 CFR Part 122.28).
c. Topographic and other maps should be consulted to determine if operational problems would effect the local environment. This could include, but is not limited to, the possibilities of oil or water discharges draining into surface waters. Minimization of damage to vegetation, crops, forests, animal habitation, etc. should also be considered. Unnecessary removal of trees, excessive grading, or alteration of other natural features should be avoided.
d. In populated areas, the location of equipment should take advantage of prevailing winds in order to ensure public safety

in the event of equipment malfunction, release, or fire. In all cases, production and water handling facilities should be located as far as practical from buildings occupied or used by the public.

e. Noise levels of production and water handling facilities should be considered when operating near populated areas. Regulations covering desirable noise levels in certain populated urban areas may require soundproofing or other noise abatement measures and consideration of use of alternate power sources to reduce noise levels.

f. Equipment should be located with consideration given to subsurface soil conditions such that there is an adequate foundation to support the facilities to be constructed and the equipment to be used in the construction processes.

g. The location of all wells should be considered to minimize rights-of-way requirements for lease roads and gathering lines.

9.3.3 Waste Management

a. Equipment and facilities should be located and designed to minimize the wastes generated by operations and maintenance activities.

b. Recyclable products should be used, where possible. Bulk storage, recyclable, and reusable containers should be considered to minimize waste.

c. Appropriate methods of collecting and recycling or disposing of waste generated during construction, operation, and maintenance of the facility should be considered.

d. Operators should develop waste management plans. Disposal of all waste should be in accordance with local, state and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information.

9.4 CONSTRUCTION CONSIDERATIONS

Before initiating construction, all necessary permits must be obtained. Construction operations and operations involving disturbance of the land may require a construction stormwater discharge permit and submittal of a construction pollution prevention plan. State regulations should be consulted to determine if the state has primacy for the area and if so, what regulations are applicable. In areas where EPA has primacy, it will be necessary to file a Notice of Intent to be covered by the General Permit at least 2 days prior to commencing construction (refer to 40 CFR Part 122.26 and 40 CFR Part 122.28).

9.4.1 Site Preparation

a. Soil characteristics should be checked to determine the appropriate foundation design for the site.

b. The size and type of equipment to be used during construction should be considered to allow sufficient room to work in a safe manner.

c. Adequate culverts and drainage ditches should be provided as required by the local environment and applicable regulations.

d. Consideration should be given to capping the open end of lines under construction at the end of each work day if a line could be accessible to wildlife.

9.4.2 Inspection and Testing

a. During construction, appropriate inspections should be performed by qualified personnel to ensure that design specifications are met.

b. Upon completion, equipment and facilities should be inspected for possible leaks. If necessary, equipment should be pressure tested in accordance with applicable codes and regulations. If fluids are used to pressure test, collect and dispose of the fluids in accordance with applicable regulations, or in the absence of any regulations refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for applicable information.

c. X-raying of welds should be considered in critical areas where extreme pressure or corrosiveness is anticipated or where potential risk to the local environment is of great concern.

9.4.3 Qualification of Personnel

The qualifications of personnel working on the construction site should be evaluated to aid in ensuring the work will be properly performed.

9.4.4 Selection of Contractors

a. The operator should verify that the contractor has implemented a safety program which includes a written hazard communication program (HAZCOM). He should also verify that the contractor is aware of safety and environment protection requirements of the operating company. The contractor should be able to supply material safety data sheets (MSDS) for all hazardous materials brought on site.

b. Requiring contractors to have performance bonds should be considered when facilities are to be constructed in environmentally sensitive areas.

9.4.5 Equipment Installation

All equipment should be installed in accordance with the original design of the equipment. Any variations from the original specifications should be thoroughly considered to ensure safety of the operations. Refer to API Recommended Practice 12R1, *Recommended Practice for Setting, Connecting, Maintenance, and Operation of Lease Tanks*, and Recommended

Practice 7C-11F, *Recommended Practice for Installation, Maintenance, and Operation of Internal-Combustion Engines* for information regarding equipment installation.

9.4.6 As-Built Drawings

Upon completion of facilities, the original drawings or schematics should be updated, as required. Changes or modifications from the original design or drawings should be noted for future reference.

9.4.7 Site Cleanup

Unused and excess construction materials should be properly stored or removed from the site upon completion. During construction, the site should be kept as clean and free of debris as possible. Where feasible, unused material should be removed from the construction site as it is determined to be surplus. Where applicable, construction waste should be recycled. Disposal of all waste should be in accordance with local, state, and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information regarding management of waste.

9.5 OPERATION AND MAINTENANCE

9.5.1 Operational Procedures

a. Development of a standard operating procedure (SOP) manual applicable to each major facility should be considered. The SOP should contain information as to the equipment located at the facility, safe operating practices for the equipment, startup and shut down procedures, and emergency procedures.
b. Whenever modifications or changes to existing facilities or equipment are proposed, additional permits or approvals may be required. Engineering drawings should be updated to show major changes.
c. Appropriate codes and regulations should be followed with respect to maintenance of records, repairs, and reporting of leaks.
d. MSDSs should be maintained on site or at appropriate locations for all hazardous materials.
e. Consideration should be given to the analysis of failures or malfunctions so that corrective action can be taken to minimize future environmental incidents.

9.5.2 Personnel Training

Personnel should be instructed relative to federal and state environmental and occupational safety and health rules and regulations, such as process safety management, HAZWOPER, HAZCOM, lockout/tagout, emergency response, release reporting, and waste management. Personnel should also be trained in the safe and efficient use of facility equipment.

9.5.3 Equipment Inspection

Routine inspections should be considered on all equipment operating in corrosive environments. All safety equipment should be tested on a routine basis to ensure proper operation.

9.5.4 Corrosion Monitoring and Treatment

Monitoring should be considered if produced fluids are suspected of being corrosive. If produced fluids are determined to be corrosive, a corrosion abatement program should be considered. This is especially important in environmentally sensitive areas. Operating procedures should provide for early identification of potential corrosion problems in failure prone equipment.

9.5.5 Housekeeping

a. The facilities should be kept clean, maintained, and operated in a safe and environmentally sound manner.
b. Facilities should be fenced in a manner to prevent access to the facility by the general public, livestock, or wildlife, where appropriate.
c. Signs should be posted in conspicuous locations to notify employees and the public of any dangerous situations such as, flammable conditions, high voltage, and hydrogen sulfide.
d. Emergency phone numbers should be posted at the entrance to the facility, if located near a populated area.
e. Weeds should be controlled to a degree compatible with the local environment by cutting, mowing,or spraying to improve appearance and reduce the fire hazard. When herbicides are used to control weeds, the chemicals should be properly applied by trained personnel. On federal lands, BLM approval is required before herbicide use and only approved chemicals may be used. Improper application of herbicides may have adverse effects on the environment and can be a violation of federal law.
f. All equipment should be painted and/or kept clean to present an acceptable appearance and to provide protection from external corrosion.
g. Waste receptacles should be provided at appropriate locations for collecting discarded paper, rags, etc. and emptied on a regular basis.

9.6 WASTE AND RESIDUAL MANAGEMENT

Waste and residual management practices for production operations should be conducted consistent with lease and landowner obligations and local, state, and federal regulations. This should include solid wastes and residuals, such as

tank bottoms, drilling fluids and cuttings, liquid wastes and residuals, such as produced water and used oil, and gaseous wastes, such as hydrocarbons and carbon dioxide. A sound waste management plan is important to protect human health and the environment and minimize long-term liabilities to the operator.

A waste or residual management plan should utilize one or all of the options listed below, in order of preference, to protect human health and the environment:

a. Source Reduction. Minimize or eliminate the volume and/or toxicity of the waste generated.
b. Recycling. Reclaim or reuse the maximum amount of waste possible.
c. Treatment. Utilize techniques to minimize the amount and the toxicity of waste after it is generated, thereby minimizing the amount that has to be disposed.
d. Disposal. Employ environmentally sound and approved methods to properly dispose of generated wastes.

9.6.1 Source Reduction

Source reduction involves decreasing the volume or toxicity of wastes or other residuals that are generated. Product substitution is an example of source reduction. Production and workover chemicals should be evaluated to determine if less toxic substitutes are available that meet the performance and economic criteria of the operator.

Reviewing common-sense housekeeping practices can be effective in reducing waste or other residual generation. Installing drip pans, as an example, on valves and fittings allows the collection of leaked oil before it contacts the soil and becomes a waste.

9.6.2 Recycling and Reclaiming

After all of the reduction options are considered, recycling or reclaiming the residual material should be evaluated. Examples of recycling and reclaiming are recovering waste oil, hydraulic oil, and oily sump water by reintroduction into the oil stream or transportation to a refinery. Drums, batteries, and scrap metal can be sold or returned to the vendor, where possible. Tank bottoms and sludges can be sold to reclaimers, where feasible.

9.6.3 Treatment

Following reduction and recycling efforts, treatment of waste should be considered to minimize the waste volume and the toxicity of the waste.

Filtration, centrifugation, evaporation, and flocculation are examples of reduction techniques that can reduce the volume of the actual waste that must be disposed. The toxicity of certain wastes can be reduced by chemical treatment, thermal treatment, and biodegradation prior to disposal.

9.6.4 Disposal

The final option for management of a waste, after source reduction, recycling, and treatment options have been considered and incorporated, is disposal. The operator should take into consideration the long-term fate of the waste and its constituents prior to disposal. Considerations that should be evaluated when choosing either an onsite or an offsite commercial disposal method are as follows:

a. General site review of the topographical and geologic features.
b. Groundwater review to determine the presence of groundwater and aquifers.
c. Area weather patterns to estimate rainfall and flooding potential.
d. General soil conditions.
e. Natural drainage areas.
f. Identification of environmentally sensitive conditions.
g. Air quality.

These criteria will help determine a waste disposal option that protects human health and the environment and limits future liability for the operator. Examples of waste disposal options that can be considered are:

a. Landspreading.
b. Roadspreading.
c. On-site burial.
d. On-site pits.
e. Annular injection.
f. Underground injection wells.
g. Regulated and permitted discharge of fluid.
h. Incineration.
i. Off-site commercial facility.

When choosing one or more of the listed waste management methods, the operator should adhere to all landowner requirements and local, state, and federal regulations. The operator should maintain adequate documentation of waste management activities. Development of a long-term records retention policy should be considered.

Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for more information regarding specific waste management options.

9.7 SPILL PREVENTION, RESPONSE, AND CLEANUP

Accidental spills (including oil and saltwater) can, besides potentially damaging the environment, create difficult operational, legal, and public relations problems. The costs to clean up a spill coupled with the environmental effects may be very significant even for a minor spill. Existing federal and state laws provide for both criminal and civil penalties, under

certain circumstances, for spills, particularly spills involving oil. It is, therefore, very important to conduct operations in a manner that minimizes the potential for unauthorized spills. Outlined hereunder are some recommended operating practices which can be implemented by operators to minimize waste volumes and impacts on the environment.

9.7.1 Prevention

The best way to avoid adverse effects of spills is to prevent their occurrence. The EPA administers 40 CFR Part 112: *Oil Pollution Prevention—Nontransportation Related Onshore and Offshore Facilities*. These regulations require that spill prevention control and countermeasure (SPCC) plans be prepared and implemented for those nontransportation related onshore and offshore facilities from which there is a reasonable chance for discharge of oil into or upon the navigable waters of the United States, adjoining shorelines, or the exclusive economic zone. API Bulletin D16 may be helpful in complying with the requirements of 40 CFR Part 112. Operators should, however, refer to the regulations for details of specific requirements. Regardless of regulatory requirements, key factors in spill incident prevention are adequately trained supervisors and field operating personnel. Four basic steps that can be taken to prevent accidental spills are:

a. The facility design should be reviewed to determine where the potential for spills exists. Information on prior spill incidents should be included in the review to assess areas where changes in equipment or practices may be needed. Using the results of the review, the following should be considered, as appropriate:

1. Modification of existing facilities or installation of new equipment or instrumentation, as needed, to reduce the possibility of spills, commensurate with the risk involved. Consideration should be given to the use of alarms, automatic shutdown equipment, or fail-safe equipment to prevent, control, or minimize potential spills resulting from equipment failure or human error.
2. Maintenance and/or corrosion abatement programs to provide for continued adequacy of all equipment.
3. Routinely scheduled tests and inspections of lines, vessels, dump valves, hoses, and other pollution prevention equipment where failure(s) and/or malfunction(s) could result in a potential spill incident. These tests and inspections should be commensurate with the complexity, conditions, and circumstances of the facility and in accordance with appropriate regulations.
4. Operating procedures that minimize potential spills. These operating procedures should be clearly written and available to all operating personnel.
5. Examination of field drainage patterns and construction of oil traps in drainage ditches at strategic points to contain spilled oil before it reaches streams or water basins.

b. Training programs should be developed on spill prevention fundamentals and presented to operating personnel as often as necessary to keep them well versed on spill prevention practices. OSHA regulations require that emergency response and cleanup personnel be appropriately equipped and trained to prevent and minimize exposures to both physical and health hazards (refer to 29 CFR Part 1910.120, 29 CFR Part 1910.1200, and other appropriate requirements).

c. Contingency and shut down plans should be developed for coping with hurricanes and other disasters (both natural and man made) so as to minimize the potential for oil spills or incidents causing pollution or other environmental damage.

9.7.2 Mitigation

Some other associated steps that should be taken to reduce the potential for oil spills are:

a. "Dead" piping and temporary connections should be removed when they are no longer required.
b. Piping subject to vibration should be braced to reduce movement and resulting fatigue failures.
c. Tanks should be checked for uneven settlement of the foundation, corrosion, and leaks.
d. Installation of pressure relief valves should be considered for liquid lines, which, if left full, could potentially rupture from liquid expansion due to heat.
e. Sleeve-type line couplings should not be used when there is a chance of line movement.

9.7.3 Reporting of Spills

Despite good preventive planning and practices, spills of oil, saltwater, and other materials can still occur. It is very important for operators to determine legal requirements for reporting such spills to regulatory agencies. Spill reporting guidelines should be developed and operating personnel trained in their implementation, as required by laws or regulations.

Whenever a discharge of oil (any spilling, leakage, pumping, pouring, emitting, emptying, or dumping, but not those discharges excluded under 40 CFR Part 110) to navigable water of the U.S. occurs, notification must be given to the NRC, USCG, or other agencies, as applicable, by the most immediate, practicable means of reporting. In some situations, the USCG has designated the federal EPA as the agency to which such spills are reported. In addition, other federal, state, or local spill reporting requirements should be observed. All requirements for reporting spills should be clearly defined in the contingency plan. Refer to the BNA publication *Spill Reporting Procedures Guide*, and API Bulletin E4 for additional information.

Discharges of other than oil may require notification to the NRC, USCG, or other appropriate agencies. Refer to API Bulletin E4 for additional information.

9.7.4 Spill Contingency Plan

In the event a spill occurs, it is extremely important for all responsible operating personnel to know how to respond quickly and effectively to control, contain, and clean up the spill. To ensure this capacity exists, a contingency plan should be prepared for inland areas as well as for areas near water. The plans should provide utilization of capabilities of oil spill cooperatives, whenever advantageous.

The EPA has prepared an "Oil and Hazardous Substance Pollution Contingency Plan" for each of its regions. This plan documents the responsibilities of Federal agencies regarding oil spills. In addition, the USCG, some states, and some local authorities have prepared oil spill contingency plans. Operators of producing facilities should become familiar with all such contingency plans pertinent to their operating areas so they will know how outside agencies will interact with the company contingency plan.

Spill plans should address the needs to advise the public about significant releases. The plan should include procedures to advise government officials and provide appropriate information and access to the press.

9.7.5 Control and Containment

In the event a spill occurs, the source of the spill should be to stopped, or reduced as much as possible, in a safe manner. The spread of the spilled substance should be controlled or contained in the smallest possible area to minimize the adverse effects. Some methods which can be used to control and contain discharged substances, particularly oil, include:

1. Retaining walls or dikes around tanks and other spill prone equipment.
2. Secondary catchment basins designed to prevent the spread of oil if it escapes the primary wall or dike.
3. Permanent booms in water basins adjoining the facility.
4. Temporary booms deployed in the water after the spill occurs.
5. Use of special chemicals to jell or biodegrade the oil to prevent the spread of oil spilled into or on water.

Federal, state, and local laws may regulate the type and capacity of secondary containment required around tanks. Where secondary containment regulations are not in place, operators should evaluate the potential for spills and damages and use this information to determine the type and size of primary and secondary containment necessary.

The type and footage of containment boom installed or stored for deployment will vary with the type, size, and location of the facility and spill potential. This information should be developed for each main area or facility and be stated in the facility contingency plan. In addition, the contingency plan should list where emergency equipment is located.

The contingency plan should state the type(s) of chemicals that can be used effectively and list sources and procedures for applying these chemicals. Many regulatory agencies have strict rules on use of chemicals and prior approval for use of chemicals should be sought from the appropriate regulatory agency.

Spill response drills/simulations should be considered, with regulatory agency and contractor personnel participating.

9.7.6 Cleanup

Existing laws covering spills all have one common provision, i.e., the "spiller" is liable for damage caused by the spill and for the cost to clean up the spilled substance. Many contingency plans prepared by regulatory agencies state that when the "spiller" is doing an unsatisfactory job of cleanup, the agency can step in, clean up the spill, and bill the "spiller" for all appropriate costs. Each operator should be prepared to effectively clean up oil spills to the satisfaction of regulatory agencies and to the public.

Cleanup procedures should be developed and included in the facility contingency plan. Up-to-date lists of effective cleanup materials and equipment and a list of potential contractors who can supply needed assistance should also be included and maintained in the contingency plan.

Depending on the spill potential at each area, a stock of appropriate cleanup materials sufficient to handle small spills should be maintained on hand at all times. The amount of cleanup material will depend on the time required to obtain more material if the size of the spill should increase.

The following suggested cleanup practices should be considered:

a. Using cleanup materials and equipment on hand, immediate action should be taken to clean up any spilled oil or other substance. Depending on the substance spilled, personnel performing and supervising cleanup operations may require specific training (i.e., emergency response or HAZWOPER training).

b. Advance planning and arrangements should include availability and ready access to vacuum trucks and to similar pickup equipment to recover the spilled material.

c. Necessary approvals should be obtained prior to disposal of spill cleanup materials.

d. Advance arrangements should be made for rights of ingress and egress to public and private property that may be affected by a spill or the ensuing cleanup operation.

e. Legal counsel should be available to facility operators and advance arrangements should be made for "qualified adjusters" to be readily available to settle damage claims.

f. Close contact should always be maintained with any regulatory agency having jurisdiction over the spill. Landowners should also be notified of spills and kept informed of spill cleanup progress.

Plans, procedures, and programs should be improved and updated by analyzing previous spill incidents. Prevention, control and containment, and cleanup procedures should be revised accordingly to make them more effective for future responses.

9.8 ENVIRONMENTAL ASSESSMENT PRIOR TO PURCHASE OR SALE OF EXISTING FIELDS AND LEASES

Prior to the purchase or sale of an existing field or lease, consideration should be given to documenting the environmental condition of that property. By documenting the presence or absence of surface, subsurface, or groundwater contamination, an operating company may be able to reduce its exposure to significant future liabilities. Aerial photographs may be beneficial during this process.

Documentation of audits, assessments, and operating practices is important to identify potential problem areas. Care should be taken to document actions taken to correct deficiencies identified by audits.

9.9 ABANDONMENT OF FACILITIES

9.9.1 Purging and Flushing of Equipment Prior to Removal

All equipment such as tankage, separation vessels, meter runs, flow lines, and pumps should be purged and flushed, as appropriate. Materials recovered should be recycled, reclaimed, or disposed of in accordance with local, state, and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information.

9.9.2 Equipment Removal

The following equipment removal issues should be considered:

a. Tanks, separation vessels, meter runs, surface lines, pumps, and any other exposed surface equipment should be removed. Removal of the associated equipment foundations should be considered.

b. Exposed piping segments from surface or subsurface equipment connecting to buried lines should be removed to a depth consistent with subsequent land use or, preferably, to the depth of buried lines. Where feasible or where desired to limit potential future liabilities, consideration should be given to removing buried lines.

c. Where appropriate, each outlet of any abandoned lines should be permanently sealed.

d. Operators should consider removing all crossing markers and other line markers.

e. Where appropriate, the location of abandoned lines should be identified on facility maps.

9.9.3 Pit Abandonment

All pits and surface impoundments should be closed and backfilled in accordance with applicable local, state, or federal regulations. The location of abandoned pits should be documented. Materials removed from pits should be reclaimed, recycled or disposed in accordance with local, state, and federal regulations. Refer to API *Environmental Guidance Document: Onshore Solid Waste Management in Exploration and Production Operations* for additional information. Documentation should be kept for disposed materials.

9.9.4 Land Restoration

Upon completion of abandonment activities, all disturbed surface areas should be cleaned up and restored to conditions similar to the adjacent land or to landowner requirements. The operator should assure that all regulatory approvals are obtained prior to initiation of work. Restoration should include stabilization and revegetation of disturbed areas using native plant species or agency approved seed mixes. Drainage and maintenance requirements should also be considered.

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