SUPPLEMENT TO SANTA CLARA UNIT DEVELOPMENT AND PRODUCTION PLAN: PLATFORM GAIL AND ASSOCIATED PIPELINES

OFFSHORE CALIFORNIA

CHEVRON U.S.A. INC.

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Address Inquiries to:

J. E. Morgan
Chevron U.S.A. Inc.
Western Region Offshore
6001 Bollinger Canyon Road
San Ramon, CA 94583-0943
415/842-0106

or

C. M. Ghylin
Chevron U.S.A. Inc.
Western Region Land Department
6001 Bollinger Canyon Road
San Ramon, CA 94583-0943
415/842-3135

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EXECUTIVE SUMMARY

1.1 Development and Production Overview

This Development and Production Plan for Platform Gail, on OCS Lease-P 0205, is accompanied by an Environmental Report and has been prepared to comply with 30 CFR Section 250.34-2. It is a supplement to the Santa Clara Unit Development and Production Plan, (Chevron U.S.A. Inc., 1979).

Chevron U.S.A Inc. (hereinafter called Chevron) is to be the operator for development of the Santa Clara Unit crude oil reserves located in OCS Lease-P 0205 Lease. Exxon has a 50% interest only in the south half of the south half of the lease and and has no ownership interest in Platform Gail.

The Santa Clara Unit Plan of Development calls for the installation of three production platforms. Two of these, Chevron's Platform "Grace" on OCS Lease-P 0217 and Union's Platform "Gilda" OCS Lease-P 0216 have already been installed. The third platform, Chevron's proposed platform "Gail," is the subject of this Development and Production Plan. It is expected that Platform Gail will be installed in 1986. OCS Leases-P 0216, P 0217 and P 0205 are depicted in Figure 1.1.

A complete schedule for the installation of Platform Gail is shown in Figure 1.2. It is expected that the first oil will be produced in the second quarter of 1987. Production from the platform is expected to peak in 1990 at 13,300 barrels per day (BOPD). Gas production is projected to peak in 1998 at 20.2 million standard cubic feet per day (MMSCFD). The project is briefly summarized below.

1.1.1 Platform Gail

Platform Gail will be a three deck, eight leg drilling/production facility installed by conventional methods in 739' (225 m) of water. The platform will contain 36 well slots; 25 of these slots will be used for production wells during the first development phase. During the second development phase an additional nine wells may be drilled.

The drilling schedule for the first developoment phase calls for 16 Sespe/Lower Topanga wells to be followed by 9 Monterey/Upper Topanga wells. Developmental drilling (both phases) will be handled by a single electric rig over an six year period. Initial Sespe/Lower Topanga production is scheduled for 1987, with a planned peak oil production 13,300 BOPD in 1990 and peak gas production of 20.2 MMSCF/day in 1997 and 1998.

During production, water will be separated from the oil on the platform. Oil with less than 1% water content will be delivered to the oil pipeline after metering. Water will also be removed from the gas before delivery to the pipeline to minimize pipeline deterioration or corrosion and other operational problems. Hydrocarbon condensate separated on the platform will be commingled with the oil and sent to shore.

A circulating heating medium system will be used to provide heat for production processes. Cogeneration will be used on the platform. The heat source for the heating medium will be the exhaust gases from the gas turbine driven electric generators. The gas turbines will be equipped with water injection to reduce NO_x emissions. To further reduce emissions, a fugitive emission inspection and maintenance program will be instituted.

Platform Gail has incorporated design features to minimize flaring and venting of gas. Two major systems to accomplish this are as follows:

a) Vapor Recovery System

This system recovers several sources of fuel and off gas (which would normally be released to the atmosphere) and compresses them into the first stage suction scrubbers of the main gas compressors. Typical recovered gas would be hydrocarbon blanket vapors from tanks or off gas from the glycol regenerator. The recovered gas is compressed and sent with the main produced gas stream for processing on Platform Grace.

b) Acid Gas Compression Facilities

Fuel gas for the platform operations will be processed to remove Hydrogen Sulfide (H2S) and Carbon Dioxide (CO2). The H2S and CO2 off gas vapors will be shipped with the main production gas for processing on Platform Grace.

Only sweet fuel gas, leading to the flare pilot and header purge, will be burned on a continual basis. This sweet gas burns with very low emissions and is required for safety considerations.

The production gas will be routed to the flare only in the event of a platform upset or an emergency.

To minimize disturbance to the marine environment, any drilling mud or cuttings that have become contaminated with oil from a subsurface formation will be transported ashore and disposed of in a government approved disposal site. Non-oily cuttings will be disposed of at the drill site. All discharges will be in strict compliance with the National Pollution Discharge Elimination System (NPDES) Permit issued by the EPA.

Extensive geophysical, biological, and archaeological surveys have been carried out to assure that the platform and pipelines (discussed below) will result in a minimum impact to the environment. Results of the surveys show that all significant ocean features will be avoided, including rocky outcrops and cultural resources.

1.1.2 Pipelines

Three submarine pipelines each nominally 8.6 inches (22 cm) in diameter will be installed between Platforms Gail and Grace. One will take oil to Platform Grace, one will transport gas to or from Grace and one will be a spare designed to transport oil or gas. The length of each of these lines from Platform Gail to Platform Grace is approximately six miles. At Grace the oil and gas will enter the pipelines that currently transport the Grace production via Platform Hope to onshore facilities at Carpinteria. The pipeline route from Gail to Grace has been chosen to avoid sub-surface features that might impact the line. It is shown in Figure 1.1.

The pipelines will be designed to ensure that they can be safely installed and operated in an environmentally acceptable manner and in compliance with MMS OCS Order No. 9. The lines will also be protected from corrosion and will be equipped with high and low pressure shutdowns to prevent any leakage in the event of an emergency.

Environmental and geophysical surveys were carried out in the area of the pipeline routes to establish that the pipelines would not impact sensitive biological habitats or significant cultural resources and would not be affected by any geological hazards or fault zones.

1.2 Oil and Gas Processing

1.2.1 Project Description

Dehydrated oil and natural gas produced at Platform Gail will be transported to Platform Grace. Any H_2S in the produced gas will be removed on Grace with the existing Stretford plant. This processed gas will then be comingled with Grace's production and transported to shore via Platform Hope.

The crude oil will not require any additional processing at Carpinteria. The existing facilities at Carpinteria will be used for the final processing of the produced gas.

The Carpinteria plant site encompasses approximately 26 acres and contains facilities for oil and gas processing and distribution. The existing plant has processed gas from several fields in the area.

The Summerland field was the first to be developed and was located within state waters. This is a Chevron joint venture, called Standard-Humble-Summerland-State or SHSS which began development circa 1959. Wet gas and oil are separated offshore and shipped separately to Carpinteria where liquids are extracted from the gas and the oil dehydrated.

The Carpinteria field was the second to be developed and was also on a state lease. This was the second Chevron joint venture, known as Standard-ARCO-Carpinteria-State or SACS and was started circa 1966. Wet gas and oil production follows the same process steps as SHSS gas and oil.

The most recent oil and gas to be handled in the plant is from the Santa Clara unit, located in Federal waters. The producing platform, Platform Grace, (installed in 1979) sends dehydrated oil and wet gas ashore via separate pipelines. The wet gas is commingled with SACS gas production at Platform Hope before going ashore. Platform Grace oil flows to Platform Hope where it goes ashore via a converted gas lift pipeline.

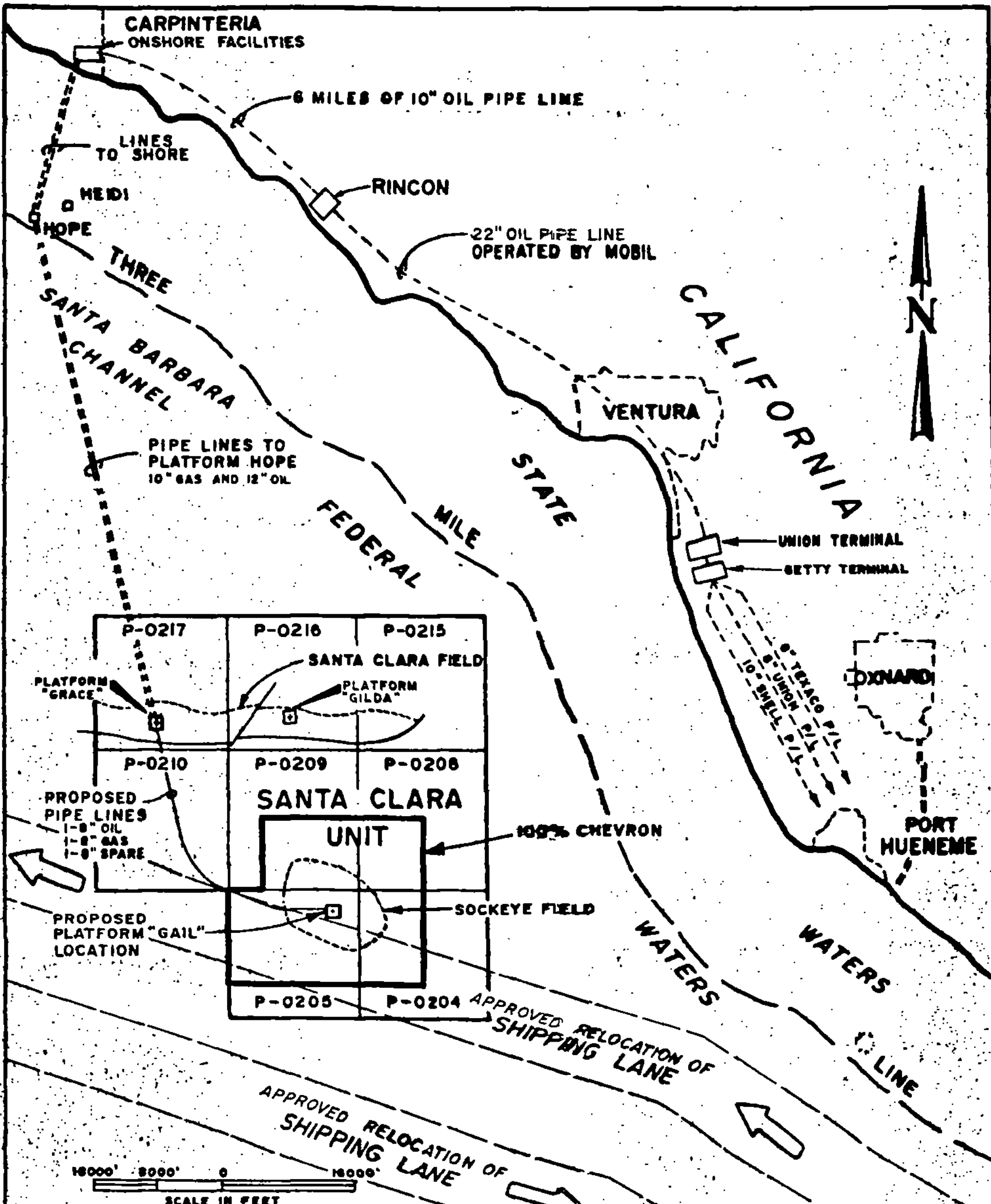
Gas production from both state leases is sweet and Platform Grace currently removes H_2S prior to shipping its gas ashore. At the gas plant, wet gas is compressed, commingled, dehydrated and cooled to remove hydrocarbon liquids in a low temperature separator (LTS) plant. The dry gas leaving the LTS plant is used for plant fuel or sold to Southern California Gas (SCG). The gas sales meter is located in the northeast corner of the Carpinteria Plant. Recovered liquids are fractionated into propane, mixed butanes, and natural gasoline. The natural gasoline is blended and sold with the crude. Propane is sold to Van Gas Distributors and butane to Chevron Liquids and Gas group for distribution.

In order to develop the Sockeye field, Chevron plans to install Platform Gail during 1986. Produced crude will be degassed and dehydrated on the platform before shipment to shore via a new pipeline to Platform Grace. Platform Gail's crude will be comingled with crude from Platform Grace.

Platform Gail's production forecasts and economics are based on developing the reserve with sweet gas first. A moderate amount of sour gas reserves can be produced on Platform Gail and sweetened on Platform Grace with the Stretford process. The unit is designed to produce up to 3.2 tons of sulfur per day by removing H_2S from the produced gas.

1.3 Crude Oil Transportation

Chevron intends to transport Platform Gail's crude oil production from the Carpinteria processing facility to Chevron's El Segundo Refinery by means of the existing pipeline from Santa Barbara County to the Los Angeles Basin.



CHEVRON'S PLATFORM "GAIL"
SOCKEYE FIELD, SANTA CLARA UNIT
SANTA BARBARA, CALIFORNIA

PROPOSED PLATFORM "GAIL" LOCATION

X= 1,046,650	Y= 726,990
LONG. 119° 24' 01" W.	LAT. 34° 07' 30" N.

ZONE 6

FIGURE 1.1

A-SB-4128-3

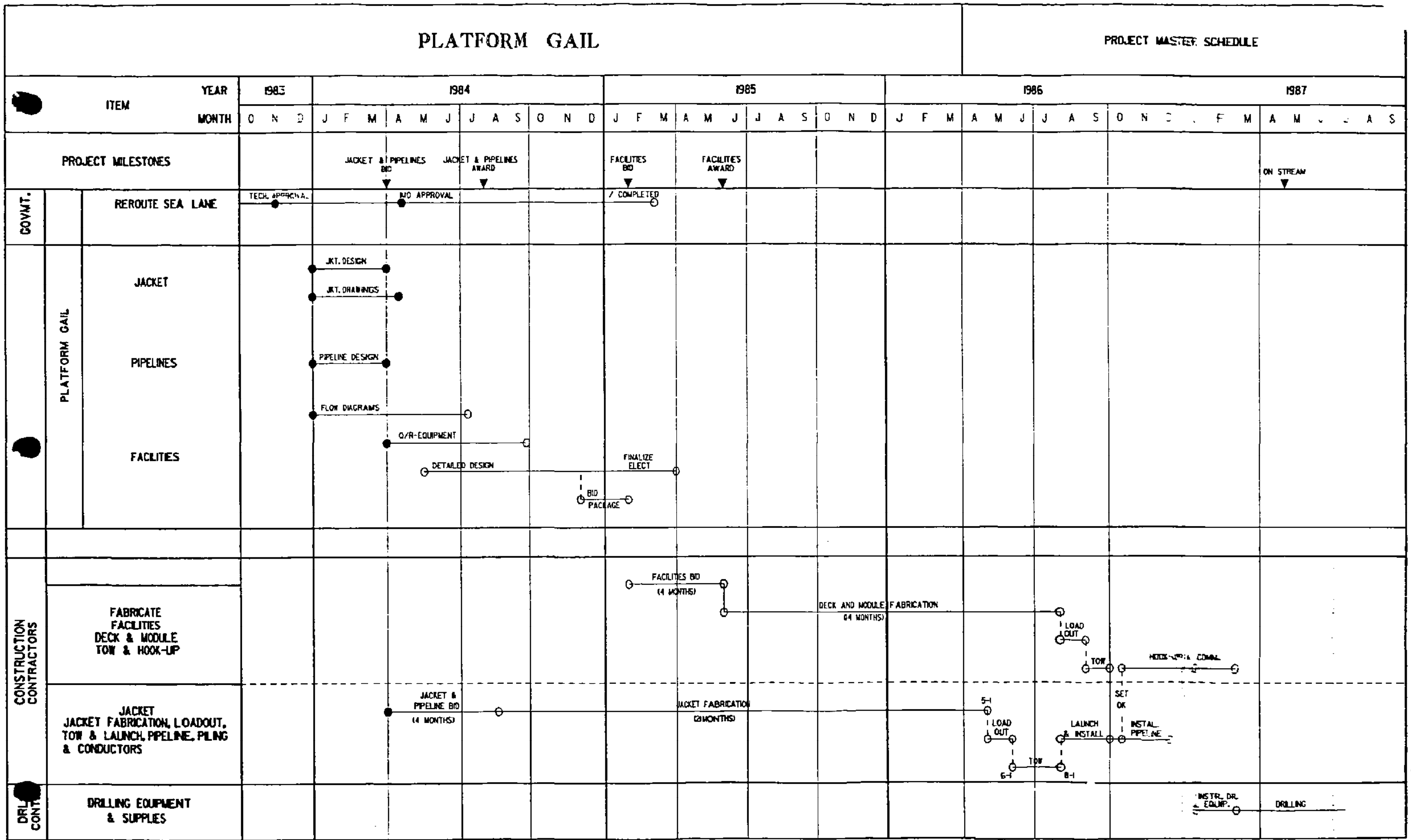

PLATFORM GAIL
PROJECT MASTER SCHEDULE
ITEM
YEAR
MONTH
1983
1984
1985
1986
1987
PROJECT MILESTONES
JACKET & PIPELINES BID
JACKET & PIPELINES AWARD
FACILITIES BID
FACILITIES AWARD
ON STREAM
GOVMT.
REROUTE SEA LANE
TECH. APPROVAL
BID APPROVAL
COMPLETED
PLATFORM GAIL
JACKET
JKT. DESIGN
JKT. DRAWINGS
PIPELINES
PIPELINE DESIGN
FLOW DIAGRAMS
FACILITIES
O/R-EQUIPMENT
DETAILED DESIGN
FINALIZE ELECT
BID PACKAGE
CONSTRUCTION CONTRACTORS
FABRICATE FACILITIES DECK & MODULE TOW & HOOK-UP
FACILITIES BID (4 MONTHS)
DECK AND MODULE FABRICATION (14 MONTHS)
LOAD OUT
TOW
JACKET JACKET FABRICATION, LOADOUT, TOW & LAUNCH, PIPELINE, PILING & CONDUCTORS
JACKET & PIPELINE BID (4 MONTHS)
JACKET FABRICATION (21 MONTHS)
LOAD OUT
TOW
LAUNCH & INSTALL
SET OK
INSTAL. PIPELINE
DRILLING EQUIPMENT & SUPPLIES
INSTR. DR. EQUIP.
DRILLING
LM 4/21/84

FIGURE 1.2

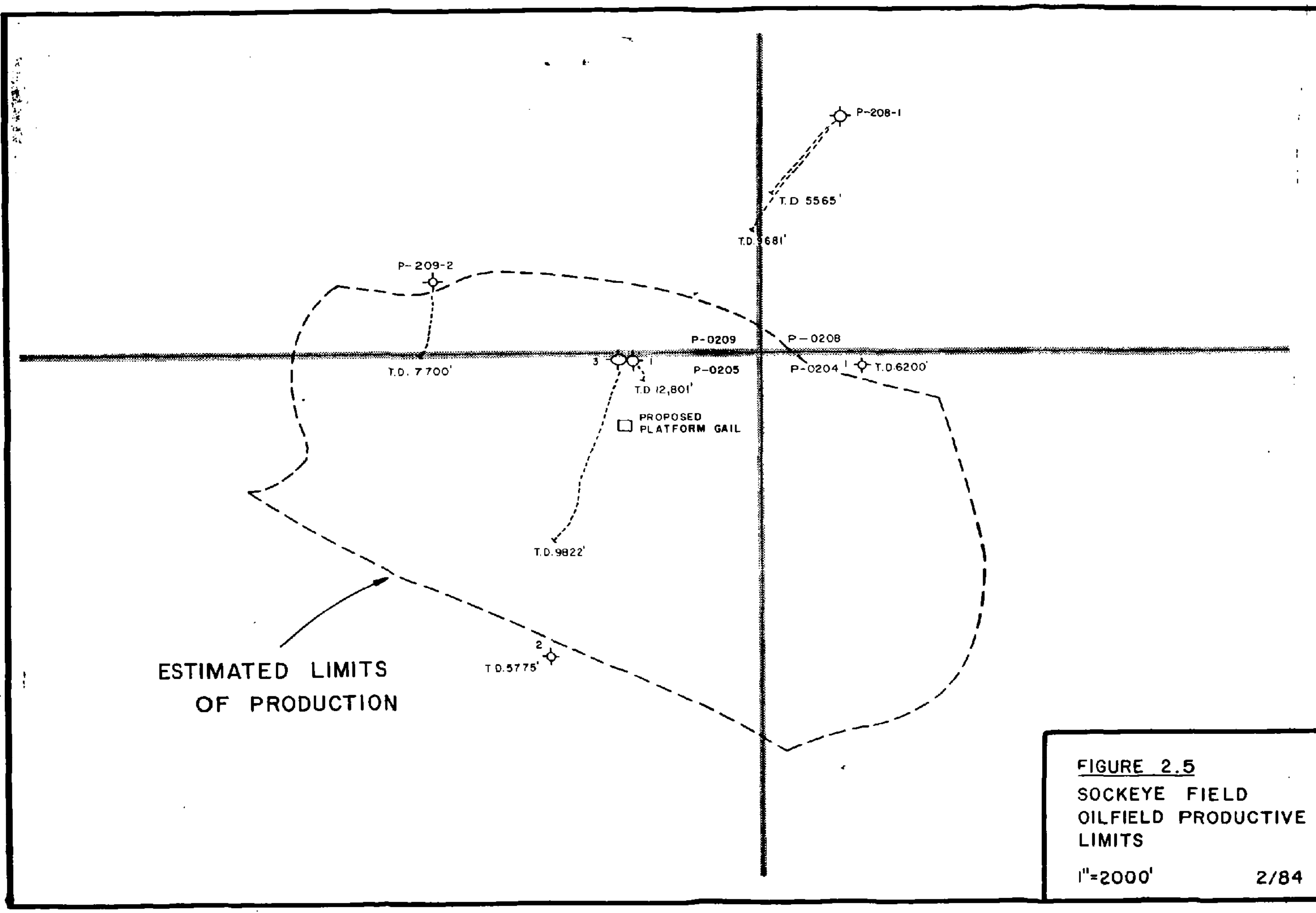


FIGURE 2.5
SOCKEYE FIELD
OILFIELD PRODUCTIVE
LIMITS

1"=2000' 2/84

SECTION 2

GEOLOGY

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GEOLOGY

2.1 Introduction

The area planned for development from Platform Gail is called the Sockeye Field. This oil and gas field is located in the eastern Santa Barbara Channel on the southern portion of the Santa Clara Unit. The field covers portions of leases OCS P 0204, P 0205, P 0208, and P 0209; Platform Gail's location is in the northeast portion of lease OCS P 0205 (Figure 2.1). Port Hueneme is located approximately 11 statute miles (18 km) east of the proposed platform. Geologic discussions for this project have been subdivided into three major categories: Regional Geology, Near-surface Geology, and Subsurface Geology. References are listed in Section 2.5. Geological information presented in this report is based on publicly available scientific and technical reports, information and data supplied by Chevron, and special studies performed by retained consulting firms. These latter reports are referenced and referred to throughout the body of this report.

2.2 Regional Geology

2.2.1 Physiography

The Santa Barbara Channel is a submerged, east-west trending, topographic and structural depression in the westernmost part of the Transverse Range Province (Figure 2.2). It is considered to be an extension of the onshore Ventura Basin, which lies to the east. The Transverse Range is characterized by dominant east-west trending physiographic and structural features. The Channel is bounded on the north by the east-west-trending Santa Ynez Range and on the south by the east-west-trending Channel Islands. Maximum water depths within this basin are about 2050'.

The Sockeye area physiographically consists of the continental Oxnard-Santa Barbara shelf dipping gently to the southwest, a steep slope also dipping to the southwest, and the present sedimentary basin. The shelf break locally occurs at water depths of 340' to 440' (100m to 130m), and the basin edge occurs at water depths of 700' to 770' (210m to 230m) (Figure 2.1).

2.2.2 Structure

The regional geology of the Santa Barbara Channel has been described in considerable detail by Vedder and others (1969) and the U.S. Geological Survey (1976) (References 2.5.1 and 2.5.2). These reports provide a comprehensive geologic summary of the stratigraphy and structure in the channel. On Figure 2.3, the relationship of the Sockeye Field to the significant structural features within the Santa Barbara Channel has been shown. The dominant structural features generally trend nearly east-west, as does the channel area. The Santa Clara Unit lies over two of these features, the Montalvo or 12-[illegible] trend (on the north, crossing leases OCS P 0215, P 0216, and P 0217) and the Hueneme trend to the south (primarily in leases OCS P 0204 and P 0205).

The northerly structural feature is part of an anticlinal trend that extends westward from the offshore part of the West Montalvo oil field for about 20 miles. Offshore, this broad anticlinal trend is bounded at depth on the north by a reverse fault that is referred to in numerous reports as the Oak Ridge fault. On the south, this trend is bounded at depth by the Mid-Channel fault, which is not considered active. While both of these faults are probably associated with the same basement break, only the Oak Ridge fault breaks through locally to the ocean floor and thus is considered active. The history of tectonic activity along this trend as well as within the Santa Barbara Channel has been discussed in reports by Greene (1976), Vedder and others (1969), and three reports by Dames and Moore (References 2.5.3, 2.5.1, and 2.5.4 - 2.5.6).

The southerly trend, called Hueneme in this report, lies just south of a structurally low area which separates the two trends by approximately 3 miles. The anticlines which have been identified along the Hueneme trend form the closure for the Hueneme Field . The Sockeye Field is associated with the Hueneme trend, but lies 2 miles (3 km) north of it. Further discussion of the Sockeye Field follows in Section 2.4.

2.2.3 Stratigraphy and Hydrocarbon Potential

Sedimentary strata in the Sockeye area range in age from Cretaceous (65-135 million years old) to Holocene (younger than about 11,000 years). Drilling of deep exploratory wells in this offshore area indicates that the sedimentary section is over 12,000' thick. A stratigraphic column of the rocks present at Sockeye is shown in Figure 2.4. Regional onshore geology is shown in Figure 2.3. Thicknesses of some of these formations have considerable variation across the area because of depositional patterns or unconformities. There are four major unconformities in the area: at the base of the Paleocene, at the base of the Miocene (the "Sespe unconformity"), at the base of the Pliocene, and at the base of the Holocene.

2.2.3.1 Precretaceous Basement Rocks

Two distinct basement assemblages occur in the Santa Barbara Channel region: a Franciscan assemblage that underlies the Santa Ynez Range, and a crystalline basement complex that underlies the Channel Islands (Reference 2.5.1). None of the nearby wells have penetrated the basement complex, therefore it is uncertain which basement complex type underlies the Sockeye Field.

2.2.3.2 Cretaceous Strata

The deepest stratigraphic penetration on the Santa Clara Unit is in the Exxon well OCS P 0205 #1, which bottomed in Upper

Cretaceous-age interbedded marine sandstones, siltstones, and shales. Similar Cretaceous sediments crop out around the margins of the Santa Barbara Basin. Total thickness of the Cretaceous strata is unknown.

2.2.3.3 Tertiary Strata

Paleocene rocks appear to be missing in the Sockeye Field; they have not been encountered in any of the wells drilled in the area. On San Miguel and Santa Cruz Islands, exposed Paleocene units consist of about 1600' (490m) of interlayered claystone, sandstone, and conglomerate (Reference 2.5.1).

Locally, Eocene rocks are marine sediments that crop out extensively in a continuous belt along the crest and southern flank of the western Santa Ynez Mountains. Eocene rocks were penetrated at a depth of about 9400' (2900m) in OCS P 0205 #1, in the Sockeye field. They consisted of marine sands and siltstones of the Juncal Formation.

Oligocene rocks in the Sockeye area consist of characteristically red and green-colored nonmarine sands, shales, and conglomerates of the Sespe Formation. This formation is about 4000' (1200m) thick in the Sockeye area and constitutes one of the major reservoirs of the field.

Above the Sespe Formation, Lower Miocene rocks are absent. Overlying this "Sespe unconformity" are the Middle Miocene Topanga Sands and the Middle to Upper Miocene Monterey Formation. These rocks constitute the other major reservoirs in the Sockeye Field, in addition to the Sespe Formation. In the Oxnard area the Middle Miocene Conejo volcanics crop out and interfinger with the Topanga sands, but they have not yet been found in wells in the Sockeye area.

The Monterey Formation locally consists of siliceous shales with considerable amounts of dolomite. It also contains lesser amounts of sandstone and streaks of limestone and chert. The Monterey crops out nearby on Santa Cruz and Santa Rosa Islands, as well as onshore along the northern Santa Barbara Channel coastline.

The Upper Miocene Santa Margarita Formation is exposed along the Santa Barbara County coastline and in the Channel Islands. Along the coast as well as in the Sockeye area, this formation consists of siltstones and diatomaceous shales. However, the Santa Margarita is volcanoclastic in the Channel Islands (Reference 2.5.1).

Pliocene rocks in the Santa Barbara Channel unconformably overlie the Miocene rocks. They consist of two lithologically similar units. The lower unit is informally named the "Repetto" and the upper unit is the "Pico". Both units consist of interbedded sandstone, siltstone, and mudstone (Reference 2.5.1). Together they are usually referred to as the Pico Formation. Pliocene rocks are exposed on the outer continental shelf from Carpinteria north to Point Arguello. Onshore exposures of these formations are thickest in the Ventura Basin.

2.2.3.4 Quaternary Strata

Sediments of Pleistocene age extend throughout the Santa Barbara Channel region. These strata are generally separated into several units as follows (from oldest to youngest): Santa Barbara Formation (late Pliocene and early Pleistocene), San Pedro Formation (early Pleistocene), and an unnamed formation of late Pleistocene age. The Santa Barbara and San Pedro formations consist of mudstones, siltstones, and conglomerates. Near Santa Barbara, these formations crop out only offshore along the outer edge of the mainland shelf. Onshore, they are either covered by younger strata or have been removed by erosion. The unnamed Upper Pleistocene deposits are widespread, generally discontinuous, and occur in varying thicknesses throughout the Channel region. Over most of the region, they are absent or only appear as a thin mantle on elevated marine terraces and on the sea floor. These Upper Pleistocene sediments consist of clays and silts which blanket the north Channel slope. They range in thickness from about 100 feet (30 m) at the top of the slope to about 1100 feet (300 m) at the base of the slope (Reference 2.5.1).

Holocene sediments cover the sea floor throughout much of the Santa Barbara Basin. However, they are absent or very thin on large parts of the mainland shelf. West of Ventura in the Santa Barbara Channel, the Holocene shelf deposits are locally as much as 150' (45 m) thick (Reference 2.5.7) and vary in grain size from fine sands to silt to clay silts and clays.

2.2.3.5 Hydrocarbon - Bearing Strata

All of the sedimentary section between the top of the Pico formation and the basement complex is considered to be potentially hydrocarbon-bearing. To date, productive hydrocarbon reservoirs in the Sockeye Field have been found within the Oligocene Sespe Formation, the Lower Miocene Topanga Sands, and the Miocene Monterey Formation. These formations where productive are encountered at subsea depths from 5400' to 5800' (1600 to 1800m) (Sespe and Lower Topanga Sands) and 4400' to 4800' (1300 to 1500m) (Upper Topanga Sands and Monterey Formation).

Only minor hydrocarbon shows have been encountered in the Upper Monterey Formation and the overlying Santa Margarita Formation. Additional testing will be required to determine whether or not productive hydrocarbons exist within these formations.

2.3 Near Surface Geology

2.3.1 I

Local and site-specific geological and geophysical surveys were conducted over and in the vicinity of OCS Leases P 0205 and P 0209 to assess geological conditions for the construction of Platform Gail and a pipeline to Platform Grace. They consisted of two geophysical surveys, a soil sampling cruise, and a soil boring cruise.

In 1974, Aquatronics, Inc. (Reference 2.5.8) performed a high resolution geophysical survey over the eastern Santa Barbara Channel for the Standard Oil Co. of California (Chevron). High resolution seismic data were gathered.

General Oceanographics, Inc. (Reference 2.5.9) ran a soil sampling cruise over portions of OCS Leases P 0204, P 0205, P 0208, and P 0209 in 1978 for Chevron.

Between January 7 and January 19, 1981, Woodward-Clyde Consultants (Reference 2.5.10) ran 221 nautical miles of high resolution geophysical surveys over the platform site and along the proposed pipeline route to Platform Grace. Also included in this survey were thirty core samples which recovered ocen floor sediments for analysis.

In a concurrent investigation in 1981, Woodward-Clyde Consultants drilled eight soil borings to depths of up to 506' (154m) below the sea floor (Reference 2.5.11). Three borings were drilled to evaluate soil conditions at the two potential platform sites (including the final site) then under consideration by Chevron for Platform Gail. Five additional soil borings were drilled upslope of the proposed platform sites in the possible slide area. Samples from these borings were used to analyze the slope stability of the area.

Data collected since 1979 to evaluate the shallow geology and soil conditions were gathered in accordance with guidelines published by the U.S. Geological Survey in NTL (Notice to Leasee) 81-2, 82-2 and OCS Order #8.

2.3.2 Geomorphology

The Sockeye field area consists of three distinct morphologic provinces: 1) the seaward portion of the continental shelf (i.e., Oxnard-Santa Barbara shelf) dipping gently to the southwest; 2) a steep slope also dipping to the southwest, and 3) the Santa Barbara Channel sedimentary basin.

The Oxnard-Santa Barbara shelf province is part of the mainland shelf which extends along the California coastline. It is predominently featureless, slopes southwesterly at from less than 1% (0.6^{o}) to 1.4% (0.8^{o}) to a water depth of about 340' to 440' (100 m to 130 m) and varies in width from 3 miles (5 km) at Point Conception to 12 miles (19 km) off Rincon Beach. The shelf is about 7.5 miles (12 km) wide in the Sockeye area.

The slope province slopes to the southwest at an average of 5% (1:20 or 3^{o}) to a water depth of 700' to 770' (210 m to 230 m). This slope continues southwesterly from about 7.5 miles (12 km) to 10.5 miles (17 km) off Hollywood Beach north of Port Hueneme.

On the slope province in the Sockeye area, the shallow sediments have been disrupted by sliding activity of Quaternary to possibly Recent age. The ocean floor in this disturbed area is hummocky, with side slopes up to 14% (1:7 or 8^{o}). Individual hummocks range in height up to 55' (17 m), in width from 100' to 700' (30 m to 210 m), and in length up to 8000' (2400 m) (Figure 2.3 of Reference 2.5.10).

Immediately above this possible slide area, in water depths of 410' to 520' (125 m to 160 m), headwall scarps appear. Here, up to 90' (27 m) of Quaternary to Recent sediments are perched above the scarps. The slide terrain has numerous large hummocky features interpreted as pullapart blocks that have moved slightly down the slope. This interpretation is based on the fact that these features exhibit little internal deformation both in seismic profiles and in X-rays of cores taken in the slide area.

In the project area, the present Santa Barbara Channel sedimentary basin begins at water depths of about 700' to 770' (210 m to 230 m). The proposed platform is close to the basin edge near the easternmost closure of the basin. The basin is on the order of 4 miles (6 km) wide near the area of Chevron's planned development. The basin slopes very gently to the southwest at 0.5% (1:200 or 0.3°) in the Sockeye area.

2.3.3 Geology

The near-surface geology in the offshore Ventura area has been investigated by Greene, Wolf, and Blum (Reference 2.5.7). They found that Holocene-age sediments blanket the shelf and overlie an angular unconformity of probable late Pleistocene age. The Holocene thickens to a maximum of about 150' (45 m) on the Ventura Shelf, about halfway between the project area and the shoreline at Oxnard, about 10 miles (16 km) to the east-northeast. In the Santa Barbara Basin, about 4 miles (6 km) west-southwest of the project area, there is a marine terrace about 300' (90 m) thick, of probable Holocene age.

Between these two areas of thick Holocene section lies the project area, where high-resolution geophysical profiles of the surface sediments have been largely obscured by shallow gas, making geological interpretation difficult. Woodward-Clyde Consultants (Reference 2.5.10) have summarized the geology as follows:

"The eastern portion of the survey area that lacks the shallow gas offers the best insight into the shallow structure of the survey area. At the shelf edge and slope, seismic profiles display a steeply dipping sequence of foreset shelf sediments overlying unconformably an erosional surface of unknown age. This erosional surface extends out from under the shelf into the basin... The basinward migration of these dip-slope, foreset shelf sediments has resulted in a continual increase in slope of the younger sediments. Basin sediments have successively lapped onto the base of the prograded foreset beds.

On several of the survey lines in the eastern area, an ancient buried slide can be mapped... The buried ancient slide mass has a general lens-shaped appearance, marked by chaotic internal reflectors and a rubble-like area at the toe of the slide. The slide plane underlying the buried slide deposits appears to be the same slide plane which underlies the youthful slide terrain area...(However, the portion under the buried slide deposits is considered inactive and probably corresponds to an unconformity surface).

The interpretation of this buried ancient slide indicates that, as steepening of the foreset beds occurred, the angle of repose became, and apparently still is, steep enough to prevent the kinds of sediments deposited on the slope from resting securely on the slope area. However, the degree to which the gravitational component determines the failure of these sediments is uncertain.

The high-resolution geophysical records were examined for indications of faulting, but no active fault traces or offsets were found."

2.4 Subsurface Geology

2.4.1 Sockeye Oilfield

Location: The Sockeye Oilfield is located approximately 11 miles (18 km) west of Port Hueneme on the Federal OCS Leases P 0204, P 0205, P 0208, and P 0209 (Figure 2.1). Water depths over the platform and pipeline project area range from about 300' to 780' (90 m to 240 m).

Structure: The trapping structure consists of a dome-shaped anticline bounded on the northern and southwestern sides by south-dipping reverse faults. Gentle dips of 3° - 15° are found on the sides of the dome sloping away from the crest. Based on geophysical data and well control, the closure extends from the Pico sands near 3000' (900m) subsea to more than 8000' (2000m) subsea in the Sespe formation. Estimated limits of production are shown in Figure 2.5.

Stratigraphy: Sedimentary strata in the area of the proposed development range in age from Cretaceous to Holocene. On Lease P 0205, this section is over 12,000' (3700m) in thickness (Figure 2.4). The sedimentary section varies from interbedded turbidite sands and shales to a thick section of siliceous shale. Sediments older than Pliocene in age have been dated by faunal methods. The shallow young Pleistocene and Holocene stratigraphic units are based on the work by H. G. Greene (Reference 2.5.3). Greene has identified these units on the basis of unconformities found in the shallow, high resolution geophysical profiles made by the U.S. Geological Survey. The shallowest unconformity seen in the profiles has been used to define the base of the Holocene sediments. The shallowest and youngest sediments consist of silty clays of Holocene age. The Holocene materials overlie marine Pleistocene and Pliocene sediments, which consist locally of interbedded silts, clays and sands. All of these sediments unconformably overlie the Upper Miocene Santa Margarita Formation of shales and silts. The Santa Margarita in turn overlies the

Miocene Monterey Formation of siliceous shale and the associated Topanga Sands. The Topanga Sands are major reservoirs in the Sockeye field. The Lower Topanga Sands are underlain by an unconformity, in which Lower Miocene rocks are missing. Under this unconformity lies the Oligocene Sespe Formation, consisting of nonmarine sands, shales, and conglomerates. These Sespe rocks constitute the other major reservoir of the Sockeye field in addition to the Topanga Sands and the Monterey Shale. The Sespe overlies the Eocene Juncal Formation of marine sands and siltstones. The Juncal unconformably overlies the Upper Cretaceous Jalama Formation, consisting of marine sands and shales.

2.4.2 Pipeline Routes

Discussions covering the geologic and geotechnical conditions along the proposed pipeline route between Platform Gail and Platform Grace are covered in Section 7.3.

2.5 References

2.5.1 Vedder, J. G. et al. (1969), Geologic Framework of the Santa Barbara Channel Region, U.S. Geological Survey Professional Paper 679-A.

2.5.2 U.S. Geological Survey (1976), Oil and Gas Development in the Santa Barbara Channel Outer Continental Shelf off California, Final Environmental Statement, Washington D.C., U.S. Government Printing Office, 3 volumes.

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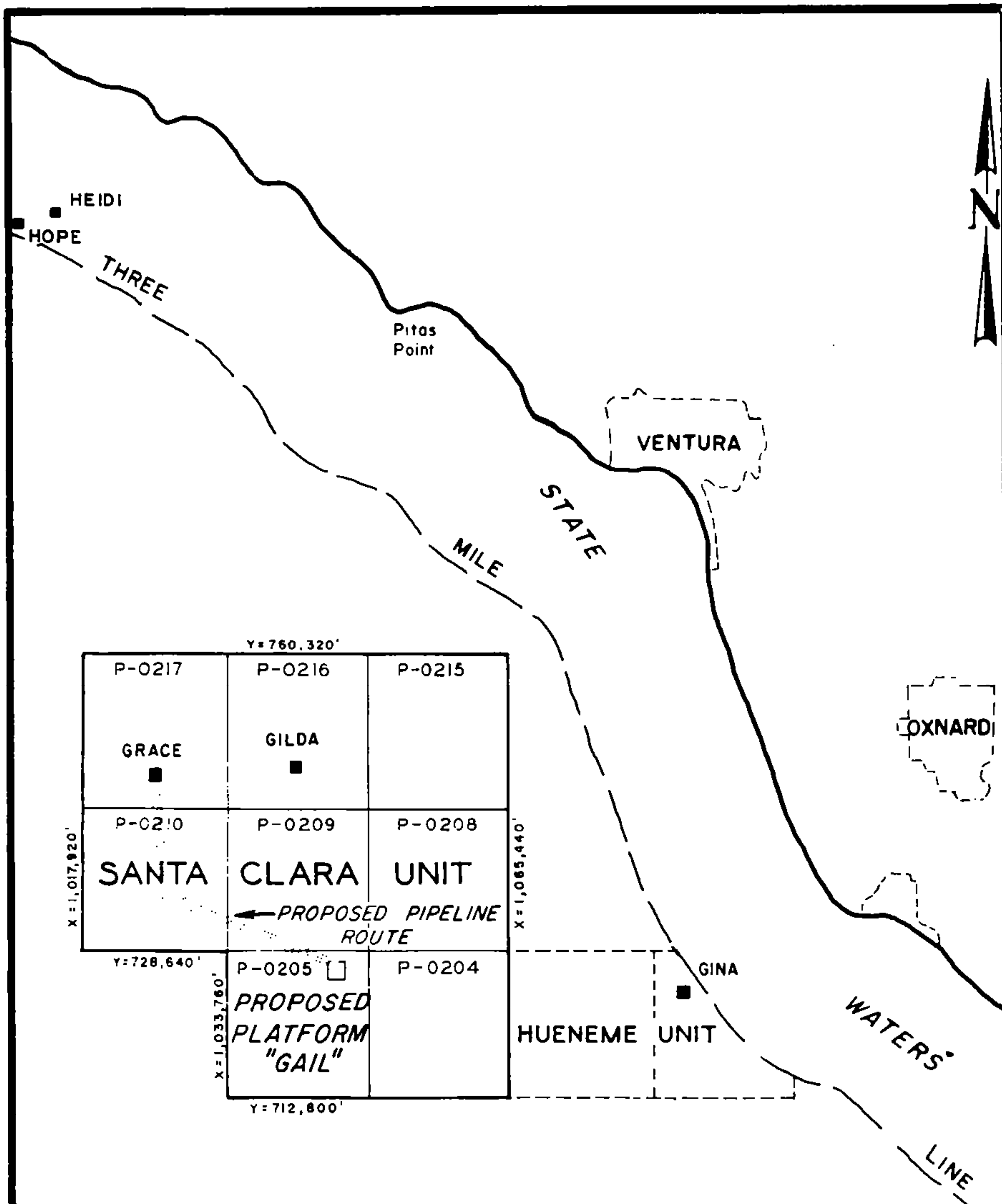


PROPOSED PLATFORM "GAIL" LOCATION

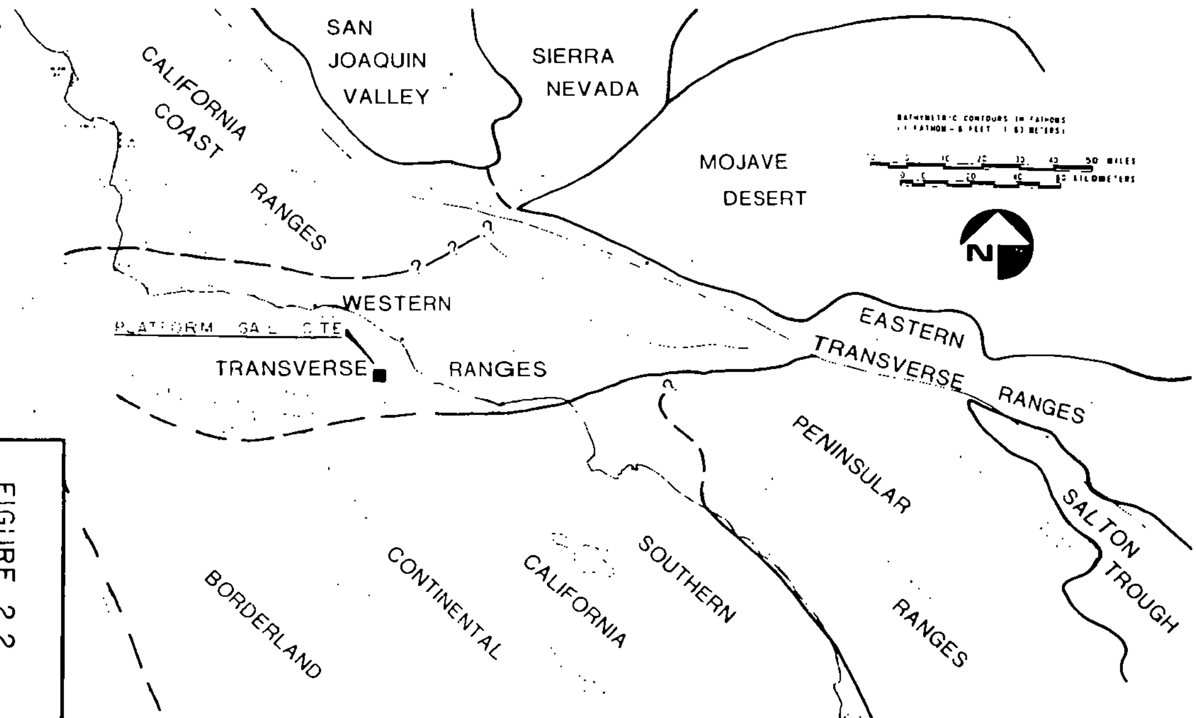
X=1,046,650' E
LONG. 119°24'01" W

Y=726,990' W
LAT. 34°07'30" N

FIGURE 2.1

LOCATION MAP
OCS-P-0205

SCALE 1"=16,000' 2/84



MODIFIED FROM JAHNS(1954)& WESTEC(1982)

FIGURE 2.2

GEOMORPHIC
PROVINCES OF
SOUTHERN CALIFORNIA

2/84

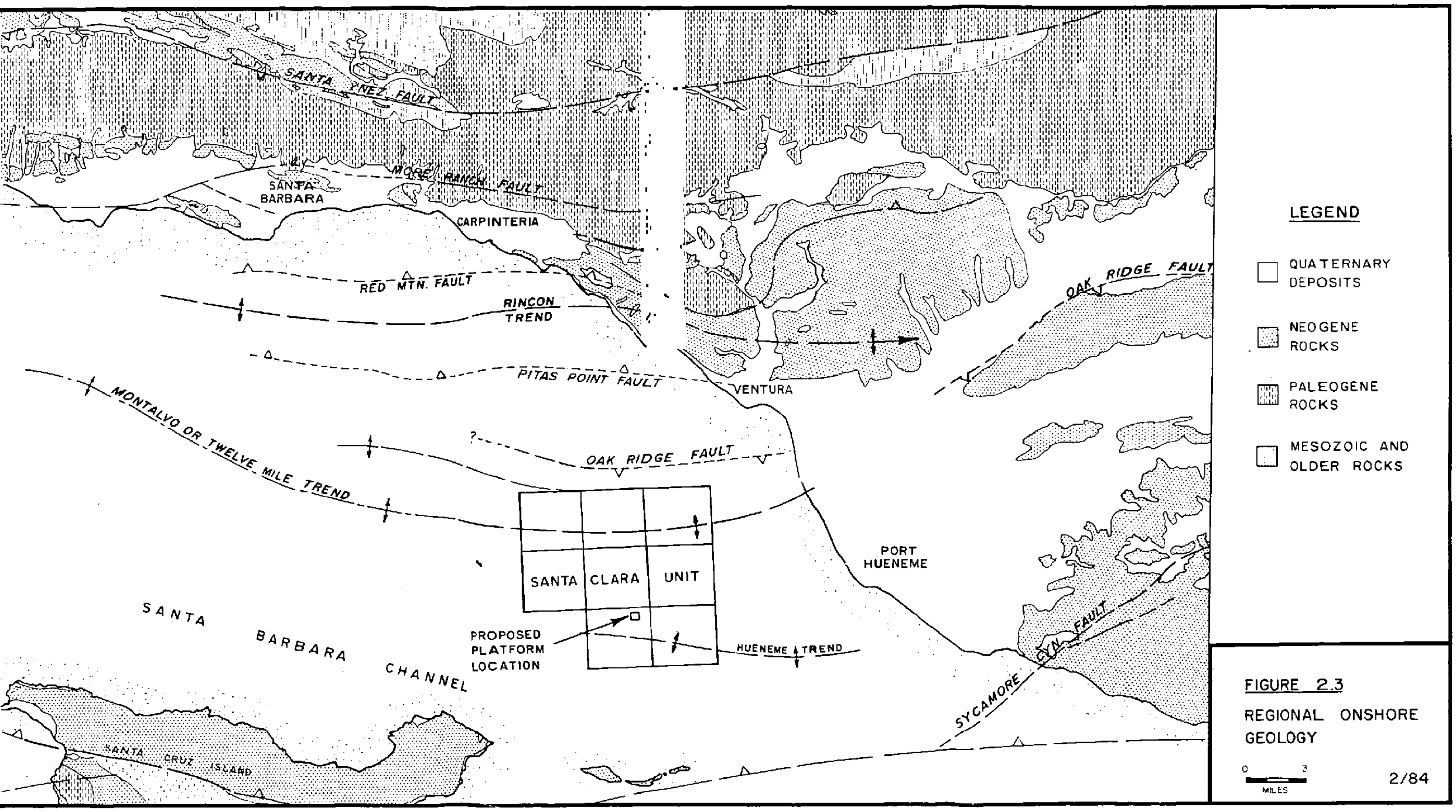


FIGURE 2.3
REGIONAL ONSHORE GEOLOGY

2/84

PERIOD	STAGE	FORMATION	SOCKEYE FIELD — APPROXIMATE DRILLED DEPTH ± 750	SOCKEYE FIELD — ESTIMATED THICKNESS
RECENT-PLEISTOCENE		UNCONSOLIDATED SANDS, SILTS, AND CLAYS	± 1000' ?	<500'
PLIOCENE	"PICO"	PICO FORMATION MARINE SANDS, CLAYS, AND SILTSTONES	± 3200'	± 2200'
MIOCENE	"DELMONTIAN"	SANTA MARGARITA FM SILTSTONE AND SHALE	± 4300'	± 1100'
	MOHNIAN	MONTEREY FORMATION		± 1100'
	LUISIAN	UPPER TOPANGA SANDS — MARINE SILICEOUS SHALE, DOLOMITE, SANDSTONE, CHERTS, AND LIMESTONE		
	RELIZIAN	L. TOPANGA SDS	± 5400'	
	SAUCESIAN			NOT PRESENT
?	ZEMORRIAN		± 5400'	
OLIGOCENE*		SESPE FM NONMARINE SANDS, SHALES, AND CONGL	± 9400'	± 4000'
? EOCENE		JUNCAL FM MARINE SANDS AND SILTSTONES	± 12,500'	± [illegible]100'
PALEOCENE			± 12,500'	NOT PRESENT
CRETACEOUS		JALAMA FM MARINE SANDS AND SHALES		?

* RECENT WORK IN PALEONTOLOGY PLACES THE OLIGOCENE IN THE ZEMORRIAN STAGE. THE SESPE FORMATION WOULD THEN BE CONSIDERED EOCENE IN AGE

FIGURE 2.4

STRATIGRAPHIC COLUMN-SOCKEYE AREA

2/84

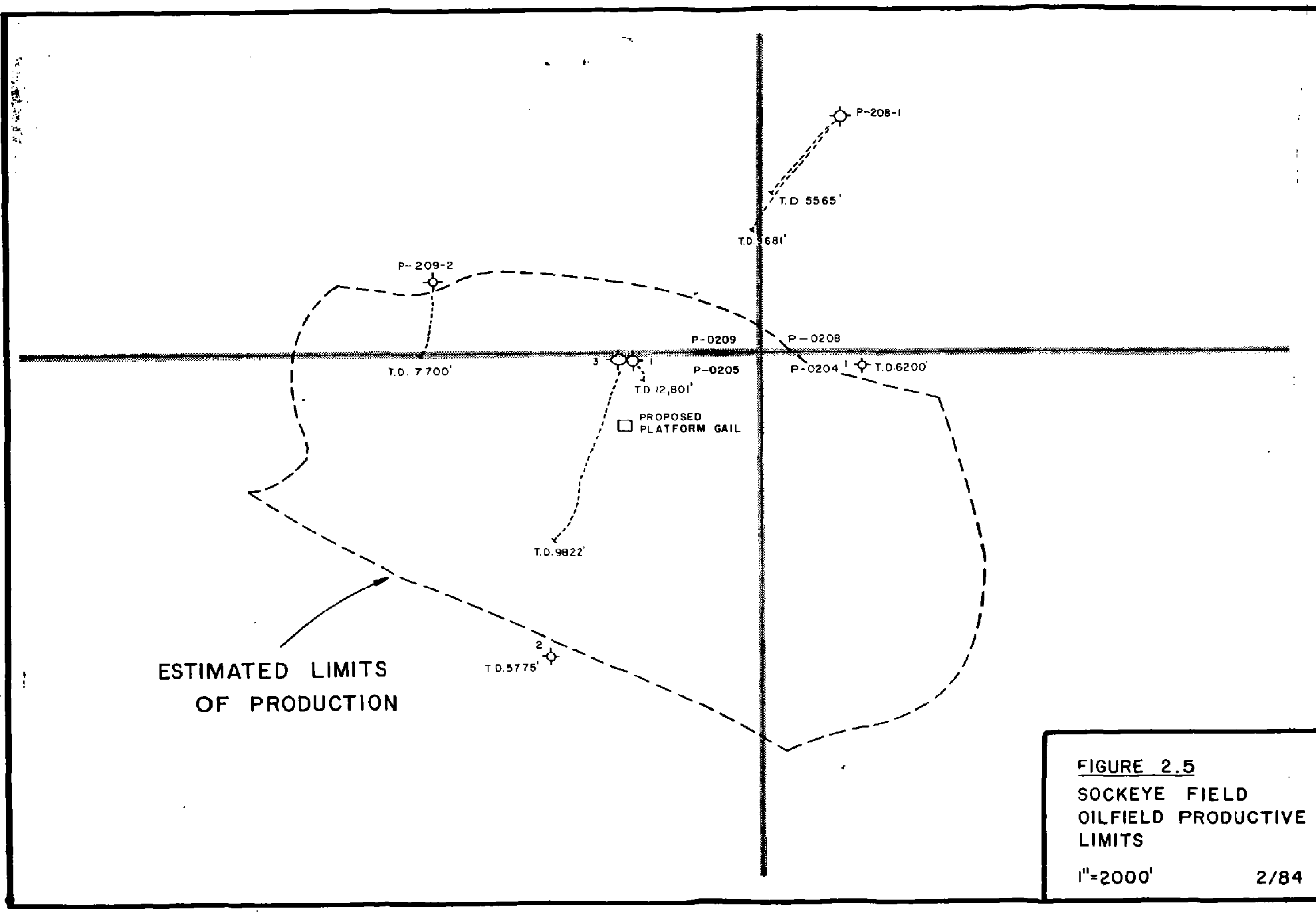


FIGURE 2.5
SOCKEYE FIELD
OILFIELD PRODUCTIVE
LIMITS

1"=2000' 2/84

SECTION 3

PROPRIETARY
RESERVOIR EVALUATION

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Section III – Reservoir Evaluation

Pursuant to the Freedom of Information Act (5 U.S.C. 552) and its implementing regulations (43 CFR Part 2) and as provided in 30 CFR 550.199(b), the information contained in this section is deleted from the public information copy of this submission.

Proprietary

Not for Public Release

SECTION 4

PLATFORM SITE AND CONSTRUCTION

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SECTION 4
PLATFORM SITE AND CONSTRUCTION

4.1 Introduction

Platform Gail will be designed to withstand site-specific environmental, installation and operational loads. The water depth and geology of the area have been evaluated extensively and will not present problems for setting, design or installation. This section describes the methodology that was used to develop the geological, geotechnical, oceanographic, and seismic design criteria. A description of the platform design and installation is also included. Detailed design data will be reviewed under the platform verification program in accordance with OCS Order 8. Design work is being performed by Brown and R^ot, Inc.

4.2 Onsite Geology

The decision to construct and install Platform Gail was made on the basis of geologic data obtained from geophysical records and the drilling of five exploratory wells. This information defined a commercial hydrocarbon accumulation which trends westerly across portions of OCS Leases P 0204, P 0205, P 0208, and P 0209 (Figure 2.6). In order to develop this accumulation adequately, by directional drilling from the shallowest possible water depth having good foundation conditions, five sites were initially considered for locating Platform Gail. From these five sites, the two most advantageous were selected: ^ne in the northeastern corner of OCS Lease P 0205, and one in the southeastern corner ^' OCS Lease P 0209. The P 0205 site is the final site and is the subject of this document (see Figure 2.6). The P 0209 site was an alternative, to be used in the event that the northbound Santa Barbara Channel shipping lane could not be moved. The International Maritime Organization (IMO) approved the lane modification at the 28th session of IMO in London, England in Ocotber 1983. Also during 1983, all concerned regulatory agencies, including the U.S. Department of Transportation and the California Coastal Commission, were provided the opportunity to review and comment on the lane change recommendation.

The lane modification, published in the Local Notice to Mariners on July 11, 1984, was subsequently published by related agencies, such as the National Oceanic and Atmospheric Administration (NOAA). The modification went into effect on February 1, 1985.

During this platform site selection process, site-specific and regional geologic studies were conducted by Woodward-Clyde Consultants (References 2.5.10 and 2.5.11) and Dames and Moore (Reference 2.5.12) at the proposed platform site and along the proposed pipeline route (Figure 1.2). These studies were conducted to assess geologic conditions and to develop geologic and geotechnical design criteria for the platform and pipeline. The conclusion of these studies is that no geologic problems are posed by the chosen platform location and pipeline route. Site-specific findings by the consulting firms for the platform are summarized in the following paragraphs. The pipeline site-specific finds are covered in Section 7.3.

4.2.1 Bathymetry

Ocean floor water depths and sea floor topography at the proposed platform site are shown on Figure 4.1 of this report and Figures 2.1 and 2.2 of Woodward-Clyde Consultants Report (Reference 2.5.10). Water depths within the survey area ranged from 300' (90 m) to 780' (236 m). At the proposed platform site, the water depth is 739' (225 m), as determined during a detailed bathymetric survey by John E. Chance and Associates (Reference 2.5.14).

At the platform site, the ocean floor is generally smooth and slopes southwesterly at a grade of 1.7% (gradient of 1:60, dip of 1^{o}). About one mile to the southwest of the platform site is the Santa Barbara Channel sedimentary basin axis, at a depth of about 780' (240 m). The sedimentary basin edge occurs about 1000' (300 m) southwest of the platform site, where the ocean floor changes to a slope of about 0.5% (1:200 or 0.3^{o}).

To the northeast of the platform site is an area of irregular bathymetry (see northeast corner of Figure 4.1). This disturbed zone was the subject of a detailed geophysical survey by Woodward-Clyde Consultants (Reference 2.5.10). They prepared an isopach map of the disturbed zone (Figure 2.5 of Reference 2.5.10). Slopes range up to 14% (1:7 or 8°) in this hummocky terrain. This area was discussed in more detail in Section 2.3.2.

4.2.2 Ocean Bottom Conditions

The Woodward-Clyde Consultants report (Reference 2.5.10) identifies various sea floor features in the survey area, including a slide terrain area, which forms an irregular bottom topography: areas of dispersed shallow gas; anchor scars; and several sonar targets identified as discarded cables. The area selected for the platform site is generally smooth and undisturbed by any of the above-mentioned features, except dispersed shallow gas, as discussed below in Section 4.2.3.

There was no evidence in either the soil samples or the high-resolution geophysical records of turbidity current activity in the project area. X-rays of cores taken during soil borings showed regular cyclic bedding and did not show the chaotic bedding that would be expected in turbidity current deposits. The geophysical records also did not show chaotic bedding, but did show that locally sediments have tended to move translationally as intact slump blocks, rather than as fluid slurries. Also, turbidity currents are usually associated with submarine canyons and fans, neither of which is present locally. Therefore, turbidity currents do not constitute a hazard or threat to the proposed project.

4.2.3 Shallow Gas and Hydrocarbon Seeps

Dispersed shallow gas occurs over more than two thirds of the survey area, at depths of 28' to 60' (8.5 to 18 m). However, the eastern boundary of the shallow gas zone occurs about 5000 ft. (1500 m) west of the proposed location of Platform Gail (Figure 4.2). Hence the platform site is free of shallow gas. Discussion of the shallow gas zone can be found in Section 7.3.1 of this Development and Production Plan and in the Woodward - Clyde Consultants Geophyical Report (Reference 2.5.10).

4.2.4 Shallow Overbur

An analysis of the soil borings and high-resolution geophysical surveys at the platform site indicated that it is underlain by over 500' (150 m) of Pleistocene to Recent sediments. Woodward-Clyde Consultants identified four soil horizons (Table 4.1). Stratum I, the uppermost stratum, consists of silty clay (CL), about 65' (20 m) thick. Stratum II extends from 65' to 410' (20 m to 125 m) and consists of interbedded silty and clayey sand (SM-SC), silty and sandy clay (CL), and sandy silt (ML). Stratum III extends from 410' to 475' (125 m to 145 m) and consists of sandy clay (CL). The deepest unit, Stratum IV, consists of silty and clayey sand (SM-SC) and sandy clay (CL). Its total thickness is unknown, but it extends past at least 500' (152 m).

For the purpose of determining geotechnical characteristics, Woodward-Clyde Consultants (Reference 2.5.11) made extensive laboratory tests on the soil samples recovered from the borings taken at the proposed platform site. This report should be referred to for geotechnical details and laboratory reports.

4.2.5 Shallow Structural Geology

In the site-specific high-resolution geophysical surveys, penetration was greatly diminished by the extensive areas of shallow gas. The acoustic impedance contrasts at the interface of the gassy sediments and overlying sediments produces a relatively high reflection coefficient. The high reflection coefficient manifests itself on the seismic reflection profiles as a bright strong reflection at the interface. Although a strong reflector is present at the interface, attenuation of the seismic energy due to absorption in the gas horizon is severe enough to limit penetration of the incident seismic wave. In areas where no gassy sediments were detected, acoustic penetration of the sparker and UNIBOOM profiling systems was up to eight times greater than the penetration in the gassy areas.

Hence, the eastern portion of the survey area that lacks the shallow gas (where Platform Gail is sited) offers the best insight into the shallow structure of the survey area. At the shelf edge and slope, seismic profiles display a steeply dipping sequence of foreset shelf sediments overlying unconformably an erosional surface of unknown age. This erosional surface extends out from under the shelf into the basin. The basinward migration of these dip-slope, foreset shelf sediments has resulted in a continual increase in slope of the younger sediments. Basin sediments have successively lapped onto the base of the prograded foreset beds.

On several of the survey lines in the eastern area, an ancient buried slide can be mapped, as shown in Figure 4.2. The buried ancient slide mass has a general lens-shaped appearance, marked by chaotic internal reflectors and a rubble-like area at the toe of the slide. The portion of the slide plane underlying these buried slide deposits is inactive and apparently corresponds to an unconformity.

Examination of the geophysical data indicated no apparent faulting shallow enough to be detected with the types of subbottom profiling systems used during the survey. However, the presence of shallow gas reduced the penetration of the subbottom profiling systems and made it impossible to fully assess the possibility of faulting over much of the area. The maximum inferred age of strata seen on the seismic profiles is Quaternary, and it appears that, if there are faults in the survey area, they have not displaced the upper Quaternary to Recent sediments.

Aquatronics, Inc., (Reference 2.5.8) interpreted two normal faults toward the western end of the survey area. These two faults could not be found on any of the seismic records during Woodward - Clyde Consultants' more detailed survey. The youngest faulting reported by Aquatronics predates the upper Pliocene. Therefore, it can be concluded that there is no active faulting in the project area.

4.2.6 D^ep Drilling Hazards

No abnormal drilling hazards are expected during drilling of the proposed wells. Chevron's drilling program will contain a casing program that will be in accordance with OCS Order #2 - Drilling Procedures. The deepest hole drilled in the area, OCS-P 0205 #1, was safely drilled to a measured depth of 12,801' (3902 m).

4.2.7 Earthquake Activity

The Santa Barbara coastal area is located within a seismically active portion of Southern California. Earthquake activity within this area that might impact the platform was investigated by Dames & Moore (Reference 2.5.12). Their study included a probabilistic seismic risk analysis which considered all the potential seismic sources shown in Figure 4.3 (as well as several faults which lie outside of the mapped area) and listed in Table 4.2. They then used an attenuation relationship to derive site-specific accelerations at the Platform Gail location. Using this method, Dames & Moore recommended a strength level design response spectrum that has a 0.22 g peak horizontal ground acceleration at the mudline for a 270 year return period (probability of about 0.10). The corresponding peak velocity is approximately 8 in./sec. Similarly, a response spectrum for ground motions from "a rare, intense" or "extreme" event in rock/stiff sand was developed. Their analysis concluded that the potential accelerations from such an event would be 0.55 g for the rock spectrum and 0.35 g for the mudline spectrum. Such an event would have a probablity of exceedance of only 0.008 within the 30 year project life, or a return period of almost 4000 years.

Dames & Moore used a phased interdisciplinary approach to determine the potential earthquake ground motion at the proposed platform site. This procedure required 1) the determination of geotechnical soil properties from site specific soil borings; 2) seismotectonic modeling of the Santa Barbara Channel area 3) the determination of seismic risk and probable ground acceleration during both "extreme" and "strength" level seismic events; and 4) the development of both an "extreme" and "strength" level response spectrum for Platform Gail. Their procedure, described in Dames & Moore's report to Chevron (Reference 2.5.12), as follows:

1. Subsurface soil characteristics were determined (Reference 2.5.12).

2. Faults believed to be active or potentially active were mapped using compiled geologic and seismic information (Figure 4.2, and Appendix A of Reference 2.5.12).

3. A source model for the generation of significant earthquakes was constructed. Table 4.2 lists these faults along with their distances from the proposed platform site and their estimated limiting maximum earthquakes (i.e. "Extreme event").

4. A seismic risk analysis was conducted by combining the source model with acceleration levels at the site (Plate 5, Reference 2.5.12) and with seismic activity (Plate 4, Reference 2.5.12). In addition, background seismicity not associated with a specific source was also specified.

5. A 270-year mean recurrence interval was used to select a zero period acceleration for the design response spectrum (Plate 7, Reference 2.5.12). An extreme response spectrum (Plate 8, Reference 2.5.12) was constructed. On Table 4.2, the limiting magnitude earthquakes are also the extreme level events.

As part of Federal requirement OCS Order #8, Chevron will determine the proposed platform's structural response to earthquake loads. A Certified Verification Agent (CVA) will also verify the earthquake design for Platform Gail.

The intent of the Federal requirements is to insure that structures subjected to earthquake loading have adequate energy absorption capacity to prevent collapse under a rare intense earthquake. This ductility check must demonstrate that the structure-foundation system is capable of absorbing at least four times the amount of energy associated with the level of structural response determined in the strength analysis with the structure remaining stable.

The studies by Dames & Moore (Reference 2.5.12), and Woodward-Clyde Consultants (Reference 2.5.11) conclude that the platform site will not be affected by a sudden fault displacements, ground failure, or tsunamis. They also present the following conclusions concerning the possible failure modes of the near-surface sediments from earthquake activity:

1. round

A review of the published literature and an analysis of the test borings and high resolution geophysical survey indicates that there are no active fault traces beneath the proposed site. Therefore, ground rupturing from fault movement is not anticipated during any earthquakes.

2. Ground Failure

(a) Liquefaction

The subsurface soils at the proposed site can safely support the proposed drilling and production equipment. Studies to evaluate soil properties and liquefaction at the proposed site indicate that the potential for liquefaction at the proposed site is extremely low (Reference 2.5.10).

(b) Site Stability

Woodward-Clyde Consultants (Reference 2.5.10) conducted a stability analysis for the Platform Gail area which included two types of loading: gravity loading controlled by the slope angle, and earthquake loading controlled by the magnitude and duration of the shaking at the site. Slopes of 1.5° (platform area), 4° (overall slope north of the platform area), and 10° (local slopes in the northern "disturbed area").

The stability analysis indicated that permanent displacements during the strength-level event would be as high as about 15 inches (38 cm) for the steep slopes in the northern area and negligible in the platform area.

Permanent displacements for the 0.35g extreme event however, ranged up to 40 inches (102 cm) for the extreme event for the disturbed area. Using extremely conservative assumptions on the mode of failure, remolded strength of soils, and topography near the "toe" of the northern slope area, the maximum amount of slope displacement is estimated to be up to 280' (85 m). However, since the proposed platform location is over 2400' (700 m) from the "toe" of the northern slope area, the effects of soil displacement in the northern slope even on the order of a few hundred feet on the response of the platform is considered to be negligible (Reference 2.5.10).

For the platform area during the extreme event, permanent displacements were expected to be on the order of 0.5 inches (1.3 cm) or less.

4.2.8 Tsunami Hazards

Based on published records and the location of the platform site in relatively open water, tsunami damage will not be a factor to be considered at the proposed platform location. Tsunamis or seismic waves are large oceanic waves that are generated by earthquakes, submarine volcanic eruptions or large submarine landslides. The waves are formed in groups having great wavelength and a long period. In deep water, wave heights (crest to trough) may be a few meters or less, wavelengths may be a hundred miles or more and with velocities greater than 400 knots (460 mph). However, as a tsunami enters shallower waters, the wave velocity diminishes and their heights increase. Waves can crest at heights of more than 100' (30 m) and strike with devastating force. Tsunami waves do not impact vessels or structures in open water because of their low amplitude and great breadth.

The largest tsunami ever reported in California followed the 1812 earthquake in the Santa Barbara Channel. This wave may have reached land elevations of 50' (15 m) at Gaviota and 30 35' (9-11 m) at Santa Barbara. The most recent tsunami to impact the California coast line occured following the 1964 Alaskan earthquake. Only minor damage was sustained by small craft in some of the coastal harbors.

4.2.9 Subsidence

Surface subsidence due to reservoir fluid withdrawal is not expected to be a problem at the Sockeye field for the following reasons:

1) The region has been in compression since the early Pleistocene.

2) The trapping structure, at the reservoir depth, has a good arch-supporting structure with associated thrust faulting.

3) The depth of burial of the oil producing section is over 3500' (1100 m) below the ocean floor. This thick section of overburden will furnish additional support.

4.2.10 Hydrology

In the Sockeye oilfield area, the electric log record begins at 885' (270 m) drilled depth, or 135' (41 m) below the ocean floor. The logs indicate that there are no sands above 1160' (355 m) drilled depth (410' or 125 m below the ocean floor) in the OCS P 0205 #3 well. Sands below this depth in this well, and sands in the OCS P 0204 # 1 well, are estimated from log analysis to contain brackish water of approximately 4000 parts per million chlorides, which would not be suitable for human consumption.

According to a U.S. Geological Survey investigation (Reference 2.5.7), the Platform Gail proposed location falls close to the fresh water-salt water interface in the Grimes Canyon aquifer, which is the most extensive aquifer in the area. The aquifer mapped by the U.S. Geological Survey may correspond to the sands observed in wells OCS P 0205 #3 and P 0204 #1.

During the geotechnical investigations for Platform Gail, subsurface soil sampling recovered interbedded silts, clays and thin sands. Even though pore water salinities ranged from 25,000 to as low as 5000 parts per million, the area could not be considered an important fresh water source zone, due to the siltiness and clayiness as well as the thinness of the sand lenses.

4.2.11 Other Mineral Deposits

Other than hydrocarbons, there are no other known mineral deposits of either commercial or noncommercial value on or adjacent to Leases OCS P 0204, P 0205, P 0208, and P 0209.

4.3 Cultural Resources

The area around proposed Platform Gail and along the route of the proposed pipeline from Platform Gail to Platform Grace was evaluated for cultural and archaeological resources. Woodward-Clyde Consultants (Reference 2.5.10) retained the services of Dr. E. Gary Stickel of Environmental Research to make this evaluation. Their report was done in accordance with Minerals Management Service's order NTL 77-3 dated March 1, 1977. This order requires a cultural survey to be made only in waters of less than 394' (120 m) in depth.

Dr. Stickel concluded from this review that there are no identifiable prehistoric cultural resources in the area of the proposed projects. Side scan sonar showed no anomalies that could be interpreted as possible shipwrecks.

4.4 Platform Structure

4.4.1. Geotechnical Design Criteria

Platform foundation design criteria for Platform Gail will be based on geotechnical information obtained from extensive state-of-the-art investigations conducted in early 1981 by Woodward Clyde Consultants (Reference 2.5.11). The information was obtained from pushed sample recovery, downhole cone penetrometer testing, in-situ remote vane testing, and gamma ray logging in deep boreholes. Results from the offshore boring program indicate that soil conditions at the platform site are favorable for the proposed construction and that potential liquefaction and slumping in subsurface soils will not be a hazard.

The static and dynamic laboratory program consisted of both conventional (classification, consolidation, permeability, miniature vane, triaxial, direct shear, and static and simple shear strength) and special (cyclic triaxial, cyclic simple shear, and resonant column) testing. The testing and analyses defined soil shear strength characteristics, lateral pile responses, axial pile responses, potential for scour, and the potential for soil liquefaction. All associated boring logs, laboratory test results, and engineering reports will be included in the detailed platform design submittal to the Minerals Management Services (MMS) in accordance with the P -tform Verification Program (MMS OCS Order No. 8). Platform foundation design criteria will be site specific for the Gail site and will be checked against API-RP2A guidelines for establishing minimum design criteria.

4.4.2 D-sign Standards

The platform structure will be designed in compliance with the MMS OCS Order NO. 8, API RP2A "Recommended Practices for Planning, Designing and Constructing Offshore Platforms", and applicable American Institute of Steel Construction (AISC) guidelines. Additionally, the platform will meet or exceed all the elements of the MMS's "Requirements for Verifying the Structural Integrity -' OCS Platforms".

4.4.3 Environmental Design Criteria

Design criteria for the platform are based on a 33 - 35 year platform life.

4.4.3.1 Earthquake Design Criteria

The earthquake design criteria are based on a detailed evaluation of earthquake potential in the western portion of the Santa Barbara Channel. They specifically account for the regional and local geologic structure, local active faulting, and local soil conditions. The design criteria are site specific. The platform design will meet both strength and ductility requirements for earthquake loading (see Section 4.2.7).

The strength requirement assures resistance to those ground motions most likely to occur during the platform's life without the platform sustaining any significant structural damage. The strength level design site motion is expressed in terms of a smoothed response spectrum. The response spectrum method of analysis is used to evaluate the platform's dynamic elastic response to earthquake ground motion.

The ductility requirement provides a platform-foundation system that has sufficient energy absorption capacity such that the platform will not collapse in the event of rare intense ground shaking. Careful joint detailing and fabrication will ensure that the structure performs as designed under earthquake loading. The seismic environment does not present any problems that preclude the safe design, installation, and operation of the offshore structure.

4.4.3.2 Oceanographic Design Criteria

The oceanographic design criteria provide for waves, currents, tides, and winds which may occur during the expected life of the structure. A review of existing oceanographic data has been made to develop estimates of these values. Hindcasting models were made to provide required site specific information. An analysis of the oceanographic data and hindcast models indicate that oceanographic conditions offer no problems for the safe design, installation and operation of the offshore structure.

a. Waves

A sophisticated wave hindcast model which develops the directional wave spectrum was used to determine design waves at the platform site during selected west coast storm events. The model was developed by Chevron Oilfield Research Company (COFRC) and verified with site specific measurements. This state-of-the-art technology was used to determine design wave heights.

b. Currents

Extreme ocean current velocities were based on an analysis by COFRC combining tidal wind driven and general background currents as a function of depth. The study was based on on-site measurements, historical data and theoretical considerations.

c. Wind

COFRC compiled an extensive meteorological data set obtained offshore during past significant storms to provide the most accurate wind design criteria available. With this data COFRC determined sustained wind velocities and gust velocities for which the platform will be designed to withstand.

d. Marine Growth

An extensive study of marine growth on other Santa Barbara Channel platforms will provide the basis for the marine growth design criteria.

4.4.4 Platform Design

The platform structure will be designed in compliance with the MMS OCS Order No. 8, API RP 2A "Recommended Practices for Planning, Designing and Constructing Offshore Platforms," and applicable American Institute of Steel Construction (AISC) guidelines. The structure will be designed for the most severe loads that might occur during launch, installation and during operations, and to safely withstand loads caused by severe storm waves or the level of earthquake groundshaking appropriate for the seismic region.

The design work is being performed by Brown & Root, Inc., and will be verified by a Certified Verification Agent according to MMS OCS Order No. 8. The design will consist primarily of stress analyses using established site specific design criteria to evaluate structural responses to extreme oceanographic, installation, operational, fatigue, and earthquake loading conditions. A comprehensive detailing of design criteria, site conditions, design analyses, and structural design will be provided as part of the Verification Documentation. A conceptual description of the proposed platform follows:

The platform will be a single piece, eight leg conventional jacket type platform installed in 739' (225 m) of water. The jacket will support a three-level deck including well conductors. The deck structure will provide space and load carrying capability for one drilling rig and oil and gas production facilities. Layout arrangements of the drilling and production decks are shown in Figures 4.4, 4.5, 4.6, and 4.7.

4.5 Platform Installation

Fabrication and installation will follow conventional procedures for such structures. Complete details for the platform will be provided as part of the Verification Documentation pursuant to MMS OCS Order No. 8. Installation of the platform and commissioning of the facilities will require four to six months. Major marine equipment required for installation of the platform will include a derrick barge or ship, the jacket launch barge, cargo barges, tug boats, supply boats, and crewboats.

Generalized procedures applicable to the platform are as follows:

4.5.1 Fabrication

The principal components of the platform; the jacket, piling, and deck modules will be fabricated and assembled in onshore yards. Sites for construction and assembly will be determined when contracts are awarded.

4.5.2 Jacket Tow and Launch

Upon completion of fabrication, the jacket structure will be loaded onto a transportation/launch barge and secured for tow. The jacket will be towed from its fabrication site to the installation area, where it will be launched from its transport barge and floated horizontally in the water.

4.5.3 Jacket Upending

Following launch, the jacket will be towed to its installation site and upended by the flooding of selected leg compartments. Final positioning will be made with the derrick barge and further flooding will set the jacket on the sea floor.

4.5.4 Pile and Conductor Installation

The main piles will be installed through the jacket legs in approximately 100' (30 m) long welded sections. The skirt piles will be installed through pile sleeves and driven to their design penetration with the aid of a retrievable follower. Design penetration is estimated to be 300' (90 m) below the mudline. Both main and skirt piles will be grouted to the jacket structure. The well conductors will be installed with the drilling rig at the time each well is spudded.

4.5.5 Deck Setting

Deck units will be set and welded to the jacket top for support of the modules structure. The top sides, composed two decks of (east and west) and four modules with production equipment pre-installed, will be transported by barge from the assembly site to the offshore installation site. The modules will be lifted by the derrick barge, set on top of the decks and welded into place. The flare boom and other miscellaneous components will then be attached to the deck structure.

4.5.6 Hookup and Com

Following setting of the decks and modules, offshore crews will make structural, piping, electrical and instrumentation interconnections between modules, and will test and commission all systems.

4.6 Platform V'-ibility

Aids to navigation will consist of four quick-flashing, Coast Guard approved, five-mile white lights (one light at each corner of the platform), and a Coast Guard approved 2-mile fog horn. A'' ~ids to navigation will meet Coast Guard regulation 33 CFR 67.20. The platform will be painted a bright, highly visible color per Coast Guard recommendation.

4.7 Shipping Lanes

Platform Gail will be located 2054 feet (622 m) outside of the buffer zone of the vessel traffic separation system (VTSS) and 3,694 feet (1,126 m) from the north bound shipping lane. See Figure 4.8 for the platform location in relation to the shipping lanes.

In 1981 the U.S. Coast Guard conducted a vessel routing survey for commercial vessels calling at the ports of Los Angeles and Long Beach. The results of the survey indicated that 99 percent of the ships using the Channel used the V^ssel Traffic Separation Scheme as opposed to alternate routes. Thus it may be concluded that these vessels will also fo''ow the pivoting of the VTSS north of Port Hueneme discussed in the following paragraph. While increased levels of transiting vessels are projected for the channel, the great majority of ships will travel within the designated traffic lanes, thus reducing the potential for marine traffic hazards. Between 1976 and 1980 the average number of daily ship movements through the Santa Barbara Channel Vessel Traffic Separation Scheme increased from 6.5 to 13 ship movements per day in each direction. This increase can be attributed to two primary factor-: 1) the increase in number of vessel arrivals and departures at the ports of Los Angeles and Long Beach and 2) the percentage of total north-south ship movements in the area that use the VTSS has increased from 77 to 93 during that period (Texaco, 1983).

On June 15, 1981, the U.S. Coast Guard submitted the Port Access Route Study (PARS) to the U.S. Coast Guard Headquarters in Washington, D.C. The study included a number of recommendations, one of which was to pivot the shipping lanes north of Port Hueneme approximately 1/4 to 1/2 mile (0.4 to 0.8 km) northwest, closer to the Channel Islands. This change will effectively shift the VTSS 1/2 mile (0.8 km) south closer to Anacapa Island and approximately 2/3 of a mile (1.1 km) from Platform Gail (Figure 3.5-4). This specific recommendation was made to eliminate oil and gas resource conflicts within the Santa Barbara Channel, and specifically in the Sockeye Field which includes Platform Gail. During the spring of 1982, notice of the proposed change was published in the Federal Register. A public hearing and comment period followed publication of the notice and continued through the end of June 1982. In late 1982, the Coast Guard submitted the recommendations to the International Maritime Organization (IMO), who reviewed the proposals. IMO approved the lane modification described above at the 28th session of IMO in London, England in October 1983. Also during 1983, all concerned regulatory agencies, including the U.S. Department of Transportation and the California Coastal Commission, were provided the opportunity to review and comment on the lane change recommendation.

The lane modification, published in the Local Notice to Mariners on July 11, 1984, will subsequently be published by related agencies, such as the National Oceanic and Atmospheric Administration (NOAA). As with all international agreements, the modification will not go into effect until February 1, 1985, due to the lead period required for the revision of navigational charts. The deadline was further extended to March 1985 at the request of Union Oil, who will be conducting exploratory drilling on Lease Tract P-0203.

Chevron is committed to the use of a United States Coast Guard approved Automatic Radar Plotting Aid (ARPA) unit to be installed on a platform or a standby boat in the Santa Clara unit area. Platform Gail will be alerted of an approaching vessel's location by an ARPA unit. The north bound shipping lane will be monitored in the east to southwest direction. This system allows for the setting up of "Guard Rings" such that when a target penetrates the ring, an alarm will be activated. The radar will track up to 20 targets and will plot their course in relation to the platform. The targets' heading, speed, etc., can be listed on a data panel.

As soon as an approaching vessel appears on the radar's designated surveillance area and there appears to be potential conflict, platform personnel will attempt to make VHF radio contact. Commercial ships are required to monitor VHF Channel 16, the distress and call frequency. When radio contact is made, the observer will ascertain the vessel's intentions and insure that the vessel will pass the platform at a safe distance. If radio contact cannot be made before an approaching vessel closes within a designated safe distance of the platform, the observer will dispatch a boat or helicopter to alert the approaching ship of the platform ahead.

The actual time of dispatch of the boat or helicopter will depend upon the speed and course of the approaching vessel as determined from the observer's vessel tracking.

4.3 Platform Removal

When the reservoir produced from Platform Gail is depleted, the platform will be removed in accordance with the applicable MMS regulations. The structure will be disposed of or used as an artificial reef as dictated by the applicable environmental engineering and economic restraints at the time. Ultimate disposition of the platform (i.e. salvage for scrap, salvage for placement as an artificial reef, etc.) will depend on various factors which must be addressed at that time.

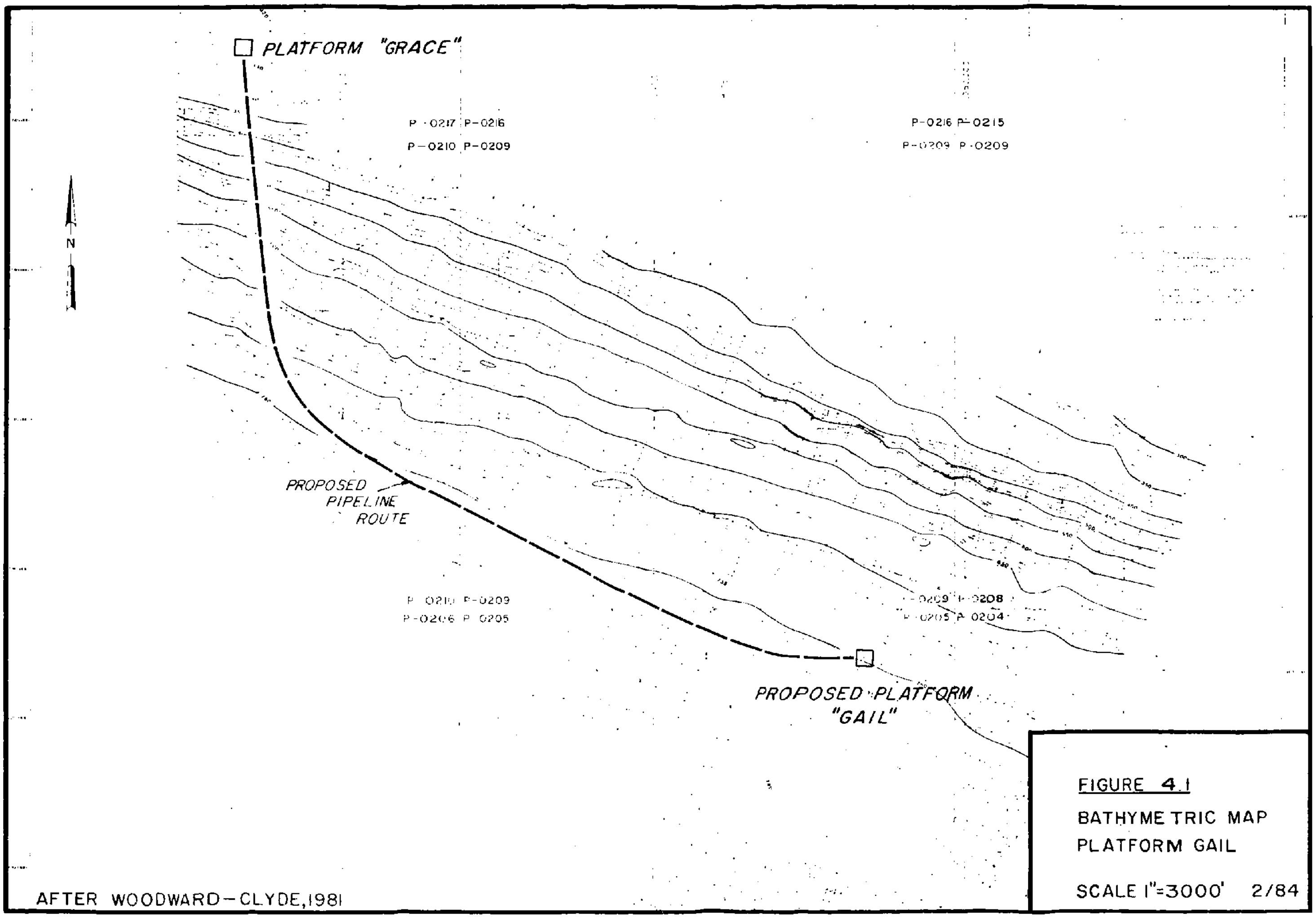


FIGURE 4.1

BATHYMETRIC MAP
PLATFORM GAIL

SCALE 1"=3000' 2/84

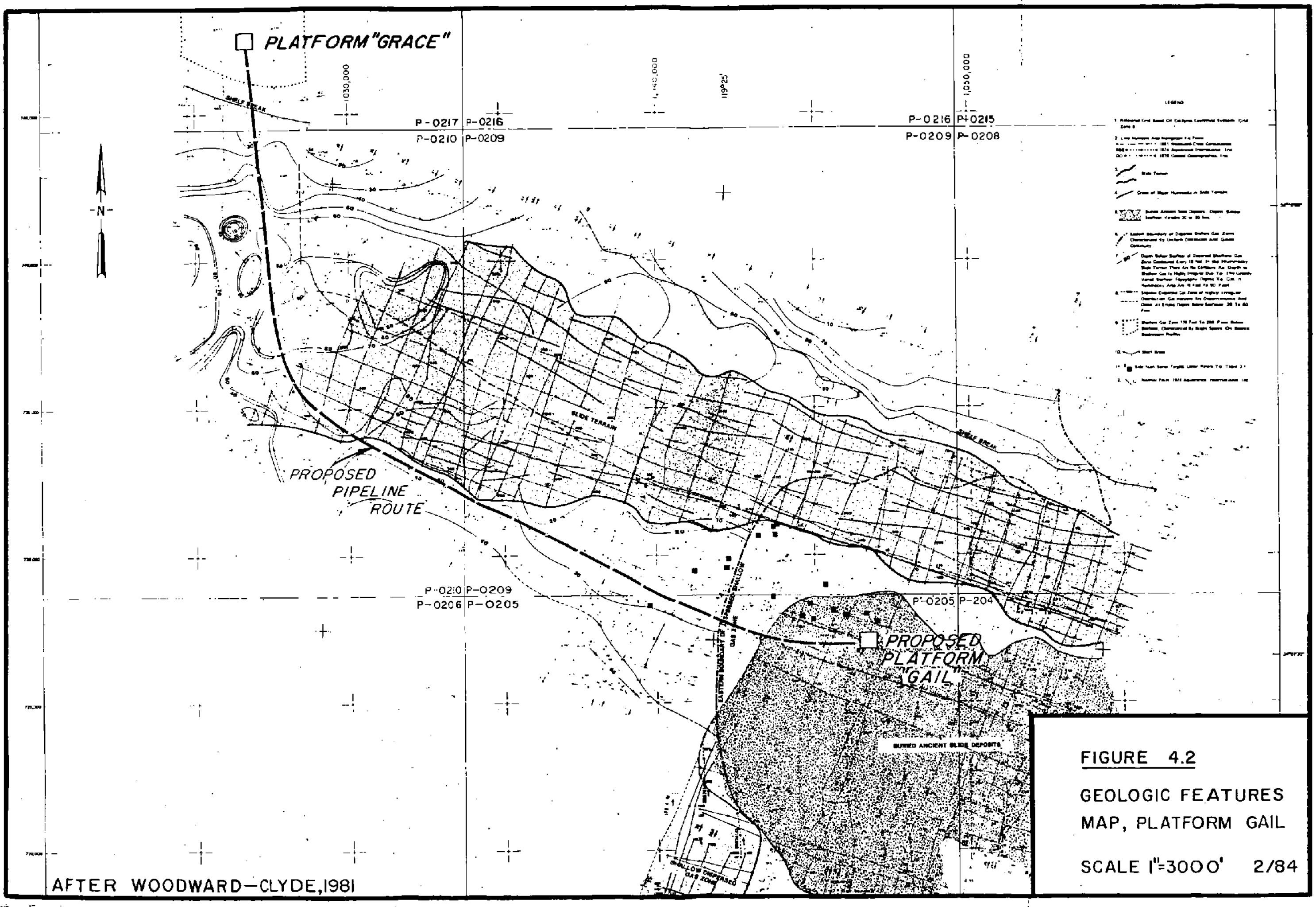


FIGURE 4.2

GEOLOGIC FEATURES MAP, PLATFORM GAIL

SCALE 1"=3000' 2/84

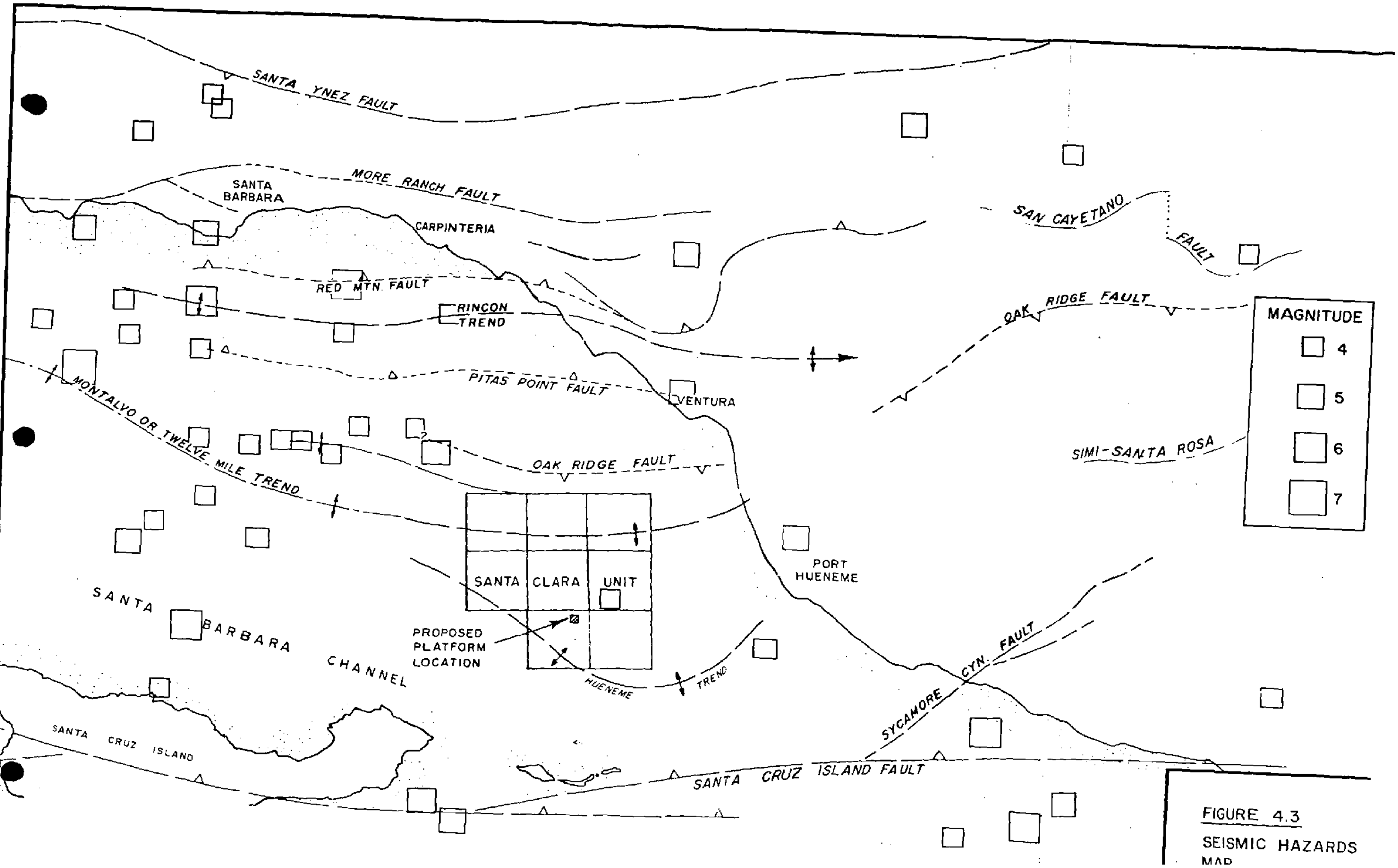
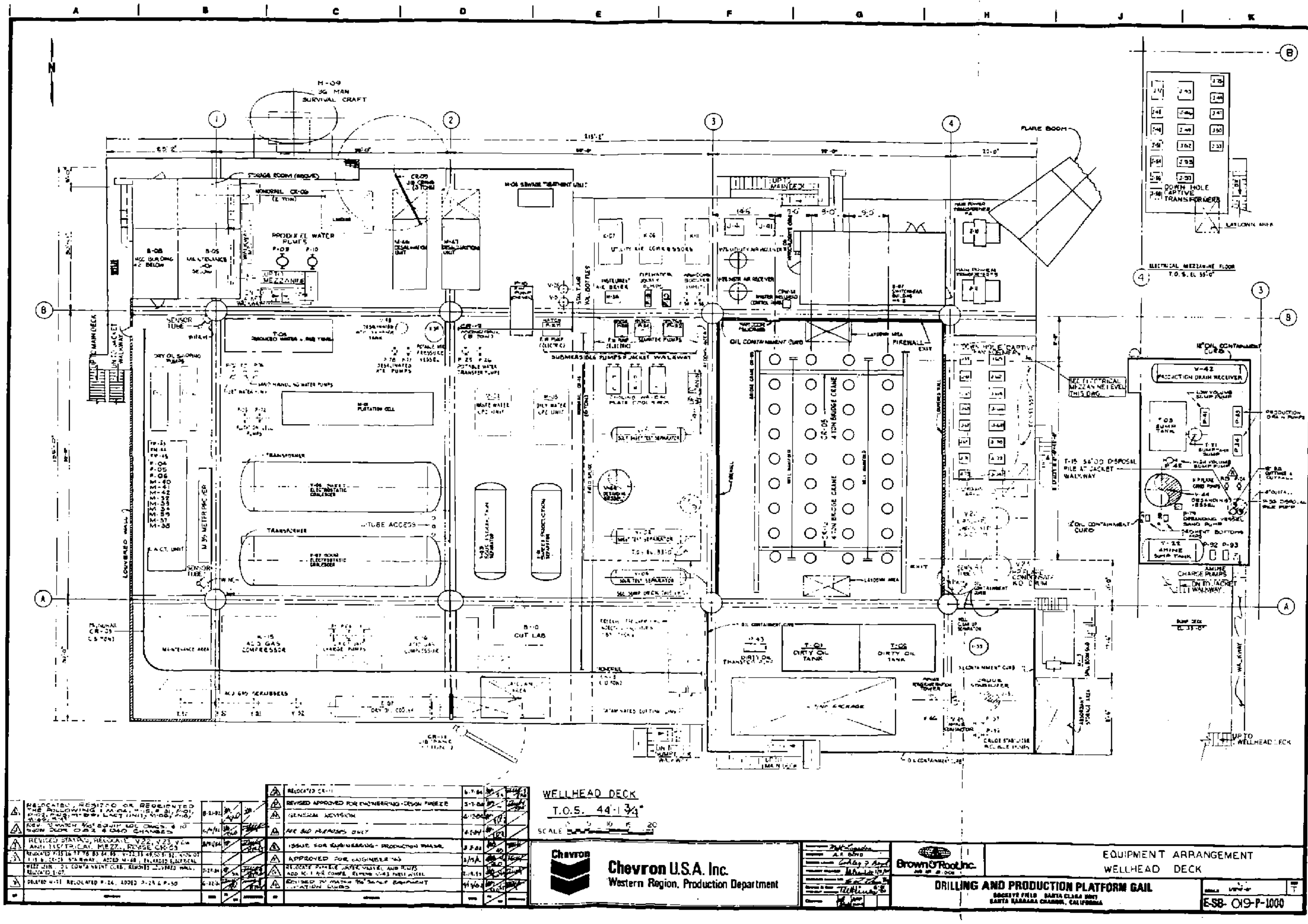
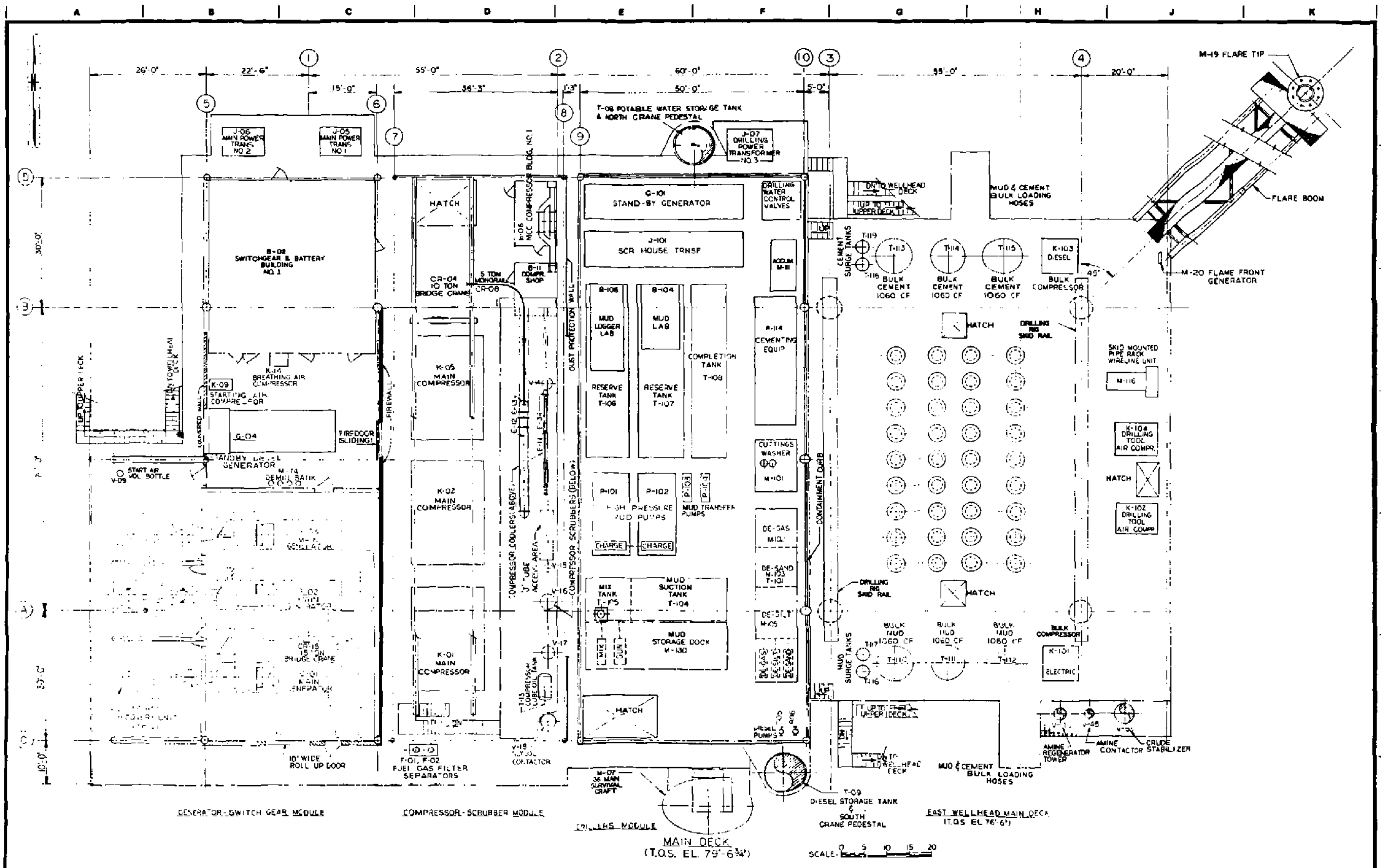


FIGURE 4.3

SEISMIC HAZARDS MAP


M-09
36 MAN
SURVIVAL CRAFT
FLARE BOOM
DOWN HOLE
CAPTIVE
TRANSFORMERS
PRODUCED WATER
PUMPS
B-08
MCC BUILDING
B-05
MAINTENANCE
CR-05
4 TON BRIDGE CRANE
OIL CONTAINMENT CURB
FIREWALL
EXIT
TRANSFORMER
TUBE ACCESS
LOUVERED WALL
SENSOR TUBE
SUBMERSIBLE PUMPS/JACKET WALKWAY
UTILITY AIR COMPRESSORS
K-15
ACI GAS
COMPRESSOR
B-10
CUT LAB
T-01
DIRTY OIL
TANK
T-05
DIRTY OIL
TANK
V-42
PRODUCTION DRAIN RECEIVER
V-33
AMINE
SUMP TANK
AMINE
CHARGE PUMPS
T-15 54" OD DISPOSAL
PILE @ JACKET
WALKWAY
OIL CONTAINMENT
CURB
ELECTRICAL MEZZANINE FLOOR
T.O.S. EL 55'-0"
UP TO
WELLHEAD DECK
WELLHEAD DECK
T.O.S. 44'-1 3/4"
SCALE
5
10
15
20
RELOCATED CR-11
REVISED APPROVED FOR ENGINEERING-DESIGN FREEZE
GENERAL REVISION
FOR BID PURPOSES ONLY
APPROVED FOR ENGINEERING
DELETED M-31 RELOCATED P-24, ADDED P-29 & P-50
Chevron
Chevron U.S.A. Inc.
Western Region, Production Department
Brown & Root, Inc.
EQUIPMENT ARRANGEMENT
WELLHEAD DECK
DRILLING AND PRODUCTION PLATFORM GAIL
E-SB-019-P-1000



1	FOR BID PURPOSES ONLY				RELOCATED T-15, M-74		
2	GENERAL REVISION - REDRAWN	4-12-84			DELETED K-03, K-04 AND REVISED G-04, K-01, K-02, V-09	7-21-84	
3	REVISED APPROVED FOR ENGINEERING - DESIGN FILE	5-7-84			REVISED STAIRS		
4	REVISED B-02, RELOCATED K-03 & K-04, J-05 & J-06, P-01 & P-02, ADDED V-19	6-7-84					
NO.	REVISION	DATE		NO.	REVISION	DATE	APPROVED

Chevron U.S.A. Inc.
Western Region, Offshore Projects Department

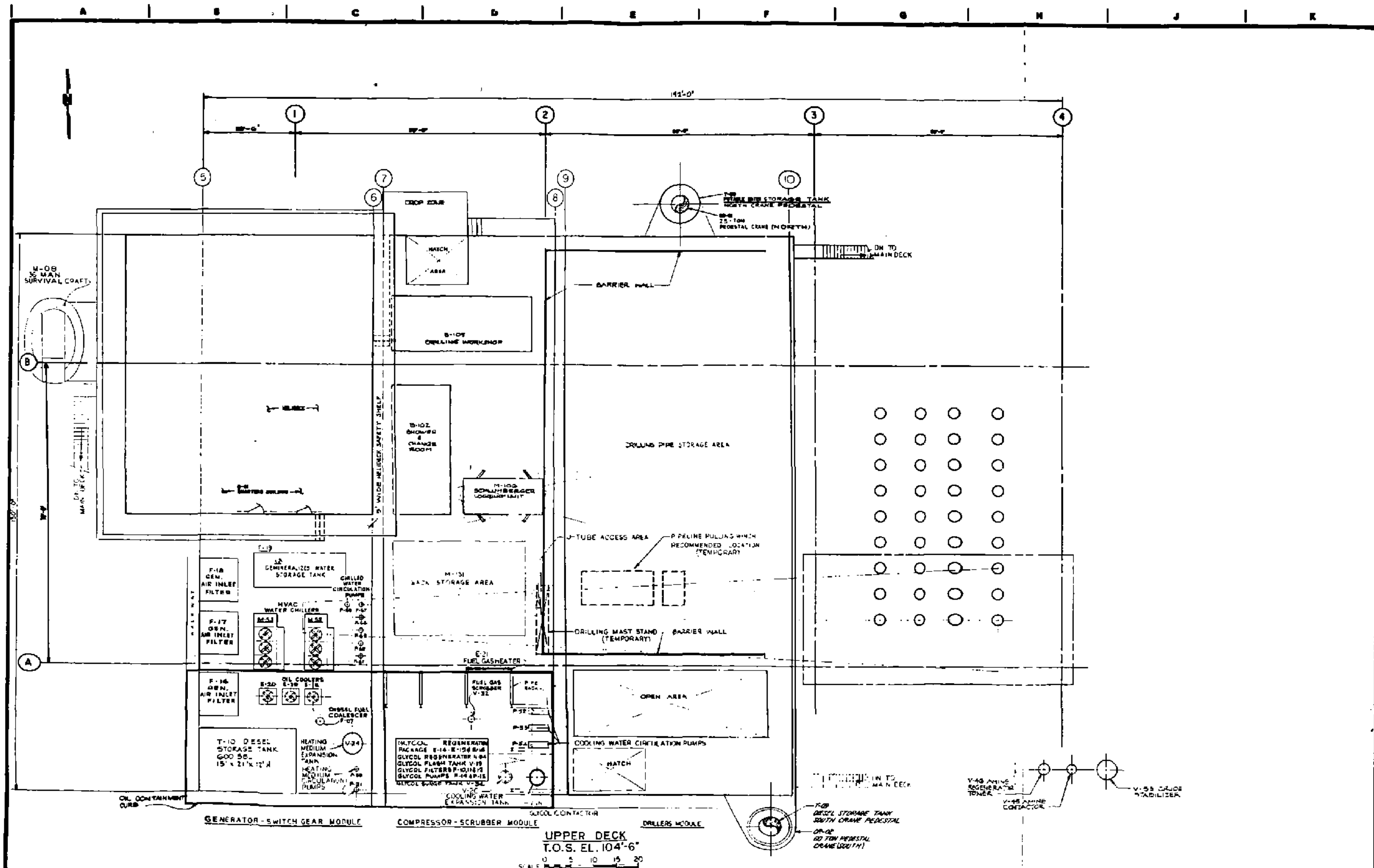
Brown & Root, Inc.

EQUIPMENT ARRANGEMENT
MAIN DECK

DRILLING AND PRODUCTION PLATFORM GAIL
SOCKEYE FIELD SANTA CLARA UNIT
SANTA BARBARA CHANNEL, CALIFORNIA

SCALE 1/8" = 1'-0"

E-SB-019-P-1010



REVISED TO MATCH 3/16 EQUIPMENT LOCATION DRAWING		REVISED APPROVED FOR ENGINEERING-DESIGN FREEZE	5-7-84	
REVISED PER PIPING DWG'S & DCOR-027 4064		DELETED B-20, RELOCATED V-18	6-7-84	
FOR BID PURPOSES ONLY		RELOCATED F-19	6-22-84	
GENERAL REVISION	4-12-84	REVISED STAIRS	9-11-84	

Chevron U.S.A. Inc.
Western Region, Production Department

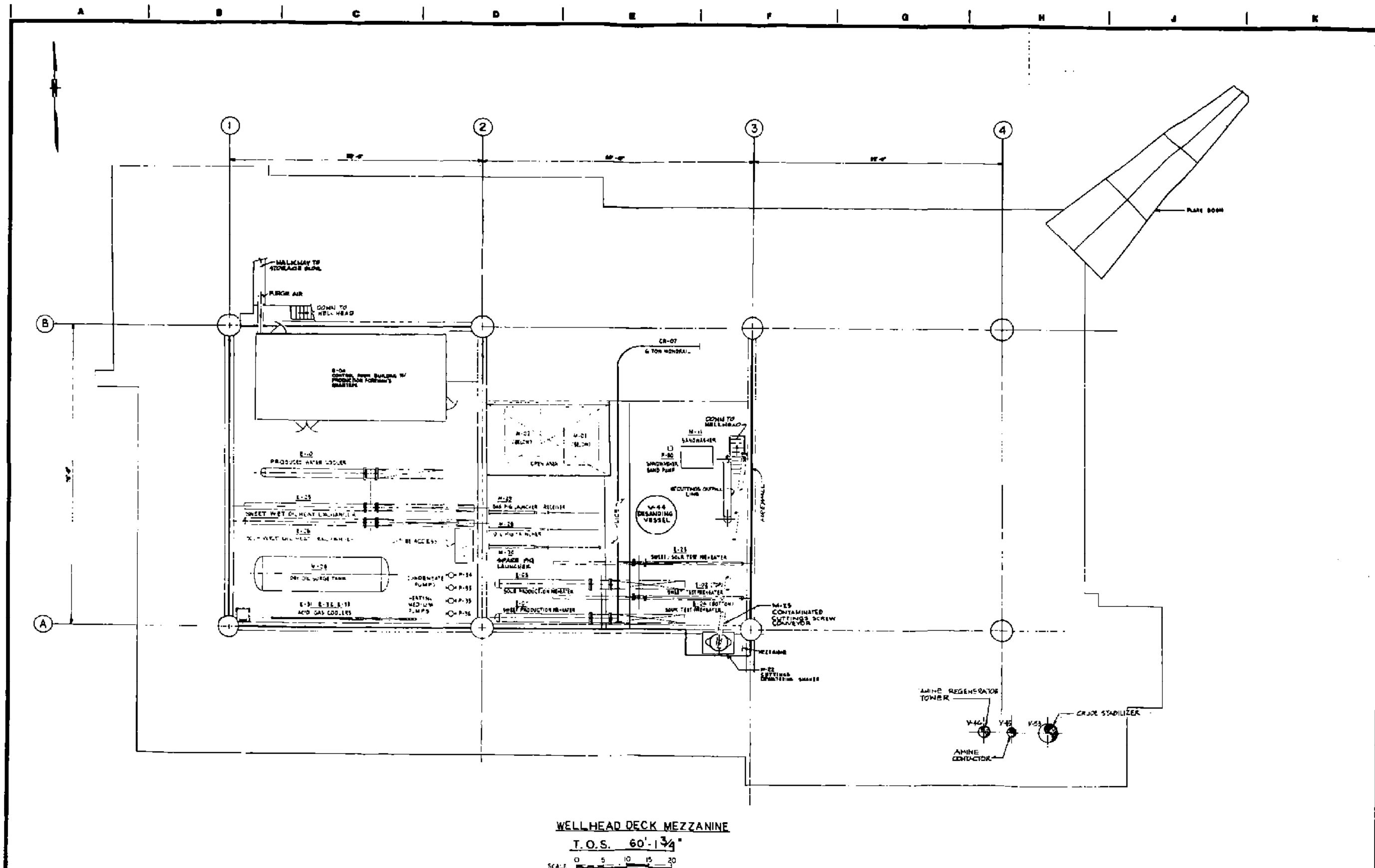
A.F. BOYD

Brown & Root, Inc.

EQUIPMENT ARRANGEMENT
UPPER DECK

DRILLING AND PRODUCTION PLATFORM GAIL
SANTA CLARA UNIT
SANTA BARBARA CHANNEL, CALIFORNIA

ESB-019-P-1020



GENERAL REVISION		GENERAL REVISION			
REVISED APPROVED FOR ENGINEERING DESIGN FREEZE		REVISED STAIRS			
RELOCATED M-28, M-29 & M-30, ADDED P-35 & P-36		REV. M-26 & M-25			
RELOCATED P-80		FOR BID PURPOSES ONLY			

Chevron U.S.A. Inc.
Western Region, Production Department

Brown & Root, Inc.

EQUIPMENT ARRANGEMENT
WELLHEAD DECK MEZZANINE

DRILLING AND PRODUCTION PLATFORM GAIL

ES8-019 - P-1050

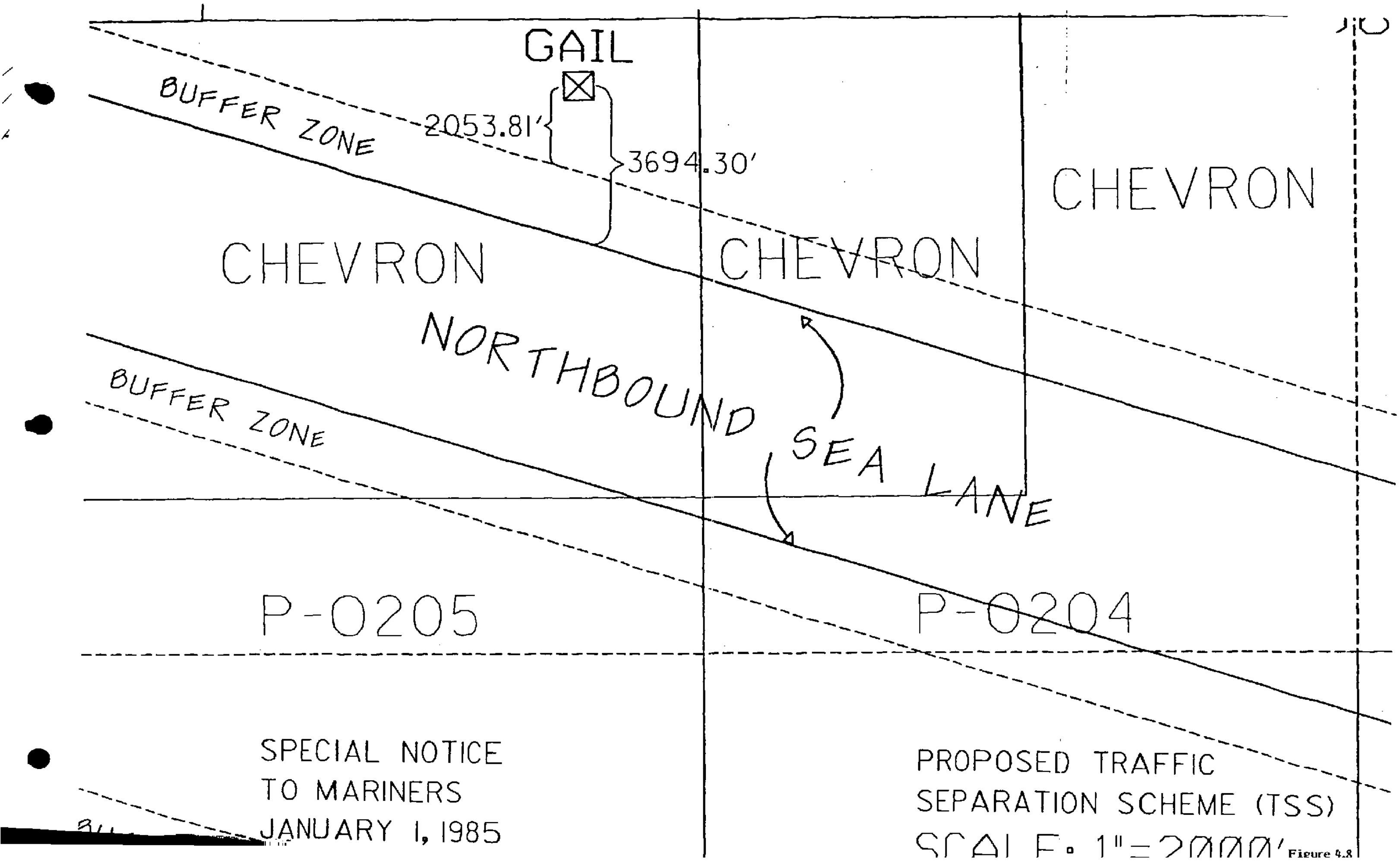

GAIL
2053.81'
3694.30'
BUFFER ZONE
CHEVRON
CHEVRON
CHEVRON
NORTHBOUND SEA LANE
BUFFER ZONE
P-0205
P-0204
SPECIAL NOTICE
TO MARINERS
JANUARY 1, 1985
PROPOSED TRAFFIC
SEPARATION SCHEME (TSS)

Figure 4.8

TABLE 4.1

PLATFORM SITE SOIL DESCRIPTION

STRATUM	DESCRIPTION	PENETRATION (FT.)
I	Soft to stiff silty clay	0' - 65'
II	Interbedded dense silty and clayey sand, very stiff to hard silty and sandy clay, and dense sandy silt.	65' - 410'
III	Very stiff to hard sandy clay	410' - 475'
IV	Interbedded dense silty and clay sand and sandy clay	475' - 500' +

TABLE 4.2
SIGNIFICANT FAULTS

Fault	Approximate Closest Distance to Site (km)	Approximate Length (km)	Recency Of Activity*	Limiting Magnitude	Percentage Of Activity
S. Andreas	85	1100	H	8.25	20
S. Cruz Island - Anacapa	17	64	Q	7.0	10
S. Ynez	41	160	Ho	7.5	6
Big Pine	60	70	H?	7.0	6
Oak Ridge/Mid-Channel (Hypocentral distance)	12	49	Ho	6.5	6
Red Mountain	23	21	Ho	6.5	6
S. Cayetano-More Ranch	31	105	Ho?	7.0	6
S. Monica	60	87	H	7.0	3
Simi-Santa Rosa Santa Susana	32	55	Q	6.75	6
S. Rosa Island	47	32	Q	7.0	2
Pitas Point	18	53	Ho	6.75	3
Palos Verdes	88	130	Ho	7.0	3

*H = Historic
Ho = Holocene
Q = Quaternary

After Dames and Moore, 1981.

SECTION 5

DRILLING FACILITIES

TABLE OF CONTENTS

FIGURES

SECTION 5
DRILLING FACILITIES

5.1 Introduction

Platform Gail will have slots for a maximum of 36 wells. Chevron presently plans to drill 25 wells during the first development phase. During the second development phase, an additional 9 wells may be drilled. One cantilever type electric drilling rig and associated crews and services will be contracted to drill the 34 wells presently planned. D~velopment drilling (both phases) is planned to span approximately 6 years and require approximately 2 months per well.

All operations will be conducted with safety to personnel and the environment as the primary consideration. Drilling operations, pollution prevention systems, and safety systems will be in accordance with MMS OCS Orders No. 2 and No. 5, EPA NPDES permit conditions, and API Recommended Practices.

5.2 D-illing Equipment

All drilling equipment and services will be handled on a contract basis. Preliminary drilling equipment layouts are shown on the Equipment Location Plan Figure-4.5 (See Section 4). Major drilling equipment will include:

5.2.1 Rig (onents

One land-type cantilever mast, 152 feet (46 m) high with 16,000 foot drilling and 1,000,000 pound hook-load capacities, will be required. The mast will be designed in accordance with A.P.I. Standard 4D for free standing masts. The draw works will be electrically powered (rated at 1500 HP) and be complete with a rotary table drive.

The hook, traveling block, and crown block will be of 500 ton load rated capacity. The drill string will be 5" or 12.7 cm, grade E and grade G drill pipe.

5.2.2 Substructures

The substructure of the rig will be capable of supporting the derrick and setback loads. It will be designed to provide unobstructed clearance for the blowout prevention equipment.

A drilling skidbase will be provided to support the mast, drawworks, subbase, and connecting stairways.

The substructure will be supported on the skidbase, resting on elevated skidbeams. The skidbase will be equipped with a hydraulic jacking system to allow transition along the direction of the well rows. The subbase will also be equipped with hydraulic jacks to allow lateral skidding over the desired well. The substructure will be capable of supporting the mast and setback loads. Mechanical restraint equipment will be provided to prevent substructure movement once positioned over the desired location.

5.2.3 Drilling Mud System

A mud system will be provided for the drilling rig.

The rig will be equipped with two mud pumps (both 1000 HP), a mixing tank (300 bbl. ±), a circulating tank (500 bbl ±), two reserve mud tanks (1280 bbl ± total), and one completion fluid tank (500 bbls. ±). A 40 bbl. trip tank is also provided.

Return mud will be treated with a high speed shale shaker, desilter, desander, degasser and centrifuge. The shale shaker unit will be equipped with a cuttings washing system to clean any oil-contaminated cuttings before ocean disposal. Cuttings that cannot be adequately cleaned by washing will be diverted to waste cuttings holding facilities, to be hauled ashore for disposal in a government approved disposal site.

Mud volume will be closely monitored using a pit volume totalizer system, an incremental flow rate indicator, and a precision fill-up measurement system. These warning systems will have visual and audible alarm signals at the driller's console. A common bulk material handling system will be provided with 3000 cu. ft. (85 cu. m.) storage capacity for clay and barite materials. Pallatized sacks of mud additives (chemicals, lost circulation material, etc.) will be stored on the platform.

5.2.4 Cementing Unit

One electrically powered dual cementing unit equipped with a liquid additive system and batch mixing tank. Three 1000 cubic foot (28 cu. m.) bulk storage tanks will be provided for the well cementing operations.

5.2.5 Power Generation

Rig power will be provided by fuel gas fired turbine generators that have diesel fuel capabilities. These generators also provide power requirements for platform and producing facilities. The drilling rig will utilize a silicon controlled rectifier (SCR) system to convert alternating current to the direct current required by the drawworks, rotary table, mud pumps, and cementing unit motors. Transformers will convert the generated AC power to lower voltages, as necessary, for the AC equipment on the rig.

A standby diesel driven electrical generator will supply power to essential drilling equipment if the turbine generators fail. The electrically powered cementing unit will be tied into the drilling emergency generator. The BOP accumulator and rig lighting will be tied into the platform standby electrical generator.

5.2.6 General Layout

The drilling mud system equipment, cementing unit and bulk storage tanks will be located on the main deck (Figure 4.5). Above the mud package will be the pipe rack. Outboard of the pipe rack, on each side of the platform, will be the platform cranes. The rig power control package and transformers will be located on the main deck.

The mast, subbase, drawworks, and associated equipment will be installed on the skidbase above the main deck.

D-i''ing contractor living quarters and offices will be located in the quarters building.

5.3 D-i'l .. · · ·

5.3.1 Casing Program

Casing setting depths and cementing will be in accordance with the USGS Pacific Region OCS Order No. 2 and/or field rules. The casing program (Figure 5.1) is based upon there being sufficient evidence from core hole drilling at the proposed platform site to justify a field rule that will preclude the necessity of installing the "structural casing." The 24" (61 cm) casing shown on the drawing meets the requirements for the "conductor casings."

5.3.2 Well Completions

The Sockeye Field is a domal structure which will be produced by dividing the reservoir into two distinctive horizontal intervals. The upper Miocene Horizon "A" contains low gravity crude. This part of the reservoir is commonly known to have unconsolidated sands and fractured shales. The lower interval contains the Miocene Horizons "B" and "C" as well as two Oligocene Horizons and two "Unnamed" horizons. These zones contain a higher gravity crude occurring in fairly consolidated sands. The two productive intervals will be completed and produced independently of each other.

Since sand control equipment will be needed in the upper zone, a gravel packed slotted liner will be incorporated into the completion technique. Two possible completion designs have been submitted at this time. (See Figures 5.2 through 5.4 for alternative completion proposals). One design is a continuous slotted liner to be gravel packed across the entire producing interval (Figure 5.2). The second design is similar but allows for segregating any large shale breaks or water bearing sands by cementing off the undesirable zone(s) behind blank pipe (Figure 5.3). The lower productive zone consists of six independent sand fingers which will be simultaneously opened into a common wellbore. The produced fluids will be commingled in the wellbore, and no interzonal isolation will be needed. The wells will be completed by selectively jet perforating the cemented blank liner opposite the productive intervals (Figure 5.4).

5.3.3 Wellhead Equipment

All wellhead components will meet API specifications. The working pressure of each wellhead section will exceed the maximum anticipated pressure imposed on that section. The wellhead will provide fluid circulation passage between each set of casing and each succeeding smaller casing or tubing.

5.3.4 B'owout Preventer Equipment

Blowout preventer (BOP) systems will be operated and tested in accordance with OCS Orde- No. 2 and/or field rules. This system will be hydraulically operated with control stations at the driller'' console on the rig floor, at the accumulator unit and at a remote platform location.

The low pressure system will consist of a 29-½" (75 cm) 500 psi annular-type blowout preventer with diverter system installed for drilling below the cemented 24" (61 cm) conductor casing string. Gravel packed completion with 2 7/8" tubing:

After the 13 3/8" (34 cm) casing is landed and cemented, the diverter system will be removed and the unitized casing head will be installed. A 5000 psi 13 5/8" (35 cm) BOP stack will be installed with a riser. The 5000 psi equipment will include an annular preventer, two pipe rams and one blind ram.

Cemented liner completion with 4" tubing:

After the 18 5/8" (47 cm) casing is landed and cemented, the diverter system will be removed and the unitized casing head will be installed. A 3000 psi 20" (51 cm) BOP stack will be installed with a riser. The 3000 psi equipment will include an annular preventer, two pipe rams, and one blind ram. After the 13 3/8" casing is landed and comented, the 13 5/8" 5000 psi BOP stack will be installed.

The BOP equipment will be actuated by pressure provided by a hydraulic accumulator unit with control panels located both on the drill rig floor and in a remote location (such as near the drilling supervisor's office). In addition, the BOP can be actuated manually by controls located on the accumulator unit itself (see Figure 5.5).

Below the BOP a drilling spool will be provided with side outlets for separate choke and kill lines. The kill line will have two valves located adjacent to the BOP; a master and a control valve. The choke line will be connected to a choke manifold and all equipment will be in accordance with "API Recommended Practice for Blowout-Prevention Equipment Systems" (see Figure 5.6).

5.3.5 Typical Drilling Procedure

Typical drilling programs for the different development wells are given here. Each well will be drilled using these general procedures supplemented as necessary for the particular well program and anticipated drilling conditions.

A typical Monterey well with 4" tubing completions will follow this general procedure: (Figure 5.4).

1. Move and rig-up. Lower 24" conductor pipe to ocean floor.

2. Drill 22" hole to 450' B.O.F. (V.D.). Under-ream hole to 30" and cement 24" conductor pipe.

3. Install diverter on 24" conductor and test.

4. Directionally drill 17" hole to 2300' B.O.F. (V.D.). Under-ream hole to 22".

5. Run and cement 18-5/8" casing at 3140 M.D. (V.D.).

6. Install 3000 psi stack and test.

7. Directionally drill 17" hole to the proper depth for setting 13-3/8" casing. Run logs.

8. Run and cement 13-3/8" casing. Install 5000 psi BOPE stack and test.

9. Drill 12¼" hole to proper depth below 13-3/8" casing. Run logs.

10. Run and cement 9-5/8" liner.

11. Run logs.

12. Perforate the production interval.

13. Install completion tubing.

14. Remove BOPE stack and install Christmas tree.

A typical Monterey well with 2-7/8" tubing completions will follow this general procedure: (Figures 5.2 and 5.3)

1. Move and rig-up. Lower 24" conductor pipe to ocean floor.

2. Drill 22" hole to 450' B.O.F. (V.D.). Under-ream hole to 30" and cement 24" conductor pipe.

3. Install diverter and low pressure BOPE stack on 24" conductor and test.

4. Directionally drill 17" hole to 2300' B.O.F. (V.D.).

5. Run and cement 13-3/8" casing at 3140 M.D.

6. Install 5000 psi BOPE stack and test.

7. Directionally drill 12¼" hole to the proper depth. Run logs.

8. Run and cement 9-5/8" casing.

9. Directionally drill 8½" r 8-3/4" hole to proper depth. Run logs.

10. Run Log.

11. Run Log 7" liner and gravel pack.

12. Run completion tubing.

13. Remove BOPE stack and install Christmas tree.

5.3.6 Pollution Prevention

To prevent pollution due to drilling operations, all runoff from drilling equipment will go to the deck drainage system (see Section 6). Drainage from the drill floor and other deck areas will be processed in either flotation units or gravity separation units such that it will comply with NPDES permit requirements prior to discharge to the ocean. Collection of any runoff will be facilitated by the inclusion of 6" (15 cm) high kick boards extending around the perimeter of the platform on all decks.

To prevent pollution due to drill cuttings, a cleaning and handling system will be installed below the shale shakers. Cuttings produced by drilling operations will be washed free of oil by this equipment prior to their disposal into the ocean through the disposal caisson. Cuttings with entrained oil that cannot be washed free will be conveyed to metal bins for storage until they can be taken to shore for disposal in a government approved disposal site.

5.3.7 Safety Features

The safety systems serving the drilling areas include the following:

5.3.7.1 Fire Suppression

a. A saltwater pumping system.

b. 1-½" (3.8 cm) hard rubber hose reels to provide coverage at any point on the platform with two hoses.

c. Two 500 gpm monitors on the main deck to cover the BOP stacks and the main deck area near the drilling rig.

e. Dry chemical fire extinguishers.

f. Standpipe connections on both boat landings for fireboat use.

5.3.7.2 Fire Detection and Alarm

A combustible gas detection system will be utilized.

5.3.7.3 H_2S Detection and Alarm

There will be H_2 sensors with alarms on the well head deck, main deck, and upper deck.

5.3.7.4 H_2S Contingency Plan

Platform Gail - Platform Grace, Santa Clara Unit. (Reference 5.5.1) contains a detailed emergency plan to be followed when encountering formations that contain hydrogen sulfide while drilling wells.

5.3.7.5 Critical Operations and Curtailment Plan

In compliance with OCS Order No. 2, a Critical Operations and Curtailment P -n for Platform Gail has been submitted as part of the Oil Spill and Emergency Contingency Plan for Platform Gail-Platform Grace (Reference 5.5.1, Appendix 6). This plan describes the critical operations that are likely to be conducted and what circumstances or conditions the critical operations are to be curtailed.

5.3.7.6 E-cape and Lifesaving Equipment

The escape system provided on Platform Gail will include life jackets and three survival capsules accommodating 34 persons each. From time of arrival of helicopter to Platform Gail, injured personnel can be delivered to St. John's Hospital (Oxnard) in approximately 15 minutes. Injured personnel will travel directly from Platform Gail via helicopter to a helipad at St. John's Hospital.

5.3.7.7 Safety Control Systems

Safety, anti-pollution, and control systems will be installed on all piping headers, machinery, and vessels pursuant to OCS Order No. 5. The system will be a combination of electric and pneumatic controls. All automatic control valves will be designed to be fail-safe. Control devices will include the following:

1. High-low pressure alarm and shutdown sensors.
2. High-low liquid level alarm and shutdown sensors.
3. Flow safety valves.
4. Pressure safety valves.
5. Vibration sensors.
6. High-low temperature alarm and shutdown sensors.

All of the above items will be designed and installed to facilitate periodic testing. These devices will be tested for accurate operation as outlined in the schedule in OCS Order No. 5.

In addition, all of these safety devices will be interconnected through a central control panel. All control of the facilities is local to the equipment. The computer contains the logic for start-up and shut down of the facilities. When a malfunction occurs, an alarm will be sounded; and if the condition is not immediately corrected, selected pieces of equipment will be shut down and in some cases the platform will shut down. Shut-downs will be accomplished by automatically closing the surface controlled subsurface safety valves and the surface controlled surface safety valves. Produced fluid will continue to move off the platform through the pipeline until the equipment is automatically shut-down by either low levels or low pressure. If the malfunction is pipeline related, liquids will not be pumped off the platform.

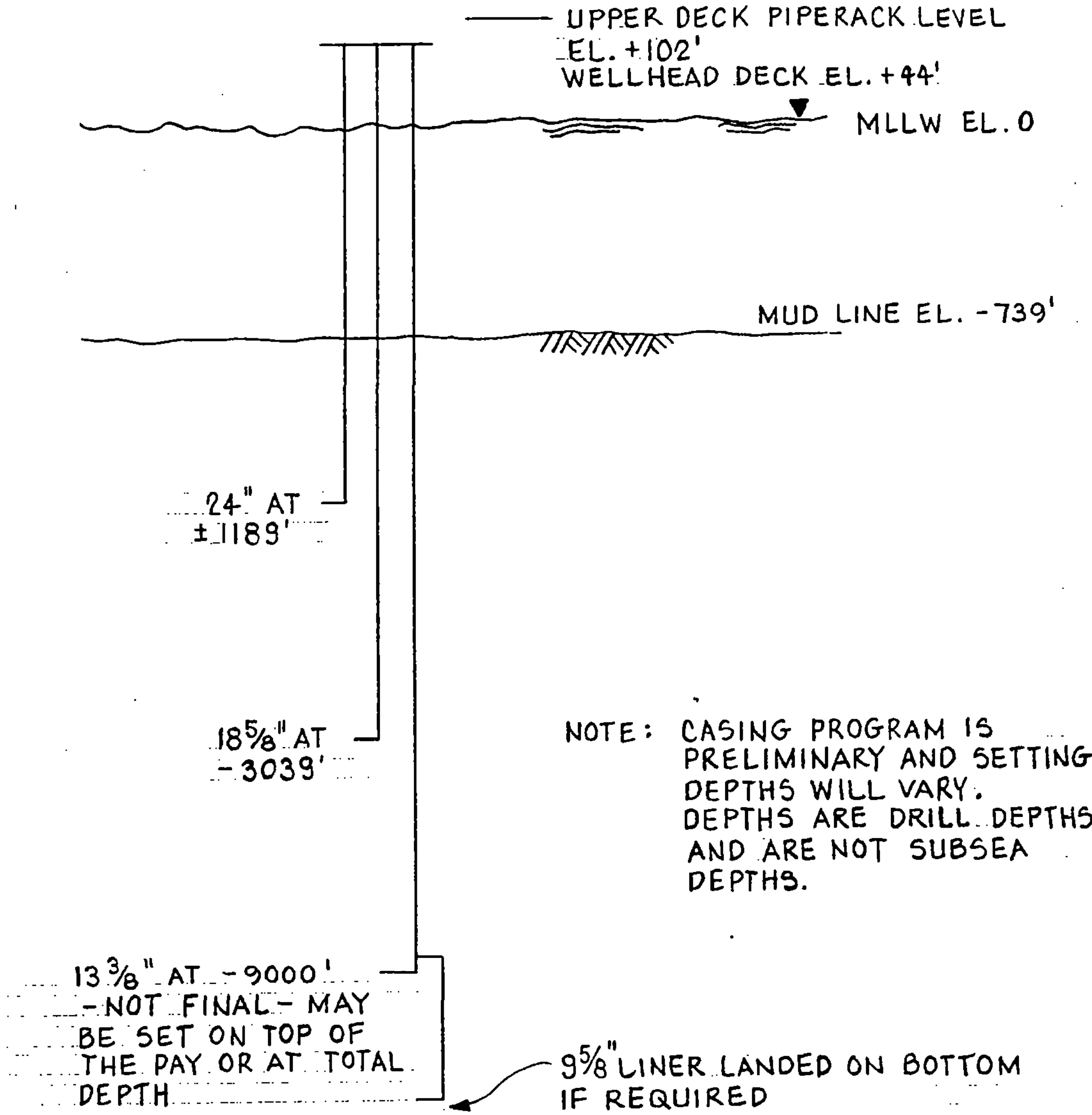
5.4 Crew and Supply Transport

Drilling crews will work regular 12-hour shifts, and will be quartered on the platform. Day shifts are expected to contain 25 persons and night shifts 25 persons. Supply boats will transport supplies as required.

Weather should have little effect on crew and supply boat operations, but emergency facilities and supplies will be provided to allow at least one week of normal operations if supply delivery is interrupted.

5.5 References

5.5.1 Chevron U.S.A. Inc. (1984). Oil Spill and Emergency Contingency Plan for Platform Gail - Platform Grace, Santa Clara Unit.



REV

Chevron

DR SCY CH.
DR APP.
ENGR.
OPR'G. DEPT. APPROVED
ENG'R. DEPT.

PLATFORM "GAIL"
CASING PROGRAM SKETCH
SANTA CLARA UNIT

SCALE NONE DATE 12-14-81

W.O.
S.O.

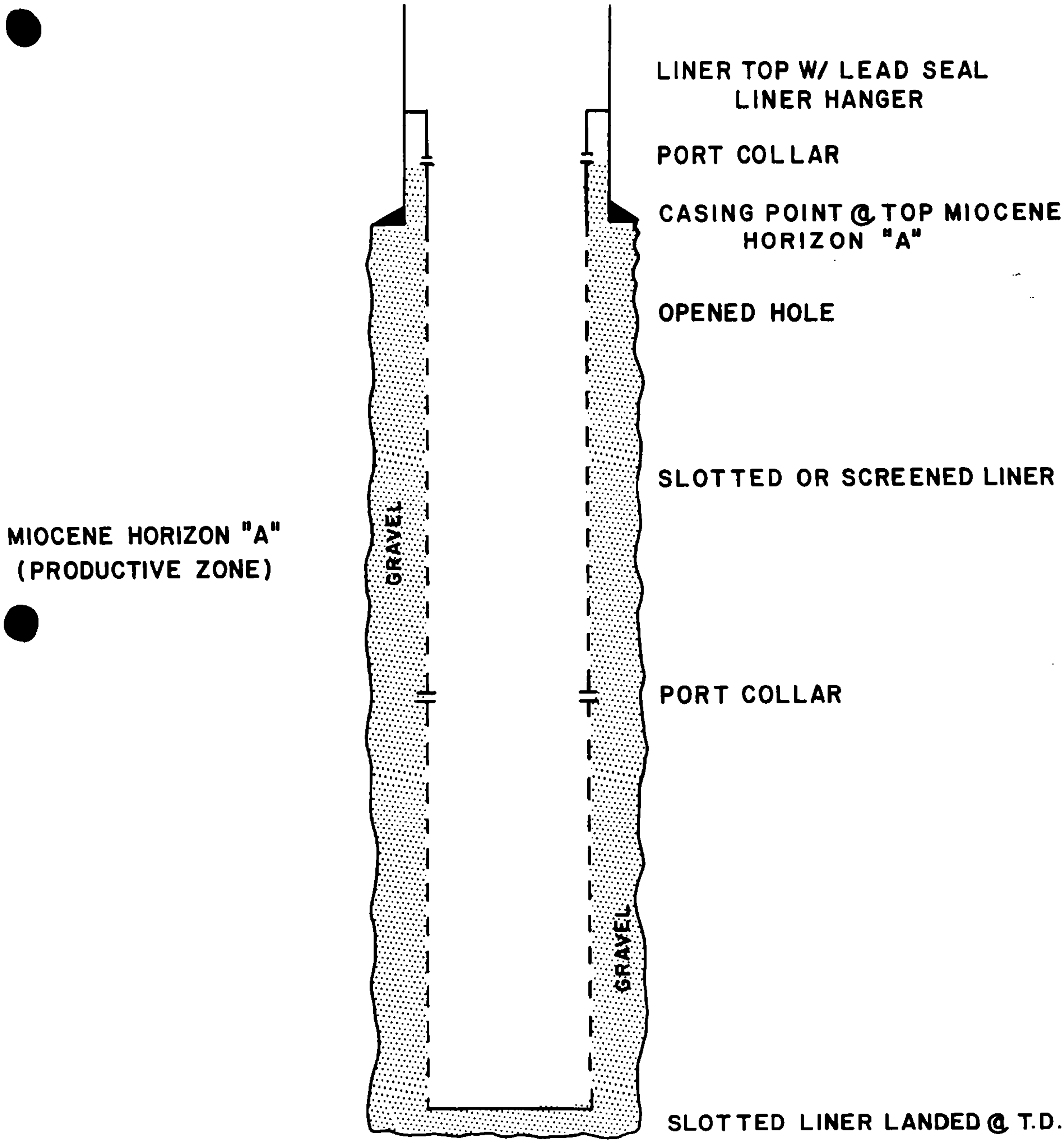
FIGURE 5-1

Printed in U.S.A.

A-5B-4436

GO-580-AB (4-71)

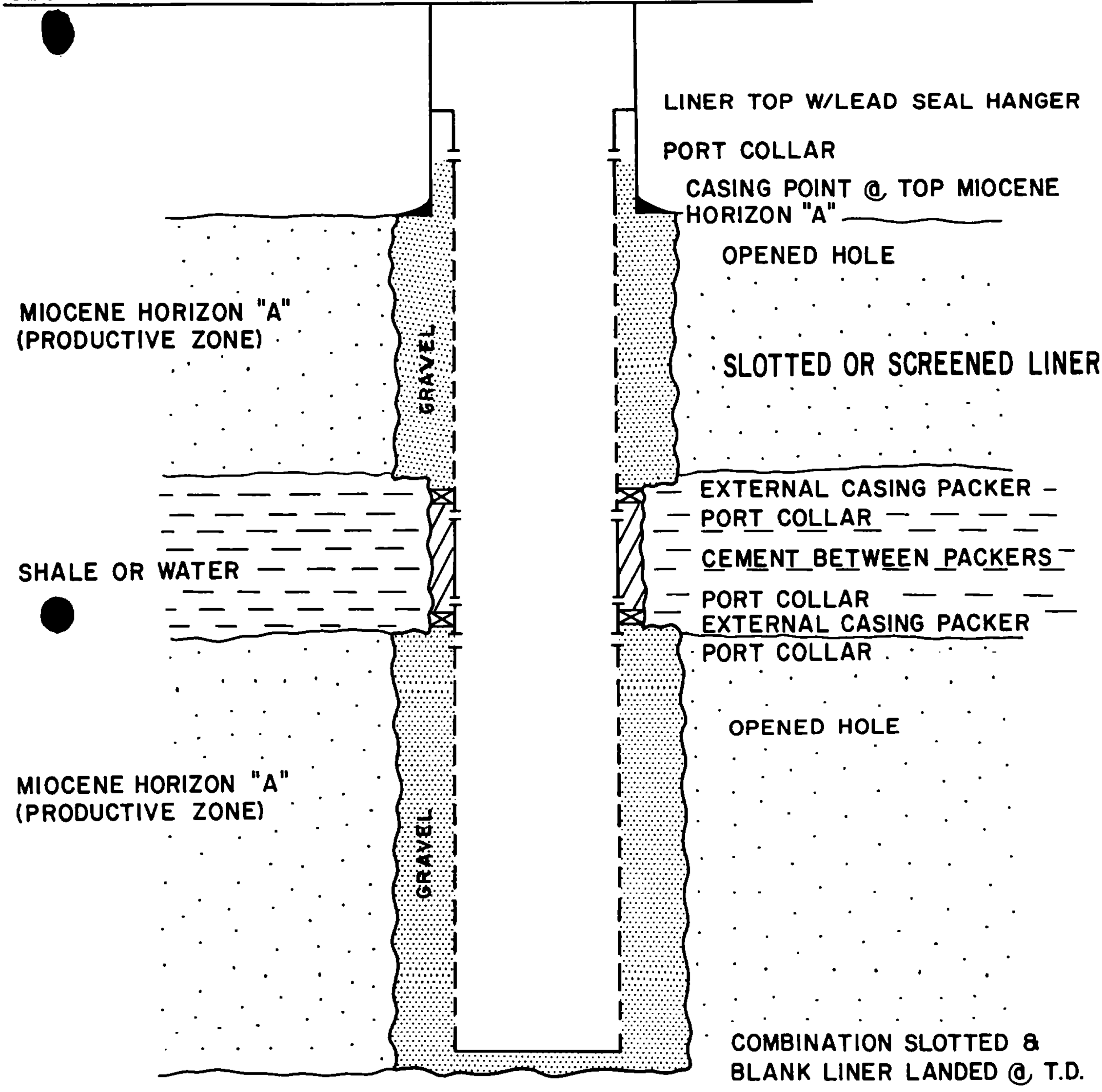
SCHEMATIC OF OPEN-HOLE TYPE GRAVEL-PACKED COMPLETION W/ SLOTTED LINER FOR MIOCENE HORIZON "A" COMPLETIONS



DRS
11/17/81

FIG. 5.2

SCHEMATIC OF OPEN-HOLE GRAVEL-PACKED COMPLETION W/COMBINATION SLOTTED & BLANK LINER FOR MIOCENE "A" COMPLETIONS



DRS
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FIG. 5.3

SCHEMATIC OF JET PERFORATED
TYPE COMPLETION W/CMT'D. LINER
FOR MIOCENE & OLIGOCENE HORIZON COMPLETIONS

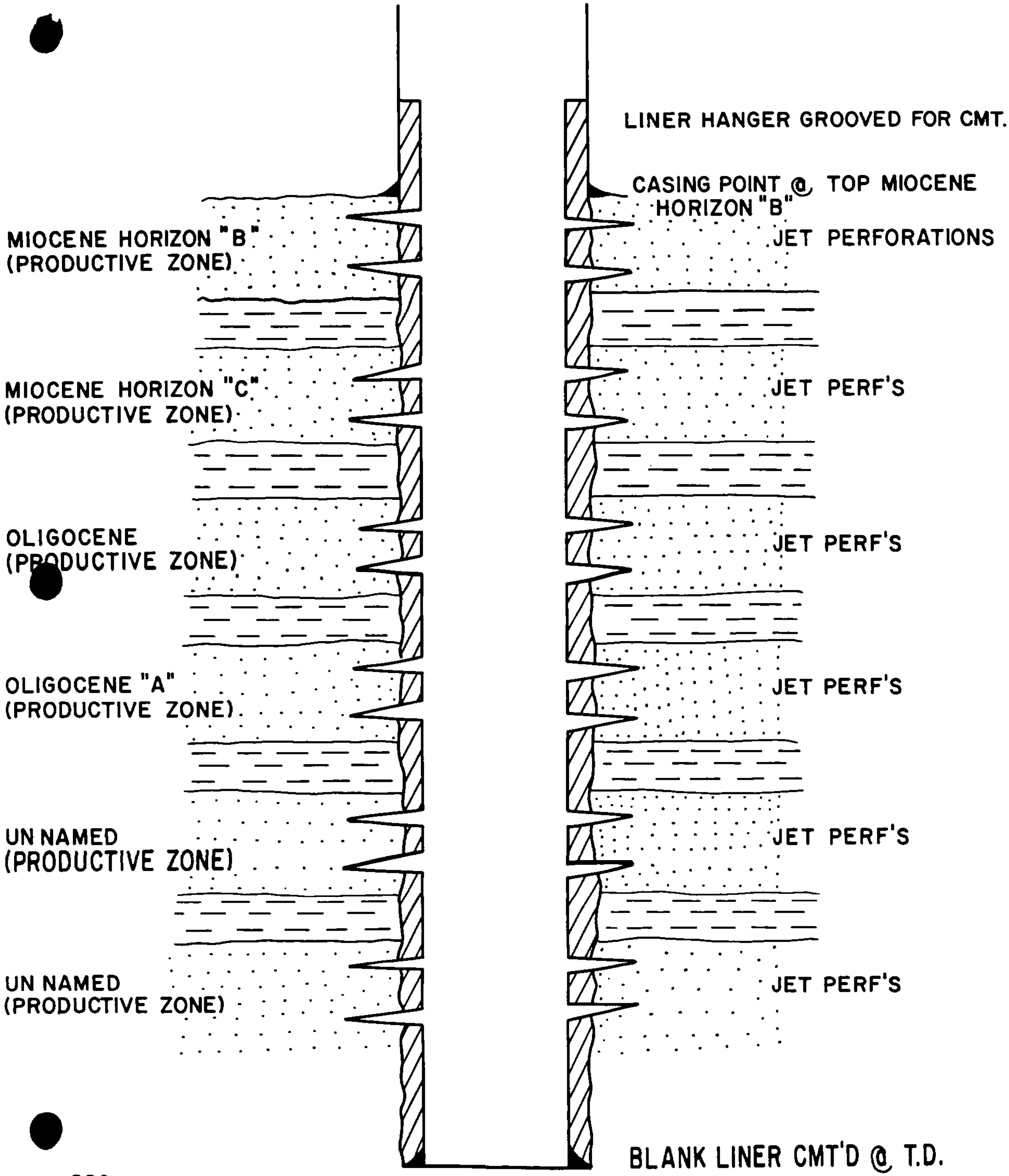

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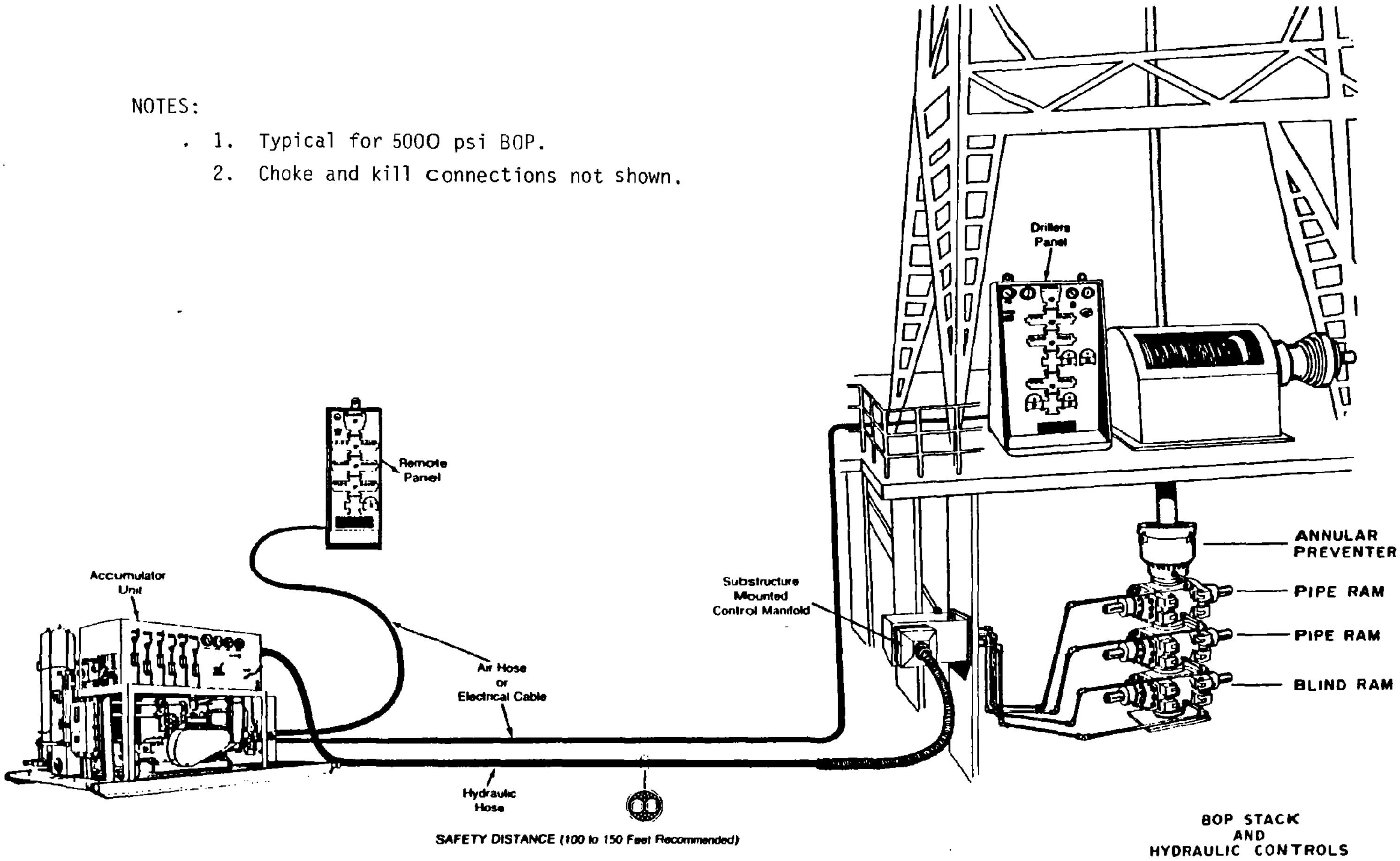
FIG. 5.4

NOTES:

1. Typical for 5000 psi BOP.
2. Choke and kill connections not shown.



BOP STACK AND HYDRAULIC CONTROLS

Figure 5.5

SCHEMATIC

FOUR PREVENTER HOOKUP

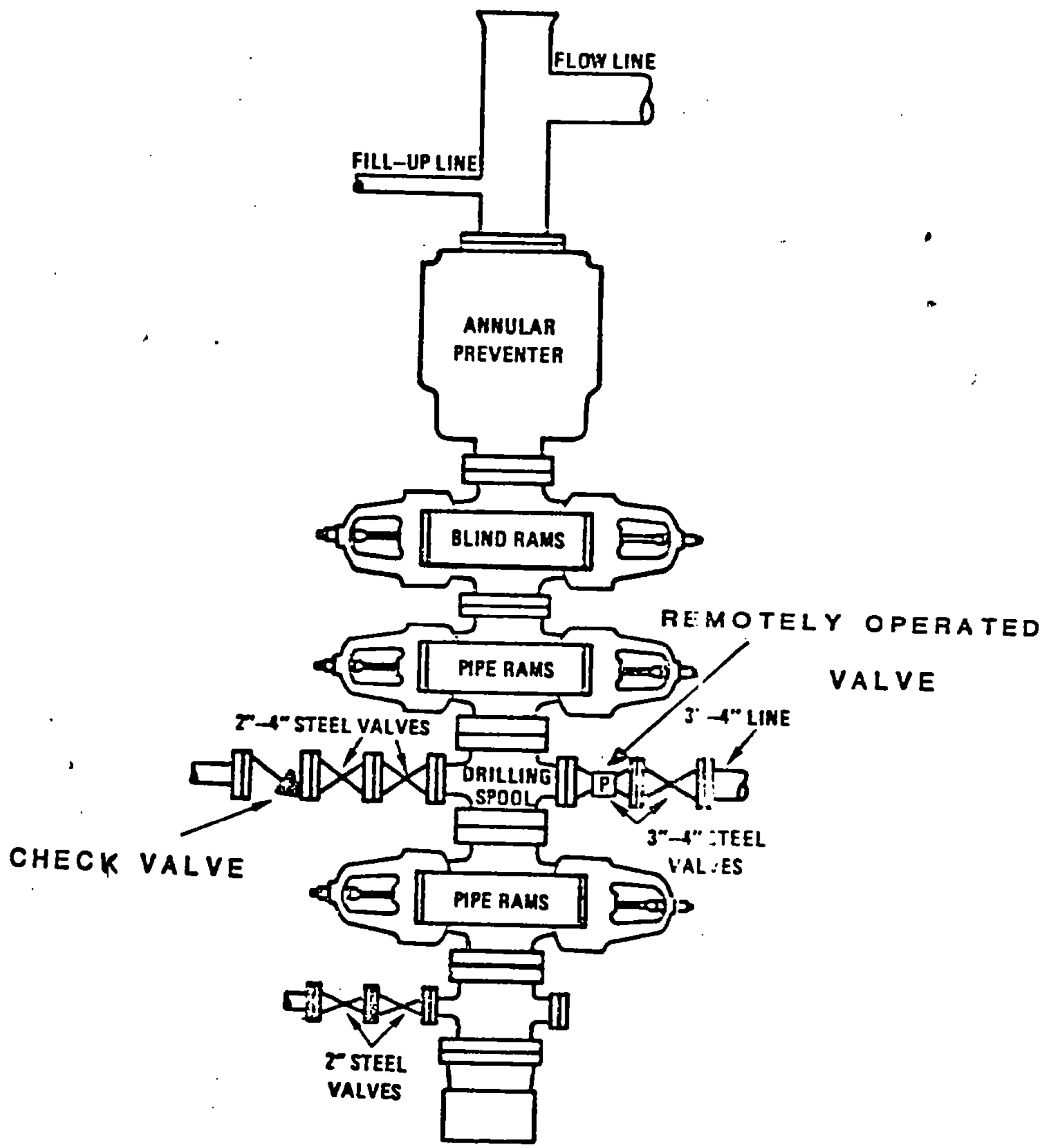
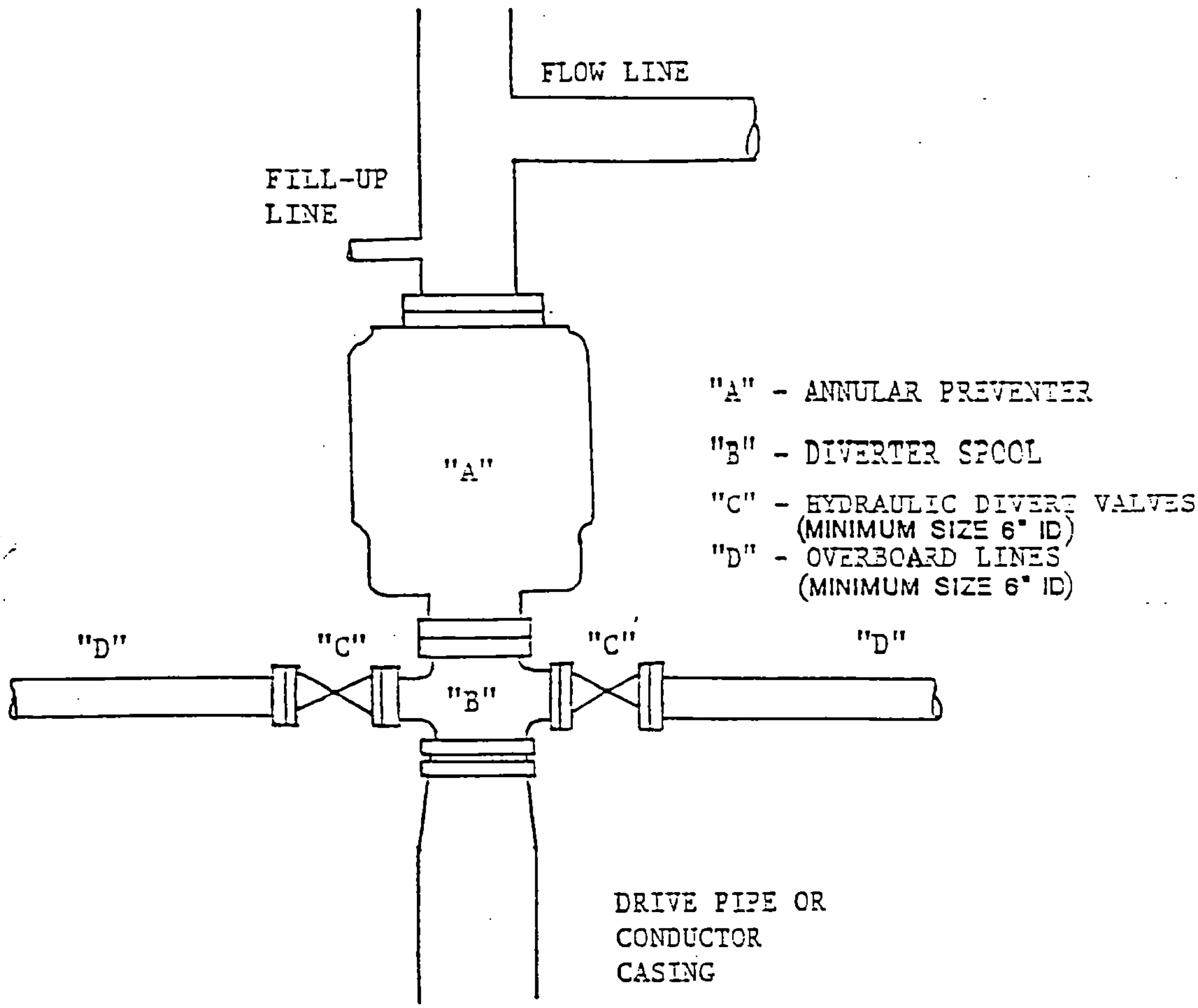


FIGURE 5.6

DIVERTER-PREVENTER HOOKUP



NOTE: ALL LINES AND VALVES SHALL MEET ALL REGULATIONS THAT APPLY

FIGURE 5-~~6~~ 7

SECTION 6
PLATFORM FACILITIES

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FIGURES

SECTION 6
PLATFORM FACILITIES

6.1 Introduction

This section describes the production equipment and related facilities to be installed on the platform and is divided into the following four parts: (1) Production Process Facilities; (2) Utility Systems; (3) Support Facilities; and (4) Environmental Impact Mitigation Measures.

The platform will contain production facilities for the separation of the produced oil, gas, and water. Stabilized dry crude oil will be pumped to onshore facilities. Gas will be dehydrated on the platform and sent to shore. Gas and oil will be transported in separate pipelines to Platform Grace for trans-shipment via Platform Hope to shore through an existing pipeline system. Equipment, controls, monitors, safety devices, etc., will be installed in accordance with applicable OCS Orders and industry standards.

Primary gas and oil separation occurs on the platform with the bulk of the gas going to Platform Grace for sweetening (if needed) and then to the Carpinteria gas plant for liquids removal. Once gas production is established, a fuel gas sweetening unit is available to process that portion of the gas that will be used in the power generation equipment and other platform needs. Separated produced water, deck drainage, and other water discharges will be treated and cleaned in compliance with EPA NPDES permit conditions before discharge into the ocean.

Utility systems and support facilities will be provided to allow the platform to be as self-sufficient as possible. Provisions for power supply, potable water production, standby power, safety systems, etc., have been made to allow operations to continue safely even though platform resupply may be interrupted for several days.

6.2 Production Process Facilities

6.2.1 Design Criteria

1. Reservoir data utilized in the design of process facilities have been obtained from tests made on five evaluation wells on Lease OCS P-0205.

a) Zone	LOWER TOPANGA & SESPE
b) Formation Depth, Subsea	5600'-6400'
c) Reservoir Pressure	2600-3000 PSIG
d) Reservoir Temperature	160° F
e) Minimum Bottom Hole Operating Pressure	400 PSIG
f) Average Gas - Oil Ratio (cu.ft/BBL)	2500
g) API Gravity @ 60° F (Average)	28°
API Gravity @ 60° F (Minimum)	24°
h) Viscosity cp (Average)	12.4 @ 77° F
	6.2 @ 122° F
i) Pour Point	+ 15° F
j) Sulphur in Oil	1.8%
k) H_2S in Gas	None
l) Gas Gravity @ 60° F	0.67
m) Maximum Flowing Rate	1100 BOPD
n) Gas Lift Rate - Initial Oil	440 BOPD
Water	50 BWPD
Gas	400 MCF/D

2. <u>Production Treating Requirements - Crude Oil</u>:

Production is to be treated to provide a marketable crude with a BS&W content of 1% or less and a vapor pressure not exceeding 11 psia. Crude oil will be gas stripped to reduce H_2S concentrations to 20 ppmw or less. The maximum normal shipping pressure for the crude oil leaving the platform is less than 900 psia.

3. <u>Production Treating Requirements - Gas</u>:

All of the gas will be dehydrated on Platform Gail. The net produced gas will be sweetened if necessary on Platform Grace using the existing Stretford facilities. The existing facilities at Carpinteria will be used for final processing and liquids removal.

4. Production Treating Requirements - Waste Water:

Produced and other waste waters are to be cleaned and discharged into the ocean. Cleaning facilities will provide water that meets the EPA NPDES permit conditions for discharge into OCS waters of the Pacific Ocean.

6.2.2 General Layout

The following factors have been considered in developing the equipment arrangements.

a) Safety.

b) Equipment Mechanical Requirements Including Environmental Protection Considerations.

c) System Integrity

d) Ease of Operation

e) Economical Use of Space

f) Equipment Serviceability

g) Compatibility with Deck Construction and Installation Concepts

As shown on Figures 6.1 - 6.5, process equipment has been located to minimize the length of interconnecting piping and to segregate this equipment from personnel-occupied areas. Fire walls and doors on the well deck effectively segregate the well bay from production, utility and safety equipment.

6.2.3 Wellheads and Flow Manifolds

Thirty-six (36) slots for well conductors will be provided: twenty-five (25) producing wells are presently planned, with eleven (11) spares reserved for future use. The wells will be arranged in four rows, with short flowlines connecting each tree to a manifold system. The manifold system will allow production to be switched between pool and test separators. All wells will be equipped with surface and subsurface safety valves in accordance with OCS Order No. 5.

6.2.4 Artificial Lift

It is anticipated that artificial lift will eventually be required for all wells. The artificial lift will be accomplished by gas lifting.

6.2.5 Oil and Gas Separation

Prior to separation, production will be heated from approximately 90°F to 150°F (32°C to 65°C) to control foaming and accelerate the breakout of produced water. Oil and gas separation is to take place at an operating pressure of approximately 130 psig.

The pool and test separators will be three-phase with free water draw-offs. The two phase well clean-up separator will be provided for new wells contaminated with drilling fluids.

6.2.6 Oil Dehydration

Two electrostatic coalescers, operating at approximately 50 psig, will be provided for oil dehydration. From the coalescers, the oil will be stabilized in a twelve tray stripping column for removal of any H_2S.

6.2.7 Oil Shipping

Dry oil from the coalescers will be pumped from a dry oil surge tank through a LACT meter and via an 8.6 inch (22 cm) O.D. (Outside Diameter) subsea pipeline to Chevron's Platform Grace. There it will commingle with Grace's oil and flow via Platform Hope to shore in Chevron's existing subsea pipeline.

6.2.8 Gas Processing and Compression

Vapor recovery gas will be commingled with casing gas, gas from the coalescers, and from the production separators, compressed in several stages to 525 psig, dehydrated and shipped to shore via Platform Grace and Platform Hope. Gas used for fuel on Platform Gail will be sweetened on the platform using the amine process. An 8.6 inch (22 cm) pipeline will be installed between Platform Gail and Platform Grace. Gas will be compressed with motor driven reciprocating compressors. Each stage of compression will be equipped with suction scrubbers, various unloaders and clearance pockets to allow for handling varying gas production rates. Gas dehydration facilities will be provided on the platform to avoid hydrate formation and corrosion in the pipeline. Conservative design capacity will be provided to minimize the need for flaring.

6.2.9 Oil and Gas Metering

All oil and gas leaving the platform will be metered. Custody transfer will be at the platform. Oil leaving the platform will be metered by double case positive displacement type meters. A mechanical prover will be installed on the platform to calibrate the meter and establish meter factors. In order to achieve the best measurement accuracy, there will be no water existing as a separate phase. This is accomplished by the installation of inline static mixers. These mixers assure uniform distribution of water in the oil. Gas volumes consumed as fuel and those delivered to the offshore gas gathering pipeline system will be metered with orifice type metering instruments operated in accordance with the specifications contained in the American Gas Association publication "Orifice Metering of Natural Gas, Gas Measurement Report Number 3." Any gas flared at the platform will be metered using dual turbine meters.

For well-test purposes, the platform test separators will be outfitted with orifice type gas metering instruments, digital readout water meters, and oil meters with capacitance type water cut sensors.

6.2.10 Condensate Handling

Condensate collected from all the gas scrubbers will flow to the production preheaters upstream of the coalescers and will be mixed with the oil stream.

6.2.11 Relief and Vent Systems

All high pressure relief valves on vessels and gas compressors, as well as blowdown valves on the gas collection systems, will be manifolded together to a high pressure scrubber and flare. Low pressure relief valves from the vapor recovery system, tanks, compressor spacer block vents, etc., will be manifolded together to a low pressure scrubber and flare.

Both the high and low pressure flares will be supported by a single flare boom. Liquids collected in the scrubbers will be drained into a waste oil tank or pumped back through the electrostatic coalescers.

Platform Gail has incorporated design features to minimize flaring and venting of gas. Two major systems to accomplish this are as follows:

a) Vapor Recovery System

This system recovers several sources of fuel and off gas, which would normally be released to atmosphere, and compresses them into the first stage suction scrubbers of the main gas compressors. Typical recovered gas would be hydrocarbon blanket vapors from tanks or the off gas from the glycol regenerator. The recovered gas is compressed and sent with the main produced gas stream for processing in Platform Grace.

b) Acid Gas Compression Facilities

Fuel gas for the platform operations will be processed to remove Hydrogen Sulfide (H_2S) and Carbon Dioxide (CO_2). The H_2S and CO_2 off gas vapors will be shipped with the main production gas for processing on Platform Grace.

Only sweet fuel gas leading to the flare pilot and header purge will be burned on a continual basis. This sweet gas burns with very low emissions and is required for safety considerations.

The production gas will be routed to the flare only in the event of a platform upset or an emergency.

6.2.12 Produced Water Treatment and Disposal

Produced water separated from the crude stream on the platform will be treated prior to discharge to the ocean through a disposal caisson. This water is recovered primarily from the production separators and the two crude oil coalescers. To meet the requirements of 40 CFR 435, Effluent Limitations for Offshore, Subcategory of the Oil and Gas Extraction Point Source category, the water will be treated by passing it through a corrugated plate interceptor to remove solids and an air flotation cell to remove suspended oil. The oil content of the discharged water will be less than 72 ppm (instantaneous average). All discharges will be in accordance with the general EPA NPDES permit.

6.3 Utility System

6.3.1 Power Generation

Electrical power will be generated at 4160 volts by three (3) 3150 KW gas turbine generators. Demineralized water will be injected into the turbines to reduce NO_x emissions. It is expected that a 70% reduction in NO_x emissions can be achieved (see Section 6.5.1). Electric motors for the main gas compressors will operate at 4000V. Stepdown transformers and motor control centers will operate motors for oil shipping pumps and general process and utility loads at 480V.

All electrical wiring and equipment on the platform will conform to National Electrical Code requirements.

6.3.2 Standby Power Generation

Standby power generation will be supplied by two diesel powered generators. One unit (approximately 850 KW) will provide electric power under emergency conditions for non-drilling related critical services such as lights, air systems, critical pumps, and the B.O.P. accumulator. The other unit (approximately 1200 KW) will provide electric power under emergency conditions for drilling related critical services such as for pulling out of the hole, critical pumps, lighting, etc. A four-hour battery supply (uninterruptible power supply) will also be provided for emergency lighting, navigation aids, communication and safety systems to back-up the standby generator (non-drilling related).

6.3.3 Diesel Fuel

Diesel fuel will be utilized for the turbine generators when fuel gas is unavailable. Diesel fuel will also be provided for the intermittent use of the drilling support equipment, cranes, the standby generator, the diesel firewater pump, and the diesel starting air compressor.

Permanent diesel storage will be provided in one crane pedestal (287 bbls) and one tank (600 bbl.). Transfer pumps, filters, distribution piping, and day tanks at each engine will be included. Connections at the boat landing level will be provided for the transfer of the diesel fuel from supply boats to the pedestal storage tank.

6.3.4 Fuel Gas

It is anticipated that gas will be the primary fuel for the turbine driven electrical generators. Gas will be imported from Platform Grace to fuel the turbines until Gail produces sufficient gas on its own. Other potential uses for fuel gas on the platform include blanket gas and the flare purge.

An Amine Unit will be available to sweeten all platform fuel gas.

6.3.5 Desalinated Sea Water

Two 1200 gph desalination units (one standby) will be utilized to produce fresh water from sea water for the potable water, demineralized water, and drilling water systems. The desalination system will keep the potable water system and mixed bed demineralizer supplied with 5 ppm TDS water, while any surplus will go to drilling water storage.

Water from the vapor compression desalination unit will enter a mixed bed cartridge type demineralizer where the total dissolved solids will be reduced from 5 ppm to less than 0.5 ppm. A demineralized water holding tank will be provided between the demineralizer and the turbine generators.

6.3.6 Potable Water

Freshwater produced from the desalinator unit will continually resupply the 300 bbl. potable water storage tank. This water will be utilized in the personnel quarters, control room, safety showers, labs and for makeup water for the enginer radiators, etc.

6.3.7 Freshwater For Drilling

Approximately 3,600 bbls. of freshwater storage will be provided in the eight (8) jacket legs. This water will be used primarily for mixing drilling muds. The water will be transported by boat from shore as required. Any excess production from the desalinator will go to the jacket leg storage.

6.3.8 Process Heating

Process heating will be provided by a circulated heating medium system. Cogeneration will be used on the platform. The heat source for the heating medium will be waste heat recovered from the electrical generator turbine drivers.

The system consists of a heating fluid expansion tank, circulating pumps, supply and return headers, and a heat source (i.e. exhaust from the generator turbine drivers).

6.3.9 Utility Air

A utility air system will be provided to distribute a supply of 110 psig air throughout the platform for such uses as air tools and hoists, pneumatic pumps, back-up for the instrument air system, etc. The system will also include adequate storage capacity.

6.3.10 Instrument Air

An instrument air system will be provided to dry, store and distribute an adequate supply of 100 psig instrument air throughout the platform process area.

6.3.11 Starting Air

A starting air system will be provided for starting the stand by diesel generator, backup fire water pump and the pedestal cranes.

6.3.12 Saltwater

Saltwater systems will be provided for fire suppression, washdown, cuttings cleaning, process cooling and desalination.

The fire suppression system is supplied by two (2) 1500 gpm electric submersible pumps and one (1) 3000 gpm diesel vertical turbine pump. Discharge pressure will be 100 psig at full flow.

The desalinator washdown, cuttings cleaning and process cooling systems are supplied by two electric submersible pumps.

6.3.13 Sewage Treatment

A packaged sewage treatment unit will be provided to process the sewage from the personnel buildings and drilling crew washrooms. The effluent from this unit will comply with U. S. Coast Guard requirements found in 33 CFR 159.53 (b) and will be discharged to the ocean through the disposal caisson.

6.3.14 Hypochlorite Generation and Cl

Numerous small storage tanks and metering pumps will be provided for injection of corrosion/inhibitors, antifoam agents, etc. The platform will include a hypochlorite generator for supplying chlorine to the saltwater intake system and potable water as required.

6.3.15 Lighting

Platform lighting will meet or exceed the Illuminating Engineering Society Recommended Levels of Illumination. Indoor lighting will consist of fluorescent and incandescent fixtures and outdoor lighting will consist of high pressure sodium vapor fixtures. Critical lighting circuits will be connected to a battery backup system to provide emergency lighting in the event of a power failure.

6.3.16 Deck Drainage

Drainage from the upper and main decks will go into a corrugated plate interceptor (CPI) where oil will be separated. This oil will then flow into the sealed production drain system for eventual processing in the main production separators. Clean water from the CPI is discharged to the ocean through the disposal caisson.

Drainage from the wellhead deck and wellhead mezzanine deck goes into a sump tank for initial oil/water separation. Water is then pumped to the CPI for additional separation and processing as outlined above for the upper and main deck drainage system. The oil is then drained into the sealed production drain system for processing as outlined above.

Drainage from the sump deck will go to the sump deck sump. Fluid from the sump will be pumped to the CPI in a similar manner as described above for the wellhead deck drainage.

All decks will be solid steel plate and have a 6" (15cm) high curb around the perimeter to prevent any runoff from overflowing into the ocean. Spray shields will be included where necessary to prevent liquid hydrocarbon spray from reaching the ocean.

6.4 Support Facilities

6.4.1 Hydraulic Control System

A hydraulic pressure system will be provided for downhole sub-surface safety valves. The system will include pneumatically controlled pumps, reservoir tanks, filters and a distribution system. This is a closed loop hydraulically powered system with spent fluid returning to a pump suction reservoir.

6.4.2 Process Control and Monitoring Systems

The general process and associated equipment will be monitored and controlled from the central control room. All monitoring and control functions such as process temperatures, pressures, flows, level alarms and shutdowns will be by a programmable controller system.

In the event that local process controls are unable to maintain the process within prescribed operating limits, alarms will be triggered in the control room to warn the operators of impending upset conditions. These alarms will cause a process alarm to sound and an alarm message to flash to indicate the precise nature of the trouble.

Should the operator not be able to correct an alarm condition before it reaches the next prescribed operational limit, the following types of safety equipment are provided to protect the process and associated equipment.

- o High/Low Pressure Sensors (Shutdowns)
- o High/Low Temperature Sensors (Shutdowns)
- o High/Low Liquid Level Sensors (Shutdowns)
- o Pressure Safety Valves (Relief)
- o High/Low Flow Sensors (Shutdown)
- o Automatic Emergency Shutdown (ESD) System
- o Manual Emergency Shutdown (ESD) System
- o Surface and Subsurface Well Safety Valves
- o Equipment Isolation Shutdown Valves (SDV's)

This safety shutdown equipment is applied in accordance with MMS OCS Order No. 5, OCS Order No. 9, and API Recommended Practice RP-14C.

When a malfunction occurs, an initial warning alarm will be sounded and if the condition cannot immediately be corrected, the process stream will be diverted to a standby unit. If no standby equipment is available, the platform will be shutdown upon reaching the high/low shutdown set point. Shutdowns will be accomplished by automatically closing the surface controlled safety valves which then blocks in equipment. Produced fluid will continue to move off the platform through the pipeline until the equipment is automatically shut down by a low level on the dry oil surge tank. If the malfunction is pipeline related, the platform would automatically shut in and contain the production.

The combustible gas detection system will have a lower trip point at 20% L.E.L. (lower explosive limit) and upper trip point at 60% L.E.L.

The H_2S detection system will have a lower trip point at 10 ppm and an upper trip point at 20 ppm. There will be H_2S sensors with alarms on the wellhead deck, main deck and upper deck.

Ultra-violet fire-eye detection or loss of air in the fusible plug loop system will initiate an Emergency Shutdown (ESD) and activate the Fire Suppression System.

6.4.3 Fire Suppression, Detection and Alarm

Primary fire detection will be by fusible plug loops and low firewater header pressure switches. Secondary protection will be by sight and automatic detection using flame detectors. Primary initiation signals are sent to a controller which in turn initiates an alarm and starts at least one electric fire pump. Should the controller not maintain continuous communications with either the electric or the diesel control system, the respective pump(s) will start automatically.

The deluge system piping will be routed to maximize reliability and minimize friction loss. Automatic valves for the deluge systems will be placed in safe areas where a fire zone header branches off the main system.

Firewater pumps will be specified to meet pump curves which ensure constant flow at constant line pressure as required for fire fighting. Pumps will furnish not less than 150 percent of the rated capacity at 65 percent of the total rated head.

The following is a brief description of the fire suppression system components:

(a) Two electric submersible fire pumps to provide firewater (1500 gallons per minute (gpm) at 100 psi residual pressure to the platform's deluge system, hose reels, and fire monitors. Each pump will start automatically on a signal from its low pressure switch on the firewater header or a signal from the control room.

(b) One standby diesel-powered right angle drive vertical turbine fire pump to provide firewater (3000 gpm minimum) at 100 psi residual pressure to the platform's deluge system, fire monitors, and hose reels. The pump will start automatically on a signal from its low pressure switch on the firewater header. The pressure setting will be lower than that of the two electric fire pump start settings.

(c) Two 50 gpm (maximum) centrifugal jockey water pumps (one operating, one standby) to maintain the firewater header at 150 psi. The pumps will take their suction from the sea water header and will prevent automatic starting of the main fire pumps due to system leaks.

(d) 1 - ½" or 1 - ¼" hard rubber hose reels will provide water/foam coverage to any point on the platform from two 100 ft. hose stations.

(e) Deluge systems with automatic area controls capable of wetting the wellhead area and process equipment with the following design densities:

1. Wellhead, 0.50 gallons per minute/ft_2 (gpm/ft^2) Surface Area (S.A.).
2. Oil shipping pumps, 0.25 gpm/ft_2 S.A.
3. Oil/diesel vessels and exchangers, 0.25 gpm/ft_2 S.A. of upper half if vessel normally - 50% full.
4. Oil/diesel pumps, 0.25 gpm/ft_2 S.A., 0.50 gpm/ft_2 S.A. for packing areas.
5. Gas compressors, 0.25 gpm/ft_2 S.A., 0.50 gpm/ft_2 S.A. for packing area.
6. Gas compression vessels and exchangers, 0.25 gpm/ft_2, S.A.
7. Pig launcher/receiver, 0.25 gpm/ft_2, S.A.
8. Sump deck, 0.25 gpm/ft_2, S.A.
9. Misc. Hydrocarbon equipment, 0.25 gpm/ft_2, S. A.
10. Structural protection, 0.10 gpm/ft_2 S.A. Flare Boom only.

(f) Two 500 gpm fire monitors on the main deck to cover the BOP stack and the upper well bay area. One 250 gpm fire monitor will be on the upper deck.

(g) Portable fire extinguishers of the appropriate size and class for the anticipated hazard will be provided and located to permit coverage of the entire platform deck areas and buildings. Different types used are dry chemical, CO_2, and Halon.

(h) Automatic Halon 1301 flooding protection system will be provided in each turbine generator enclosure.

(i) Manual fire alarm pull stations will be provided in the generator room, and quarters buildings, and production area buildings.

(j) Firehose connections at the boat landing (for fire boat use) will be piped to the platform distribution system.

(k) Fire hose cabinets will be on each level inside the quarters building.

(l) Automatic dry chemical spray over stove and grill will be in the quarters building.

The following is a brief description of the fire detection and alarm system components:

(a) Flame sensors. These will signal a local controller which will signal the platform Modicon programmable controller. An audible alarm is then initiated. An ESD condition with zone deluge will commence unless over ridden by the operators.

(b) Fusible plugs will initiate an ESD and zone deluge.

(c) Visual sighting. Personnel can initiate shutdown and suppression activities from the main control room or fusible plug panels and ESD stations.

(d) Thermal rate-of-rise detectors. These will signal the Modicon programmable controller, initiate an audible alarm, and shutdown building ventilation.

(e) Turbine enclosure flame and rate-of-rise detectors. These will signal a local controller which will signal the Modicon programmable controller. An audible alarm is then initiated which will start the Halon flooding system, will start the diesel generator, and will shut off the turbine fuel supply.

6.4.4 Personnel Quarters

Personnel quarters are to be sized for normal drilling and production activities. Facilities include sleeping accommodations for about 72 persons with restroom facilities, locker rooms, wash rooms, a galley, dispensary, and recreation/training rooms. The quarters building will be designed to minimize transmission of vibration and noise. A heliport will be situated on top of the quarters building.

6.4.5 Escape and Lifesaving Equipment

The platform will be equipped with three U.S. Coast Guard approved escape/survival capsules, accomodating 36 persons each, plus an adequate number of life preservers, life floats, ring life buoys, first aid kits, litters, and other lifesaving appliances as required by 33 CFR 144. The capsules will be equipped with emergency oxygen systems.

6.4.6 Corrosion Control

Corrosion is to be controlled by using corrosion-resistant coatings on the top-side structures and equipment, an underwater sacrificial anode system, and internal coating for selected piping, vessels and tanks. Corrosion inhibitors will also be added during operations. In addition, piping and vessels will be designed with adequate corrosion allowance, and valves will be specified with appropriate corrosive resistant trims.

6.4.7 Aids to Navigation

Aids to navigation will consist of four quick-flashing, Coast Guard approved white lights visible for 5 miles (one light at each corner of the platform), and a Coast Guard approved fog horn with a 2-mile audible range. All aids to navigation will meet Coast Guard Regulations for Class A Structures (33 CFR 67.20). The platform will be painted white to assure high visibility.

The drilling rig derrick will be illuminated for aviation safety with a combination of steady and flashing red lights. The heliport perimeter is outlined with lights plus one flashing amber beacon. The heliport lights are illuminated only during flight operations.

A United States Coast Guard approved Automatic Radar Plotting Aid (ARPA) unit will be installed on the platform. The radar unit will include an anti-collision system which will alert operators if a vessel is on a collision course with the platform. The radar unit will monitor the northbound shipping lane in the east to southwest direction (see Section 4.7).

6.4.8 Communication Facilities

Intra-platform communication will utilize hardwired speakers and handsets. Additionally, there will be hand-held portable radios for operational communication.

For external communication with crew boats, supply boats, helicopters, shore bases, other platforms, etc., there will be several radio systems. A Company-owned microwave system will provide telephone service and circuits for the pipeline leak detection system.

6.5 Environmental Impact Mitigation Measures

6.5.1 Turbine Water Injection

Although not required by regulation, turbines on the platform will be equipped with water injection to reduce emissions of NOx. The system will inject demineralized water (approximately 0.5 ppm or less solids content) into the turbine. Injection of water will lower combustion temperatures which results in lower rates of NOx production. Injection rates of 0.5 to 1.0 pounds of water per pound of fuel are expected. At these injection rates, reductions in NOX production of 70% have been demonstrated. The Allison 501KB turbine is the same type which will be utilized on Platform Gail. As shown in Figure 6.1, at 14,600 RPM @ 60°F, the NO_x emissions are 4.4 lbs per engine - hour at a fuel/water ratio of 1.0 lb of fuel to 0.8 lbs of H_2O. Without water injection (using the same parameters) the NO_x emissions are 16.0 lbs per engine -hour. This represents a 72.5% NO_x reduction.

Significant operating experience with gas turbines has demonstrated the feasibility of water injection. Water injection has been proven to be feasible by emissions compliance tests on the San Diego Union-Tribune Centaur generator which utilizes water injection to reduce NO_x emissions (Reference 6.6.1). Information regarding water injection is available in "Standards for Support and Environmental Impact Statement, Volume I, Proposed Standards of Performance for Stationary Gas Turbines", EPA, September, 1977. Chevron is continuing to follow the progress of water injection technology.

6.5.2 Gas Blanketing and Vapor Recovery

All pressure vessels, surge tanks and other process equipment operating at or near atmospheric pressure, are connected to a gas blanketing and vapor

recovery header system which maintains a slight positive pressure on the system. As gas is released from process fluids or forced out of vessels and tanks as they are filled, it is compressed by vapor recovery compressors and flows into the sales gas system. As fluids are withdrawn from vessels or tanks, blanket gas is made up from the platform fuel gas system. This type of gas blanketing and vapor recovery reduces explosion hazards by eliminating oxygen, eliminates VOC (volatile organic compounds) emissions normally associated with atmospheric tanks and vessels, and recovers energy that would otherwise be lost.

6.5.3 Waste Heat Recovery

A significant amount of heat is required on the platform for process heating and to assist in degassing the oil before shipment. Heat is also required to regenerate glycol and amine used in the gas dehydration and sweetening systems, respectively. Since gas turbines are used for power generation, waste heat will be recovered from the turbine exhaust to satisfy platform heat requirements. This measure conserves fuel and reduces emissions by eliminating the need for fired heaters. It also lowers the temperature of the turbine exhaust entering the atmosphere.

6.5.4 Spill Prevention and Containment

All platform facilities are designed to prevent the occurrence of an oil spill. The platform decks are enclosed with a containment curb to prevent accidental spillage on the decks from going overboard. Deck drains gather up fluids and route them to sumps where the solids and liquids are separated. The liquids are pumped back into the main oil separation system; solids are stored for transportation to shore for disposal. All process bleed valves and drains are also routed to a sump from which fluids are pumped back into the main oil separation system. All process liquid relief valves are piped into closed systems with liquids flowing to a surge tank from which they are pumped back into the main oil separation system.

In the unlikely event that an overboard spill occurs, Platform Gail will receive oil spill response from Chevron's on-site equipment and from Clean Seas, the local oil spill cooperative.

a. Chevron's crew boat normally stationed at Platform Grace which is equipped with 750 ft. of boom and sorbent materials,

b. The Walosep W-1 skimmer which is skid mounted to be lowered to Platform Grace's crew boat.

c. Chevron's crew boat normally stationed at Carpinteria pier which is equipped with 750 ft. of boom and sorbent materials.

Should it prove necessary, Platform Grace and Platform Gail will both be equipped with 750 ft. of boom which can be lowered to a crew boat by a platform crane.

Available oil spill related equipment, both onsite and aboard Mr. Clean.

The following is a list of Chevron provided oil spill equipment which may be utilized at a spill from Platform Gail:

Platform Gail

750 ft of Whittaker Expandi boom 4300 series or equivalent.
240 ft of 3M sorbent boom or equivalent.
1-1/2 boxes (1,500 pieces) 3M sorbent pads (18" x 18") or equivalent.

Platform Grace

750 ft of Whittaker Expandi boom 4300 series or equivalent.
One Walosep W-1 skimmer.
240 ft of 3M sorbent boom or equivalent.
1 box (1,000 pieces) 3M sorbent pads (18" x 18") or equivalent.

Crew Boat Stationed at Platform Grace

750 ft of Whittaker Expandi boom 4300 series or equivalent.
1 box (1,000 pieces) 3M sorbend pads (18" x 18") or equivalent.
240 ft 3M sorbent boom or equivalent.
One 1,200 gal. floating storage bag for recovered oil.

Crew Boat Stationed at the Carpinteria Pier

750 ft of Whittaker Expandi boom 4300 series or equivalent.

1 box (1,000 pieces) 3M sorbent pads (18" x 18") or equivalent.

240 ft 3M sorbent boom or equivalent.

One 1,200 gal. floating storage bag for recovered oil.

Oil spill containment/cleanup equipment will be similar to that carried by the vessel Mr. Clean II of the Clean Seas Cooperative. The Clean Seas vessel to be most likely utilized in the event of a major oil spill is Mr. Clean I, stationed at the Santa Barbara harbor. It is currently equipped as follows:

Vessel - 136' x 36'

Offshore Devices Inc. (ODI) advancing mode skimming system with pumps and hoses.

Walosep W-3 skimmer.

100 bbl oil-water separator tank.

2000 ft of Goodyear 14" x 24" inflatable boom.

1500 ft of Whittaker Expandi boom 4300 series.

One Vikoma Seapack with 1600 ft of boom.

One vessel mounted dispersant spraying system.

One 16 ft skiff with 25 hp outboard engine.

One 32 ft fast response boat with 2 - 175 hp outboard engines.

4 Kepner 5000 gal. floating oil storage bags.

One 12 ton crane.

5-10 bbls Corexit 9527 dispersant.

Miscellaneous sorbent materials.

For a detailed discussion of the proposed actions and oil spill equipment in case of an oil spill occurrence, please refer to the Oil Spill and Emergency Contingency Plan for Platform Gail - Platform Grace, Santa Clara Unit (Reference 5.5.1).

6.5.5 Emergency Flare

All vapor safety relief valves exhaust into a closed flare header system which gathers the emergency releases and routes them through a scrubber to one of two flare burners. The high and low pressure burners are designed to be smokeless.

6.5.6 Fugitive Emission Inspection Program

Fugitive emissions are those which result from leaks around pump seals, valve stems, hatches, connections and other process components. To minimize these hydrocarbon emissions, Chevron will institute a fugitive emission inspection and maintenance plan on Platform Gail.

6.6 Reference

6.6.1 Solar Turbines Incorporated (1982). Emissions Performance Tests of the Centaur Generator Set with Water Injection for Union-Tribune - PD37201. Report prepared for the San Diego Union - Tribune.

501KB EMISSIONS DATA

A. EMISSIONS

Speed rpm	Water Injection H2O/Fuel lb/lb	Tamb F	CO ppm	CO lb/eng-hr	NOx ppm	NOx lb/eng-hr	Guaranteed @ 15% O2 (dry) ppm
14200	0.	40	20	2.5	70	15	
	0.	60	19	2.3	71	14	
	0.	80	18	2.1	71	14	
	.8	40	30	3.8	20	4.2	
	.8	60	28	3.4	20	4.1	36
	.8	80	26	3.1	20	4.0	
14600	0.	40	20	2.5	77	16	
	0.	60	19	2.3	76	16	
	0.	80	17	2.1	75	15	
	.8	40	30	3.9	22	4.7	
	.8	60	28	3.5	21	4.4	38
	.8	80	26	3.2	21	4.3	

B. EXPLANATIONS

(1) Emissions are corrected from test data using Indianapolis pipeline natural gas. Only the values of dry NOx at 15% O2 are guaranted because variabilities for production and measurement are not included for all other emissions data.

(2) Engine Conditions.

Ambient: P = 14.7 psia

Specific Humidity at 40 F = .00314

60 F = .00633

80 F = .01338

Load: 4135 hp

Western Engine Co, May 1, 1985.

FIGURE 6.1

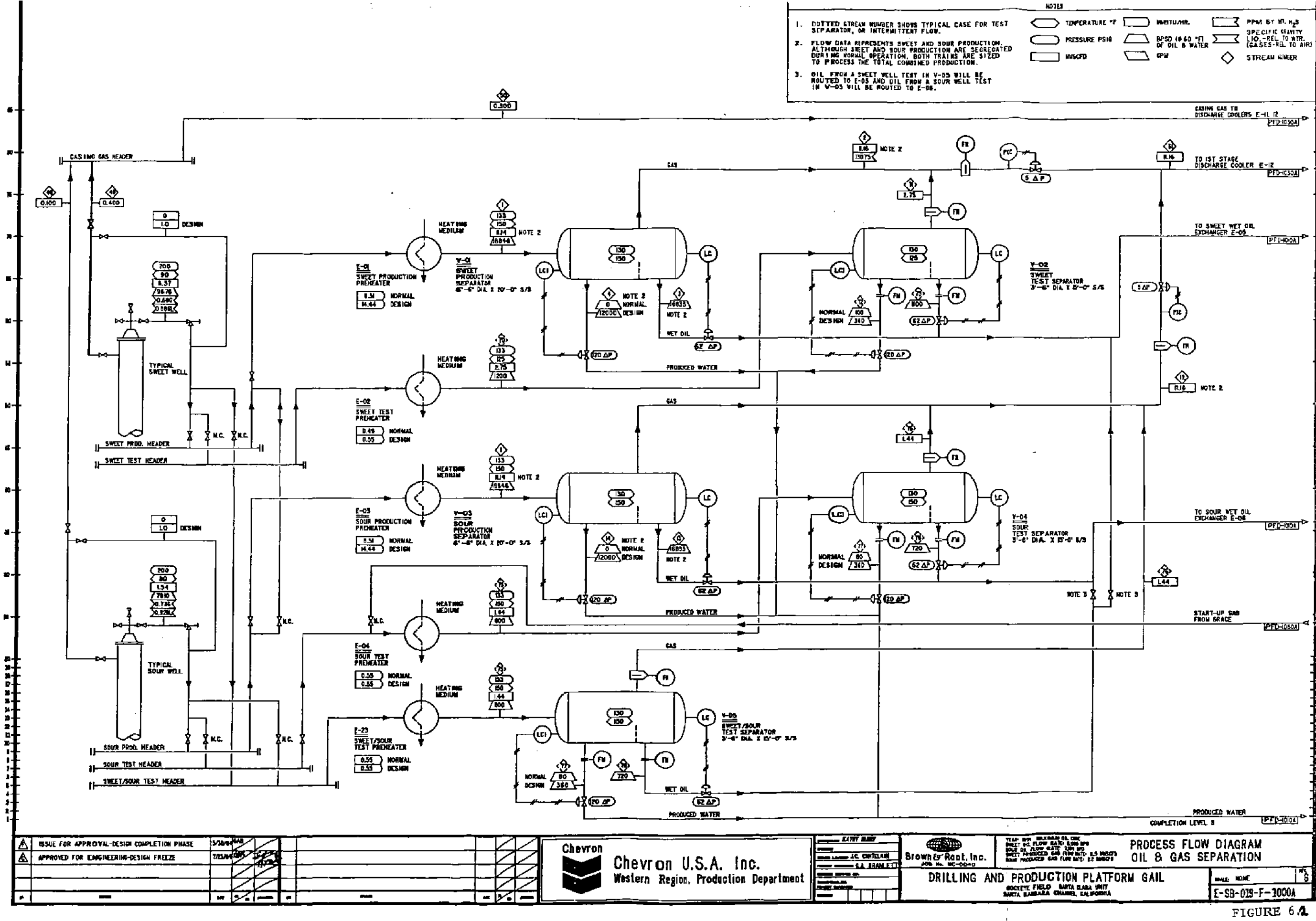
NOTES
1. DOTTED STREAM NUMBER SHOWS TYPICAL CASE FOR TEST SEPARATOR, OR INTERMITTENT FLOW.
2. FLOW DATA REPRESENTS SWEET AND SOUR PRODUCTION. ALTHOUGH SWEET AND SOUR PRODUCTION ARE SEGREGATED DURING NORMAL OPERATION, BOTH TRAINS ARE SIZED TO PROCESS THE TOTAL COMBINED PRODUCTION.
3. OIL FROM A SWEET WELL TEST IN V-05 WILL BE ROUTED TO E-05 AND OIL FROM A SOUR WELL TEST IN V-05 WILL BE ROUTED TO E-06.
TEMPERATURE °F
PRESSURE PSIG
MMSCFD
MMBTU/HR.
BPSD (@ 60 °F) OF OIL & WATER
GPM
PPM BY WT. H2S
SPECIFIC GRAVITY LIQ.-REL. TO WTR. (GASES-REL. TO AIR)
STREAM NUMBER
CASING GAS HEADER
CASING GAS TO DISCHARGE COOLERS E-11, 12
TO 1ST STAGE DISCHARGE COOLER E-12
TO SWEET WET OIL EXCHANGER E-05
TO SOUR WET OIL EXCHANGER E-06
START-UP GAS FROM GRACE
PRODUCED WATER
COMPLETION LEVEL 8
TYPICAL SWEET WELL
TYPICAL SOUR WELL
SWEET PROD. HEADER
SWEET TEST HEADER
SOUR PROD. HEADER
SOUR TEST HEADER
SWEET/SOUR TEST HEADER
E-01 SWEET PRODUCTION PREHEATER
E-02 SWEET TEST PREHEATER
E-03 SOUR PRODUCTION PREHEATER
E-04 SOUR TEST PREHEATER
E-23 SWEET/SOUR TEST PREHEATER
V-01 SWEET PRODUCTION SEPARATOR
V-02 SWEET TEST SEPARATOR
V-03 SOUR PRODUCTION SEPARATOR
V-04 SOUR TEST SEPARATOR
V-05 SWEET/SOUR TEST SEPARATOR
HEATING MEDIUM
GAS
WET OIL
PRODUCED WATER
NORMAL
DESIGN
Chevron
Chevron U.S.A. Inc.
Western Region, Production Department
Brown & Root, Inc.
PROCESS FLOW DIAGRAM
OIL & GAS SEPARATION
DRILLING AND PRODUCTION PLATFORM GAIL
SOCKEYE FIELD SANTA CLARA UNIT
SANTA BARBARA CHANNEL, CALIFORNIA
ISSUE FOR APPROVAL-DESIGN COMPLETION PHASE
APPROVED FOR ENGINEERING-DESIGN FREEZE
E-SB-029-F-3000A

FIGURE 6.4

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DATE JUL 23 1984

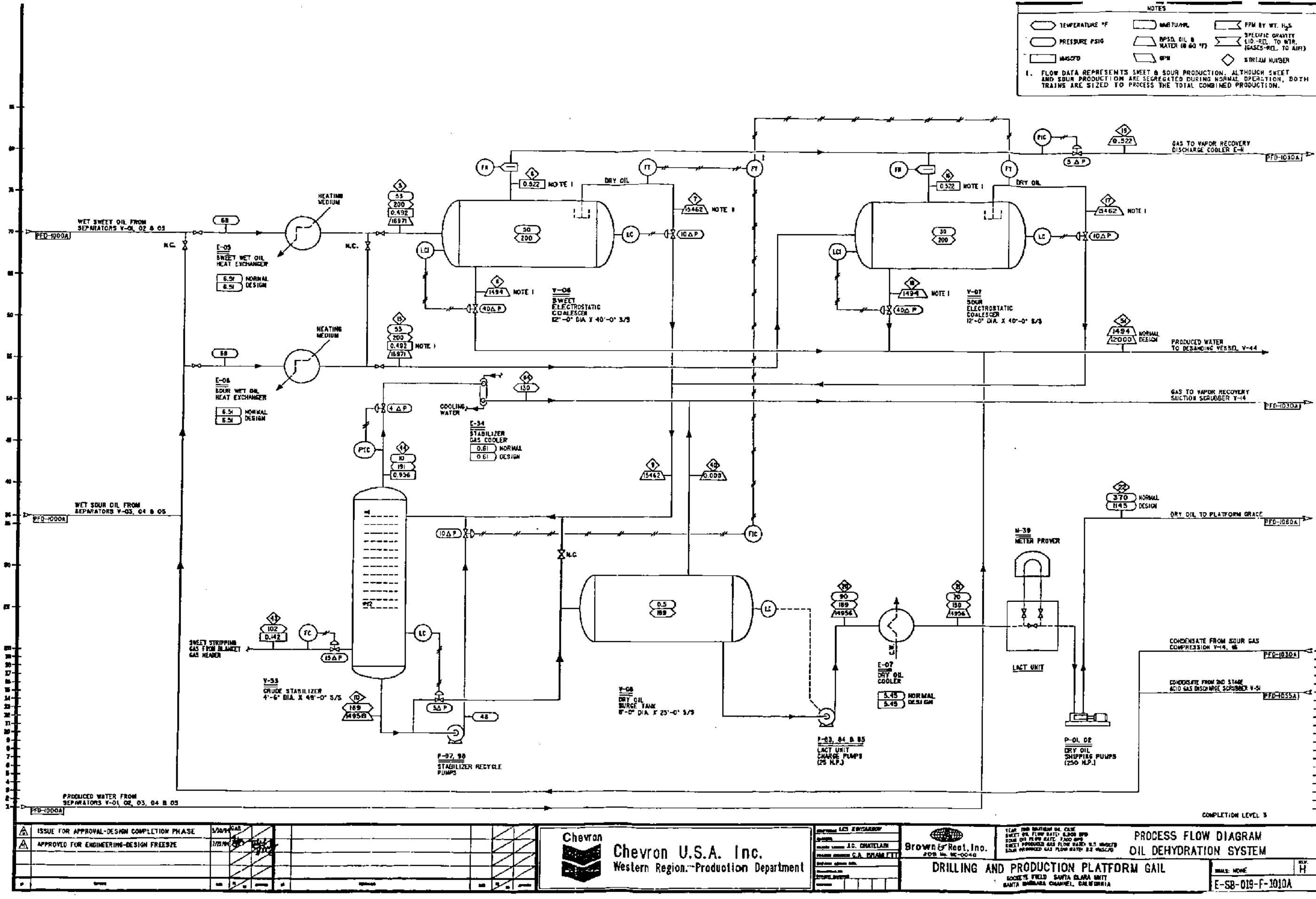

Figure 6.3

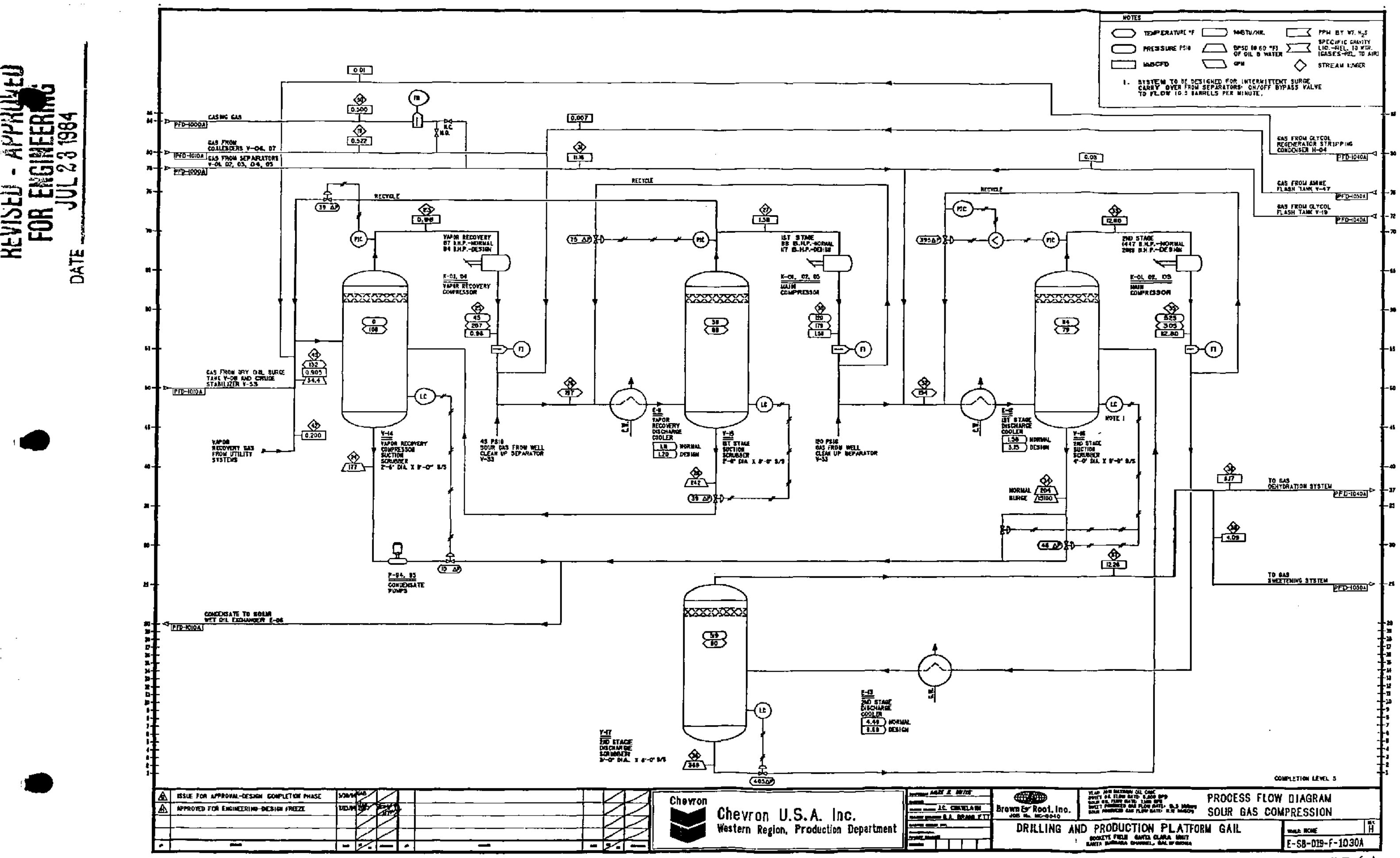
REVISED - APPROVED FOR ENGINEERING
JUL 23 1984
DATE
NOTES
TEMPERATURE °F
PRESSURE PSIG
MMBTU/HR.
MMSCFD
GPM
STREAM NUMBER
1. SYSTEM TO BE DESIGNED FOR INTERMITTENT SURGE CARRY OVER FROM SEPARATORS. ON/OFF BYPASS VALVE TO FLOW 10.5 BARRELS PER MINUTE.
CASING GAS
RECYCLE
VAPOR RECOVERY COMPRESSOR SUCTION SCRUBBER
1ST STAGE SUCTION SCRUBBER
2ND STAGE SUCTION SCRUBBER
MAIN COMPRESSOR
CONDENSATE PUMPS
2ND STAGE DISCHARGE COOLER
NORMAL
DESIGN
TO GAS DEHYDRATION SYSTEM
TO GAS SWEETENING SYSTEM
COMPLETION LEVEL 5
ISSUE FOR APPROVAL-DESIGN COMPLETION PHASE
APPROVED FOR ENGINEERING-DESIGN FREEZE
Chevron
Chevron U.S.A. Inc.
Western Region, Production Department
J.C. CHATELAIN
Brown & Root, Inc.
PROCESS FLOW DIAGRAM
SOUR GAS COMPRESSION
DRILLING AND PRODUCTION PLATFORM GAIL
SANTA BARBARA CHANNEL, CALIFORNIA
SCALE NONE
H
E-SB-019-F-1030A

FIGURE 6.4

REVISED - APPROVED FOR ENGINEERING
DATE JUL 23 1984

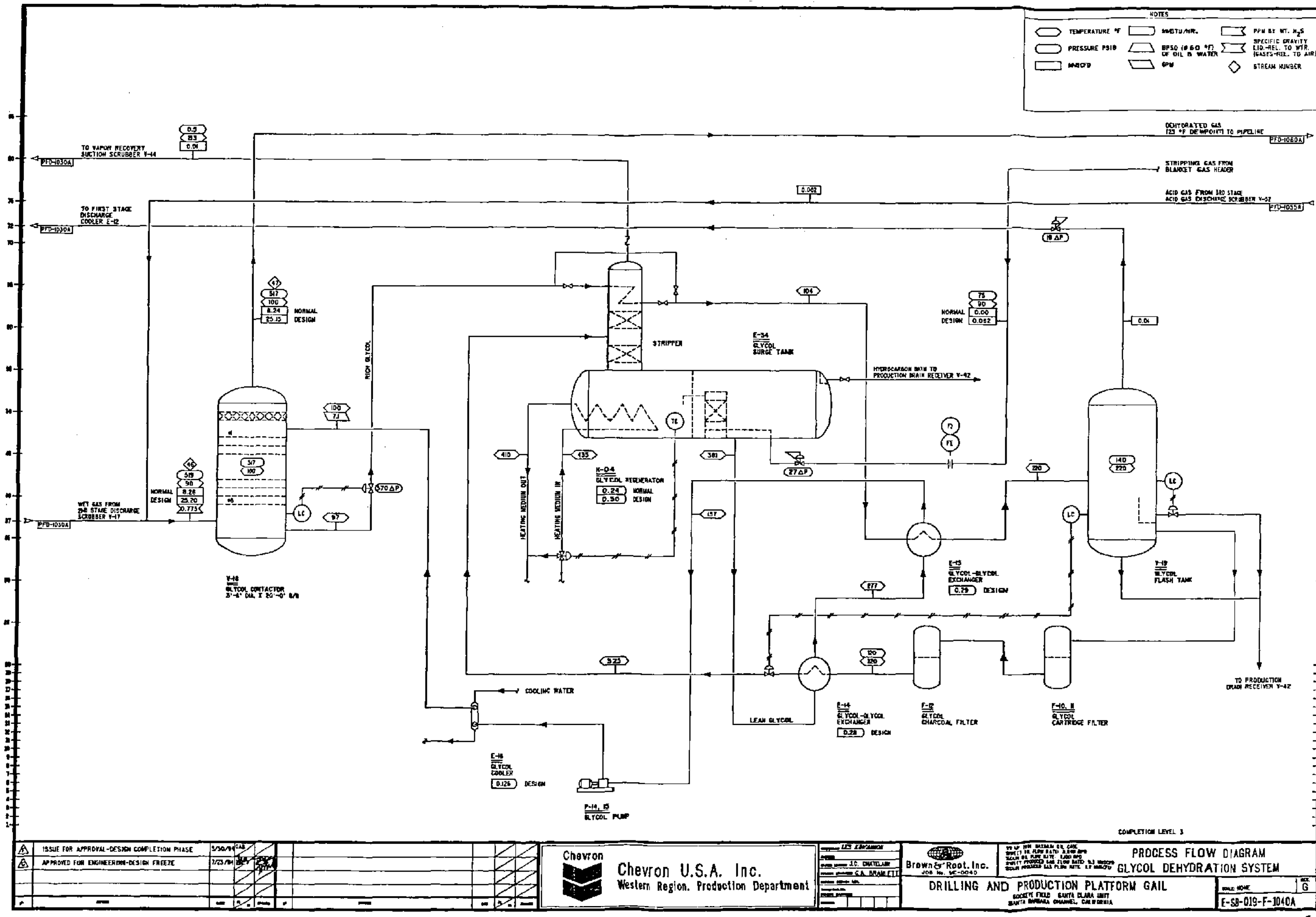

FIGURE 6.5

REVISED - APPROVED FOR ENGINEERING
DATE JUL 23 1984

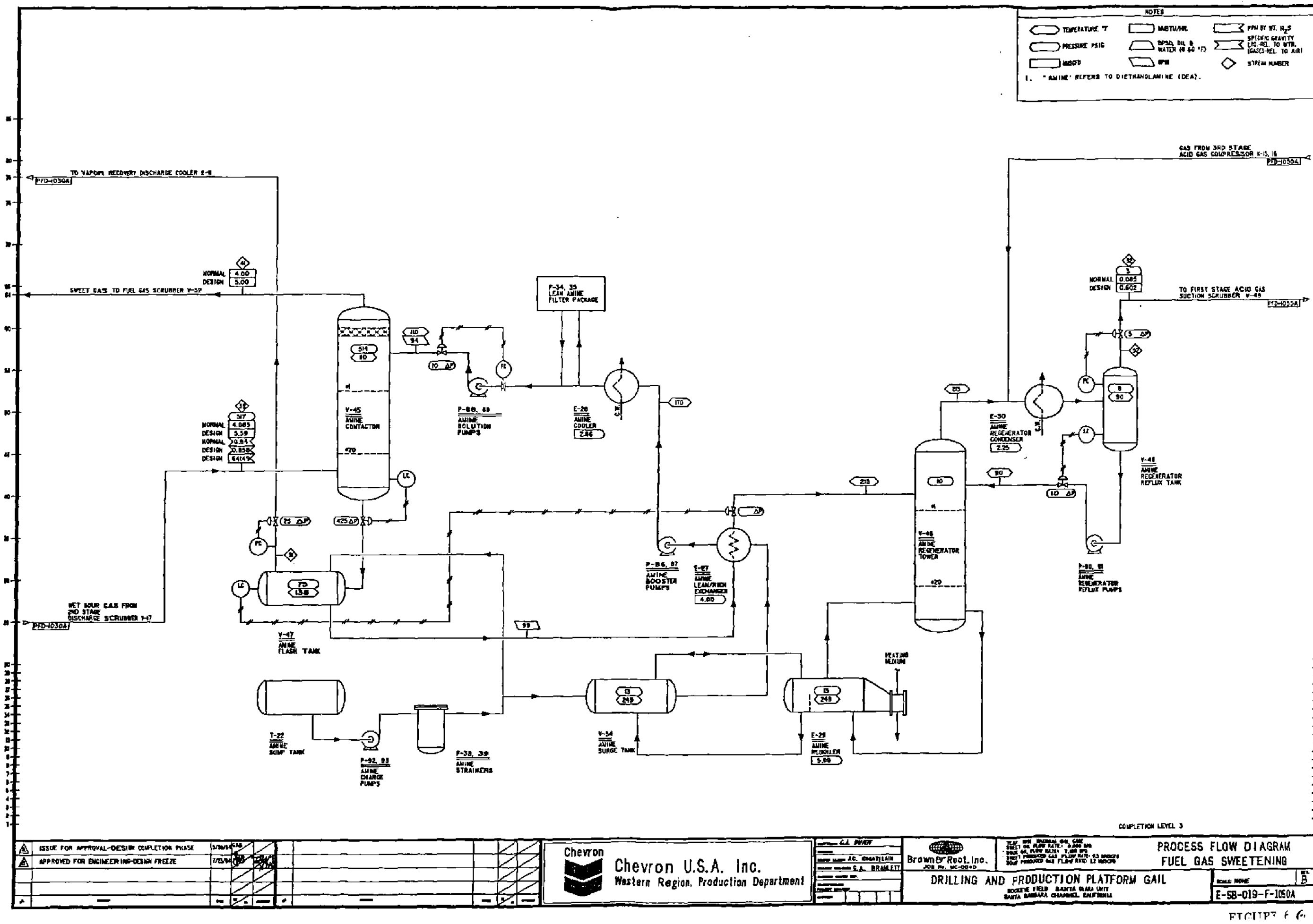

FIGURE 6.6

SECTION 7
PIPELINE SYSTEM

TABLE OF CONTENTS

FIGURES

SECTION 7
PIPELINE SYSTEM

7.1 Introduction

The subsea pipeline system from Gail will consist of three 8.6" (22 cm) outside diameter pipelines which will be brought to the surface at Platform Grace. These are planned for installation during late 1986. One line will be used to transport Gail's oil production and one for the gas production. The third line is a spare which can operate in either service or as a utility line. The lines will be manifolded to the existing two lines (one oil and one gas) from Grace to Hope and then to an existing metering station at Carpinteria. On Grace, the gas line will have a pig launcher/receiver. The other two lines will have pig receivers. There will be no gas or oil metering facilities on Grace for the Gail production. The effect on Grace with the current design is expected to be minimal.

From Carpinteria, oil will be routed by existing pipeline facilities to Chevron's El Segundo Refinery. The natural gas will be commingled with Platform Grace gas, transported through Chevron's existing pipeline to an existing metering station at Carpenteria and then processed in a new gas sweetening plant and an existing separation plant at Carpinteria. The gas will then be sold to Southern California Gas Company pipeline.

The following sections will present the pipeline route selection, corridor details, design codes, design basis, proposed operations, and other considerations.

7.2 Pipeline Route

The proposed pipeline route is shown in Figure 1.1 (See Section 1). The length of the pipelines from Platform Gail to Grace is approximately 6 miles (10 km). The line profile is a gradual slope from a 739' (225 m) water depth at Gail to a 318' (97 m) depth at Grace.

7.3 Pipeline Corridor: Platform Gail to Platform Grace

Surveys and detailed geological evaluations recently completed along the proposed pipeline route by Woodward Clyde Consultants (Reference 2.5.10 and 2.5.11) indicate the features that are described in the following sections.

7.3.1 Geological and Geotechnical Conditions

A detailed geophysical investigation was performed along the pipeline route from proposed Platform Gail to Platform Grace by Woodward-Clyde Consultants in 1981 (Reference 2.5.10). The surveyed corridor was about 7000' (2000 m) wide and 37,000' (11,000 m) long. Immediately adjacent to this corridor are a slope stability and platform site survey areas, extending the total surveyed area in the pipeline vicinity to over 16 square miles (41 square kilometers). Nineteen soil samples were taken along this route. Based on this survey work, the final route for the pipeline was selected to avoid seafloor anomalies.

The geological conditions along the proposed pipeline route are generally favorable for the laying and maintaining of the pipeline. The route does not cross any faults or hard-bottom features. The route was chosen to proceed west-northwesterly from Platform Gail rather than northwesterly, as would be more direct, in order to avoid the slope instability area. Here, internally coherent blocks of sediment appear to have moved translationally downslope, as discussed in Sections 2.3.2 and 4.2.1. By heading west-northwesterly, the pipeline will skirt around the edge of the slide terrain (Figure 4.2) at an area where slopes are low (less than 1.9° or 1:30 or 3%). Therefore, very little deflection would be expected during earthquake loading.

The distribution of shallow gas along the proposed pipeline route (Figure 4.2) has been summarized by Woodward - Clyde Consultants (Reference 2.5.10) as follows:

> "Shallow gas horizons occur over more than two thirds of the survey area. Geochemical analysis (subcontracted to Carbon Systems Inc., see Appendix D) of sediment cores retrieved during the boring program corroborated the evidence of shallow gas as indicated by the seismic subbottom profiles. The testing indicated that the gas was mostly methane derived from leakage of petrogenic gases from reservoirs below. The geochemical analysis also showed that methane values were not high enough to indicate the presence of large quantities of gas in the bubble phase, thus implying that the gas is largely dissolved in the pore waters.

The shallow gas over most of the area appears to be dispersed but relatively continuous. The UNIBOOM profiles indicated gas by showing grey zones in which other reflectors are masked and by a lack of penetration below those zones with occasional bright spots... It was possible to contour the depth below the sea floor to the dispersed gas-charged sediments...except in the area of the slide terrain where the hummocky topography made the contouring unreliable.

A small portion of the shallow dispersed gas was mapped but not contoured, as its distribution was highly irregular and discontinuous... The depth from the sea floor in this area to the gas horizons was about 28' to 60' (8.5-18 m).

Shallow gas mapped around the area of Platform Grace has a decidedly different character. Compared to the areas of shallow dispersed gas, the area south of Platform Grace showed dramatic bright spots on the UNIBOOM profiles with a very irregular distribution; the gas here also appeared to be considerably deeper, about 168' to 250' (51 to 76 m), than the bulk of the gas mapped in the area. Because of the dramatic bright spots, it is inferred that the gas in this area may be present in greater concentration and amounts than in other areas of the survey." (Reference 2.5.10)

The seafloor sediments along the route will also adequately support the pipeline. The soil along most of the pipeline route consists of a surface layer of silty sand to sandy silt (SM-ML) about 12" to 18" (30 cm to 46 cm) thick. The silty sands are underlain by very soft to medium stiff clays of medium to low plasticity. The soil along the pipeline route close to Platform Grace consists of silty sands to sandy silts to the maximum depth sampled (2' to 3' or 0.6 m to 1 m). Additional details of the geological conditions along the pipeline route are given in Section 4.2 of Reference 2.5.9.

7.3.2 Cultural Resources

Woodward-Clyde Consultants utilized the services of Dr. E. Gary Stickel to review the route of the proposed pipeline for cultural and archaeological resources. Data recently acquired by Chevron on Lease P 0210 were reviewed by Dr. Stickel. Very little of the survey area is within the 394' (120 m) water depth (or shallower) specified by NTL 77-3. Dr. Stickel identified five side-scan sonar anomalies (A through E) within this water depth. Anomalies A and B were identified as linear features that are probably cables or anchor drag marks. Anomaly C is the existing pipeline from Platform Grace to Platform Hope. Anomaly D was faint and was identified as possible anchor drag marks. Anomaly E had low relief and possibly represented exposed stiff sediments at the shelf-slop break. As these five anomalies have no cultural significance, Dr. Stickel determined that there are no cultural resources within the survey area.

7.4 Design Codes

The pipelines will be designed, constructed, tested, operated, and inspected in accordance with the latest edition of the following design standards:

- Liquid Petroleum Transportation Piping Systems, American National Standards Institute (ANSI) B31.4.
- Gas Transmission and Distribution Piping Systems, American National Standards Institute (ANSI) B31.8.
- Transportation of Hazardous Liquids by Pipeline: Minimum Federal Safety Standards, Department of Transportation Regulation 49, Part 195.
- Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, Department of Transportation Regulation 49, Part 192.
- Recommended Practice for Design, Construction, Operation and Maintenance of Offshore Hydrocarbon Pipelines, American Petroleum Institute Publication API-RP 1111.

- OCS Order No. 9.

7.5 Pipeline Design Basis

A schematic of the pipeline system from Platform Gail to Platform Grace is included as Figure 7.1.

The oil characteristics used in sizing studies to date are:

Gravity: API 17^{o} - 28^{o}
Oil Viscosity: 9^{cs} - 606^{cs} (at 104^{o}F)

The gas will be at its hydrocarbon dewpoint when leaving Platform Gail. As the temperature drops, liquids will condense. Assuming a 525 psig discharge at Gail and a required 380 psig pressure at Grace, and using pigging spheres to control the effects of liquids, the 8.625" (22 cm) line will handle 25 MMSCFD.

The pipelines will also be capable of operating successfully at offpeak capacity. For the oil line, calculations show that a restart can be accomplished with the line contents at 47^{o}F if there is an extended shutdown. For the gas line, low flows will cause excessive pressure drops if condensed liquids are allowed to accumulate. Therefore, pigging will be scheduled to avoid this situation.

The proposed pipelines will be designed to ensure that they can be safely installed and operated in an environmentally acceptable manner. Specific design data will be supplied in compliance with MMS OCS Order No. 9.

7.5.1 Design/Operating Conditions

Maximum design pressure of the oil, gas, and spare pipelines to Platform Grace will require less wall thickness than that required to withstand installation stresses. For the oil and spare pipelines, an ANSI 600 system will be the minimum design pressure. The gas pipeline will have an ANSI 300 system. Maximum operating pressures will be less than 900 psig in the crude line and less than 740 psig in the gas line.

By adjusting the discharge pressures, the pipelines will be capable of handling the range of expected flows at maximum efficiency. The oil line size will be sufficient to transport up to 15,100 barrels per day of crude oil. The gas pipeline will be sized to have a capacity of 25.2 MMSCFD.

Temperature of crude in the oil pipeline is expected to range from 47°F to 130°F. Temperature of the gas line is expected to range from 45°F to 90°F. The pipelines will be designed to accommodate thermal effects without damage.

7.5.2 Mechanical Design

Pipeline material specifications will be developed to satisfy requirements of both operating and installation modes.

Pipelines will be designed to resist predicted recurring environmental loads resulting from steady-state and wave induced currents, and seismic activity. A report is available on ocean currents, based on current surveys previously carried out in the area (Reference 4.7.3).

7.5.3 Corrosion Protection

Pipelines will be protected from external corrosion by coatings and cathodic protection (sacrificial anodes). Internal corrosion will be controlled through the use of corrosion inhibitors, through proper selection of pipeline materials, and additional pipewall thickness to provide corrosion allowance.

7.5.4 Construction

The pipelines will be installed using the conventional laybarge and stringer method. Pipe joints, 40 (12 m) to 60 (18 m) feet in length, are welded together offshore on a floating deck and then lowered to the seabed in a controlled configuration to prevent overstressing (See Figure 7.2).

The pipejoints are welded into a continuous string on a long, greatly curved production ramp. The anchored lay barge is pulled forward one pipe length as each new joint is added. During pull up, the pipe string passes down the ramp onto a stringer, and to the ocean floor in a S-curved configuration . Tensioners positioned along the production ramp provide a hold back force which limits the curvature of the pipe string and hence the maximum stress to which the pipe is subjected.

Prior to construction, all pipe and coatings will be inspected for defects. Pipeline welding procedures and welders will be qualified. During construction, all girth welds will be 100 percent radiographically inspected. Full time, qualified inspectors will monitor all phases of construction. Pipelines will be gauged and will be pressure tested with corrosion inhibited water to 1.50 times the maximum design pressure. The test water will remain in the pipelines until production begins and will be treated in accordance with applicable regulations prior to disposal.

7.6 Pipeline Operations

Platform Gail's volumetric comparison oil leak detection system is comprised of a computer system that will perform a volumetric balance in one-minute intervals. Obtaining a volumetric balance entails the comparing of all volumes which have entered a pipeline segment to the volumes which have left the segment. All pipeline volumes will be temperature compensated to 60°F and adjusted by the appropriate meter factor. Additionally, the pipeline inventory will be corrected for changes due to pressure fluctuations. A volumetric meter will be installed at the exit from Gail and at the entry to Grace on both the oil line and the spare line. Volumetric meters already exist on the oil line exit point from Grace and at the oil line entry point to Carpinteria.

The volumetric balance is checked at seven different leak levels over different time periods spanning from one minute to monthly. If an excessive imbalance occurs an alarm will be sounded. This volumetric balance system enables the detection and alarm of leaks as small as 0.1 barrel per minute in a 20-minute period and 100 barrels over a 30-day period. Also, if a leak of two barrels or more occurs in a one-minute interval, the system will alarm. The leak detection system will be designed in accordance with MMS OCS Order No. 9.

Gas entering offshore pipelines will also be metered as will deliveries to the onshore facilities. A continuous comparison is not feasible due to the 2-phase nature of the flow.

High and low pressure shut-down devices will automatically shut-in offshore production and shut-down pipeline(s) if changes in pressure (high or low) exceed preset limits. Pipelines coming onto and leaving platforms will have automatic shut-down valves operated in accordance with MMS OCS Order No. 9.

Corrosion inhibitors, pipeline pigs, and instrumented pigs will be used as needed to assure that pipelines remain free of potentially harmful deposits and defects. For the gas line, pigging will be used to displace condensate in the line and to control pressure drop.

All Gail pipelines will be operated in accordance with MMS OCS Order No. 9. This will include external inspections of the lines, testing of safety devices, and actuation of isolating valves on the prescribed schedule.

7.7 Other Considerations

7.7.1 Fishing/Marine Pipeline Compatibility

The pipelines will lie on the seabed. There are no plans for installation of any appurtenances for subsea tie-ins on the Gail pipelines. If provision is made for future subsea tie-ins, a smooth cover for the pipeline that rests on the seabed will be installed to ensure compatibility with fishing equipment and to preclude damage to the pipeline systems.

7.7.2 Seabed Topographic Alterations

Anchor scars can occur on the ocean floor as a result of anchoring drilling vessels (drillships, semi-submersibles), pipelaying barges, or occassionally jack-up drilling barges. The extent of any disturbance may vary from area to area. Differences in the amount of disturbance generally result from variations in ocean floor sediments and weather conditions. It has been noted that the most severe scarring of the ocean floor has occurred where drilling vessels or pipelaying barges have been anchored in soft bottom sediments and have been subjected to storm conditions. During normal offshore operations (anchor deployment and anchor retrieval by the lay barge) only a minor disturbance of the ocean floor would be expected to occur. Chevron's contractors will be instructed to take all feasible steps to minimize scarring.

If seabed scarring does occur, various alternatives to mitigate the situation will be explored. As possible mitigating procedure, Chevron could use underwater video equipment and, in some cases, side-scan sonar to determine the extent of disturbance to the ocean floor after platform and pipeline installation. In the event a disturbance of the ocean floor is indicated by the surveys, Chevron would undertake appropriate mitigation measures to minimize the disturbance to the ocean floor if such disturbance appears to impair the future use of the area by fishermen.

Chevron will continue its efforts to inform local fishermen of potential hazards during the exploratory project via meetings with fishermen's groups and announcements of the projects activities in the Coast Guard's Notices to Mariners.

If anchoring procedures or accidential equipment loses attributable to Chevron's activities leave seafloor obstructions which foul fishing nets, fishermen will be compensated for lost gear by Chevron. The Fishermen's Contingency Fund will continue to be available in those cases where clear responsibility cannot be established. Therefore, potential impacts of the proposed project on commercial fishing are expected to be minor, localized, and temporary.

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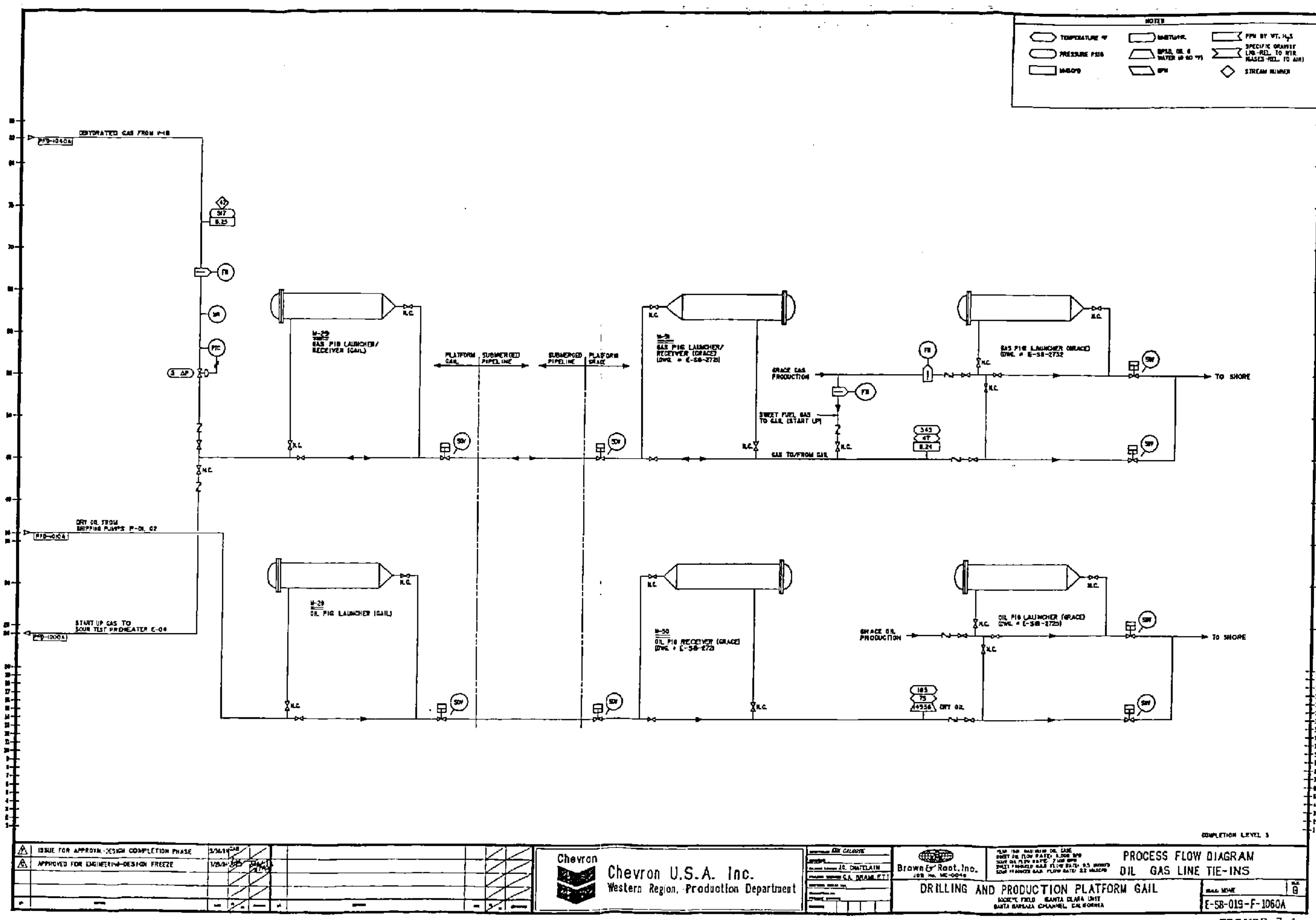
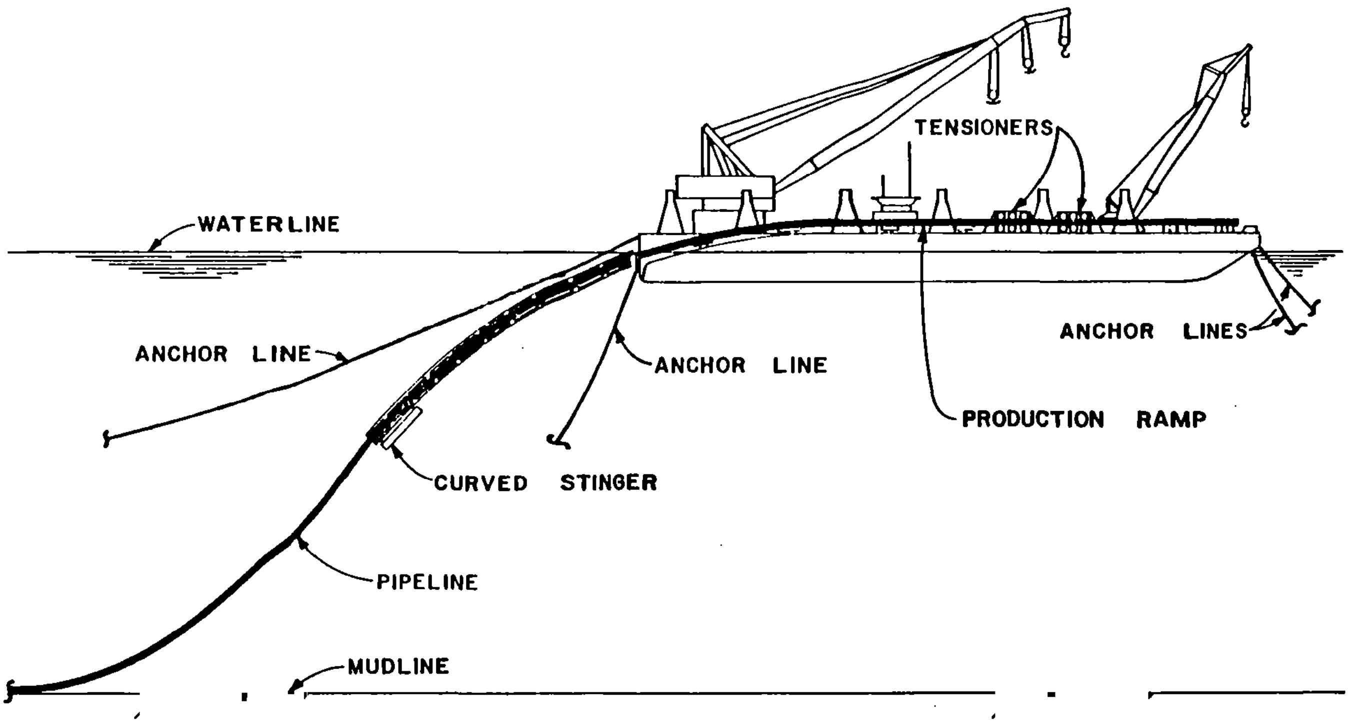


FIGURE 7.1



LAYBARGE AND STINGER SYSTEM

FIGURE 7.2