APPENDIX G

GOLDEN PASS

DRAFT FINAL
AQUATIC RESOURCE MITIGATION PLAN
(May 5, 2005)

Golden Pass Aquatic Resource Mitigation Plan
Table of Contents

GOLDEN PASS AQUATIC RESOURCE MITIGATION PLAN

1.0 PROJECT DESCRIPTION

The proposed Golden Pass LNG (GPLNG) Terminal will be constructed on a 477-acre tract of land located in Jefferson County, Texas. The terminal property is approximately 10 miles south of Port Arthur, Texas and 2 miles northwest of Sabine, Texas, and is bounded by wetlands abutting Texas State Highway 87 to the west and south, and the Sabine-Neches Waterway (SNWW) to the east and north. This approximately 477-acre tract of land will be owned by GPLNG. The GPLNG Terminal includes the following primary components:

- A marine terminal that may be expanded to receive up to 200 LNG ships per year, with berthing capabilities to moor two LNG ships;
- LNG unloading and transfer facilities and related mechanical and piping support systems;
- Up to five onsite LNG storage tanks (approximately 155,000 cubic meters (m^3) working capacity each), ten LNG vaporizers and related regasification support systems capable of an average capacity of up to 2.0 billion cubic feet per day (bcfd) of natural gas, with a peak capacity of 2.7 bcfd; and
- Associated terminal support facilities, including administrative buildings, storage and maintenance areas, electric power systems, terminal access roads, and other civil works related to the GPLNG Terminal.

Golden Pass Pipeline LP (GPPL) proposes to construct and operate the Golden Pass Pipeline System, designed to deliver up to an average of 2 bcfd of regasified natural gas from the GPLNG Terminal to existing Texas intrastate and interstate natural gas pipeline systems. The Golden Pass Pipeline System will consist of three pipelines and associated pipeline support facilities, including pig launchers and receivers, and metering equipment to include:

- Golden Pass Pipeline, an approximately 78-mile, 36-inch diameter pipeline commencing at the proposed GPLNG Terminal's send-out metering station and continuing to a terminus at a new metering and regulating station (M and R station) at an interconnection with an existing Transcontinental Gas Pipeline Corporation (Transco) interstate pipeline near Starks, Louisiana.
- Golden Pass Loop Line, an approximately 43-mile, 36-inch diameter pipeline commencing at the proposed GPLNG Terminal's send-out metering station parallel to and looping the Golden Pass Pipeline as far as the Texoma Pipeline Meter Station in Orange County, Texas.
- Beaumont Lateral, an approximately 2-mile, 24-inch diameter lateral pipeline connecting the Golden Pass Pipeline to Beaumont-Port Arthur industrial customers including the ExxonMobil Beaumont refinery in Jefferson County, Texas.

At this time, up to 10 interconnections with existing intrastate and interstate pipelines are planned for the GP Pipeline System. Table 1 lists the potential interconnections and the Beaumont Lateral.

Table 1 - Potential Interconnect and Delivery Information

Potential GPPL Interconnect	Potential Deliveries mcfd[†]	Diameter (inches)
NGPL	900	30, 30
Centana	100	10
KM – Texas	200	20
KM – Tejas	500	20
Beaumont Area including ExxonMobil's Refinery	300	24
AEP Texoma Pipeline	1,000	30
Florida Gas Transmission	440	24
Channel (HPL AS)	500	30
Tennessee	700	30
TETCO	750	30
Transco	1,000	30, 30, 42

[†] mcfd – million cubic feet per day

2.0 DESCRIPTION OF AFFECTED AQUATIC RESOURCES

An aquatic resource determination was conducted on approximately 477 acres at the proposed GPLNG Terminal Property and approximately 1,775 acres along the 77.8-mile proposed Golden Pass Pipeline System construction right-of-way (ROW). The proposed construction ROW includes work areas, permanent and temporary access roads, pipe yards, and interconnects. The underwater aquatic resource surveys did not identify any submerged aquatic vegetation (BESI 2004a and BESI 2004b).

This report addresses the wetlands potentially impacted by the project. The majority of the terminal site is situated within a formerly used United States Army Corps of Engineers (USACE) dredge placement area. Geotechnical investigations conducted at the terminal site confirm that the top (surface) 10 to 14 feet of soil was hydraulically dredged material placed by the USACE more than 30 years ago (Fugro South, 2004). The dredged material typically consisted of clay, silty clay, silts and clayey silts and is generally fine-grained. This material and the underlying native soils and sediment were originally thought to be unsuitable for beneficial use; however, after additional evaluation (URS, 2005), beneficial use has been determined practicable. Dredged material not used for beneficial purposes will be placed in existing dredged material placement areas.

GPLNG and GPPL have taken measures to reduce the potential effects to wetlands by:

- Optimizing the footprint of the facility design to avoid and minimize filling of wetlands;
- Routing of the Golden Pass Pipeline System to avoid wetlands; and,
- Selecting construction techniques that minimize wetland impacts.

The acreage of jurisdictional wetlands at the terminal has been determined by the USACE, Galveston District. Table 2 shows the estimated pipeline acreage by wetland category (type) as originally determined in late 2003 plus USACE jurisdictional acreage at the terminal as determined in March 2005. As of May 4, 2005, the USACE jurisdictional wetland determination of the pipeline route is underway with completion expected by the end of the month. (Note to reader: highlighted acreage could be revised based on the outcome of the USACE jurisdictional wetland determination for the pipeline route.)

Table 2 - Temporary and Permanent Wetland Acreage Impacted by the Project

Terminal, Pipeline, Access Roads, Pipe yards, Interconnect Sites			
Habitat Classification	Total Delineated Wetland Acreage	Wetland Acreage Impacts	
		Temporary	Permanent
Bottomland Hardwood Wetland	38.4098	0.0000	4.9354
Coastal Emergent Marsh	233.2253	16.4600	44.7202
Ditch	1.2932	1.0953	0.0000
Herbaceous Agriculture Wetland	72.9039	0.0000	0.0000
Herbaceous Wetland	239.4324	136.0599	62.8722
Mixed Pine-Hardwood Wetland	46.3491	0.0000	41.7383
Pine Flatwoods Wetland	19.7947	0.0000	15.3479
Scrub Shrub Agriculture Wetland	3.5060	0.0000	0.0000
Scrub Shrub Wetland	95.0283	72.3409	0.8033
Swamp	17.9863	0.0000	1.8237
Water	381.3982	0.0000	0.2648
Unvegetated Shoreline	0.5019	0.0000	0.5019
Total	1149.8291	225.9561	173.0077
Wetlands delineated that have temporary or permanent impacts (PL)	290.1971	225.9561	64.2410
Wetlands delineated that have no temporary or permanent impacts (PL)	602.8929		
Wetlands delineated that have temporary or permanent impacts (Term)	98.1849	0.0000	108.7667
Wetlands delineated that have no temporary or permanent impacts (Term)	158.5542		
Total	1149.8291	225.9561	173.0077

2.1 Wetland Types

Existing Conditions

Wetlands are defined as "those areas inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (33 CFR Part 328). Wetlands are protected from alteration or destruction by Federal and State regulations. At the Federal level, wetlands are protected under Section 404 of the Clean Water Act. Under Section 404, the USACE has the authority to regulate the discharge of dredged or fill materials into waters and adjacent wetlands of the United States. The State of Texas does not have a specific aquatic resource protection law or program but exerts the authority to protect aquatic resources under Section 401 of the Clean Water Act, which requires that the Railroad Commission (RRC) conduct a Section 401 certification review of USACE Section 404 permit applications to determine if a proposed discharge would comply with State water quality standards. (The Texas standards for review are set out at 30 TAC Chapter 279.) The Texas Coastal Management Program (1997) (administered by the Coastal Coordination Council) also protects aquatic resources within the

designated Coastal Zone. This Aquatic Resource Mitigation Plan was developed in accordance with the USACE Regulatory Guidance Letter No. 02-2 dated December 24, 2002.

The GPLNG Terminal and a portion of the Golden Pass Pipeline System (approximately MP 0-56) lies within the Coastal Prairie ecoregion, which historically contained vast areas of freshwater and tidal wetlands, intermixed with upland prairie and forest. This ecoregion has undergone significant alteration in the last several decades. In particular, the area of freshwater wetlands has significantly decreased due to saltwater intrusion caused by development, dredging, channelization, land subsidence, and other factors (BLM, 2004). The presence and ongoing spread of non-native vegetation species has reduced the vegetative diversity and wildlife habitat quality of freshwater and tidal wetlands in this region.

Wetland delineation was conducted in areas with landowner / manager permission in accordance with methods defined in the USACE Wetlands Delineation Manual (USACE, 1987). The Cowardin system of wetland classification (Cowardin, et al., 1979) was used to classify the wetlands into several wetland types, which are described in Table 3. The Cowardin system further classifies these wetland types according to their flooding regime, which ranges from temporarily or irregularly flooded to seasonally flooded or permanently flooded. Table 2 lists the delineated wetlands estimated to be impacted by the GPLNG Terminal and Golden Pass Pipeline System.

Table 3 - Habitat Description

WETLANDS (ALL TYPES)	HABITAT DESCRIPTION
Coastal Emergent Marsh	Consists of brackish, intermediate, and fresh marshes. Includes smooth cordgrass, black rush, salt meadow cordgrass, cattail, and bulrush.
Herbaceous Wetland	Includes natural palustrine wetlands and man-made wetlands in existing ROWs and other disturbed sites. Includes a wide variety of emergent species, such as cattail, rushes, bulrush, arrowhead, etc.
Scrub-Shrub Wetland	Generally includes sites in various stages of regrowth from timber harvest, fallow fields/pasture, or some other disturbance. Species include water oak, red maple, Chinese tallow, bramble, etc.
Mixed Pine/Hardwood Wetland	Includes mixture of loblolly and slash pines and hardwood species, such as, water oak, sweetgum, magnolia, and red maple.
Pine Flatwoods Wetland	Mainly composed of loblolly and slash pines with the occasional water oak, sweetgum, Chinese tallow or other hardwood species.

WETLANDS (ALL TYPES)	HABITAT DESCRIPTION
Bottomland Hardwood Wetland	Dominated by overcup oak, Laurel oak, willow oak, green ash, and other hydrophytic hardwood species.
Swamp	Normally associated with riparian zones and dominated by bald cypress, water tupelo, and water elm.
Ditch	Man made or modified natural drainages, which typically support herbaceous wetland communities.
Herbaceous Agriculture Wetland	Herbaceous wetlands that are under cultivation, such as rice.
Scrub Shrub Agriculture Wetland	Scrub shrub wetlands that have developed on agricultural lands. Typically found in fallow rice fields or wet cattle pastures.

The data reflected in Table 2 were generated from field surveys and for areas where land access was denied or the route was adjusted, aerial photography interpretation delineated wetland areas.

Wetlands are defined by the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. Topography and soil characteristics along the pipeline corridor dictate the presence of those parameters, and therefore dictate the presence, type, and extent of wetlands along the construction ROW. The following sections describe the wetland categories listed above, and Table 4 lists representative species for each of the wetland category.

Coastal Emergent Marsh

The coastal emergent marsh consists of three primary marsh communities: brackish marsh (5-10 parts per thousand salinity), intermediate marsh (0.5-3.5 parts per thousand salinity), and coastal fresh marsh (<0.5 parts per thousand salinity; Stutzenbaker, 1999). Coastal emergent marsh is restricted primarily to the GPLNG Terminal Property and MP 0 through MP 14.05 of the Golden Pass Pipeline System, and low floodplain areas associated with Taylor Bayou, Hillebrandt Bayou, and non-forested tidal wetlands in the Neches River bottom, excluding open water.

Brackish marsh communities are restricted to canal borders and shoreline areas associated with tidal areas just east of Highway 87 (MP 0-1), in the GPLNG Terminal Property, Keith Lake and associated side bays (Johnson Lake, Shell Lake, and Salt Bayou), and along the Gulf Intracoastal Waterway (GIWW). These are tidal brackish marshes typically with smooth cordgrass shoreline

fringes and saltmeadow cordgrass dominating just inshore. The saltmeadow cordgrass marsh often includes some or all of the following species: common reed, hog cane, chairmaker's bulrush, saltmarsh bulrush, cattail, eastern baccharis, marshelder, and sea-ox-eye daisy. The intermediate marsh includes the above listed species, with increasing dominance by black rush and saltmarsh bulrush in the intertidal zone. Other commonly occurring species within the intermediate marsh communities include hog cane, chairmaker's bulrush, California bulrush, and cattail. Dominant shrub species in the brackish and intermediate marshes include eastern baccharis, marshelder, sea-ox-eye daisy, Carolina wolf-berry, rattlebox, and common reed.

The coastal fresh marsh community occurs in tidal and non-tidal areas on the coastal plain with a salinity range of 0-0.5 parts per thousand (Stutzenbaker, 1999). This habitat intergrades with the intermediate marsh along tidally influenced canals and bayous that exchange with more saline water bodies such as the GIWW. A large section of coastal fresh marsh, with exception of upland levees and open water areas, occurs north of the GIWW. Intermediate marsh species occur more commonly along canals and bayous in close proximity to the GIWW. Salt meadow cordgrass is the dominant plant species in this community with rice cutgrass, yellow bristle grass, cattail, California bulrush, fall panicum, saltmarsh bulrush, Olney bulrush, rattlebox, bigpod sesbania, seedbox, swamp smartweed, white waterlily, lotus, pennywort, and watergrass also occurring (Sutherlin, 1998). Big Hill Bayou and most of the canals are bordered by bands of fresh marsh species such as common reed, giant cutgrass, cattail, dwarf spikerush, and California bulrush.

Herbaceous Wetlands

This community classification includes natural, as well as man-made wetlands resulting from hydrologic modifications. Herbaceous wetlands occur within existing ROWs and cattle grazing pastures which are temporarily to seasonally flooded. These areas are common and vary in size from <0.01 acre to >1 acre. Many of the herbaceous species listed in the coastal emergent marsh section (above) are represented in this community in varying combinations and dominance. Commonly encountered plant species in this habitat include Gulfcoast spikerush, dwarf spikerush, slender spikerush, soft-stem rush, pine barren flatsedge, green flatsedge, rusty flatsedge, bushy bluestem, dallisgrass, dotted smartweed, water primrose, swamp smartweed, and maidencane. In eastern portions of Texas, slender spikegrass also occurs.

Scrub/Shrub Wetlands

This classification represents several community variations: The most common variation includes many of the plants listed in the emergent wetland section above, but also includes shrubby species such as bramble, marshelder, saplings (usually water oak, red maple, and sweetgum) and/or Chinese tallow. Other areas with the scrub/shrub wetland classification are sites in various states of re-growth in areas of disturbance. These areas often contain mixes of scrub/shrub sapling species listed above, pine, waxmyrtle, and other plants common to the surrounding area.

Coastal scrub/shrub marsh communities, associated with coastal emergent marsh, are often dominated by saltmeadow cordgrass and shrubby species including marshelder, eastern baccharis, sea-ox-eye daisy, seaside goldenrod, and Chinese tallow.

A scrub/shrub community variant was identified in the floodplain of the Houston River bottom. The primary species observed were mayhaw, swamp tupelo, and waxmyrtle. The herbaceous layer consists of maiden-cane, wooly panic grass, and soft rush.

Mixed Pine/Hardwood Wetlands

This community typically occurs as an extension of adjacent upland forest communities where wetter conditions dominate. Overstory species composition is similar to the upland habitat and often includes loblolly pine, slash pine, water oak, magnolia, sweetbay magnolia, blackgum, swamp tupelo, red maple, and laurel oak. The sapling/shrub layer includes these species and waxmyrtle, American holly, hawthorn spatula or mayhaw, sweet gum, and eastern baccharis. The herbaceous layer consists of slender spike grass (primarily in Newton County, Texas and Calcasieu Parish, Louisiana), dwarf spike rush, poison ivy, and royal fern. The woody vine layer consists of rattan vine and yellow jasmine.

Pine Flatwoods Wetlands

Two pines, loblolly pine and the wetter slash pine, dominate the tree stratum in this vegetation community. Other tree species include Chinese tallow and sweetgum. The sapling/shrub layer is comprised of the aforementioned species and waxmyrtle, willow oak, and hawthorn. The herbaceous layer consists of soft-stem rush, slender spike grass, dwarf spike rush, poison ivy, rusty flatsedge, St. Johns wort, blackberry (*Rubus argutus*), and laurel-leaf greenbrier.

Bottomland Hardwood Wetlands

Bottomland hardwood wetland communities occur along the larger streams and rivers and are characterized by overcup oak, Laurel oak, willow oak, green ash, sweetgum, American hornbeam, deciduous holly, cedar elm, Texas sugarberry, red maple, and hawthorn (Nixon and Cunningham, 1985). Shrub species commonly associated with this community include the above listed species and indigo bush, swamp cyrilla, poison ivy, Drummond sesbania, dogwood, and Sebastian bush. Common woody vines include wooly Dutchman's pipe, American buckwheat vine, common greenbrier, supplejack, cross vine, Virginia creeper, sweet grape, and Kentucky wisteria. Nixon and Cunningham (1985) indicate that some of the local variations in bottomland hardwood communities within the project area might include American hornbeam, water oak, blackgum, and sweetgum on ridges between sloughs and swamps, with Carolina ash, red maple, American snowbell, and laurel oak dominating on flats between ridges. Some flats support extensive populations of dwarf palmetto (Nixon et al., 1973).

Species dominance in the bottomland hardwood wetland communities is highly varied, from highly vegetatively diverse communities to much less complex stands of overstory species like red maple or sweetgum.

Swamp

Cypress tupelo swamp communities are restricted primarily to wetlands associated with the river banks and islands of the larger rivers in the area (e.g., in the Neches River and the Sabine River riparian zones). The most extensive swamp communities occur in association with bottomland hardwood wetlands in the Sabine River bottom. Cypress tupelo swamp communities often include some or all of the following species: bald cypress, water tupelo, swamp privet, water elm, Carolina ash, water locust, and common buttonbush (Burandt et al., 1977, Nixon and Cunningham, 1985). Other commonly encountered species include summersweet clethra, water willow, scarlet rosemallow, corkwood, sweetbells leucothoe, possumhaw viburnum, cupseed, and decumaria vine. Swamp community composition variations include wetlands dominated by sweetgum and/or red maple.

Ditch

This habitat is composed of drainage ditches or irrigation canals that were created out of existing uplands or modified natural drainages. These habitats

support flora similar to low quality herbaceous wetlands. Typical vegetation includes: cattail, alligator weed, sesbania, and smartweed.

Herbaceous Agricultural Wetlands

This habitat is typically associated with active rice or crawfish production. These communities are similar to other palustrine emergent wetlands. Jungle rice, smart weed, and various spike rushes are normally the dominant vegetation.

Scrub Shrub Agricultural Wetlands

This habitat includes wetlands that have developed in fallow rice fields and wet cattle pastures. Vegetation types are similar in community structure to other scrub shrub wetlands, and are typically dominated by sesbania, Chinese tallow, and black willow.

Table 4 - Representative Plant Species by Wetland Category

Vegetation Community	Scientific Name	Common Name
Coastal Emergent Marsh	*Spartina alterniflora*	Smooth cordgrass
	Spartina patens	Saltmeadow cordgrass
	Juncus roemerianus	Black rush
	Bulboshoenus robustus	Saltmarsh bulrush
	Spartina cynasuriodes	Hog cane
	Schoenoplectus americanus	Chairmaker's bulrush
	Typha latifolia	Cattail
	Baccharis halmifolia	Eastern baccharis
	Iva frutescens	Marshelder
	Borrichia frutescens	Sea-ox-eye daisy
	Lyceum carolinianum	Carolina wolf-berry
	Sesbania drummondii	Rattlebox
	Phragmites australis	Common reed
	Leersia oryzoides	Rice cutgrass
	Setaria lutescens	Yellow bristle grass
	Panicum dichotomiflorum	Fall panicum
	Schoenoplectus americanus	Olney bulrush
	Sesbania herbacea	Bigpod sesbania
	Ludwigia octovalis	Seedbox
	Polygonum hydropiperoides	Swamp smartweed
	Nymphaea odorata	White waterlily
	Nelumb lutea	Lotus
	Hydrocotyle sp.	Pennywort
	Luziola fluitans	Watergrass
	Zizaniopsis miliacae	Giant cutgrass
	Eleocharis parvula	Dwarf spikerush
	Leptocloa fusca	Bearded sprangletop

Vegetation Community	Scientific Name	Common Name
	Echinochloa walteri	Wild millet
	Eleocharis cellulosa	Gulfcoast spikerush
	E. quadrangulata	Squarestem spikerush
	Paspalum vaginatum	Seashore paspalum
	Carex spp. And cyperus spp.	Sedges
Herbaceous Wetlands	*Eleocharis cellulosa*	Gulfcoast spikerush
	Eleocharis parvula	Dwarf spikerush
	Eloecharis montevidensis	Slender spikerush
	Juncus effuses	Soft-stem rush
	Cyperus retrorsa	Pine barren flatsedge
	Cyperus virens	Green flatsedge
	Cyperus odoratus	Rusty flatsedge
	Andropogon glomeratus	Bushy bluestem
	Paspalum dilatatum	Dallisgrass
	Polygonum punctatum	Dotted smartweed
	Ludwigia peploides	Water primrose
	Polygomum hydropiperoides	Swamp smartweed
	Panicum hemitomon	Maidencane
	Chasmanthium laxum	Slender spikegrass
Scrub/Shrub Wetlands	*Rubus spp.*	Bramble
	Iva frutescens	Marshelder
	Quercus nigra	Water oak
	Acer rubrum	Red maple
	Liquidambar styraciflua	Sweetgum
	Sapium serbiferum	Chinese tallow
	Pinus spp.	Pine
	Myrica cerifera	Waxmyrtle
	Spartina patens	Saltmeadow cordgrass
	Baccharis halimifolia	Eastern baccharis
	Borrichia frutescens	Sea-ox-eye daisy
	Solidago sempervirens	Seaside goldenrod
Palustrine Forested Wetlands[1]	*Pinus taeda*	Loblolly pine
	Pinus elliottii	Slash pine
	Quercus nigra	Water oak
	Magnolia grandiflora	Magnolia
	Magnolia virginiana	Sweetbay magnolia
	Nyssa sylvatica	Blackgum
	Nyssa biflora	Swamp tupelo
	Acer rubrum	Red maple
	Quercus laurifolia	Laurel oak
	Myrica cerifera	Waxmyrtle
	Ilex opaca	American holly
	Crataegus spp.	Hawthorn

Vegetation Community	Scientific Name	Common Name
	Liquidambar styraciflua	Sweet gum
	Baccharis halimifolia	Eastern baccharis
	Chasmanthium laxum	Slender spike grass
	Eleocharis parvula	Dwarf spike rush
	Toxicodendron radicans	Poison ivy
	Osmunda regalis	Royal fern
	Berchemia scandens	Rattan vine
	Gelsemium sempervirens	Yellow jessmine
	Sapium serbiferum	Chinese tallow
	Quercus phellos	Willow oak
	Juncus effuses	Soft-stem rush
	Cyperus odoratus	Rusty flatsedge
	Hypericum cistifolium	St. Johns wort
	Rubus argutus	Blackberry
	Smilax laurifolia	Laurel-leaf greenbrier
	Quercus lyrata	Overcup oak
	Fraxinus pennsylvanica	Green ash
	Carpinus caroliniana	American hornbeam
	Ilex decidua	Deciduous holly
	Ulmus crassifolia	Cedar elm
	Celtis laevigata	Texas sugarberry
	Amorpha fruticosa	Indigo bush amorph
	Cyrilla racemiflora	Swamp cyrilla
	Sesbania drummondii	Drummond sesbenia
	Cornus florida	Dogwood
	Sesbastiana fruticosa	Sebastian bush
	Aristolochia tomentosa	Dutchmans pipe
	Brunnichia ovata	American buckwheat vine
	Smilax rotundifolia	Common greenbrier
	Berchimia scandens	Supplejack
	Bignonia capreolata	Cross vine
	Parthenocissus quinquefolia	Virginia creeper
	Vitus cinerea	Sweet grape
	Wisteria macrostachya	Kentucky wisteria
	Fraxinus caroliniana	Carolina ash
	Styraz americana	American snowbell
	Sabal minor	Dwarf palmetto
	Persea borbonia	Red bay
	Itea virginica	Virginia sweetspire
	Lyona ligustina	He-huckleberry
	Rhododendron canescens	Hoary azalea
	Cephalanthus occidentalis	Common buttonbush
	Toxicodendron vernix	Poison sumac
	Vaccinium arkansanum	Arkansas blueberry

Vegetation Community	Scientific Name	Common Name
	Alnus serrulata	Alder
	Viburnum nudum	Possumhaw viburnum
	Taxodium distichum	Bald cypress
	Foresliera acuminale	Swamp privet
	Planera aquatica	Water elm
	Gleditsia aquatica	Water locust
	Clethra alnifolia	Summersweet clethra
	Decodon verticillatus	Water willow
	Hibiscus militaris	Scarlet rosemallow
	Leitneria floridana	Corkwood
	Leucothoe racemosa	Sweetbells leucothoe
	Calycocarpum lyonii	Cupseed
	Decumaria Barbara	Decumaria vine

[1] Includes mixed pine/hardwood wetlands, pine flatwoods wetlands, bottomland hardwood, and cypress tupelo swamp.

3.0 MITIGATION APPROACH

Table 2 outlines the delineated acreage of each wetland community (category) expected to be:

- Temporarily affected during construction and restored which would not result in a permanent loss of habitat, and
- Permanently affected by construction and operation of the terminal and pipeline.

Temporary impacts include pipeline construction through coastal emergent marsh, herbaceous wetland (palustrine emergent), and scrub/shrub wetlands and temporarily disturbed construction areas (laydown areas, staging areas, etc.). These areas will be graded and restored to pre-construction conditions for both the GPLNG Terminal and the Golden Pass Pipeline System as applicable. Wetlands in temporarily affected sites will be allowed to revegetate, restoring wetland function. Permanent impacts include the area within the facility footprint; pipeline interconnect locations, permanent access roads, and removal of forested wetlands. Where possible, construction techniques like horizontal directional drilling (HDD) will be implemented to avoid and/or minimize impacts.

In addition, extensive use of HDD technology to avoid impacts to 19 watercourses or sensitive areas and alternative pipeline routes involving

additional mileage (discussed in Resource Report 10) were evaluated to minimize impacts. Golden Pass representatives met with Texas Parks and Wildlife Department (TPWD) staff and toured the J. D. Murphree Wildlife Management Area to evaluate the pipeline routing through the coastal marsh. TPWD staff provided valuable input that resulted in avoiding wetland impacts associated with pipeline construction, especially in coastal marsh south of the GIWW. The route proposed by TPWD staff presented the least amount of impacts and included:

(1) Avoiding encroachment onto wetlands by routing the pipelines through the open waters of Keith, Johnson, and Shell lakes,

(2) Aligning pipelines along existing levee system and drainage ditches north of the GIWW to minimize wetlands impacts, and

(3) Burying pipelines to sufficient depth for TPWD to continue maintenance and periodic replacement of flow control structures located within the drainage ditch and levee system.

These recommendations have been incorporated into the proposed pipeline route.

3.1 Mitigation for Temporary Impacts

GPLNG and GPPL propose to mitigate areas of temporary impact through restoration of the affected areas at a 1:1 ratio according to the Federal Energy Regulatory Commission (FERC) Wetland and Waterbody Construction and Mitigation Procedures. These procedures, and the proposed mitigation implementation plans, include:

- Trench breakers will be installed to prevent the pipeline from draining wetlands.
- A permanent slope breaker will be installed at the base of slopes for gradients steeper than five percent.
- No fertilizer, lime, or mulch will be applied to wetlands, unless instructed in writing by the appropriate state agency.
- GPLNG and GPPL will consult with the appropriate state agency to develop a project specific wetland restoration plan.

- Until a project specific management plan is implemented, GPLNG and GPPL will revegetate construction ROW utilizing seed mixes, rates, and dates obtained from the local soil conservation authority [in upland areas].
- GPLNG and GPPL will ensure that all disturbed wetland areas successfully revegetate with wetland herbaceous or woody species.
- GPLNG and GPPL will remove temporary sediment barriers between wetlands and uplands once uplands have been stabilized.

3.2 Mitigation for Permanent Impacts

GPLNG and GPPL estimate construction of the terminal and pipeline will permanently affect 161.92 acres of wetlands based on third-party consultant and USACE surveys (Table 2). The wetland acreage as represented in Tables 6 and 7 is final. Table 8 wetlands are considered to be preliminary, as the USACE is currently making a jurisdictional determination that will ascertain the final wetlands acreage requiring mitigation associated with pipeline construction. As stated previously in Section 2.0, the USACE jurisdictional determination in progress may delineate additional jurisdictional wetlands along the pipeline ROW. Based on the available survey information, GPLNG and GPPL will implement a mitigation plan that incorporates the following components:

- Restoration of approximately 244 acres of eroded coastal marsh within in the J.D. Murphree Wildlife Management Area for compensation of permanent impacts to coastal emergent marsh, herbaceous wetlands, and transitional herbaceous wetlands;
- Acquisition and donation of sufficient acreage of forested wetlands in proximity to existing nature preserves located in southeast Texas. This would provide compensatory mitigation for permanent impacts to bottomland hardwood wetlands, swamp, mixed pine-hardwood wetlands, pine flatwoods wetlands, and scrub shrub wetlands within the Sabine/Neches River watershed. Acquisition of suitable property is underway; and,
- Acquisition of approximately 40 acres of land in the Southwest Louisiana Pine Wetland Mitigation Bank operated by The Nature Conservancy (TNC). This would provide compensatory mitigation for permanent impacts to pine flatwoods wetlands in the Calcasieu River watershed.

3.3 Goals and Objectives

The goal of wetland mitigation is to ensure no net loss of wetland functional value for the wetlands affected by the proposed Project. For the proposed project, this goal will be accomplished through restoration of temporarily impacted areas, restoration of approximately 244 acres of eroded coastal marsh within the J.D. Murphree WMA, the acquisition and donation of forested wetlands in proximity to existing nature preserves located in southeast Texas, and participation in the TNC mitigation bank.

4.0 ESTIMATED WETLAND ACREAGE REQUIRING MITIGATION

Table 2 provides the originally delineated acreage estimated to require mitigation plus USACE jurisdictional acreage to date. Upon completion of the USACE jurisdictional determination for the pipeline, these values will be revised accordingly. As of March 11, 2005 USACE jurisdictional determination at the terminal has been completed and incorporated into this plan. Jurisdictional determination for the pipeline route is currently underway with completion expected by the end of May 2005.

5.0 MITIGATION

GPLNG and GPPL Aquatic Resource Mitigation Plan encompasses three components:

- Marsh creation and restoration in the J.D. Murphree Wildlife Management Area by placing inorganic soils into the shallow open water areas indicative of coastal marsh erosion;
- Acquire forested wetlands for protection in proximity to existing nature preserves located in southeast Texas; and,
- Acquiring mitigation bank acreage in Louisiana through TNC.

5.1 Marsh Creation and Restoration

Background: The coastal marsh in the J.D. Murphree Wildlife Management Area is exhibiting degradation where exposed to periodic intrusions of salt water. Through time, areas of the marsh are converting into shallow open water areas. TPWD staff at the J.D. Murphree Wildlife Management Area seek a supply of highly fluidized inorganic soils to fill areas of shallow open waters that have formed immediately north of the Keith and Johnson lakes. Based on 2001 aerial photography, it is anticipated that the largest shallow open water area comprises

244 acres. TPWD indicates that these open water areas are typically 2 feet deep.

Minimum Mitigation Standard: Based on the third-party consultant wetlands delineation surveys, the GPLNG and GPPL project anticipates that 34.48 acres of coastal emergent marsh, 62.53 acres of herbaceous wetlands, and nominally 30 to 35 acres of transitional herbaceous wetlands will be converted into permanent facilities at the terminal and along the pipeline route. To compensate for these land conversions, GPLNG and GPPL propose to create 244 acres of wetlands.

Design Considerations: The inorganic soils will be placed via a dredged slurry pipe. It is anticipated that these soils will consolidate overtime. To assure that the desired marsh final elevation is achieved, GPLNG and GPPL will initially fill the shallow open water areas to an elevation of +1-foot mean sea level (MSL). The fill material will be highly fluidized (e.g., 70 percent water / 30 percent solids [sediments]) to minimize mounding of the placed fill material. Based on TPWD input, it is anticipated that the surrounding coastal marsh is sufficiently competent to act as containment levees so that the fill material will be captured in the shallow open water areas.

Dredged Material Characterization / Sediment Compatibility: The goal of the wetland mitigation plan described herein is to compensate for project-related wetland effects by re-establishing marsh vegetation in degraded (open water) portions of an expansive intermediate marsh located on the J.D. Murphree Wildlife Management Area adjacent to Keith Lake in Jefferson County, Texas. To accomplish this objective, GPLNG proposes to beneficially use a portion (approximately 1.2 million cubic yards [MCY]) of the "new work" material generated from the construction of the GPLNG Terminal as fill in the Compensatory Mitigation Site (Figures 1 and 2). The estimated thickness of fill in these areas will be three feet.

Shallow subsurface soils in the GPLNG dredge area are typically soft clays of relatively recent origins. The dredge prism soil classification in Table 5 is based on site boring logs (Appendix A) from an on-site geotechnical investigation provided by Fugro South, Inc. (Fugro South, Inc. 2004). The material that is planned for the Compensatory Mitigation Site consists of the soil classifications represented in Table 5.

Table 5: Dredge Prism Soil Classification

Soil Classification	Elevation Range (feet MLLW)	Volume (Million Cubic Yards [MCY])
Soft Clay	+6 to -10	1.9
Fine Sand	-10 to -23	1.7
Very Soft Clay and Sandy Clay	-23 to -32	1.2
Very Soft Clay	-32 to -44	1.5
Total		6.3

Sediment chemistry is a key consideration when considering the beneficial use of dredge material for marsh restoration. An analysis of the soil and sediment (ERM 2004) was performed for the site to determine the compatibility of the material for beneficial use. Initially, concerns were raised regarding detection of selenium and manganese at levels exceeding respective effect thresholds. Additional sediment sampling and analysis was conducted in the spring 2005 to determine if the proposed dredge material was suitable for placement within Pintail Flats (URS, 2005).

Subsequent review of the selenium and manganese results and evaluation of applicable sediment screening levels indicate that the dredged material can be used for beneficial use as fill material to restore coastal marsh (URS, 2005).

Thus, the sediment would be useful as a substrate for marsh restoration.

GPLNG provided the USACE, EPA, and FERC with the final report and analysis confirming the applicability of using dredged material for beneficial use (URS, 2005).

Compensatory Mitigation Site Construction: Material dredged during construction of the GPLNG Terminal will be beneficially used as fill to create substrate for marsh vegetation within fresh to brackish "open water" areas at the JD Murphree Wildlife Management Area, which is managed by the TPWD. Figure 1 outlines the overall site plan and includes the potential dredge pipeline routes and possible booster pump locations. Figure 2 depicts the specific fill areas to be used as Compensatory Mitigation Sites.

Depending on economic factors, the project may be constructed with either one or multiple, hydraulic cutter-head dredges. A dedicated dredge pipeline will be

routed to the fill areas as depicted in the conceptual layout (Figure 2). The following construction sequence highlights the order of work as well as equipment that can be expected for this Compensatory Mitigation Site:

Construction Sequence

1. The Contractor will deploy equipment to perform the work. Dredge pipe (HDPE or steel) will be routed from the hydraulic cutterhead dredge at the terminal to the placement location. The dredge pipeline route may include road and channel crossings, floating segments, submerged segments to allow boat passage, and sections that traverse the existing marsh into the Compensatory Mitigation Site. The dredge pipeline may be floated and/or dragged into place through the use of marsh trackhoes.
2. At the Compensatory Mitigation Site, the dredge (slurry) pipeline will be extended to the furthest location where the fill will be placed. Wye valves will be strategically placed along the route to redirect flow as the work progresses. Marsh trackhoes will be used to move the slurry pipeline so that material is distributed throughout the area. Fill will be placed to elevation +1.0 feet MSL, which will allow for consolidation and settlement of the fill to the target inter-tidal elevation after construction. The highly fluidized material will flow easily into the area and will be contained by the marsh vegetation around the perimeter of the open water areas.
3. The slip will be dredged to supply material (estimated to be approximately 1.2 MCY) for the Compensatory Mitigation Site.
4. As portions of the area are filled, the operation will back out along the slurry pipeline corridor. The pipeline will be broken down and either reconnected at the valve locations or removed from the area. Depressed areas may be created along the slurry pipeline corridor due to the movement of equipment in/out of the work area. Grade will be restored with dredge material as the slurry pipeline is broken down.
5. The Compensatory Mitigation Sites will be allowed to naturally colonize with the existing species along the perimeter of the existing open water areas.

6. The mitigation area will be monitored as prescribed in the following Monitoring Plan. Planting/seeding as detailed in the Vegetation Plan may be used to augment the natural colonization if the trend for establishing vegetation does not appear to meet the target minimum standard of 80% of coverage of the 244.52-acre mitigation site.

Vegetation and Monitoring Plan: The goal of the wetland mitigation plan described herein is to compensate for project related wetland effects by re-establishing marsh vegetation in degraded (open water) portions of an expansive intermediate marsh located on the J.D. Murphree Wildlife Management Area adjacent to Keith Lake in Jefferson County, Texas. To accomplish this objective, GPLNG proposes to beneficially use dredged material to fill approximately 244-acres of open water. GPLNG will rely mostly on natural colonization of filled areas to re-establish marsh vegetation; re-establishment will be considered complete if after three years filled areas have an areal vegetation coverage of approximately 80 percent. The following sections outline the procedures by which GPLNG proposes to achieve these objectives.

Following deposition of fill materials, GPLNG will allow for a one-year sediment conditioning and colonization period. At the end of this period, GPLNG will collect geo-referenced aerial photographs of the mitigation site to estimate vegetative cover. These photographs will be compared to pre-construction or baseline aerial photographs to determine the extent to which the proposed mitigation site has been colonized by vegetation (i.e., increase in vegetation coverage). Similar analyses will be performed at two and three years post-construction. If after each year the rate of colonization in the mitigation site is not on-track to meet the project's three-year objective of 80 percent coverage, natural colonization will be augmented by planting as necessary to achieve this objective. If necessary, GPLNG will plant/seed common wetland plant species such as cordgrass (*Spartina* spp.), bulrushes (*Scirpus* spp.), and other salt-tolerant wetland plants typical of adjacent marshes, in those areas not sufficiently vegetated according to the following specifications.

Planting Specifications:

I. Transplant Source

   a. Source areas for transplants will be identified and approved by the TPWD prior to use.

b. Staking of the approved transplant harvest areas will be in accordance with applicable JD Murphree Wildlife Management Area guidelines.

II. Planting Schedule

a. Planting shall be conducted between mid-October and mid-June. If planting outside of this timeframe is required, GPLNG will coordinate with the USACE and TPWD at least two weeks prior to commencement of those plantings.

III. Transplanting Methods

a. Transplanting techniques to be utilized within each plot will be coordinated with the USACE and TPWD as the specific location and configuration of these areas is being established.

i. Planting units shall consist of multiculm sodded or multiculm sprigs to avoid incidental damage to source areas; alternate harvest techniques may be considered, but would require prior coordination with the USACE and/or TPWD.

IV. Transplant Monitoring, Success Criteria, and Corrective Actions:

a. A post-transplant survival survey shall be conducted within 90 days of each planting effort. Using acceptable quantitative survey methods, a minimum of 15 percent of all transplanted plots will be randomly selected for each survey effort.

b. If after 90 days transplant survival is less than 50 percent, areas not sufficiently vegetated shall be re-planted within 30 days of the transplant survival survey.

c. Follow-up transplant survival surveys in re-planted areas shall be conducted at 90-day intervals until transplant survival is greater than 50 percent or until areal vegetation coverage exceeds 80 percent.

d. Written reports detailing the survey results and including representative photographs of transplants shall be submitted to the USACE and TPWD within 60 days of the completion of each survey effort.

If mitigation is unsuccessful (i.e., vegetation coverage is less than 80 percent) at the end of the three-year monitoring period, GPLNG will consult with the USACE to determine if any corrective actions are warranted. If, at any time during the monitoring period, it becomes apparent that the selected location is unlikely to support target vegetation, GPLNG may determine to re-locate the mitigation site or modify the mitigation project. In such an event, GPLNG will consult with the USACE and the TPWD regarding the most appropriate corrective action. GPLNG shall develop a corrective action plan and solicit approval of this plan from the USACE prior to any such modification.

5.2 Acquisition of Land Rights for Conservation

Background: Initial mitigation of forested wetlands considered utilization of mitigation banks. In discussions with various resource agencies it was determined that recognized mitigation banks in Texas lacked sufficient acreage to satisfy the proposed project needs and the regulatory process for land bank expansion was in excess of three years. With assistance of the TPWD and through further investigation, a suitable tract of forested wetlands was identified that satisfies the projects needed acreage for compensatory mitigation in the Sabine/Neches watershed. Commercial negotiations are currently underway.

Minimum Mitigation Standard: GPLNG and GPPL anticipates that 4.94 acres of bottomland hardwood wetlands, 41.74 acres of mixed pine-hardwood wetlands, 15.35 acres of pine flatwoods wetlands, and 1.82 acres of swamp will be converted into permanent facilities at the terminal and along the pipeline route. To compensate for these land conversions, GPLNG and GPPL propose to acquire and donate land adjacent to an existing agency operated conservation preserve within the Sabine/Neches watershed of southeast Texas. This land is under threat of development and timber harvesting. The following provides the minimum mitigation standard regarding preservation:

- Bottomland Hardwood wetlands: 4.94 acres x 5:1 mitigation ratio resulting in 25 acres of mitigation
- Mixed Pine-Hardwood wetlands: 41.74 acres x 5:1 mitigation ratio resulting in 209 acres of mitigation
- Pine Flatwoods wetlands: 15.35 acres x 4:1 mitigation ratio resulting in 61 acres of mitigation

- Swamp: 1.82 acres x 7:1 mitigation ratio resulting in 13 acres of mitigation
- Total estimated minimum mitigation area is 309 acres. The 309 acres will be revised following completion of the pending USACE jurisdictional wetlands determination.

Conserved Land Characterization: The tract of land described above has adequate area to offset potential increases in wetland acreage if the USACE jurisdictional determination results in increased wetland acreage.

Property Conservation: Wetlands delineation will be conducted to determine habitat classifications, quality (TPWD WHAP analysis), and acreage. After completion of delineation and USACE confirmation, title will be transferred to a resource agency for preservation. In the event the USACE determines insufficient forested wetlands exist on this tract, or other concerns arise, additional tracts will be identified and acquired for donation.

5.3 Mitigation Bank Utilization

Background: In discussions with Louisiana Department of Wildlife and Fisheries (LDWF) it was recognized that the GPPL project impacted forested wetlands in the Sabine, Neches, and Calcasieu River watersheds. Mitigation for the Sabine/Neches watershed is proposed as described in Section 5.2. However, mitigation of forested wetlands impacted only in Louisiana had not been addressed. With assistance of LDWF and the New Orleans Corps of Engineers four potential mitigation banks were identified that contained acreage available for compensatory mitigation.

Mitigation for Calcasieu River watershed: Permanent impacts in the Calcasieu River watershed consists of approximately 11.5 acres of pine flatwoods and 1.2 acres of mixed pine-hardwood wetlands. Approximately 40 acres of pine wetlands will be acquired from TNC Southwest Louisiana Pine Wetland Mitigation Bank to provide compensatory mitigation for impacts in Louisiana.

5.4 Rationale for Locations

The agency sponsored restoration project, land acquisition / donation, and mitigation bank will be located within the Sabine/Neches River and Calcasieu River watersheds. This rationale complements the goal of Section 404(b)(1) guidelines of no net loss of function and value.

5.5 Mitigation Acreage Considerations

The following tables list mitigation acreage by habitat:

Table 6 - Terminal: Inside Formerly Used Dredged Material Placement Area

Habitat Classification	Total Wetland Acreage	Wetland Acreage Impact		Proposed Mitigation Acres
		Temporary	Permanent	
Coastal Emergent Marsh	0.1562	0.0000	0.1562	244 acre BU Site
Herbaceous Wetland	63.0869	0.0000	62.4220	
Scrub Shrub	0.3597	0.0000	0.3597	
Water	0.2657	0.0000	0.2648	
Unvegetated Shoreline	0.5019	0.0000	0.5019	
Subtotal	64.3704	0.0000	63.7046	

Table 7 - Terminal: Outside Formerly Used Dredged Material Placement Area

Habitat Classification	Total Wetland Acreage	Wetland Acreage Impact		Proposed Mitigation Acres
		Temporary	Permanent	
Coastal Emergent Marsh	190.9300	0.0000	44.5640	244 acre BU Site
Herbaceous Wetland	0.0545	0.0000	0.0545	
Scrub Shrub	1.3842	0.0000	0.4436	
Subtotal	192.3687	0.0000	45.0621	
Total Terminal	256.7391	0.0000	108.7667	244

Table 8 - Pipeline Including Access Roads, Pipe Yards, and Interconnect Sites

Habitat Classification	Total Wetland Acreage	Wetland Acreage Impact		Proposed Mitigation Acres
		Temporary	Permanent	
Bottomland Hardwood Wetlands	38.4098	0.0000	4.9354	25
Coastal Emergent Marsh	42.1391	16.4600	0.0000	0
Ditch	1.2932	1.0953	0.0000	0
Herbaceous Agriculture Wetland	72.9039	0.0000	0.0000	0
Herbaceous Wetland	176.2910	136.0599	0.3957	1
Mixed Pine-Hardwood Wetland	46.3491	0.0000	41.7383	310
Pine Flatwoods Wetland	19.7947	0.0000	15.3479	
Scrub Shrub Agriculture Wetland	3.5060	0.0000	0.0000	0
Scrub Shrub Wetland	93.2844	72.3409	0.0000	0
Swamp	17.9863	0.0000	1.8237	13
Water	381.1325	0.0000	0.0000	0
Total pipeline	893.0900	225.9561	64.2410	349

6.0 Pipeline Monitoring Plan

6.1 Temporary Impacts

Monitoring the success of the wetland restoration for temporarily affected wetlands will be conducted for three years or until the revegetation is considered to be successful as described in FERC 2003, Wetland and Waterbody Construction and Mitigation Procedures (FERC 2003, TPWD March 2004, USFWS Oct. 2004). Revegetation shall be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. GPLNG, GPPL, and/or their agents will conduct monitoring in these areas.

6.2 Additional Monitoring Plans

Areas within the pipeline construction corridor and associated work areas will be restored to pre-project contours. Pre- and post-construction elevation surveys will be conducted. Elevation survey results will be submitted to the USACE within 90 days after completion of pipeline installation. Additional soil from off-site may be brought into areas containing highly organic soils susceptible to high erosion rates.

Aerial photography with Geographic Information System (GIS) analysis will be used to monitor the entire pipeline construction corridor and an additional 200-meter buffer zone (100 meters paralleling each side of the construction corridor). The following GIS/Remote Sensing method and standard will be used:

The pipeline corridor will be monitored by pre- and post-construction aerial photography (taken 12 months after construction completion to allow for vegetative regrowth) at a scale of 1:4800 or 1 inch to 400 feet. GIS and Remote Sensing techniques will be used to conduct an analysis of change to determine the amount of vegetated marsh impacted by pipeline construction activities. Monitoring reports will be submitted that include at a minimum: (1) a pre-project GIS analysis assessing the existing emergent marsh to open water ratio, in acres, within the permitted corridor (which includes the construction corridor and the 200 meter buffer zone); (2) a post-project GIS analysis assessing the emergent marsh to open water ratio, in acres, within the permitted corridor (which includes the construction corridor and the 200 meter buffer zone); (3) Ortho corrected imagery covering the construction corridor and buffer zone, maximum of 6-inch pixel size and Color Infra-red imagery, about 2 meter spatial accuracy;

(4) all vector deliverable to be in Arcview Shapefile format with Federal Geographic Data Committee (FGDC) compliant metadata and all raster imagery in GeoTIFF format with FGDC compliant metadata. A binary classification system will be used consisting of open water and vegetated areas. The classified data will meet or exceed 90 percent attribute accuracy as determined by industry standard and verified by statistically valid ground truth sampling techniques - this may include Global Positioning System based ground surveys.

Monitoring reports will be submitted to the USACE, detailing the results from the pre- and post-GIS analysis and the above referenced data sets, within 90 days after completion of the 12-month interval between the pre- and post-construction analysis.

7.0 MAINTENANCE AND CONTINGENCY PLAN

7.1 Maintenance

Maintenance of temporary impacts and long-term vegetation management of the pipeline ROW will be conducted by GPPL according to the FERC regulations summarized below.

- Vegetative maintenance will not be conducted over the entire width of the ROW. Rather a corridor centered on the pipeline and up to 10 feet wide will be maintained in an herbaceous state. Trees within 15 feet of the pipeline greater than 15 feet in height may be cut and removed from the permanent ROW as per the FERC guidelines in order to protect the integrity of the pipeline operations over time (FERC 2003).
- Herbicides will not be used within 100 feet of a wetland unless directed to do so by the appropriate state agency (FERC 2003).

7.2 Contingency Plan

If revegetation success is not achieved after three years, the area at the terminal site or pipeline ROW that has not revegetated will have the topography checked by a land survey to determine if long-term surface grading impacts remain from construction. Proper grade will be restored if necessary, and the area will be revegetated and monitored for another year, as before. If revegetation is not successful after an additional year of monitoring, a supplemental planting will be conducted.

8.0 LITERATURE CITED

BESI, 2004a. Benthic habitat Assessment in the Port Arthur Ship Channel Adjacent to Doornbos Property

BESI, 2004b. Benthic Habitat Assessment in Keith, Johnson, and Shell Lakes for the Golden Pass LNG Pipeline Project

FERC. 2003. Wetland and Waterbody Construction and Mitigation Procedures

FUGRO – South, 2004 Golden Pass LNG Terminal Geotechnical Report

TPWD March 2004, Texas Parks & Wildlife letter dated March 5, 2004 to FERC

USFWS Oct. 2004, USDOI Fish and Wildlife Service letter dated October 20,2004 to FERC

Environmental Resources Management, Inc. 2004. Analysis of sediment and soil as potential dredged material. Report prepared for Golden Pass LNG Terminal LP, 14 May 2004.

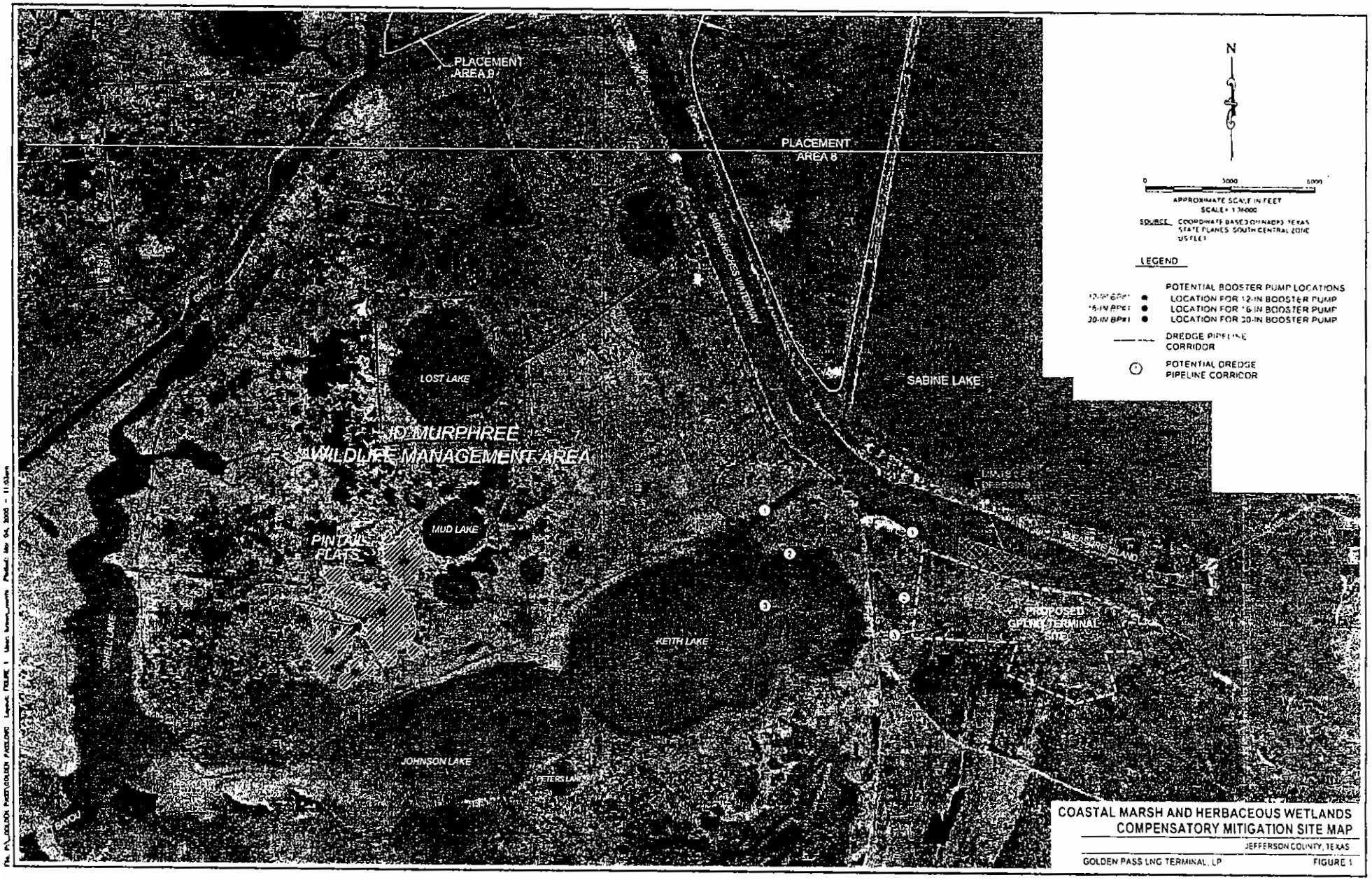
Fugro South, Inc. 2004. Location map and soil borings, Appendix A *In* Moffatt & Nichol International, Inc. 2004. Golden Pass LNG Terminal Project-Dredged Material Management Plan. Report no. USSP-MNE-10-JR-645-1012 prepared for prepared for Golden Pass LNG Terminal LP.

URS, 2005. Golden Pass LNG Terminal Project, Dredge Material Evaluation for Beneficial Use - Pintail Flats. Report prepared for Golden Pass LNG Terminal LP, April 2005.

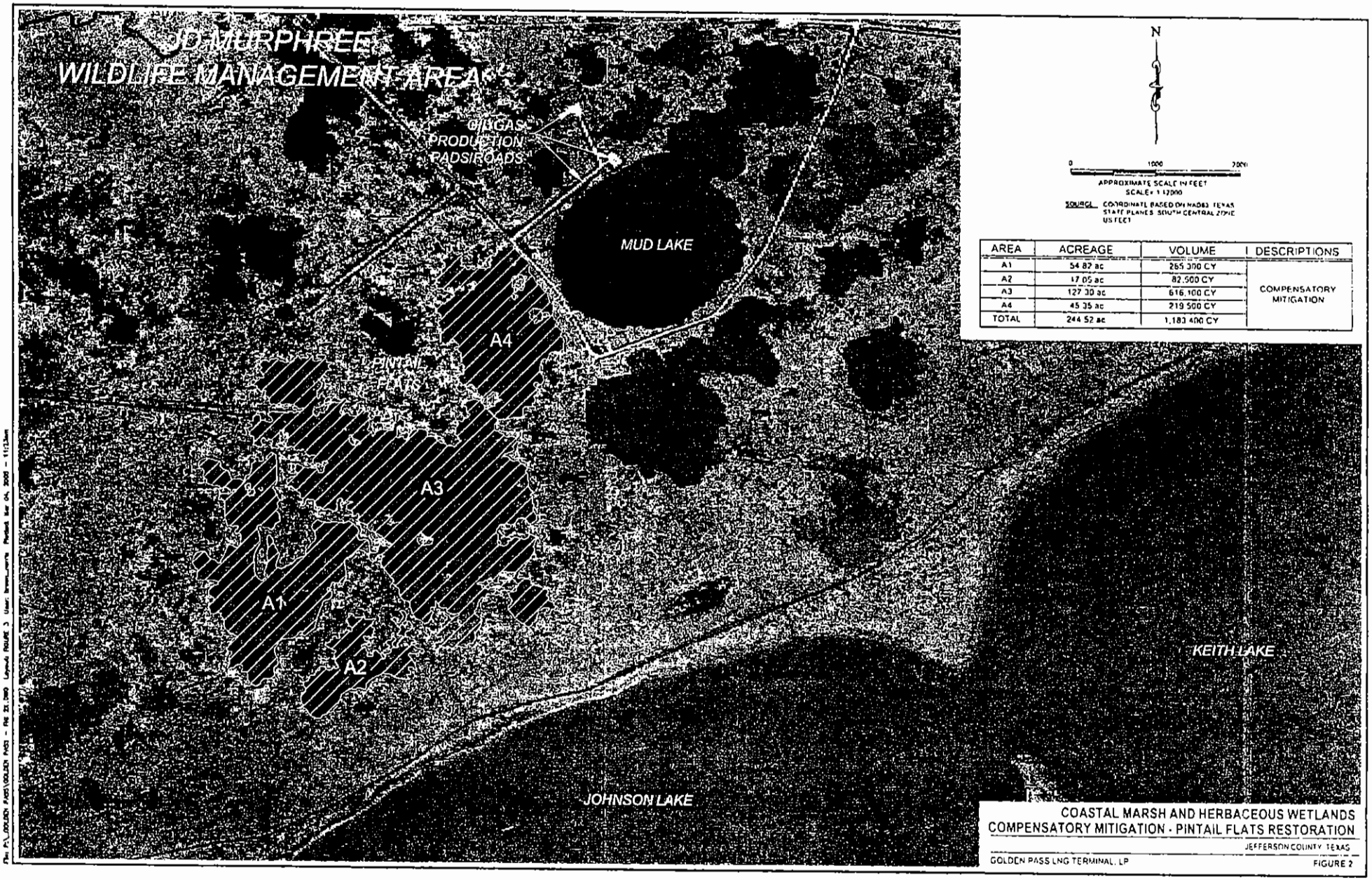
Revisions:

3/15/05 - pages i, 3, 4, 5, 13, 15, 16, 24
4/4/05 - pages 3, 4, 15, 16, 24
4/14/05 - pages 10, 14, 18
5/5/05 - pages i, 2, 3, 4, 13, 14, 15, 16, 18, 19, 21, 22, 23, 24, 27

Figures



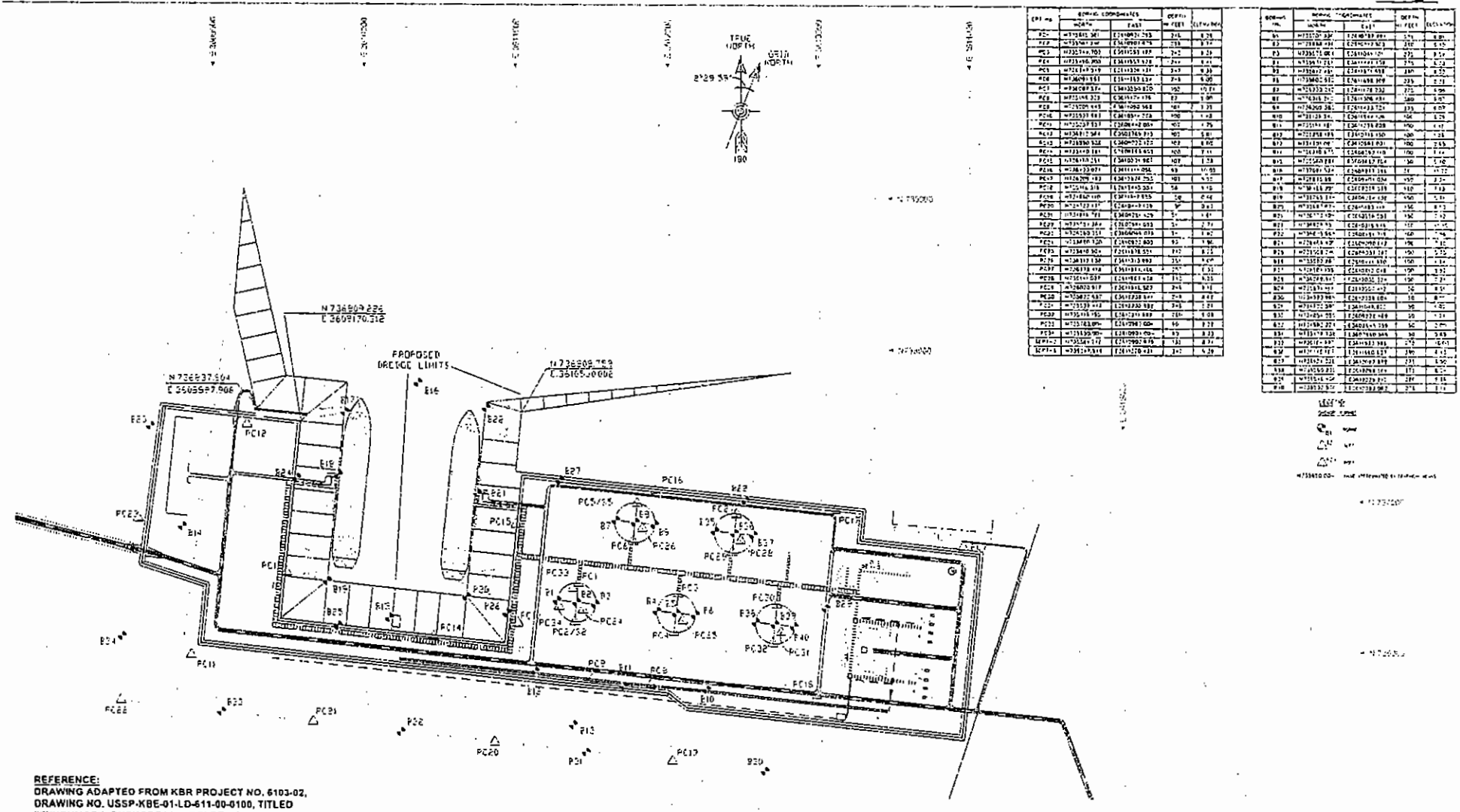
NON-INTERNET PUBLIC



AREA	ACREAGE	VOLUME	DESCRIPTIONS
A1	54.82 ac	265,300 CY	COMPENSATORY MITIGATION
A2	17.05 ac	82,500 CY	
A3	127.30 ac	616,100 CY	
A4	45.35 ac	219,500 CY	
TOTAL	244.52 ac	1,183,400 CY	

COASTAL MARSH AND HERBACEOUS WETLANDS
COMPENSATORY MITIGATION - PINTAIL FLATS RESTORATION
JEFFERSON COUNTY, TEXAS
GOLDEN PASS LNG TERMINAL, LP
FIGURE 2

NON-INTERNET PUBLIC



REFERENCE:
DRAWING ADAPTED FROM KBR PROJECT NO. 6103-02,
DRAWING NO. USSP-KBE-01-LD-611-00-0100, TITLED
"EXXONMOBIL ONSHORE LNG GOLDEN PASS SOIL
BORING LOCATION PLAN, SABINE PASS, TEXAS MASTER SITE LAYOUT"

OVERALL SITE PLAN

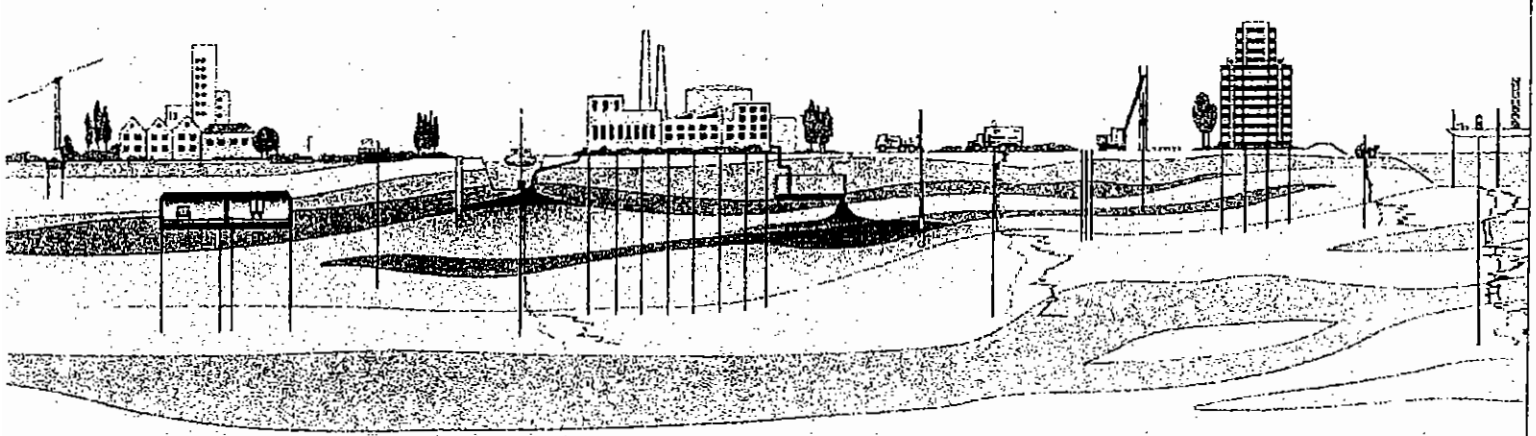
Mar. 30, 2004 G:\ExxonMobil LNG Projects\Golden Pass\Drafting\0415096\POB3.dwg

PLATE 3

FUGRO SOUTH, INC.

GEOTECHNICAL STUDY
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

EXXONMOBIL DEVELOPMENT COMPANY
HOUSTON, TEXAS



NON-INTERNET PUBLIC MATERIAL HAS BEEN REMOVED FROM THIS SECTION – THE MATERIAL IS LOCATED BEHIND THE TAB MARKED "NON-INTERNET PUBLIC"

DRAWING – OVERALL SITE PLAN

LOCATION: See Plate 1
COORDINATES: 735561 (North)
3609683 (East)
SURFACE EL.: 5.40'

DEPTH, FT	WATER LEVEL SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH (KIPS PER SQ FT)
				FILL: CLAY, very stiff, brown and gray, with roots and organic material - soft below 2'				38	4.8	89	23	66	
				FILL: CLAY, very soft, gray, with petroleum waste	1.4			45					
				CLAY, soft, gray - with roots to 10'	-0.6			61	2.6				
10				- very soft below 10' - with sand pockets and shell fragments below 10'	-6.6		1						
			3	SAND, very loose to medium dense, gray, fine, with shell fragments - with clay seams below 14'									
20			17										
			1	CLAY, very soft, gray, with sand pockets	-17.6			94					
				SANDY CLAY, very soft, gray	-21.1			32		29	20	9	
30				CLAY, soft, gray - with a shell layer at 33.5'	-26.1								
				- soft, with shell fragments below 38'				64					
40				- with silt pockets below 43'				74					
				- firm below 49'				79					
50				- slickensided below 54'				75		110	24	86	
								71					

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 9, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles/G. Lindsey

Date:
Drawn By:
Date:
Checked By:

LOG OF BORING NO. B-15
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-15a

LOCATION: See Plate 1
COORDINATES: 735561 (North)
3609683 (East)

SURFACE EL.: 5.40'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	- with sand partings, 62' to 72'				74				
70					77				
	- stiff, gray, with silty sand seams and organic material below 72'					3.1			
	- firm, dark brown, with sand pockets at 78'		103		23				
80	SANDY CLAY, firm, gray, with shell fragments and sand pockets	-74.6			25				
	CLAY, firm, gray, with sand pockets and shell fragments	-82.6			50				
90	- stiff below 94'		97		28				
	- with many sand pockets at 94'	-89.6							
	SANDY CLAY, very stiff, light gray and brown				20				
100									
	CLAY, very stiff, light gray and brown, with shell fragments	-101.6			22				
110									
	- with many silt partings at 119'		90		34				

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 9, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles/G. Lindsey

Date
Drawn By
Date
Checked By

LOG OF BORING NO. B-15
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-15b

FUGRO

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: 735561 (North) 3609583 (East) SURFACE EL.: 5.40' STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH (KIPS PER SQ FT)
					CLAY, very stiff, light gray									
130					- pushed tube N/R; drove split spoon - stiff, with silt partings below 130' (pushed w/ spoon)				48					
140					- firm at 139'				57					□
150					- stiff, with sand partings and shell fragments below 148'	-144.6	74		38					□ ●
160														
170														

Shear strength legend: ◻ Penetrometer; ◇ Torvane; △ Field Vane; Unconfined ▼; Triaxial ●; Miniature Vane ▲. Scale: 0.5, 1.0, 1.5, 2.0, 2.5

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 9, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles/G. Lindsey

LOG OF BORING NO. B-15
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-15c

Drawn By: Date
Checked By: Date

FUGRO

LOCATION: See Plate 1
COORDINATES: 737092 (North)
3609877 (East)
SURFACE EL.: 11.22'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
0	FILL: CLAY, stiff, brown - with shell fragments to 4'				39		82	33	49
					57				
	FILL: CLAY, very soft to soft, gray - with sand pockets to 8'	7.2			47				
				96	60		87	31	56
10	- firm at 10'								
	CLAY, very soft to firm, gray - with organic material, 12' to 16' - sandy silt layer, 13' to 14'	-0.8			61				
	- firm at 16' - with ferrous nodules and sand pockets, 16' to 20'				59				
20	- firm at 20'			73	65				
	CLAYEY SAND, gray - with shell fragments, 20' to 22' - with clay pockets, 22' to 24'	-9.8 -12.8							
	SILTY SAND, gray - with clay pockets, 26' to 27'	-15.8							
	CLAY, very soft to firm, gray - with sand pockets, organic material, and shell fragments, 28' to 40'		66		54		84	27	57
30					44				
					45				
40	- with organic material, 40' to 51'				65				
	- firm below 44'				81				
50	- stiff at 50'				62				
	SANDY CLAY, firm to stiff, light gray, with calcareous nodules	-39.8							
	CLAY, brown and gray, with ferrous nodules and calcareous nodules	-42.8 -44.8			35				

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.

DATE: January 14, 2004
TOTAL DEPTH: 56'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 56'
BACKFILL: Cement-Bentonite Grout
LOGGER: J. Phipps

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-16

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-16

FUGRO

LOCATION: See Plate 1
COORDINATES: 736896 (North)
3609404 (East)
SURFACE EL.: 8.34'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					FILL: CLAY, firm, brown, with organic material - with roots to 1'				37		63	17	46
					FILL: SILTY SAND, fine, brown, with clay	4.8							
					FILL: CLAY, very soft to firm, dark gray and gray	3.8			86				
10							55		88		78	21	57
									42				
					SILTY CLAY, soft, gray	-3.7							
					SAND, loose, fine, gray - with clay seams to 16'	-5.7		6					
20				9				9					
					SILTY CLAY, soft, gray	-11.7							
					- with many shell fragments, 24' to 25'				26				
30					CLAY, stiff, tan and gray, with sand pockets	-19.7	97		28		62	17	45
					SILTY CLAY, stiff, brown - with ferrous nodules and streaks to 35'	-24.7			29				
					- with silt partings, 38' to 40'				33				
40							85		37				
					- firm at 45'								
					CLAY, firm to stiff, gray	-39.7			48				
50									52				
									55				

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 85 ft failed at low strain.

DATE: December 15, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 4'
WET ROTARY: 4' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-17

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-17a

FUGRO

LOCATION: See Plate 1
COORDINATES: 736896 (North)
3609404 (East)
SURFACE EL.: 8.34'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %
	SILTY CLAY, firm to stiff, brown, with silt partings	-54.7	87		32
70	CLAYEY SAND, brown	-59.7		32	
	SILTY CLAY, soft to firm, gray, with sand and sand pockets	-64.7			28
	- with shell fragments below 78'				51
80	- stiff at 85'		78		41
90	CLAYEY SILT, gray, with shell fragments	-79.7			
	CLAY, firm to stiff, gray	-84.7			41
100	- light gray and tan, with silt pockets below 98'				24
	SILTY CLAY, firm, gray	-97.7			
110	- with shell fragments and sand pockets, 108' to 110'		102		24
	- stiff with silt partings below 118'				29

CLASSIFICATION: ORGANIC CONTENT, %; LIQUID LIMIT; PLASTIC LIMIT; PLASTICITY INDEX (PI)

SHEAR STRENGTH
□ Penetrometer ◇ Torvane △ Field Vane
Unconfined ▼ Triaxial ● Miniature Vane ▲
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 85 ft failed at low strain.

DATE: December 15, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 4'
WET ROTARY: 4' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-17

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-17b

LOCATION: See Plate 1
COORDINATES: 736896 (North)
3609404 (East)
SURFACE EL.: 8.34'

DEPTH, FT	WATER LEVEL SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	CLASSIFICATION: UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH
				SILTY CLAY, stiff, gray, with silt partings									
					-119.7								
130				CLAY, firm, gray - very stiff at 130'		77		45					3.1●
140								50					
								49					
150					-141.7								
160													
170													

□ Penetrometer ◇ Torvane △ Field Vane
Unconfined ▼ Triaxial ● Miniature Vane ▲
KIPS PER SQ FT: 0.5, 1.0, 1.5, 2.0, 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 85 ft failed at low strain.

DATE: December 15, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 4'
WET ROTARY: 4' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-17

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-17c

FUGRO

LOCATION: See Plate 1
COORDINATES: 736486 (North)
3609360 (East)
SURFACE EL.: 7.13'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					FILL: CLAY, stiff, brown and gray, with organic material								
					-soft, brown and gray below 4'				52		61	17	44
					CLAY, soft to firm, gray, with organic material	1.1			94				
									33				
10							75		50	2			
				1	SANDY CLAY, very soft to soft, gray, with shell fragments	-4.9			63				
					CLAY, soft to firm, gray, with sand partings	-10.9			80		116	26	90
20													
									40		51	16	35
					- very stiff, light gray and brown, 28' to 33'				25				
30													
					- stiff, brown below 33'				30				
					- with silt partings below 38'								
40					- firm, brown and light gray, with silt partings below 40'		89		31		74	19	55
									41				
									46				
50													
					- stiff at 55'		68		54		92	25	67
					SANDY CLAY, firm, gray, with shell fragments	-49.9			34				

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.

DATE: December 16, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

Date:
Drawn By:
Date:
Checked By:

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-18
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-18a

FUGRO

LOCATION: See Plate 1
COORDINATES: 736486 (North)
3609360 (East)
SURFACE EL.: 7.13'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					SANDY CLAY, firm, gray, with shell fragments								
					CLAY, firm, brown, with sand partings	-55.9			41		53	15	38
70					SANDY CLAY, firm, light gray and brown	-60.9			23				
80					CLAY, firm to stiff, gray, with sand partings	-70.9	74		49				
					SANDY CLAY, firm to stiff, gray, with shell fragments	-75.9			29				
90								79	29				
					CLAY, stiff, light gray and brown	-85.9	100		26				
100									28				
					- very stiff with sand partings below 107'				23		46	13	33
110													
					- stiff to very stiff, with silt partings and calcareous nodules below 117'		94		26				

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.

DATE: December 16, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-18

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-18b

LOCATION: See Plate 1
COORDINATES: 736486 (North)
3609360 (East)
SURFACE EL.: 7.13'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
130					CLAY, stiff to very stiff, light gray and brown, with silt partings and calcareous nodules				44				
140							71		50				
150						-142.9			41				
160													
170													

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.

DATE: December 16, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-18

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-18c

LOCATION: See Plate 1
COORDINATES: 735795 (North)
3609284 (East)
SURFACE EL.: 5.71'

DEPTH, FT	WATER LEVEL / SYMBOL / SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
0			FILL: CLAY, stiff to very stiff, brown, with organic material				38				
			- very soft to firm below 4'				82				
			- with many roots and organic material at 4'								
			- with sand pockets and organic material, 6' to 9'				68	4	99	23	76
10			- with sand pockets at 11'				83				
		13	SILTY SAND, loose to medium dense, dark gray, with clay pockets and shell fragments	-5.3		26					
		8									
			SANDY CLAY, soft, gray, with fine sand pockets	-10.3			69				
20											
			- with many fine sand pockets at 24'				31		27	19	8
			- very soft, 24' to 25'								
			- with shell fragments below 26'				48				
30			- with sand pockets at 29'								
							78				
40			- firm at 39'								
							81				
			- with sand pockets at 48'								
50							73				
							41				

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial samples at 85 ft and 130 ft failed at low strain.

DATE: December 12, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

Date:
Drawn By:
Date:
Checked By:

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-19

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-19a

FUGRO

LOCATION: See Plate 1
COORDINATES: 735795 (North)
3609284 (East)
SURFACE EL.: 5.71'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH (KIPS PER SQ FT)
	- with a few silt seams at 59'									
	- stiff below 59'									
	- light gray, with many shell fragments below 63'		105		23		31	15	16	
	- firm from 63' to 65'									
70	- light brown, with sand seams and calcareous nodules below 69'									
	CLAY, firm to stiff, brown and gray, with sand pockets ans seams	-67.3			30					
	- with sand partings and organic material at 79'				45					
80										
	- with sand pockets at 84'		100		25					3.0
	- gray, with sand partings and shell fragments at 88'				49					
90										
	- with silty sand pockets and organic material below 94'				25					
	SANDY CLAY, very stiff, brown and gray	-90.3	110		20					
100										
	CLAY, very stiff, brown and gray, with many sand pockets	-99.3			21					
110										
	- with silt partings below 119'									

SHEAR STRENGTH: ☐ Penetrometer ▼ Unconfined; ◇ Torvane ● Triaxial; △ Field Vane ▲ Miniature Vane

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial samples at 85 ft and 130 ft failed at low strain.

DATE: December 12, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-19

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-19b

LOCATION: See Plate 1
COORDINATES: 735795 (North)
3609284 (East)
SURFACE EL.: 5.71'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
0	CLAY, very stiff, brown and gray								
130	- stiff, gray, with sand pockets below 128'		73		50				
140									
150	- with shell fragments below 148'	-144.3			46				
160									
170									

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial samples at 85 ft and 130 ft failed at low strain.

DATE: December 12, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: G. Lindsey

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\104150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-19

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-19c

LOCATION: See Plate 1
COORDINATES: 735698 (North)
3610183 (East)
SURFACE EL.: 6.93'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	BLOWS PER FOOT	SAMPLES	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FILL: CLAY, stiff to very stiff, brown - with roots to 0.5' - brown and gray below 2'						48		84	22	62
	FILL: SANDY SILT, gray, with clay pockets	2.9									
	FILL: CLAY, very soft, dark gray	0.9					90				
10	FILL: CLAY, stiff, dark gray, with roots and organic material	-1.1					28	3	45	13	32
	SILTY SAND, very loose, dark gray, fine	-4.6	3			32					
20	SILTY CLAY, firm, dark gray	-11.1									
	CLAY, firm, dark gray	-16.1			54		81 78				
30	SILTY SAND, loose, gray - with clay below 28.5'	-20.1	6			36					
	SILTY CLAY, soft to firm, gray - with sand and shell fragments below 34'	-24.6			78		45				
40	CLAY, soft, gray - with shell fragments below 39'	-31.1					31				
	SILTY CLAY, very soft to firm, gray - with organic pockets below 43'	-36.1			59		67				
50							64	5			
							69				
					54		81				

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 25, 60 and 150 ft failed across soft spots.

DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-20

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-20a

LOCATION: See Plate 1
COORDINATES: 735698 (North)
3610183 (East)
SURFACE EL.: 6.93'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					SILTY CLAY, very soft to firm, gray								
					- with fine sand pockets below 64'				77				
70									80				
							57		70				
					CLAY, stiff, tan and light gray	-69.1							
					- very calcareous, 78' to 79'				21				
80					- with calcareous nodules below 78'								
					- very stiff at 80'								
					- with silt pockets below 83'		89		33				
					SILTY CLAY, firm to stiff, gray and brown	-81.1			33				
90					- with a clayey silt seam, 88.5' to 89'								
					- gray below 93'				30				
					- with sand seams, 96.5' to 97.5'								
100							100		24				
					- with sand seams, 104' to 104.5'								
						-101.6							
110			X	8	SILTY SAND, loose, fine, gray, with shell fragments	-103.1		44					
					CLAY, stiff, gray								
					- with silt partings and organic material below 118'	-112.1	92		31				

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 25, 60 and 150 ft failed across soft spots.

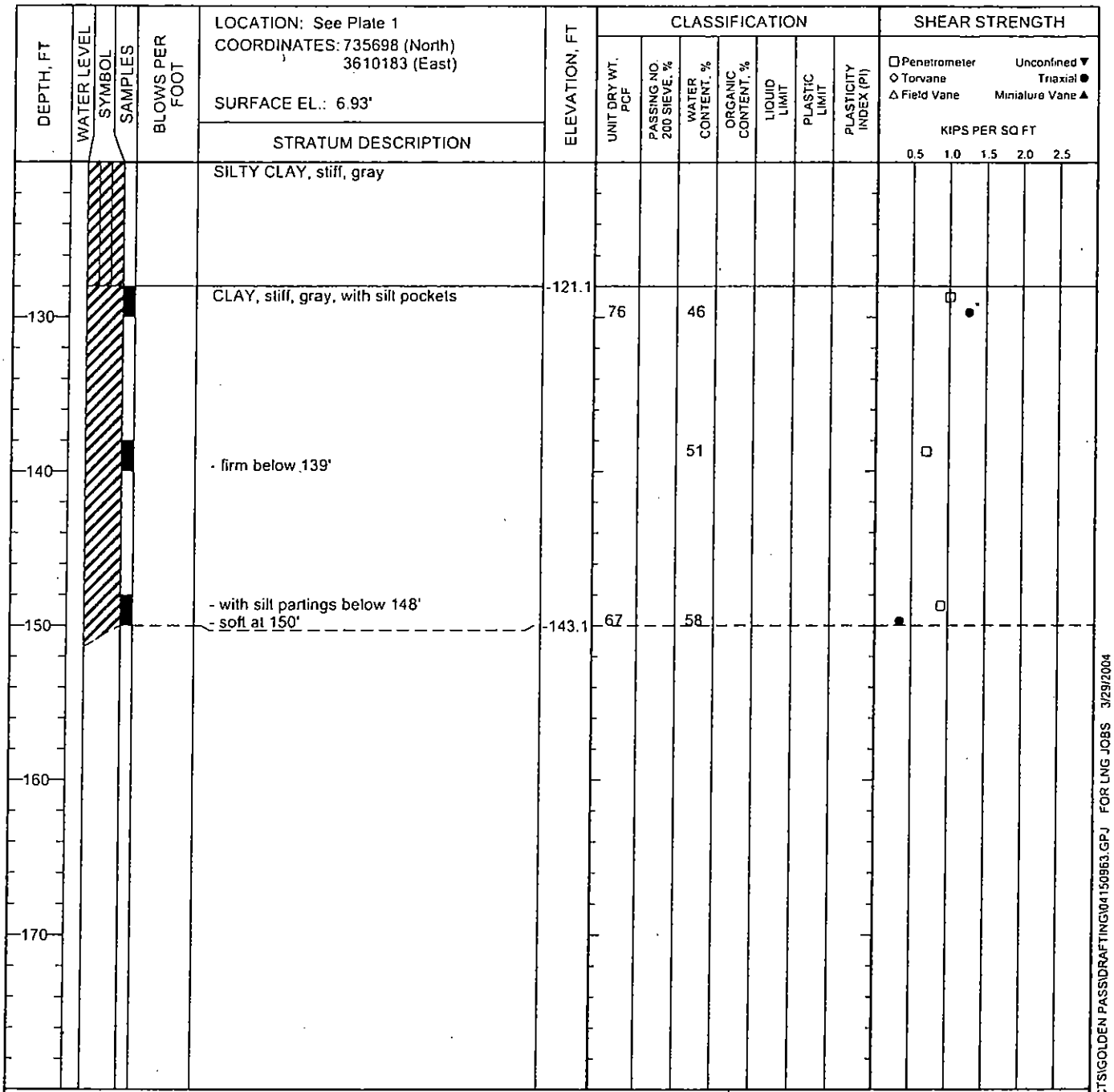
DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-20

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-20b



NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 25, 60 and 150 ft failed across soft spots.

DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\0415O963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-20

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-20c

FUGRO

LOCATION: See Plate 1
COORDINATES: 736373 (North)
3610257 (East)
SURFACE EL.: 7.42'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	BLOWS PER FOOT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FILL: SILTY CLAY, firm, gray, with organic material	5.9								
	FILL: CLAY, soft, gray, with silt pockets									
	- dark gray and gray, with odor below 4'					59		76	20	56
	- very soft below 6'					78				
	CLAY, firm, gray, with roots	-0.6								
10	- soft, with silt pockets below 10'					66		72	17	55
	- very soft, with sand pockets below 12'					68				
	SILTY SAND, loose, fine, gray - pushed tube N/R; pushed spoon	-6.6								
20	- with clay seams and shell fragments below 18'		10		21					
	CLAY, soft, gray	-15.6	3			49		89	21	68
	- with sand seams to 30'									
	- with shell fragments and sand pockets, 28' to 38'					38				
30				92		31				
						40				
	- with organic material below 38'						4			
40				60		67				
	- firm below 43'					92				
						103				
50	- very organic below 53'			51		79	19			
	SILTY CLAY, soft, gray, with roots	-50.6				28				

SHEAR STRENGTH
□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane
KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. ▽: Water First Noticed. ▼: Depth To Water after 30 minutes.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 8'
WET ROTARY: 8' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-21

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-21a

FUGRO

LOCATION: See Plate 1
COORDINATES: 736373 (North)
3610257 (East)
SURFACE EL.: 7.42'

DEPTH, FT	STRATUM DESCRIPTION	BLOWS PER FOOT	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH (KIPS PER SQ FT)
	SILTY CLAY, soft, gray										
	SANDY CLAY, stiff, gray and tan, with calcareous nodules		-58.6			17					
70	- pushed tube N/R; pushed spoon										
	SILTY SAND, medium dense, brown and gray, with silty clay pockets	28	-64.1		49						
	CLAY, stiff, brown and gray, slickensided	13	-70.6			37					
80	CLAY, stiff, brown and gray										
	CLAYEY SAND, loose, gray	6	-73.6		39						
	CLAY, firm, gray, with shell fragments, silty sand seams, and silty sand pockets	4	-80.1			43					
90	- pushed tube N/R; pushed spoon					38					
	- stiff, brown and gray, with sand pockets at 96'										
100	- stiff to very stiff from 96' to 105'			110		20					3.9 ●
	- firm at 105'					22					
110	- with calcareous nodules at 108'										
	- with silt pockets below 108'										
	- very stiff, with silt seams below 111'			91		32					3.2 ●

Penetrometer ▼ Unconfined
Torvane ◆ Triaxial ●
Field Vane △ Miniature Vane ▲

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. ▽: Water First Noticed. ▼: Depth To Water after 30 minutes.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 8'
WET ROTARY: 8' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-21

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-21b

LOCATION: See Plate 1
COORDINATES: 736373 (North)
3610257 (East)
SURFACE EL.: 7.42'

DEPTH, FT	WATER LEVEL SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
				CLAY, firm, brown and gray								
				- gray below 126'				45				
130												
						71		52				
140												
								54				
150					-142.6							
160												
170												

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:
1. ▽: Water First Noticed. ▼: Depth To Water after 30 minutes.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 120 ft failed at low strain.

DATE: December 6, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: 0' to 8'
WET ROTARY: 8' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: T. Mireles

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-21

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-21c

LOCATION: See Plate 1
COORDINATES: 736929 (North)
3610317 (East)
SURFACE EL.: 11.40'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	SHEAR STRENGTH (KIPS PER SQ FT)
	FILL: CLAY, stiff to very stiff, brown, with organic material									
	- with gravel and shell fragments below 2'									
	- soft, brown and light gray, with sand pockets below 4'				29	2	42	14	28	
	FILL: CLAY, soft, dark gray, with sand and shell fragments	5.4			64		86	21	65	
10	- with small roots at 10'									
	- with silty sand seams, 10.5' to 11.5'	-0.1			33					
	CLAY, soft, dark gray				35					
	- gray, with organic pockets and shell fragments below 12'		80		40					
	- with many shell fragments at 15'									
20	SILTY SAND, gray, with shell fragments	-7.6			26					
	CLAY, firm, gray	-9.6			59		73	19	54	
	- soft at 28'				39					
	- with sand seams below 28'									
30	- with a shell fragment seam at 29'									
	- light gray and tan below 31'				26					
	- firm below 34'		98		25					
	- brown and gray, with silt partings below 38'				27					
40	- stiff below 39'									
	- brown, 43' to 48'									
	- with clayey silt seams at 45'		94		30					
	SILTY SAND, brown and gray	-36.6								
50	- with clay seams below 48'									
	SILTY CLAY, firm to stiff, gray	-39.6								
			75		47					
					52					

Penetrometer ▼ Unconfined
Torvane ● Triaxial
Field Vane ▲ Miniature Vane

KIPS PER SQ FT: 0.5 1.0 1.5 2.0 2.5

3.8

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 95 and 110 ft failed at low strain.

DATE: December 5, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-22

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-22a

FUGRO

LOCATION: See Plate 1
COORDINATES: 736929 (North)
3610317 (East)
SURFACE EL.: 11.40'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	ELEVATION, FT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					SILTY CLAY, firm to stiff, gray				35				
70					- brown below 68'		85		37				
					SANDY CLAY, very stiff, light gray and tan - with calcareous nodules below 73'	-61.6			19				
80					SILTY SAND, brown and light gray - with clay below 78'	-66.6		46					
					CLAY, stiff, gray - with silt pockets below 83' - with silt partings, 83' to 84'	-71.6	81		39				
90					CLAYEY SILT, gray - with sand below 88' - with clay seams at 90'	-76.6							
					CLAY, stiff, gray - with silt partings below 93'	-81.6	76		46 24				
100													
					SILTY CLAY, stiff to very stiff, light gray and brown - with calcareous nodules below 108'	-93.6	100		25				
110					- gray below 118' - with silt partings below 119' - with a clayey silt seam at 120'				29				

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 95 and 110 ft failed at low strain.

DATE: December 5, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

Q:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\0415096 3.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-22

LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-22b

FUGRO

LOCATION: See Plate 1
COORDINATES: 736929 (North)
3610317 (East)
SURFACE EL.: 11.40'

DEPTH, FT	STRATUM DESCRIPTION	ELEVATION, FT	BLOWS PER FOOT	UNIT DRY WT. PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	ORGANIC CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	SILTY CLAY, stiff to very stiff, gray									
		-116.6								
130	CLAY, stiff, gray			82		39				
140	- firm below 139'					49				
		-136.6								
150	SILTY SAND, medium dense, gray - with shell fragments below 148.5'	-138.6	26							
160										
170										

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Field Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

Date:
Drawn By:
Date:
Checked By:

NOTES:

1. Depth-to-water not measured during drilling.
2. Terms and symbols defined on Plate A-41.
3. Boring coordinates based on NAD 27, Texas State Plane coordinate datum. Elevations based on NGVD 29.
4. * Triaxial sample at 95 and 110 ft failed at low strain.

DATE: December 5, 2003
TOTAL DEPTH: 150'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 150'
BACKFILL: Cement-Bentonite Grout
LOGGER: L. Baker

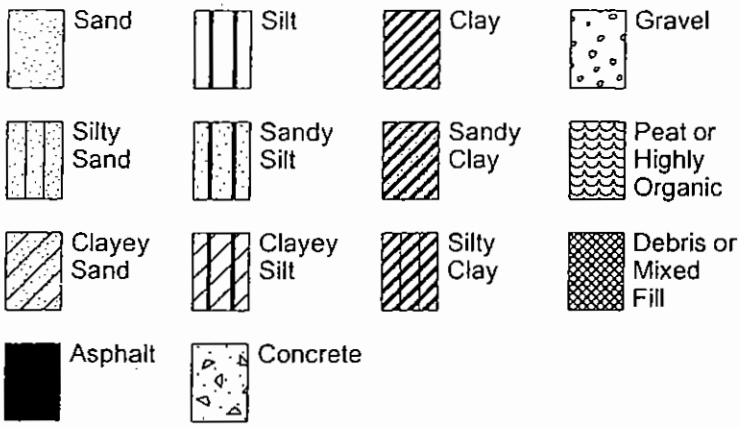
O:\EXXONMOBIL LNG PROJECTS\GOLDEN PASS\DRAFTING\04150963.GPJ FOR LNG JOBS 3/29/2004

LOG OF BORING NO. B-22

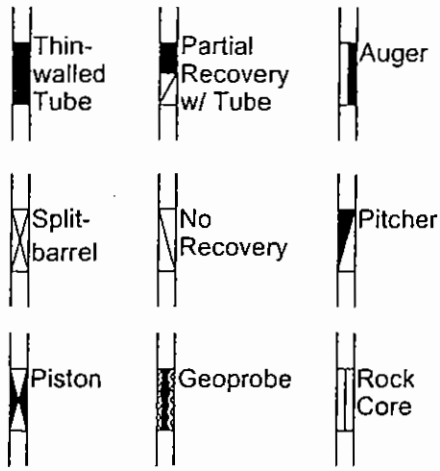
LNG PROCESS AREA, MARINE AREA, AND PERIMETER DIKES
EXXONMOBIL DEVELOPMENT COMPANY
GOLDEN PASS, SABINE, TEXAS

PLATE A-22c

SOIL TYPES

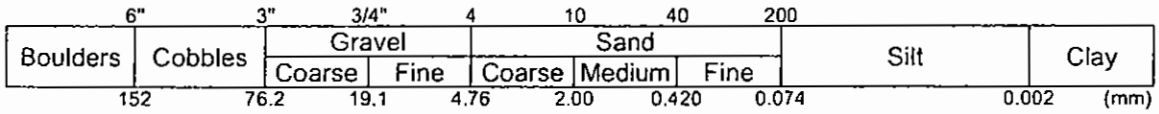


SAMPLER TYPES

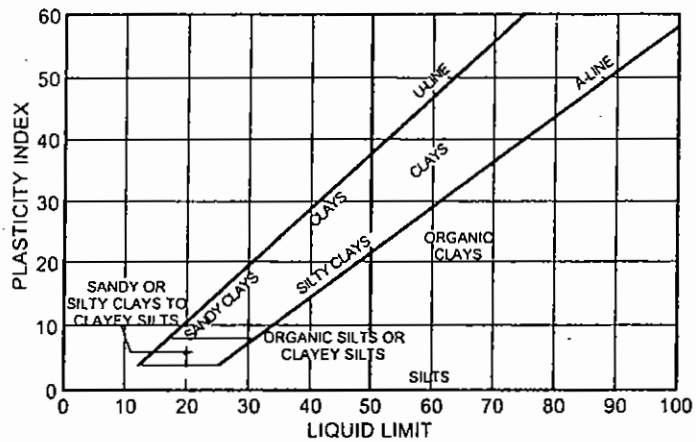


SOIL GRAIN SIZE

U.S. Standard Sieve



PLASTICITY CHART



SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (1 of 2)

PLATE A-41a

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.
WOH	Weight of Hammer drove sampler 12 inches, without driving spoon.
WOR	Weight of Rod drove sampler 12 inches, without attaching hammer.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

DENSITY OF GRANULAR SOILS

Descriptive Term	*Relative Density, %	**Blows Per Foot (SPT)
Very Loose	< 15	0 to 4
Loose	15 to 35	5 to 10
Medium Dense	35 to 65	11 to 30
Dense	65 to 85	31 to 50
Very Dense	> 85	> 50

*Estimated from sampler driving record.

**Requires correction for depth, groundwater level, and grain size.

STRENGTH OF COHESIVE SOILS

Term	Undrained Shear Strength, ksf	Blows Per Foot (SPT) (approximate)
Very Soft	< 0.25	0 to 2
Soft	0.25 to 0.50	2 to 4
Firm	0.50 to 1.00	4 to 8
Stiff	1.00 to 2.00	8 to 16
Very Stiff	2.00 to 4.00	16 to 32
Hard	> 4.00	> 32

SHEAR STRENGTH TEST METHOD

U - Unconfined Q = Unconsolidated - Undrained Triaxial

P = Pocket Penetrometer T = Torvane V = Miniature Vane F = Field Vane

HAND PENETROMETER CORRECTION

Our experience has shown that the hand penetrometer generally overestimates the in-situ undrained shear strength of over consolidated Pleistocene Gulf Coast clays. These strengths are partially controlled by the presence of macroscopic soil defects such as slickensides, which generally do not influence smaller scale tests like the hand penetrometer. Based on our experience, we have adjusted these field estimates of the undrained shear strength of natural, overconsolidated Pleistocene Gulf Coast soils by multiplying the measured penetrometer reading by a factor of 0.6. These adjusted strength estimates are recorded in the "Shear Strength" column on the boring logs. Except as described in the text, we have not adjusted estimates of the undrained shear strength for projects located outside of the Pleistocene Gulf Coast formations.

Information on each boring log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the time and places indicated, and can vary with time, geologic condition, or construction activity.

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (2 of 2)